Washington State Regional Haze State Implementation Plan

Appendix A

Western Regional Air Partnership Consultation Process

WRAP Consultation Process
Through October 11, 2007

Prepared by WRAP Staff
October 2007

INTRODUCTION and BACKGROUND

Section 308 of 40CFR Part 51, the regional haze rule, calls for consultations among states where there are cross-state impacts of haze producing emissions to ensure states are aware of and agree to each other's reasonable progress goals and long-term strategies. The rule also provides for consultations with federal land management agencies that have jurisdiction over federal mandatory Class areas, specifically calling out for: Notification of FLMs 60 days prior to public hearings; Addressing comments from FLMs in each SIP, Ongoing consultation as SIPs are implemented, reviewed and revised. The rule encourages states and tribes to utilize regional planning processes to facilitate the consultation requirement.

The WRAP participants have, over the years used the WRAP process to maximize the opportunity for consultation among states, between states and tribes, land management agencies and stakeholders. The regional haze rule provides for specific points of consultation and outlines general procedures for meeting the requirement, to achieve appropriate consistencies and allow opportunities for formal comment and response.

The purpose of this document is to gather in one place a consolidated list of each forum, committee and workgroup, its purpose, membership, significant work products and meetings recorded and posted on the WRAP webpage. Although there have been many more meetings and conference calls than are documented here, this list demonstrates the extent of consultation among the WRAP partners and stakeholders for the last eight years. All of the material contained here is taken from the WRAP website at: www.wrapair.org . The electronic version of this document contains hyperlinks to various pages on the WRAP website.

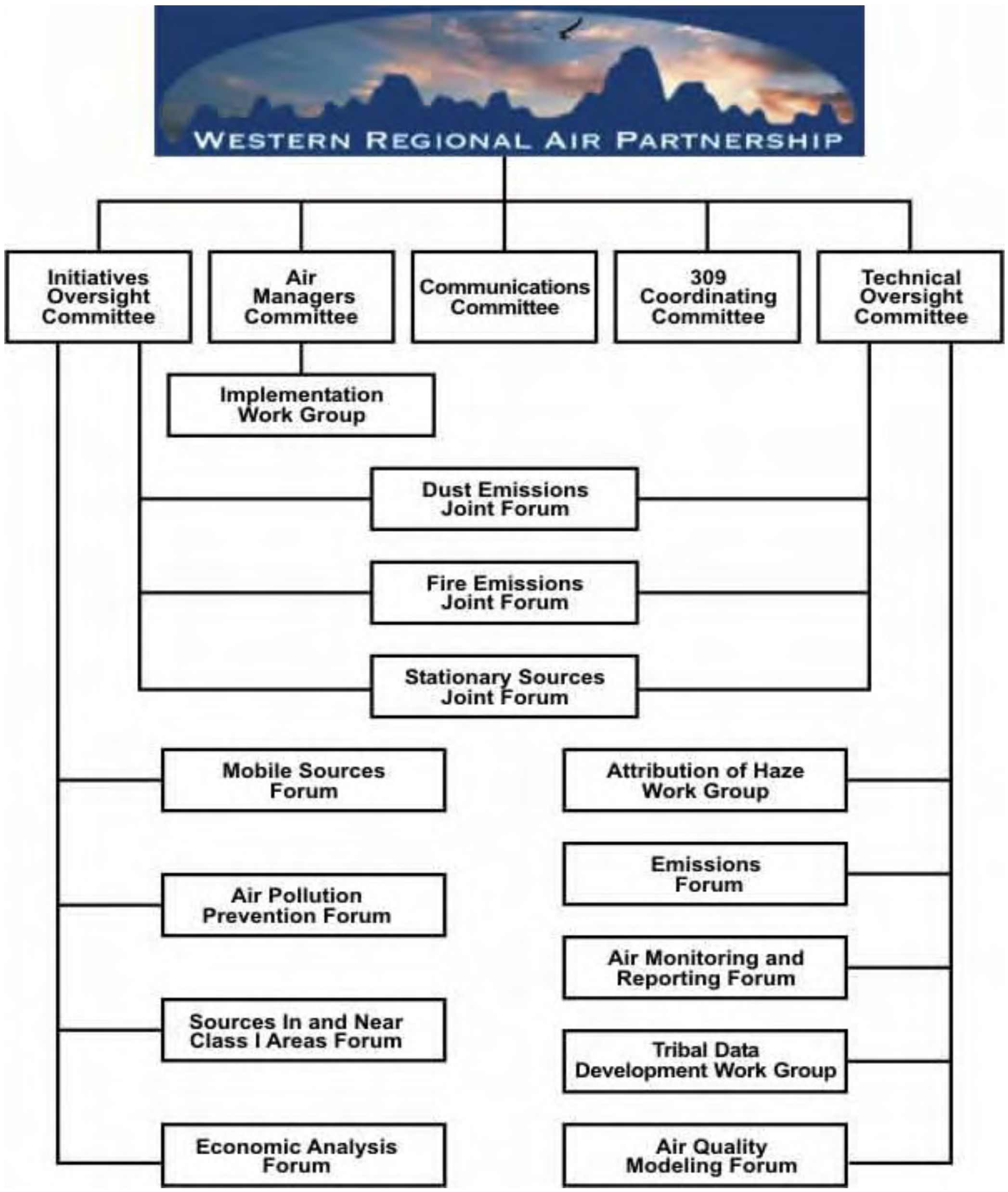
WRAP MEMBERSHIP and ORGANIZATIONAL DESCRIPTION

Members

The Western Regional Partnership (WRAP) was formed in 1997 as a regional planning organization to support states and tribes in preparing and implementing regional haze plans. The WRAP is a partnership among states, tribes, FLMs and EPA, with participation of stakeholders.

The WRAP membership, reflected in the Board of Directors, is organized to maximize decision making through consensus and consultation. The Board is co-chaired by a state and a tribal governor and has as board members a designated representative from each state and an equal number of representatives from tribes, EPA, and each federal land management agency with at least one federal Class I area. Stakeholder input is achieved through participation on forums that focus on technical and policy issues related to requirements of the Regional Haze Rule. Lists of selected work products are provided for each forum and committee below.

WRAP Organizational Chart



WRAP COMMITTEES, FORUMS, and WORKGROUPS

309 Coordinating Committee

Purpose
To facilitate ongoing communications among the 309 jurisdictions and to facilitate implementation of the plans, including but not limited to the tracking of renewable energy and energy efficiency use and programs and the tracking of emissions for the SO2 backstop program, clean air corridors, and fires.

Membership
Members
Technical and planning staff from the four states of AZ, NM, UT, WY and Bernalillo County, NM that submitted regional haze SIPs in 2003

Significant Work Products
Major Projects:

- Western Backstop SO2 Trading Program Model Rule (08/13/03) PDF
- Western Backstop SO2 Trading Program Model Rule Supplement (08/13/03) PDF
- Model SIP/TIP for the Western Backstop SO2 Trading Program (08/13/03) DOC
- Final Draft 309 SIP Template, not including the Western Backstop SO2 Trading Program (07/10/03) DOC
- Technical Support Document PDF (6.9 mb)
- More Complete list of SIP- related documents 309 Material
- (Insert more recent SO2 milestones, supporting the 2007 re-submittals of 309 plans)

Meetings
2004 Events:

- 05/24/04 Call to Coordinate Pre-Trigger SO2 Reporting and Milestone Comparisons PDF or DOC
- 02/05/04 309 Conference Call Notes PDF or DOC

Air Managers Committee

Purpose
To provide air managers with a forum for discussing WRAP related matters of concern to them. These matters may cover a spectrum of air quality issues. The Committee also provides a mechanism for communication and guidance to the technical and policy forums as to what air managers believe is needed to support their regional planning efforts.

Membership

Members

Air program directors of all WRAP states and tribes, federal land management agencies, EPA

Major Projects:

- Implementation Work Group
- 309 STIP-II Work Group
- RA BART Guidelines
- RA BART Case Studies
- 308 SIP Templates

Meetings

2007 Events:

- 08/28/07 AMC Meeting, Denver, CO

2006 Events:

- 05/08/06 AMC Conference Call Notes PDF or DOC

2005 Events:

- 02/18/05 Air Managers Committee Conference Call
  - Call Notes PDF or DOC
  - Proposed AMC 2006 Workplan Narrative PDF or DOC

2004 Events:

- 07/06/04 AMC State Caucus Call
- 04/14/04 AMC Call
- 01/12/04 AMC Call

2003 Events:

- 11/19/03 308 Planning Group Meeting, Phoenix, AZ
  - Agenda PDF or DOC
- 06/25/03 AMC Call (Notes: PDF)
- 03/19/03 WRAP Forums and Planning Team Meeting, Santa Fe, NM
  - AMC Meeting Notes DOC
  - AMC Meeting Agenda PDF

2002 Events:

- 11/26/02 AMC Call Notes DOC

- 09/04/02 Air Managers Committee Meeting, Santa Fe, NM
- 05/23/02 Air Managers Committee Meeting, Salt Lake City, UT
- 04/15/02 Air Managers Committee/WESTAR Meeting Minutes, Incline Village, NV PDF

2001 Events:

- 09/27/01 Northern Air Managers Committee Meeting Minutes, Portland, OR PDF
- 07/10/01 Northern Air Managers Conference Call Document DOC

2000 Events:

- 05/09/00 Northern Air Managers Committee Meeting Presentation, Phoenix, AZ PDF
- 05/03/00 Northern Air Managers Conference Call Minutes
- 02/14/00 Northern Air Managers Conference Call Minutes

Implementation Work Group

Purpose
Formed under direction of the Air Managers Committee in 2004, to help states and tribes prepare their haze implementation plans on a regional scale to meet the requirements of 40 CFR 51.308 and 401 CFR 51.309(g); To ensure common agreements and consensus among states and tribes on planning approaches, use of regional data and analysis tools developed by the WRAP, and otherwise meet the consultation requirements of the Regional Haze Rule

Membership
Members
Technical planning staffs of states and tribes, plan review staff of federal land management agencies, EPA.

Significant Work Products (partial list-for complete list go to)
http://www.wrapair.org/forums/iwg/docs.html

- WRAP Technical Status Report PDF or DOC (6/8/07)
- EPA Checklist for Regional Haze SIPs (08/04/06) DOC or PDF
- State/Tribal Timelines, periodic updates (See webpage)
- Class I Area Profiles - Draft Profile Template (July 2006) DOC
- Draft 308 Regional Haze SIP Template (06/02/06) DOC
- WRAP BART Clearinghouse (Updated 08/31/07) XLS
- WRAP RFP: "Analysis of Regional Haze State and Federal Implementation Plans for Tribal Implications/Issues" (09/15/06) PDF
- FLM Recommendations on SIP Contents and Consultations (08/01/06) PDF
- WRAP Comments on Draft EPA Guidance (08/07/06) DOC or PDF

- Sample Contribution Matrix for Supporting the Consultation Process (06/15/06) PPT
- Western Regional Haze State Implementation Plans, State & Federal Protocol PDF or DOC
- Draft EPA Guidance on Consultation (06/20/06) DOC
- Clearview Newsletters (Regional Haze/WRAP Activity Update – See webpage above)

Meetings
2007 Events (as of August, 2007):

- 08/29/07 IWG Meeting, Denver, CO
- 05/15/07 IWG Conference Call
- 04/17/07 IWG Meeting, San Diego, CA
- 04/13/07 TSS Demonstrating Reasonable Progress Training Call
- 03/15/07 IWG Conference Call
- 02/15/07 IWG Conference Call
  - Notes PDF or DOC
- 02/15/07 TSS Training for SIP Planners Call
- 01/25/07 IWG Conference Call

2006 Events:

- 12/21/06 IWG Conference Call Notes PDF or DOC
- 12/06/06 IWG Meeting, Santa Fe, NM
- 11/16/06 IWG Conference Call
- 10/26/06 IWG Conference Call
- 09/21/06 IWG Conference Call
- 08/29/06 IWG Meeting, Portland, OR
- 08/21/06 IWG Conference Call
- 08/02/06 IWG Special Conference Call
- 07/20/06 IWG Conference Call
- 06/15/06 IWG Conference Call
- 05/24/06 IWG Meeting, Sacramento CA
- 05/18/06 IWG Conference Call
- 04/20/06 IWG Conference Call
- 03/16/06 IWG Conference Call
- Draft IWG 5/24-25 Agenda PDF or DOC
  - Call Notes PDF or DOC
- 02/16/06 IWG Conference Call
- 01/19/06 IWG Conference Call

2005 Events:

- 12/15/05 IWG Conference Call

- 10/13/05 IWG Conference Call
- 09/29/05 IWG Conference Call
  - Agenda: PDF or DOC
- 08/29/05 IWG Meeting, Portland, OR
  - Agenda: PDF or DOC
  - Meeting Notes: PDF or DOC
- 08/18/05 IWG Conference Call
- 07/21/05 IWG Conference Call
- 06/16/05 IWG Conference Call
- 05/19/05 IWG Conference Call
  - Agenda: PDF or DOC
  - Call Notes: PDF or DOC
- 04/21/05 IWG Conference Call
- 03/17/05 IWG Conference Call
  - Agenda PDF or DOC
  - Meeting Notes PDF or DOC
- 03/08/05 IWG Meeting, San Francisco, CA
  - Agenda PDF or DOC
  - Meeting Notes PDF or DOC
    - Presentation of Draft Phase I Attribution of Haze Report PDF or PPT
    - Update on the CO SIP Process and Outcomes PDF or PPT
    - Process Timeline PDF or DOC
    - Attribution of Haze: What Are the Pieces and How Do They Fit? PDF or PPT
    - Nevada Attribution of Haze Case Study PDF or PPT *Use of Attribution of Haze Report for preliminary analysis of Jarbidge Wilderness Area in Nevada*
    - Presentation: Glacier NP Attribution of Haze Case Study PDF or PPT *Use of Attribution of Haze Report for preliminary analysis of Glacier National Park in Montana*
    - 308 Template Table of Contents PDF or DOC *Working draft Table of Contents for prototype 308 SIP/TIP-Writers of first drafts identified*
- 02/17/05 IWG Conference Call
  - Call Notes PDF or DOC
- 01/20/05 IWG Conference Call

2004 Events:

- 12/14/04 IWG Meeting, Tempe, AZ
  - Agenda PDF or DOC
    - DRAFT 308 Regional Haze SIP/TIP Relationship Table Work Products to Road Map, Sorted by Road Map PDF or DOC

        - DRAFT 308 Regional Haze SIP/TIP Relationship Table Work Products to Road Map, Alpha Sorted by Work Product Code PDF or DOC
        - 308 SIP Development – A Resource Matrix for SIP Preparers PDF or DOC
        - DRAFT Road Map (as of 4/22/04) Regional Haze State Implementation Plan
          Under Section 309(g) of the Regional Haze Rule PDF or DOC
        - DRAFT Master Key for Road Map, Relationship Table, and Matrix PDF or DOC
        - DRAFT 308 Regional Haze SIP/TIP Development Road Map PDF or PPT
        - Roadmap/Resource Matrix Guide PDF or PPT
- 10/28/04 IWG Conference Call
- 09/16/04 IWG Conference Call
    - Call Notes PDF or DOC
        - 2005 Workplan SIP Schedule PDF or XLS
        - 2004 Closeout and 2005 Deliverables Table PDF or DOC
        - 308 Regional Haze SIP Development Road Map (Draft) PDF or PPT
- 07/07/04 IWG Conference Call
- 05/27/04 IWG Conference Call (Notes: PDF or DOC)
- 04/29/04 IWG Conference Call (Notes: PDF or DOC)
- 03/23/04 308/309(g) IWG Meeting, Santa Fe, NM

Communications Committee

Purpose
Facilitate the exchange of information between the standing committees and forums of the WRAP, and is also charged with developing materials that help the general public understand the WRAP process and take part in its decision making. Some of the products of the Communications Committee have included outreach materials to encourage direct participation, the development of internal and external communications plans and the construction of this Web site.

Membership
Members
Representatives from states, tribes, FLMs and EPA who are specialists in public information and communication

Major Projects
- Communications Manual PDF or DOC
- Fact Sheets & Handouts
    - WRAP Fact Sheet HTML, PDF or DOC
    - NTEC/WRAP Fact Sheet PDF or WPD
    - Committees and Forums Fact Sheet (April 2004) HTML, PDF or DOC

  - WRAP Participation: Commitments and Benefits PDF or DOC
  - Interest/Sign-up Form PDF or DOC
  - Air Pollution Prevention Forum: Energy Efficiency Flier PDF
  - Fire Emissions Joint Forum Flyer: Smoke Impacts on Regional Haze (June 2003) PDF
  - Tribal Data Development Work Group Fact Sheet PDF or DOC
- Kid's Corner
- Presentation Resources
- Web Site Resources

Meetings
2006 Events:

- 06/30/06 Committee Call Minutes PDF or DOC
- 04/03/06 Committee Meeting, Salt Lake City, UT
  - Agenda PDF or DOC
  - Website Statistics Update PDF or DOC
  - Green Tag Presentation PDF or DOC

2005 Events:

- 09/27/05 Committee Meeting, Missoula, MT
  - Meeting Notes PDF or DOC
  - Agenda PDF or DOC
    - Draft Strategic Plan PDF or DOC
    - WRAP Web Site Statistics Update (09/15/05) PDF or DOC
- 05/16/05 Committee Meeting, Phoenix, AZ
  - Meeting Notes PDF or DOC
  - Agenda PDF or DOC
    - Attendees PDF or DOC
    - 2003-05 WRAP Web Statistics PDF or DOC

2004 Events:

- 12/06/04 Committee Meeting, San Francisco, CA
- 04/07/04 Committee Meeting, Tempe, AZ
  - Agenda PDF or DOC
  - Meeting Notes PDF or DOC

2003 Events:

- 10/13/03 Committee Meeting, Salt Lake City, UT
  - Agenda PDF or DOC
  - Meeting Notes PDF or DOC
- 04/01/03 Committee Meeting, Portland, OR PDF or DOC

2002 Events:

- 12/12/02 Committee Meeting, San Francisco, CA
- 07/22/02 Committee Meeting, Denver, CO
- 07/05/02 Subcommittee on Outreach Call Minutes PDF
- 04/04/02 Committee Conference Call Minutes DOC

2001 Events:

- 11/13/01 Committee Meeting, DOC Salt Lake City, UT
- 07/24/01 TOC Team Call Minutes DOC
- 06/22/01 TOC Team Call Minutes DOC
- 05/22/01 Committee Meeting Minutes, DOC Albuquerque, NM
- 02/06/01 Committee Conference Call Minutes

2000 Events:

- 09/26/00 Committee Meeting Minutes, Sacramento, CA
- 09/14/00 Speaker's Bureau Conference Call Minutes
- 09/07/00 Committee Conference Call Minutes
- 08/10/00 Committee Meeting Minutes, Seattle Washington
- 07/26/00 Committee Conference Call Minutes
- 07/18/00 Committee Conference Call Minutes
- 06/14/00 Committee Conference Call Minutes
- 06/06/00 Committee Conference Call Minutes
- 05/30/00 Committee Conference Call Minutes
- 05/24/00 Committee Conference Call Minutes
- 05/17/00 Committee Conference Call Minutes
- 05/08/00 Committee Meeting Minutes, Tempe, AZ
- 01/06/00 Committee Conference Call Minutes

1999 Events:

- 09/17/99 Committee Meeting Minutes, Salt Lake City, UT
- 08/12/99 Committee Conference Call Minutes
- 06/17/99 Committee Meeting Minutes, Seattle, WA
- 05/06/99 Committee Meeting Minutes, Denver, CO

Planning Team

Purpose

As needed to address long-term planning and administrative issues, such as annual WRAP work plans and the WRAP strategic plan. Some of the functions performed by the

Planning Team were previous performed by the Coordinating Group, which no longer exists. A record of Coordinating Group activities can be found on the Meetings & Calls page of the Planning Team portion of this website

Membership
Members
Co-chairs of all WRAP forums, the co-chairs of the Air Managers Committee, the co-chairs of the Communications Committee, and all members of the Initiatives Oversight and Technical Oversight Committees.

Significant Work Products
- WRAP Work Plan Update for 2005-2007 (05/05/05) PDF or DOC
- WRAP 2005 Work Plan (12/07/04) PDF or DOC
- WRAP 2004 Work Plan (10/14/03) PDF or DOC
- WRAP Strategic Plan 2003-2008 (09/29/03) PDF or DOC
- WRAP 2003 Work Plan (11/12/02) PDF or DOC

Other Major Projects
- Strategic Planning Work Group

Meetings
2006 Events:

- 02/22/06 Planning Team Meeting, Salt Lake City, UT

2005 Events:

- 03/09/05 Planning Team Meeting, San Francisco, CA

2004 Events:

- 07/20/04 Planning Team Meeting, Denver, CO
    - Agenda PDF or DOC
        - Individual Work Plans Available as of July 13 PDF or DOC
        - 2004 Financial Status and 2005 Proposed Projects XLS or PDF
        - 2004 Work Plan PDF
        - Strategic Plan PDF

2003 Events:

- 08/13/03 Planning Team Meeting, Denver, CO
- 03/18/03 WRAP Forums and Planning Team Meeting, Santa Fe, NM

2002 Events:

- 10/07/02 Planning Team Meeting, Tempe, AZ

- 07/25/02 Planning Team Meeting, Denver, CO

2001 Events:

- 09/05/01 Planning Team Meeting, Seattle, WA

2000 Events:

- 07/17/00 Coordinating Group Meeting Minutes, Denver, CO
- 06/05/00 Group Conference Call Minutes
- 03/29/00 Coordinating Group Meeting Minutes, Salt Lake City, UT

1999 Events:

- 11/01/99 Coordinating Group Meeting Minutes, Salt Lake City, UT
- 10/27/99 Group Conference Call Minutes
- 10/20/99 Group Conference Call Minutes
- 10/07/99 Group Conference Call Minutes
- 09/29/99 Group Conference Call Minutes
- 09/22/99 Group Conference Call Minutes
- 09/16/99 Coordinating Group Meeting Minutes, Salt Lake City, UT
- 09/08/99 Group Conference Call Minutes
- 09/01/99 Group Conference Call Minutes
- 07/20/99 Coordinating Group Meeting Minutes, Salt Lake City, UT
- 06/16/99 Coordinating Group Meeting Minutes, Seattle, WA
- 05/14/99 Coordinating Group Meeting Minutes, Phoenix, AZ
- 04/22/99 Group Conference Call Minutes

Initiatives Oversight Committee

Purpose
Provides general oversight for the coordination and development of air quality strategies necessary to promote the implementation of the Grand Canyon Visibility Transport Commission's recommendations.

Membership
Members
representatives from three tribes, three states, a federal land manager, and EPA representative, and two representatives each from the environmental and industrial communities

Significant Work Products
- WRAP Comments On Draft Guidance (02/10/06) PDF
- WRAP Letter Seeking Coordination of Regional Haze SIP Submittal Dates (11/03/03)

  - Letter to Senators Inhofe and Baucus PDF
  - Letter to Senators Stevens and Byrd PDF
  - Letter to Representatives Tauzin and Dingell PDF
  - Letter to Representatives Young and Obey PDF
  - Map of PM-2.5 designations and haze SIP due dates GIF (40 kb) or PPT (700 kb)
- Letter to Lydia Wegman (EPA) by IOC/TOC Chairs Containing updated questions to those sent on 01/18/02.
  - Letter PDF (01/07/03)
  - EPA Response PDF (03/03)
- Final EPA Protocol for Reviewing 309 SIPs PDF(03/31/03)
- Draft EPA Protocol for Reviewing 309 SIPs PDF (03/10/03)
- Cover Letter to Draft EPA Protocol PDF (03/10/03)
- Discussion paper: Options for Preserving the WRAP's SO2 Annex in Federal Multi-Pollutant Legislation for Electric Utilities DOC WPD (04/22/02)
- Letter to Lydia Wegman (EPA) Containing 19 questions regarding the regional haze rule and SIPs PDF (01/18/02)

2006 Events:

- 05/23/06 WRAP Workshop on Carbon, Fire and Dust, Sacramento, CA
- 01/10/06 WRAP Workshop on Sulfate, Nitrate, and Reasonable Progress, Tucson, AZ

2003 Events:

- 07/28/03 NOx Issues in the West, Denver, CO
- 03/18/03 WRAP Forums and Planning Team Meeting, Santa Fe, NM

2002 Events:

- 10/09/02 IOC Meeting, Tempe, AZ
- 10/07/02 Planning Team Meeting, Tempe, AZ
- 07/25/02 Planning Team Meeting, Denver, CO
- 07/11/02 IOC Meeting, Denver, CO
- 03/20/02 IOC Meeting Minutes and Documents, Tempe, AZ

2001 Meetings:

- 12/13/01 IOC Meeting Minutes, San Diego, CA PDF
- 09/05/01 Planning Team Meeting, Seattle, WA
- 07/23/01 IOC Conference Call Minutes DOC
- 06/18/01 IOC Meeting Minutes, Portland, OR DOC
- 04/30/01 IOC Conference Call Minutes DOC

2000 Events:

- 11/09/00 IOC Meeting Agenda
- 09/15/00 IOC Conference Call Minutes
- 08/23/00 IOC Conference Call Minutes
- 03/28/00 IOC Meeting Minutes
- 01/31/00 IOC Conference Call Minutes
- 01/10/00 IOC Meeting Minutes

Technical Oversight Committee

Purpose
The TOC identifies technical issues and tasks necessary to support the activities of the WRAP and refers these issues to the technical forums. The TOC identifies issues to be addressed by the forums, based on input, priorities, and directions from the WRAP. The TOC reviews any recommendations made by the forums and subsequently makes its own recommendations to the WRAP.

Membership
Members
Representatives from three tribes, three states, a federal land manager, and EPA representative, and two representatives each from the environmental and industrial communities

Significant Work Products
- Technical Support System (TSS)
- GIS Landuse Database
- AoH Phase II Project

Major Projects
- Attribution of Haze WG

Meetings
2007 Events (Through September, 2007):

- 09/25/07 Regional Haze Emissions Inventories Meeting, Salt Lake City, UT
- 06/19/07 TSS Orientation & Review Workshop, Denver, CO
- 06/01/07 TOC/Co-Chairs Conference Call
- 05/04/07 TOC/Co-Chairs Conference Call
- 04/06/07 TOC/Co-Chairs Conference Call
- 03/02/07 TOC/Co-Chairs Conference Call
- 02/02/07 TOC/Co-Chairs Conference Call
- 01/05/07 TOC/Co-Chairs Conference Call

2006 Events:

- 12/01/06 TOC Conference Call (Notes: PDF or DOC)
- 11/06/06 TOC Conference Call (Notes: PDF or DOC)
- 10/06/06 TOC Conference Call (Notes: PDF or DOC)
- 09/01/06 TOC Conference Call - Cancelled
- 08/04/06 TOC Conference Call
- 07/07/06 TOC Conference Call (Notes: PDF or DOC)
- 06/02/06 TOC Conference Call (Notes: PDF or DOC)
- 05/05/06 TOC Conference Call
- 04/07/06 TOC Conference Call (Notes: PDF or DOC)
- 03/03/06 TOC Conference Call (Notes: PDF or DOC)
- 02/13/06 TOC Conference Call
  - February 13, 2006 Draft: EPA PM NAAQS Proposal of January 17, 2006
  - Technical Comments by WRAP PDF or DOC
- 02/03/06 TOC Conference Call (Notes: PDF or DOC)
- 01/06/06 TOC Conference Call (Notes: PDF or DOC)
  - Forums Update PDF or DOC

2005 Events:

- 12/02/05 TOC Conference Call
- 11/04/05 TOC Conference Call
- 10/07/05 TOC Conference Call
- 09/02/05 TOC Conference Call
- 08/05/05 TOC Conference Call
- 07/08/05 TOC Conference Call
- 04/08/05 TOC Conference Call
- 02/11/05 TOC Conference Call
- 01/13/05 TOC Conference Call

2004 Events:

- 12/06/04 TOC Conference Call
- 11/08/04 TOC Conference Call
- 10/14/04 TOC Conference Call
- 09/17/04 TOC Conference Call
- 08/12/04 TOC Conference Call
- 07/13/04 TOC WIGIMS Call
- 07/08/04 TOC Co-Chairs Call
- 07/07/04 TOC WIGIMS Call
- 06/17/04 TOC Conference Call
- 05/13/04 TOC Co-Chairs Meeting, San Francisco, CA
- 04/15/04 TOC Conference Call
- 03/12/04 TOC Conference Call
- 02/12/04 TOC Conference Call
- 01/26/04 TOC Technical Summit, Tempe, AZ
- 01/08/04 TOC Conference Call

2003 Events:

- 12/04/03 TOC Conference Call
- 11/13/03 TOC Conference Call
- 09/11/03 TOC Conference Call Documents
    - Meeting Notes PDF, DOC or WPD
    - Agenda PDF or DOC
    - 2004 Workplan and Budget Requests (08/18/03) XLS
    - WIGIMS Scope of Work (07/17/03) PDF or DOC
    - Attribution of Haze Workgroup Mission Statement (09/11/03) PDF, DOC or WPD
    - Technical Forum's Status Report PDF or DOC
- 07/11/03 TOC Conference Call
    - Meeting Notes PDF or WPD
    - Agenda PDF or DOC
    - July 2003 Technical Forums Update PDF or DOC
- 06/13/03 TOC Conference Call Notes PDF, DOC or WPD
- 05/05/03 Technical Oversight Committee Meeting, Denver, CO
- 03/18/03 WRAP Forums and Planning Team Meeting, Santa Fe, NM
- 03/07/03 TOC Conference Call
    - Agenda DOC
    - Status of Technical Forums Summary DOC
    - Notes PDF
- 02/10/03 Technical Oversight Co-Chairs Meeting, Scottsdale, AZ
    - Meeting Minutes PDF
- 01/17/03 TOC Conference Call Notes PDF

2002 Events:

- 12/13/02 TOC Conference Call Summary DOC
- 10/09/02 TOC & Technical Co-Chairs Meeting, Tempe, AZ
- 10/07/02 Planning Team Meeting, Tempe, AZ
- 07/25/02 Planning Team Meeting, Denver, CO
- 07/09/02 WRAP Technical Conference & Presentations, Denver, CO
- 06/12/02 TOC Technical Oversight Committee Meeting, Seattle, WA
- 04/19/02 TOC Conference Call Summary DOC
- 03/07/02 Technical Oversight Committee Meeting, Scottsdale, AZ
    - Meeting Notes DOC
- 01/10/02 TOC & Technical Co-Chairs Conference Call

2001 Events:

- 12/17/01 TOC & Technical Co-Chairs Conference Call
- 11/29/01 TOC & Technical Co-Chairs Conference Call
- 10/25/01 TOC Conference Call Summary

- 09/05/01 Planning Team Meeting, Seattle, WA
- 06/21/01 TOC & Technical Co-Chairs Conference Call Summary PDF
- 03/29/01 TOC & Technical Co-Chairs Meeting Summary PDF
- 07/16/01 TOC Meeting Agenda, Denver CO PDF

Air Pollution Prevention Forum

Purpose
Created by the WRAP to examine barriers to use of renewable energy and energy efficient technologies, identify actions to overcome such barriers, and recommend potential renewable energy and energy efficiency programs and policies that could result in a reduction of air pollution emissions from energy production and energy end-use sectors in the Grand Canyon Visibility Transport Region.

Membership
Members
Representatives of state energy and public utility agencies, tribal environmental groups, private utilities, alternative energy enterprises and other stakeholders

Significant Work Products
Energy Efficiency Flier (PDF, 03/22/04)

- WRAP Policy on Renewable Energy and Energy Efficiency As Pollution Prevention Strategies For Regional Haze (April 2003) DOC
- Economic Assessment of Implementing the 10/20 Goals and Energy Efficiency Recommendations (October 2002) DOC
- Recommendations of the AP2 Forum to Increase the Generation of Electricity from Renewable Sources (06/30/00) Final PDF
    - Appendices A-D PDF
    - Appendix E XLS
    - Appendices F-G PDF

Other Major Projects

- Renewable Energy Credits / WREGIS
- Tribal Resources
- Quantitative Work Group

Meetings
2003 Events:

- 05/20/03 Pollution Prevention Workshop for Preparation of 309 Plans, Portland, OR

2002 Events:

- 06/06/02 Forum Meeting, Portland, OR
- 02/19/02 Forum & SIP Guidebook Meetings

2001 Events:

- 03/15/01 Forum Meeting Summary, Sacramento, CA DOC

2000 Events:

- 12/05/00 Forum Meeting Summary, Portland, OR
  Agenda for the AP2 Meeting
- 05/31/00 Forum Meeting Summary, San Francisco, CA
- 05/09/00 Presentation at Meeting, Phoenix, AZ
- 03/13-14/00 Meeting, Portland, OR
- 01/31 - 02/01/00 Meeting San Diego, CA

Dust Emissions Joint Forum

Purpose
To consolidate the WRAP's efforts involving dust. Previously, three forums had worked on dust issues: the Mobile Sources Forum, the Research and Development Forum, and the Emissions Forum.

Membership
Members
Representatives of state and local air and transportation planning agencies, tribal environmental programs, federal land management agencies, with stakeholders from industrial and agricultural interests.

Significant Work Products
Major Projects:

- New Mexico Pilot – Demonstration of use of analytical tools for planning
- Definition of Dust – Document to distinguish natural and anthropogenic sources of fugitive dust emissions
- Fine Fraction of Fugitive Dust – Document with research results and recommendations on AP-42 PM2.5 emission factors
- Causes of Dust Analysis – Report evaluating relative importance of different source categories to total dust concentrations
- Fugitive Dust Emissions from Wind Erosion – Evaluation of estimating methodologies for wind-blown fugitive dust.
- Fugitive Dust Handbook – A reference document for estimating cost effectiveness of alternate dust control techniques

Meetings
2006 Events:

- 12/12/06 DEJF Conference Call
- 10/24/06 DEJF Conference Call
- 09/26/06 DEJF Conference Call Notes: PDF or DOC
- 05/23/06 WRAP Workshop on Fire, Carbon and Dust, Sacramento, CA
- 02/28/06 DEJF Conference Call PDF or DOC

2005 Events:

- 11/15/05 DEJF Meeting, Tempe, AZ
- 10/24/05 DEJF Conference Call PDF or DOC
- 08/23/05 DEJF Conference Call PDF or DOC
- 05/12/05 DEJF Meeting, Palm Springs, CA
- 05/10/05 Fugitive Dust Control Conference, Palm Springs, CA
- 04/26/05 DEJF Conference Call PDF or DOC
- 03/22/05 DEJF Conference Call PDF or DOC
- 02/22/05 DEJF Conference Call PDF, WPD or DOC
- 01/25/05 DEJF Conference Call PDF or DOC
- 01/04/05 DEJF Conference Call PDF, DOC or WPD

2004 Events:

- 11/30/04 DEJF Conference Call PDF or DOC
- 11/15/04 DEJF & AoH Work Group Meeting, Las Vegas, NV
  - DEJF & AoH Work Group Meeting Agenda PDF or DOC
  - DEJF Meeting Minutes by Lee Gribovicz PDF or DOC or WPD
  - DEJF Meeting Attendee List PDF or DOC
  - Fugitive Dust Handbook and Website PDF or PPT
    Richard Countess, Countess Environmental (1/15, 1:15p)
  - Dust Emission Research in the Northern Chihuahuan Desert of NM PDF (3.8 MB)
    Dale Gillette, NOAA (1/15, 2:15p)
  - Projection of 2018 Dust Emission Inventory PDF or DOC
    Lee Alter and Tom Moore, WGA (1/15, 3:30p)
  - Dust Watch Proposal PDF or PPT
    Lee Alter, WGA (1/15, 3:30p)
  - Overview of AoH Report - Process & Status PDF or PPT
    Joe Adlhoch, Air Resource Specialists (11/16, 9:30a)
  - DEJF Windblown Dust Model – Results & Status PDF or PPT
    Gerard Mansell, ENVIRON (11/16, 10:30a)
- 10/22/04 DEJF Conference Call Minutes PDF or DOC
- 09/28/04 DEJF Conference Call Minutes PDF or DOC
- 08/24/04 DEJF Conference Call Minutes PDF, WPD or DOC
- 08/13/04 DEJF Conference Call Minutes PDF or WPD
- 07/27/04 Dust Emissions Joint Forum Meeting, Reno, NV
  - Agenda PDF or DOC
  - Minutes PDF or WPD
  - Forum Overview and Timeframes, Lee Alter PDF or PPT
  - Update on Dust Handbook, Richard Countess PDF or PPT
  - Update on Windblown Dust Inventory, Gerry Mansell, PDF or PPT
  - Update on Ambient Analysis of 20% Worst Days, Jin Xu, PDF or PPT
  - Dust Monitoring and Modeling at Owens Lake, Duane Ono, PDF or PPT

  - Recent CA Legislation and Control Measures, Mel Zeldin, PDF or PPT
  - Using Satellite Imagery to Improve Dust Emission Inventories, Chat Cowherd, PDF or PPT
  - Using Satellite Imagery to Identiry Dust Emission Areas and Compliance, David Groeneveld (forthcoming)
  - Fugitive Dust Research at DRI, Hampden Kuhns, PDF or PPT
- 05/25/04 Dust Emissions Joint Forum Conference Call Minutes PDF or DOC
- 04/27/04 Dust Emissions Joint Forum Conference Call
  - Call Minutes PDF or WPD
  - Agenda PDF or DOC
  - Draft Work Plan for Development of a Fugitive Dust Handbook and Website PDF or DOC
- 03/23/04 Dust Emissions Joint Forum Conference Call Minutes PDF or WPD
- 02/24/04 Dust Emissions Joint Forum Meeting, Las Vegas, NV
  - Agenda PDF or DOC
  - Minutes PDF
  - Rd. dust measurement techniques (Rodney Langston) PDF or PPT
  - Transportation conformity and haze issues (Susan Hardy) PDF or PPT
  - Notes on the definition and categorization of dust (Lee Alter) PDF or DOC
  - Dust impacts on the 20% worst visibility days (Vic Etyemezian) PDF or PPT
  - Notes on dust impacts on the 20% worst days (Lee Alter) PDF or DOC
  - Summary/recs for a wind-blown dust inventory (Gerry Mansell) PDF or PPT
  - Additional recs for a wind-blown dust inventory (Michael Uhl) PDF or PPT
  - Next steps for a wind-blown dust inventory (Tom Moore) PDF or PPT
  - Comparison of the Fugitive Dust Model to Emission at Keeler Dunes (Duane Ono) PDF or PPT
- 02/10/04 Dust Emissions Joint Forum Conference Call Minutes PDF or DOC
- 01/13/04 Dust Emissions Joint Forum Conference Call Minutes PDF or DOC

2003 Events:

- 12/16/03 Dust Emissions Joint Forum Conference Call Minutes PDF or DOC
- 11/14/03 Dust Emissions Joint Forum Conference Call Minutes PDF or DOC
- 10/29/03 Emissions Joint Forum & Dust Emissions Joint Forum Meeting, Las Vegas, NV
- 03/19/03 WRAP Forums and Planning Team Meeting, Santa Fe, NM

2002 Events:

- 11/06/02 Dust Emissions Joint Forum Meeting, Las Vegas, NV

2001 Events:

- 05/07/01 Teleconference on WRAP Dust Issue DOC
  The Emissions Forum coordinated a conference call on fugitive dust issues in the WRAP 1996 Base Year Emission Inventory, and on potential cooperative efforts between the WRAP/EPA/WESTAR to address these concerns.

2000 Events:

- 12/14/00 Research and Development Forum Fugitive Dust Workshop, Las Vegas, NV

Economic Analysis Forum

Purpose
To provide the WRAP and WRAP forums with projections of econometric parameters needed to forecast changes in emissions, and assessments of the economic effects of pollution controls on the region and sub-regions, including Indian Country.

Membership
Members
Representatives of state and local economic analysis and council of government organizations, EPA, federal land management agencies and stakeholders.

Significant Work Products
Major Projects:

- Economic Analysis Framework
- Framework Application Test

Meetings
2003 Events:

- 03/18/03 WRAP Forums and Planning Team Meeting, Santa Fe, NM
  Economic Analysis Forum Meeting Agenda PDF

2002 Events:

- 12/13/02 Economic Analysis Framework Workshop, Denver, CO

Emissions Forum

Purpose
To oversee the development of a comprehensive emissions tracking and forecasting system which can be utilized by the WRAP, or its member entities, monitors the trends in

actual emissions, and forecasts the anticipated emissions which will result from current regulatory requirements and alternative control strategies.

Membership
Members
Representatives of state and tribal air programs, EPA and federal land managers, with stakeholders from industrial and environmental interests. Membership on the forum is augmented by a workgroup of state staff members that work on emissions inventories

Significant Work Products
Major Projects:

- EDMS Operations & Maintenance – Primary source of comprehensive emissions data bases for base-year and projection years
- Oil/Gas Area Source Emissions/Controls – Ongoing evaluation of existing and state-of-the-art controls for oil and gas production facilities
- Stationary/Area Source Emission Projections – Planning emission estimates for base year
- Updating Mobile Source Emissions – Evaluation of effects on mobile source emissions from recent federal requirements
- EDMS Project Page – Working interactive webpage that users can access regional emissions data, develop reports for decision makers and the public
- AK Aviation Inventory – Emission estimates from aviation sector of transportation emissions in Alaska

Meetings
2007 Events:

- 06/27/07 EDMS Status Call
- 05/30/07 EDMS Status Call
- 05/01/07 EDMS Status Call
- 03/29/07 EDMS Status Call
- 02/28/07 EDMS Status Call
- 01/17/07 EDMS Status Call

2006 Events:

- 11/30/06 Emissions Forum Call, Call Notes: PDF or DOC
- 10/18/06 Emissions Forum Meeting, Spokane, WA
- 08/14/06 Emissions Forum Call
- 08/02/06 EDMS Steering Committee Call
- 07/12/06 Emissions Forum Meeting, Portland, OR
- 05/31/06 Emissions Forum Call
- 04/18/06 Emissions Forum Meeting, Tempe, AZ
- 02/07/06 Emissions Forum Meeting, Santa Fe, NM

- 01/18/06 Emissions Forum Call

2005 Events:

- 12/05/05 Emissions Data Management System Web Training Call
- 12/02/05 Emissions Forum Call (Notes: PDF)
- 10/05/05 Emissions Forum Call (Notes: PDF or DOC)
- 09/27/05 Emissions Forum Meeting, Missoula, MT
- 06/21/05 Emissions Forum Call
- 05/24/05 Emissions Forum Call (Notes: PDF or DOC)
- 04/26/05 Alaska Regional Haze Technical Analysis Meeting
- 02/10/05 Emissions Forum Call (Notes: PDF or DOC)
- 01/26/05 Emissions Forum Meeting, San Diego, CA

2004 Events:

- 12/10/04 Emissions Forum Call (Notes: PDF or DOC)
- 11/08/04 Emissions Forum Call
- 10/19/04 Emissions Forum Meeting & EDMS Training, Boise, ID
- 08/05/04 Emissions Forum Call
- 07/14/04 Emissions Forum Meeting, Reno, NV
- 06/18/04 Emissions Forum Call
- 05/11/04 EDMS Project Workshop
- 04/09/04 Emissions Forum Call
- 03/24/04 Emissions Forum Meeting, Santa Fe, NM
- 02/03/04 Emissions Forum Call

2003 Events:

- 10/28/03 Emissions Forum & Dust Emissions Forum Joint Meeting, Las Vegas, NV
- 10/14/03 NARSTO Workshop on Innovative Emission Inventory Methods, Austin, TX
- 09/05/03 Emissions Forum Call
- 07/01/03 Emissions Forum Meeting, Portland, OR
- 05/07/03 Emissions Data Management System Needs Assessment Workshop, Denver, CO
- 03/19/03 WRAP Forums and Planning Team Meeting, Santa Fe, NM

2002 Events:

- 11/14/02 Emissions Forum Meeting, Tempe, AZ
- 05/23/02 Emissions Forum Workplan & Budget Meeting, Salt Lake City, UT
- 04/03/02 Emissions Forum/EI Work Group Conference Call Minutes DOC or WPD
- 01/29/02 Emissions Forum Meeting, Phoenix, AZ

2001 Events:

- 09/27/01 Emissions Forum & Emissions Work Group Meeting, UC Riverside
- 05/14/01 Emissions Forum Meeting, Spokane, WA
- 05/07/01 Teleconference on WRAP Dust Issue DOC
- 02/01/01 Emissions Forum Final Meeting Minutes PDF or WPD
- 2000 Events
- 07/11/00 Emissions Forum Final Meeting Minutes WPD
- 08/30/00 Emissions Forum Final Meeting Minutes WPD

Fire Emissions Joint Forum

Purpose
to assist the Western Regional Air Partnership in addressing the Grand Canyon Visibility Transport Commission's (GCVTC) Recommendations on fire, and to implement requirements of §309 of the regional haze rule.

Membership
Members
Representatives of state and tribal agencies with specialties in fire and smoke management, EPA, federal land managers and stakeholders representing industrial, agricultural, environmental interests

Significant Work Products
Major Projects:

- Annual Emission Goal
- Basic Smoke Mgmt. Programs
- Emissions
    - Phase I Fire EI
    - Phase II Fire EI
    - Phase III/IV Fire EI
    - InterRPO Wildfire EI
- Emissions Reduction Techniques
- Enhanced Smoke Management Programs
- Fire Tracking Systems
- National Fire Emissions Technical Workshop
- Natural Background
- Non-Burning Alternatives on Agricultural Lands
- Non-Burning Alternatives on Wildlands
- Prescribed Fire Plan Assessment
- Public Education and Outreach
- Regional Coordination
- TWIST (Technical WRAP-up Implementation Support Team)

Meetings
2007 Events:

- 09/26/07 FEJF Meeting, Salt Lake City, UT
- 06/25/07 FEJF Conference Call
- 05/29/07 FEJF Conference Call
- 04/24/07 FEJF Conference Call
- 02/22/07 Fire Emissions Joint Forum Meeting, San Diego, CA
- 01/30/07 FEJF Conference Call

2006 Events:

- 11/28/06 FEJF Conference Call
- 10/17/06 Fire Emissions Joint Forum Meeting, Spokane, WA
- 07/11/06 Fire Emissions Joint Forum Meeting, Portland, OR
- 05/23/06 WRAP Workshop on Fire, Carbon and Dust, Sacramento, CA
- 04/25/06 FEJF Conference Call
- 03/28/06 FEJF Conference Call
- 03/07/06 FEJF Meeting, Albuquerque, NM
- 01/24/06 FEJF Conference Call

2005 Events:

- 12/20/05 FEJF Conference Call Notes PDF or DOC
- 11/30/05 FEJF Meeting, Seattle, WA
- 10/25/05 FEJF Conference Call Notes PDF or DOC
- 09/28/05 FEJF Meeting, Missoula, MT
- 08/23/05 FEJF Conference Call Notes PDF or DOC
- 07/26/05 FEJF Conference Call Notes PDF or DOC
- 06/07/05 FEJF Meeting, Denver, CO
- 02/23/05 FEJF Meeting, Salt Lake City, UT
- 02/09/05 Inter-RPO Fire and Smoke Technical and Policy Coordination Meeting, Round Rock, TX

2004 Events:

- 12/08/04 FEJF Meeting, Las Vegas, NV
- 09/08/04 FEJF Meeting, Worley, ID
- 06/16/04 308/309 Smoke Management Planning Workshop, Portland, OR
- 06/15/04 FEJF Meeting, Portland, OR
- 05/04/04 National Fire Emissions Technical Work Shop, New Orleans, LA
- 03/10/04 FEJF Meeting, San Diego, CA

2003 Events:

- 12/10/03 FEJF Meeting, Tucson, AZ
  - Agenda PDF or DOC
  - Attendee List PDF or DOC
  - Presentation: Plans for Fire Emissions Inventories (Moore) PPT
  - Presentation: Fire Emissions from 30,000' - Regional Haze Planning Needs and Level(s) of Effort (Moore/Alter) PPT
  - Issue Paper: FEJF De Minimis Task Team PDF or DOC
- 09/24/03 FEJF Meeting, Portland, OR
  - Agenda PDF or DOC
  - Draft Minutes PDF or DOC
  - Attendee List PDF or DOC
  - Emission Reduction Techniques for Agricultural Burning and Wildland Fire PDF or PPT
    (Draft Annotated Bibliography, Indices, and Summary Table—Kenneth Meardon, MACTEC)
  - Lee Alter's WRAP Update Power Point Presentation PDF or PPT
  - FEJF Draft 04 Workplan PDF or DOC
  - Dave Randall's Model Sensitivity Runs Presentation PDF
  - De-minimus outline PDF or DOC
- 06/03/03 FEJF Meeting, San Francisco, CA
- 03/18/03 FEJF Meeting, Santa Fe, NM

2002 Events:

- 12/10/02 FEJF Meeting, Jackson, WY
  Includes Meeting Documents and Presentations from the meeting.
  (Updated 12/24/02)
- 09/18/02 FEJF Meeting, Phoenix, AZ
- 05/15/02 FEJF Meeting, Coeur d'Alene, ID
- 04/26/02 FEJF Conference Call PDF
  02/06/02 FEJF Meeting, Tucson, AZ PDF
- ARCHIVE - 2001 and earlier

Mobile Sources Forum

Purpose
Initially, in its first couple of years (2000-02), the MSF led the development of a WRAP-wide mobile source emission inventory and worked with the Air Quality Modeling Forum to define and analyze the significance of mobile sources with respect to the requirements of §309 of the regional haze rule. Federal promulgation of emission and fuel standards successfully addressed mobile source emissions for regional haze. The Mobile Sources Forum is now actively engaged in facilitating state and local diesel retrofit programs.

Membership
Members

Representatives of state agencies with specialties in mobile source and transportation planning, EPA, and other federal agencies involved in transportation, stakeholders from the auto manufacturing and fuel supply industry and environmental organizations.

Significant Work Products
Major Projects:

- Offroad Diesel Retrofit Guidance Document
- Offroad Retrofits
- Offroad Retrofit Economic Analysis
- Updating Mobile Source Emissions

Meetings
2007 Events:

- 06/07/07 Workshop for Developing And Implementing A State Funded Retrofit Program
- 05/03/07 Mobile Sources Forum Call
- 03/22/07 Mobile Sources Forum Call
- 01/30/07 Mobile Sources Forum Call
- 2006 Events
- 10/03/06 WRAP Diesel Retrofit Boot Camp, Las Vegas, NV

2005 Events:

- 01/27/05 WRAP Member Offroad Retrofit Program Workshop, San Diego, CA

2003 Events:

- 07/16/03 Workshop on EPA's Nonroad Proposal, Denver, CO

2002 Events:

- 10/30/02 Mobile Sources Forum Meeting, Denver, CO
- 10/09/02 MSF/IOC Conference Call
    - The Forum was invited participate in the IOC Meeting via speakerphone for the following mobile source agenda item: Discussion of ***Preliminary Mobile Source Significance Test Modeling Results*** PPT (Revised IOC Mobile Source Power Point presentation)
- 04/15/02 Mobile Sources Forum Meeting, Denver, CO

2001 Events:

- 07/25/01 Mobile Sources Forum Meeting Agenda DOC

2000 Events:

- 06/07/00 Mobile Sources Forum Meeting Minutes PDF

Sources In and Near Class I Areas Forum

Purpose
To help implement those recommendations by working with parks and local communities to develop and implement strategies to minimize emissions and the resulting visibility impacts.

Membership
Members
Representatives from state and federal land management agencies, stakeholders from hearth products industries and environmental interests

Significant Work Products
Major Projects:

- Evaluation of PM10 SIPs
- In-Park Emissions
- Near Emissions
- Gateway Community Demo Project

Meetings
2002 Events:

- (12/10/02) Sources In and Near Class I Areas Forum Meeting, Novato, CA
  The Forum will review and finalize the workplan that its contractor (ENVIRON) will follow in characterizing emissions near Class I areas throughout the WRAP region. The meeting will be held from 12-3 at ENVIRON's offices in Novato, CA. (Posted 11/21/02)
- Sources In and Near Class I Areas Forum
  1999 Meeting Minutes (zip file)

Stationary Sources Joint Forum

Purpose
The Stationary Sources Joint Forum (SSJF) was established in January 2004 and replaces the Market Trading Forum (MTF). See comments below. The SSJF is focused more broadly on stationary source issues throughout the WRAP and their relationship to Section 308 SIP requirements. Stationary source issues addressed include BART, reasonable progress goals, oil and gas emissions and control technologies for electricity generating units.

Membership
Members
Representatives of state and tribal air agencies, EPA and federal land managers, with stakeholders from industrial, electric utility and environmental interests.

Significant Work Products
Major Projects:

- Oil/Gas Area Source Emissions/Controls
- EGU NOx Controls
- Stationary/Area Source Data Pivot Tables
- Stationary/Area Source Emission Projections
- General BART Information
- Identifying BART-Eligible Sources
- EPA's IAQR

Meetings
2006 Events:

- 11/14/06 SSJF Meeting, Tempe, AZ
- 08/16/06 SSJF Meeting, Salt Lake City, UT
- 05/30/06 SSJF/309 Workgroup Call on SO2 PDF or DOC
- 05/10/06 Oil and Gas Workgroup Call PDF or DOC
- 05/05/06 AMC Conference Call Notes PDF or DOC
- 02/01/06 SSJF Meeting, Denver, CO

2005 Events:

- 09/07/05 SSJF Meeting, Denver, CO
- 05/10/05 SSJF Meeting, Palm Springs, CA
- 02/23/05 SSJF Meeting, Salt Lake City, UT

2004 Events:

- 12/13/04 SSJF Meeting, Tempe, AZ
  - Update on Identifying BART-eligible sources PDF ZIP
  - Tribal Point Source Project PDF or PPT
- 2003 SO2 Emissions and Milestone Report PDF or PPT
  - Attribution of Haze Project Update PDF or PPT
- 06/02/04 SSJF Meeting, Denver, CO
  - Agenda PDF or DOC
  - Minutes PDF or WPD
  - Summary of Action Items and Future Work (Pat Cummins) PDF or DOC
  - Identification of BART-eligible sources (project update) PDF or PPT
  - EPA's summary of BART reproposal PDF or PPT

  - Status of WRAP comments on BART reproposal (update) PDF or PPT
  - EPA's analysis of EGU NOx controls in the West PDF or PPT and XLS
  - EPA's analysis of the CAIR's impact on SO2 emissions in the 309 states PDF or PPT
  - Lee Alter's summary of EGU NOx emissions XLS
  - Overview of oil and gas development emissions and haze issues PDF or PPT
  - Attribution of haze (project update) PDF or PPT
- 04/13/04 SSJF Conference Call Notes PDF or DOC
- 02/18/04 Stationary Sources Joint Forum Meeting, Denver, CO
  - Agenda PDF or DOC
  - Minutes PDF or WPD
  - BART Overview PDF or PPT
  - WRAP Technical Approach PDF or PPT
  - EPA Update on BART, IAQR, and Hg PDF or PPT
  - Issues related to expanding EPA's proposed Interstate Air Quality Rule (IAQR) to cover regional haze in the West PDF or DOC

Archived
NOTE: The Market Trading Forum was originally organized to develop SO2 milestones and a backstop trading program for major point sources under 40CFR 51.309 to implement recommendations of the Grand Canyon Visibility Transport Commission. In 2004, after the 309 SIPs were submitted the MTF was re-organized and established new goals to develop BART, Reasonable Progress Goals, Long-term strategies for point sources under 40CFR 51.308
Market Trading Forum (Archive Status as of 1/2004 – activities related to § 309)

Technical Analysis Forum

Purpose
The Technical Analysis Forum was formed in December 2006 by the Technical Oversight Committee. The TAF will coordinate and manage the processing, display, delivery, and explanation of technical data for regional haze planning activities. The TAF will assume responsibility for combining the participants and maintaining the activities and ongoing projects of the Ambient Air Monitoring & Reporting Forum, the Air Quality Modeling Forum, and the Attribution of Haze Workgroup. See comments below

Membership
Members
A large membership of several representatives from each WRAP state, several tribes, EPA regions, federal land management agencies with technical expertise in emissions, monitoring and modeling. Stakeholder representation is from industry and environmental interests.

Significant Work Products

Major Projects:

- Technical Support System Website
    - *Technical Support System Project Page*
- Regional Modeling Center
- VIEWS Website
- Causes of Haze Website

Meetings
2007 Events:

- 10/11/07 Technical Analysis Forum Meeting, San Francisco, CA
- 08/20/07 Technical Analysis Forum Call
- 07/16/07 Technical Analysis Forum Call
- 06/13/07 Technical Analysis Forum Call
- 05/22/07 Technical Analysis Forum Meeting, Boise, ID
- 04/16/07 Technical Analysis Forum Call
- 03/19/07 Technical Analysis Forum Call
- 02/26/07 Technical Analysis Forum Call
- 02/06/07 Technical Analysis Forum Meeting, Las Vegas, NV
- 01/08/07 Technical Analysis Forum Call

Archived
NOTE: The following forums and workgroups were merged in 2006 into the Technical Analysis Forum
Air Monitoring and Reporting Forum (Archive Status as of 12/06)
Air Quality Modeling Forum (Archive Status as of 12/06)
Attribution of Haze Work Group (Archive Status as of 12/06)

Tribal Data Development Work Group

Also ***Tribal Caucus***

Purpose
To assist and advise WRAP on gathering tribal air quality data and other air quality issues related to the WRAP mission from Tribes in the WRAP area. The TDD-WG will work with the other WRAP forum and non-tribal communities to improve understanding communities of protocols and processes for obtaining and using tribal data.

Membership
Members
Members or employees of federally recognized tribes in the WRAP area that will be impacted by WRAP decisions.

Significant Work Products
- 2002 and 2018 Point Source and Oil & Gas Area Source Inventory for Tribes

- TEISS (Tribal Emission Inventory Software Solution)
- Description PDF
- Software Development Plan PDF
- Appendix C: Emission Estimation Methods PDF
- Appendices D-G PDF

Meetings
2007 Events:

- 08/28/07 Tribal Caucus Meeting, Denver, CO
- 07/17/07 TDDWG Meeting, Worley, ID
- 04/16/07 TDDWG Meeting, San Diego, CA
- 01/23/07 TDDWG Meeting, Palm Springs, CA

2006 Events:

- 11/28/06 WRAP Tribal Technical & Policy Workshop, Albuquerque, NM
- 10/12/06 TDDWG Meeting, Scottsdale/Fountain Hills, AZ (Fort McDowell Yavapai Nation)
- 09/11/06 Tribal Caucus Meeting, Whitefish, MT
- 07/26/06 TDDWG Meeting, Lewiston, ID
- 05/01/06 NTEC Conference, Temecula, CA
- 04/10/06 Advanced EI/TEISS Technical Assistance Training, Seattle, WA
- 03/28/06 TEISS Training, Las Vegas, NV
- 03/14/06 TDDWG & Inter-RPO Tribal WG Joint Meeting Albuquerque, NM
- 02/21/06 TEISS Training, Las Vegas, NV

2005 Events:

- 12/12/05 Tribal Caucus Meeting, Palm Springs, CA
- 12/07/06 TDDWG Meeting, Santa Fe, NM
- 11/01/05 Advanced EI/TEISS Technical Assistance Training, Phoenix, AZ
- 08/17/05 TDDWG Meeting, Polson, MT
- 05/16/05 Tribal Caucus Meeting, Phoenix, AZ
- 05/03/05 NTEC Conference, Greenbay, WI
- 01/19/05 TDDWG Meeting, Lake Tahoe, NV

2004 Events:

- 11/09/04 Tribal Caucus Meeting Salt Lake City, UT
- 10/19/04 TDDWG Meeting, Boise, ID
- 10/12/04 Tribal Caucus Call
- 10/05/04 National Tribal Air Association's 3rd Annual Conference
- 09/07/04 TDDWG Conference Call
- 08/10/04 Tribal Caucus Call
- 06/29/04 TDDWG Meeting, Tempe, AZ
- 04/05/04 Tribal Caucus Meeting, Tempe, AZ

- 03/02/04 National Tribal Forum Series on Air Quality, San Diego, CA
- 02/09/04 TDDWG Meeting, Las Vegas, NV

2003 Events:

- 11/13/03 TDDWG Meeting, Las Vegas, NV
- 10/13/03 Alaska Tribal Conference on Environmental Management, Anchorage, AK
- 10/13/03 Tribal Caucus Meeting, Salt Lake City, UT
- 09/16/03 WRAP Tribal Policy and Technical Workshop, Albuquerque, NM
- 08/06/03 TDDWG Meeting, Seattle, WA
- 04/28/03 TDDWG Meeting, Sacaton, AZ
- 04/01/03 Tribal Air Caucus Meeting, Portland, OR

2002 Events:

- 05/22/02 Tribal Caucus Meeting, Salt Lake City, UT
- 04/08-09/02 TDDWG Meeting, RMC, Riverside, CA
- 01/08-09/02 TDDWG Meeting, Phoenix, AZ

2001 Events:

- 09/26/01 Meeting Minutes
- 01/24/01 Meeting Minutes
- 05/31/01 Meeting Minutes
- 09/13/01 TDDWG Meeting, Albuquerque, NM
- 01/24/01 TDDWG Meeting, Las Vegas, NV, PDF or DOC

2000 Events:

- 01/13/00 TDDWG Meeting, Phoenix, AZ

1999 Events:

- 06/17/99 TDDWG Meeting
  Additional TDDWG Meeting Minutes for 1999 (zip file)

Washington State Regional Haze State Implementation Plan

Appendix B

Federal Land Managers Comments and Ecology's Response to Comments

Contents

Section B-1 Overview of Appendix B

One of the major requirements of the Regional Haze Rule (RHR) is formal consultation on the draft Regional Haze (RH) State Implementation Plan (SIP):

> *The State must provide the Federal Land Manager with an opportunity for consultation, in person and at least 60 days prior to holding any public hearing on an implementation plan (or plan revision) for regional haze required by this subpart. This consultation must include the opportunity for the affected Federal Land Managers to discuss their:*
>
> *(i) Assessment of impairment of visibility in any mandatory Class I Federal area; and*
>
> *(ii) Recommendations on the development of the reasonable progress goal and on the development and implementation of strategies to address visibility impairment.* [1]

Between March and June, Ecology provided the Federal Land Managers (FLMs) with the FLM Consultation Draft of Washington's RH SIP for review. Ecology held a formal consultation with the FLMs in person at Ecology's headquarters in Olympia, WA and via conference call on May 18, 2010. The purpose of the meeting was to discuss visibility impairment at mandatory Class I Areas and Washington's draft RH SIP. As a result of the meeting, Ecology extended the 60-day consultation period by 7 days in an e-mail to the FLMs to allow more time for submittal of formal written comments. Copies of Ecology's correspondence with the FLMs on formal consultation are included in Section B-2.

Section B-3 contains a summary of the comments received from the U.S. Department of the Interior National Parks Service (USDI-NPS) and Ecology's response as required by the RHR[2].

Copies of the formal written comments by the USDI-NPS are included in Section B-4.

Section B-5 contains a summary of the comments received from the U.S. Department of Agriculture Forest Service (USDA-FS) and Ecology's response as required by the RHR[3].

Copies of the formal written comments by the USDA-FS are included in Section B-6.

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[1] 40 CFR 51.308(i)(2)
[2] 40 CFR 51.308(i)(3)
[3] 40 CFR 51.308(i)(3)

COPY

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600 • Olympia, WA 98504-7600 • 360-407-6000
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

March 29, 2010

Scott Copeland
Forest Service
Washakie Ranger District
333 E Main St
Lander WY 82520-3499

Dear Scott:

You are receiving this as a member of the Federal Land Manager (FLM) team that has consulted informally with Ecology on Washington's Regional Haze SIP (RH SIP). Ecology is now ready to initiate formal consultation with FLMs on the draft RH SIP.

The Regional Haze Rule (RHR) provides that:

> *The State must provide the Federal Land Manager with an opportunity for consultation, in person and at least 60 days prior to holding any public hearing on the implementation plan...for regional haze.... This consultation must include the opportunity for the affected Federal Land Managers to discuss their:*
>
> *(xi) Assessment of impairment of visibility in any mandatory Class I Federal area; and*
>
> *(xii) Recommendations on the development of the reasonable progress goals and on the development and implementation of strategies to address visibility impairment*
>
> —40 CFR 51.308(i)(1)

The FLM Consultation Draft of Washington's RH SIP is on the enclosed CD with the exception of TransAlta. We are still working on TransAlta and will send it out when ready. The CD contains the initial draft BART technical support document and initial draft compliance order brought to public hearing last October.

The 60-day review period runs from Wednesday March 31, 2010 through Friday June 4, 2010. To include the FLM comments and our responses in the public review draft being taken to public hearing, we must receive FLM written comments by the end of the 60-day consultation period on June 4, 2010. Comments may be sent by regular mail or overnight to Ecology's Lacey, WA headquarters located at 300 Desmond Drive, Lacey WA 98503.

Ecology staff are available to meet in person at Ecology's headquarters in Lacey, Washington in fulfillment of the RHR SIP requirement for "an opportunity for consultation…in person" on the following dates:

Tuesday, May 18th from 1:00pm – 4:00pm
Wednesday, May 19th from 9:00am – 12:00pm
Thursday, May 20th from 1:00pm – 4:00pm
Tuesday, May 25th from 9:00am – 12:00pm
Thursday, May 27th from 9:00am – 12:00pm

We have set up a Doodle poll to help us arrange this meeting. Please indicate your availability at your earliest convenience. Because of other things that are happening during this period, it is important that we establish the date for "consultation, in person" as early as possible. Our experience is that it is easier to select and hold a date than find one at the last moment.
If you have questions, please feel free to contact me at 360-407-6874 or Doug.Schneider@ecy.wa.gov .

Sincerely,

Doug

Doug Schneider
Regional Haze SIP Coordinator

Enclosure: CD

cc: Doug Schneider
Sarah Rees
Al Newman
Julie Oliver
Jeff Johnston

FLM recipients:
Janice Peterson, Forest Service
Rick Graw, USDA Forest Service
Barbara Samora, Mount Rainier National Park
Tim Allen, US Fish & Wildlife Service
Don Shepherd, National Park Service
Scott Copeland, Forest Service

From: Johnston, Jeff (ECY)
Sent: Thursday, May 27, 2010 4:27 PM
To: john_bunyak@nps.gov; Sandra_V_Silva/R9/FWS/DOI.FWS@nps.gov; Barbara Samora (NPS) ; Copeland, Scott (ISDA, FS); Shepherd, Don (NPS); Janice Peterson (USDA-FS); Brewer, Pat (NPS); Rick Graw (USDA FS); Tim Allen (US FWS)
Cc: Rees, Sarah (ECY); Schneider, Doug; Newman, Alan (ECY); Oliver, Julie (ECY); Dhammapala, Ranil (ECY); Chen, Qing (ECY)
Subject: FLM - Ecology follow-up on Regional Haze SIP discussion

Federal Land Managers –

Thanks again for taking the time to review the draft Washington Regional Haze SIP, offer your comments, and meet with Ecology last week to discuss. Ecology found the discussion helpful and we are working to strengthen the SIP based on many of your comments. We would also like to thank you for your offer to help Ecology with some of the analysis requested in your comments on our document. Unfortunately, however, given the tight timelines that we are on in order to meet EPA's deadline, we will not be able to take you up on your offer.

Here are the steps Ecology is planning to take to address the concerns expressed in your written comments and during our meeting on 5/18. Ecology will:

1. Discuss the different emissions inventories and their use in the analysis, including additional discussion of why the PRP18a inventory was chosen for our analysis.
2. Expand on fire-related issues, including a discussion of the State's agricultural burning program.
3. Take a closer look at why visibility impairment gets worse at the North Cascades monitor.
4. Expand the four-factor analysis in chapter 9 and make it more similar to Oregon's.
5. Expand the discussion of monitoring data, specifically looking at the observed seasonal trends.

From the conversation on 5/18, it sounded like we can expect to receive the Forest Service's comments in the same form as what we received on 5/17 due to the logistics of getting the appropriate signature on a revised set of comments. The National Park Service is able to modify their official comments based on hearing from Ecology on our plans for updating the SIP in response to your initial comments.

The 60-day comment period officially ends on Friday, June 4, 2010. Given that it has taken Ecology more than a week to get back to you with the above, we can extend this comment period by 7 days. Please get your official comments to Ecology by Friday, June 11, 2010.

Thanks again for your assistance with the Washington Regional Haze SIP. We appreciate your willingness to work with us on submitting the Regional Haze SIP to EPA this fall.

Jeff

Jeff Johnston, Ph.D.
Manager, Science & Engineering Section
Air Quality Program, Washington Department of Ecology
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Section B-3 Ecology's Summary of the U.S. Department of the Interior National Parks Service's Comments and Ecology's Response

The following is a summary of the comments offered by the USDI-NPS on the Consultation Draft RH SIP document. The draft Best Available Retrofit Technology (BART) determinations were previously commented on by the USDI-NPS during the public comment periods in Fall 2009. Most of the BART comments provided by USDI-NPS reiterated the comments provided during the BART public comment periods.

General comments:
Ecology provided a clearly written Consultation Draft RH SIP that contains several, but not all, of the key policy elements the USDI-NPS outlined in an August 2006 letter to the state. The Consultation Draft RH SIP demonstrates that using the Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring data and the technical analyses produced by the Western Regional Air Partnership (WRAP) that Washington understands the causes of visibility impairment at Class I areas in Washington.

The Consultation Draft RH SIP is missing the required analysis of factors to set Reasonable Progress Goals (RPG). The Consultation Draft RH SIP is also lacking a substantive long-term strategy for improving Visibility in Class I areas of Washington. The proposed RPGs do not reflect substantive improvement in visibility and in the case of the monitor representing the North Cascades NP and Glacier Peak Wilderness, projects degradation in visibility.

The BART determinations have addressed some of the USDI-NPS procedural concerns raised in November 2009 comments on the BART orders, but made no changes to the control requirements.

Response:
Ecology found the discussion helpful and we are working to strengthen the RH SIP based on many of FLMs comments. We would also like to thank the USDI-NPS for their offer to help Ecology with some of the analysis requested in your comments on our document.

Ecology made a commitment in an e-mail from Jeff Johnston to the FLMs dated May 27, 2010 to address the following concerns expressed during our meeting on May 18, 2010:

1. Discuss the different emissions inventories and their use in the analysis, including additional discussion of why the 2018 Preliminary Reasonable Progress Emissions (PRP18) inventory was chosen for our analysis.
2. Expand on fire-related issues, including a discussion of the State's agricultural burning program.
3. Take a closer look at why visibility impairment gets worse at the North Cascades monitor.
4. Expand the four-factor analysis in Chapter 9 and make it more similar to Oregon's.
5. Expand the discussion of monitoring data, specifically looking at the observed seasonal trends.

Further information on some of these specific items is provided below in the responses to more specific FLM comments.

Comments on Chapter 5 – Baseline and Natural Conditions:
National Park Service (NPS) suggests looking at time series of IMPROVE monitor results to better understand the timing and seasonal variability of sulfate nitrate and fires.

Response:
In evaluating baseline conditions, Ecology has evaluated the seasonality of various pollutants at the IMPROVE monitors to supplement the information in the Particulate Matter Source Apportionment Technology (PSAT) and Weighted Emissions Potential (WEP) analyses provided by WRAP. Additional information on the seasonality at each of the IMPROVE monitors has been added to Chapter 5.

Comments on Chapter 6 – Emissions Inventory:
USDI-NPS has a number of questions and requests for clarifications related to emission inventories that are used as the basis for the Consultation Draft RH SIP. The comments and questions ask Ecology to clarify:

- the inventory utilized by WRAP for establishing baseline condition modeling,
- what 'on the books' controls account for reduction in point source Sulfur Dioxide (SO_2)
- whether the PRP18a inventory included the effect of proposed BART determinations,
- the basis for selecting the PRP18a inventory and modeling utilized in the analyses for the SIP,
- the basis for emission differences between inventories (i.e. the growth in area source emissions between 2002 and 2018 inventories, the source of the reductions in Nitrogen Oxides (NO_x) between the PRP18a and PRP18b inventories) and
- differences between the potential 2018 inventories (specifically the PRP18a inventory used by Washington and the PRP18b inventory).

Response:
Ecology incorporated additional information into Chapter 6 Emissions Inventories and Chapter 7 WRAP Modeling. Ecology also added Appendix M Model Performance Appendix that specifically looks at how well the Community Multi-Scale Air Quality (CMAQ) performs in Washington. Further information may be found in the WRAP's Technical Support System (TSS) Road Map located in Appendix G.

While the various inventories developed for the three scenarios played a role in the development of the technical analysis for the WRAP region, only PRP18a inventory was available when Ecology began developing the state's RH SIP. By the time the WRAP PRP18b inventory and modeling were available, Ecology did not have time or resources to redo our analysis.

Comments on Chapter 7 – Western Regional Air Partnership Modeling:
Section 7.3 on model performance provides little information to judge the confidence of the state in the model results presented. NPS suggests that model performance charts for sulfate, nitrate

and Organic Carbon (OC) be presented. There should be a discussion on how well the WRAP models represent meteorology and measured values at IMPROVE monitors in Washington.

Ecology should clarify the significant differences between the inventory versions reported in Chapter 6 (WRAP 2002 Plan 02d and 2018 PRP18a), the earlier versions used for the PSAT modeling (2002 Plan 02c and 2018 base b) and the later 2018 inventory used in the WEP analysis (2002 Plan 02d and PRP18b).

Response:
Ecology incorporated additional information into Chapter 7 WRAP Modeling. Ecology also added Appendix M Model Performance Appendix that specifically looks at how well the CMAQ performs in Washington.

Ecology expanded the emission inventory chapter to include information on the baseline and projected inventories.

Comments on Chapter 8 – Source Apportionment of Washington's Mandatory Class I Areas and Washington's Impacts on Out-of-State Mandatory Class I Areas:
This work is accurately performed. Consider the residence time plots in the Causes of Haze technical information archive for more additional information.

Response:
Thank you for your comment. Ecology has considered this information in addressing projected visibility for North Cascades National Park and Glacier Peak Wilderness.

Comments on Chapter 9 – Reasonable Progress Goals:
Ecology has not met the requirements of 40 CFR 51.308(d)(1) on setting RPGs in this chapter.

The RPGs set are the same as the WRAP PRP18a modeling results. The document does not indicate how the statutory four factors were considered in setting these progress goals.

Specifically for the NOCA1 monitor which represents the North Cascades National Park and Glacier Peak Wilderness, the WRAP 2018 modeling indicates that sulfate and OC are projected to increase and the projected visibility increases. With this situation it is difficult to understand how Ecology can conclude existing controls are sufficient to demonstrate reasonable progress. Ecology needs to analyze the cause of this increase so that appropriate strategies can be developed to prevent it.

As part of the company-specific four factor analysis we request that Ecology require low NO_x and ultra low NO_x burner replacements identified as cost effective in the Tesoro BART analysis but unable to be performed with in the BART timeframe.

The USDI-NPS used the WRAP Emissions Data Management System (EDMS) to produce a list of 37 emission units in Washington that each has projected emissions above 350 tons of SO_2 or NO_x per year. Such a list can be used along with information on the distance of the source from a Class I Area and the residence time of air over the grid cell containing the unit to help prioritize Ecology's intended emission control analysis for the long-term strategy.

Ecology is using the PRP18a emission inventory and modeling results. The PRP18b inventory includes emission reductions that are not part of the PRP18a inventory. The PRP18b modeling indicates slightly better visibility that the PRP18a modeling. If the PRP18b inventory is more accurate, Ecology should cite the PRP18b modeling results in its analyses.

Response:
Ecology incorporated additional information into Chapter 6 Emissions Inventories and Chapter 7 WRAP Modeling. Ecology also developed Appendix F – Four Factor Analysis, and incorporated new information into Chapter 9 – RPG and Chapter 10 – Long Term Strategy (LTS) for Visibility Improvement.

Ecology's investigation of the projected increases in visibility impairment at NOCA1 concluded that the projected increase in visibility impairment is the result of the comparatively long residence time of air parcels near the monitor combined with the presence of large point sources of SO_2.

More importantly, Ecology found that all of the WRAP's 2018 emission inventories (including the PRP18a inventory) did not include almost 9,500 tons per year of sulfur reductions from 3 oil refineries located in 2 counties indicated by residence time analysis to have the greatest potential for impacting NOCA1. As a consequence of sulfur reductions for the 3 refineries 27 times larger than those in WRAP 2018 inventories and the inordinately large fires that occurred in 2003, Ecology updated Chapter 9 – RPGs to set "no degradation" as the RPG for NOCA1. Time and resources did not allow this revised goal to be modeled at this time, but modeling will be performed for future SIP updates.

Ecology is continuing to explore all available options for requiring the addition of the low NO_x and ultra low NO_x burners at the Tesoro refinery that were not cost effective within the BART timeframe.

Comments on Chapter 10 LTS for Visibility Improvement:
This chapter should contain a discussion of the BART controls required. These facilities and emission units still may need to reduce emissions to make reasonable progress to improve visibility.

Washington's silvicultural Smoke Management Plan (SMP) was included in the 1999 Reasonably Attributable Visibility Impairment (RAVI) SIP. Has this been updated since 1999? A discussion of the state's program for controlling agricultural burning needs to be included. These discussions are to determine how the programs restrict emissions.

A wood stove emission limitation is discussed, but the relationship of this limitation and the apparent increase in residential wood combustion emissions included in the emission inventory is not explained.

Response:
Ecology has revised Chapter 10 – LTS for Visibility Improvement. Chapter 11 – BART includes a discussion of the controls required and the modeled visibility improvements based on the required BART controls.

The Washington State Department of Natural Resources (DNR) administers the silvicultural SMP. The DNR has not updated the plan since it was incorporated into the 1999 revision to the RAVI SIP.

Additional information on the state's agricultural burning program has been added to Chapter 10.

Ecology expanded the discussion on the relationship between increases in residential wood combustion (wood stove usage) due to population growth as reflected in the 2018 emission inventories and the affect on RPGs in Chapter 9 RPGs.

Comments on Chapter 11 – Best Available Retrofit Technology and Best Available Retrofit Technology determinations:
Ecology has not fully addressed our previous comments (November 20, 2009).

Ecology has not adequately evaluated the potential visibility improvement resulting from emission controls. The visibility benefits at all affected Class I areas resulting from controlling emissions at a particular source should be part of the process of making the decision on BART controls.

USDI-NPS has one overall comment applicable to all the BART determinations: Ecology should be evaluating the cumulative visibility improvement at all Class I Areas in determining cost effective emission controls for BART.

Alcoa Wenatchee
The modeling that was used to exempt this source from BART is unacceptable and a BART determination should be made.

For the following plants, the comments submitted on the individual BART determinations reiterate concerns raised as part of comment on the draft BART Orders; TransAlta Centralia Power Plant, Tesoro, Port Townsend Paper Co., and Alcoa Intalco.

Response:
The USDI-NPS previously commented on the draft BART determinations during the two public comment periods in Fall 2009. By-and-large the BART comments provided by USDI-NPS reiterated the comments provided during the BART public comment periods.

Ecology prepared summaries of the comments received during the two BART comment periods and prepared written responses to the comments received. Ecology also revised several of the BART technical support documents addressing concerns raised by USDI-NPS. Copies of these summaries and responses along with the revised technical support documents are included in

Appendix L – Best Available Retrofit Technology Technical Support Documents and Compliance Orders.

As discussed in Appendix I, Ecology believes that given the complex terrain found in the vicinity of Alcoa Wenatchee Works, the finer grid modeling that we accepted provide more realistic results for the impacts of the facility on Alpine Lakes Wilderness.

United States Department of the Interior
NATIONAL PARK SERVICE
Air Resources Division
P.O. Box 25287
Denver, CO 80225

TAKE PRIDE® IN AMERICA

IN REPLY REFER TO:

June 11, 2010

N3615 (2350)

Ted Sturdevant, Director
Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Mr. Sturdevant:

On April 1, 2010, we received Washington's draft regional haze implementation plan for review. We appreciate the opportunity to work with the State through the development and review of this plan to make progress toward achieving natural visibility conditions at our National Parks and Wilderness Areas.

This letter acknowledges that the U.S. Department of the Interior, National Park Service, in consultation with the U.S. Fish and Wildlife Service, has received and conducted a substantive review of the Washington draft Regional Haze Rule implementation plan in fulfillment of your requirements under the federal regulations 40 CFR 51.308(i)(2). Please note, however, that only the U.S. Environmental Protection Agency (EPA) can make a final determination regarding the document's completeness and, therefore, ability to receive federal approval from EPA.

Our review focused on eight key content areas that were outlined in a letter dated August 1, 2006, that we sent to each State. The content areas reflect priorities for the Federal Land Manager agencies, and our enclosed comments address these priorities. As we have discussed with your staff, we are concerned that the draft implementation plan as written does not meet all the regulatory requirements of the Regional Haze Rule. Washington has proposed reasonable progress goals without conducting the required four factor analysis of possible emission controls. The proposed reasonable progress goals do not reflect substantive improvement in visibility, and in the case of North Cascades National Park and Glacier Peak Wilderness Area, actually project a degradation in visibility by 2018 compared to the 2000-2004 baseline. We also have concerns with the determinations of Best Available Retrofit Technology (BART). Our BART comments supplement those that we provided on November 20, 2009.

We had a constructive discussion with your staff on May 18, 2010, and have offered our assistance in addressing our technical concerns. We look forward to continued dialog as you revise the implementation plan and respond to our comments per section 40 CFR 51.308(i)(3). For further information regarding our comments, please contact Pat Brewer of my staff, at (303) 969-2153.

Again, we appreciate the opportunity to work closely with the State of Washington to improve visibility in our Class I national parks and wilderness areas.

Sincerely,

John Bunyak

for Christine L. Shaver
Chief, Air Resources Division

Enclosure

cc: Mahbubul Islam
Manager, State and Tribal Air Programs Unit
U.S. EPA Region 10
1200 Sixth Avenue
Seattle, WA 98101

Stuart Clark
Manager, Air Quality Program
Department of Ecology
P.B. Box 47600
Olympia, Washington 98504-7600

National Park Service Comments
Washington Draft State Implementation Plan for Regional Haze
June 11, 2010

General Comments
Washington Department of Ecology (Ecology) has provided a clearly written draft regional haze State Implementation Plan (SIP). The draft plan contains several, but not all, of the key policy elements that we outlined in our August 2006 letter to the States. Ecology has demonstrated using the IMPROVE monitoring data and technical analyses provided by the Western Regional Air Partnership (WRAP) that Washington understands the causes of visibility impairment at the Class I areas in Washington.

The draft SIP is missing the required analysis of the four statutory factors to set reasonable progress goals and lacks a substantive long-term strategy for improving visibility in Class I areas in Washington. Ecology is taking few actions beyond reporting existing federal or previous state actions. Ecology needs to do more to demonstrate its commitment to improving visibility.

Ecology's Best Available Retrofit Technology (BART) determinations addressed some of our procedural concerns, but made no changes in control requirements from the draft BART determinations.

We provide more detailed comments on these concerns below. We also agree with comments provided by the Forest Service. We are willing and would welcome the opportunity to assist Ecology to implement the recommended analyses prior to submitting the final SIP to EPA.

Specific Comments

Chapter 5 Baseline and Natural Conditions

It would be helpful to look at daily time series data for each IMPROVE monitor for each year to better understand the frequency of contributions from fire (e.g., few major events vs multiple smaller events) and to better characterize the seasonal variation in contributions from nitrate and sulfate. Daily time series plots can be generated from the VIEWS website (http://views.cira.colostate.edu/web/).

Chapter 6 Emissions Inventory

WRAP provided several inventories to the western states to support regional planning. Ecology has chosen to discuss only two of the available WRAP inventory versions, 2002 Plan d (Plan02d) and 2018 Projected Reasonable Progress version a (PRP18a). It would be helpful to report that a 2002 actual inventory was used for model performance evaluation for the 2002 base year and to clarify how those emissions differed from the 2000-2004 average emissions used in Plan 02d.

Ecology should provide more discussion of the basis for differences between the 2002 Plan02d and the 2018 PRP18a inventory. Please identify the specific On the Books controls that account for the reduction in point source sulfur dioxide (SO_2). Please define whether the PRP18a inventory includes all the controls determined to be BART for sources subject to BART in Washington.

Please discuss the basis for increases between 2002 and 2018 in emissions of SO_2 from area sources and increases in emissions of nitrogen oxides (NO_x), volatile organic compounds (VOC), primary organic carbon (OC), and elemental carbon (EC) from point and area sources. It is difficult to claim progress in improving visibility when Washington emissions are increasing rather than decreasing.

Please clarify why Ecology chose to use the earlier 2018 PRP18a inventory rather than the more recent 2018 PRP18b inventory. We recommend that Ecology use the PRP18b inventory and modeling results. At a minimum, Ecology should explain the significant differences between the PRP18a and PRP18b inventories and define which inventory is more accurate. For example, total projected SO_2 emissions from Washington point sources were 12,262 tons lower in the PRP18b inventory than in the PRP18a inventory. Total NO_x emissions from point sources were 5,250 tons lower in PRP18b than PRP18a. Are these differences due to emissions controls or changes in inventory methods? Did Ecology or WRAP generate these inventory changes?

Chapter 7 WRAP Modeling

Section 7.3 on model performance provides very little information to judge the confidence to place in the modeling results reported over the next 50 pages. It is preferable for Ecology to include model performance charts for sulfate, nitrate, and organic carbon. At a minimum, Ecology should discuss how well the regional models represent meteorology and air quality at the IMPROVE monitors in Washington.

The last sentence in section 7.3 is incomplete.

Section 7.4 accurately discusses the Particulate Source Apportionment Technology (PSAT) modeling and the Weighted Emissions Potential analyses (WEP). In Section 7.4.3 it is important for Ecology to clarify the significant differences between the inventory versions reported in Section 6 (WRAP 2002 Plan02d and 2018 PRP18a), the earlier inventories used for the PSAT modeling (2002 Plan02c and 2018 base b) and the later 2018 inventory used in the WEP analyses (2002 Plan02d and 2018 PRP18b).

Please correct the figure title for Figure 7-3 which refers to WEP results not PSAT results. The last two sentences in Section 7.4.3 appear contradictory.

Chapter 8 Source Apportionment

WRAP's PSAT results for sulfate and nitrate source apportionment and the WRAP WEP analyses are accurately reported. Residence time analyses can assist in defining source areas that most frequently impact Class I areas. In addition to the residence time plots available on the WRAP Technical Support System (TSS) under the WEP analyses, residence time plots are also provided under the Causes of Haze technical archive: http://www.coha.dri.edu/images/backtraj/wa_w20_0500m_backtraj_northcascades.gif.

Chapter 9 Reasonable Progress Goals

Ecology has not met the requirements of the regional haze rule Section § 51.308 (d) (1):

> "The reasonable Progress goals must provide for an improvement in visibility for the most impaired days...
>
> (i) In establishing a reasonable progress goal for any mandatory Class I Federal area within the State, the State must:
>
> (A) Consider the costs of compliance, the time necessary for compliance, the energy and non-air quality environmental impacts of compliance, and the remaining useful life of any potentially affected sources, and include a demonstration showing how these factors were taken into consideration in selecting the goal."

Ecology set reasonable progress goals for the Class I areas in Washington the same as the WRAP PRP18a modeling results. DOE did not consider the four statutory factors. Modeled visibility in 2018 does not meet the uniform rate of progress for 2018. At North Cascades National Park and Glacier Peak Wilderness Area, visibility is projected to degrade by 2018. Both sulfate and organic carbon are projected to increase at North Cascades National Park in 2018 compared to 2002. This result does not comply with Section § 51.308 (d) (1). Ecology needs to explain the basis for these results.

It is difficult to see how Ecology can conclude that the existing controls are sufficient to demonstrate reasonable progress, especially when point and area source emissions in Washington are projected to increase by 2018.

Tesoro Refining and Marketing Company originally proposed to install and operate low NOx burners or ultra low NOx burners on process heaters by 2018 as part of their Best Available Retrofit Technology (BART) proposal. Ecology found the proposed controls to be technically and economically feasible. Since Tesoro proposed to install controls on two heaters during a regularly scheduled maintenance outage in 2017, these controls were determined to be too late to meet BART requirements and not required in Tesoro's permit. We ask Ecology to require by permit that these controls be operational by 2018 as part of the current reasonable progress demonstration.

The regional haze rule Section § 51.308 (d) (1) (vi) instructs:

> "The State may not adopt a reasonable progress goal that represents less visibility improvement than is expected to result from implementation of other requirements of the CAA during the applicable planning period."

Ecology is using the WRAP PRP18a inventory for reasonable progress goals, yet the more recent WRAP PRP18b inventory has lower emissions and the PRP18b modeling results project slightly better visibility at the Class I areas than the PRP18a modeling results. If the PRP18b inventory and modeling results provide a more accurate representation of visibility benefits from expected controls by 2018, then Ecology should cite the PRP18b modeling results.

For the reasonable progress analysis, Ecology should identify the major sources in Washington that may contribute to visibility impairment in Class I areas and potential future controls.

Using the WRAP Emissions Data Management System (EDMS), in the attached table we identified 37 individual units in Washington that have projected 2018 emissions greater than 350 tons per year of either SO_2 or NO_x in the WRAP PRP18a inventory. (Facility name is listed more than once if there are multiple processes at one facility.)

Ecology could use data available through the WRAP EDMS and WRAP WEP to qualitatively rank the potential contributions of Washington point sources to Class I areas. Emissions, distance from the source to the Class I area, and residence time of the grid cell where the source is located can be used to rank the relative importance of specific point sources for consideration in a reasonable progress analysis. Such an analysis is advisable to prioritize DOE's intended control analysis under the long-term strategy. We are available to assist in such an analysis.

Chapter 10 Long Term Strategy

The long-term strategy should include a discussion of the BART controls. Even if exempted from BART, industrial sources may still need to reduce emissions to make reasonable progress toward improving visibility.

Ecology indicates that Washington's silvicultural Smoke Management Plan was included in the 1999 SIP for Reasonably Attributable Visibility Impairment (RAVI). Please clarify if the Smoke Management Plan has been updated since 1999. Please provide additional discussion of the state's control requirements for agricultural burning. More discussion is needed to demonstrate how these smoke management programs restrict emissions.

Ecology discusses that Washington has already implemented a program to address residential wood combustion but does not discuss that the inventory provided by WRAP for this sector is increasing, not decreasing. Please clarify whether the WRAP PRP18a inventory accounts for Washington's residential wood control programs.

Chapter 11 Best Available Retrofit Technology (BART)

Ecology has not fully addressed our previous comments (November 20, 2009).

BART sources in Washington impact several Class I areas. Cumulative visibility impacts need to be considered when determining the appropriate level of control for BART. Ecology's response that there is no single clearly defined method to consider cumulative impacts does not address our concern. The visibility benefits of controlling a source that impacts 12 Class I areas are greater than the benefits of controlling a source that impacts 1 Class I area, and Ecology's BART analyses should consider cumulative, multi-park impacts. We are willing to assist you in calculating cumulative impacts and multi-park benefits of control scenarios.

Our detailed comments on the proposed BART determinations are provided in the attached analyses and summarized below.

Alcoa Wenatchee: We strongly disagree with using an ultra fine modeling grid to exempt Alcoa Wenatchee from BART eligibility. Control options for this source should have been evaluated.

Centralia:

- We believe that Selective Catalytic Reduction (SCR) is both technically feasible and cost effective to reduce visibility impacts and should be determined to be BART for Centralia.
- TransAlta assumes that due to space constraints, SCR would have to be located on top of the electrostatic precipitator (ESP). TransAlta did not consider the feasibility of a downstream location. Ecology should not have eliminated low-dust and tail-end SCR with resized ductwork as feasible options.
- Ecology has underestimated the ability of SCR to reduce emissions. Ecology assumes that SCR can achieve an annual emissions limit of 0.07 lb/mmBtu or 70% NOx reduction. EPA's Clean Air Markets data base demonstrates that 19 units are achieving an annual emissions rate of 0.05 lb/mmBtu or 90% NOx removal. By underestimating SCR efficiency, cost effectiveness is underestimated.
- Costs of SCR installation are overestimated. The EPA Control Cost manual should have been used as recommended by EPA in the BART guidelines. Several cost items were included in the analysis that are not allowed in the Cost Manual.
- With higher removal efficiency and lower total costs, NPS estimated a reasonable cost effectiveness at $5622/ton, compared to $9091/ton estimated by TransAlta's consultant.
- TranAlta underestimated the visibility benefits of SCR. TransAlta has lowered sulfur dioxide emissions by burning low sulfur coal from Powder River Basin in Wyoming (called FlexFuel project). TransAlta evaluated the visibility benefits of Selective Noncatalytic Reduction (SNCR) with FlexFuel but evaluated SCR without the benefit of FlexFuel. Thus the benefits of SCR are underrepresented.
- We have previously asked Ecology to consider the cumulative visibility impacts of TransAlta on the 12 Class I areas that are within 300 km of the facility, and the potential visibility improvements in those areas from the various control alternatives.

Tesoro:

- Ecology found that NOx emissions controls originally proposed as BART by Tesoro are appropriate and cost effective to implement in the 2017-2018 timeframe. Because these controls cannot be installed by 2015, Ecology determined that they did not meet the BART requirements. Ecology should require these controls to be installed by 2018 as part of reasonable progress.

Port Townsend:

- Ecology must evaluate all technically-feasible and proposed options against the proposed BART limits if these are higher than current emissions limits.
- Ecology must evaluate the visibility impacts of switching to lower sulfur fuels.
- Ecology should have evaluated upgrades to existing control equipment.
- We believe a wet Electrostatic Precipitator for Power Boiler #10 is cost effective and represents BART.

Intalco:

- Costs of Limestone Slurry Forced Oxidation were overestimated.
- Intalco and Ecology should better explain why seawater scrubbing and sodium-based scrubbing were rejected for potline SO_2 emissions.

Conclusions

We would like to see Ecology make a more substantive effort to reduce emissions to improve visibility. We are willing to assist Ecology to address the concerns raised in this review.

Washington Point Source 2018 Emissions SO2 or NOx Greater than 350 Tons/Year
(from Western Regional Air Partnership; plant name is listed more than once if there are multiple units and/or processes at one facility)

Source Category	Source Category	Plant Name	2018 SO2 tons/yr	2018 NOx tons/yr
Primary Metal Production	Aluminum Ore (Electro-reduction)	Aluminum Co Of America Wenatchee Works	3,026	56
		Goldendale Aluminum	433	63
		Intalco Aluminum Corp Ferndale	4,734	29
Pulp and Paper and Wood Products	Sulfate (Kraft) Pulping	Boise Cascade	3,873	609
		Fort James Camas Llc	12	589
		Longview Fibre	125	815
		Pt Townsend Paper	448	374
		Simpson Tacoma Kraft	557	543
		Weyerhaeuser Co	67	839
	Sulfite Pulping	Fort James Camas Llc	8	480
		Weyerhaeuser Co.	284	572
Petroleum Industry	Process Heaters	Bp Cherry Point Refinery	904	1,684
		Conoco Phillips	744	640
		Puget Sound Refining Company	16	577
		Tesoro Northwest Company	1,100	761
	Flares	Puget Sound Refining Company	665	29
	Catalytic Cracking Units	Puget Sound Refining Company	1,571	
	Petroleum Coke Calcining	Bp Cherry Point Refinery	245	843
	Blowdown Systems	Conoco Phillips	559	393
Mineral Products	Cement Manufacturing (Wet Process)	Lafarge North America Inc	1,209	3,528
	Cement Manufacturing (Dry Process)	Ash Grove Cement Co, E Marginal	312	1,597
	Glass Manufacture	Cardinal FG	72	830
		Saint-Gobain Containers Inc	193	669
	Lime Manufacture	Graymont Western Us Inc Total	151	394
Chemical Manufacturing	Nitric Acid	Agrium Us Inc	0	415

Source Category	**Source Category**	**Plant Name**	**2018 SO2 tons/yr**	**2018 NOx tons/yr**
Electric Generation	Bituminous/ Subbituminous Coal	Transalta Centralia Generation	2,491	14,477
	Wood/Bark Waste	Avista	9	660
	Residual Oil	Daishowa America	412	71
Industrial Combustion Boilers	Process Gas	Conoco Phillips	1,223	103
		Longview Fibre	1,898	27
		Puget Sound Refining Company	4	629
		Tesoro Northwest Company	3,775	1,650
	Wood/Bark Waste	Kimberly-Clark Corporation	499	571
		Weyerhaeuser Co	821	1,666
	Residual Oil	Tesoro Northwest Company	707	117
	Natural Gas	Longview Fibre	1	499
Solid Waste Disposal - Government	Municipal Incineration	Waste To Energy	15	451

Section B-5 Ecology's Summary of the U.S. Department of Agriculture Forest Service's Comments and Ecology's Response

The following is a summary of the comments offered by the USDA-FS on the Consultation Draft RH SIP document.

General comments:
The major concerns with the draft is the projected worsening of visibility for the Glacier Peak Wilderness area and the rate of progress to restore visibility to conditions at all monitoring sites, but especially at the PASA1 IMPROVE monitoring site representing the Pasayten Wilderness.

The USDA-FS also has concerns with these specific issues:

- emission inventories contains unexplained increases in point and area source emissions
- source apportionment analysis which is too broad to identify specific emissions sources
- four factor analysis presented in the Consultation Draft RH SIP is lacking and not adequate to use in development of reasonable progress goals or a long-term strategy
- BART determinations should be revisited and more aggressive emission reductions selected because of the rate of progress and projected worsening of conditions

The USDA-FS also has concerns about possible implications of errors in:

- projected future emissions from emissions from anthropogenic fires
- commitment to improving air quality and visibility in the Columbia River Gorge
- changes to Class I Area Boundaries since 1977

Response:
Ecology found the discussion helpful and we are working to strengthen the RH SIP based on many of FLMs comments.

Ecology made a commitment in an e-mail from Jeff Johnston to the FLM dated May 27, 2010 to address the following concerns expressed during our meeting on May 18, 2010:

1. Discuss the different emissions inventories and their use in the analysis, including additional discussion of why the PRP18a inventory was chosen for our analysis.
2. Expand on fire-related issues, including a discussion of the State's agricultural burning program.
3. Take a closer look at why visibility impairment gets worse at the North Cascades monitor.
4. Expand the four-factor analysis in Chapter 9 and make it more similar to Oregon's.
5. Expand the discussion of monitoring data, specifically looking at the observed seasonal trends.

Further information on some of these specific items is provided below in the responses to more specific FLM comments.

Comments on emission inventories:
What are the sources of the large increases in point and area source emissions projected for 2018?

Response:
A more thorough understanding of the sources that contribute to visibility impairment is beneficial in understanding the effects on Class I Areas. We note that taken together point and area source emissions of SO_2 decrease as do mobile source emissions. The result is an overall 40% emissions decrease. Point and area source emissions of NO_x are projected to increase, but this increase is small compared to the much larger projected decrease in mobile source emissions. Point and area sources of Volatile Organic Compounds (VOCs) and OC are projected to increase but there is some uncertainty about these inventories and they could be improved.

Ecology incorporated additional information into Chapter 6 – Emissions Inventories and Chapter 7 – WRAP Modeling. Chapter 9 RPGs includes discussions on the effects of the projected increases on rate of progress.

Comments on source apportionment:
Overall the USDA-FS suggests the source apportionment analyses performed could be improved, suggesting a number of techniques that could be used to improve the analyses and point to sources or source categories that could be addressed to reduce visibility impairment. Examples cited are seasonal evaluation of the sulfate impact at the SNPA1 site representing the Alpine Lakes Wilderness.

A more thorough analysis by individual pollutant (NO_x for nitrates, SO_2 for sulfates, etc.) of the sources that impact the NOCA1 monitor should be performed, including re-evaluation of BART for the sources indicated contribute or cause visibility impairment within the North Cascades National Park or Glacier Peak Wilderness, identification of other contributing sources and a proposal to reduce emissions from those sources, an explanation of how Ecology will address the Canadian sources that contribute to visibility impairment. The USDA-FS suggests this type of analysis should be performed for each of the mandatory Class I Areas in Washington.

Response:
Ecology evaluated the seasonality of various pollutants at the IMPROVE monitors to supplement the information in the PSAT and WEP analyses provided by WRAP. Additional information on the seasonality at each of the IMPROVE monitors has been added to Chapter 5.

The NOCA1 situation is discussed more thoroughly below in response to comments on RPGs. Briefly, the modeled impacts showing increased visibility degradation appear to result from the long residence time of air parcels near the monitor and the presence of large point source of SO_2. More importantly, All the WRAP 2018 emission projections are flawed. Three large oil refineries in the residence time area with the greatest potential impact on NOCA1 have unaccredited emission reductions totaling almost 9.500 tons of SO_2 per year. A discussion of Ecology's findings is found in Chapter 9 – RPGs.

Comments on Reasonable Progress Goals:

While Ecology notes that potential controls to further reduce emissions are “not reasonable at this time” due to the need for Ecology to evaluate their applicability to sources in the state, determining the visibility benefits of implementing controls, and putting controls into regulatory form. This rationale is different from the four factors and Ecology has not provided sufficient basis for why it will take so long to attain natural conditions.

The WRAP report contained in Appendix F is not specific to sources in Washington, and thus is too general to provide sufficient information to develop RPGs. Ecology needs to take the next steps in conducting a four factor analysis for sources specific to Washington State.

Another related issue pertains to Ecology’s RPG for North Cascades National Park and Glacier Peak Wilderness. The USDA-FS finds that the WRAP modeling that projects degradation at these two Class I Areas represented by the NOCA1 monitor is unacceptable and counter to the requirements of the RHR. The rate of progress for the other Class I areas extends beyond the 2064 goal is not acceptable to the USDA-FS.

The USDA-FS goes on with a number of specific questions on elements of the plan related to the setting of the RPG and the emission inventory. Questions revolve around the source of primary organic aerosols from area sources and how sulfate can increase in proportion of the total visibility impairment when primary SO_2 emissions go down. They would also like to determine when ammonia is a limiting pollutant in the formation of haze and how Ecology plans on addressing ammonia emissions.

Response:
Ecology also developed a set of Washington-specific Four Factor Analyses (Appendix F) and incorporated new information into Chapter 9 – RPG, and Chapter – 10 LTS for Visibility Improvement. This information includes identification of candidate source categories for control of SO_2 and NO_x and the approximate time lines involved in developing rules or regulatory orders and the anticipated timeframe for installing the newly required controls.

Ecology’s investigation of the projected increases in visibility impairment at NOCA1 concluded that the projected increase in visibility impairment is the result of the comparatively long residence time of air parcels near the monitor combined with the presence of large point sources of SO_2.

More importantly, Ecology found that all of the WRAP’s 2018 emission inventories (including the PRP18a inventory) did not include almost 9,500 tons per year of sulfur reductions from 3 oil refineries located in 2 counties indicated by residence time analysis to have the greatest potential for impacting NOCA1. As a consequence of sulfur reductions at these 3 refineries 27 times larger than those in WRAP 2018 inventories and the inordinately large fires that occurred in 2003, Ecology updated Chapter 9 – RPGs to set “no degradation” as the RPG for NOCA1. Time and resources did not allow this revised goal to be modeled at this time, but modeling will be performed for future SIP updates.

The RHR breaks the RH Program into several planning phases extending from 2005 to 2064. This foundational RH SIP covers the initial planning period from 2005-2018. For this foundational plan, Ecology incorporated additional information into Chapter 6 – Emissions Inventories and Chapter 7 – WRAP Modeling. Ecology also incorporated new information into Chapter 9 – RPGs and Chapter 10 – LTS for Visibility Improvement on the effects of the projected emissions increases on rate of progress. During future planning periods the SIP will be reviewed and revised to address Washington's emissions.

Comments on the Long-Term Strategy:
Tables in Chapter 8 indicate that Washington sources contribute to visibility impairment in Oregon, Idaho, and Montana Class I areas. However, the Consultation Draft RH SIP does not discuss how Washington plans to reduce emissions that affect these out-of-state Class I areas. The plan needs to include information addressing how Washington plans to reduce the impact of its emissions on visibility in Class I areas in other states assisting them in meeting their reasonable progress goals. USDA-FS also encourages Ecology to consider sustainability and energy conservation as part of its Long-Term Strategy for all pollutants.

Response:
Participation in the WRAP fostered a regionally consistent approach to RH planning in the western states and provided a sound mechanism for consultation. The result is that the western states have agreed upon the RPGs being set for 2018 and the appropriateness of strategies to achieve these goals for all mandatory Class I Areas in the WRAP region. To put the matter in its simplest terms, controls including BART to reduce visibility-impairing pollutants at mandatory Class I Areas within Washington will also contribute to visibility improvement at mandatory Class I Areas outside Washington.

We appreciate your suggestion about sustainability and energy conservation. Washington State is a leader in addressing climate change. We expect these activities will be reflected in future RH SIPs.

Comments on New Source Review:
The USDA-FS asks that there be a clear linkage between the Prevention of Significant Deterioration (PSD) process and the RH SIP. To avoid potential confusion, at facilities in which federally enforceable emission reductions are created as part of the State RH SIP, please clarify that these emission reductions could not also be used as credits in the determination of net emission increase as used in determining applicability of PSD.

Response:
These emissions reductions cannot be used as credits in the determination of net emission increase in determining the applicability of PSD. This has been incorporated into Chapter 11 – BART.

Comments on BART Modeling:
The USDA-FS has two major issues with the draft BART determination and suggests that the State's BART determinations should be re-evaluated in light of the rate of progress in attaining natural conditions. The note that Ecology dismissed several control options due to cost has limited the rate of progress. Ecology should focus on the facilities which contribute to visibility impairment, especially at the Class I areas in which visibility is not expected to improve or

improve very slowly. Consider the pollutants which contribute impairment and the leeway Ecology has in determining BART. When considering the cost and benefits, we ask Ecology to take a more determined approach in selecting BART which will allow for a faster rate of improvement than currently projected.

Response:
The draft BART determinations were previously commented on by the USDA-FS during the public comment periods in Fall 2009.

Ecology prepared summaries of the comments received during the two BART comment periods and prepared written responses to the comments received. Ecology also revised several of the BART technical support documents addressing concerns raised by USDA-FS. Copies of these summaries and responses along with the revised technical support documents are included in Appendix L – BART Technical Support Documents and Compliance Orders.

Comments on BART Exemption Modeling:
The USDA-FS disagrees with the modeling performed to exempt the Alcoa Wenatchee aluminum smelter was done incorrectly and the plant should be subject-to-BART.

Response:
As discussed in Appendix I - 0.5-km Grid Spacing to Evaluate the Impacts of BART, Ecology believes that given the complex terrain found in the vicinity of Alcoa Wenatchee Works, the finer grid modeling that we accepted provides more realistic results for the impacts of the facility on the Alpine Lakes Wilderness. The Washington – Oregon – Idaho Modeling Protocol (found in Appendix H) was developed to provide consistency between the BART modeling done in the three states. However, authors of the protocol agreed that the document was to be a guideline, and that states would have the ability to deviate from the guideline under certain circumstances. Ecology believes that the particular circumstance of Alcoa Wenatchee Works, specifically the complex terrain surrounding the facility, was an instance in which an exception to the modeling protocol was technically justified. Ecology is concerned about visibility in the Alpine Lakes Wilderness and we will work over the coming years with a variety of tools to improve visibility conditions.

Comments on expectations of emissions from fire:
The USDA-FS indicates that the projected 30% reduction in anthropogenic fire emissions is unrealistic and may hamper the ability to achieve the goals of the RHR. In general Ecology needs to better clarify the sources included in the category, especially clarify what is an anthropogenic fire and what is a natural fire. The text of the sections discussing anthropogenic and natural fires may be misleading and adversely interfere with the USDA-FS in its goal of lighting more small fires to prevent large wildfires.

Response:
The fire emissions inventory was developed by the WRAP Fire Emissions Joint Forum. The projected emission reductions reflect the most likely emission reduction techniques that would be applied to both prescribed fire and agricultural burning throughout the entire WRAP region.

The WRAP Fire Emissions Joint Forum created the Natural Background Task Team to develop a methodology to classify fire as either "natural" or "anthropogenic." Additional information about how fire was categorized has been added to Chapter 6 Emissions Inventories.

Comments on Columbia River Gorge National Scenic Area:
This Regional Haze plan should coordinate with the strategy being developed to protect and improve visibility within the Columbia River National Scenic Area. The USDA-FS asks Ecology continue its commitment towards protecting and enhancing air quality and visibility in the scenic area by adding language to the Washington SIP similar to that included in Section 1.6.2 of the Oregon RH SIP.

Response:
In 2007 the Washington State Legislature restored funding for activities need to develop the RH SIP for the 8 mandatory Class I Areas in Washington as required by the RHR. The Legislature did not restore funding for all visibility related activities. Since the Columbia River Gorge National Scenic Area is a Class II Area it is not addressed by the RH SIP.

Washington has responded to an information request by the Oregon Department of Environmental Quality (ODEQ) on how smoke is controlled in Washington so that this can be included in the Columbia Gorge Air Quality Strategy that ODEQ is developing.

Comments on correction to Class I area boundaries:
The USDA-FS notes that there is an incorrect sentence in Chapter 4 and the map of the Alpine lakes wilderness in Figure 4-4 is incorrect and provides Ecology with an updated map for use.

Response:
Ecology has removed the questioned sentence from Chapter 4. We revised Figures 4-1 and 11-1 showing the boundaries of the Alpine Lakes Wilderness. Figure 4-4 is from Causes of Haze Assessment Descriptive Maps and we are unable to revise this figure.

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PO Box 3623
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File Code: 2580
Date: June 8, 2010

Mr. Doug Schneider
Regional Haze SIP Coordinator
Air Quality Program
Washington Department of Ecology
PO Box 47600
Olympia, WA 98504-7600

Dear Mr. Schneider:

Re: **Forest Service Technical Comments on Regional Haze SIP**

As the federal land manager, responsible for protecting visibility in five of the eight federal Class I wilderness areas in the State of Washington, the USDA Forest Service has a vested interest in the outcome of Washington's Regional Haze (RH) State Implementation Plan (SIP). As such, we have been actively involved in numerous meetings with Ecology during the development of this plan. We have submitted numerous comments during the development of the BART determinations, and now we appreciate the opportunity to see the culmination of Ecology's efforts in the proposed Regional Haze SIP.

After reviewing this document, we conclude that we are dissatisfied with the draft RH SIP. Our dissatisfaction stems from two major areas of concern (1) the expected worsening of visibility in the Glacier Peak Wilderness, and (2) the extremely slow rate of progress in restoring visibility to natural conditions at the Pasayten Wilderness (698 years). We are also dissatisfied with the slow rate of progress anticipated for Alpine Lakes, Goat Rocks, and Mt Adams Wilderness areas. We would like to see Ecology develop a plan in which visibility will be restored to natural conditions within a much shorter time frame than currently proposed.

Our concerns on specific issues of the plan include: unexplained increases in the emission inventories of point and areas sources, source apportionment which is too broad to identify specific emission sources, and a lack of an adequate four-factor analysis in developing Reasonable Progress Goals (RPGs). Consequently, the long-term strategy is not specific enough to lay the foundation for restoring visibility impairment in a timely manner. Given the slow rate of progress and projected worsening of conditions, we believe the BART determinations should be revisited and more aggressive emission reductions selected. We have provided numerous comments on individual BART assessments. We ask Ecology to revisit our comments in light of establishing faster rates of progress.

We also have concerns about the implications of errors in the projected future emissions from anthropogenic fires, commitment to improving air quality and visibility in the Columbia River Gorge, and changes to Class I area boundaries since 1977. Specific areas of concern are discussed in more detail below.

Our Regional Forester, Mary Wagner, also provided an executive summary of these comments to the Director of WDOE, Mr. Ted Sturdevent. She has requested to have a follow-up telephone call to discuss these concerns.

Issues with Rate of Progress of Restoring Natural Conditions

As shown in Table 9-1, none of the federal Class I areas in Washington are expected to restore visibility to natural conditions within the 54 years remaining (i.e., by 2064), as envisioned by the authors of the Regional Haze Rule. The projected dates of restoring visibility to natural conditions vary by Class I area, and range from an additional 64 to 698 years or more. In fact, for two Class I areas, Ecology's goal is to allow visibility to get worse, thus preventing a projection of how many years will be required to achieve the goal of the Regional Haze Rule. In our judgment, this is not reasonable.

The expected slow rate of progress stems from a number of underlying issues associated with several of the core elements of the plan including: emission inventories, source apportionment, reasonable progress goals, long-term strategy, and BART determinations. Each of these is described in more detail below. In light of the projected slow rate of restoring visibility to natural conditions, we urge Ecology to revisit each of these core elements with a mind-set to greatly improve upon the projected rate of progress.

Emission Inventories

Tables 6-1 – 6-7. What are the sources of the large increases in point and area source emissions projected for 2018? An understanding of these sources will help in developing a more aggressive rate of restoring visibility to natural conditions.

Source Apportionment

The source apportionments could be improved by considering additional analyses and tools not presented in the RH SIP. For example, consider the Alpine Lakes Wilderness. A review of the composition and timing of the worst-case days at this site reveal that the period from April through October has the highest contribution from sulfates (reference – Views 2.0 Website). Using the WRAP TSS emissions and apportionment tool, WA point sources are the largest contributing source category to sulfates at this site, especially during July and August. In fact, the point source contribution to sulfates at Alpine Lakes actually increases between 2002 and 2018. These increases offset some of the reductions from mobile sources. Ecology should revisit the source apportionment analyses in more detail, and refine its strategy toward achieving the goals of the regional haze rule.

Additionally, a pollutant-specific source apportionment for each Class I area should be re-evaluated in light of the projected rate of progress, again with the purposeful intention of improving the rate of progress. For example, consider the information presented in Figure 9-2 for North Cascades National Park and Glacier Peak Wilderness. The projected light extinction from organic mass and sulfate exceed the uniform rate of progress. Thus considerable effort should be placed on more-specifically identifying sources contributing to organic mass and sulfates. These are discussed in a very general sense in Chapter 8 and 9, but could also be combined with the information contained in the BART analyses shown in Chapter 11. Figure 8-13 illustrates that Washington point sources and Canadian point and area sources are the largest contributing sources to sulfate. Tables 11-5, 11-6, 11-8, and 11-11, reveal that the four facilities which were subject to BART, for which Ecology is proposing no additional controls, all contribute to haze in these Class I areas. Given the leeway Ecology has in determining BART, we advocate that the BART analyses should be revisited; this time with a more assertive consideration of cost-benefits. What about the other point sources in Washington? What is Ecology's plan to reduce impacts from these contributing sources? At a minimum, Ecology should be more specific in identifying these contributing sources. What about the Canadian sources? Does Ecology have any intention of engaging with the Canadian government about the impact from these sources? If so, please elaborate. This same line of investigation should be pursued for each pollutant for each Class I area.

Reasonable Progress Goals

The Regional Haze rule states *(40 CFR 51.308 (d) 1(ii))* that if the State established a reasonable progress goal that provides for a slower rate of improvement in visibility than the rate that would be needed to attain natural conditions by 2064, the State must demonstrate, based upon the four-factor analysis (i.e., considering cost of compliance, the time necessary for compliance, the energy and non-air quality environmental impacts of compliance, and the remaining useful life of the source) that the rate of progress for the implementation plan to attain natural conditions is (1) not reasonable and (2) that the progress goal adopted by the State is reasonable.

Table 9-1 presents a summary of Ecology's proposed Reasonable Progress Goals (RPGs) for Washington's Class I areas. In all cases the RPGs are slower than the Uniform Glide Path 2018 target. For each Class I area, Ecology acknowledges that there are potential controls applicable to sources in Washington. However, further controls are "not reasonable at this time" (page 9-5) because Ecology needs to investigate the applicability of specific controls to sources in the state, determining the visibility benefits of implementing controls, and putting controls into regulatory form. However, this rationale is different from the four factors: cost of compliance, time necessary for compliance, the energy and non-air quality environmental impacts of compliance, and remaining useful life of the source. As such, Ecology has not provided sufficient basis for why it will take so long to attain natural conditions. This is a key missing component of Ecology's RH SIP.

Another related issue pertains to Ecology's RPGs for North Cascades National Park and Glacier Peak Wilderness. Table 9-1 shows that the 2000 – 2004 baseline conditions at these two Class I areas is 16.01 deciviews (dv). Yet, the 2018 RPG is 17.24 dv. Or put another way, Ecology is proposing a RGP in which visibility gets worse, not better. This clearly is not allowed by the rule. Section 51.308 (d) (1) of the Regional Haze rule states that "…*the reasonable progress goals must provide for an improvement in visibility for the most impaired days over the period of the implementation plan* and ensure no degradation in visibility for the least impaired days over the same period." Ecology needs to develop an RPG for these Class I areas consistent with the rule.

In our judgment, the RPGs set for the Class I areas in Washington are not reasonable as they allow for degradation of visibility at two Class I areas, and estimate that it will take 323 to 698 years to achieve natural conditions at two additional Class I areas, and the remaining four Class I areas will take 64-87 years to restore visibility to natural conditions.

The WRAP report contained in Appendix F is not specific to sources in Washington, and thus is too general to provide sufficient information to develop RPGs. Ecology needs to take the next steps in conducting a four factor analysis for sources specific to Washington State. Table 11-2 identifies numerous point sources which Washington identified as not being eligible for BART. A four factor analysis should be conducted for these sources. In August 2007, the Forest Service provided Ecology with a screening analysis identifying candidate sources for conducting a four factor analysis as part of its RFP analysis. These sources were: Kimberly-Clark Corp., Everett; Ash Grove Cement, E. Marginal; Boise White Paper Co., Wallula; Nippon Paper Industries, Port Angeles; Saint Gobain Containers, Seattle. Please provide a four factor analysis for these sources.

In addition to the issues associated with its four factor analysis, the RPG portion of the SIP has some discrepancies which need to be addressed. Page 9-3 & others. "Statewide emissions of SO_2 are projected to decline almost 40% between the 2000-2004 baseline period and 2018. This decline results from a 29% reduction in point source emissions and a 95% reduction in on-road and off-road mobile source emissions." Yet in Chapter 8, PSAT point source impacts from sulfate are projected to increase or remain roughly the same at WA class I areas. Where are the 40% reductions coming from such that they don't benefit WA Class I's?

Additionally, Figure 9-2 shows an expected increase in most impaired day sulfate impacts at NOCA1, yet PSAT results in Figure 8-13 show no real change in net contributions. How is that possible? Figure 9-2 also shows an expected increase in extinction from organics. Figure 8-21 suggests that a significant fraction of the increase results from WA area sources. If true, then it is not clear that Ecology has demonstrated that it is doing its share to meet RPG's at NOCA1.

Page 9-8 implies that backyard burning is responsible for area source increases of primary organic carbon as follows:

> *"Area sources are responsible for most of the rest of the primary organic aerosols emissions. The projected human-caused increase in 2018 emissions basically reflects increases in emissions from residential wood combustion, backyard burning, and construction activities. The increases reflect population increase."*

However residential wood combustion growth should be minimal due to "*Emission standards for woodstoves and fireplaces that are more restrictive than current EPA standards* " (p 10-9) and, "*Construction activities have not been identified as contributing to visibility impairment in mandatory Class I Areas in Washington. History shows the impacts occur close to the construction site*" (p 10-8).

So are we left to conclude that backyard burning is responsible for area source increases? Please clarify. Also, please explain why these area sources have not been included in the RP plans.

In addition, to the primary pollutants contributing to haze, there may be situations in which other reactive chemical species, such as ammonia, may be limiting the formation of haze. As such, the reductions in primary pollutants such as SOx and NOx may not be effective in reducing haze. Please identify locations and times when, and if, ammonia is a limiting pollutant in the formation of haze, and if so, how Ecology plans to address limiting ammonia emissions.

Long Term Strategy

Section 51.308(d)(3) states that the long-term strategy must include enforceable emission limitations, compliance schedule, and other measures as necessary to achieve the reasonable progress goals established by States having mandatory Class I Federal areas. As Washington's RGPs should be revised, so should the Long Term Strategy, accordingly.

Per Tables 8-4 and 8-5, emission sources in Washington contribute to visibility impairment in the several of the Class I areas of Oregon, Idaho, and Montana, both in the baseline and the 2018 scenario. However, there is no further discussion or specifics of Ecology's plan to reduce WA source emissions accordingly. Without these specifics identified, Washington is hindering the ability of surrounding states to meet their RPGs. Please rectify this situation by (1) demonstrating that Washington has included all measures necessary to obtain its share of the emission reductions needed to meet the progress goals for these other Class I areas and (2) specify the enforceable emission limitations, compliance schedules, and other measures necessary to achieve RPGs in Class I areas in surrounding states.

We also encourage Ecology to consider sustainability and energy conservation as part of its Long-Term Strategy for all pollutants.

New Source Review

We routinely request that states add a linkage between their PSD process and their RH SIP. We note that the PSD program can be particularly effective with respect to the goal of no degradation of the clearest days. To avoid potential confusion, at facilities in which federally enforceable emission reductions are created as part of the State RH SIP, please clarify that these emission reductions could not also be used as credits in the determination of net emission increase as used in determining applicability of PSD.

BART Modeling

There are two major issues with Ecology's BART determinations: (1) they are not as effective as they could be in helping to restore visibility to natural conditions by 2064, and (2) Ecology inappropriately exempted the Alcoa Aluminum plant in Malaga, WA from BART.

Ecology's BART determinations should be re-evaluated in light of the projected slow rate of progress in restoring visibility to natural conditions. While states have some latitude in determining BART, Ecology's dismissal of several viable control options due to costs, have clearly limited the rate of progress. Ecology should focus on the facilities which contribute to visibility impairment, especially at the Class I areas in which visibility is not expected to improve or improve very slowly. Consider the pollutants which contribute impairment and the leeway Ecology has in determining BART. When considering the cost and benefits, we ask Ecology to take a more determined approach in selecting BART which will allow for a faster rate of improvement than currently projected.

BART Exemption Modeling

The Forest Service disagrees with Ecology's determination to exempt the Alcoa Aluminum plant in Malaga from BART, based upon procedural and technical issues. We note the BART modeling protocol identifies procedures to conduct modeling for BART-eligible sources in Washington State. The modeling protocol was the result of a cooperative effort among Idaho Department of Environmental Quality, Oregon Department of Environmental Quality, and Washington Department of Ecology, and in consultation with the U.S. Fish and Wildlife Service, the National Park Service, the U.S. Forest Service, and the U.S. Environmental Protection Agency. The protocol adopts the BART Guideline and addresses both the BART exemption modeling as well as the BART determination modeling. Collaboration on the protocol and meteorological data sets helps to ensure modeling consistency. In implementing the protocol, the Alcoa aluminum plant in Malaga, WA was found to be subject to BART. However, Ecology circumvented the protocol by allowing use of a method not specified in the protocol, which resulted in the exemption of this source from BART. This "refinement" remains the subject of technical debate in the modeling community. The Forest Service considers this violation of the modeling protocol equivalent to a "breach of contract", as the modeling protocol is an agreement. As such, any changes made must be approved by all parties.

In May of 2008, the Forest Service requested that Ecology postpone its determination of BART applicability to this source until after the EPA-State-Local Modelers meeting to be held in June 2008 in Denver, CO at which time EPA and Ecology would be presenting their analyses of the use of incorporating fine grid resolution into CALMET and the CALPUFF modeling system (Email from Rick Graw to Jeff Johnston). On May 27, 2008, Ecology denied the request of the Forest Service. However, when this issue was brought to the attention of the U.S. EPA Region 10, EPA's Regional Meteorologist Herman Wong informed Ecology's Modeler –Clint Bowman that the technical approach accepted by

Ecology was unacceptable (Email from Herman Wong to Clint Bowman, July 8, 2008). We also note that in Herman Wong's email, he makes reference to emails from Bret Anderson (EPA OAQPS) to Clint Bowman, also communicating EPA's rationale for rejecting the use of 0.5 km CALMET grid resolution settings.

We also note that U.S. EPA Region 10 reiterated that it would not accept the BART analysis for this facility unless it provided adequate technical justification that was reviewed and accepted by all agencies involved in producing the protocol (Email from Rob Wilson to Jeff Johnson, June 8, 2009).

Given that Alpine Lakes Wilderness is the Class I area most impacted by this facility, and the area is not projected to improve visibility at the URP, and the primary emissions from this facility are SO_2, and that sulfates are one of the key contributors to worst-case visibility, we believe BART is not only applicable, it is likely necessary to help Alpine Lakes Wilderness achieve natural conditions by 2064. Ecology needs to prepare a BART determination for this facility. If Ecology continues to refuse to do so, we request that the US EPA prepare the BART determination.

Unrealistic Expectations of Emissions from Fire

The projected 30% decrease in anthropogenic fire emissions is unrealistic, and may hamper the ability of Ecology to make substantial progress in meeting the goals of the Regional Haze Rule. Ecology needs to clarify which emission sources are included in this source category. We understand, after talking with the WRAP staff, its contractors, and members of the Fire Emissions Joint Forum, that anthropogenic fire emissions include agricultural burning, and certain types of controlled silvicultural burning. Please clarify the sources that are included in the "anthropogenic" and "natural fire" categories. A cross-walk between the source category definitions used in the WA RH SIP and the WRAP reference materials would be helpful.

We note that many of the emission reduction techniques that account for the modeled emission reductions were already in use in 2002. As such, the baseline emissions are likely too high because they did not account for the controls being implemented at the time. The SIP, as written, gives a false sense that these emissions will be decreasing again in the future. The total amount of land burned by the Forest Service, east of the Cascades is expected to increase in the coming years, and burning west of the Cascades is expected to remain stable. The Forest Service is willing to work with Ecology to provide better estimates of expected changes in emissions resulting from restorative and maintenance burning activities.

The 2018 projections for emissions from natural and anthropogenic fire in Table 6-1 through 6-8 show that smoke is remaining constant for natural fires and decreasing for anthropogenic fire. Yet, on page 10-4 of the draft RH SIP, Ecology states that more smoke can be expected due to increases in prescribed burning and natural fires. Please explain.

We are concerned that inaccuracies with respect to projected reductions in emissions from fire in this SIP may be misinterpreted by individuals or local agencies, and may unnecessarily restrict the Forest Service from accomplishing its mission, thus potentially increasing the threat of wildfires. Please correct this inaccuracy in the plan or at least clarify the appropriate use of this information.

Columbia River Gorge National Scenic Area

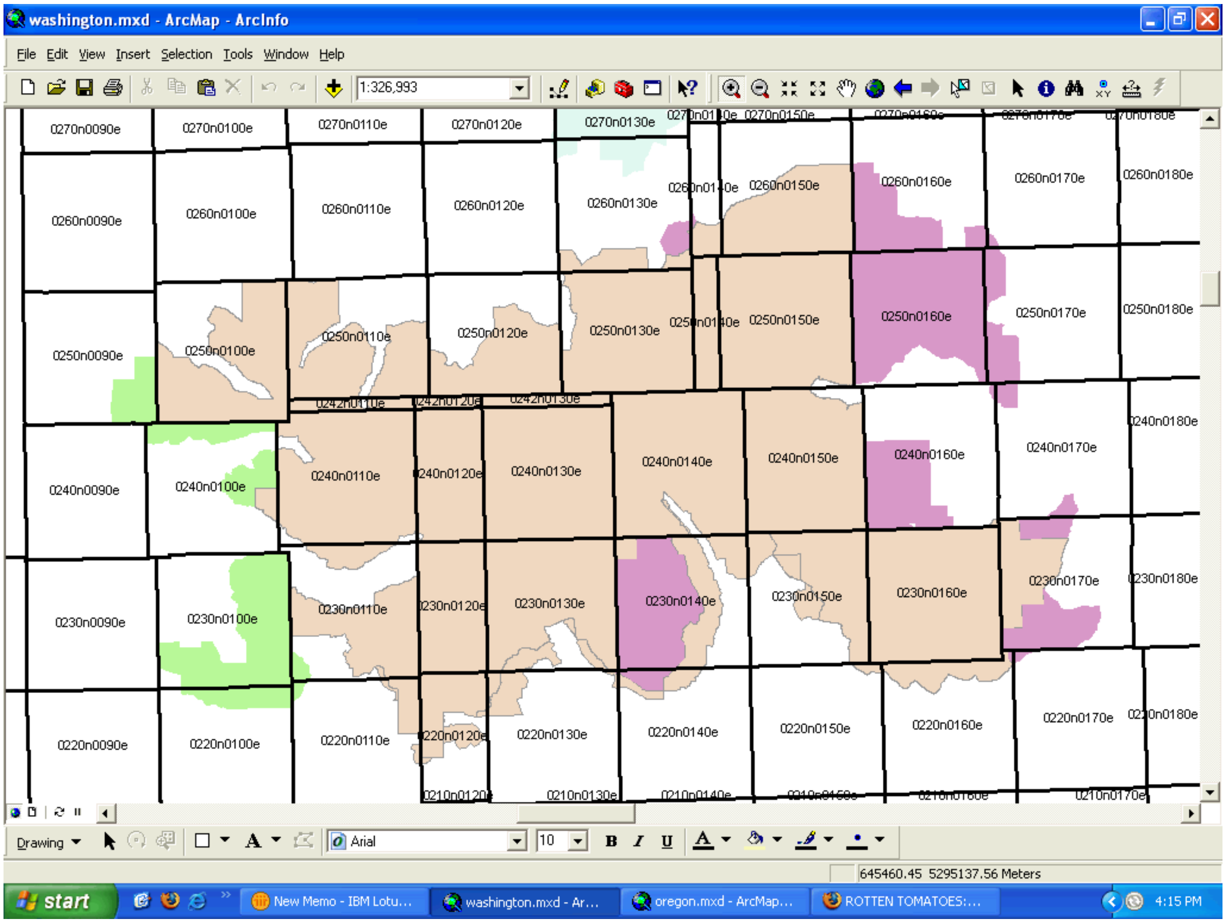
As Washington is developing its SIP for Regional Haze, the Columbia River Gorge National Scenic Area (CRGNSA) is also developing its strategy to protect and enhance air quality in the CRGNSA. Just as the State of Oregon has a key role in this strategy, so does Washington. The Department of Ecology and local Clean Air Agencies have the ability to control Washington emissions which contribute to the air pollution of the CRGNSA. Numerous studies on the causes of air pollution and haze in the CRGNSA have identified emissions originating in both Oregon and Washington, and beyond as contributing sources to these issues. The same haze-causing pollution which affects federal Class I areas in Washington also affects visibility and air quality in other areas of the state. As such, the Regional Haze Rule affords Washington an opportunity to leverage this rule to improve air quality state-wide. In the past, Ecology has committed resources to studying the causes of air pollution in the CRGNSA. We now ask that Ecology continue its commitment towards protecting and enhancing air quality and visibility in the CRGNSA by adding language to the Regional Haze SIP, similar to the language included in Section 1.6.2 of the Oregon draft Regional Haze SIP, to maximize the benefits of its plan and share in a common commitment to protecting the visibility and air quality in the CRGNSA.

Correction to Class I Area Boundaries

The final sentence in the paragraph below, taken from Chapter 4: Monitoring Visibility in Washington's Mandatory Class I Areas, is incorrect. Expansions are also Class I. Please correct this language.

> *Table 4-1 provides information on the size and FLM of each of the mandatory Class I Areas. The acreages may not match the current acreages of the national park or wilderness area for reasons including more accurate surveys or expansion of the area. While boundary line adjustments or expanded acreages are technically not part of the mandatory Class I Area defined in federal regulations, any improvements to visibility will impact these areas too.*

The map you are using for Alpine Lakes wilderness is incorrect (Figure 4-4). Below is the correct extent of the wilderness. We will be happy to assist you in getting the correct boundaries for this wilderness.



We understand that based upon our May 18, 2010 consultation, that some of these issues may be addressed in a revision to the draft SIP. We request that Ecology revise its RPGs to restore visibility to all Class I areas within Washington at much faster time frames than currently proposed. We appreciate your thoughtful consideration of our comments.

Sincerely,

/s/ Richard L. Graw

RICHARD L. GRAW
Air Resource Management Specialist

Enclosures

Herman Wong/R10/USEPA/US

07/08/2008 06:42 AM

To clint@ecy.wa.gov

cc rdha461@ecy.wa.gov, dsch461@ecy.wa.gov, anew461@ECY.WA.GOV, rgraw@fs.fed.us, Elizabeth_Waddell@nps.gov, tim_allen@fws.gov,

bcc

Subject CALPUFF Fine Grid Modeling for BART Eligible Sources: Alcoa and Intalco

Clint:

The National Park Service (NPS) and the Forest Service (FS) have been discussing with me your acceptance of the BART exemption modeling results using a grid spacing of 500-meters (m) for the Alcoa stationary source. They have provided me with a copy of Douglas Schneider's email of 27 May 2008 with attachment. The Office of Air Quality Planning and Standards (OAQPS) emailed me a copy of your POWERPOINT presentation from the June, 2008 modeler's workshop and your "On the Characteristics and Acceptability of Small Grid Spacing in CALPUFF" dated 01 May 2008. The latter indicates that Alcoa and Intalco were modeled at fine grids of 500-m and 1000-m, respectively. In addition, Bret Anderson copied me on his replies to your email correspondence related to the use of fine grids. I also discussed this issue with Tim Allen at the Fish & Wildlife Service (FWS) separately although I don't think their Class I areas are being affected.

After reviewing the materials and hearing the NPS and FS describe their concerns, I believe that Ecology and Alcoa's consultant, TRC, have not technically justified the use of a fine grid to exempt Alcoa out of BART. In the past, we have been trusting of other parties in accepting new procedures, techniques or options without complete documentation and a thorough analysis. This past practice is inconsistent with our guidance and policies and continues to plague us as it applies to the use of the CALPUFF Modeling System. Nevertheless, R10 is willing to allow the use of new procedures, techniques or options as long as an acceptability demonstration is made in accordance with applicable guidance and is fully vetted by peers. This was emphasized over and over again at the 2007 and 2008 modeler's workshops and by me.

Our primary concerns with the use of a fine grid in CALPUFF for a BART exemption (and determination) modeling analysis are as follows:

1. On an important procedural matter, Idaho, Oregon, Washington, NPS, FS, FWS and R10 agreed to consult each other if a BART eligible source or a state deviates from the three state common modeling protocol. Only the three Federal Land Managers (FLMs) and OAQPS were informed of your plan and eventual decision.

2. Your presentation and analyses were based on the use of the non guideline version of CALPUFF and inadequate meteorology. An evaluation of the observed vs measured wind fields was impossible because of instrument problems, and there were a significant amount of calm conditions (up to 50%) in the datasets. A 4-kilometer (km), 1-km and 500-m modeled impact comparison analysis was also conducted. However, the comparisons were based on the use of CALPUFF versions 5.711 and 6.112. Both of these versions are not recommended by EPA.

3. In discussing the modeling with Bret Anderson, he agreed that the model is predicting lower numbers and was concerned that we may have discovered another

problem. From the workshop and conversations, we need to:

(a) understand the logic for the derivation of the large sigma-z values (the code), and

(b) confirm that the large sigma-z values are biasing towards underpredictions.

4. At the 2007 modeler's workshop at Virginia Beach, OAQPS spent at least two days detailing the coding errors and technical issues contained in the non guideline version of CALMET. (At that time, I believe it was Version 5.8 before it became the recommended version.) CALMET Version 6.211 is a non guideline model and likely contains the same errors and technical issues as the non guideline version of 5.8. Hence, I don't recommend Version 6.211 to be used outside of what we agreed to in the common modeling protocol.

5. The CALPUFF modeling system has never been evaluated or tested against tracer gas studies/experiments using a fine grid. As a minimum, Ecology and TRC should have submitted a protocol to R10 for acceptance to evaluate and test the sensitivity using a fine grid resolution in CALPUFF Version 5.8.

6. In Ecology's email, I disagree that time and policy should drive the justification. It is more important to EPA and the FLMs to use good science that is defensible from a technical perspective! While the MM5/WRF-to-CALPUFF program is not ready, the recommended CALPUFF Version 5.8 is available.

It is my technical judgment that the use of a fine grid with the non guideline CALPUFF Version 6 is unacceptable. Ecology and TRC should consider conducting additional evaluations, tests and analyses using Version 5.8 or accept the results that followed the original common protocol.

Again, I would request that Ecology route technical issues through me and not go directly to OAQPS.

Clint, please give me a call if you want to chat about our judgments.

Herman Wong
Atmospheric Scientist
Regional Office Modeling Contact
USEPA Region 10
Office of Environmental Assessment (OEA-095)
1200 Sixth Ave, Suite 900
Seattle, WA 98101-1128
206.553.4858
Email: wong.herman@epa.gov

Wilson.Rob@epamail.epa.gov

06/08/2009 11:21 AM

To jefj461@ECY.WA.GOV

Cc Islam.Mahbubul@epamail.epa.gov, tim_allen@fws.gov, john_notar@nps.gov, Elizabeth_Waddell@nps.gov, rgraw@fs.fed.us, Wong.Herman@epamail.epa.gov

bcc

Subject BART modeling for Intalco

History:

This message has been forwarded.

Jeff,

It has come to my attention that Ecology has accepted a BART modeling analysis for Intalco. The analysis apparently employed the CALPUFF model using a grid spacing of less than four kilometers, and is therefore inconsistent with the BART modeling protocol that was negotiated and agreed to with EPA R10, Washington, Oregon, Idaho, and the Federal Land Managers.

Last summer Herman Wong of my staff provided clear guidance to Ecology (attached below) that this type of modeling application is not acceptable unless adequate technical justification is provided. Furthermore, you and I discussed this matter in a meeting on July 28, 2008, that Ecology managers initiated with EPA managers. You agreed that your staff needed to provide assurance that the modeling analyses performed for BART were consistent with the protocol, or, if they deviated from the protocol, they were accompanied by adequate technical justification. The technical justification required review and acceptance by all of the agencies involved in producing the protocol. To date we have not received adequate technical justification.

Rob

USDA United States Department of Agriculture | Forest Service | Pacific Northwest Region

333 SW First Avenue (97204)
PO Box 3623
Portland, OR 97208-3623
503-808-2468

File Code: 2580
Date: June 15, 2010

Mr. Ted Sturdevant
Director
Washington Department of Ecology
PO Box 47600
Olympia, WA 98504-7600

RECEIVED
JUN 17 2010
DEPARTMENT OF ECOLOGY
OFFICE OF DIRECTOR

Dear Mr. Sturdevant:

Re: Washington's Regional Haze Plan

Over the last eight years, the Forest Service and the Department of Ecology have developed a strong working relationship addressing forest roads and water quality. The results have been great programs towards mutual goals. I am writing this letter in a similar spirit of meeting mutual expectations for environmental quality. As the federal land manager responsible for protecting visibility in five of the eight federal Class I wilderness areas in the State of Washington, the USDA Forest Service has a vested interest in the outcome of Washington's Regional Haze (RH) State Implementation Plan (SIP). As such, we have been actively involved in numerous meetings with the Washington Department of Ecology (Ecology) during the development of this plan. While these discussions have been informative, we have often been dissatisfied and frustrated over key components of the plan. The Plan will not restore visibility in any of the federal Class I areas in Washington to natural conditions by 2064, as envisioned by the authors of the Regional Haze Rule. The projected dates of restoring visibility to natural conditions vary by Class I area; ranging from an additional 64 to 698 years or more. For two Class I areas, the Plan allows visibility to degrade by 2018, thus preventing a projection of how many years will be required to achieve the goal of the Regional Haze Rule. The Forest Service is not satisfied with these projected outcomes. As our agencies work closely on a number of issues, we desire a relationship of mutual consideration and respect for concerns. We believe it is important for a plan to be developed which assures that visibility will be restored to natural conditions within a much shorter time frame than currently proposed.

Our concerns on specific issues of the plan include: unexplained increases in the emission inventories of point and areas sources, non-specific source apportionment, and a lack of an adequate four-factor analysis in developing Reasonable Progress Goals (RPGs). Consequently, the long-term strategy is not specific enough to lay the foundation for reducing visibility impairment in a timely manner. Given the slow rate of progress and projected worsening of conditions, we believe the Best Available Retrofit Technology (BART) determinations should be revisited and more aggressive emission reductions selected. We have provided numerous comments on individual BART assessments. We ask Ecology to revisit our comments in light of establishing faster rates of progress.

We have an additional concern about emission inventories that estimate a 30% decline in anthropogenic fire within the planning period. To restore fire adapted ecosystems on the east side of the Cascades, we anticipate increased levels of prescribed fire as a means of reducing the risk of large wildfires. We are concerned about the implications of this projection, particularly, with how it may be misinterpreted by local air agencies. Please correct this inaccuracy in the plan, or at a minimum add clarifying language into the appropriate use of this information.

Washington's RH SIP will also have benefits beyond reducing haze in federal Class I areas. These haze-causing pollutants also participate in the formation of some criteria air pollutants (e.g., PM2.5, NO_2, SO_2, and O_3), all of which are potentially dangerous to human health, and cause haze. Given the multiple benefits associated with emission reduction accomplished through this rule, we request that Ecology give consideration to these issues when making emission reduction decisions. Because Ecology has the ability to regulate air pollution from sources within Washington State, we would like to see this plan include language recognizing Ecology's ability and commitment to protecting and enhancing visibility of the Columbia River Gorge National Scenic Area, and using the Regional Haze SIP as a vehicle towards this end, similar to what Oregon has put in its Regional Haze SIP.

My staff has submitted the Forest Service technical comments on the Regional Haze SIP to Mr. Doug Schneider, Ecology's Regional Haze Coordinator, in a separate letter.

I would like to schedule a follow-up telephone call with you to discuss these concerns. I will have my secretary schedule a time which is convenient for the both of us.

Sincerely,

for MARY WAGNER
Regional Forester

Washington State Regional Haze State Implementation Plan

Appendix C

Additional Information for Interagency Monitoring of Protected Visual Environment Sites that Monitor Visibility for Washington's Mandatory Class I Areas

This appendix contains additional information for the 6 IMPROVE sites that measure visibility impairment for the 8 mandatory Class I Areas in Washington. The supplemental information includes nearby populations, industrial centers, and wind patterns.

Olympic IMPROVE Site: OLYM1

Nearby Population/Industrial Centers and Local Sources

Because of the size of the National Park, different areas may be affected by different sources. For the northeastern National Park area, where the OLYM1 monitoring site is located, nearby industrial and urban emission sources that most immediately affect the area are in Port Angeles, 35 km (20 mi) west, emissions from which may include residential woodstove emissions. Other portions of the eastern National Park area are across Puget Sound from the Seattle metropolitan area 50 km (30 mi) to the east and downwind for prevailing west wind conditions. For the western Park area including the Coastal section, there are no additional large source areas, although there may be timber and shipping related industries.

Wind Patterns

Prevailing winds at well-exposed locations near the northwestern U.S. coast are generally from the north or northwest throughout the year and especially in the summer months, a consequence of the semi-permanent high pressure that lies off the Pacific Coast. Southerly and easterly winds can occur during the winter, when the Pacific High moves southward and weakens. This pattern is indicated in monthly Quillayute Washington wind roses for summer months, which show the prevalence of westerly coastal winds. Winter Quillayute Washington wind roses may be more influenced by local diurnal flows as air drains to the west off the slopes of the Olympic range in the absence of strong opposing western synoptic flow.

The Olympic Mountains present an unusual near-circular obstruction to westerly winds, which consequently tend to divide at low levels and flow to the north and south, converging on the lee side, where the OLYM1 IMPROVE site is located. At times, channeling and compression of westerly winds the Strait of Juan de Fuca can result in high speed “Strait Winds”. Rising motions above the low-level convergence zone produce clouds and precipitation that may affect eastern portions of Olympic National Park to some extent. Near the IMPROVE site, resulting westerly flow is from the direction of Port Angeles 35 km (20 mi) west of the site. In the western National Park area and the Coastal area there will be a more direct effect from the ocean including periodic sea and land breezes. These areas are also sheltered and generally upwind from anthropogenic sources around Puget Sound that have more direct impact on eastern Park areas.

Potential local transport routes towards the OLYM1 site include transport or anthropogenic components from the west, the direction of Port Angeles. Transport from the heavily populated Seattle area on the east side of Puget Sound may occur during infrequent easterly wind conditions.

Inversions/Trapping

Temperature inversions are relatively common in the greater Puget Sound area that includes northeastern National Park locations represented by OLYM1. In wintertime, the common situation is a surface based radiation inversion that can persist until ventilated by an incursion of marine air from the Pacific. In the extended summer months, May to October, the common inversion condition over the eastern Pacific is a subsidence inversion caused by the persistent sub-tropical high-pressure system. Typical inversion heights are 300 to 600 m (1,000 to 2,000 ft), and the OLYM1 monitoring site may be near this height much of the time. In western National Park areas the summertime subsidence inversion, aided by a diurnal sea/land breeze is likely, more so than the wintertime surface inversion.

North Cascades IMPROVE Site: NOCA1

Nearby Population/Industrial Centers

The northern Puget Sound area near the mouth of the Skagit River is ~ 100 km (60 mi) west of the NOCA1. The city of Seattle is 160 km (100 mi) southwest.

Wind Patterns

Synoptic winds in the region are generally westerly, with more northwesterly flow during the summer when the Pacific High is off the coast of northwestern U.S., and more westerly flow during the winter when the Pacific High has retreated southward. This pattern can be seen in monthly Seattle Washington wind roses although these surface wind patterns may differ somewhat from upper level winds because of terrain effects. During the winter, with high pressure over the Great Basin and Idaho and low pressure west of the Cascades easterly gradient (synoptic) flow is common.

The NOCA1 IMPROVE site is within the upper Skagit River channeled flow regime, with westerly channeled upvalley flow enhanced at times by prevailing westerly synoptic flow.

Inversions/Trapping

Locally, the NOCA1 site is in a lower valley location and may at times be within valley trapping inversions that do not extend to higher National Park elevations. On a larger scale, inversion breakup and vertical mixing during periods of weak synoptic forcing could at times bring urban emissions from Seattle and northern Puget Sound 100 to 160 km to the west into the area. Mixing heights calculated for Salem Oregon (Ferguson and Rorig, 2003), a maritime location similar to the Seattle and Puget sound region, show winter heights generally below 300 m (1,000 ft), which would prevent urban emissions from reaching the NOCA1 site elevation, but Spring and summer Salem mixing heights frequently reach to 1,500 m or higher which could allow Puget Sound urban emissions to mix to the NOCA1 elevation. Resulting transport to NOCA1 could result from concurrent afternoon up valley flow or from entrainment of emissions near the mixing height into higher level air flow, and subsequent transport to the monitoring site.

Calculated Fall Salem mixing heights were typically 300 to 600 m, lower than in the spring and summer but occasionally high enough to bring valley emissions to the NOCA1 site elevation.

Regionally, summertime subsidence inversions associated with the establishment of the semi-permanent Pacific high-pressure system could result in regional aerosol buildup over periods of days. Subsidence inversion heights are typically at elevations of 2,000 to 3,000 m (6,000 to 10,000 ft), well above the NOCA1 IMPROVE site. With weak northwesterly winds, Puget Sound emissions can become trapped against the Cascades and/or pushed up the Skagit River valley towards the NOCA1 IMPROVE site. Highest regional aerosol concentrations may occur during summertime stagnation and subsidence inversion periods in conjunction with western wildland fires.

Snoqualmie Pass IMPROVE Site: SNPA1

Nearby Population/Industrial Centers

The Seattle metropolitan area and Puget Sound source region is about 50 km (30 mi) west of SNPA1 at its closest point, and 1,000 to 1,100 m (3,200 to 3,600 ft) lower in elevation. The city of Seattle is 70 km (40 to 45 mi) west northwest of the monitoring site. East of the Cascades, the cities of Wenatchee and Yakima are near 150 km (90 to 100 mi) to the east and southeast respectively.

Wind Patterns

Synoptic winds in the region are generally westerly, with more northwesterly flow during the summer when the Pacific High is off the coast of northwestern U.S., and more westerly flow during the winter when the Pacific High has retreated southward. This pattern can be seen in monthly Seattle Washington wind roses although these surface wind patterns may differ somewhat from upper level winds because of terrain effects. During the winter, with high pressure over the Great Basin and Idaho and low pressure west of the Cascades easterly gradient (synoptic) flow is common. The SNPA1 IMPROVE site is located near the crest of the Cascades and may be exposed to airflow over the Cascades and to aerosols transported from upwind sources by upper level winds. Although it is above valley elevations to the west, SNPA1 may at times see diurnal up valley transport from the Seattle area via the South Fork of the Snoqualmie River. If it occurs, such flow transport would show a diurnal pattern of aerosol characteristics.

Inversions/Trapping

Locally, the SNPA1 site is at a ridge crest location and probably above trapping inversions that may develop at valley bottom locations east and west of the Cascade crest. On a larger scale, inversion breakup and vertical mixing during periods of weak synoptic forcing could at times bring urban emissions from the Seattle and Puget Sound source region 50 to 75 km (30 to 50 mi) west of Wilderness boundaries to western Wilderness and SNPA1 elevations. Mixing heights calculated for a similar maritime location at Salem, Oregon (Ferguson and Rorig, 2003) show winter heights generally below 300 m (1,000 ft), which would prevent urban emissions from reaching the SNPA1 site elevation, but Spring and summer Salem mixing heights frequently reach to 1,500 m or higher which could allow urban emissions to arrive at SNPA1. This could result from concurrent afternoon up valley flow or from entrainment and transport by higher level flow. Fall mixing heights are typically 300 to 600 m, lower than in the spring and summer but occasionally high enough to bring valley emissions to the SNPA1 site elevation.

Regionally, summertime subsidence inversions associated with the establishment of the semi-permanent Pacific high-pressure system could result in regional aerosol buildup over periods of days. Subsidence inversion heights are typically at elevations of 2,000 to 3,000 m (6,000 to 10,000 ft), well above the SNPA1 IMPROVE site. With weak northwesterly winds, Puget Sound emissions can become trapped against the Cascades and possibly impact lower crest elevations such SNPA1. Highest aerosol concentrations may result during summertime stagnation and subsidence inversion periods in conjunction with western wildland fires.

Mount Rainier IMPROVE Site: MORA1

Nearby Population/Industrial Centers

The small community of Ashford (pop ~300) is located about 6 km (3.7 mi) east of the site. The nearest major population center is Tacoma, some 50 to 60 km (~ 35 mi) due northwest. Washington State Highway 706, a main entrance to the National Park from the west, goes through the valley within 1 km of the monitoring site.

Wind Patterns

Generally, wind directions at the site are channeled to an east/west direction. In absence of synoptic forcing, the site is characterized by mountain/valley circulations, with easterly (from the east) nighttime drainage flow and westerly daytime upslope flow in the valley. The west to east orientation of the valley may serve to enhance synoptic westerly wind flow. Historical data show predominantly east and northeast directional flow during October – December and westerly flow during January – February.

Inversions/Trapping

This valley may be subject to inversion and trapping of pollutants during periods of high pressure and stagnation. In those cases, the monitoring site, located at the bottom of the valley, would be contained within the trapped stable layer.

White Pass IMPROVE Site: WHPA1

Nearby Population/Industrial Centers and Local Sources

The significant population centers and source regions nearest to the Goat Rocks Wilderness and the WHPA1 IMPROVE site are Seattle and the Puget Sound area 100 km (60 mi) to the northwest and Portland Oregon 120 km (75 mi) to the southwest. The Centralia power plant, which has implemented emission controls in recent years, is located near Centralia Washington 100 km due west near the Cowlitz River that has origins in the Goat Rocks Wilderness.

Wind Patterns

Synoptic winds in the region are generally westerly. During the winter, with high pressure over the Great Basin and Idaho and low pressure west of the Cascades easterly gradient (synoptic) flow is common. The WHPA1 IMPROVE site is located near the crest of the Cascades and should be well exposed to these upper airflows and to aerosols transported aloft from upwind sources. Lower Goat Rocks Wilderness elevations may see more typical mountain/valley circulation patterns, especially during periods of weak synoptic forcing, which bring valley air to higher elevations during the day. At WHPA1, aerosols transported with this mountain valley circulation would likely show a diurnal pattern.

Inversions/Trapping

Because of WHPA1's high elevation relative to surrounding terrain it should be generally above surface based valley inversions in Wilderness Area headwaters basins. Summertime subsidence inversions associated with the establishment of the semi-permanent Pacific high-pressure system can result in regional aerosol buildup over periods of days. Subsidence inversion heights are typically at elevations of 2,000 to 3,000 m (6,000 to 10,000 ft), near the WHPA1 site elevation.

Pasayten IMPROVE Site: PASA1

Nearby Population/Industrial Centers

Seattle and Puget Sound source regions are ~ 200 km (120 mi) west of the PASA1 site, on the other (west) side of the Cascade crest. Aerosols may be transported to the monitoring site from the Puget Sound region by upper level (850 mb) westerly winds. Columbia Plateau sources and the Spokane Washington area are close to the PASA1 site. Columbia Plateau sources including agricultural and crustal (dust) components may impact the site during regional summertime stagnation periods when lofted to upper levels on hot afternoons.

Wind Patterns

Synoptic winds in the region are generally westerly, with more northwesterly flow during the summer when the Pacific High is off the coast of northwestern U.S., and more westerly flow during the winter when the Pacific High has retreated southward. Monthly Spokane Washington wind roses indicate this pattern, although wintertime wind directions are more northeasterly, bringing continental air southward with high pressure over the Canadian interior. Note that these surface wind patterns may differ somewhat from upper level winds because of terrain effects. During the winter, with high pressure over the Great Basin and Idaho and low pressure west of the Cascades easterly gradient (synoptic) flow is common. Upper westerly flow may bring Puget Sound area emissions to the monitoring site. With weaker summertime regional pressure gradients, a diurnal pattern may allow Columbia River Basin and Plateau emissions to be lofted to upper levels, including the PASA1 site, during the day and return with down slope flow at night (Ferguson, 1998)

Inversions/Trapping

The PASA1 site is at a ridge top location and should be above local surface based trapping inversions. On a larger scale, persistent low level temperature inversions over the Columbia Basin keep pollutants trapped at low elevations during most of the winter. Mixing heights calculated for Spokane Washington (Ferguson and Rorig, 2003), show winter heights generally below 300 m (1,000 ft), which would prevent urban emissions from reaching the PASA1 site elevation, but spring and summer Spokane mixing heights frequently reach to 1,500 m (4,920 ft), allowing Columbia Basin emissions to reach the PASA1 site elevation of 1,634 m (5,360 ft). Calculated Fall Spokane mixing heights were typically near 900 m, lower than in the spring and summer but occasionally high enough to bring valley emissions to the PASA1 site elevation.

Regionally, summertime subsidence inversions associated with the establishment of the semi-permanent Pacific high-pressure system could result in regional aerosol buildup over periods of days. Subsidence inversion heights are typically at elevations of 2,000 to 3,000 m (6,000 to 10,000 ft), near or above the PASA1 site elevation. Highest regional aerosol concentrations may occur during summertime stagnation and subsidence inversion periods in conjunction with western wildland fires.

Washington State Regional Haze State Implementation Plan

Appendix D

Western Regional Air Partnership Interagency Monitoring Protected Visual Environments Monitoring Data Substitutions

WRAP IMPROVE Data Substitutions
04/03/07

In the Western Regional Air Partnership (WRAP) states, data substitution was performed for nine IMPROVE monitoring sites to achieve RHR data completeness, or to fully populate 2002, WRAP's selected modeling year. These data substitutions included estimating missing species from other on-site measurements and appropriately scaling data collected at selected donor sites which had favorable long-term comparisons. This document outlines the data substitution methods used at these sites.

Data Completeness Requirements

Regional Haze Rule (RHR) guidance outlines IMPROVE aerosol data completeness requirements including the following conditions:

- Individual samples must contain all species required for the calculation of light extinction (sulfate, nitrate, organic carbon, elemental carbon, soil, coarse mass, and, for the new IMPROVE algorithm, chloride or chlorine)
- Individual seasons must contain at least 50% of all possible daily samples
- Individual years must contain at least 75% of all possible daily samples
- Individual years must not contain more than 10 consecutive missing daily samples
- The baseline period (2000-04) must contain at least 3 complete years of data

Further details can be found in the RHR guidance document for tracking progress: http://www.epa.gov/ttn/oarpg/t1/memoranda/rh_tpurhr_gd.pdf.

Routine Data Substitutions

RHR guidelines provide provisions to fill in missing data under specific circumstances. There are currently two methods routinely used in preparing the RHR data set to substitute data for missing samples:

- The use of a surrogate in the data set:
    - Total sulfate is generally determined as 3 times the sulfur measured on the A module filter. If sulfur is missing, the sulfur measurement from the B module filter is used to calculate sulfate.
    - For the new IMPROVE algorithm, sea salt is calculated from chloride measured on the B module filter. If chloride is missing or below detection limit, the chlorine measurement from the A module filter is used to calculate sea salt.

- The application of "patching" missing data described by the RHR guidance:

◦ Missing samples not substituted using a surrogate as described above can be patched, or replaced, by a seasonal average if the patching exercise passes a series of tests outlined in the guidance document.

Once these methods have been applied to the data, the resulting complete years are eligible for use in calculation of baseline conditions and tracking progress under the Regional Haze Rule. These methods have been applied to all IMPROVE data.

Sites Not Meeting Data Completeness Requirements

After routine data substitutions were made, some WRAP sites still failed to meet data completeness requirements for the baseline period. These sites are listed in Table 1. Sites were candidates for substitution for two reasons:

- The sites had fewer than 3 complete years of data, thus RHR visibility metrics for the baseline period could not be calculated.

- The sites had at least 3 years of complete data, but were missing 2002, the year selected for regional modeling. If this year is missing, then the worst 20% visibility days from 2002 cannot be determined, and the relative response factors (RRFs), which are used to predict visibility metrics in 2018, cannot be calculated.

Sites that did not meet data completeness requirements were not necessary for submittal of State Implementation Plans (SIPs) are indicated with an asterisk (*) in Table 1. Additional data substitutions for these sites have not been applied.

Table 1
WRAP Sites Failing RHR Data Completeness Requirements

State	Site	<3 years	Missing 2002
AZ	BALD1	X	X
	INGA1*	X	X
	TONT1		X
CA	KAIS1	X	X
	RAFA1	X	X
	SEQU1		X
	TRIN1		X
MT	FLAT1*	X	X
	FOPE1*	X	X
	GLAC1		X
	NOCH1*	X	X
UT	CAPI1	X	X
WA	NOCA1	X	

* Indicates additional substitution is not required for a SIP.

Additional Data Substitutions

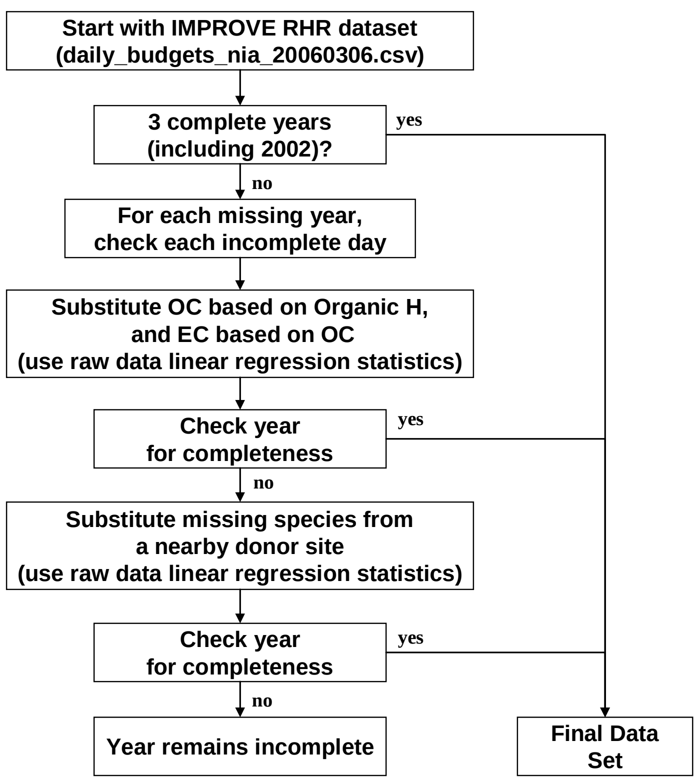
This section outlines the WRAP methods for additional data substitutions designed to address the problems at sites listed in Table 1. Similar methods have been used at IMPROVE sites with incomplete data records in other RPOs.

Figure 1 presents a flow chart of the WRAP data substitution methods. The starting data set was the RHR IMPROVE data using the "New IMPROVE Algorithm," updated March 2006, (http://vista.cira.colostate.edu/views/Web/IMPROVE/SummaryData.aspx). This data set includes the routine surrogate and patched data substitutions allowed by RHR guidance. Note that only years deemed incomplete under RHR guidance were candidates for additional data substitutions. Years deemed complete were not changed, even thought there may have been missing samples during those years.

The first of the additional substitution methods used organic hydrogen as a surrogate for organic carbon, and resultant organic carbon as a surrogate for elemental carbon. If the carbon data substitution was not sufficient to complete the required years, measured mass for individual species from nearby IMPROVE sites with favorable long-term comparisons were scaled appropriately and used as surrogates. IMPROVE donor sites were selected in consultation with individual states. These methods are described in detail below.

Figure 1

Flow Chart of Data Substitution Methods Used



All substitutions were made using quarterly specific Kendall-Theil linear regressions statistics. These statistics were chosen because they are more resistant to outliers than the standard linear least squares statistics. Kendall-Theil slopes and intercepts were used to calculate substituted values from surrogates.

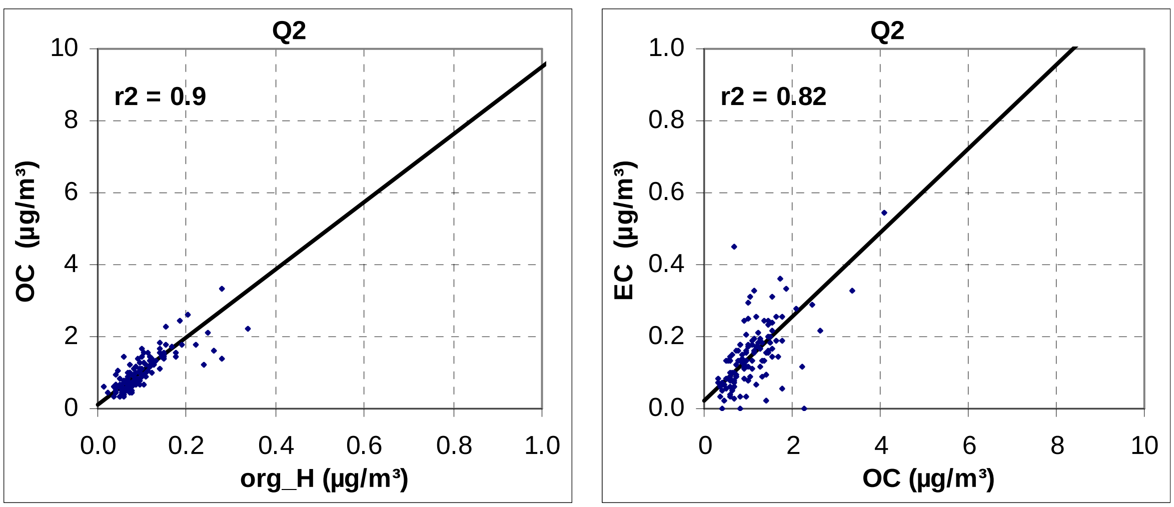
1. Carbon Substitutions

The first substitution method relied on using a surrogate for carbon mass measurements when the C module data is not available. Hydrogen (H) is measured on the A module filter, and is assumed to be primarily associated with organic carbon and inorganic compounds such as ammonium sulfate. Therefore, organic carbon (OC) can be estimated using the historical comparison between estimated organic H and OC. Organic H is estimated by subtracting the portion of H that is assumed to be associated with the inorganic compounds from the total H (Org_H = H – 0.24*S).

Figure 2 presents a sample comparison for data collected at the Tonto National Monument site in Arizona during the second quarter between 2000-04 for OC and organic H. Once OC has been estimated using this method, elemental carbon (EC) mass is determined using long-term comparisons between OC and EC at the site. Statistics were calculated and applied quarterly to account for seasonal variations.

Figure 2

Comparison of OC and Estimated Organic H, and EC and OC at Tonto National Monument, AZ Using Second Quarter Raw OC and Organic H Data, 2000-04



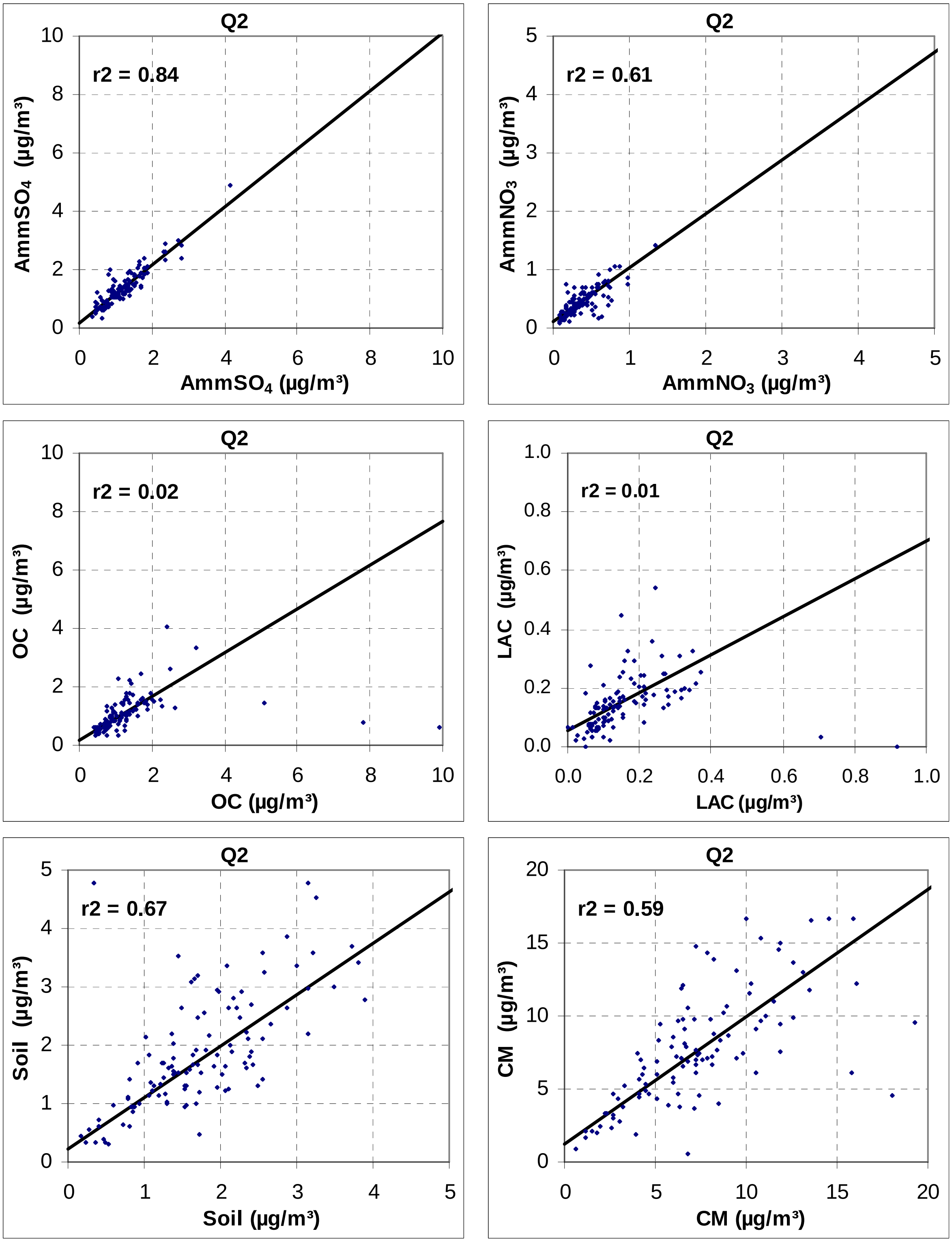
2. Donor Site Substitutions

In the WRAP, the carbon data substitution methods were not sufficient to complete the required years. A second method involved identification of another nearby IMPROVE site which had favorable long-term comparisons and similar regional characteristics to be used as a donor site. Candidate sites were identified, and final donor sites for surrogate mass were selected in consultation with states.

Figure 3 presents a sample inter-site mass comparison by species for data collected during the second quarter, 2000-04, between the Tonto National Monument site and the Sierra Ancha site in Arizona. Component specific correlations were calculated and applied quarterly. Note that only species missing in a given sample were substituted based on donor site data. Species collected at the site under investigation were never replaced with data from a donor site.

Figure 3

Comparison of Aerosol Species Mass Between
Tonto National Monument, AZ (y-axis) and Sierra Ancha, AZ (x-axis)
Using Second Quarter Raw Data, 2000-04



2. Data Completeness Following Substitutions

Table 2 indicates which years required some degree of substitution, where a 2 indicates a substituted year, a 1 indicates the year was already complete under RHR guidelines, and dashes indicate the year did not meet RHR guidelines and no additional substitutions were made. The table also lists sites that were selected as donor sites.

The minimum data requirement of 3 complete years (including 2002) was met for each site, and additional substitutions beyond these requirements were made on a case by case basis in consultation with individual states. For example, at the KAIS1 site, substitutions were made only for the 2002 year even though substituted data (from the YOSE1 donor site) was available for other years. In this case, the years 2000 and 2001 had less than 50% of the original RHR data. In contrast, additional substitutions were applied for all incomplete years (2000-2002) at the RAFA1 site. For the RAFA1 site, the original RHR data was more substantial (73-86% available) and substitutions had less of an impact on the worst days distributions.

Table 2
Data Completeness at WRAP Sites Following Data Substitution

State	Site	<3 years	Missing 2002	Donor	2000	2001	2002	2003	2004
AZ	BALD1	X	X	TONT1	--	2	2	1	1
	TONT1		X	SIAN1	--	1	2	1	1
CA	KAIS1	X	X	YOSE1	--	--	2	1	1
	RAFA1	X	X	PINN1	2	2	2	1	1
	SEQU1		X	DOME1	1	1	2	2	1
	TRIN1		X	LAVO1	--	1	2	1	1
MT	GLAC1		X	FLAT1	1	1	2	2	1
UT	CAPI1	X	X	CANY1	2	2	2	1	1
WA	NOCA1	X		SNPA1	--	1	1	2	2

-- indicates an incomplete year with no substitutions made
1 indicates a complete RHR year
2 indicates a year is considered complete with some substituted values

Availability and Archival of Data Sets

A dedicated page on the VIEWS database will act as the repository of all site-specific substitute data sets: http://vista.cira.colostate.edu/views/web/documents/substitutedata.aspx. Table 3 presents a key to the substituted data files. All materials prepared in the data substitution work (descriptive narrative, tables of regression statistics, graphics, etc.) will be posted on this site for review by states, tribes, and other data users. This information will also be made accessible through the TSS.

Table 3
Key to Substituted Data Files

Column Header	Description
site	IMPROVE site code
year	
month	
day	
QUARTER	1 = Jan. – Mar., 2 = Apr.-Jun., 3 = Jul. – Sept., 4 = Oct. – Dec.
date	
Group	10 = One of the 20% best visibility days; 90 = One of the 20% worst visibility days
good_year	0 = incomplete year, 1 = complete RHR year, 2 = complete year with substitutions
ss_rayleigh	Site specific Rayleigh value (clean air extinction)
fsrh	f(RH) value for small sulfate, nitrate and organic mass
flrh	f(RH) value for large sulfate, nitrate and organic mass
fssrh	f(RH) value for sea salt mass
Sea_Salt	Sea salt mass (µg/m3)
Soil	Soil Mass (µg/m3)
Amm_NO3	Ammonium nitrate mass (µg/m3)
OMC	Organic mass by carbon (µg/m3)
LAC	Light absorbing carbon (aka EC/Elemental Carbon) (µg/m3)
CM	Coarse mass (µg/m3)
Amm_SO4	Ammonium sulfate mass (µg/m3)
Large_OMC	Large organic mass (µg/m3)
Small_OMC	Small organic mass (µg/m3)
Large_Amm_SO4	Large ammonium sulfate mass (µg/m3)
Small_Amm_SO4	Small ammonium sulfate mass (µg/m3)
Large_Amm_NO3	Large ammonium nitrate mass (µg/m3)
Small_Amm_NO3	Small ammonium nitrate mass (µg/m3)
EAmm_SO4	Extinction due to ammonium sulfate (Mm-1)
EAmm_NO3	Extinction due to ammonium nitrate (Mm-1)
EOMC	Extinction due to organic carbon mass (Mm-1)
ELAC	Extinction due to light absorbing carbon mass (Mm-1)
ESoil	Extinction due to soil mass (Mm-1)
ECM	Extinction due to coarse mass (Mm-1)
ESea_Salt	Extinction due to sea salt mass (Mm-1)
RBext	Reconstructed aerosol extinction (Mm-1)
TBext	Reconstructed total extinction (Mm-1)
OC_SUB1	OC substituted using OC vs. organic H correlations
EC_SUB1	EC substituted using EC vs. OC correlations
(NH4)2SO4_SUB2	Ammonium sulfate substituted using site donor correlations
(NH4)NO3_SUB2	Ammonium nitrate substituted using site donor correlations
OM_SUB2	Organic mass substituted using site donor correlations
EC_SUB2	Elemental carbon (aka light absorbing carbon) substituted using site donor correlations
Soil_SUB2	Soil substituted using site donor correlations
CM_SUB2	Coarse mass substituted using site donor correlations
SeaSalt_SUB2	Sea salt substituted using site donor correlations

Results for Washington Sites

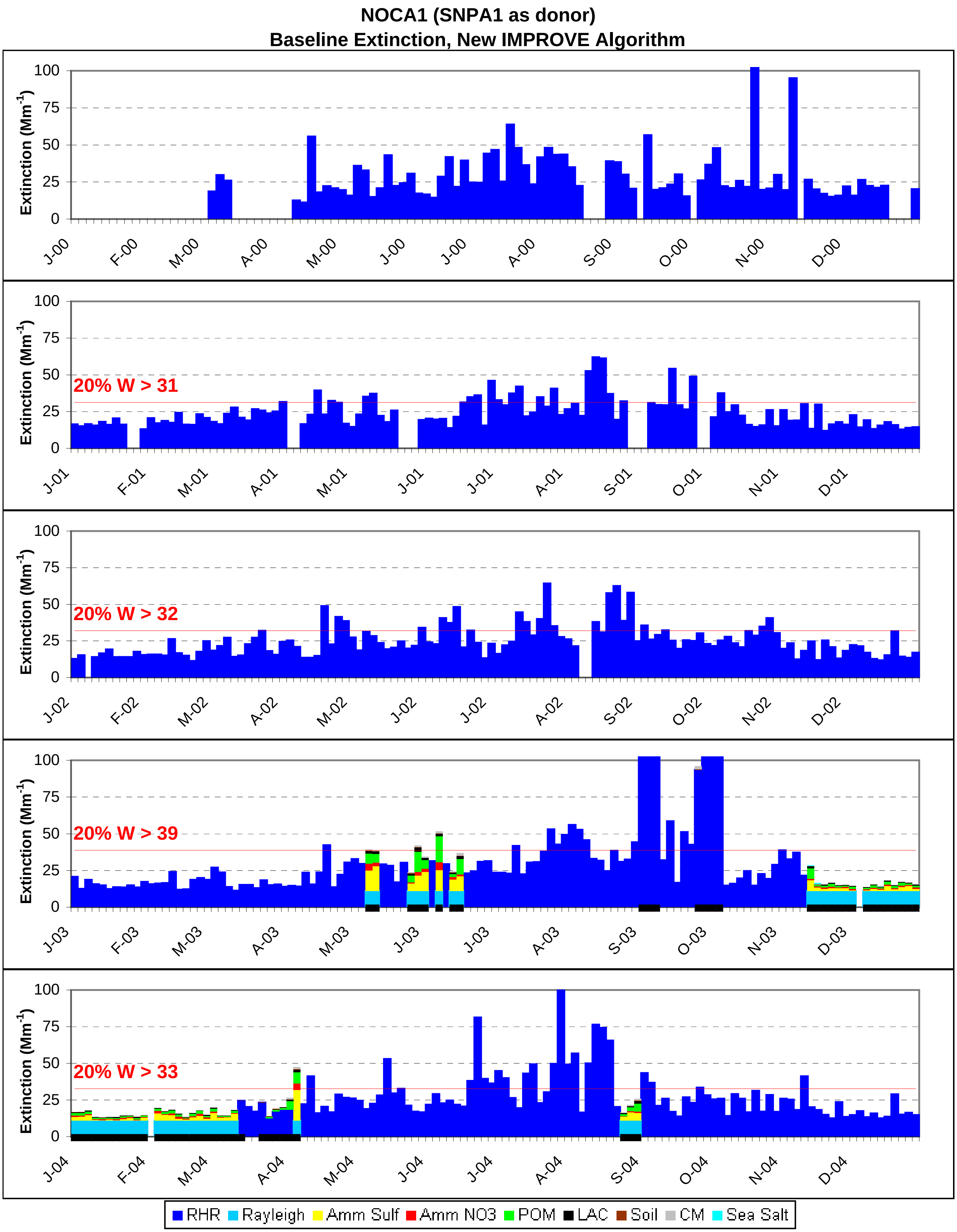
The charts and tables on the following pages detail the substitutions that were used for the Washington NOCA1 site. The following charts/tables are provided for each site:

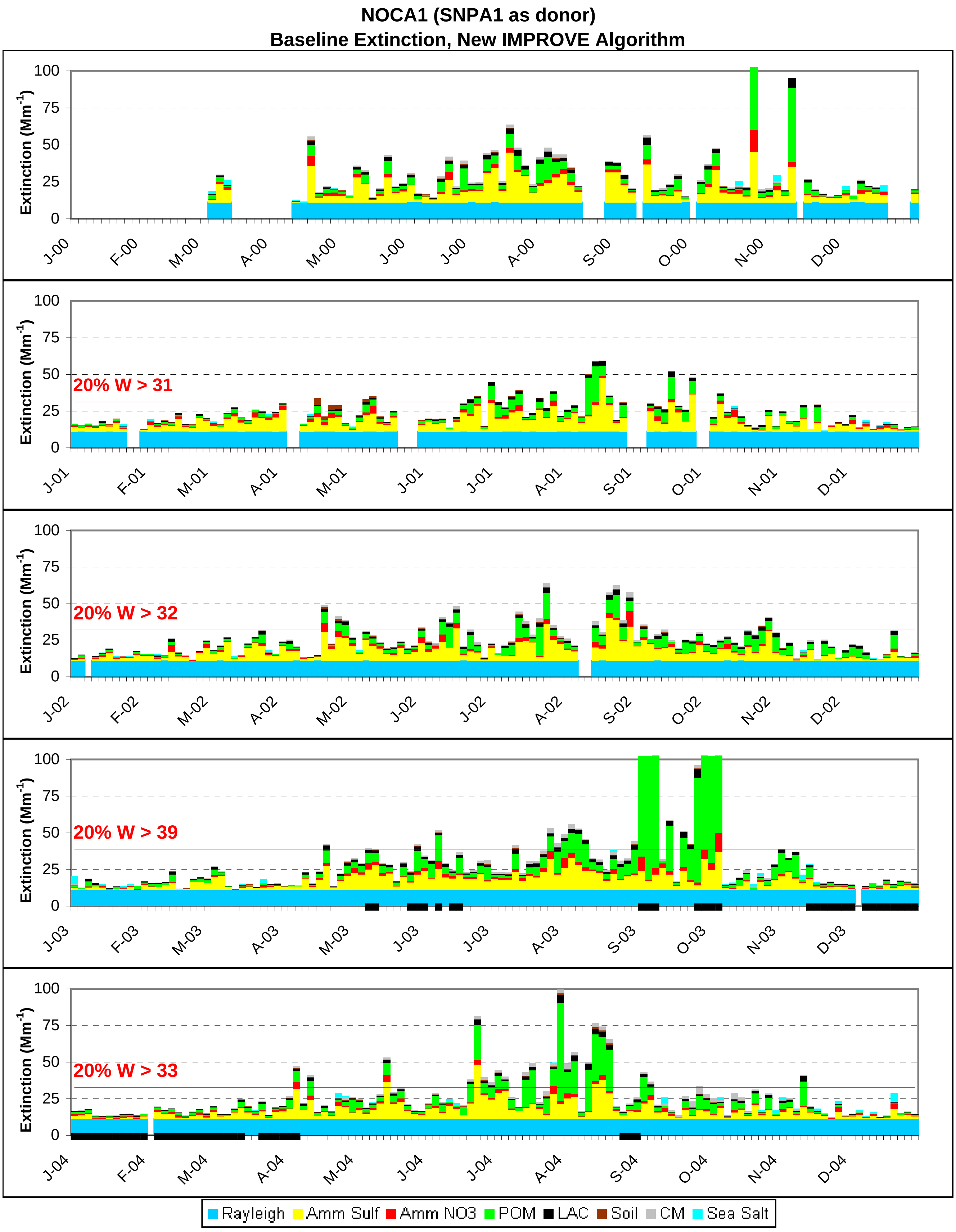
- **1st chart:** Bar charts by year indicating original RHR data in blue, and substituted data by species in the standard IMPROVE colors. Substituted days are also indicated by a black bar underneath the day. The red line indicates the threshold above which days are counted in the 20% worst days for that year. A red line is not included for any year that was incomplete and not substituted.

- **2nd chart:** Bar charts by year indicating speciation of all data. Days in which all or part of the day was substituted are indicated by a black bar underneath the day. The red line indicates the threshold above which days are counted in the 20% worst days.

- **Table:** The table lists the Kendall-Theil regression statistics used to calculate substituted values. Data represent raw mass value correlations for aerosol collected during 2000-04 for all days, and by quarter. The median absolute deviation (MAD) statistic was used to characterize the degree of correlation, where the closer the MAD statistic is to zero, the better the line fit.

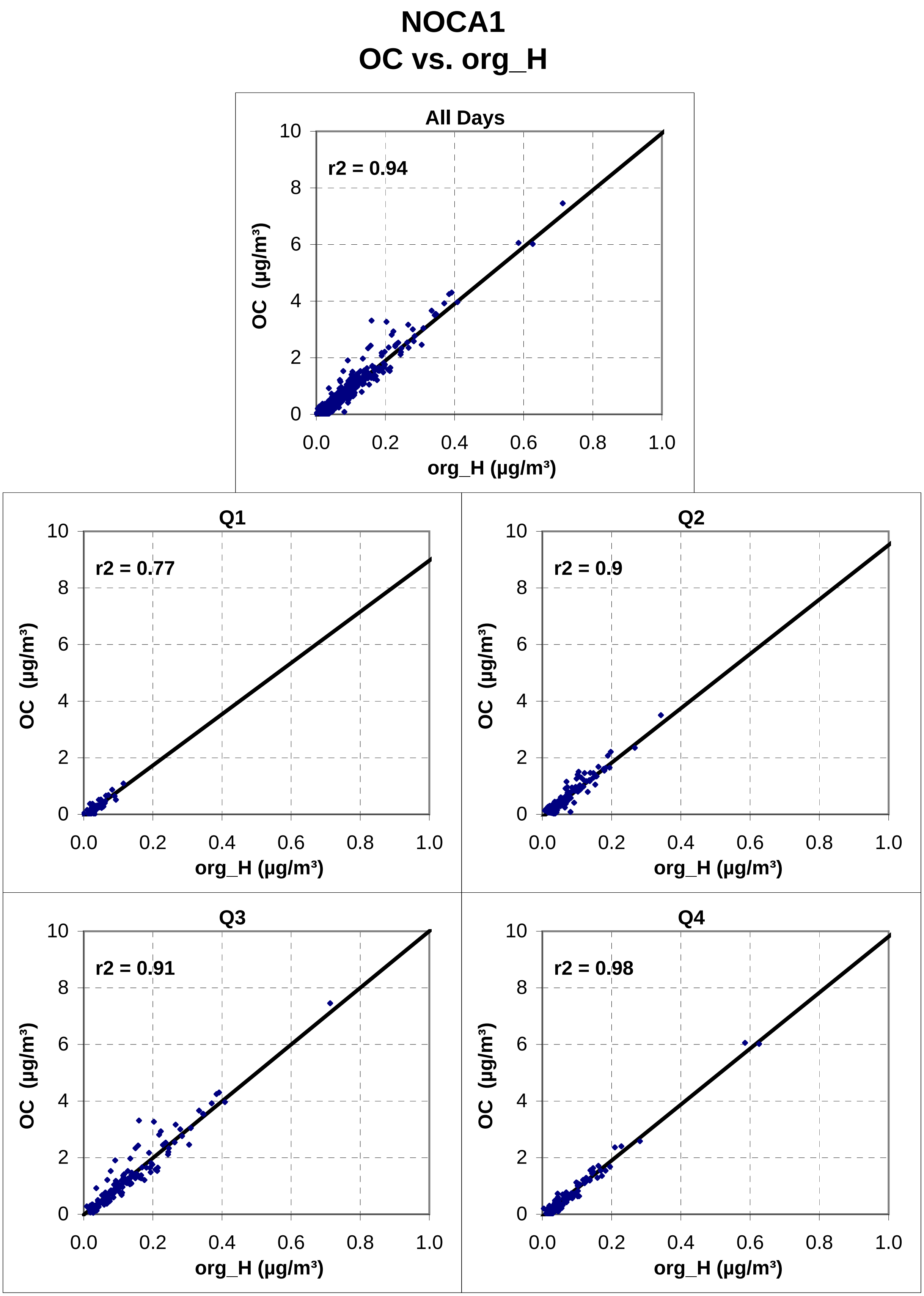
- **Scatter plots:** A series of nine scatter plots, showing the distribution of points and the line fits for the regression statistics that were used to calculate substituted values. Plots indicate raw data collected at the sites during 2000-04, with donor sites represented on the x-axis.


NOCA1 (SNPA1 as donor)
Baseline Extinction, New IMPROVE Algorithm
Extinction (Mm-1)
100
75
50
25
0
J-00
F-00
M-00
A-00
M-00
J-00
J-00
A-00
S-00
O-00
N-00
D-00
20% W > 31
J-01
F-01
M-01
A-01
M-01
J-01
J-01
A-01
S-01
O-01
N-01
D-01
20% W > 32
J-02
F-02
M-02
A-02
M-02
J-02
J-02
A-02
S-02
O-02
N-02
D-02
20% W > 39
J-03
F-03
M-03
A-03
M-03
J-03
J-03
A-03
S-03
O-03
N-03
D-03
20% W > 33
J-04
F-04
M-04
A-04
M-04
J-04
J-04
A-04
S-04
O-04
N-04
D-04
RHR
Rayleigh
Amm Sulf
Amm NO3
POM
LAC
Soil
CM
Sea Salt

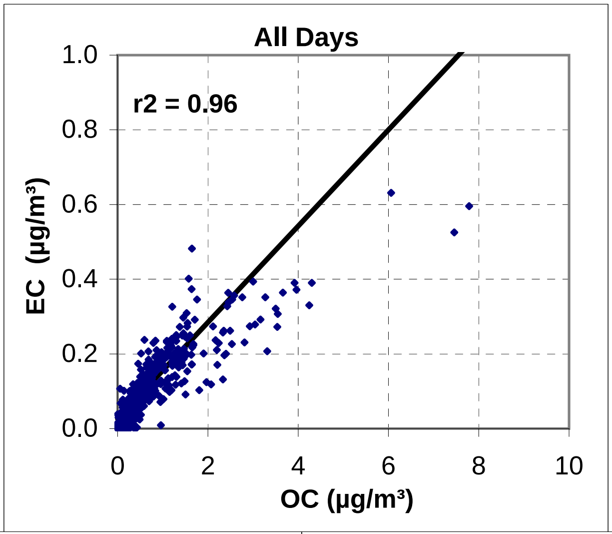

NOCA1 (SNPA1 as donor)
Baseline Extinction, New IMPROVE Algorithm
Extinction (Mm-1)
100
75
50
25
0
J-00 F-00 M-00 A-00 M-00 J-00 J-00 A-00 S-00 O-00 N-00 D-00
20% W > 31
J-01 F-01 M-01 A-01 M-01 J-01 J-01 A-01 S-01 O-01 N-01 D-01
20% W > 32
J-02 F-02 M-02 A-02 M-02 J-02 J-02 A-02 S-02 O-02 N-02 D-02
20% W > 39
J-03 F-03 M-03 A-03 M-03 J-03 J-03 A-03 S-03 O-03 N-03 D-03
20% W > 33
J-04 F-04 M-04 A-04 M-04 J-04 J-04 A-04 S-04 O-04 N-04 D-04
Rayleigh Amm Sulf Amm NO3 POM LAC Soil CM Sea Salt

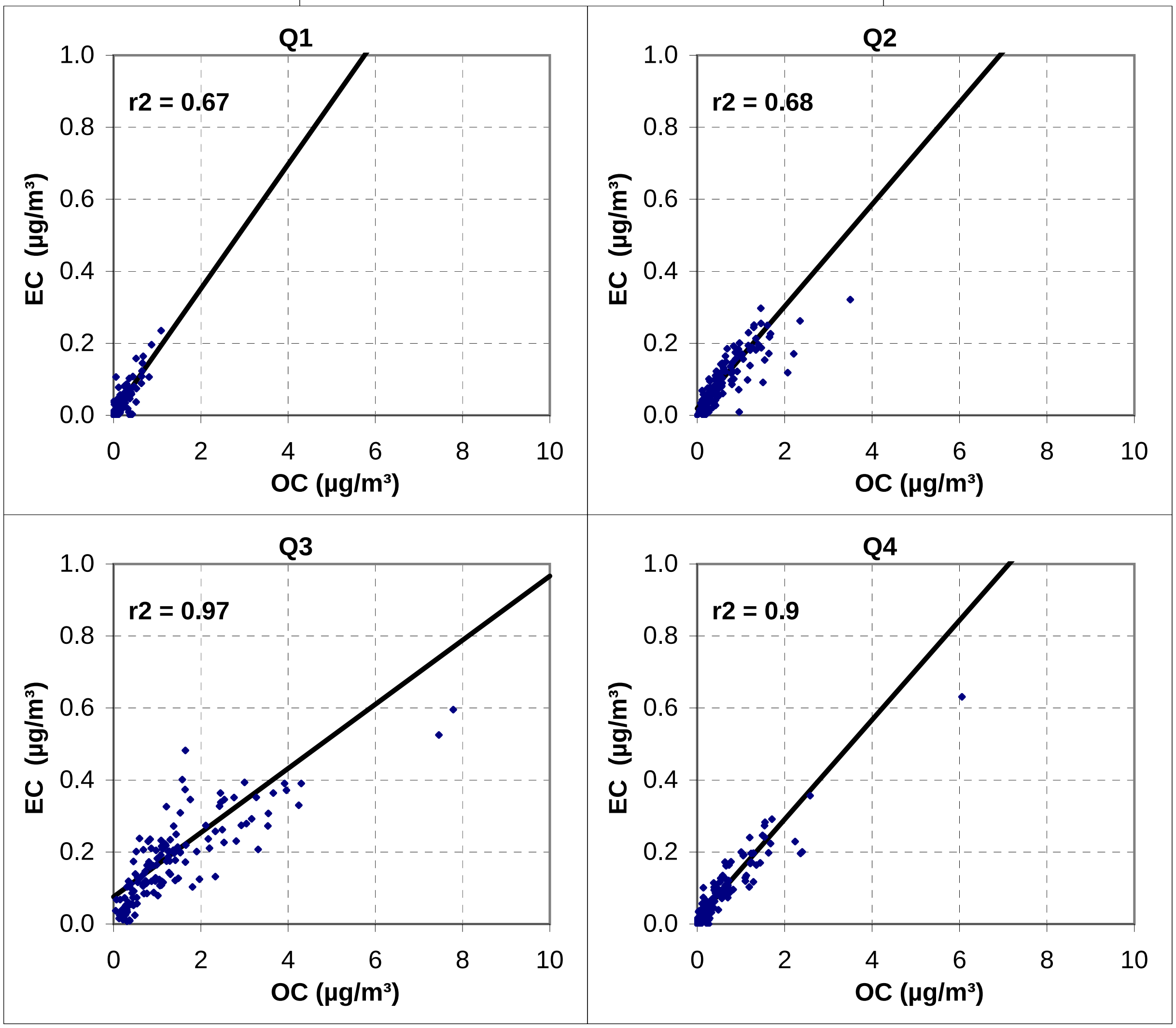
Statistics for North Cascades, WA Substitutions

NOCA1						
Components	**KT Stats**	**All**	**1**	**2**	**3**	**4**
OC vs. org_H	**Slope**	10.04	9.05	9.62	10.02	9.89
	Intercept	-0.11	-0.08	-0.10	-0.02	-0.08
	MAD	0.09	0.06	0.08	0.15	0.10
EC vs. OC	**Slope**	0.13	0.17	0.14	0.09	0.14
	Intercept	0.03	0.01	0.02	0.08	0.01
	MAD	0.03	0.01	0.02	0.05	0.02
NOCA1 vs. SNPA1						
Components	**KT Stats**	**All**	**1**	**2**	**3**	**4**
SO4	**Slope**	0.80	0.67	0.70	0.76	0.70
	Intercept	-0.01	0.00	0.20	0.04	0.00
	MAD	0.17	0.09	0.26	0.36	0.09
NO3	**Slope**	0.17	0.04	0.39	0.32	0.00
	Intercept	0.03	0.05	0.03	0.03	0.05
	MAD	0.05	0.03	0.05	0.06	0.03
OC	**Slope**	0.69	0.35	0.70	0.77	0.31
	Intercept	-0.01	0.06	0.01	0.18	0.15
	MAD	0.17	0.09	0.12	0.27	0.22
LAC	**Slope**	0.38	0.20	0.44	0.41	0.19
	Intercept	0.01	0.01	0.01	0.06	0.03
	MAD	0.04	0.02	0.03	0.06	0.04
Soil	**Slope**	0.68	0.52	0.70	0.76	0.36
	Intercept	0.01	0.02	0.03	0.00	0.03
	MAD	0.03	0.02	0.05	0.05	0.02
CM	**Slope**	0.69	0.16	0.54	0.81	0.39
	Intercept	0.30	0.22	0.58	0.69	0.32
	MAD	0.46	0.16	0.40	0.64	0.28
Sea Salt	**Slope**	0.00	0.00	0.00	0.00	0.08
	Intercept	0.00	0.00	0.00	0.00	0.00
	MAD	0.00	0.00	0.00	0.00	0.00

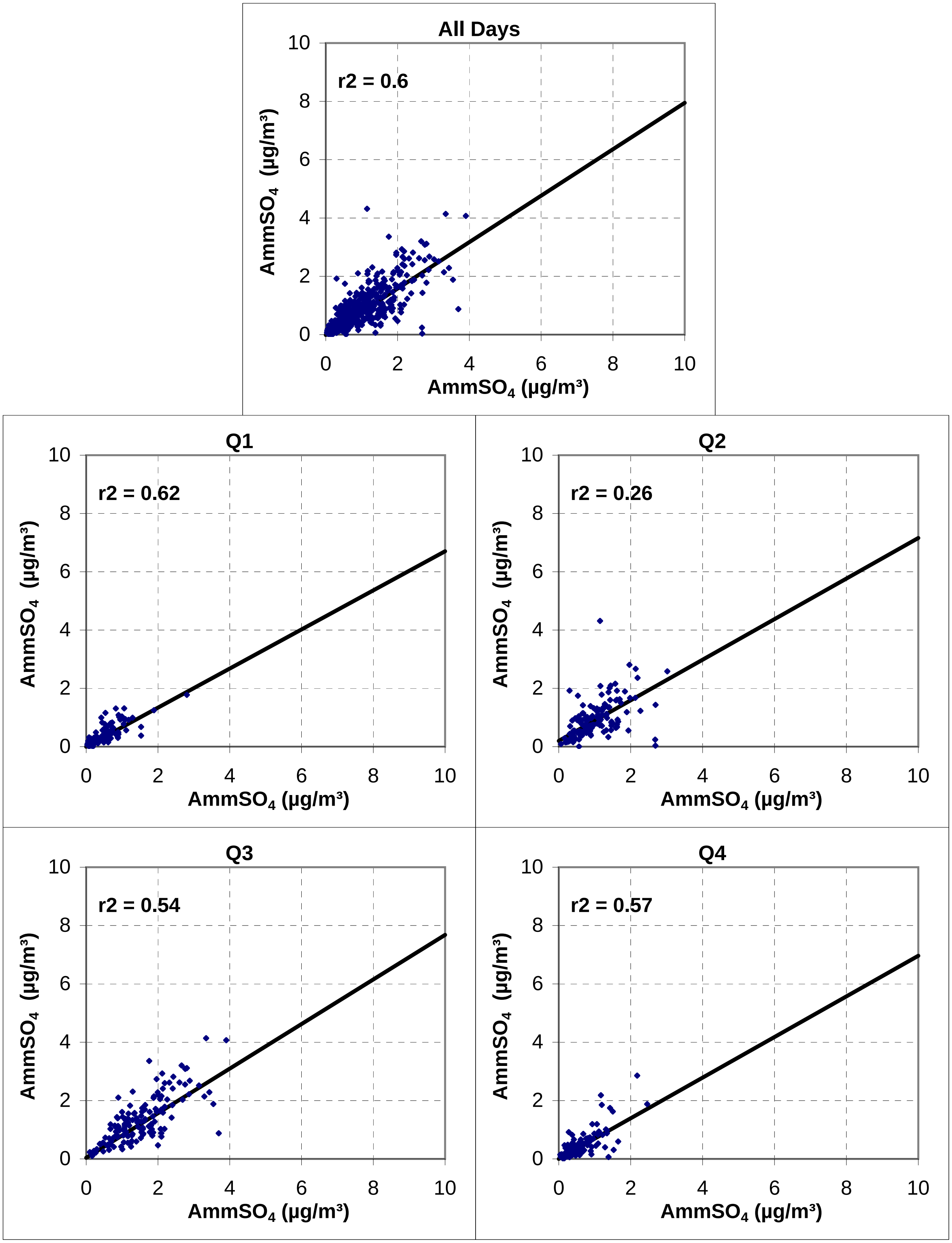

NOCA1
OC vs. org_H
All Days
r2 = 0.94
Q1
r2 = 0.77
Q2
r2 = 0.9
Q3
r2 = 0.91
Q4
r2 = 0.98
OC (µg/m³)
org_H (µg/m³)
0
2
4
6
8
10
0.0
0.2
0.4
0.6
0.8
1.0

NOCA1
EC vs. OC

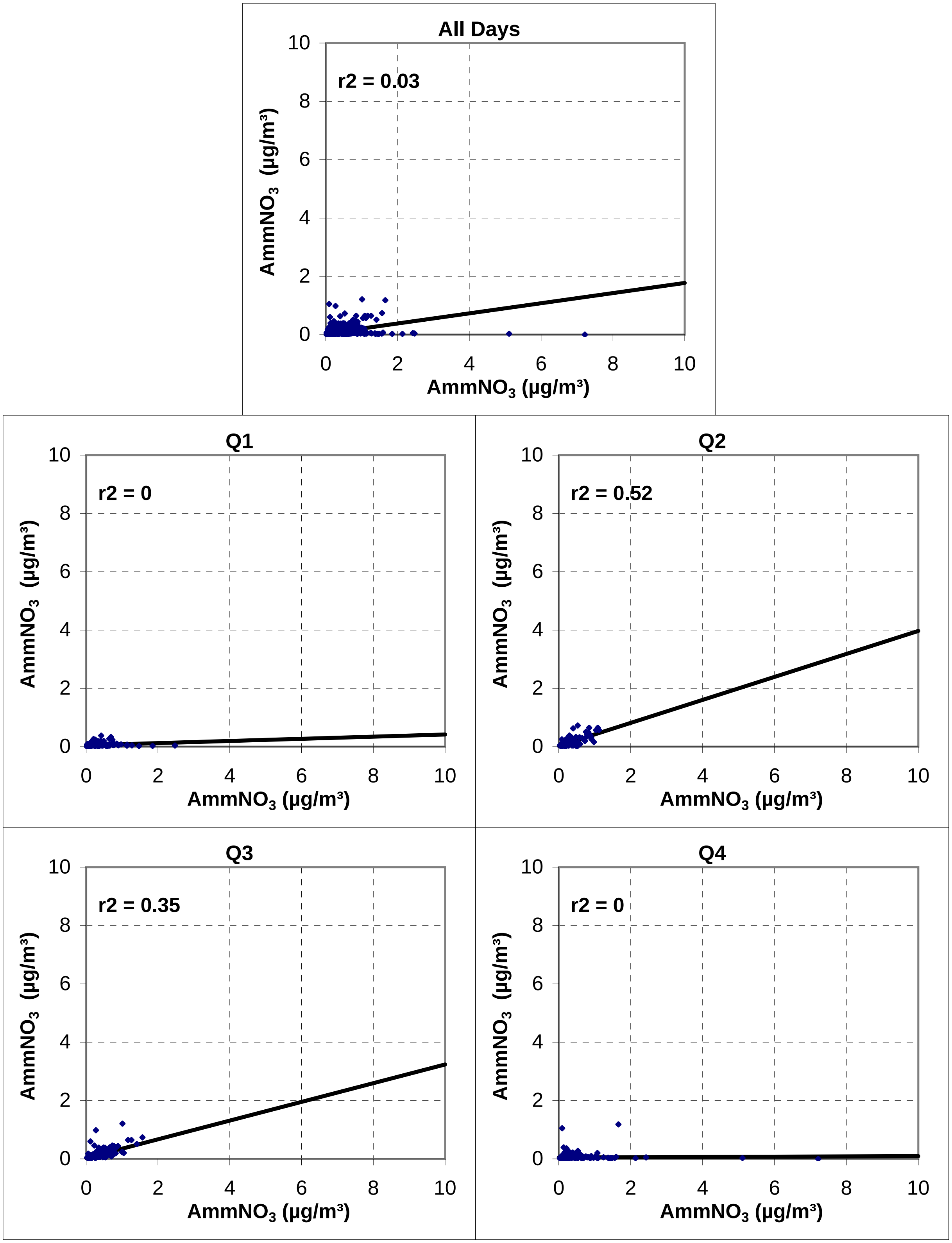




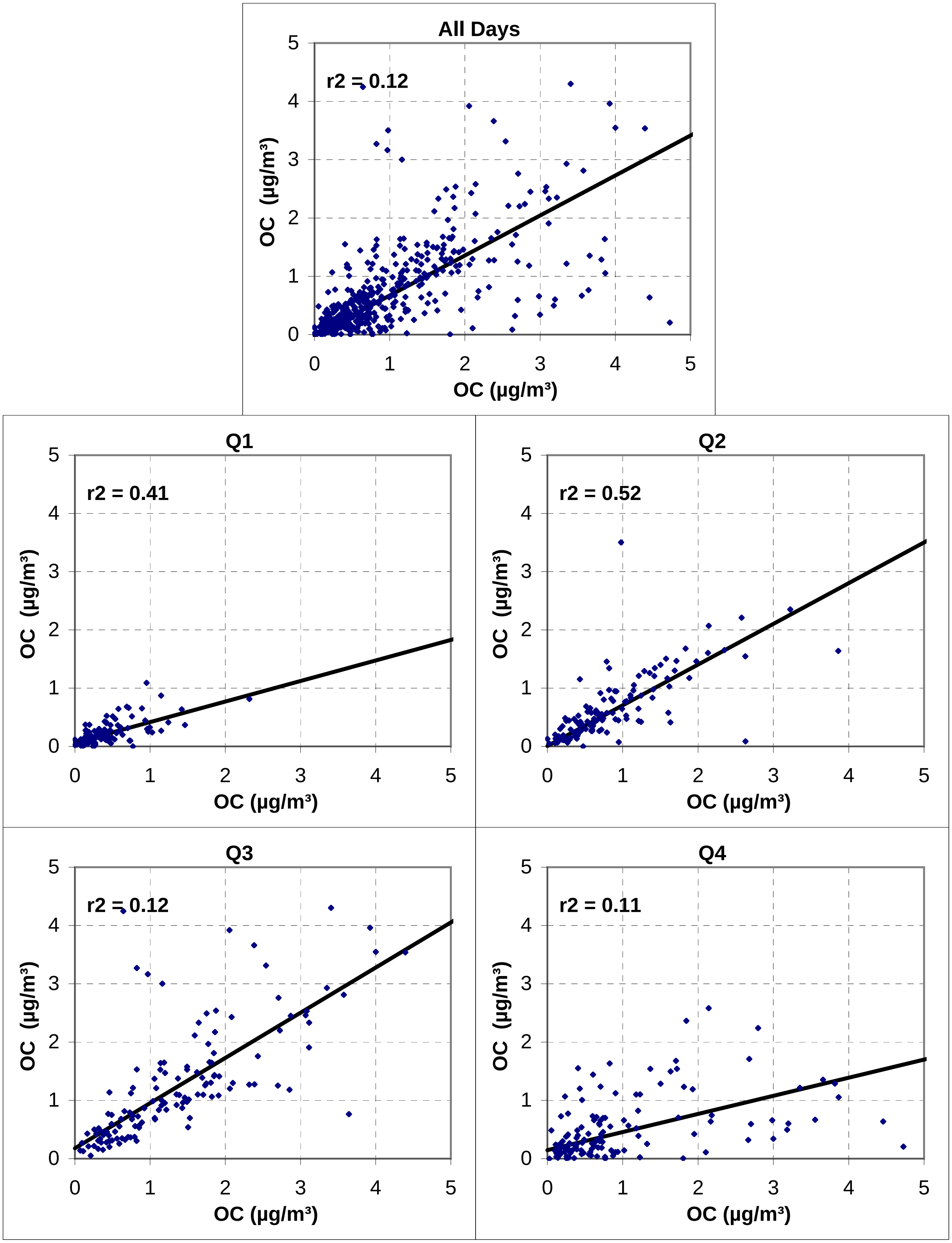
NOCA1 vs. SNPA1
Ammonium Sulfate



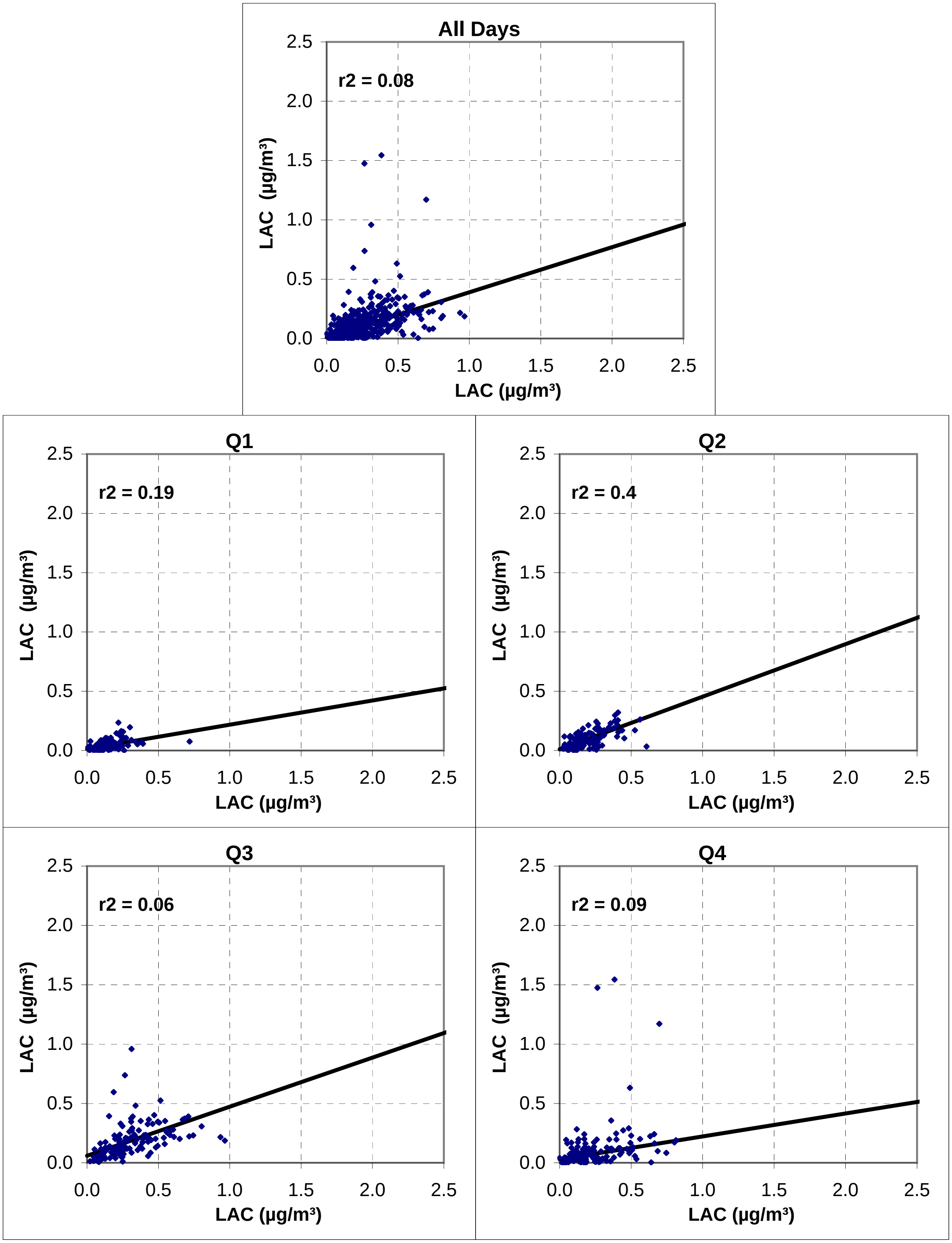
NOCA1 vs. SNPA1
Ammonium Nitrate



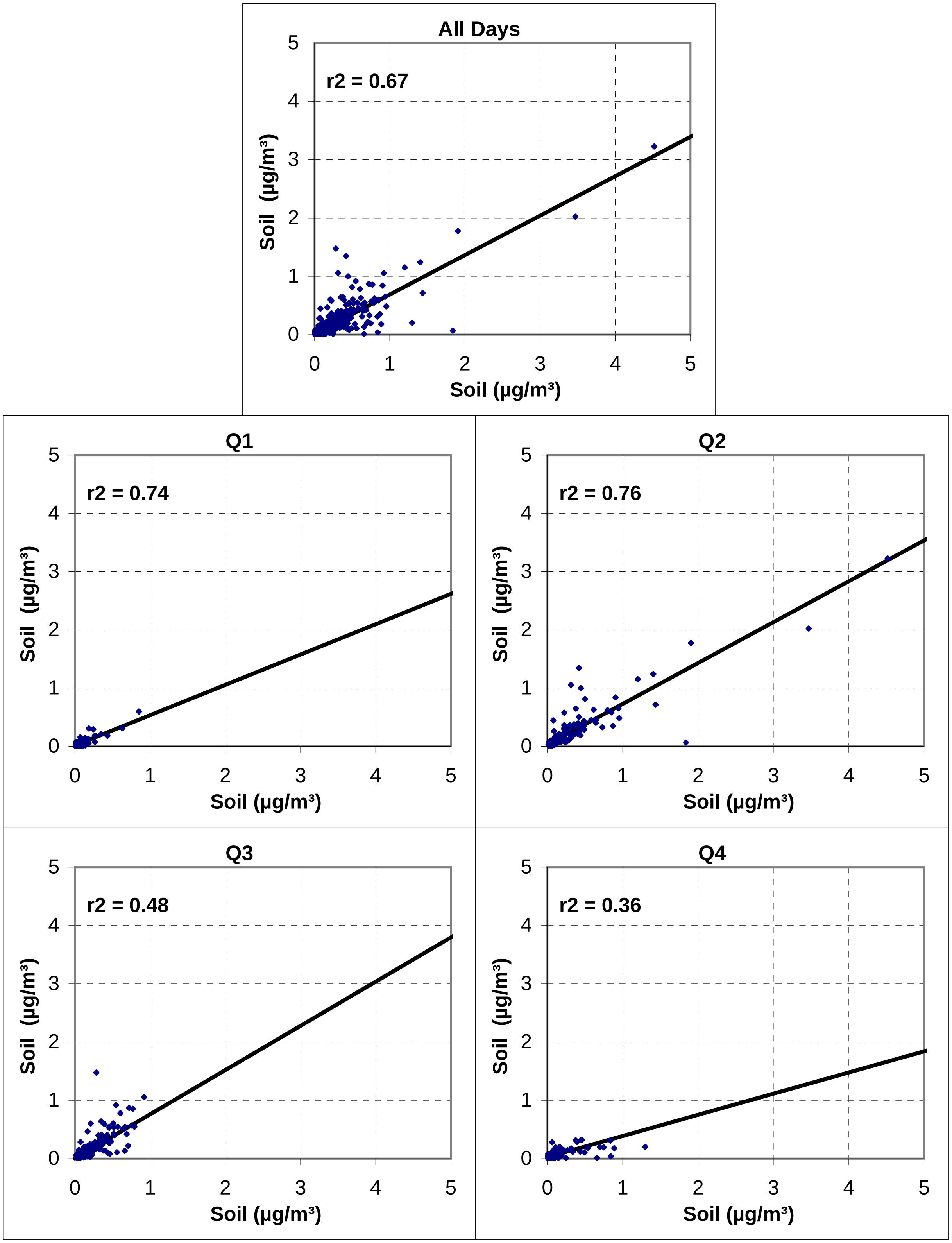
NOCA1 vs. SNPA1
Organic Carbon



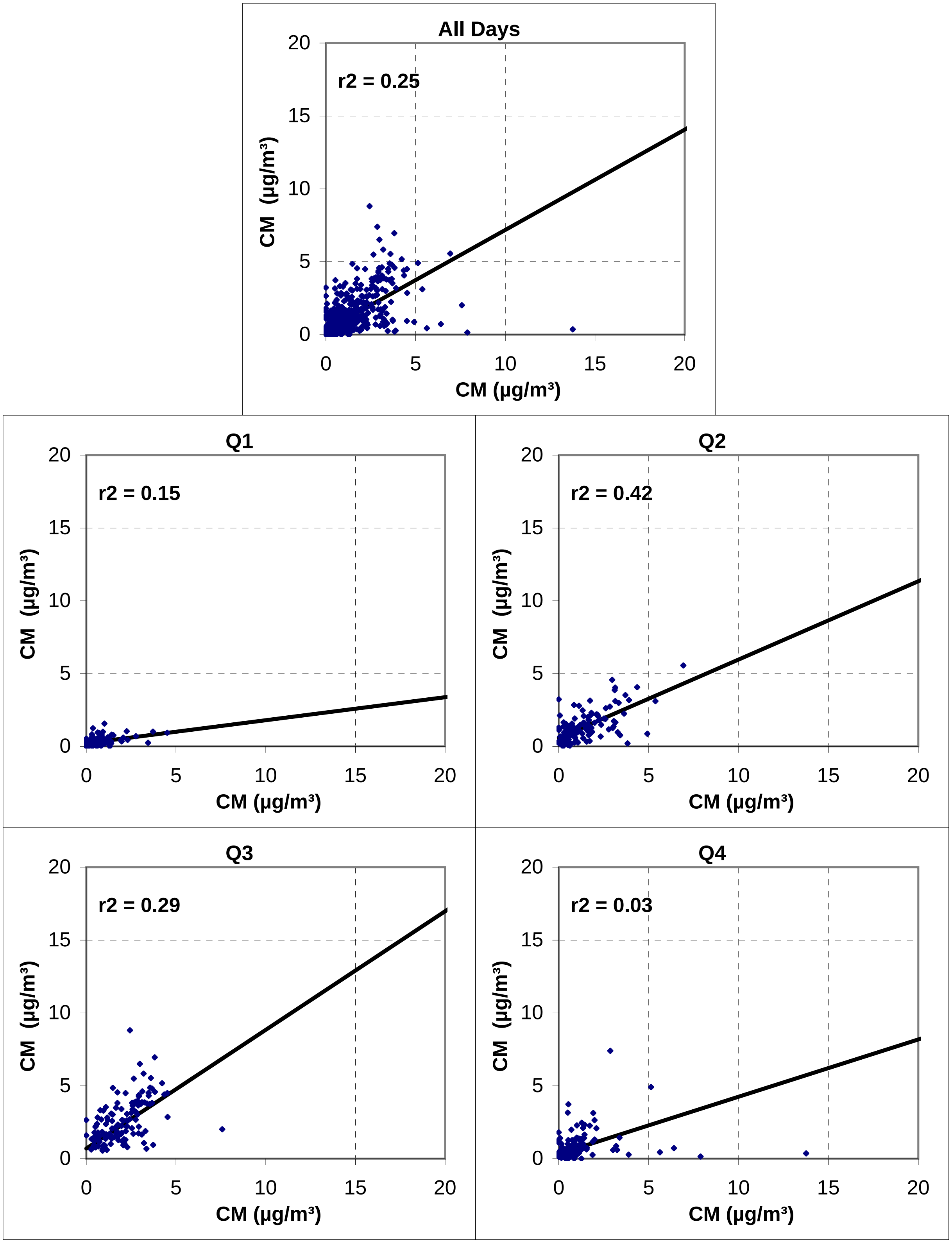
NOCA1 vs. SNPA1
Light Absorbing Carbon



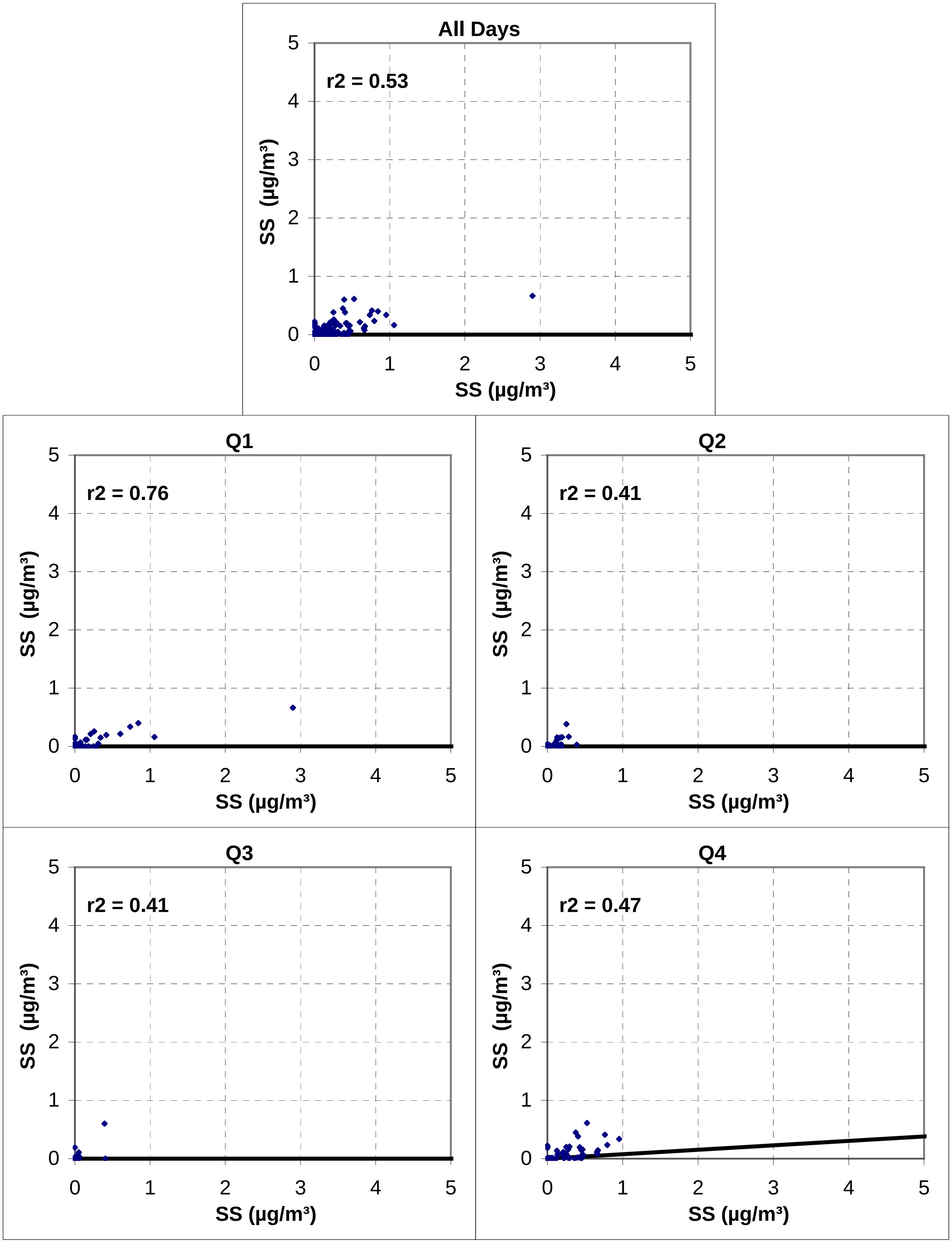
NOCA1 vs. SNPA1
Soil



NOCA1 vs. SNPA1
Coarse Mass



NOCA1 vs. SNPA1
Sea Salt



Washington State Regional Haze State Implementation Plan

Appendix E

Supplementary Information for Setting Reasonable Progress Goals

Overview

This appendix consists of two sections. The first is a series of tables summarizing monitoring and modeling information for Washington's mandatory Class I Areas. These tables area taken from the WRAP's Technical Support System (TSS).   The second is revised 2018 visibility projections for NOCA1, the IMPROVE monitoring site representing North Cascades National Park and Glacier Peak Wilderness. The revised projections were prepared by Cassie Archuleta, Air Resource Specialists, Inc., Fort Collins, CO for the state of Washington and the WRAP.

Class I Area Summary Tables - Olympic National Park

<table>
<tr><td rowspan="3"></td><td colspan="7">Class I Area Visibility Summary: Olympic NP, WA
Visibility Conditions: Worst 20% Days
RRF Calculation Method: Specific Days (EPA)
Emissions Scenarios: 2000-04 Baseline (plan02d) & 2018 PRP (prp18a)</td></tr>
<tr><td>Monitored</td><td colspan="2">Estimated</td><td colspan="4">Projected</td></tr>
<tr><td>2000-04 Baseline Conditions (Mm-1)</td><td>2064 Natural Conditions (Mm-1)</td><td>2018 Uniform Rate of Progress Target (Mm-1)</td><td>2018 Projected Visibility Conditions (Mm-1)</td><td>Baseline to 2018 Change In Statewide Emissions (tons / %)</td><td>Baseline to 2018 Change In Upwind Weighted Emissions[1] (%)</td><td>Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[1] (%)</td></tr>
<tr><td>Sulfate</td><td>16.67</td><td>1.53</td><td>11.93</td><td>16.24</td><td>-33,830
-39%</td><td>-14%</td><td>-14%</td></tr>
<tr><td>Nitrate</td><td>8.3</td><td>2.04</td><td>6.60</td><td>5.91</td><td>-174,838
-46%</td><td>-42%</td><td>-42%</td></tr>
<tr><td>Organic Carbon</td><td>12.06</td><td>3.05</td><td>9.51</td><td>13.23</td><td>2,178
4%</td><td>20%</td><td>22%</td></tr>
<tr><td>Elemental Carbon</td><td>2.74</td><td>0.29</td><td>2.12</td><td>2.3</td><td>-3,329
-25%</td><td>-23%</td><td>-24%</td></tr>
<tr><td>Fine Soil</td><td>0.3</td><td>0.26</td><td>0.29</td><td>0.41</td><td>8,216
23%</td><td>30%</td><td>30%</td></tr>
<tr><td>Coarse Material[2]</td><td>1.78</td><td>1.94</td><td>1.81</td><td rowspan="2">Not Applicable</td><td>40,184
38%</td><td>9%</td><td>10%</td></tr>
<tr><td>Sea Salt[2]</td><td>1.44</td><td>3.39</td><td>1.87</td><td colspan="3" rowspan="3">Not Applicable</td></tr>
<tr><td>Total Light Extinction</td><td>54.28</td><td>23.50</td><td>44.57</td><td>52.31</td></tr>
<tr><td>Deciview</td><td>16.74</td><td>8.44</td><td>14.81</td><td>16.38</td></tr>
</table>

WRAP TSS - 12/31/2008

1) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRP (prp18a) emissions scenarios.
2) Visibility projections not available due to model performance issues.

	Class I Area Visibility Summary: Olympic NP, WA **Visibility Conditions:** Best 20% Days **RRF Calculation Method:** Specific Days (EPA) **Emissions Scenarios:** 2000-04 Baseline (plan02d) & 2018 PRP (prp18a)						
	Monitored	**Estimated**		**Projected**			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)[1]	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[2] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[2] (%)
Sulfate	2.66	0.39	Not Applicable	2.39	-33,830 -39%	-21%	-21%
Nitrate	1.24	0.34	Not Applicable	1	-174,838 -46%	-42%	-42%
Organic Carbon	1.91	0.66	Not Applicable	2.19	2,178 4%	23%	25%
Elemental Carbon	0.65	0.09	Not Applicable	0.5	-3,329 -25%	-20%	-21%
Fine Soil	0.03	0.03	Not Applicable	0.04	8,216 23%	30%	31%
Coarse Material[3]	0.32	0.3	Not Applicable	Not Applicable	40,184 38%	6%	6%
Sea Salt[3]	0.62	0.31	Not Applicable		Not Applicable		
Total Light Extinction	18.43	13.12	Not Applicable	18.06			
Deciview	6.02	2.7	Not Applicable	5.82			

WRAP TSS - 12/31/2008

1) 2018 Uniform Rate of Progress Target for Best 20% Days is not defined.
2) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRP (prp18a) emissions scenarios.
3) Visibility projections not available due to model performance issues.

Class I Area Summary Tables - North Cascades National Park and Glacier Peak Wilderness

	Class I Area Visibility Summary: Glacier Peak W, WA: North Cascades NP, WA **Visibility Conditions:** Worst 20% Days **RRF Calculation Method:** Specific Days (EPA) **Emissions Scenarios:** 2000-04 Baseline (plan02d) & 2018 PRPa (prp18a)						
	Monitored	**Estimated**		**Projected**			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[1] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[1] (%)
Sulfate	14.87	2.03	10.99	18.19	-33,830 -39%	-10%	-10%
Nitrate	2.69	2.11	2.56	2.43	-174,838 -46%	-37%	-39%
Organic Carbon	33.02	6.48	24.39	39.74	2,178 4%	6%	12%
Elemental Carbon	3.81	0.51	2.95	3.22	-3,329 -25%	-20%	-30%
Fine Soil	0.48	0.5	0.48	0.89	8,216 23%	29%	31%
Coarse Material[2]	1.75	1.89	1.78	Not Applicable	40,184 38%	41%	50%
Sea Salt[2]	0.01	0.2	0.05		Not Applicable		
Total Light Extinction	67.64	24.72	53.36	77.23			
Deciview	16.01	8.39	14.23	17.24			

WRAP TSS - 12/24/2009

1) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRPa (prp18a) emissions scenarios.
2) Visibility projections not available due to model performance issues.

	Class I Area Visibility Summary: Glacier Peak W, WA: North Cascades NP, WA Visibility Conditions: Best 20% Days RRF Calculation Method: Specific Days (EPA) Emissions Scenarios: 2000-04 Baseline (plan02d) & 2018 PRPa (prp18a)						
	Monitored	**Estimated**		**Projected**			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)[1]	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[2] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[2] (%)
Sulfate	1.39	0.26	Not Applicable	1.36	-33,830 -39%	-30%	-31%
Nitrate	0.42	0.32	Not Applicable	0.26	-174,838 -46%	-48%	-50%
Organic Carbon	0.64	0.26	Not Applicable	0.64	2,178 4%	2%	3%
Elemental Carbon	0.24	0.05	Not Applicable	0.23	-3,329 -25%	-26%	-38%
Fine Soil	0.04	0.04	Not Applicable	0.05	8,216 23%	22%	24%
Coarse Material[3]	0.19	0.17	Not Applicable	Not Applicable	40,184 38%	48%	64%
Sea Salt[3]	0.13	0.05	Not Applicable		Not Applicable		
Total Light Extinction	14.05	12.13	Not Applicable	13.87			
Deciview	3.37	1.93	Not Applicable	3.24			

WRAP TSS - 12/24/2009

1) 2018 Uniform Rate of Progress Target for Best 20% Days is not defined.
2) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRPa (prp18a) emissions scenarios.
3) Visibility projections not available due to model performance issues.

Class I Area Summary Tables – Alpine Lakes Wilderness

	Class I Area Visibility Summary: Alpine Lakes W, WA **Visibility Conditions:** Worst 20% Days **RRF Calculation Method:** Specific Days (EPA) **Emissions Scenarios:** 2000-04 Baseline (plan02d) & 2018 PRP (prp18a)						
	Monitored	**Estimated**		**Projected**			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[1] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[1] (%)
Sulfate	17.08	2.01	12.40	14.66	-33,830 -39%	-32%	-32%
Nitrate	11.56	2.62	9.03	7.49	-174,838 -46%	-51%	-53%
Organic Carbon	15.41	4.45	12.27	14.52	2,178 4%	-3%	-4%
Elemental Carbon	4.22	0.37	3.21	2.61	-3,329 -25%	-39%	-43%
Fine Soil	0.42	0.53	0.45	0.52	8,216 23%	19%	20%
Coarse Material[2]	1.5	1.69	1.54	Not Applicable	40,184 38%	60%	80%
Sea Salt[2]	0.44	0.97	0.56		Not Applicable		
Total Light Extinction	61.63	23.62	49.17	52.74			
Deciview	17.84	8.43	15.64	16.32			

WRAP TSS - 12/31/2008

1) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRP (prp18a) emissions scenarios.
2) Visibility projections not available due to model performance issues.

	Class I Area Visibility Summary: Alpine Lakes W, WA **Visibility Conditions:** Best 20% Days **RRF Calculation Method:** Specific Days (EPA) **Emissions Scenarios:** 2000-04 Baseline (plan02d) & 2018 PRP (prp18a)						
	Monitored	**Estimated**		**Projected**			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)[1]	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[2] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[2] (%)
Sulfate	2.6	0.41	Not Applicable	2.01	-33,830 -39%	-45%	-45%
Nitrate	1.16	0.31	Not Applicable	0.97	-174,838 -46%	-52%	-53%
Organic Carbon	1.06	0.43	Not Applicable	1.08	2,178 4%	-3%	-4%
Elemental Carbon	0.88	0.09	Not Applicable	0.52	-3,329 -25%	-39%	-43%
Fine Soil	0.06	0.05	Not Applicable	0.07	8,216 23%	21%	22%
Coarse Material[3]	0.21	0.18	Not Applicable	Not Applicable	40,184 38%	81%	106%
Sea Salt[3]	0.51	0.16	Not Applicable		Not Applicable		
Total Light Extinction	17.48	12.64	Not Applicable	16.37			
Deciview	5.5	2.33	Not Applicable	4.86			

WRAP TSS - 12/31/2008

1) 2018 Uniform Rate of Progress Target for Best 20% Days is not defined.
2) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRP (prp18a) emissions scenarios.
3) Visibility projections not available due to model performance issues.

Class I Area Summary Tables - Mount Rainier National Park

	Class I Area Visibility Summary: Mount Rainier NP, WA **Visibility Conditions:** Worst 20% Days **RRF Calculation Method:** Specific Days (EPA) **Emissions Scenarios:** 2000-04 Baseline (plan02d) & 2018 PRP (prp18a)						
	Monitored	**Estimated**		**Projected**			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[1] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[1] (%)
Sulfate	23.7	2.2	16.58	18.55	-33,830 -39%	-49%	-49%
Nitrate	5.14	2.62	4.51	4.15	-174,838 -46%	-50%	-51%
Organic Carbon	15.06	3.44	11.67	14.18	2,178 4%	-7%	-8%
Elemental Carbon	5.13	0.34	3.85	2.8	-3,329 -25%	-43%	-44%
Fine Soil	0.51	0.55	0.52	0.61	8,216 23%	18%	19%
Coarse Material[2]	2.2	2.45	2.26	Not Applicable	40,184 38%	109%	128%
Sea Salt[2]	0.06	0.99	0.27		Not Applicable		
Total Light Extinction	62.81	23.59	49.87	53.54			
Deciview	18.24	8.54	15.98	16.66			

WRAP TSS - 12/31/2008

1) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRP (prp18a) emissions scenarios.
2) Visibility projections not available due to model performance issues.

	Class I Area Visibility Summary: Mount Rainier NP, WA **Visibility Conditions:** Best 20% Days **RRF Calculation Method:** Specific Days (EPA) **Emissions Scenarios:** 2000-04 Baseline (plan02d) & 2018 PRP (prp18a)						
	Monitored	**Estimated**		**Projected**			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)[1]	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[2] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[2] (%)
Sulfate	2.57	0.34	Not Applicable	1.78	-33,830 -39%	-44%	-45%
Nitrate	0.64	0.31	Not Applicable	0.61	-174,838 -46%	-49%	-50%
Organic Carbon	1.49	0.52	Not Applicable	1.4	2,178 4%	-4%	-5%
Elemental Carbon	0.66	0.06	Not Applicable	0.44	-3,329 -25%	-34%	-39%
Fine Soil	0.05	0.06	Not Applicable	0.05	8,216 23%	15%	17%
Coarse Material[3]	0.55	0.5	Not Applicable	Not Applicable	40,184 38%	87%	125%
Sea Salt[3]	0.49	0.14	Not Applicable		Not Applicable		
Total Light Extinction	17.44	12.93	Not Applicable	16.33			
Deciview	5.47	2.56	Not Applicable	4.83			

WRAP TSS - 12/31/2008

1) 2018 Uniform Rate of Progress Target for Best 20% Days is not defined.
2) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRP (prp18a) emissions scenarios.
3) Visibility projections not available due to model performance issues.

Class I Area Summary Tables – Goat Rocks Wilderness and Mount Adams Wilderness

	Class I Area Visibility Summary: Goat Rocks W, WA: Mount Adams W, WA **Visibility Conditions:** Worst 20% Days **RRF Calculation Method:** Specific Days (EPA) **Emissions Scenarios:** 2000-04 Baseline (plan02d) & 2018 PRP (prp18a)						
	Monitored	**Estimated**		**Projected**			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[1] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[1] (%)
Sulfate	9.92	1.97	7.69	8.52	-33,830 -39%	-42%	-42%
Nitrate	3.05	2.42	2.90	2.14	-174,838 -46%	-49%	-50%
Organic Carbon	9.63	5.7	8.63	8.93	2,178 4%	0%	0%
Elemental Carbon	1.79	0.48	1.47	1.18	-3,329 -25%	-35%	-39%
Fine Soil	0.56	0.63	0.58	0.71	8,216 23%	11%	11%
Coarse Material[2]	1.74	1.92	1.78	Not Applicable	40,184 38%	59%	83%
Sea Salt[2]	0.39	0.51	0.42		Not Applicable		
Total Light Extinction	37.09	23.63	33.38	33.60			
Deciview	12.76	8.35	11.73	11.79			

WRAP TSS - 12/31/2008

1) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRP (prp18a) emissions scenarios.
2) Visibility projections not available due to model performance issues.

	Class I Area Visibility Summary: Goat Rocks W, WA: Mount Adams W, WA Visibility Conditions: Best 20% Days RRF Calculation Method: Specific Days (EPA) Emissions Scenarios: 2000-04 Baseline (plan02d) & 2018 PRP (prp18a)						
	Monitored	**Estimated**		**Projected**			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)[1]	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[2] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[2] (%)
Sulfate	0.89	0.23	Not Applicable	0.65	-33,830 -39%	-45%	-46%
Nitrate	0.24	0.17	Not Applicable	0.27	-174,838 -46%	-47%	-49%
Organic Carbon	0.25	0.17	Not Applicable	0.27	2,178 4%	2%	3%
Elemental Carbon	0.14	0.04	Not Applicable	0.11	-3,329 -25%	-26%	-32%
Fine Soil	0.03	0.04	Not Applicable	0.04	8,216 23%	4%	4%
Coarse Material[3]	0.15	0.12	Not Applicable	Not Applicable	40,184 38%	50%	80%
Sea Salt[3]	0.13	0.08	Not Applicable		Not Applicable		
Total Light Extinction	11.84	10.86	Not Applicable	11.61			
Deciview	1.66	0.82	Not Applicable	1.47			

WRAP TSS - 12/31/2008

1) 2018 Uniform Rate of Progress Target for Best 20% Days is not defined.
2) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRP (prp18a) emissions scenarios.
3) Visibility projections not available due to model performance issues.

Class I Area Summary Tables – Pasayten Wilderness

Class I Area Visibility Summary: Pasayten W, WA
Visibility Conditions: Worst 20% Days
RRF Calculation Method: Specific Days (EPA)
Emissions Scenarios: 2000-04 Baseline (plan02d) & 2018 PRP (prp18a)

	Monitored	Estimated		Projected			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[1] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[1] (%)
Sulfate	8.06	1.7	6.32	7.82	-33,830 -39%	-16%	-18%
Nitrate	3.28	2.17	3.02	2.45	-174,838 -46%	-36%	-41%
Organic Carbon	21.9	5.91	17.12	22.18	2,178 4%	3%	10%
Elemental Carbon	3.32	0.55	2.61	3.53	-3,329 -25%	-14%	-33%
Fine Soil	0.82	0.81	0.81	0.82	8,216 23%	19%	23%
Coarse Material[2]	2.07	2.25	2.11	Not Applicable	40,184 38%	18%	25%
Sea Salt[2]	0.08	0.2	0.11		Not Applicable		
Total Light Extinction	49.53	23.59	41.66	48.95			
Deciview	15.23	8.25	13.60	15.09			

WRAP TSS - 1/9/2009

1) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRP (prp18a) emissions scenarios.
2) Visibility projections not available due to model performance issues.

Class I Area Visibility Summary: Pasayten W, WA
Visibility Conditions: Best 20% Days
RRF Calculation Method: Specific Days (EPA)
Emissions Scenarios: 2000-04 Baseline (plan02d) & 2018 PRP (prp18a)

	Monitored	**Estimated**		**Projected**			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)[1]	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[2] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[2] (%)
Sulfate	1.54	0.39	Not Applicable	1.09	-33,830 -39%	-30%	-33%
Nitrate	0.54	0.34	Not Applicable	0.24	-174,838 -46%	-42%	-47%
Organic Carbon	0.54	0.2	Not Applicable	0.36	2,178 4%	2%	6%
Elemental Carbon	0.21	0.04	Not Applicable	0.1	-3,329 -25%	-20%	-37%
Fine Soil	0.07	0.07	Not Applicable	0.03	8,216 23%	17%	20%
Coarse Material[3]	0.16	0.14	Not Applicable	Not Applicable	40,184 38%	19%	26%
Sea Salt[3]	0.12	0.06	Not Applicable		Not Applicable		
Total Light Extinction	13.18	11.24	Not Applicable	12.10			
Deciview	2.73	1.16	Not Applicable	1.89			

WRAP TSS - 1/9/2009

1) 2018 Uniform Rate of Progress Target for Best 20% Days is not defined.
2) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRP (prp18a) emissions scenarios.
3) Visibility projections not available due to model performance issues.

NOCA1 Revised 2018 Visibility Projections

(November 2, 2010)

WRAP 2018 visibility projections were made using the Plan02d and PRP18a modeling results applied in a relative sense to the 2000-2004 baseline years monitoring data**.** Projections were made using relative response factors (RRFs), which are defined as the ratio of the future-year modeling results to the current-year modeling results. The calculated RRFs are applied to the baseline observed visibility conditions to project future-year observed visibility.

Projected 2018 values are available through the WRAP TSS (http://vista.cira.colostate.edu/tss/). These values were created as follows:

- The 20% worst visibility days from the Plan02d and PRP18a modeled results were selected according to the EPA recommended "specific days" method and used to calculate RRFs.
- Factors were applied to daily mass values for each of the 20% worst days measured during the baseline period.
- Extinction was calculated from the scaled mass values using the revised IMPROVE algorithm.
- Daily extinction was converted to deciview values.
- Daily values were averaged annually.
- Annual values were averaged to represent the projected 2018 extinction.

For the NOCA site, the original WRAP RRFs applied to each PM species to calculate 2018 projections from the baseline 2001-2004 data are listed in Table 1.

Table 1
WRAP Relative Reduction Factors
NOCA

	Old RRF (Specific Days)
Amm. Sulfate	1.21
Amm. Nitrate	0.90
OMC	1.19
EC	0.85
Soil	1.86
CM	1
SeaSalt	1

Using these RRFs, deciview projections for the year 2018 are higher than the glideslope path to natural conditions. This is largely due to projected increases in ammonium sulfate and organic mass extinction. The 2018 modeling results used to generate the RRF factors included emissions data that have been determined to be erroneously high in SO_2. Also, the 2001-2004 period used as baseline data for the NOCA1 site was influenced by high organic matter measurements in 2003. Organic emissions estimates are heavily influenced by fire activity, and 2003 was an anomalously high fire year in the Pacific Northwest. This caused 2001-2004 data scaled with RRF factors to produce even higher 2018 estimates.

To address these issues, new approximations of RRFs for ammonium sulfate and organic mass for the NOCA1 site were generated. For ammonium sulfate, monitored mass for the 2005-2008 IMPROVE aerosol data was averaged for the 20% worst extinction days. The ratio of this average mass to the 2001-2004 baseline average mass was used as an updated ammonium sulfate RRF. The calculation is as follows:

$$\mathrm{RRF_{new}\,(Amm.SO_4)} = \frac{\text{2005 - 2008 Avg. Amm.}\mathrm{SO_4}\text{ Mass (20\% Worst Days)}}{\text{2001 - 2004 Avg. Amm.}\mathrm{SO_4}\text{ Mass (20\% Worst Days)}} = \frac{1.52\ \mu\mathrm{g/m^3}}{1.70\ \mu\mathrm{g/m^3}} = 0.89$$

For organic mass, the RRF was lowered from a 1.19 to a 1.0, to represent no increase in organic mass for the 2018 projected values. Revised RRFs based on these changes are listed in Table 2.

Table 2
New Relative Reduction Factors
NOCA

	New RRF (Specific Days)
Amm. Sulfate	0.89*
Amm. Nitrate	0.90
OMC	1*
EC	0.85
Soil	1.86
CM	1
SeaSalt	1

*New values

Mass and extinction values calculated using original and new RRF values are listed in Table 3. With revised RRFs, ammonium sulfate extinction is projected to decrease by about 1.7 Mm^{-1}, as opposed to increasing by 3.3 Mm^{-1}. Also, revised organic carbon mass extinction is held constant, where previous estimates showed an increase of about 6.7 Mm^{-1}. The net effect is that the 2018 dV value is projected to decrease by about 0.4 dV, as opposed to a projected increase of 1.2 dV in 2018.

For method verification, all daily baseline data was obtained from the WRAP TSS website, and calculations using original RRFs were performed external to the TSS. Average baseline and 2018 projected values calculated externally were verified against values reported on the TSS. The accompanying spreadsheet (NOCA_NewRRF_20101101.xls) contains all daily and annual average mass and extinction data for baseline years, original 2018 projected values, new 2018 projected values, and 2005-2008 monitored values.

Table 3
Mass and Extinction Summary for NOCA1
For Original and New 2018 Projected Conditions

	2001-2004 Baseline Conditions		Original 2018 Projected Conditions		New 2018 Projected Conditions	
	Mass (μg/m³)	Extinction (Mm^{-1})	Mass (μg/m³)	Extinction (Mm^{-1})	Mass (μg/m³)	Extinction (Mm^{-1})
Ammonium Sulfate	1.70	14.87	2.05	18.19	1.52*	13.22*
Ammonium Nitrate	0.29	2.69	0.26	2.43	0.26	2.43
Organic Carbon Mass	6.73	33.02	7.98	39.74	6.73*	33.02*
Elemental Carbon	0.38	3.81	0.32	3.22	0.32	3.22
Soil	0.48	0.48	0.89	0.89	0.89	0.89
Coarse Mass	2.92	1.75	2.92	1.75	2.92	1.75
Sea Salt	0.00	0.01	0.00	0.01	0.00	0.01
Total b_{ext}	67.64		77.23		65.55*	
dV	16.01		17.24		15.62*	

*New values

Washington State Regional Haze State Implementation Plan

Appendix E

Supplementary Information for Setting Reasonable Progress Goals

Overview

This appendix consists of two sections. The first is a series of tables summarizing monitoring and modeling information for Washington's mandatory Class I Areas. These tables area taken from the WRAP's Technical Support System (TSS). The second is revised 2018 visibility projections for NOCA1, the IMPROVE monitoring site representing North Cascades National Park and Glacier Peak Wilderness. The revised projections were prepared by Cassie Archuleta, Air Resource Specialists, Inc., Fort Collins, CO for the state of Washington and the WRAP.

Class I Area Summary Tables - Olympic National Park

Class I Area Visibility Summary: Olympic NP, WA
Visibility Conditions: Worst 20% Days
RRF Calculation Method: Specific Days (EPA)
Emissions Scenarios: 2000-04 Baseline (plan02d) & 2018 PRP (prp18a)

	Monitored	Estimated		Projected			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[1] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[1] (%)
Sulfate	16.67	1.53	11.93	16.24	-33,830 -39%	-14%	-14%
Nitrate	8.3	2.04	6.60	5.91	-174,838 -46%	-42%	-42%
Organic Carbon	12.06	3.05	9.51	13.23	2,178 4%	20%	22%
Elemental Carbon	2.74	0.29	2.12	2.3	-3,329 -25%	-23%	-24%
Fine Soil	0.3	0.26	0.29	0.41	8,216 23%	30%	30%
Coarse Material[2]	1.78	1.94	1.81	Not Applicable	40,184 38%	9%	10%
Sea Salt[2]	1.44	3.39	1.87	Not Applicable	Not Applicable		
Total Light Extinction	54.28	23.50	44.57	52.31	Not Applicable		
Deciview	16.74	8.44	14.81	16.38	Not Applicable		

WRAP TSS - 12/31/2008

1) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRP (prp18a) emissions scenarios.
2) Visibility projections not available due to model performance issues.

<table>
<tr><td rowspan="3"></td><td colspan="7">Class I Area Visibility Summary: Olympic NP, WA
Visibility Conditions: Best 20% Days
RRF Calculation Method: Specific Days (EPA)
Emissions Scenarios: 2000-04 Baseline (plan02d) & 2018 PRP (prp18a)</td></tr>
<tr><td>Monitored</td><td colspan="2">Estimated</td><td colspan="4">Projected</td></tr>
<tr><td>2000-04 Baseline Conditions (Mm-1)</td><td>2064 Natural Conditions (Mm-1)</td><td>2018 Uniform Rate of Progress Target (Mm-1)[1]</td><td>2018 Projected Visibility Conditions (Mm-1)</td><td>Baseline to 2018 Change In Statewide Emissions (tons / %)</td><td>Baseline to 2018 Change In Upwind Weighted Emissions[2] (%)</td><td>Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[2] (%)</td></tr>
<tr><td>Sulfate</td><td>2.66</td><td>0.39</td><td>Not Applicable</td><td>2.39</td><td>-33,830
-39%</td><td>-21%</td><td>-21%</td></tr>
<tr><td>Nitrate</td><td>1.24</td><td>0.34</td><td>Not Applicable</td><td>1</td><td>-174,838
-46%</td><td>-42%</td><td>-42%</td></tr>
<tr><td>Organic Carbon</td><td>1.91</td><td>0.66</td><td>Not Applicable</td><td>2.19</td><td>2,178
4%</td><td>23%</td><td>25%</td></tr>
<tr><td>Elemental Carbon</td><td>0.65</td><td>0.09</td><td>Not Applicable</td><td>0.5</td><td>-3,329
-25%</td><td>-20%</td><td>-21%</td></tr>
<tr><td>Fine Soil</td><td>0.03</td><td>0.03</td><td>Not Applicable</td><td>0.04</td><td>8,216
23%</td><td>30%</td><td>31%</td></tr>
<tr><td>Coarse Material[3]</td><td>0.32</td><td>0.3</td><td>Not Applicable</td><td rowspan="2">Not Applicable</td><td>40,184
38%</td><td>6%</td><td>6%</td></tr>
<tr><td>Sea Salt[3]</td><td>0.62</td><td>0.31</td><td>Not Applicable</td><td colspan="3" rowspan="3">Not Applicable</td></tr>
<tr><td>Total Light Extinction</td><td>18.43</td><td>13.12</td><td>Not Applicable</td><td>18.06</td></tr>
<tr><td>Deciview</td><td>6.02</td><td>2.7</td><td>Not Applicable</td><td>5.82</td></tr>
</table>

WRAP TSS - 12/31/2008

1) 2018 Uniform Rate of Progress Target for Best 20% Days is not defined.
2) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRP (prp18a) emissions scenarios.
3) Visibility projections not available due to model performance issues.

Class I Area Summary Tables - North Cascades National Park and Glacier Peak Wilderness

	Class I Area Visibility Summary: Glacier Peak W, WA: North Cascades NP, WA **Visibility Conditions:** Worst 20% Days **RRF Calculation Method:** Specific Days (EPA) **Emissions Scenarios:** 2000-04 Baseline (plan02d) & 2018 PRPa (prp18a)						
	Monitored	**Estimated**		**Projected**			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[1] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[1] (%)
Sulfate	14.87	2.03	10.99	18.19	-33,830 -39%	-10%	-10%
Nitrate	2.69	2.11	2.56	2.43	-174,838 -46%	-37%	-39%
Organic Carbon	33.02	6.48	24.39	39.74	2,178 4%	6%	12%
Elemental Carbon	3.81	0.51	2.95	3.22	-3,329 -25%	-20%	-30%
Fine Soil	0.48	0.5	0.48	0.89	8,216 23%	29%	31%
Coarse Material[2]	1.75	1.89	1.78	Not Applicable	40,184 38%	41%	50%
Sea Salt[2]	0.01	0.2	0.05		Not Applicable		
Total Light Extinction	67.64	24.72	53.36	77.23			
Deciview	16.01	8.39	14.23	17.24			

WRAP TSS - 12/24/2009

1) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRPa (prp18a) emissions scenarios.
2) Visibility projections not available due to model performance issues.

	Class I Area Visibility Summary: Glacier Peak W, WA: North Cascades NP, WA **Visibility Conditions:** Best 20% Days **RRF Calculation Method:** Specific Days (EPA) **Emissions Scenarios:** 2000-04 Baseline (plan02d) & 2018 PRPa (prp18a)						
	Monitored	**Estimated**		**Projected**			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)[1]	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[2] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[2] (%)
Sulfate	1.39	0.26	Not Applicable	1.36	-33,830 -39%	-30%	-31%
Nitrate	0.42	0.32	Not Applicable	0.26	-174,838 -46%	-48%	-50%
Organic Carbon	0.64	0.26	Not Applicable	0.64	2,178 4%	2%	3%
Elemental Carbon	0.24	0.05	Not Applicable	0.23	-3,329 -25%	-26%	-38%
Fine Soil	0.04	0.04	Not Applicable	0.05	8,216 23%	22%	24%
Coarse Material[3]	0.19	0.17	Not Applicable	Not Applicable	40,184 38%	48%	64%
Sea Salt[3]	0.13	0.05	Not Applicable		Not Applicable		
Total Light Extinction	14.05	12.13	Not Applicable	13.87			
Deciview	3.37	1.93	Not Applicable	3.24			

WRAP TSS - 12/24/2009

1) 2018 Uniform Rate of Progress Target for Best 20% Days is not defined.
2) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRPa (prp18a) emissions scenarios.
3) Visibility projections not available due to model performance issues.

Class I Area Summary Tables – Alpine Lakes Wilderness

Class I Area Visibility Summary: Alpine Lakes W, WA
Visibility Conditions: Worst 20% Days
RRF Calculation Method: Specific Days (EPA)
Emissions Scenarios: 2000-04 Baseline (plan02d) & 2018 PRP (prp18a)

	Monitored	Estimated		Projected			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[1] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[1] (%)
Sulfate	17.08	2.01	12.40	14.66	-33,830 -39%	-32%	-32%
Nitrate	11.56	2.62	9.03	7.49	-174,838 -46%	-51%	-53%
Organic Carbon	15.41	4.45	12.27	14.52	2,178 4%	-3%	-4%
Elemental Carbon	4.22	0.37	3.21	2.61	-3,329 -25%	-39%	-43%
Fine Soil	0.42	0.53	0.45	0.52	8,216 23%	19%	20%
Coarse Material[2]	1.5	1.69	1.54	Not Applicable	40,184 38%	60%	80%
Sea Salt[2]	0.44	0.97	0.56	Not Applicable	Not Applicable		
Total Light Extinction	61.63	23.62	49.17	52.74	Not Applicable		
Deciview	17.84	8.43	15.64	16.32	Not Applicable		

WRAP TSS - 12/31/2008

1) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRP (prp18a) emissions scenarios.
2) Visibility projections not available due to model performance issues.

	Class I Area Visibility Summary: Alpine Lakes W, WA Visibility Conditions: Best 20% Days RRF Calculation Method: Specific Days (EPA) Emissions Scenarios: 2000-04 Baseline (plan02d) & 2018 PRP (prp18a)						
	Monitored	**Estimated**		**Projected**			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)[1]	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[2] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[2] (%)
Sulfate	2.6	0.41	Not Applicable	2.01	-33,830 -39%	-45%	-45%
Nitrate	1.16	0.31	Not Applicable	0.97	-174,838 -46%	-52%	-53%
Organic Carbon	1.06	0.43	Not Applicable	1.08	2,178 4%	-3%	-4%
Elemental Carbon	0.88	0.09	Not Applicable	0.52	-3,329 -25%	-39%	-43%
Fine Soil	0.06	0.05	Not Applicable	0.07	8,216 23%	21%	22%
Coarse Material[3]	0.21	0.18	Not Applicable	Not Applicable	40,184 38%	81%	106%
Sea Salt[3]	0.51	0.16	Not Applicable		Not Applicable		
Total Light Extinction	17.48	12.64	Not Applicable	16.37			
Deciview	5.5	2.33	Not Applicable	4.86			

WRAP TSS - 12/31/2008

1) 2018 Uniform Rate of Progress Target for Best 20% Days is not defined.
2) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRP (prp18a) emissions scenarios.
3) Visibility projections not available due to model performance issues.

Class I Area Summary Tables - Mount Rainier National Park

	Class I Area Visibility Summary: Mount Rainier NP, WA **Visibility Conditions:** Worst 20% Days **RRF Calculation Method:** Specific Days (EPA) **Emissions Scenarios:** 2000-04 Baseline (plan02d) & 2018 PRP (prp18a)						
	Monitored	**Estimated**		**Projected**			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[1] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[1] (%)
Sulfate	23.7	2.2	16.58	18.55	-33,830 -39%	-49%	-49%
Nitrate	5.14	2.62	4.51	4.15	-174,838 -46%	-50%	-51%
Organic Carbon	15.06	3.44	11.67	14.18	2,178 4%	-7%	-8%
Elemental Carbon	5.13	0.34	3.85	2.8	-3,329 -25%	-43%	-44%
Fine Soil	0.51	0.55	0.52	0.61	8,216 23%	18%	19%
Coarse Material[2]	2.2	2.45	2.26	Not Applicable	40,184 38%	109%	128%
Sea Salt[2]	0.06	0.99	0.27		Not Applicable		
Total Light Extinction	62.81	23.59	49.87	53.54			
Deciview	18.24	8.54	15.98	16.66			

WRAP TSS - 12/31/2008

1) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRP (prp18a) emissions scenarios.
2) Visibility projections not available due to model performance issues.

	Class I Area Visibility Summary: Mount Rainier NP, WA **Visibility Conditions:** Best 20% Days **RRF Calculation Method:** Specific Days (EPA) **Emissions Scenarios:** 2000-04 Baseline (plan02d) & 2018 PRP (prp18a)						
	Monitored	**Estimated**		**Projected**			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)[1]	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[2] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[2] (%)
Sulfate	2.57	0.34	Not Applicable	1.78	-33,830 -39%	-44%	-45%
Nitrate	0.64	0.31	Not Applicable	0.61	-174,838 -46%	-49%	-50%
Organic Carbon	1.49	0.52	Not Applicable	1.4	2,178 4%	-4%	-5%
Elemental Carbon	0.66	0.06	Not Applicable	0.44	-3,329 -25%	-34%	-39%
Fine Soil	0.05	0.06	Not Applicable	0.05	8,216 23%	15%	17%
Coarse Material[3]	0.55	0.5	Not Applicable	Not Applicable	40,184 38%	87%	125%
Sea Salt[3]	0.49	0.14	Not Applicable		Not Applicable		
Total Light Extinction	17.44	12.93	Not Applicable	16.33			
Deciview	5.47	2.56	Not Applicable	4.83			

WRAP TSS - 12/31/2008

1) 2018 Uniform Rate of Progress Target for Best 20% Days is not defined.
2) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRP (prp18a) emissions scenarios.
3) Visibility projections not available due to model performance issues.

Class I Area Summary Tables – Goat Rocks Wilderness and Mount Adams Wilderness

	Class I Area Visibility Summary: Goat Rocks W, WA: Mount Adams W, WA **Visibility Conditions:** Worst 20% Days **RRF Calculation Method:** Specific Days (EPA) **Emissions Scenarios:** 2000-04 Baseline (plan02d) & 2018 PRP (prp18a)						
	Monitored	**Estimated**		**Projected**			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[1] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[1] (%)
Sulfate	9.92	1.97	7.69	8.52	-33,830 -39%	-42%	-42%
Nitrate	3.05	2.42	2.90	2.14	-174,838 -46%	-49%	-50%
Organic Carbon	9.63	5.7	8.63	8.93	2,178 4%	0%	0%
Elemental Carbon	1.79	0.48	1.47	1.18	-3,329 -25%	-35%	-39%
Fine Soil	0.56	0.63	0.58	0.71	8,216 23%	11%	11%
Coarse Material[2]	1.74	1.92	1.78	Not Applicable	40,184 38%	59%	83%
Sea Salt[2]	0.39	0.51	0.42		Not Applicable		
Total Light Extinction	37.09	23.63	33.38	33.60			
Deciview	12.76	8.35	11.73	11.79			

WRAP TSS - 12/31/2008

1) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRP (prp18a) emissions scenarios.
2) Visibility projections not available due to model performance issues.

	Class I Area Visibility Summary: Goat Rocks W, WA: Mount Adams W, WA **Visibility Conditions:** Best 20% Days **RRF Calculation Method:** Specific Days (EPA) **Emissions Scenarios:** 2000-04 Baseline (plan02d) & 2018 PRP (prp18a)						
	Monitored	**Estimated**		**Projected**			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)[1]	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[2] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[2] (%)
Sulfate	0.89	0.23	Not Applicable	0.65	-33,830 -39%	-45%	-46%
Nitrate	0.24	0.17	Not Applicable	0.27	-174,838 -46%	-47%	-49%
Organic Carbon	0.25	0.17	Not Applicable	0.27	2,178 4%	2%	3%
Elemental Carbon	0.14	0.04	Not Applicable	0.11	-3,329 -25%	-26%	-32%
Fine Soil	0.03	0.04	Not Applicable	0.04	8,216 23%	4%	4%
Coarse Material[3]	0.15	0.12	Not Applicable	Not Applicable	40,184 38%	50%	80%
Sea Salt[3]	0.13	0.08	Not Applicable		Not Applicable		
Total Light Extinction	11.84	10.86	Not Applicable	11.61			
Deciview	1.66	0.82	Not Applicable	1.47			

WRAP TSS - 12/31/2008

1) 2018 Uniform Rate of Progress Target for Best 20% Days is not defined.
2) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRP (prp18a) emissions scenarios.
3) Visibility projections not available due to model performance issues.

Class I Area Summary Tables – Pasayten Wilderness

Class I Area Visibility Summary: Pasayten W, WA
Visibility Conditions: Worst 20% Days
RRF Calculation Method: Specific Days (EPA)
Emissions Scenarios: 2000-04 Baseline (plan02d) & 2018 PRP (prp18a)

	Monitored	Estimated		Projected			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[1] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[1] (%)
Sulfate	8.06	1.7	6.32	7.82	-33,830 -39%	-16%	-18%
Nitrate	3.28	2.17	3.02	2.45	-174,838 -46%	-36%	-41%
Organic Carbon	21.9	5.91	17.12	22.18	2,178 4%	3%	10%
Elemental Carbon	3.32	0.55	2.61	3.53	-3,329 -25%	-14%	-33%
Fine Soil	0.82	0.81	0.81	0.82	8,216 23%	19%	23%
Coarse Material[2]	2.07	2.25	2.11	Not Applicable	40,184 38%	18%	25%
Sea Salt[2]	0.08	0.2	0.11		Not Applicable		
Total Light Extinction	49.53	23.59	41.66	48.95			
Deciview	15.23	8.25	13.60	15.09			

WRAP TSS - 1/9/2009

1) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRP (prp18a) emissions scenarios.
2) Visibility projections not available due to model performance issues.

<table>
<tr><td rowspan="3"></td><td colspan="7">Class I Area Visibility Summary: Pasayten W, WA
Visibility Conditions: Best 20% Days
RRF Calculation Method: Specific Days (EPA)
Emissions Scenarios: 2000-04 Baseline (plan02d) & 2018 PRP (prp18a)</td></tr>
<tr><td>Monitored</td><td colspan="2">Estimated</td><td colspan="4">Projected</td></tr>
<tr><td>2000-04 Baseline Conditions (Mm-1)</td><td>2064 Natural Conditions (Mm-1)</td><td>2018 Uniform Rate of Progress Target (Mm-1)[1]</td><td>2018 Projected Visibility Conditions (Mm-1)</td><td>Baseline to 2018 Change In Statewide Emissions (tons / %)</td><td>Baseline to 2018 Change In Upwind Weighted Emissions[2] (%)</td><td>Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[2] (%)</td></tr>
<tr><td>Sulfate</td><td>1.54</td><td>0.39</td><td>Not Applicable</td><td>1.09</td><td>-33,830
-39%</td><td>-30%</td><td>-33%</td></tr>
<tr><td>Nitrate</td><td>0.54</td><td>0.34</td><td>Not Applicable</td><td>0.24</td><td>-174,838
-46%</td><td>-42%</td><td>-47%</td></tr>
<tr><td>Organic Carbon</td><td>0.54</td><td>0.2</td><td>Not Applicable</td><td>0.36</td><td>2,178
4%</td><td>2%</td><td>6%</td></tr>
<tr><td>Elemental Carbon</td><td>0.21</td><td>0.04</td><td>Not Applicable</td><td>0.1</td><td>-3,329
-25%</td><td>-20%</td><td>-37%</td></tr>
<tr><td>Fine Soil</td><td>0.07</td><td>0.07</td><td>Not Applicable</td><td>0.03</td><td>8,216
23%</td><td>17%</td><td>20%</td></tr>
<tr><td>Coarse Material[3]</td><td>0.16</td><td>0.14</td><td>Not Applicable</td><td rowspan="2">Not Applicable</td><td>40,184
38%</td><td>19%</td><td>26%</td></tr>
<tr><td>Sea Salt[3]</td><td>0.12</td><td>0.06</td><td>Not Applicable</td><td colspan="3" rowspan="3">Not Applicable</td></tr>
<tr><td>Total Light Extinction</td><td>13.18</td><td>11.24</td><td>Not Applicable</td><td>12.10</td></tr>
<tr><td>Deciview</td><td>2.73</td><td>1.16</td><td>Not Applicable</td><td>1.89</td></tr>
</table>

WRAP TSS - 1/9/2009

1) 2018 Uniform Rate of Progress Target for Best 20% Days is not defined.
2) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRP (prp18a) emissions scenarios.
3) Visibility projections not available due to model performance issues.

NOCA1 Revised 2018 Visibility Projections
(November 2, 2010)

WRAP 2018 visibility projections were made using the Plan02d and PRP18a modeling results applied in a relative sense to the 2000-2004 baseline years monitoring data**.** Projections were made using relative response factors (RRFs), which are defined as the ratio of the future-year modeling results to the current-year modeling results. The calculated RRFs are applied to the baseline observed visibility conditions to project future-year observed visibility.

Projected 2018 values are available through the WRAP TSS (http://vista.cira.colostate.edu/tss/). These values were created as follows:

- The 20% worst visibility days from the Plan02d and PRP18a modeled results were selected according to the EPA recommended "specific days" method and used to calculate RRFs.
- Factors were applied to daily mass values for each of the 20% worst days measured during the baseline period.
- Extinction was calculated from the scaled mass values using the revised IMPROVE algorithm.
- Daily extinction was converted to deciview values.
- Daily values were averaged annually.
- Annual values were averaged to represent the projected 2018 extinction.

For the NOCA site, the original WRAP RRFs applied to each PM species to calculate 2018 projections from the baseline 2001-2004 data are listed in Table 1.

Table 1
WRAP Relative Reduction Factors
NOCA

	Old RRF (Specific Days)
Amm. Sulfate	1.21
Amm. Nitrate	0.90
OMC	1.19
EC	0.85
Soil	1.86
CM	1
SeaSalt	1

Using these RRFs, deciview projections for the year 2018 are higher than the glideslope path to natural conditions. This is largely due to projected increases in ammonium sulfate and organic mass extinction. The 2018 modeling results used to generate the RRF factors included emissions data that have been determined to be erroneously high in SO_2. Also, the 2001-2004 period used as baseline data for the NOCA1 site was influenced by high organic matter measurements in 2003. Organic emissions estimates are heavily influenced by fire activity, and 2003 was an anomalously high fire year in the Pacific Northwest. This caused 2001-2004 data scaled with RRF factors to produce even higher 2018 estimates.

To address these issues, new approximations of RRFs for ammonium sulfate and organic mass for the NOCA1 site were generated. For ammonium sulfate, monitored mass for the 2005-2008 IMPROVE aerosol data was averaged for the 20% worst extinction days. The ratio of this average mass to the 2001-2004 baseline average mass was used as an updated ammonium sulfate RRF. The calculation is as follows:

$$\mathrm{RRF_{new}\,(Amm.SO_4)} = \frac{\text{2005 - 2008 Avg. Amm.}\mathrm{SO_4}\text{ Mass (20\% Worst Days)}}{\text{2001 - 2004 Avg. Amm.}\mathrm{SO_4}\text{ Mass (20\% Worst Days)}} = \frac{1.52\ \mu\mathrm{g/m^3}}{1.70\ \mu\mathrm{g/m^3}} = 0.89$$

For organic mass, the RRF was lowered from a 1.19 to a 1.0, to represent no increase in organic mass for the 2018 projected values. Revised RRFs based on these changes are listed in Table 2.

Table 2
New Relative Reduction Factors
NOCA

	New RRF (Specific Days)
Amm. Sulfate	0.89*
Amm. Nitrate	0.90
OMC	1*
EC	0.85
Soil	1.86
CM	1
SeaSalt	1

*New values

Mass and extinction values calculated using original and new RRF values are listed in Table 3. With revised RRFs, ammonium sulfate extinction is projected to decrease by about 1.7 Mm^{-1}, as opposed to increasing by 3.3 Mm^{-1}. Also, revised organic carbon mass extinction is held constant, where previous estimates showed an increase of about 6.7 Mm^{-1}. The net effect is that the 2018 dV value is projected to decrease by about 0.4 dV, as opposed to a projected increase of 1.2 dV in 2018.

For method verification, all daily baseline data was obtained from the WRAP TSS website, and calculations using original RRFs were performed external to the TSS. Average baseline and 2018 projected values calculated externally were verified against values reported on the TSS. The accompanying spreadsheet (NOCA_NewRRF_20101101.xls) contains all daily and annual average mass and extinction data for baseline years, original 2018 projected values, new 2018 projected values, and 2005-2008 monitored values.

Table 3
Mass and Extinction Summary for NOCA1
For Original and New 2018 Projected Conditions

	2001-2004 Baseline Conditions		**Original 2018 Projected Conditions**		**New 2018 Projected Conditions**	
	Mass ($\mu g/m^3$)	**Extinction (Mm^{-1})**	**Mass ($\mu g/m^3$)**	**Extinction (Mm^{-1})**	**Mass ($\mu g/m^3$)**	**Extinction (Mm^{-1})**
Ammonium Sulfate	1.70	14.87	2.05	18.19	1.52*	13.22*
Ammonium Nitrate	0.29	2.69	0.26	2.43	0.26	2.43
Organic Carbon Mass	6.73	33.02	7.98	39.74	6.73*	33.02*
Elemental Carbon	0.38	3.81	0.32	3.22	0.32	3.22
Soil	0.48	0.48	0.89	0.89	0.89	0.89
Coarse Mass	2.92	1.75	2.92	1.75	2.92	1.75
Sea Salt	0.00	0.01	0.00	0.01	0.00	0.01
Total b_{ext}	67.64		77.23		65.55*	
dV	16.01		17.24		15.62*	

*New values

Washington State Regional Haze State Implementation Plan

Appendix F

Four-Factor Analysis

Overview

Ecology developed a set of Four-Factor Analyses for the 8 mandatory Class I Areas in Washington. Section 308(d)(1)(i)(A) of the Regional Haze Rule (RHR) requires that Washington consider the following four factors and demonstrate how they were taken into consideration in selecting the Reasonable Progress Goal for a Class I Area:

- Costs of compliance
- Time necessary for compliance
- Energy and non-air quality environmental impacts of compliance, and
- Remaining useful life of any potentially affected sources.

These four factors, which are a statutory requirement of Section 169A(g)(1) of the Clean Air Act, are sometimes called "the four statutory factors".

This appendix discusses the rationale and scope of the Four-Factor Analyses developed for Washington State and provides an overview of each individual Four-Factor Analysis.

Rationale and Scope of the Four-Factor Analyses

In applying the four factors Ecology considered control of sources, key visibility-impairing pollutants, Washington's share of visibility-impairment in the state's mandatory Class I Areas, and Washington emissions of key visibility-impairing pollutants.

1. Focus on control of sources within the state of Washington

The purpose of a Four-Factor Analysis is to evaluate a source or source category for potential controls. The state of Washington cannot require controls on sources in other states, in Canada, off-shore in the Pacific Ocean, or outside modeling domain of the Western Regional Air Partnership (WRAP). Accordingly, Ecology's application of the four factors in this Regional Haze (RH) State Implementation Plan (SIP) considers only anthropogenic (or man-made) sources of visibility-impairing pollutants located within the state of Washington.

2. Focus on Sulfate and Nitrate
3.

Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring indicates that Sultate (SO_4), Organic Matter Carbon (OMC), and Nitrate (NO_3) are usually the most significant pollutants impairing visibility in mandatory Class I Areas in Washington. Modeling performed by the WRAP's Regional Modeling Center (RMC) indicates these will still continue to be the most significant visibility-impairing pollutants in 2018 when the controls included in the WRAP's Preliminary Reasonable Progress 18 (PRP18a) modeling for 2018 are implemented. Not only are SO_4 and NO_3 largely from anthropogenic sources but SO_4 and NO_3 have a disproportionately large impact on visibility.

4. Focus on point sources

Washington point sources of SO_4 and NO_3 will continue to have a significant impact on visibility impairment in mandatory Class I Areas in Washington in 2018 (Table 1).

The WRAP's Particulate Matter Source Apportionment Technology (PSAT) analysis for 2018 indicates that almost all of the Washington sources of SO_4 impacting mandatory Class I Areas in the state are anthropogenic. As a result of sulfur reductions from federal motor vehicle fuels regulations, most of the anthropogenic sources of SO_4 are point sources. Reductions of Sulfur Dioxide (SO_2) emissions from point sources would reduce Washington's share of SO_4 impacts on its mandatory Class I Areas.

The WRAP's PSAT analysis for 2018 indicates that most of Washington sources of NO_3 impacting mandatory Class I Areas in the state are anthropogenic. These anthropogenic sources are mostly mobile sources and point sources. By comparison area sources are relatively unimportant.

Washington State's focus for further NO_3 reductions at mandatory Class I Areas should be point sources. Point sources will be a more significant source of NO_3 in 2018 as a result of engine rules that are reducing NO_3 precursors from mobile sources. The reduction in NO_3 precursor's makes mobiles sources a relatively less important source of NO_3. Aside from rules already "on the books", which are being implemented or will be implemented before 2018, no additional rules providing large reductions in NO_3 precursors are expected in the mobile source category before 2018.

5. Focus on significant specific industries and emission source categories of point sources

Ecology decided to evaluate Washington's point sources further to identify point sources that Ecology could consider for more in-depth analysis of potential emission reductions. Ecology's focused its evaluation on point-source categories because of its consistency with the WRAP's emission inventories. A source category approach is also consist with the Reasonably Available Control Technology (RACT) requirements of state law for setting emission limits on existing sources discussed below in subsection 5.

The WRAP structured its emission inventories according to Standard Classification Codes (SCCs). The SSCs categorize point-source emissions data as follows:

- Major categories (the first level of the SSCs) are referred to as SCC1.
  - Major categories are subdivided into major industry groups (the second level of the SSCs) and referred to as SSC3.
    - Major industry groups are subdivided into specific industries and emission source categories (the third level of the SCCs) and referred to as SCC6.

Ecology started by reviewing projected 2018 SO_2 and Nitrogen Oxides (NO_x) emissions from the three major categories of point sources with the highest total SO_2 and NO_x emissions. These were the SCC1 major categories of industrial processes, external combustion boilers, and internal combustion engines.

Table 1 Washington Source Category Contributions to Mandatory Class I Areas in 2018[1]

Class I Area	SO_4 — Most Impaired Days				
	Total WA Share (%)	Anthropogenic WA Share (%)	Anthropogenic Source Category Shares (%)		
			Point	Area	Mobile
Olympic National Park	24%	24%	19%	4%	1%
North Cascades National Park & Glacier Peak Wilderness	29%	28%	24%	3%	1%
Alpine Lakes Wilderness	28%	28%	19%	6%	3%
Mount Rainier National Park	34%	33%	22%	8%	3%
Goat Rocks Wilderness & Mount Adams Wilderness	23%	23%	16%	5%	2%
Pasayten Wilderness	16%	12%	9%	2%	1%

Class I Area	NO_3 — Most Impaired Days				
	Total WA Share (%)	Anthropogenic WA Share (%)	Anthropogenic Source Category Shares (%)		
			Point	Area	Mobile
Olympic National Park	42%	40%	15%	6%	19%
North Cascades-National Park & Glacier Peak Wilderness	31%	27%	9%	4%	14%
Alpine Lakes Wilderness	56%	51%	10%	7%	34%
Mount Rainier National Park	69%	66%	18%	11%	37%
Goat Rocks Wilderness & Mount Adams Wilderness	50%	49%	12%	8%	29%
Pasayten Wilderness	37%	27%	5%	3%	19%

[1]Based on the Western Regional Air Partnerships Particulate Matter Source Apportionment Technology modeling

Tables 2 and 3 below provide projected Washington emissions for the three major categories and for specific industries or emission source categories within the major categories (SCC6). The tables are based on the WRAP 2018a emission inventory (see Chapter 6). The 2018a inventory includes the effects of various "on the books" emission reductions, but not the effects of proposed BART determinations.

Table 2 Preliminary Reasonable Progress Emissions 2018 Sulfur Dioxide Point Source Inventory

Major Category (SCC1)	Major Industry Group (SCC3)	Specific Industry or Emission Source Category (SCC6)	Total SO_2 (tpy)
Industrial Processes	Primary Metal Production	Aluminum Ore (Electro-Reduction)	8,193
		Steel Manufacturing	4
	Petroleum Industry	Process Heaters	2,764
		Catalytic Cracking Units	1,571
		Flares	1,095
		Blowdown Systems	559
		Petroleum Coke Calcining	245
		Incinerators	58
		Desulfurization	39
		Fugitive Emissions	17
	Pulp and Paper and Wood Products	Sulfate (Kraft) Pulping	5,081
	Mineral Products	Sulfite Pulping	378
		Cement Manufacturing (Wet Process)	1,209
		Glass Manufacture	317
		Cement Manufacturing (Dry Process)	312
		Lime Manufacture	151
		Brick Manufacture	89
		Asphalt Concrete	31
		Industrial Processes Total	22,112
External Combustion Boilers	Industrial	Process Gas	6,959
		Wood/Bark Waste	1,820
		Residual Oil	1,569
		Bituminous/Sub-bituminous Coal	300
		Distillate Oil	44
		Natural Gas	8*
	Electric Generation	Bituminous/Sub-bituminous Coal	2,491
		Residual Oil	417
		Wood/Bark Waste	27
	Commercial/Institutional		148
	Space Heaters		0
		External Combustion Boilers Total	13,783

Major Category (SCC1)	Major Industry Group (SCC3)	Specific Industry or Emission Source Category (SCC6)	Total SO_2 (tpy)
Internal Combustion Engines	Industrial	Large Bore Engine	626
		Natural Gas	50
		Distillate Oil (Diesel)	2
		Liquified Petroleum Gas (LPG)	0
	Electric Generation	Natural Gas	118
		Landfill Gas	59
		Process Gas	5
		Flares	1
		Distillate Oil (Diesel)	0
	Commercial/Institutional		48
	Engine Testing		2
		Internal Combustion Boilers Total	911

* Sulfur Dioxide from natural gas is considered to be an insignificant source of emissions by Environmental Protection Agency and others.

Table 3 Preliminary Reasonable Progress Emissions 2018 Nitrogen Oxides Point Source Inventory

Major Category (SCC1)	Major Industry Group (SCC3)	Specific Industry or Emission Source Category SCC6)	Total NO_X (tpy)
External Combustion Boilers	Electric Generation	Bituminous/Sub-bituminous Coal	14,477
		Wood/Bark Waste	802
		Natural Gas	161
		Residual Oil	77
		Distillate Oil	34
	Industrial	Wood/Bark Waste	5,176
		Process Gas	2,646
		Natural Gas	2,123
		Residual Oil	419
		Solid Waste	97
		Bituminous/Sub-bituminous Coal	43
		Liquefied Petroleum Gas (LPG)	18
		Distillate Oil	17
	Commercial/Institutional	Natural Gas	709
		Wood/Bark Waste	31
		Distillate Oil	29
		Residual Oil	11
	Space Heaters		25
		External Combustion Boilers Total	26,895

Major Category (SCC1)	Major Industry Group (SCC3)	Specific Industry or Emission Source Category (SCC6)	Total SO_2 (tpy)
Industrial Processes	Mineral Products	Cement Manufacturing (Wet Process)	3,528
		Glass Manufacture	1,620
		Cement Manufacturing (Dry Process)	1,597
		Lime Manufacture	394
		Gypsum Manufacture	89
		Asphalt Concrete	49
		Brick Manufacture	30
	Pulp and Paper and Wood Products	Sulfate (Kraft) Pulping	3,769
		Sulfite Pulping	1,296
	Petroleum Industry	Process Heaters	3,668
		Catalytic Cracking Units	n/a*
		Petroleum Coke Calcining	843
		Blowdown Systems	393
		Flares	67
		Incinerators	38
		Fugitive Emissions	26
	In-Process Fuel Use	Natural Gas	544
		Wood	47
	Chemical Manufacturing	Nitric Acid	415
		Ammonium Nitrate Production	20
		Sulfuric Acid (Contact Process)	13
	Secondary Metal Production	Steel Foundries	282
		Aluminum	38
		Other Not Classified	21
		Miscellaneous Casting Fabricating	14
		Fuel Fired Equipment	13
	Primary Metal Production	Aluminum Ore (Electro-Reduction)	149
		Fuel Fired Equipment	108
		Industrial Processes Total	19,070

Major Category (SCC1)	Major Industry Group (SCC3)	Specific Industry or Emission Source Category (SCC6)	Total SO_2 (tpy)
Internal Combustion Engines**	Electric Generation	Natural Gas	868
		Process Gas	149
		Landfill Gas	59
		Distillate Oil (Diesel)	22
	Commercial/Institutional	Natural Gas	890
		Distillate Oil (Diesel)	8
	Industrial	Natural Gas	444
		Large Bore Engine	74
		Distillate Oil (Diesel)	29
		Liquefied Petroleum Gas (LPG)	1
		Internal Combustion Engines Total	2,544

* While catalytic cracking units do not directly emit any air pollutants, the associated catalyst regeneration systems and carbon monoxide boilers that control the emissions from the catalyst regenerators produce large quantities of Nitrogen Oxides. The Nitrogen Oxides are the product of the combustion of the carbon monoxide from the catalyst regeneration process and ammonia in the refinery gas used to supplement the carbon monoxide supplied as fuel by the regenerator to the carbon monoxide boiler.

** The internal combustion engines represented in this table include a variety of engine types, sizes and fuels.

Ecology's evaluation indicated that certain specific industries and emission source categories of two major categories, industrial processes and external combustion boilers, produce the largest emissions of SO_2 and NO_X. Ecology decided to consider any specific industry or emissions source category emitting 1,000 tons or more per year of either SO_2 or NO_X as "significant".

The specific industries and emission source categories identified by Ecology as significant are summarized in Table 4.

Table 4 Significant Specific Industries and Emission Source Categories (≥1000 tpy)

Specific Industry or Emission Source Category	Significant Specific SO_2 Industry or Emissions Source Category?	Significant Specific NO_x Industry or Emissions Source Category?
Industrial Processes		
Primary Metal Production		
Aluminum Ore Electro-Reduction	Yes	No
Petroleum Industry		
Process Heaters	Yes	Yes
Catalytic Cracking Units*	Yes	Yes
Flares	Yes	No
Pulp and Paper and Wood Products		
Sulfate (Kraft) Pulping	Yes	Yes
Sulfite Pulping	No	Yes
Mineral Products		
Cement (Wet Process)	Yes	Yes
Cement (Dry Process)	No	Yes
Glass Manufacture	No	Yes
External Combustion Boilers		
Industrial		
Process Gas	Yes	Yes
Wood/Bark Waste	Yes	Yes
Residual Oil	Yes	No
Natural Gas	No	Yes
Electric Generation		
Bituminous/Sub-bituminous Coal	Yes	Yes

* Includes emissions from associated catalyst regenerators and carbon monoxide boilers.

6. Focus on selected specific industries and emission source categories of point sources

Ecology's evaluation of significant emissions identified a total of 14 specific industries and emissions source categories with SO_2 or NO_x emissions of 1,000 tons or more per year. Ecology deemed some of the specific industries and emission source categories better prospective opportunities for emission reductions to improve visibility than others. This conclusion was based on a number of factors including information acquired through the Best Available Retrofit Technology (BART) determinations on individual sources subject to BART in some of the specific industries and emission source categories, experience in community-scale ambient air quality modeling, and availability of emission controls.

Ecology decided to focus its four-factor analyses on the set of specific industries and emission source categories deemed most likely to result in emissions reductions, The final list selected for four factor analyses is provided in Table 5.

Table 5 Specific Industries and Emission Source Categories Selected for a Four-Factor Analysis

Specific Industry or Emission Source Category	Significant Specific SO_2 Industry or Emissions Source Category?	Significant Specific NO_X Industry or Emissions Source Category?
Industrial Processes		
Primary Metal Production		
Aluminum Ore Electro-Reduction	Yes	No
Petroleum Industry		
Process Heaters	Yes	Yes
Catalytic Cracking Units*	Yes	Yes
Pulp and Paper and Wood Products		
Sulfate (Kraft) Pulping	Yes	Yes
Sulfite Pulping	No	Yes
Mineral Products		
Cement (Wet Process)	Yes	Yes
Cement (Dry Process)	No	Yes
Glass Manufacture	No	Yes
External Combustion Boilers		
Industrial		
Wood/Bark Waste	Yes	Yes
Residual Oil	Yes	No
Natural Gas	No	Yes

* Includes emissions from associated catalyst regenerators and carbon monoxide boilers.

Four Factor Analyses for Selected Specific Industries and Emission Source Categories

Ecology developed a single set of four-factor analyses for Washington's 8 mandatory Class I Areas. Basically the individual sources in the 11 selected specific industries and emission source categories are located along the Interstate 5 (I-5) corridor in western Washington and are capable of contributing to visibility impairment at more than one mandatory Class I Areas. I-5 runs in an essentially north-south direction between the Canadian and Oregon borders west of the Cascade Mountains in what is sometimes referred to as the Puget Sound trough. Seven of Washington's eight Class I Areas border the Puget Sound trough. The eighth mandatory Class I Area is located largely on the eastern side of the crest of the Cascade Mountains.

Two sources in the selected set of specific industries and emission source categories lie to the east of the Cascade Mountains in eastern Washington. These are Alcoa Wenatchee Works, an aluminum electro-ore reduction plant, and Boise White Paper LLC Wallula Mill, a Kraft pulp and paper plant. A visibility analysis for Alcoa Wenatchee Works (which is BART-eligible) showed that it contributed to visibility impairment essentially at Alpine Lakes Wilderness but did not meet the 0.5 dv significance level that would have made the Wenatchee Works subject to

BART. Boise White Paper LLC Wallula Mill has the potential to contribute to impairment at more than one mandatory Class I Area.

The four-factor analyses presented here set the stage for future development of regulations or source specific emission limitation orders to reduce SO_2 and NO_x emissions for individual sources. Washington State law requires Ecology to develop new requirements for an existing emission source category through a formal rulemaking action, if there are at least three sources or emission units within a source category or by individual regulatory order if there are less than three sources or units in the source category.[1] Ecology can issue a new rule (or revise an existing one) to require the installation of new emission controls. The rule would either include a schedule of compliance for sources to meet the revised standard or regulatory agencies would develop compliance schedules to bring the sources into compliance with the new emission standard.

The process in state law called RACT requires a detailed evaluation of the characteristics of each existing source covered by the rule process along with an evaluation of the efficacy of installation of various control equipment. The result of the process is a rule requiring all units of the defined source category to achieve a set of defined emission limitations. A RACT rule allows the sources a limited time to upgrade the controls to meet the new or revised emission standards. Washington State law does include an economic hardship provision. A company that demonstrates it meets criteria for economic hardship is allowed either an extended time to achieve compliance or an alternate, source-specific emission limitation.

The set of 8 four-factor analyses for the 11 specific industries and emission source categories is presented in the same order as in Table 5 except for the industrial external combustion boilers. Residual oil and natural gas boilers are discussed together before the discussion of wood/bark waste boilers. The four-factor analyses for 3 other sets of sources—sulfate (Kraft) pulping and sulfite pulping, wet process and dry process cement production, and oil- and gas-fired industrial external combustion boilers—are grouped into single discussions for each set.

1. Aluminum Ore Electro-Reduction

This source category consists of the electro-refining cells located at the two remaining primary aluminum smelters in the state.[2] Both smelters are owned and operated by Alcoa. One smelter (Intalco) was subject to BART and a comprehensive review of SO_2 emission controls was performed to determine BART controls for this smelter (see Chapter 11). The other smelter (Alcoa Wenatchee Works) is the subject of this 4-factor analysis.

- Available emission controls

The available emission reduction options for SO_2 controls on an aluminum smelter, are (1) limiting the sulfur content of the coke used to make the anodes or (2) the addition of a wet scrubbing system to the control the potline primary system emissions. A wet scrubbing system

[1] §70.94.154 RCW

[2] The Goldendale Aluminum smelter in the Plan02d (and earlier) WRAP inventories is currently being demolished and is not considered here.

at the Alcoa Wenatchee Works facility could use either lime or caustic soda. The BART determination for the Intalco smelter found that coke with a lower sulfur content than was currently being used was not available.

- Costs of compliance

The costs of compliance are based on the emission control technology employed by a facility. The cost discussion for the emission controls identified as applicable to the Intalco smelter is equally applicable to the Alcoa Wenatchee Works. The discussion included an evaluation of how to implement a wet scrubbing system on an existing aluminum smelter. The costs for addition of a wet scrubbing system to remove 90% of the SO_2 from the potline primary emissions control system are approximately $5000-7500 per ton of SO_2 removed. This is a cost Ecology considers to be not cost-effective at this time.

- Time necessary for compliance

The overall time for compliance is expected to be 4–5 years from the time the process is started. The initial time period (1–2 years) is for completion of the technical analyses on the controls, negotiation of the regulatory order. Acquisition and installation of the required control technology will take approximately 2–3 years once a regulatory order is issued.

- Energy and non-air quality environmental impacts of compliance

The imposition of any of the reasonably available SO_2 control technologies does not impose a significant electrical energy impact on the smelter compared to the smelter's overall electrical needs. The additional energy impacts due to using a wet scrubbing system are relatively small.

The non-air quality impact of utilizing a wet scrubbing system is threefold.

- First, there will be an additional energy usage to transport the sorbent chemical to the Wenatchee site and to produce the lime or caustic soda.
- Second, a new solid waste will be generated by the smelter (calcium or sodium sulfite and sulfate with some small amounts of calcium or sodium fluorides as well).
- Third, there will be a new wastewater discharge to the Columbia River. Any issues that will affect the ability to acquire permission for a new wastewater discharge permit are currently not known. Typically the issuance of a permit is anticipated to occur within the 1-2 year period for the initial development of a regulatory order for the SO_2 controls. A previous National Pollutant Discharge Elimination System (NPDES) permit allowing discharge of wet scrubber water was rescinded in the 1970s when the existing wet scrubbing system for fluoride control was converted to a dry system to meet state ambient air quality fluoride standards[3].
- Remaining useful life of any potentially affected sources

[3] This same action resulted in a PSD permit for the increases SO_2 resulting from the elimination of the wet fluoride control system.

Alcoa has not requested an enforceable limitation on the lifetime of the Alcoa Wenatchee Works. Ecology assumes that it will continue to operate into the future.

- Summary

Based on the above, it is Ecology's opinion that there is currently no reasonable control technology to reduce SO_2 emissions from the Wenatchee Works facility.

2. Petroleum Industry Process Heaters

Process heaters are similar to hot water heaters, but they heat petroleum, not water. In Washington, most process heaters are found at the 5 petroleum refineries, principally the 4 largest refineries[4] located in Skagit and Whatcom counties. Process heaters heat the crude petroleum oil and intermediate distillation products to produce specific products such as gasoline, aviation fuels, on- and off-road specification diesel fuel, some home heating oil, marine diesel, ship bunker (residual) fuel oil, petroleum coke, and other gaseous and liquid fuels derived from petroleum.

The process heaters at the refineries primarily use refinery waste gas as fuel. The refinery gas may be supplemented by natural gas or an alternative back-up fuel may be utilized at specific heaters when refinery gas supply is inadequate to operate all heaters and boilers at a refinery.

The age of process heaters at the refineries range from original equipment installed between 38 and 55 years ago to less than 5 years old. Three of the 5 refineries in Washington date from the mid 1950s[5]. The fourth refinery[6] dates from about 1972. The fifth and smallest refinery[7] has been completely rebuilt with new heaters over the course of the last 20 years. Over the course of the last 10 years, all of the refineries have been subject to emission reduction requirements. Three of the 4 large refineries have been required to implement emission reduction projects as the result of Environmental Protection Agency (EPA) led national enforcement actions against the parent companies. All of the refineries have had to comply with hydrocarbon emission reductions, SO_2 reductions, particulate reductions, and Hazardous Air Pollutant (HAP) reductions as the result of federal New Source Performance Standards (NSPS) or National Emission Standards for Hazardous Air Pollutants (NESHAP)/Maximum Available Control Technology (MACT) regulations.

- Available emission controls

SO_2 controls on process heaters are primarily limited to reduction in the sulfur content of the refinery gas or fuel oil used as fuel. All 5 refineries meet the refinery gas sulfur content requirements in the NSPS for refineries and thereby minimize SO_2 emissions from refinery gas. Installation of new or additional refinery gas sulfur reduction systems involve the installation or

[4] BP Cherry Point Refinery, Conoco-Phillips, Tesoro, and Shell (Puget Sound Refining)
[5] Shell, Tesoro, and Conoco Phillips
[6] BP Cherry Point
[7] US Oil in Tacoma

expansion of sulfur recovery systems to process the increased quantity of hydrogen sulfide removed from the refinery gas.

There may be one or more process heaters where the possibility of an add-on SO_2 control system may be feasible. Two of the 5 refineries (BP Cherry Point and Tesoro) have process heaters that were subject to BART. In the BART analyses, no process heater was identified as specifically amenable to sulfur reductions via add-on emission controls.

NO_X controls on process heaters are primarily limited to changes in burners to modern low or ultra low NO_X designs. Selective Non-catalytic Reduction (SNCR) and selective catalytic reduction (SCR) installations have not been evaluated due to the significant reductions that can be achieved through the use of low NO_x burner designs and the relatively low per unit emission rates of the uncontrolled heaters. For typical process heaters, the installation of low or ultra low NO_X burners results in emission reductions of about 50% or more from the 'conventional' design burners. These modern burners also use less fuel per Btu of heat output resulting in less fuel usage and corollary reductions in SO_2 and other pollutants. Because low NO_x and ultra low NO_x burners have a longer flame length, the burners may not fit under process heaters and unit specific evaluations are required in order to determine which type of burner can a be retrofit on a specific process heater.

- Costs of compliance

Both SO_2 controls and NO_x controls for process heaters were reviewed as part of the BART analyses submitted by 2 of Washington's 5 petroleum refineries. It is Ecology's opinion that the emission control techniques and costs associated with implementing these controls on the other refineries is equivalent to the costs presented by the two sources subject to BART. Control options and costs for process heaters are summarized in Table 6.

Table 6 Summary of Emission Control Options for Process Heaters

Pollutant	Control Option	Control Efficiency	Cost Effectiveness[a] ($/ton)
SO_2	Reduction in refinery gas sulfur content	Up to 90% based on pre-control sulfur content	$1300 – 1700
NO_X	Low NO_X Burners	40%	$4500 – 16,000
	Ultra Low NO_X Burners	75 – 85%	$4500 – 16,000
	Selective Non-Catalytic Reduction (SNCR)	60%	$890 – 5200
	Selective Catalytic Reduction (SCR)	70 – 90%	$2900 – 6700
	Low NO_X Burners and SCR	70 – 90%	$2900 – 6700

[a] Costs for Low nitrogen oxides and Ultralow nitrogen oxides burners are based on Best Available Retrofit Technology analyses submitted to Ecology by BP Cherry Point and Tesoro. The other cost information is based the EC/R Incorporated report prepared for the WRAP and located at the end of this appendix.

The ability or reasonableness to install additional refinery gas sulfur reduction or possibly SO_2 controls is refinery specific. Considerations that have to be evaluated are the existing level of refinery gas sulfur removal, the ability to treat additional sulfur or need to expand existing sulfur recovery units must also be evaluate don a plant specific basis.

Based on the characteristics of individual heaters and scheduling of control or burner installation within normal unit turn-around activities[8], NO_x controls can be cost-effective for installation.

- Time necessary for compliance

Ecology would have to develop regulations to define new emission reduction requirements for process heaters. The rule process is anticipated to take approximately 2 years and the installation of controls coming out of that process would occur over a period of years since specific unit turn-arounds occur on approximately 3-to-5 year intervals.

Based on discussions with the 2 refineries subject to BART and staff at the local air pollution authority that regulates the 4 largest refineries, it would take approximately 9–12 years to implement SO_2 and NO_x emission reductions from all process heaters at the plants. This is based on the rotating 3-to-5 year schedules used by refineries for turn-arounds that take different process areas out of service for major maintenance activities. Emission reduction projects such as new burner installations occur only at these major maintenance periods.

- Energy and non-air quality environmental impacts of compliance

The installation of low or ultra low NO_x burners at an existing refinery can result in minimal adverse impacts on refinery operations and energy needs. However, if refinery gas usage is reduced below the ability of the plant to store excess gas or otherwise make beneficial use of it, the possibility of increased use of the flare system to burn off excess gas is possible. Increased flare usage will tend to negate the reduction in NO_x resulting from low NO_x burner installations

Increased removal of sulfur from the refinery gas can result in the need to increase the capacity of the existing sulfur recovery system, or require the construction of an additional sulfur recovery system. The resulting elemental sulfur (or sometimes sulfuric acid) must be disposed of in some way. If a market cannot be found, then the sulfur would have to be landfilled.

- Remaining useful life of any potentially affected sources

None of the petroleum refineries has requested an enforceable limitation on their projected lifetime. Ecology assumes they will continue operation into the future.

- Summary

Based on the above, it is Ecology's opinion that further investigations into the ability to further reduce SO_2 emissions and NO_x emissions from process heaters should be performed. If cost-effective reductions are available, rules should be developed to limit emissions.

[8] Turn-arounds are the only occasion when process units are intentionally taken out of operation. During a turn-around, major maintenance occurs on all process units that are shut down. There may be modifications to units that increase their throughput rates, efficiency, or decrease emissions or all three.

3. Petroleum Industry Catalytic Cracking Units

The 4 largest petroleum refineries in Washington (BP Cherry Point, Conoco-Phillips, Tesoro, and Shell) all have both Fluidized Catalytic Cracking Units (FCCUs), catalyst regenerators, and their associated emission controls, Carbon Monoxide (CO) boilers. As noted earlier, fluidized cracking units do not directly produce emissions, but the catalyst regenerators produce carbon monoxide and sulfur oxides in the process of regenerating the catalyst. The carbon monoxide is commonly used as fuel for a carbon monoxide boiler.

FCCUs are used to split heavier hydrocarbons into lighter hydrocarbons. The result is the production of more gasoline and diesel than would be otherwise contained in the crude oil. FCCUs use a heavy metal catalyst that becomes covered with carbon and sulfur compounds over time. The carbon and sulfur are burnt off the catalyst in a catalyst regenerator and the cleaned catalyst is returned to the FCCU. The off-gas from the catalyst regenerator (which is very high in carbon monoxide) is sent to a CO boiler where the CO is burned to CO_2, the sulfur compounds are converted to SO_2, and heat is recovered for use in the refinery. The flue gas from a CO boiler can be very high in SO_2 but is typically low in NO_X. FCCU/CO boiler systems have been upgraded and MACT controls installed in the last 10 years at 3 of the largest refineries in response to MACT requirements on heavy metal emissions from the FCCU regenerator system.

- Available emission controls

SO_2 controls for FCCU/CO boilers systems are the typical add-on wet and dry scrubbing systems. These systems are capable of achieving up to 90% reduction in SO_2 in the CO boiler exhaust. The Shell refinery installed SO_2 reduction technology on its FCCU/CO boiler in 2005 to comply with the MACT requirements for FCCU catalyst regenerators.

Desulfurization ($DeSO_x$) catalysts are added to FCCUs but the effectiveness of this catalyst system is not entirely predictable. The technology is very reasonable when it works, but not reasonable when it doesn’t. Plant specific trials are required for this technology to determine plant specific feasibility.

Removal of sulfur from the feed to an FCCU could occur. To date analyses of reduction of sulfur in the FCCU feed have been reported as ‘expensive’ and only in relationship to reducing the sulfur content of petroleum coke used in aluminum smelters for the production of anodes and cathodes for electrolytic cells. Reducing the sulfur content of the feed to an FCCU would entail expansion of hydrogen production capacity, construction of a new hydrotreater, and expansion of sulfur removal scrubbing systems and the sulfur recovery system.

For NO_x reductions, low NO_X burners are feasible, but most NO_x formation is results from the combustion temperatures required for burning CO in the CO boiler. SNCR, SCR, and the Trademarked low temperature NO_x removal System (LoTOx™) have been identified as feasible for installation on CO boilers. The firm that produces the LoTOx™ system incorporates it within wet flue gas scrubbing systems to remove SO_2. Existing wet scrubbing systems however may not be compatible with the LoTOx™ process and a unit-specific evaluation of the feasibility may be required.

- Costs of compliance

The costs of reducing SO_2 and NO_x from FCCU/CO boiler systems have been evaluated as part of the BART analysis for the BP Cherry Point and Tesoro petroleum refineries. The costs in those analysis indicate that it may be reasonable to require SO_2 or NO_x reduction from the FCCU/CO boiler systems at one or more of the other refineries.

No technical feasibility and cost analyses for additional controls at the other two large refineries have been done. This would have to be done through the rule/regulatory order development process. Potential control options and costs for FCCU/CO boiler systems are summarized in Table 7.

Table 7 Summary of Emission Control Options for Fluidized Catalytic Cracking Units/ Carbon Monoxide Boiler Systems

Pollutant	Control Option	Control Efficiency	Cost Effectiveness[b] ($/ton)
SO_2	$DeSO_x$ catalyst	20 – 50%	Unknown
	Wet Scrubbers	70 – 90%	$1500 – 1800
	Desulfurization of FCCU feed	Up to 90%	$6200 – 8000
NO_X	$LoTO_x$	85%	$1700 - 2000
	Selective Non-Catalytic Reduction (SNCR)	40 – 80%	$2500
	Selective Catalytic Reduction (SCR)	80 – 90%	$2500

[b] See the EC/R Incorporated report prepared for the WRAP at the end of this appendix.

The DeSOx catalyst system is very reasonable when it works, but not reasonable when it doesn't. Plant specific trials are required to determine plant specific feasibility.

Information from the vendor for the LoTOx™ process indicate existing wet scrubber systems for SO_2 control may be metallurgically incompatible with the process and adversely impact the economic feasibility of installing the LoTOx™ process at a facility.

- Time necessary for compliance

Ecology must go through rulemaking to implement new emission control requirements that affect 3 or more sources in a source category. With 4 petroleum refineries with FCCU/CO boiler systems, rulemaking must occur before Ecology can impose new emission controls.

The time needed to develop a new rule is approximately 2 years. The petroleum refineries will need to schedule the emission control projects within their major maintenance project schedules. As a result, the time to achieve new emission standards may take 3-9 years after the issuance of the rule.

- Energy and non-air quality environmental impacts of compliance

All emission controls systems available to control NO_x or SO_2 require energy, either as additional electricity to operate the control equipment or to produce the chemicals used by the control system. This energy also produces greenhouse gases, exasperating climate change.

The use of any potential NO_x control option will result in either a new nitrate discharge to the wastewater treatment system or a new solid waste being produced. Similarly add-on SO_2 controls will result in a new solid waste stream and possibly an increase in the discharge of treated effluent to the receiving water (Puget Sound in all cases).

- Remaining useful life of any potentially affected sources

None of the petroleum refineries has requested an enforceable limitation on their projected lifetime. Ecology assumes they will continue operation into the future.

- Summary

Based on the above, it is Ecology's opinion further reductions in SO_2 and NO_x from FCCU systems should be further evaluated to determine if cost effective emission reductions are available on either a category basis or for a specific facility.

4. Sulfate (Kraft) Pulping and Sulfite Pulping

Chemical pulp mills utilize chemistry to break wood chips down into long cellulose fibers by separating the cellulose from the lignin in the wood. While the chemicals used in the Kraft process and the sulfite process are different, chemicals for both processes can be recovered for re-use in the pulping process through combustion of the dissolved lignin and chemical conversion of the recovered chemicals into forms that are reusable in the pulping process. The combustion unit used to recover the chemicals for re-use is called a chemical recovery furnace.

In the sulfite process, chemical recovery is a one-step process involving just the chemical recovery furnace. In the Kraft process, multiple steps are involved in addition to the chemical recovery furnace.

Typically a Kraft recovery furnace has very low SO_2 emissions with occasional, short-term 'burps' of high emissions. The most significant SO_2 emissions occur from the 'burps'. The operation of a sulfite recovery furnace is similar to that of a Kraft furnace.

Washington currently has 6 operating Kraft mills[9] and one operating sulfite mill[10]. All the recovery furnaces in Washington are equipped with boiler tubes and also operate as boilers. They are occasionally referred to as recovery boilers.

- Available emission controls

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[9] Port Townsend Paper Co., Simpson-Tacoma Kraft, Longview Fibre, Weyerhaeuser-Longview, Georgia Pacific-Camas, and Boise White Paper LLC at Wallula.
[10] Kimberley-Clarke

SO_2 emission controls for chemical recovery furnaces are combustion modifications to assure the proper reducing chemistry exists for recovery of the sulfur compounds used in the pulping process. The purpose is to optimize the recovery of the most expensive chemicals in the process—sulfur in the Kraft process and sodium or magnesium (in the form of sodium or magnesium sulfite) in the sulfite process.

Combustion controls are staged combustion air to control the reduction and oxidation zones in the furnace. The standard level of combustion control on a Kraft recovery furnace is to utilize tertiary air. The best combustion controls involve a 4th air stage and are termed quaternary control. For a sulfite process furnace, secondary air is all that is currently employed.

Add-on wet and dry SO_2 controls are technically feasible on Kraft process recovery furnaces; though their use would affect the chemistry of the process. In a 2005 review of available emission controls for various source categories, Northeast States for Coordinated Air Use Management (NESCAUM) observed that "Flue gas desulfurization as an effective control strategy [for Kraft recovery furnaces] is uncertain due to the mostly low and unpredictable levels of SO_2 emitted."[11] A similar review has not been located for sulfite process recovery furnaces.

NO_x emission controls that have been demonstrated to work on recovery furnaces are primarily combustion modifications. As a consequence of combustion air staging to maximize sulfur recovery, NO_x emissions are also controlled. Currently this is the common method to control NO_x at recovery furnaces in Washington.

At this time add-on NO_x controls have not been implemented on Kraft recovery furnaces in the US. The BART analysis for one of the Kraft pulp mills in Washington indicated that the LoTOx™ process is available and could be implemented. However the technology supplier indicates that it is not pursuing this source category.

Add-on NO_x control has not been implemented at any currently or recently operating sulfite recovery furnace. As a result the efficacy of add-on NO_x controls for sulfite furnaces is not known.

- Costs of compliance

Two of the 6 Kraft pulp mills (Port Townsend Paper Corporation and Weyerhaeuser-Longview) have recovery furnaces subject to BART. The BART analyses for both mills evaluated a number of SO_2 and NO_x controls that might be installed on the furnaces. It is our opinion that the costs for installation of add-on emission controls depicted in those 2 BART analyses is a reasonable evaluation of the cost of controls available. The control options and costs for wood pulping chemical recovery furnaces are summarized in Table 8.

[11] Assessment of Control Options for BART-Eligible Sources, Northeast States for Coordinated Air Use Management, 2005, page 5-3

Table 8 Summary of Emission Control Options for Wood Pulping Chemical Recovery Furnaces

Pollutant	Control Option	Control Efficiency	Cost Effectiveness[c] ($/ton)
SO_2	Existing Staged Combustion Air	Baseline control level	---
	Wet Scrubbers[d]	90+%	$6000 - 13150
	Dry Scrubbers[e]	90%	$5000 - 11000
NO_x	Staged Combustion Air	25+%	$500 - 1500
	Selective Catalytic Reduction (SCR)	70 – 90%[f]	---
	LoTOx™ or similar oxidation reduction process	85%	$1700 -2000

[c] See the EC/R Incorporated report prepared for the WRAP at the end of this appendix.
[d] Assumed similar to oil-fired boilers since sulfur content of flue gas normally less than 100 ppm.
[e] Same assumptions as wet scrubbers.
[f] Not demonstrated in practice due to the probability of catalyst poisoning.

- Time necessary for compliance

Ecology must establish new emission standards through rule. The rule process will take approximately 2 years and the time to achieve compliance with new emission standards would take approximately 3 years.

- Energy and non-air quality environmental impacts of compliance

There will be increased electrical needs to implement any of the technically feasible controls for chemical recovery furnaces. This increased electrical need can come from purchased electricity or electricity produced by the pulp mill.

Additional energy and environmental impacts will come from the production of chemicals used in the processes and their transport to the plant.

New wastewater discharges are not anticipated because the existing wastewater systems are basically compatible with the wastewater streams that would be produced from a wet scrubbing system.

- Remaining useful life of any potentially affected sources

None of the existing Kraft and sulfite pulp mills has requested an enforceable limitation on its projected lifetime. Ecology assumes they will continue operation into the future.

- Summary

Based on the above, it is Ecology's opinion that emission reductions at pulp mill chemical recovery furnaces is not a high priority to pursue for emission reductions in the initial long term strategy.

5. Cement Production, Wet Process and Dry Process

Cement production is the source of significant emissions for SO_2 and NO_x. The production of cement uses a kiln with intense heat to calcine lime and other minerals into cement clinker.

Washington has 2 cement kilns—one wet process kiln and one dry process kiln. The wet process kiln (Lafarge located in Seattle) was subject to BART and will be required to reduce emissions to comply with BART requirements. The four factors were addressed in the BART determination and Ecology did not do any further analysis for this plant or the wet process generally in this four-factor analysis.

The dry process kiln (Ash Grove Cement located in Seattle) was subject to Prevention of Significant Deterioration (PSD) and Best Available Control Technology (BACT) requirements when the plant was rebuilt in the late 1980*s*. The plant has lower combustion-based NO_x emissions than a comparable wet process kiln.

- Available emission controls

Available SO_2 controls for a dry process kiln are predominantly optimization of the existing innate control capacity of the cement process or the addition of a dry scrubbing system that produces a calcium sulfite/sulfate product that is compatible with the cement product.

NO_x controls on a dry process kiln include low NO_x burners, SNCR, and SCR. The ability to utilize any one of these techniques is affected by the plant-specific configuration such as the presence of a pre-calciner or a burner that is separated from the kiln.

- Costs of compliance

Costs to control NO_x are expected to be equivalent with those found by Texas and Florida in their evaluations of controls on dry process cement kilns and development of RACT. These control options and costs of SO_2 and NO_x for dry process lime kilns are summarized in Table 9.

Table 9 Summary of Emission Control Options for Dry Process Cement Kilns

Pollutant	Control Option	Control Efficiency	Cost Effectiveness[f] ($/ton)
SO_2	Sorbent Injection	60 - 80%	$2000 – 7400
	Wet Scrubbers	90 - 99%	$2200 – 6900
	Dry Scrubbers	90 - 95%	N/A
NO_x	Low NO_X burners	30 - 40%	$245 – 1000
	Selective Non-Catalytic Reduction (SNCR)	35%	$310 - 2500
	Selective Catalytic Reduction (SCR)	80 - 85	$4635

[f] See the EC/R Incorporated report prepared for the Western Regional Air Partnership at the end of this appendix.

- Time necessary for compliance

It will take 1–2 years to complete the technical analyses and develop the regulatory order to require emission reductions from the dry process kiln. Once the regulatory order is issued, it will take the company about 2–3 years to install any required controls and achieve compliance with the standards.

- Energy and non-air quality environmental impacts of compliance

Ecology anticipates minimal adverse energy and environmental impacts for imposition of any potential controls.

- Remaining useful life of any potentially affected sources

Based in information available to Ecology, Ecology assumes this dry kiln cement plant will continue operating into the future.

- Summary

Based on the above, it is Ecology's opinion significant emission reductions from this source are not likely to occur. However, as time is available at Ecology or the local air pollution control agency, a detailed plant specific evaluation should be performed over the next 10 year period.

6. Glass Manufacture

Ecology has one flat glass production plant (Cardinal Glass) that started operation in 2008 and one container glass plant (St. Gobain).

The Cardinal flat glass plant went through PSD and has installed BACT for SO_2 and NO_x. Natural gas is used to fuel the glass furnace and other thermal processes. As a result of its age and inclusion of BACT, this plant is not evaluated further at this time. As this plant approaches its periodic furnace rebuilding in 10 or 15 years, it may be appropriate to revisit the emission control opportunities at that time.

The St. Gobain container glass plant is fueled by natural gas. The plant uses silica sand, limestone, and other raw materials to produce new glass. Some used glass (cullet) is used in the process. The plant has 5 melting furnaces: one is electric, a second uses the regenerative heating process, and the other 3 utilize oxy-fuel. The oxy-fuel technique is considered to be BACT for NO_x control on bottle glass furnaces. SO_2 control is addressed through the use of electricity and natural gas for glass production.

This plant has been included in a recent federal consent decree that established new emission limitations at all St. Gobain facilities in the country. As part of the consent decree, EPA established SO_2 and NO_x emission limitations for the Seattle plant based on the oxy-fuel technology. The Seattle plant meets the consent decree emission limitations without having to add new emission controls or modify the furnaces. The emission limits established by EPA in the consent decree is higher than the emission limit that the local air pollution control agency has established for the furnaces. The plant is required to comply with the more stringent emission limits.

- Summary

While there may be additional emission reductions that are cost-effective to install at the St. Gobain facility, Ecology believes that EPA's recent consent decree establishes reasonable emission controls for the facility. As a result, Ecology is not proposing to evaluate the opportunity for additional emission controls at this plant.

7. Industrial External Combustion Boilers – Residual Oil and Natural Gas

Residual oil and natural gas-fired boilers are located throughout the state and used in all types of industries and commercial operations. Oil-fired boilers are confined to locations where natural gas is not available such as the Olympic Peninsula and northeastern Washington. Where available, natural gas is preferred as fuel. A number of boilers are capable of using either natural gas or oil. This capability is usually included to allow the boiler owner to contract for less expensive interruptible natural gas supplies.

- Available emission controls

There are a number of applicable technologies to reduce the SO_2 from boilers. The principal methods are as follows:

- change from a moderate or high sulfur content fuel oil to a lower sulfur content fuel
- conversion to natural gas or wood
- installation of a wet or dry flue gas desulphurization system

Fuel sulfur changes are possible, but can be costly for a specific facility depending on a number of factors, such as the cost difference between the low and higher sulfur content oil, the cost of delivery of the fuel, any special handling or plant modifications required to use the lower sulfur content fuel. For example, a system designed to fire #6 residual fuel oil requires modification to utilize lighter, lower sulfur content fuel oils such as #2 oil.

For the few units that utilize residual or reclaimed fuel oil, SO_2 reductions could be achieved via changing to lower sulfur content oil.

Conversion of an existing oil-fired boiler to wood-firing involves modifications to the boiler fire box to be capable of using a solid fuel rather than a liquid fuel. Similarly the conversion from oil (or wood) to natural gas requires new burners and other fire box modifications to accommodate the different combustion characteristics of natural gas.

Wet or dry flue gas desulphurization can be installed on many different systems to reduce SO_2. Wet systems are common on the large units and rarely on smaller ones. The large systems are predominantly based on the use of lime or limestone. A spray bar wet scrubbing system is commonly used to contact the lime/limestone water solution with the flue gas. The SO_2 reacts with the lime/limestone in water droplets and the resulting sulfite is collected in the scrubber sump.

Dry systems are common on large units where water is scarce and on smaller scale units that are required to add desulphurization systems. Dry systems commonly involve the injection of lime or sodium carbonate into the flue gas to react with the SO_2 to produce a sulfite or sulfate that is collected in a particulate control device.

To reduce NO_X from these boilers, controls are primarily limited to improvements to combustion air distribution systems, or the installation of an add-on emission control system such as SNCR or SCR. For units fires by natural gas or oil, low and ultra low NO_x burners are available that can be retrofitted in the existing boiler.

Over-fire air improvements involve a variety of techniques to optimize the distribution of oxygen within the firebox. The goal is to improve the overall combustion process and reduce the peak flame temperature. Reducing the peak flame temperature will result in lower NO_x emissions.

SNCR involves introducing ammonia or urea into the boiler at a location where the gas is between 1500 and 1700 degrees Fahrenheit.

SCR is similar to SNCR except that a catalyst is used to lower the temperature of the ammonia/NO_x reaction. SCR has been applied to many types of boilers.

- Cost of compliance

Table 10 below summarizes the control options and costs for residual oil and natural gas-fired boilers.

Table 10 Summary of Emission Control Options for Residual Oil and Natural Gas-Fired Boilers

Pollutant	Control Option	Control Efficiency	Cost Effectiveness[g] ($/ton)
SO_2	Change to lower sulfur fuel	Depends on difference in fuel sulfur content	Less than $5000 to greater than $15,000
	Wet Scrubbers	90%	$4700 – 10,000
	Dry Scrubbers	50 – 90%	$850 – 8300
NO_x	Overfire Air	25+%	$500 – 1500
	Selective Non-Catalytic Reduction (SNCR)	30 – 75%	$2000 – 10,000
	Selective Catalytic Reduction (SCR)	40 – 90%	$1000 – 25,000

[g] See the EC/R Incorporated report prepared for the Western Regional Air Partnership at the end of the appendix.

Fuel sulfur changes can be costly for a specific facility depending on a number of factors, such as the cost difference between the low and higher sulfur content oil, the cost of delivery of the fuel, any special handling or plant modifications required to use the lower sulfur content fuel. For example, a system designed to fire #6 residual fuel oil requires modification to utilize lighter, lower sulfur content fuel oils such as #2 oil.

The cost of changing to lower sulfur content oil has been evaluated for one facility. The cost-effectiveness to change from a 0.76% sulfur fuel oil to a 0.5% sulfur oil is greater than $10,000 per ton SO_2 reduced. At the same time the cost effectiveness to use ultra low sulfur diesel fuel (0.0015% sulfur) is above $15,000 per ton SO_2 reduced.

Conversion of an oil boiler to natural gas has not been evaluated recently in Washington. The process involves replacement of oil burners with new gas burners or the addition of new gas burners to the existing oil burners.

Similarly the conversion of an oil fired boiler to wood firing is not known. The last such conversion in Washington occurred nearly 40 years ago. It involves a significant reconstruction of the firebox, so the cost could be significant.

- Time necessary for compliance

The time necessary for compliance will vary by boiler. Some existing boilers are already equipped with the best emission controls that are available as a result of being new 'greenfield' units. At the other end of the spectrum owner/operators will find that installation of a new boiler will be the best option.

Overall the time for an existing boiler to achieve compliance will be 4-to-6 years. In order to require existing sources to implement new emission controls, Ecology will need 2-to-3 years to develop and finalize a rule containing the requirements. Following the rule development, sources are allowed a period of time to come into compliance. It generally takes 2-to-3 years to construct new emission controls that achieve compliance with a new air quality control requirement.

- Energy and non-air quality environmental impacts of compliance

Minimal amounts of energy will be required to operate add-on emission control systems. The use of ammonia or urea for SNCR or SCR will consume additional energy for production and transport to the facility.

Add on sulfur controls will generate both a wastewater needing treatment and disposal and a new solid waste. The effects of these changes are not currently known,

- Remaining useful life of any potentially affected sources

The boilers have a range of ages. For analysis purposes, Ecology assumes that none of them are limited in remaining useful lifetime. There are a few boilers that were originally constructed prior to 1960 and are still operating at or near original design rates.

- Summary

Based on the above, it is Ecology's opinion that there may be individual units where cost-effective emission controls can be installed. The units affected and the control options will depend upon the adopted rule requirements.

8. Industrial External Combustion Boilers – Wood/Bark Waste

In Washington, external combustion boilers are primarily fueled by natural gas or wood wastes. The largest number of boilers are fueled by natural gas and residual oil followed by wood-fueled boilers.

"Wood-fired" boilers burn primarily wood or wood products residuals plus other fuels. These boilers are located at pulp mills, lumber and plywood mills, power plants, district heating plants, and rural schools. In addition to wood or wood product residuals, these boilers use other wastes such as logging waste, land clearing woody material, short fiber pulp sludge, pulp mill wastewater sludge, old cardboard reject materials, minimal amounts of internally generated demolition wastes, and 'urban forest'[12]. Individual boilers may also utilize coal, natural gas or oil burners to stabilize the combustion process or overcome 'wet wood fuel' [13].

- Available emission controls

Wood fuel is a low sulfur content fuel. At this time no wholly wood-fired boiler in Washington utilizes SO_2 controls.

There are combination fuel-fired boilers that are classed as wood-fired that also fire coal, fuel oil and pulp mill sludge containing sulfur. These combination fuel-fired boilers utilize SO_2 controls. The same add-on SO_2 controls evaluated above for natural gas- and oil-fired boilers can be used on these wood-fired boilers. Fuel sulfur reduction is confined to the back-up fuels. Pulp mills have to decide whether to use pulp mill sludge for fuel or dispose of it as solid waste.

Similarly the same list of NO_x controls evaluated for oil- and gas-fired boilers is available for wood-fired units. In addition to those controls, evaluations for BACT determinations indicate that use of a fluidized bed boiler can reduce NO_x emissions compared to a more conventional stoker design.

- Cost of compliance

The costs of compliance are quite facility specific. The general costs of compliance are represented by Table 11.

[12] Urban forest is a term used to describe woody materials coming from urban areas. Urban forest includes materials ranging from clean wood waste, used pallets and yard wastes such as tree and shrub trimmings.
[13] Wet wood fuel is a term applied to wood that is greater than 60% water when introduced to the boiler.

Table 11 Summary of Emission Control Options for Wood/Bark Waste Boilers

Pollutant	Control Option	Control Efficiency	Cost Effectiveness[g] ($/ton)
SO_2	Change to lower sulfur fuel	Depends on difference in fuel sulfur content	Less than $5000 to greater than $15,000
	Wet Scrubbers	90%	$4700 – 10,000
	Dry Scrubbers	50 – 90%	$850 – 8300
NO_x	Overfire Air	25+%	$500 – 1500
	Selective Non-Catalytic Reduction (SNCR)	30 – 75%	$2000 – 10,000
	Selective Catalytic Reduction (SCR)	40 – 90%	$1000 – 25,000

[g] See the EC/R Incorporated report prepared for the Western Regional Air Partnership at the end of this appendix.

- Time necessary for compliance

The time necessary for compliance will vary by boiler. Some even will already be equipped with the best emission controls that are available as a result of being new ‘greenfield’ units. At the other end of the spectrum owner/operators will find that installation of a new boiler will be the best option.

Overall the time for an existing boiler to achieve compliance will be 4-to-6 years. In order to require sources to implement new emission controls, Ecology will need 2-to-3 years to develop and finalize a rule containing the requirements. Following the rule development, sources are allowed a period of time to come into compliance. It generally takes 2-to-3 years to construct new emission controls that achieve compliance with a new air quality control requirement.

- Energy and non-air quality environmental impacts of compliance

The energy and non-air quality environmental impacts of controls are expected to be minimal,

- Remaining useful life of any potentially affected sources

The boilers have a range of ages. For analysis purposes, Ecology assumes that none of them are limited in remaining useful lifetime. There are a few boilers that were originally constructed prior to 1960 and are still operating at or near original design rates.

- Summary

Based on the above, it is Ecology’s opinion that there may be individual units where cost-effective emission controls can be installed. The units affected and the control options will depend upon the adopted rule requirements.

Conclusions from the Four-Factor analysis

Based on the set of four-factor analyses above, Ecology concludes it is not reasonable to require controls for the selected specific industries and emission source categories as a component of this foundational RH SIP.

The four-factor analyses indicate there is the potential for SO_2 and NO_x emission reductions on a number of individual sources, principally boilers (oil, natural gas, and wood-fired), process heaters, and FCCU/CO boiler systems The information developed for this four factor analysis will be used to prioritize sources for rulemaking to define Reasonably Available Control Technology (RACT). The role of RACT in Washington's Long-Term Strategy for Visibility Improvement is discussed in Chapter 10.

Supplementary Information for Four Factor Analyses by WRAP States

May 4, 2009 (Corrected 4/20/10)

Revised Draft Report

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Scope of Document

This document provides an initial analysis of the four factors which must be considered in establishing a reasonable progress goal toward achieving natural visibility conditions in mandatory Class I areas. These factors were examined for several candidate control measures for priority pollutants and emission sources. The results of this report are intended to inform policymakers in setting reasonable progress goals for the Class I areas in the Western Regional Air Partnership (WRAP) region.

This document does not address policy issues, set reasonable progress goals, or recommend a long-term strategy for regional haze. Separate documents will be prepared by the States which address the reasonable progress goals, each state's share of emission reductions, and coordinated emission control strategies.

Disclaimer

The analysis described in this document has been funded by the Western Governors' Association. It has been subject to review by the WGA and the WRAP. However, the report does not necessarily reflect the views of the sponsoring and participating organizations, and no official endorsement should be inferred.

Contents

Abbreviations

ACT	Alternative Control Techniques
ALAPCO	Association of Local Air Pollution Control Officials
BART	Best Available Retrofit Technology
CAIR	Clean Air Interstate Rule
CAA	Clean Air Act
CO_2	Carbon Dioxide
EC	Elemental Carbon
EDMS	Emissions Data Management System
EGU	Electric Generating Units
EPA	Environmental Protection Agency
ESP	Electrostatic Precipitator
FCC	Fluid Catalytic Cracking
FGR	Flue Gas Recirculation
FF	Fabric Filters
H_2S	Hydrogen Sulfide
ICAC	Institute of Clean Air Companies
ICI	Industrial/Commercial/Institutional
LEC	Low-Emission Combustion
LNB	Low-NOx Burners
MRPO	Midwest Regional Planning Organization
N_2O_5	Dinitrogen Pentoxide
NAAQS	National Ambient Air Quality Standards
NACAA	National Association of Clean Air Agencies
NEI	National Emissions Inventory
NESCAUM	Northeast States for Coordinated Air Use Management
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NSCR	Nonselective Catalytic Reduction
NSPS	New Source Performance Standards
OC	Organic Carbon
OFA	Overfire Air
PM	Particulate Matter
PM_{10}	Particulate Matter Particles of 10 Micrometers or Less
$PM_{2.5}$	Particulate Matter Particles of 2.5 Micrometers or Less
PSD	Prevention of Significant Deterioration
RPO	Regional Planning Organizations
SCC	Source Classification Codes
SCR	Selective Catalytic Reduction
SIC	Standard Industrial Classification
SNCR	Selective Noncatalytic Reduction
SO_2	Sulfur Dioxide

STAPPA	State and Territorial Air Pollution Program Administrators
ULNB	Ultra-Low NOx Burners
VOC	Volatile Organic Compounds
WRAP	Western Regional Air Partnership

Units

acfm	Actual Cubic Feet per Minute
cfm	Cubic Feet per Minute
kWh	Kilowatt Hour
MM-BTU/hr	Million British Thermal Units per Hour
MW	Megawatt
ppmv	Parts per Million by Volume
scfm	Standard Cubic Feet per Minute

1. Introduction

The Regional Haze Rule requires States to set reasonable progress goals toward meeting a national goal of natural visibility conditions in Class I areas by the year 2064. The first reasonable progress goals will be established for the planning period 2008 to 2018. The Western Regional Air Partnership (WRAP), along with its member states, tribal governments, and federal agencies, are working to address visibility impairment due to regional haze in Class I areas. The Regional Haze Rule identifies four factors which should be considered in evaluating potential emission control measures to meet visibility goals. These are as follows:

1. Cost of compliance
2. Time necessary for compliance
3. Energy and non-air quality environmental impacts of compliance
4. Remaining useful life of any existing source subject to such requirements

The purpose of this report is to analyze these factors for possible control strategies intended to improve visibility in the WRAP region. The following priority source categories of emissions are addressed:

1. Reciprocating internal combustion engines and turbines
2. Oil and natural gas exploration and production field operations
3. Natural gas processing plants
4. Industrial boilers
    a. Coal- and oil- fired
        i. By size category
            Up to and including 200 million British Thermal Units (BTU) per hour
            Greater than 200 million BTU/hour
        ii. By age category
            Constructed prior to regulations for Prevention of Significant Deterioration (PSD) (before August 7, 1977)
            After PSD regulations but before the Clean Air Act Amendments of 1990 (August 7, 1977 through December 31, 1990)
            After the Clean Air Act Amendments of 1990
    b. Wood fired industrial boilers
    c. Natural gas fired industrial boilers
5. Cement manufacturing plants
6. Sulfuric acid manufacturing plants
7. Pulp and paper plant lime kilns
8. Petroleum refineries

We have identified control measures for emissions of nitrogen oxides (NO_X) and sulfur dioxide (SO_2), which can react in the atmosphere to produce visibility-obscuring particulate matter on a regional scale, and also for direct emissions of particulate matter. For direct particulate matter emissions, we have evaluated the impacts of control measures on various particulate matter components, including $PM_{2.5}$, PM_{10}, elemental carbon (EC) particulate matter, and particulate organic carbon (OC). Data on emissions of volatile organic compounds (VOC) were also collected. In addition, although VOC emission control measures were not explicitly evaluated in this study, the impacts of NO_X, SO_2, and particulate matter controls on VOC were calculated where co-control benefits would occur.

It must be noted that the source category analyses in this report are general in nature. In developing their Regional Haze State Implementation Plans (SIPs), states will also draw on other category-specific analyses and source-specific analyses.

This report is organized in 10 sections, including this introduction. Section 2 describes the methodology for the four factor analysis. The next 8 sections present the results of factor analyses for the priority emission source categories listed above.

2. Methodology

The first step in the technical evaluation of control measures for a source category was to identify the major sources of emissions from the category. Emissions assessments were initially based on 2002 emissions inventory in the WRAP Emissions Data Management System (EDMS),[1] which consists of data submitted by the WRAP states in 2004. The states then reviewed the emissions data and parameters from the EDMS used for this analysis and provided updated data when applicable. In some cases, detailed data on PM_{10} and $PM_{2.5}$ emissions were not available from the WRAP inventory. Therefore, PM_{10} and $PM_{2.5}$ data from the U.S. Environmental Protection Agency's (EPA) 2002 National Emissions Inventory (NEI) were used to supplement the WRAP inventory where necessary.

Once the important emission sources were identified within a given emission source category, a list of potential additional control technologies was compiled from a variety of sources, including control techniques guidelines published by the EPA, emission control cost models such as AirControlNET[2] and CUECost,[3] Best Available Retrofit Technology (BART) analyses, White Papers prepared by the Midwest Regional Planning Organization (MRPO),[4] and a menu of control options developed by the National Association of Clean Air Agencies (NACAA).[5] The options for each source category were then narrowed to a set of technologies that would achieve the emission reduction target under consideration. The following sections discuss the methodology used to analyze each of the regional haze factors for the selected technologies.

2.1 Factor 1 – Costs

Control costs include both the capital costs associated with the purchase and installation of retrofit and new control systems, and the net annual costs (which are the annual reoccurring costs) associated with system operation. The basic components of total capital costs are direct capital costs, which includes purchased equipment and installation costs, and indirect capital expenses. Direct capital costs consist of such items as purchased equipment cost, instrumentation and process controls, ductwork and piping, electrical components, and structural and foundation costs. Labor costs associated with construction and installation are also included in this category. Indirect capital expenses are comprised of engineering and design costs, contractor fees, supervisory expenses, and startup and performance testing. Contingency costs, which represent such costs as construction delays, increased labor and equipment costs, and design modification, are an additional component of indirect capital expenses. Capital costs also include the cost of process modifications. Annual costs include amortized costs of capital investment, as well as costs of operating labor, utilities, and waste disposal. For fuel switching options, annual costs include the cost differential between the current fuel and the alternate fuel.

The U.S. EPA's *Guidance for Setting Reasonable Progress Goals under the Regional Haze Program* (June 1, 2007) indicates that the four-factor analyses should conform to the methodologies given in the *EPA Air Pollution Control Cost Manual*.[6] This study draws on cost analyses which have followed the protocols set forth in the Cost Manual. Where possible, we have used the primary references for cost data. Cost estimates have been updated to 2007 dollars using the Marshall & Swift Equipment Cost Index or the Chemical Engineering Plant Cost Index, both of which are published in the journal, *Chemical Engineering.*

For Factor 1, results of the cost analysis are expressed in terms of total cost-effectiveness, in dollars per ton of emissions reduced. A relevant consideration in a cost-effectiveness calculation is the economic condition of the industry (or individual facility if the analysis is performed on that basis). Even though a given cost-effectiveness value may, in general, be considered "acceptable," certain industries may find such a cost to be overly burdensome. This is particularly true for well-established industries with low profit margins. Industries with a poor economic condition may not be able to install controls to the same extent as more robust industries. A thorough economic review of the source categories selected for the factor analysis is beyond the scope of this project.

2.2 Factor 2 – Time Necessary for Compliance

For Factor 2, we evaluated the amount of time needed for full implementation of the different control strategies. The time for compliance was defined to include the time needed to develop and implement the regulations, as well as the time needed to install the necessary control equipment. The time required to install a retrofit control device includes time for capital procurement, device design, fabrication, and installation. The Factor 2 analysis also included the time required for staging the installation of multiple control devices at a given facility.

2.3 Factor 3 – Energy and Other Impacts

Table 2-1 summarizes the energy and environmental impacts analyzed under Factor 3. We evaluated the direct energy consumption of the emission control device, solid waste generated, wastewater discharged, acid deposition, nitrogen deposition, and climate impacts (e.g., generation and mitigation of greenhouse gas emissions).

In general, the data needed to estimate these energy and other non-air pollution impacts were obtained from the cost studies which were evaluated under Factor 1. These analyses generally quantify electricity requirements, steam requirements, increased fuel requirements, and other impacts as part of the analysis of annual operation and maintenance costs.

Costs of disposal of solid waste or otherwise complying with regulations associated with waste streams were included under the cost estimates developed under Factor 1, and were evaluated as to whether they could be cost-prohibitive or otherwise negatively affect the facility.

Energy needs and non-air quality impacts of identified control technologies were aggregated to estimate the energy impacts for the specified industry sectors. However, indirect energy impacts were not considered, such as the different energy requirements to produce a given amount of coal versus the energy required to produce an equivalent amount of natural gas.

Table 2-1 Summary of Energy and Environmental Impacts Evaluated Under Factor 3

Energy Impacts
Electricity requirement for control equipment and associated fans
Steam required
Fuel required
Environmental Impacts
Waste generated
Wastewater generated
Additional carbon dioxide (CO_2) produced
Reduced acid deposition
Reduced nitrogen deposition
Benefits from reductions in $PM_{2.5}$ and ozone, where available
Impacts Not Included
Impacts of control measures on boiler efficiency
Energy required to produce lower sulfate fuels
Secondary environmental impacts to produce additional energy (except CO_2) produced

2.4 Factor 4 – Remaining Equipment Life

Factor 4 accounts for the impact of the remaining equipment life on the cost of control. Such an impact will occur when the remaining expected life of a particular emission source is less than the lifetime of the pollution control device (such as a scrubber) that is being considered. In this case, the capital cost of the pollution control device can only be amortized for the remaining lifetime of the emission source. Thus, if a scrubber with a service life of 15 years is being evaluated for a boiler with an expected remaining life of 10 years, the shortened amortization schedule will increase the annual cost of the scrubber.

The ages of major pieces of equipment were determined where possible, and compared with the service life of pollution control equipment. The impact of a limited useful life on the amortization period for control equipment was then evaluated, along with the impact on annualized cost-effectiveness.

2.5 References for Section 2

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6. EPA (2002), *EPA Air Pollution Control Cost Manual*, *6th ed.,* EPA/452/B-02-001, U.S. EPA, Office of Air Quality Planning and Standards, RTP, NC, Section 5 - SO_2 and Acid Gas Controls, pp 1-30 through 1-42, http://www.epa.gov/ttncatc1/products.html#cccinfo.

3. Reciprocating Internal Combustion Engines and Turbines

Reciprocating engines and turbines at industrial, commercial, and institutional facilities in the WRAP region are estimated to emit about 274,000 tons of NO_X per year, based on the 2002 emissions inventory for the region.[1] These sources are commonly grouped together under the general category of internal combustion engines. Most of the emissions from this category, about 247,000 tons per year, are from sources that are listed in the point source inventory; however, the area sources inventory also includes about 27,000 tons of NO_X emissions from internal combustion engines. The area source emissions estimates are derived from industrial, commercial, and institutional fuel consumption in the WRAP states. NO_X emissions from internal combustion engines represent about 23% of total point source emissions of NO_X in the WRAP region, and about 19% of all stationary source (point and area source) NO_X emissions in the region.

Table 3-1 shows estimated emissions of NO_X, SO_2, PM_{10}, $PM_{2.5}$ and VOC in the WRAP region, broken down by state, engine type, and fuel. The emissions estimates for NO_X, SO_2, and VOC were taken from the WRAP emissions data management system.[1] Estimates for PM_{10} and $PM_{2.5}$ were taken from the National Emissions Inventory (NEI). As the table shows, SO_2, VOC and particulate matter emissions from reciprocating engines and turbines sources are much lower than NO_X emissions. Emissions of OC and EC are not specifically quantified in either the WRAP inventory or the NEI, but can be estimated as a percentage of PM_{10} emissions using data from EPA's SPECIATE database.[2] EC and OC are estimated to comprise 78.8% and 18.5% of diesel PM_{10} emissions; and 38.4% and 24.7% of natural gas combustion PM_{10} emissions, respectively.

The point source emissions estimates in Table 3-1 include reciprocating engines and turbines used in oil and natural gas production and exploration operations, and at natural gas processing facilities. These emissions are included again in Chapters 3 and 4, which discuss control measures for these operations.

Reciprocating engines account for about 64% of the NO_X emissions from point sources in the internal combustion category, and turbines account for about 36%. The area source inventory does not differentiate between reciprocating engines and turbines, but reciprocating engines are expected to make up the bulk of area sources. Most of the turbines burn gaseous fuels, which include natural gas, liquefied petroleum gas, and industrial process gas. Reciprocating engines are divided between gaseous fuels and liquid fuels, such as kerosene and diesel oil.

Emissions from individual diesel reciprocating engines range up to 850 tons of NO_X per year, and natural gas fired reciprocating engine emissions range up to 1,370 tons of NO_X per year. Individual diesel-fired turbines range up to 1,400 tons of NO_X per year, and natural gas turbines range up to 877 tons NO_X per year.[1]

Table 3-1. Emissions from Reciprocating Internal Combustion Engines and Turbines in the WRAP Region

	AK	AZ	CA	CO	ID	MT	ND	NM	NV	OR	SD	UT	WA	WY	Tribes	Total
NO_X emissions in 2002 (tons/year)																
Point sources																
Turbines - gaseous fuel	44,293	3,593	11,832	4,233	697	321	524	9,433	4,088	2,028	372	1,302	1,267	2,113	1,890	87,987
Turbines - liquid	4,446	15	411	90	3	0	0	109	9	0	3	48	0	0	6	5,142
Reciprocating - gas	50	2,979	10,114	18,628	1,715	2,511	3,861	41,962	84	348	0	3,097	875	1,258	2,348	89,830
Reciprocating - liquid	12,779	1,370	12,735	5,336	312	3,968	305	6,714	209	0	7	2,156	114	13,060	5,051	64,116
Area source (unspecified)																
Natural gas	0	0	14,778	0	0	0	0	0	70	0	0	0	0	0	0	14,848
Kerosene	0	0	11,327	0	0	0	0	922	75	0	0	0	0	0	0	12,323
Total	61,569	7,957	61,197	28,287	2,726	6,800	4,691	59,141	4,535	2,376	383	6,602	2,256	16,431	9,294	274,246
SO_2 emissions in 2002 (tons/year)																
Point sources																
Turbines - gaseous fuel	705	31	352	143	7	9	20	20	20	31	11	22	85	4	18	1,479
Turbines - liquid	2,539	1	75	3	0	0	0	0	0	3	0	4	0	0	0	2,628
Reciprocating - gas	0	2	180	65	0	0	12	244	0	0	0	8	53	11	200	774
Reciprocating - liquid	670	37	689	71	23	234	8	53	14	0	0	185	553	1	19	2,557
Area source (unspecified)																
Natural gas	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	12
Kerosene	0	0	708	0	0	0	0	84	0	0	0	0	0	0	0	793
Total	3,915	71	2,016	281	31	243	40	402	34	35	11	219	691	17	238	8,243
PM_{10} emissions in 2002 (tons/year)																
Turbines - gas	167	765	459	335	976	115	0	105	27	542	4	6	13	0	2,481	5,995
Turbines - liquid	140	1	88	10	0	0	0	4	5	0	0	2	2	0	0	254
Reciprocating - gas	0	25	232	294	25	0	25	158	0	1	0	27	10	32	14	843
Reciprocating - liquid	179	14	436	42	201	56	2	64	135	1	0	26	1	0	279	1,435
Total	486	806	1,215	681	1,202	171	27	330	167	544	4	61	26	33	2,774	8,527
$PM_{2.5}$ emissions in 2002 (tons/year)																
Turbines - gas	66	665	450	242	966	36	0	53	25	129	3	5	11	0	1,743	4,394
Turbines - liquid	127	1	80	10	0	0	0	3	5	0	0	2	2	0	0	231
Reciprocating - gas	0	24	231	294	25	0	25	160	0	1	0	23	10	32	13	837
Reciprocating - liquid	168	13	418	34	69	38	2	63	131	1	0	22	1	0	127	1,089
Total	361	703	1,179	580	1,060	74	27	280	161	131	4	52	23	33	1,884	6,551
VOC emissions in 2002 (tons/year)																
Turbines - gas	665	93	1,088	652	27	66	40	548	20	217	35	81	65	49	69	3,715
Turbines - liquid	2	0	33	6	0	0	0	2	70	0	0	5	0	0	1	119
Reciprocating - gas	1	133	1,884	3,440	53	88	106	2,326	1	26	0	90	83	441	232	8,904
Reciprocating - liquid	466	29	824	1,340	11	216	23	3,044	9	0	0	198	7	1,236	128	7,531
Total	1,133	256	3,829	5,439	90	370	169	5,920	100	242	36	375	156	1,726	429	20,270

Source: NOX, SO2, and VOC emissions were taken from the WRAP emissions data management system, and PM10 and PM2.5 emissions were taken from the NEI.

Table 3-2 lists potential control measures for NO_X emissions from reciprocating engines and turbines. A number of options were identified for stationary reciprocating engines in an Alternative Control Techniques (ACT) guidance document written by the U.S. EPA in 1993, and in more recent analyses for New Source Performance Standards.[3,4] Reciprocating engines can be designed to operate under rich fuel mixture, or lean fuel mixture conditions. Air-to-fuel-ratio adjustments and ignition retarding adjustments can be used to control emissions under either fuel mixture condition and for diesel or natural gas engines. This approach typically requires the installation of an electronic control system. In addition, fuel efficiency is generally reduced and emissions of soot may be increased. Low-Emission Combustion (LEC) retrofit technology can also reduce emissions from lean burn reciprocating engines by an average of 89%.[5] LEC involves modifying the combustion system to achieve very lean combustion conditions (high air-to-fuel ratios). EPA prepared an update to the ACT guidance for reciprocating engines in 2002 which focused on LEC technology.[5] Selective Catalytic Reduction (SCR) can also be used either alone or in conjunction with the above technologies to reduce NO_X emissions from reciprocating engines or turbines by 90%.[6] In addition, Non-Selective Catalytic Reduction (NSCR) can be used for rich-burn natural gas engines.[4]

A separate ACT guidance document identifies control options for particulate matter emissions from diesel engines.[7] In addition, the WRAP sponsored a study of control options for engines used in the oil and gas industry.[8] This study covered control measures for NO_X, particulate matter, and VOC.

Another ACT guidance document analyzed control options for turbines using gaseous and liquid fuels. [9] Turbines can be retrofit with water or steam injection to reduce emissions by up to 80%. In addition, SCR can be used in conjunction with water or steam injection or low-NO_X burner technology to reduce emissions by 93 to 96%. The ACT did not analyze retrofit installations or low-NOX burner technology for turbines, or impact of SCR used alone (without water or steam injection or low-NO_X burner technology).

3.1 Factor 1 – Costs

Table 3-3 provides cost estimates for the emission control options which have been identified for reciprocating engines and turbines. For each option, the table gives an estimate of the capital cost to install the necessary equipment, and the total annual cost of control, including the amortized cost associated with the capital equipment cost. Retrofit costs were not available for low-NO_X burners.

The capital and annual cost figures are expressed in terms of the cost per unit of engine size, where the engine size is expressed in horsepower for reciprocating engines and million British thermal units per hour (MM-Btu/hr) for turbines. The table shows a range of values for each cost figure, since the cost per unit of engine size will depend on the engine size and other factors. The lower ends of the cost ranges typically reflect larger engines, and the higher ends of the cost ranges typically reflect lower engine sizes. Table 3-3 also shows the estimated cost effectiveness for each control measure, in terms of the cost per ton of emission reduction.

Table 3-2. Control Options for Reciprocating Engines and Turbines

Source Type	Control Technology	Pollutant controlled	Baseline emissions (1000 tons/yr)	Estimated control effieiency (%)	Potential emission reduction (1000 tons/year)	Refer-ences
Turbines	Water or steam injection	NO_X	95	68 - 80	65 - 76	9
	Low-NO_X burners	NO_X	95	68 - 84	65 - 80	9
	SCR	NO_X	95	90	80	6,7,9
	Water or steam injection with SCR	NO_X	95	93 - 96	88 - 91	9
Reciprocating engines, gaseous fuels	Air-fuel ratio adjustment	NO_X	105	10 - 40	10 - 42	3
	Ignition retarding technologies	NO_X	105	15 - 30	16 - 31	3
	Low-emission combustion (LEC) retrofit	NO_X	105	80 - 90	84 - 94	5
	SCR	NO_X	105	90	94	3,4,6
	NSCR	NO_X	a	90 - 99	a	4
		VOC	a	40 - 85	a	4
	Replacement with electric motors	NO_X	105	100	105	8
		SO_2	0.79	100	0.79	
		PM_{10}	0.84	100	0.84	
		$PM_{2.5}$	0.84	100	0.84	
		EC	0.32	100	0.32	
		OC	0.21	100	0.21	
		VOC	8.9	100	8.9	
		Overall[b]	115		116	
Reciprocating engines, diesel and other liquid fuels	Ignition timing retard	NO_X	76	15 - 30	11 - 23	3,8
	EGR	NO_X	76	40	31	3,8
	SCR	NO_X	76	80 - 95	61 - 73	3,4,6,8
	Replacement of Tier 2 engines with Tier 4	NO_X	76	87	67	8
		PM_{10}	1.4	85	1.2	
		$PM_{2.5}$	1.1	85	0.9	
		EC	0.6	85	0.5	
		OC	0.5	85	0.4	
		VOC	7.5	87	6.6	
		Overall[b]	85		75	
	Diesel oxidation catalyst	PM_{10}	1.4	25	0.4	7,8
		$PM_{2.5}$	1.1	25	0.3	
		EC	0.6	25	0.2	
		OC	0.5	25	0.1	
		VOC	7.5	90	6.8	
		Overall[b]	9.0		7.2	

[a]NSCR applies only to rich-burn engines. The distribution of emissions between rich-burn and lean-burn engines is not known.

[b]For control measures reducing multiple pollutants, overall emissions and emission reductions reflect the sum of all pollutants. However, EC, OC, and PM2.5 are components of PM10, and therefore are not added separately to the totals.

Table 3-3. Estimated Costs of Control Options for Reciprocating Engines and Turbines

Source Type	Control Technology	Pollutant controlled	Estimated control efficiency (%)	Estimated capital cost ($/unit)	Estimated annual cost ($/year /unit)	Units	Cost effectiveness ($/ton)	Refer-ences
Turbines	Water or steam injection	NO_X	68 - 80	4.4 - 16	2 - 5	1000 Btu	560 - 3,100	9
	Low-NO_X burners[a]	NO_X	68 - 84	8 - 22	2.7 - 8.5	1000 Btu	5,200 - 16,200	9
	SCR	NO_X	90	8 - 22	2.7 - 8.5	1000 Btu	2000 - 10,000	6,7,9
	Water or steam injection with SCR	NO_X	93 - 96	13 - 34	5.1 - 13	1000 Btu	1,000 - 6,700	9
Reciprocating engines, gaseous fuels	Air-fuel ratio adjustment	NO_X	10 - 40	4.4 - 43	13 - 86	hp	320 - 8,300	3
	Ignition retarding technologies	NO_X	15 - 30	na	10 - 32	hp	310 - 2,000	3
	LEC retrofit	NO_X	80 - 90	120 - 820	30 - 210	hp	320 - 2,500	5
	SCR	NO_X	90	20 - 180	40 - 461	hp	430 - 4,900	3,4,6
	NSCR[b]	NO_X	90 - 99	17 - 35	3 - 6	hp	16 - 36	4
		VOC	40 - 85				1,500 - 6,200	4
		Overall[c]					16 - 36	
	Replacement with electric motors	NO_X	100	120 - 140	38 - 44	hp	100 - 4,700	8
		SO_2					>13,000	
		PM_{10}					>13,000	
		$PM_{2.5}$					>13,000	
		EC					>33,000	
		OC					>50,000	
		VOC					1,000 - 60,000	
		Overall[c]					90 - 4,300	
Reciprocating engines, diesel and other liquid fuels	Ignition timing retard	NO_X	15 - 30	16 - 120	14 - 66	hp	1,000 - 2,200	3,8
	EGR	NO_X	40	100	26 - 67	hp	780 - 2,000	3,8
	SCR	NO_X	80 - 95	100 - 2,000	40 - 1,200	hp	3,000 - 7,700	3,4,6,8
	Replacement of Tier 2 engines with Tier 4	NO_X	87	125	20	hp	900 - 2,400	8
		PM_{10}	85				25,000 - 68,000	
		$PM_{2.5}$	85				25,000 - 68,000	
		EC	85				>50,000	
		OC	85				>50,000	
		VOC	87				22,000 - 59,000	
		Overall[c]					840 - 2,200	
	Diesel oxidation catalyst	PM_{10}	25	10	1.7	hp	1,400	7,8
		$PM_{2.5}$	25				1,400	
		EC	25				3,300	
		OC	25				4,200	
		VOC	90				350	
		Overall[c]					280	

[a]Costs estimates for low-NO_X burners reflect the incremental costs of new low-NO_X burners versus standard burners. Retrofit costs for existing burners were not available.

[b]NSCR applies only to rich-burn engines. The distribution of emissions between rich-burn and lean-burn engines is not known.

[c]For control measures reducing multiple pollutants, the overall cost-effectiveness is the cost per total reduction of all pollutants. However, EC, OC, and PM2.5 are components of PM10, and therefore are not added separately to the emission reduction total.

3.2 Factor 2 – Time Necessary for Compliance

Once a state decides to adopt a particular control strategy, up to 2 years will be needed to develop the necessary rules to implement the strategy. We have estimated that sources may then require up to a year to procure the necessary capital to purchase control equipment. The Institute of Clean Air Companies (ICAC) has estimated that approximately 13 months is required to design, fabricate, and install SCR or SNCR technology for NO_X control.[10] However, the time necessary will depend on the type and size of the unit being controlled. For instance, state regulators' experience indicates that closer to 18 months is required to install this technology.[11] Additional time up to 12 months may be required for staging the installation process if multiple sources are to be controlled at a single facility. Based on these figures, the total time required achieve emission reductions for reciprocating engines and turbines is estimated at a total of 5½ years.

3.3 Factor 3 – Energy and Other Impacts

Table 3-4 shows the estimated energy and non-air pollution impacts of control measures for reciprocating engines and turbines. In general, air-to-fuel-ratio adjustments and ignition retarding technologies have been found to increase fuel consumption by up to 5%, with a typical value of about 2.5%.[12,13] This increased fuel consumption would result in increased CO_2 emissions. LEC technology is not expected to increase fuel consumption; and may provide some fuel economy.[12]

Diesel oxidation catalyst and diesel filtration technologies would produce an increase in fuel consumption in order to overcome the pressure drop through the catalyst bed and the filter. This is assumed to be roughly the same as the increase in fuel consumption for SCR installations, about 0.5%.[12] In the case of diesel oxidation catalyst, the catalyst would have to be changed periodically, producing an increase in solid waste disposal.[14] If diesel reciprocating engines are replaced with electric motors, there would be an increase in electricity demand, but this would be offset by the fuel consumption that would be avoided by replacing the engine.

For turbines, water injection and steam injection would require electricity to operate pumps and ancillary equipment.[14] Water injection would produce an increase in fuel consumption in order to evaporate the water, and steam injection would require energy to produce the steam. The increased electricity, steam, and fuel demands would produce additional CO_2 emissions.

Installation of SCR on any type of engine would cause a small increase in fuel consumption, about 0.5%, in order to force the exhaust gas through the catalyst bed.[12] This would produce an increase in CO_2 emissions to generate the electricity. In addition, spent catalyst would have to be changed periodically, producing an increase in solid waste disposal.[14]

Table 3-4. Estimated Energy and Non-Air Environmental Impacts of Potential Control Measures for Reciprocating Engines and Turbines

Source Type	Control Technology	Pollutant controlled	Potential emission reduction (1000 tons/year)	Additional fuel requirement (%)	Energy and non-air pollution impacts (per ton of emission reduced)				
					Electricity requirement (kW-hr)	Steam requirement (tons steam)	Solid waste produced (tons waste)	Wastewater produced (1000 gallons)	Additional CO_2 emitted (tons)
Turbines	Water or steam injection	NO_X	65 - 76	a		31			8.1
	Low-NO_X burners	NO_X	65 - 80	a					
	SCR	NO_X	80	a					
	Water or steam injection with SCR	NO_X	88 - 91	0.45			0.026		1.7
Reciprocating engines, gaseous fuels	Air-fuel ratio controllers	NO_X	10 - 42	a					
	Ignition retarding technologies	NO_X	16 - 31	a					
	LEC retrofit	NO_X	84 - 94	a					
	SCR	NO_X	94	0.5			0.008		0.43
	NSCR	NO_X, VOC	d	0.5			0.008		0.24
	Replacement with electric motors	NO_X	105	(100)	66,000				b
		SO_2	0.79						
		PM_{10}	0.84						
		$PM_{2.5}$	0.84						
		EC	0.32						
		OC	0.21						
		VOC	8.9						
		Overall[e]	116						
Reciprocating engines, diesel and other liquid fuels	Ignition timing retard	NO_X	11 - 23	a					
	EGR	NO_X	31	2.7					2.0
	SCR	NO_X	61 - 73	0.5			0.008		0.38
	Replacement of Tier 2 engines with Tier 4	NO_X	67	c					c
		PM_{10}	1.2						
		$PM_{2.5}$	0.9						
		EC	0.5						
		OC	0.4						
		VOC	6.6						
		Overall[e]	75						
	Diesel oxidation catalyst	PM_{10}	0.4	0.5			b		316
		$PM_{2.5}$	0.3						
		EC	0.2						
		OC	0.1						
		VOC	6.8						2.5
		Overall[e]	7.2						2.6[d]

NOTES:

blank indicates no impact is expected.

[a]The measure is expected to improve fuel efficiency.

[b]CO_2 from the generation of electricity would be offset by avoided emissions due to replacing the diesel engine

[c]EPA has estimated that the control measures used to meet Tier 4 standards will be integrated into the engine design so that sacrifices in fuel economy will be negligible.

[d]NSCR applies only to rich-burn engines. The distribution of emissions between rich-burn and lean-burn engines is not known.

[e]For control measures reducing multiple pollutants, overall emissions and reflect the sum of all pollutants. However, EC, OC, and $PM_{2.5}$ are components of PM_{10}, and therefore are not added separately to the totals. Impacts are expressed as the impact per ton of total polluants reduced.

3.4 Factor 4 – Remaining Equipment Life

Information was not available on the age of reciprocating engines and turbines in the WRAP region. However, engines in industrial service are often refurbished to extend their lifetimes. Therefore, the remaining lifetime of most reciprocating engines and turbines is expected to be longer than the projected lifetime of pollution control technologies which have been analyzed for this category. In the case of add-on technologies such as SCR, the projected lifetime is 15 years.

If the remaining life of a reciprocating engine or turbine is less than the projected lifetime of a pollution control device, then the capital cost of the control device would have to be amortized over a shorter period of time, corresponding to the remaining lifetime of the emission source. This would cause an increase in the amortized capital cost of the pollution control option, and a corresponding increase in the total annual cost of control. This increased cost can be quantified as follows:

$$A_1 = A_0 + C \times \frac{1-(1+r)^{-m}}{1-(1+r)^{-n}}$$

where:

A_1 = the annual cost of control for the shorter equipment lifetime ($)
A_0 = the original annual cost estimate ($)
C = the capital cost of installing the control equipment ($)
r = the interest rate (0.07)
m = the expected remaining life of the emission source (years)
n = the projected lifetime of the pollution control equipment

3.5 References for Section 3

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4. Oil and Gas Exploration and Production Field Operations

The WRAP region is an important domestic source of crude oil and natural gas. Many of the WRAP states have active production fields for oil and natural gas; and exploration operations are also underway to identify additional reserves. Both the production and exploration industries involve a number of operations which emit NO_X, SO_2, particulate matter and VOC. Turbines are used to drive compressors and other equipment, and diesel engines are used in a variety of applications. Flares and incinerators are used to dispose of waste gases, and process heaters are used in various operations. In addition, emissions emanate from various gas treatment operations, such as glycol dehydrators and amine treatment units.

Table 4-1 summarizes emissions from the industry, broken down by state and by the various emission sources. Point source emissions of NO_X, SO_2, and VOC from these operations were extracted from the 2002 WRAP emissions inventory, which catalogs emission sources by their Standard Industrial Classification (SIC).[1] SIC 131 covers crude petroleum and natural gas production, and SIC 138 covers oil and gas field exploration services. Estimates for PM_{10} and $PM_{2.5}$ were extracted from the 2002 National Emissions Inventory (NEI), which also classifies emissions by SIC. It must be noted that the point source emissions in Table 4-1 for reciprocating engines and turbines in the oil and gas production and exploration sector are also included in the emission totals reported in Table 3-1 (for all reciprocating engines and turbines). However, the point source inventories do not include small engines such as oil well motors and gas well engines. Emissions for these sources have been estimated by the WRAP in a separate oil and gas industry study,[2] and these estimates are also included in Table 4-1.

Based on the inventory emissions estimates, NO_X emissions are the predominant regional haze precursor emissions in oil and gas exploration and production operations. Overall NO_X emissions from these operations are estimated at about 294,000 tons/year, which represent about 20% of stationary source (point and area source) NO_X emissions in the region. These result from combustion processes in engines, turbines, heaters, incinerators, and flares. It should be noted that emissions from point source engines and turbines, about 166,000 tons/year, also fall into the reciprocating engines and turbines category discussed in Chapter 3. However, according to an analysis of oil and gas emission sources sponsored by the WRAP, emissions estimates from small engines at oil and gas operations are not believed to be included in the area source inventory internal combustion estimates.[2]

Most turbines at oil and gas production and exploration operations are fired by natural gas. Emissions from individual natural gas turbines at production operations range up to about 877 tons of NO_X per year, which is comparable to natural gas turbines at industrial facilities. Emissions from individual natural gas turbines at exploration operations range up to 131 tons of NO_X per year. Natural gas reciprocating engines at oil and gas production and exploration operations are somewhat smaller than natural gas reciprocating engines at industrial facilities. NO_X emissions from individual gas reciprocating engines range up to 700 tons per year for oil

Table 4-1. Emissions from Oil and Gas Production and Exploration in the WRAP Region

Emission source			AK	AZ	CA	CO	ID	MT	ND	NM	NV	OR	SD	UT	WY	Tribes	Total
							NO_X emissions (tons/year)										
Production	Point sources	Recip. Engines (mostly gas)	4,208	642	8,050	24,525	2,590	3,996	4,838	52,219	83	1,182	323	2,983	12,272	1,127	119,519
		Turbines, gas	40,987		2,490	571		0	0	345	0			66	956	630	46,044
		Process heaters	935		1,518	100		4	84	339	0			12	92	1	3,085
		Flares	361		72	17		0	164	48	0			12	95	2	772
	Other engines	Oil well motors	0	0		9		42	75	329	1		3	31	111		601
		Compressor engines		8		3,271		1,791	2,920	35,140	33	73	284	843	1,791		46,154
		Other gas well engines	9	9	8,070	15,946		4,678	101	14,602	4	12	44	2,127	6,398		52,000
		Coal methane pumps				1,489				92					1,428		3,009
Exploration	Point sources	Recip. Engines (mostly gas)	235		268	123		0	0	3,447	0			0	195	0	4,269
		Turbines, gas	0		0	0		0	0	890	0			0	0	0	890
		Other	64		128	93		0	0	187	0			18	182	2	673
	Non-point engines	Drill rig motors	877			2,803		1,046	1,536	5,476	24		29	334	4,997		17,122
Total			47,677	659	20,597	48,947	2,590	11,557	9,718	113,113	145	1,267	683	6,426	28,517	1,762	293,658
							SO_2 emissions (tons/year)										
Production	Point sources	Incinerators	0		17	0		0	199	0	0			1,420	7,404	0	9,041
		Flares	38		158	3		2	77	3,822	0			33	4,318	48	8,499
		Sulfur recovery units	0		0	0		0	283	820	0			0	1,284	0	2,387
		Process heaters (gas)	92		730	1		0	0	69	0			0	0	3	896
		Turbines, gas	704		57	1		0	0	0	0			1	0	10	773
		Recip. Engines (mostly gas)	17		43	35		0	11	0	0			0	0	196	302
		Other	8		95	55		0	0	36	0			0	2	1	197
Exploration	Non-point engines	Drill rig motors	66			118		225	358	244	1		6	17	150		1,185
Total			926		1,099	212		227	929	4,992	1		6	1,472	13,159	258	23,280
							PM_{10} emissions (tons/year)										
Production	Point sources	Process heaters, gas	50	0	268	7	0	0	0	12	0	0	0	0	2	0	339
		Recip. Engines (mostly gas)	0		11	189		0	0	3	0			3	5	0	211
		Turbines, gas	144		36	13		0	0	1	0			0	0	0	194
		Other	107	0	70	14	0	0	0	14	0	0	0	3	1	0	209

Table 4-1. Emissions from Oil and Gas Production and Exploration in the WRAP Region

Emission source			AK	AZ	CA	CO	ID	MT	ND	NM	NV	OR	SD	UT	WY	Tribes	Total
Exploration	Point sources	General	0	0	10	2	0	0	0	7	0	0	0	0	0	0	19
Total			301	0	395	224	0	0	0	37	0	0	0	6	8	0	972
PM $_{2.5}$ emissions (tons/year)																	
Production	Point sources	Process heaters, gas	44		268	7		0	0	12	0			0	2	0	333
		Recip. Engines (mostly gas)	0		11	189		0	0	3	0			1	5	0	209
		Turbines - natural gas	60		34	12		0	0	1	0			0	0	0	108
		Other	65	0	69	13	0	0	0	12	0	0	0	2	1	0	162
Exploration	Point sources	General	0	0	10	1	0	0	0	7	0	0	0	0	0	0	18
Total			169	0	392	222	0	0	0	35	0	0	0	4	8	0	830
VOC emissions (tons/year)																	
Production	Point sources	Recip. Engines (mostly gas)	209		647	3,697		28	55	670	0			96	294	213	5,908
		Fugitive emissions	0		1,302	1,079		6	0	125	3			75	747	50	3,388
		Glycol dehydrator	25		3	2,669		2	0	126	0			48	229	95	3,195
		Other	2		602	1,313		0	0	1	17			61	297	48	2,340
		Storage	0		405	611		2	0	125	3			41	43	20	1,251
		Process heaters	49		167	751		0	6	159	0			1	11	20	1,163
		Turbines	641		210	103		0	0	11	0			14	42	46	1,066
		Flares	527		67	10		0	6	33	0			25	33	3	704
Exploration	Point sources	Recip. Engines (mostly gas)	5		6	34		0	0	1,900	0			0	107	0	2,052
		Storage	0		1	0		0	0	979	0			0	1	0	981
		Glycol dehydrator	0		0	34		0	0	605	0			0	6	0	645
		Fugitive emissions	0		0	2		0	0	180	0			0	30	0	213
		Other	11		15	113		0	0	233	0			1	252	1	626
Total			1,469		3,424	10,417		38	67	5,148	22			361	2,090	497	23,533

and gas production operations, and up to 210 tons per year for exploration operations, compared with a maximum of 1,370 tons per year for reciprocating engines at industrial facilities. Diesel engines at oil and gas operations are also smaller than those at industrial facilities. NO_X emissions from individual diesels range up to 46 tons per year for production operations, and 10 tons per year for exploration operations, compared with 850 tons per year for the largest industrial diesel engine.[1]

SO_2 emissions from oil and gas exploration and production are estimated to be an order of magnitude lower than NO_X emissions. SO_2 emissions from incinerators and flares result from the presence of sulfur compounds in waste gases that are burned at the production site. These are generally the waste gases from natural gas sweetening operations such as amine treatment units. Although the process heaters at oil and gas production facilities are listed as using natural gas fuel, SO_2 emissions from these sources are reported to be about 4,000 tons/year. These emissions may result from the combustion of unsweetened natural gas at the well head. SO_2 emissions from drill rig motors also result from the presence of sulfur compounds in the motor fuels.

PM_{10}, $PM_{2.5}$, and VOC emissions from oil and gas exploration and production are also estimated to be an order of magnitude lower than NO_X emissions. Emissions of OC and EC are specifically quantified in either the WRAP inventory or the NEI, but can be estimated as a percentage of PM_{10} emissions using data from EPA's SPECIATE database.[3] EC and OC are estimated to comprise 78.8% and 18.5% of diesel PM_{10} emissions; and 38.4% and 24.7% of natural gas combustion PM_{10} emissions, respectively.

Table 4-2 lists potential control measures for oil and gas production and exploration emissions. The table includes options for reciprocating engines and turbines, process heaters, flares and incinerators, and sulfur recovery units. As discussed in Chapter 3, a number of options are available to control emissions from gas-fired reciprocating engines, diesel-fueled reciprocating engines, and turbines.[2,4,5,6,7,8] Reciprocating engines can be designed to operate under rich fuel mixture, or lean fuel mixture conditions. Air-to-fuel-ratio adjustments and ignition retarding technologies can be used to control emissions under either fuel mixture condition. Low-Emission Combustion (LEC) retrofit technology which can also reduce emissions from lean burn reciprocating engines by an average of 89%. LEC involves modifying the combustion system to achieve very lean combustion conditions (high air-to-fuel ratios). Selective Catalytic Reduction (SCR) can also be used either alone or in conjunction with the above technologies to reduce NO_X emissions from reciprocating engines or turbines by 90%. In addition, Non-Selective Catalytic Reduction (NSCR) can be used for rich-burn natural gas engines.[8]

SO_2 emissions from incinerators and flares could be avoided by installing sulfur recovery units to remove sulfur from the waste gases prior to incineration or flaring.[9] These emissions can also be reduced by compressing sulfur-containing acid gases and injecting these gases into non-producing rock formations.[10] Flue gas scrubbing has also been used to control SO_2 emissions from incinerators.[11,12] SO_2 emissions from existing sulfur recovery units can be reduced by adding additional recovery stages, or by adding a tail gas treatment unit.[12] In some cases, it may be possible to avoid SO_2 emissions from process heaters by substituting a lower-sulfur sweetened natural gas for the gas currently being burned. A number of options are available to

Table 4-2. Control Options for Oil and Gas Production and Exploration

Source Type	Control Technology	Pollutant controlled	Baseline emissions (1000 tons/yr)	Estimated control efficiency (%)	Potential emission reduction (1000 tons/year)	Refer-ences
Compressor engines and gas fueled reciprocating engines	Air-fuel ratio adjustment	NO_X	166	10 - 40	17 - 66	2,5
	Ignition timing retard	NO_X	166	15 - 30	25 - 50	2
	Low-emission combustion (LEC) retrofit	NO_X	166	80 - 90	130 - 150	2,5
	SCR	NO_X	166	90	150	2,8,12
	NSCR	NO_X	a	90 - 99	a	8
		VOC	a	40 - 85	a	8
	Replacement with electric motors	NO_X	166	100	166	2
		SO_2	0.30	100	0.30	
		PM_{10}	0.21	100	0.21	
		$PM_{2.5}$	0.21	100	0.21	
		EC	0.08	100	0.08	
		OC	0.05	100	0.05	
		VOC	5.9	100	5.9	
		Overall[b]	172		172	
Drilling rig engines and other diesel engines	Ignition timing retard	NO_X	60	15 - 30	9 - 18	2
	Exhaust gas recirculation	NO_X	60	40	24	2
	SCR	NO_X	60	80 - 95	48 - 57	2,8,12
	Replacement of Tier 2 engines with Tier 4	NO_X	60	87	52	2
		PM_{10}	0.2	85	0.2	2
		$PM_{2.5}$	0.2	85	0.2	
		EC	0.1	85	0.1	
		OC	0.1	85	0.1	
		VOC	8.0	87	6.9	2
		Overall[b]	68		59	
	Diesel oxidation catalyst	PM_{10}	0.23	25	0.06	2
		$PM_{2.5}$	0.18	25	0.05	
		EC	0.10	25	0.03	
		OC	0.08	25	0.02	
		VOC	8.0	90	7.2	2
		Overall[b]	8.2		7.3	
Turbines	Water or steam injection	NO_X	47	68 - 80	32 - 38	11
	Low-NO_X burner (LNB)	NO_X	47	68 - 84	32 - 39	11
	SCR	NO_X	47	90	42	6,7,12
	Water or steam injection with SCR	NO_X	47	93 - 96	44 - 45	11

Table 4-2. Control Options for Oil and Gas Production and Exploration

Source Type	Control Technology	Pollutant controlled	Baseline emissions (1000 tons/yr)	Estimated control efficiency (%)	Potential emission reduction (1000 tons/year)	Refer-ences
Flares	Add or expand sulfur recovery unit	SO_2	8.5	90 - 95	c	9
	Acid gas injection	SO_2	8.5	100	c	10
Incinerators	Spray dryer absorber	SO_2	9.0	80 - 95	7.2 - 8.6	12
	Wet FGD	SO_2	9.0	90 - 99	8.1 - 9	11,12
	Acid gas injection	SO_2	9.0	100	c	10
Sulfur recovery units	Additional recovery stages	SO_2	2.4	94 - 96	2.2 - 2.3	11,14
	Tail gas treatment unit (TGTU)	SO_2	2.4	90 - 99.5	2.1 - 2.4	11,14
Process heaters	Substitution of lower sulfur fuel	SO_2	4.0	up to 90	0 - 3.6	9,12
	LNB	NO_X	3.1	40	1.2	13,14
	ULNB	NO_X	3.1	75 - 85	2.3 - 2.6	12,13,14
	LNB and FGR	NO_X	3.1	48	1.5	13,14
	SNCR	NO_X	3.1	60	1.9	12,13,14
	SCR[d]	NO_X	3.1	70 - 90	2.2 - 2.8	12,13,14
	LNB and SCR	NO_X	3.1	70 - 90	2.2 - 2.8	12,13,14
Glycol dehydrators	Optimize glycol circulation rate	VOC	3.8	33 - 67	1.3 - 2.6	2

[a]NSCR applies only to rich-burn engines. The distribution of emissions between rich-burn and lean-burn engines is not known.

[b]For control measures reducing multiple pollutants, overall emissions and emission reductions reflect the sum of all pollutants. However, EC, OC, and PM2.5 are components of PM10, and therefore are not added separately to the totals.

[c]Insufficient information is available in the emissions inventory to determine the percentage of flare or incinerator emissions in this category that is amenable to these control strategies.

[d]SCR can be used for mechanical draft process heaters. Natural draft heaters would have to be converted to mechanical draft for installation of SCR.

reduce NO_X emissions from process heaters. Combustion modifications including low-NO_X burners (LNB), ultralow-NO_X burners (ULNB), and flue gas recirculation (FGR) reduce the formation of NO_X. In addition, flue gases from the process heaters can be treated with selective catalytic reduction (SCR) or selective non-catalytic reduction (SNCR) to reduce NO_X emissions. These post-combustion controls can be used either alone or in conjunction with combustion controls.[13,14]

4.1 Factor 1 – Costs

Table 4-3 provides cost estimates for the emission control options which have been identified for oil and gas production and exploration operations. For each option, the table gives an estimate of the capital cost to install the necessary equipment, and the total annual cost of control, including the amortized cost associated with the capital equipment cost. The capital and annual cost figures are expressed in terms of the cost per unit of engine size or per unit of process throughput. Engine size is expressed in horsepower for reciprocating engines and MMBtu/hour for turbines. Throughput for process heaters is also expressed in MMBtu/hour. Process throughput for sulfur recovery units is expressed in terms of the amount of sulfur recovered.

Sulfur recovery units are believed to be more cost-effective than post-combustion controls for reducing SO_2 emissions from flares and incinerators at oil and gas production operations. Recent analyses of controls for Regional Haze precursors have focused on add-on controls for SO_2, rather than such process modifications. However, costs of sulfur recovery units were estimated in an earlier study of model refineries in different size ranges.[9] These estimates have been updated to current dollars using the Chemical Engineering plant cost index.

Table 4-3 shows a range of values for each cost figure, since the cost per unit of process throughput size will depend on the process size and other factors. The lower ends of the cost ranges typically reflect larger engines or processes, and the higher ends of the cost ranges typically reflect smaller engines or processes. The table also shows the estimated cost effectiveness for each control measure, in terms of the cost per ton of emission reduction.

4.2 Factor 2 – Time Necessary for Compliance

Once a state decides to adopt a particular control strategy, up to 2 years will be needed to develop the necessary rules to implement the strategy. We have estimated that sources may then require up to a year to procure the necessary capital to purchase control equipment. The Institute of Clean Air Companies (ICAC) has estimated that approximately 13 months is required to design, fabricate, and install SCR or SNCR technology for NO_X control.[15] However, the time necessary will depend on the type and size of the unit being controlled. For instance, state regulators' experience indicates that closer to 18 months is required to install this technology.[16] In the CAIR analysis, EPA estimated that approximately 30 months is required to design, build, and install SO_2 scrubbing technology for a single emission source.[17] The analysis also estimated that up to an additional 12 months may be required for staging the installation process if multiple sources are to be controlled at a single facility. Based on these figures, the total time required to achieve emission reductions for oil and gas production and exploration operations is estimated at a total of 6½ years.

Table 4-3. Estimated Costs of Control for Oil and Gas Production and Exploration

Source Type	Control Technology	Pollutant controlled	Estimated control efficiency (%)	Estimated capital cost ($/unit)	Estimated annual cost ($/year /unit)	Units	Cost effectiveness ($/ton)	Refer-ences
Compressor engines	Air-fuel ratio adjustment	NO_X	10 - 40	5.3 - 42	0.9 - 6.8	hp	68 - 2,500	2,5
	Ignition timing retard	NO_X	15 - 30	na	1 - 3	hp	42 - 1,200	2
	LEC retrofit	NO_X	80 - 90	120 - 820	30 - 210	hp	320 - 2,500	5
	SCR	NO_X	90	100 - 450	40 - 270	hp	870 - 31,000	2,8,12
	NSCR[a]	NO_X	90 - 99	17 - 35	3 - 6	hp	16 - 36	8
		VOC	40 - 85				1,500 - 6,200	8
		Overall[b]					16 - 36	
	Replacement with electric motors	NO_X	100	120 - 140	38 - 44	hp	100 - 4,700	2
		SO_2					>55,000	
		PM_{10}					>79,000	
		$PM_{2.5}$					>79,000	
		EC					>205,000	
		OC					>319,000	
		VOC					3,000 - 130,000	
		Overall[b]					100 - 4,500	
Drilling rig engines and other engines	Ignition timing retard	NO_X	15 - 30	16 - 120	14 - 66	hp	1,000 - 2,200	2
	EGR	NO_X	40	100	26 - 67	hp	780 - 2,000	2
	SCR	NO_X	80 - 95	100 - 2,000	40 - 1,200	hp	3,000 - 7,700	2,8,12
	Replacement of Tier 2 engines with Tier 4	NO_X	87	125	20	hp	900 - 2,400	2
		PM_{10}	85	125	20	hp	25,000 - 68,000	2
		$PM_{2.5}$						
		EC						
		OC						
		VOC	87	125	20	hp	22,000 - 59,000	2
		Overall[b]					840 - 2,200	
	Diesel oxidation catalyst	PM_{10}	25	10	1.7	hp	1400	2
		$PM_{2.5}$					1400	
		EC					3,300	
		OC					4,200	
		VOC	90	10	1.7	hp	350	2
		Overall[b]					280	

Table 4-3. Estimated Costs of Control for Oil and Gas Production and Exploration

Source Type	Control Technology	Pollutant controlled	Estimated control efficiency (%)	Estimated capital cost ($/unit)	Estimated annual cost ($/year /unit)	Units	Cost effectiveness ($/ton)	References
Turbines	Water or steam injection	NO_X	68 - 80	4.4 - 16	2 - 5	1000 BTU	560 - 3,100	7
	Low-NO_X burners[c]	NO_X	68 - 84	8 - 22	2.7 - 8.5	1000 BTU	2,000 - 10,000	7
	SCR	NO_X	90	13 - 34	5.1 - 13	1000 BTU	1,000 - 6,700	6,7,12
	Water or steam injection with SCR	NO_X	93 - 96	13 - 34	5.1 - 13	1000 BTU	1,000 - 6,700	7
Flares	Add or expand sulfur recovery unit	SO_2	90 - 95	0.1 - 1.1	28 - 190	ton-Sulfur/year	14 - 95	9
	Acid gas injection	SO_2	100					10
Incinerators	Spray dryer absorber	SO_2	80 - 95				1,500-1,900	12
	Wet FGD	SO_2	90 - 99				1,500 - 1,800	11,12
	Acid gas injection	SO_2	100					10
Sulfur recovery units	Additional recovery stages	SO_2	94 - 96					11,14
	Tail gas treatment unit (TGTU)	SO_2	90 - 99.5				1,100 - 1,200	11,14
Process heaters	Substitution of lower sulfur fuel	SO_2	up to 90					9,12
	LNB	NO_X	40	3.8 - 7.6	0.41 - 0.81	1000 BTU	2,100 - 2,800	13,14
	ULNB	NO_X	75 - 85	4.0 - 13	0.43 - 1.3	1000 BTU	1,500 - 2,000	12,13,14
	LNB and FGR	NO_X	48	16	1.7	1000 BTU	2,600	13,14
	SNCR	NO_X	60	10 - 22	1.1 - 2.4	1000 BTU	4,700 - 5,200	12,13,14
	SCR[d]	NO_X	70 - 90	33 - 48	3.7 - 5.6	1000 BTU	2,900 - 6,700	12,13,14
	LNB and SCR	NO_X	70 - 90	37 - 55	4 - 6.3	1000 BTU	2,900 - 6,300	12,13,14
Glycol dehydrators	Optimize glycol circulation rate	VOC	33 - 67	31 - 170	5 - 28	gal/hr		2

[a]NSCR applies only to rich-burn engines. The distribution of emissions between rich-burn and lean-burn engines is not known.

[b]For control measures reducing multiple pollutants, the overall cost-effectiveness is the cost per total reduction of all pollutants. However, EC, OC, and PM2.5 are components of PM10, and therefore are not added separately to the emission reduction total.

[c]Costs estimates for low-NO_X burners for turbines reflect the incremental costs of new low-NO_X burners versus standard burners. Retrofit costs for existing burners were not available.

[d]SCR cost estimates for process heaters apply to mechanical draft heaters. Natural draft heaters would have to be converted to mechanical draft for installation of SCR. This would increase both the capital and annualized costs of control by about 10%.

4.3 Factor 3 – Energy and Other Impacts

Table 4-4 shows the estimated energy and non-air pollution impacts of control measures for sources at oil and gas production and exploration operations. For gas-fired reciprocating engines and diesel engines, air-to-fuel-ratio adjustments and ignition retarding technologies have been found to increase fuel consumption by up to 5%, with a typical value of about 2.5%.[18,19] This increased fuel consumption would result in increased CO_2 emissions. LEC technology is not expected to increase fuel consumption; and may provide some fuel economy.[18]

Diesel oxidation catalyst and diesel filtration technologies would produce an increase in fuel consumption in order to overcome the pressure drop through the catalyst bed and the filter. In the case of diesel oxidation catalyst, the catalyst would have to be changed periodically, producing an increase in solid waste disposal.[20] If diesel reciprocating engines are replaced with electric motors, there would be an increase in electricity demand, but this would be offset by the fuel consumption that would be avoided by replacing the engine.

For turbines, water injection and steam injection would require electricity to operate pumps and ancillary equipment.[20] Water injection would produce an increase in fuel consumption in order to evaporate the water, and steam injection would require energy to produce the steam. The increased electricity, steam, and fuel demands would produce additional CO_2 emissions.

Installation of SCR on any type of engine would cause a small increase in fuel consumption, about 0.5%, in order to force the exhaust gas through the catalyst bed.[18] This would produce an increase in CO_2 emissions to generate the electricity. In addition, spent catalyst would have to be changed periodically, producing an increase in solid waste disposal.[20]

Sulfur recovery units require electricity and steam. Wet or dry scrubbers applied to incinerators and tail gas treatment units applied to sulfur recovery units would use electricity for the fan power needed to overcome the scrubber pressure drop. These systems would also produce solid waste, and wet scrubbers would produce wastewater which would require treatment. Injection of acid gases would require the consumption of fuel to compress the gases. However, this option would also result in the sequestration of CO2 present in the injected gas stream.[10]

Low-NO_X burners for process heaters are expected to improve overall fuel efficiency. FGR would require additional electricity to recirculate the fuel gas into the heater. In SCR systems for process heaters, fans would be required to overcome the pressure drop through the catalyst bed. The fans would require electricity, with resultant increases in CO_2 to generate the electricity. In addition, spent catalyst would have to be changed periodically, producing an increase in solid waste disposal.[20]

Table 4-4. Estimated Energy and Non-Air Environmental Impacts of Potential Control Measures for Oil and Gas Production and Exploration

					Energy and non-air pollution impacts (per ton of emission reduced)				
Source Type	Control Technology	Pollutant controlled	Potential emission reduction (1000 tons/year)	Additional fuel requirement (%)	Electricity requirement (kW-hr)	Steam requirement (tons steam)	Solid waste produced (tons waste)	Wastewater produced (1000 gallons)	Additional CO_2 emitted (tons)
Compressor engines	Air-fuel ratio adjustment	NO_X	17 - 66	a					
	Ignition retarding technologies	NO_X	25 - 50	a					
	LEC retrofit	NO_X	130 - 150	a					
	SCR	NO_X	150	0.5			0.008		0.43
	NSCR	NO_X, VOC	e	0.5			0.008		0.24
	Replacement with electric motors	NO_X	166	(100)	66,000				b
Drilling rig engines and other engines	Ignition timing retard	NO_X	9 - 18	a					
	EGR	NO_X	24	2.7					2.0
	SCR	NO_X	48 - 57	0.5			0.008		0.38
	Replacement of Tier 2 engines with Tier 4	NO_X	52	c					c
		$PM_{2.5}$, PM_{10}, EC, OC	0.2	c					c
		VOC	6.9	c					c
		Total[e]	59						
	Diesel oxidation catalyst	$PM_{2.5}$, PM_{10}, EC, OC	0.1	0.5			b		316
		VOC	7.2						2.5
		Total[f]	7.3						2.6[e]
Turbines	Water or steam injection	NO_X	32 - 38	a		31			8.1
	Low-NO_X burner (LNB)	NO_X	32 - 39	a					
	SCR		42	a					
	Water or steam injection with SCR	NO_X	44 - 45	0.45			0.026		1.7

Table 4-4. Estimated Energy and Non-Air Environmental Impacts of Potential Control Measures for Oil and Gas Production and Exploration

Source Type	Control Technology	Pollutant controlled	Potential emission reduction (1000 tons/year)	Additional fuel requirement (%)	Energy and non-air pollution impacts (per ton of emission reduced): Electricity requirement (kW-hr)	Steam requirement (tons steam)	Solid waste produced (tons waste)	Wastewater produced (1000 gallons)	Additional CO_2 emitted (tons)
Process heaters	Substitution of lower sulfur fuel	SO_2	0 - 3.6	b					b
	LNB	NO_X	1.2	a	g				
	ULNB	NO_X	2.3 - 2.6	a	g				
	LNB and FGR	NO_X	1.5		3,300				3.3
	SNCR	NO_X	1.9	0.16	460				3.2
	SCR	NO_X	2.2 - 2.8		8,400		0.073		8.4
	LNB and SCR	NO_X	2.2 - 2.8		8,400		0.073		8.4
Flares	Add or expand sulfur recovery unit	NO_X	up to 8.5		270	3.2	<0.01		1.1
	Acid gas injection	SO_2	up to 8.5	d					h
Incinerators	Spray dryer absorber	SO_2	7.2 - 8.6		400		3.7		1.1
	Wet FGD	SO_2	8.1 - 9		1,100	3.1	2.8	3.7	2.6
	Acid gas injection	SO_2	up to 9.0	d					h
Sulfur recovery units	Additional recovery stages	SO_2	2.2 - 2.3		270	3.2	<0.01		1.1
	Tail gas treatment unit (TGTU)	SO_2	2.1 - 2.4		190	3.5		3.7	1.1
Glycol dehydrators	Optimize glycol circulation rate	VOC	1.3 - 2.6	a					

NOTES:

blank indicates no impact is expected.

[a]The measure is expected to improve fuel efficiency.

[b]CO_2 from the generation of electricity would be offset by avoided emissions due to replacing the diesel engine

[c]EPA has estimated that the control measures used to meet Tier 4 standards will be integrated into the engine design so that sacrifices in fuel economy will be negligible.

[d]Some impact is expected but insufficient information is available to evaluate the impact.

[e]NSCR applies only to rich-burn engines. The distribution of emissions between rich-burn and lean-burn engines is not known.

[f]For control measures reducing multiple pollutants, energy and other impacts are expressed as the impact per per total reduction of all pollutants. (However, EC, OC, and $PM_{2.5}$ are components of PM_{10}, and therefore are not added separately to the emission reduction total.)

[g]Some designs of low-NOX burners and ultralow-NOX burners require the use of pressurized air supplies. This would require additional electricity to pressurize the combustion air.

[h]Acid gas injection is also expected to result in sequestration of the CO_2 present in the acid gas stream.

4.4 Factor 4 – Remaining Equipment Life

Information was not available on the age of oil and gas production and exploration equipment in the WRAP region. The remaining lifetime of most equipment is expected to be longer than the projected lifetime of pollution control technologies which have been analyzed for this category. In the case of add-on technologies, the projected lifetime is 15 years.

If the remaining life of an emission source is less than the projected lifetime of a pollution control device, then the capital cost of the control device would have to be amortized over a shorter period of time, corresponding to the remaining lifetime of the emission source. This would cause an increase in the amortized capital cost of the pollution control option, and a corresponding increase in the total annual cost of control. This increased cost can be quantified as follows:

$$A_1 = A_0 + C \times \frac{1-(1+r)^{-m}}{1-(1+r)^{-n}}$$

where:

A_1 = the annual cost of control for the shorter equipment lifetime ($)
A_0 = the original annual cost estimate ($)
C = the capital cost of installing the control equipment ($)
r = the interest rate (0.07)
m = the expected remaining life of the emission source (years)
n = the projected lifetime of the pollution control equipment

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5. Natural Gas Processing Operations

Natural gas processing facilities carry out a number of operations to remove impurities from natural gas before it is piped to consumers. In addition, the gas is typically fractionated to remove propane and heavier hydrocarbons, which are then processed as separate products. Emission sources at natural gas processing facilities include many of the same sources found at gas production operations, discussed in the previous chapter. Turbines and natural gas reciprocating engines are used to drive compressors and other equipment. Flares and incinerators are used to dispose of waste gases, and process heaters are used in various operations. In addition, emissions of SO_2 emanate from sulfur recovery operations at sour natural gas processing plants.

Table 5-1 summarizes emissions from the natural gas processing industry, broken down by state and by the various emission sources. Point source emissions of NO_X, SO_2, and VOC from these operations were extracted from the 2002 WRAP emissions inventory, which catalogs emission sources by their Standard Industrial Classification (SIC).[1] SIC 132 covers natural gas processing. Estimates for PM_{10} and $PM_{2.5}$ were extracted from the 2002 NEI, which also classifies emissions by SIC. It must be noted that the point source emissions in Table 5-1 for reciprocating engines and turbines in the natural gas processing industry are also included in the emission totals reported in Table 3-1 for all reciprocating engines and turbines. However, these emissions are separate from those reported in Table 4-1 for the oil and gas production and exploration sector.

Total NO_X emissions from natural gas processing are estimated at about 31,000 tons/year, and SO_2 emissions are estimated at about 12,000 tons/year. These emissions represent about 2% of stationary source (point and area source) NO_X emissions, and 1% of stationary source SO_2 emissions in the region.

PM_{10} and $PM_{2.5}$ emissions from natural gas processing facilities are estimated to be an order of magnitude lower than NO_X emissions. Emissions of OC and EC are not specifically quantified in either the WRAP inventory or the NEI, but can be estimated as a percentage of PM_{10} emissions using data from EPA's SPECIATE database.[2] EC and OC are estimated to comprise 38.4% and 24.7% of natural gas combustion PM_{10} emissions, respectively.

Emissions from individual reciprocating engines at natural gas processing plants range up to about 1,000 tons per year, compared with 1,373 tons per year for the largest natural gas fired reciprocating engines at industrial facilities. Emissions from individual turbines range up to 338 tons of NO_X per year, compared with 845 tons per year for the largest natural gas turbines at industrial facilities.[1]

Table 5-2 lists potential control measures for natural gas processing emissions. The table includes options for reciprocating engines and turbines, process heaters, flares and incinerators, and sulfur recovery units. As discussed in Chapter 3, a number of options are available to control emissions from gas-fired reciprocating engines, diesel-fueled reciprocating engines, and

Table 5-1. Emissions from Natural Gas Processing in the WRAP Region

Emission source	AK	CA	CO	MT	ND	NM	NV	UT	WY	Tribes	Total
					NO_X emissions (tons/year)						
Reciprocating engines (natural gas)	86	626	1,027	33	2,428	15,976	0	612	1,935	1,140	23,863
Turbines	1,533	11	107	0	0	4,317	0	0	27	486	6,482
Process heaters	19	7	30	0	55	263	0	1	122	1	498
Boilers	1	29	60	0	0	193	0	20	6	26	335
Flares	0	14	1	0	0	56	0	1	25	0	97
Other[a]	0	14	5	0	10	122	0	1	82	0	234
Total	1,639	686	1,228	33	2,493	20,871	0	634	2,172	1,654	31,411
					SO_2 emissions (tons/year)						
Sulfur recovery units	0	0	0	0	1,604	4,739	0	0	196	0	6,539
Flares	0	1	0	0	67	3,628	0	0	506	0	4,203
Incinerators	0	0	0	0	358	417	0	0	0	0	775
Process heaters	0	0	0	0	0	274	0	0	0	7	281
Other[a]	0	1	1	0	0	14	0	0	6	113	136
Total	0	2	1	0	2,030	9,072	0	0	708	119	11,934
					PM_{10} emissions (tons/year)						
Reciprocating engines - natural gas	0	3	0	0	25	70	0	4	0	0	102
Other[a]	2	3	4	0	0	20	0	1	1	0	31
Total	2	6	4	0	25	90	0	5	1	0	134
					$PM_{2.5}$ emissions (tons/year)						
Reciprocating engines - natural gas	0	3	0	0	25	70	0	3	0	0	102
Other[a]	2	3	4	0	0	19	0	1	1	0	30
Total	2	6	4	0	25	90	0	4	1	0	131
					VOC emissions (tons/year)						
Storage	0	10	52,006	0	5	395	0	12	146	35	52,610
Reciprocating engines	0	687	102	20	44	1,135	0	13	278	29	2,308
Fugitive emissions	0	308	91	0	0	317	0	5	242	132	1,095
Glycol dehydrator	0	2	118	0	0	113	0	31	55	5	324
Turbines	10	0	0	0	0	187	0	0	0	21	219
Other[a]	1	89	210	0	2	54	0	90	35	35	515
Total	11	1,095	52,527	20	51	2,202	0	151	757	257	57,070

[a]Includes glycol dehydrator reboilers, incinerators, amine treatment units, and sources not specifically classified in the emissions inventory. For SO_2, incinerators are broken out separately.

Table 5-2. Control Options for Natural Gas Processing

Source Type	Control Technology	Pollutant controlled	Baseline emissions (1000 tons/yr)	Estimated control efficiency (%)	Potential emission reduction (1000 tons/year)	Refer-ences
Reciprocating engines, gas	Air-fuel ratio adjustment	NO_X	24	10 - 40	2 - 10	3,7
	Ignition timing retard	NO_X	24	15 - 30	4 - 7	3,7
	Low-emission combustion (LEC) retrofit	NO_X	24	80 - 90	19 - 21	4,7
	SCR	NO_X	24	90	21	7,8,12
	NSCR	NO_X	a	90 - 99	a	8
		VOC	a	40 - 85	a	8
	Replacement with electric motors	NO_X	24	100	24	7
		PM_{10}	0.10	100	0.10	
		$PM_{2.5}$	0.10	100	0.10	
		EC	0.04	100	0.04	
		OC	0.03	100	0.03	
		VOC	2	100	2	
		Overall[b]	26		26	
Turbines	Water or steam injection	NO_X	6.5	68 - 80	4.4 - 5.2	6
	Low-NO_X burner (LNB)	NO_X	6.5	68 - 84	4.4 - 5.4	6
	SCR	NO_X	6.5	90	5.8	5,6
	Water or steam injection with SCR	NO_X	6	93 - 96	6	6
Process heaters	Substitution of lower sulfur fuel	SO_2	0.28	up to 90	0 - 0.25	9,12
	LNB	NO_X	0.50	40	0.20	13,14
	ULNB	NO_X	0.50	75 - 85	0.37 - 0.42	12,13,14
	LNB and FGR	NO_X	0.50	48	0.24	13,14
	SNCR	NO_X	0.50	60	0.30	12,13,14
	SCR[c]	NO_X	0.50	70 - 90	0.35 - 0.45	12,13,14
	LNB and SCR	NO_X	0.50	70 - 90	0.35 - 0.45	12,13,14
Boilers	LNB with OFA	NO_X	0.33	30 - 50	0.1 - 0.17	11,12
	LNB, OFA, and FGR	NO_X	0.33	30 - 50	0.1 - 0.17	11,12
	SNCR	NO_X	0.33	30 - 75	0.1 - 0.25	11,12
	SCR	NO_X	0.33	40 - 90	0.13 - 0.3	11,12
Flares	Add or expand sulfur recovery unit	SO_2	4.2	90 - 95	d	9
	Acid gas injection	SO_2	4.2	100	d	10
Sulfur recovery units for amine treatment units	Additional recovery stages	SO_2	6.5	94 - 96	6.1 - 6.3	11,14
	Tail gas treatment unit (TGTU)	SO_2	6.5	90 - 99.5	5.9 - 6.5	11,14
Incinerators	Spray dryer absorber	SO_2	0.78	80 - 95	0.62 - 0.74	12
	Wet FGD	SO_2	0.78	90 - 99	0.7 - 0.77	11,12
	Acid gas injection	SO_2	0.78	100	d	10
Glycol dehydrators	Optimize glycol circulation rate	VOC	0.32	33 - 67	0.11 - 0.22	7

[a]NSCR applies only to rich-burn engines. The distribution of emissions between rich-burn and lean-burn engines is not

[b]For control measures reducing multiple pollutants, overall emissions and emission reductions reflect the sum of all pollutants. However, EC, OC, and PM2.5 are components of PM10, and therefore are not added separately to the totals.

[c]SCR can be used for mechanical draft process heaters. Natural draft heaters would have to be converted to mechanical draft for installation of SCR.

[d]Insufficient information is available in the emissions inventory to determine the percentage of flare or incinerator emissions in this category that is amenable to these control strategies.

turbines.[3,4,5,6,7,8] Reciprocating engines can be designed to operate under rich fuel mixture, or lean fuel mixture conditions. Air-to-fuel-ratio adjustments and ignition retarding technologies can be used to control emissions under either fuel mixture condition. Low-Emission Combustion (LEC) retrofit technology can also reduce emissions from lean burn reciprocating engines by an average of 89%. LEC involves modifying the combustion system to achieve very lean combustion conditions (high air-to-fuel ratios). Selective Catalytic Reduction (SCR) can also be used either alone or in conjunction with the above technologies to reduce NO_X emissions from reciprocating engines or turbines by 90%. In addition, Non-Selective Catalytic Reduction (NSCR) can be used for rich-burn natural gas engines.[8]

SO_2 emissions from incinerators and flares could be reduced by installing sulfur recovery units to remove sulfur from the waste gases prior to incineration or flaring.[9] These emissions can also be reduced by compressing sulfur-containing acid gases and injecting these gases into non-producing rock formations.[10] Flue gas scrubbing has also been used to control SO_2 emissions from incinerators.[11,12] SO_2 emissions from existing sulfur recovery units can be reduced by adding additional recovery stages, or by adding a tail gas treatment unit.[12] In some cases, it may be possible to avoid SO_2 emissions from process heaters by substituting a lower-sulfur sweetened natural gas for the gas currently being burned. A number of options are available to reduce NO_X emissions from process heaters. Combustion modifications including LNB, ULNB, and FGR reduce the formation of NO_X. In addition, flue gases from the process heaters can be treated with SCR or SNCR to reduce NO_X emissions. These post-combustion controls can be used either alone or in conjunction with combustion controls.[13,14]

5.1 Factor 1 – Costs

Table 5-3 provides cost estimates for the emission control options which have been identified for the natural gas processing industry. For each option, the table gives an estimate of the capital cost to install the necessary equipment, and the total annual cost of control, including the amortized cost associated with the capital equipment cost. The capital and annual cost figures are expressed in terms of the cost per unit of engine size or per unit of process throughput. Engine size is expressed in horsepower for reciprocating engines and MMBtu/hour for turbines. Throughput for process heaters is also expressed in MMBtu/hour. Process throughput for sulfur recovery units is expressed in terms of the amount of sulfur recovered.

Sulfur recovery units are believed to be more cost-effective than post-combustion controls for reducing SO_2 emissions from flares and incinerators at natural gas processing facilities. Recent analyses of controls for Regional Haze precursors have focused on add-on controls for SO_2, rather than such process modifications. However, costs of sulfur recovery units were estimated in an earlier study of model refineries in different size ranges.[9] These estimates have been updated to current dollars using the Chemical Engineering plant cost index.

Table 5-3 shows a range of values for each cost figure, since the cost per unit of throughput will depend on the engine or process size and other factors. The lower ends of the cost ranges typically reflect larger engine or process sizes, and the higher ends of the cost ranges typically reflect smaller engine or process sizes. The table also shows the estimated cost effectiveness for each control measure, in terms of the cost per ton of emission reduction.

5.2 Factor 2 – Time Necessary for Compliance

Once a state decides to adopt a particular control strategy, up to 2 years will be needed to develop the necessary rules to implement the strategy. We have estimated that sources may then require up to a year to procure the necessary capital to purchase control equipment. The Institute of Clean Air Companies (ICAC) has estimated that approximately 13 months is required to design, fabricate, and install SCR or SNCR technology for NO_X control.[15] However, the time necessary will depend on the type and size of the unit being controlled. For instance, state regulators' experience indicates that closer to 18 months is required to install this technology.[16] In the CAIR analysis, EPA estimated that approximately 30 months is required to design, build, and install SO_2 scrubbing technology for a single emission source.[17] The analysis also estimated that up to an additional 12 months may be required for staging the installation process if multiple sources are to be controlled at a single facility. Based on these figures, the total time required achieve emission reductions for natural gas processing facilities is estimated at a total of 6½ years.

5.3 Factor 3 – Energy and Other Impacts

Table 5-4 shows the estimated energy and non-air pollution impacts of control measures for sources at natural gas processing facilities. For gas-fired reciprocating engines and diesel engines, air-to-fuel-ratio adjustments and ignition retarding technologies have been found to increase fuel consumption by up to 5%, with a typical value of about 2.5%.[18,19] This increased fuel consumption would result in increased CO_2 emissions. LEC technology is not expected to increase fuel consumption; and may provide some fuel economy.[18]

For turbines, water injection and steam injection would require electricity to operate pumps and ancillary equipment.[13] Water injection would produce an increase in fuel consumption in order to evaporate the water, and steam injection would require energy to produce the steam. The increased electricity, steam, and fuel demands would produce additional CO_2 emissions.

Installation of SCR on any type of engine would cause a small increase in fuel consumption, about 0.5%, in order to force the exhaust gas through the catalyst bed.[18] This would produce an increase in CO_2 emissions to generate the electricity. In addition, spent catalyst would have to be changed periodically, producing an increase in solid waste disposal.[13]

Table 5-3. Estimated Costs of Control for Natural Gas Processing

Source Type	Control Technology	Pollutant controlled	Estimated control efficiency (%)	Estimated capital cost ($/unit)	Estimated annual cost ($/year /unit)	Units	Cost effectiveness ($/ton)	Refer-ences
Reciprocating engines, gas	Air-fuel ratio adjustment	NO_X	10 - 40	5.3 - 42	0.9 - 6.8	hp	68 - 2,500	3,7
	Ignition timing retard	NO_X	15 - 30	na	1 - 3	hp	42 - 1,200	3,7
	LEC retrofit	NO_X	80 - 90	120 - 820	30 - 210	hp	320 - 2,500	4,7
	SCR	NO_X	90	100 - 450	40 - 270	hp	870 - 31,000	7,8,12
	NSCR[a]	NO_X	90 - 99	17 - 35	3 - 6	hp	16 - 36	4
		VOC	40 - 85				1,500 - 6,200	4
		Overall[b]					16 - 36	
	Replacement with electric motors	all[b]	100	120 - 140	38 - 44	hp	100 - 4,700	7
Turbines	Water or steam injection	NO_X	68 - 80	4.4 - 16	2 - 5	1000 Btu/hr	560 - 3,100	6
	Low-NO_X burners[c]	NO_X	68 - 84	8 - 22	2.7 - 8.5	1000 Btu/hr	5,200 - 16,200	6
	SCR	NO_X	90	13 - 34	5.1 - 13	1000 Btu/hr	1,000 - 6,700	5,6
	Water or steam injection with SCR	NO_X	93 - 96	13 - 34	5.1 - 13	1000 Btu/hr	1,000 - 6,700	6
Process heaters	Substitution of lower sulfur fuel	SO_2	up to 90					9,12
	LNB	NO_X	40	3.8 - 7.6	0.41 - 0.81	1000 BTU	2,100 - 2,800	13,14
	ULNB	NO_X	75 - 85	4.0 - 13	0.43 - 1.3	1000 BTU	1,500 - 2,000	12,13,14
	LNB and FGR	NO_X	48	16	1.7	1000 BTU	2,600	13,14
	SNCR	NO_X	60	10 - 22	1.1 - 2.4	1000 BTU	4,700 - 5,200	12,13,14
	SCR[d]	NO_X	70 - 90	33 - 48	3.7 - 5.6	1000 BTU	2,900 - 6,700	12,13,14
	LNB and SCR	NO_X	70 - 90	37 - 55	4 - 6.3	1000 BTU	2,900 - 6,300	12,13,14
Boilers	LNB with OFA	NO_X	30 - 50				500 - 5,300	11,12
	LNB, OFA, and FGR	NO_X	30 - 50				500 - 11,000	11,12
	SNCR	NO_X	30 - 75				400 - 2,500	11,12
	SCR	NO_X	40 - 90				2,400 - 7,200	11,12
Flares	Add or expand sulfur recovery unit	NO_X	90 - 95	0.1 - 1.1	28 - 190	ton-Sulfur/year	14 - 95	9
	Acid gas injection	SO_2	95					10
Sulfur recovery units for amine treatment units	Additional recovery stages	SO_2	94 - 96	0.1 - 1	28 - 150	ton-Sulfur/year	14 - 75	9
	Tail gas treatment unit (TGTU)	SO_2	90 - 99.5	0.3 - 1.1	67 - 190	ton-Sulfur/year	33 - 95	9
Incinerators	Spray dryer absorber	SO_2	80 - 95				1,500-1,900	12
	Wet FGD	SO_2	90 - 99				1,500 - 1,800	11,12
	Acid gas injection	SO_2	100					10
Glycol dehydrators	Optimize glycol circulation rate	VOC	33 - 67	31 - 170	5 - 28	gal/hr		7

[a]NSCR applies only to rich-burn engines. The distribution of emissions between rich-burn and lean-burn engines is not known.

[b]For control measures reducing multiple pollutants, the overall cost-effectiveness is the cost per total reduction of all pollutants. However, EC, OC, and PM2.5 are components of PM10, and therefore are not added separately to the emission reduction total.

[c]Costs estimates for low-NO_X burners for turbines reflect the incremental costs of new low-NO_X burners versus standard burners. Retrofit costs for existing burners were not available.

[d]SCR cost estimates for process heaters apply to mechanical draft heaters. Natural draft heaters would have to be converted to mechanical draft for installation of SCR. This would increase both the capital and annualized costs of control by about 10%.

Table 5-4. Estimated Energy and Non-Air Environmental Impacts of Potential Control Measures for Natural Gas Processing

					Energy and non-air pollution impacts (per ton of emission reduced)				
Source Type	Control Technology	Pollutant controlled	Potential emission reduction (1000 tons/year)	Additional fuel requirement (%)	Electricity requirement (kW-hr)	Steam requirement (tons steam)	Solid waste produced (tons waste)	Wastewater produced (1000 gallons)	Additional CO_2 emitted (tons)
Reciprocating engines	Air-fuel ratio controllers	NO_X	2 - 10	a					
	Ignition timing retard	NO_X	4 - 7	a					
	LEC retrofit	NO_X	19 - 21	a					
	SCR	NO_X	21	0.5			0.008		0.43
	NSCR	NO_X, VOC	e	0.5			0.008		0.24
	Replacement with electric motors	NO_X	24	(100)	66,000				b
Turbines	Water or steam injection	NO_X	4.4 - 5.2	a		31			8.1
	Low-NO_X burner (LNB)	NO_X	4.4 - 5.4	a					
	SCR	NO_X	5.8	0.45			0.026		1.7
	Water or steam injection with SCR	NO_X	6	0.45			0.026		1.7
Process heaters	Substitution of lower sulfur fuel	SO_2	0 - 0.25						
	LNB	NO_X	0.2	a	f				
	ULNB	NO_X	0.37 - 0.42	a	f				
	LNB and FGR	NO_X	0.24		3,300				3.3
	SNCR	NO_X	0.3	0.16	460				3.2
	SCR	NO_X	0.35 - 0.45		8,400		0.073		8.4
	LNB and SCR	NO_X	0.35 - 0.45		8,400		0.073		8.4
Boilers	LNB with OFA	NO_X	0.1 - 0.17	a					
	LNB, OFA, and FGR	NO_X	0.1 - 0.17		3,300				3.3
	SNCR	NO_X	0.1 - 0.25	0.16	460				3.2
	SCR	NO_X	0.13 - 0.3		8,400		0.073		8.4
Flares	Add or expand sulfur recovery unit	SO_2	up to 4.2		270	3.2	<0.01		1.1
	Acid gas injection	SO_2	up to 4.2	d					g
Sulfur recovery units for gas sweetening units	Additional recovery stages	SO_2	6.1 - 6.3		270	3.2	<0.01		1.1
	Tail gas treatment unit (TGTU)	SO_2	5.9 - 6.5		190	3.5		3.7	1.1
Incinerators	Spray dryer absorber	SO_2	0.62 - 0.74		400				1.1
	Wet FGD	SO_2	0.7 - 0.77		1,100	3.1		3.7	2.6
	Acid gas injection	SO_2	up to 0.78	d					g
Glycol dehydrators	Optimize glycol circulation rate	VOC	0.11 - 0.22	a					

NOTES:
blank indicates no impact is expected.
[a]The measure is expected to improve fuel efficiency.
[b]CO_2 from the generation of electricity would be offset by avoided emissions due to replacing the diesel engine
[c]EPA has estimated that the control measures used to meet Tier 4 standards will be integrated into the engine design so that sacrifices in fuel economy will be negligible.
[d]Some impact is expected but insufficient information is available to evaluate the impact.
[e]NSCR applies only to rich-burn engines. The distribution of emissions between rich-burn and lean-burn engines is not known.
[f]Some designs of low-NOX burners and ultralow-NOX burners require the use of pressurized air supplies. This would require additional electricity to pressurize the combustion air.

[g]Acid gas injection is also expected to result in sequestration of the CO_2 present in the acid gas stream.

Sulfur recovery units require electricity and steam. Wet or dry scrubbers applied to incinerators and tail gas treatment units applied to sulfur recovery units would use electricity for the fan power needed to overcome the scrubber pressure drop. These systems would also produce solid waste, and wet scrubbers would produce wastewater which would require treatment. Injection of acid gases would require the consumption of fuel to compress the gases. However, this option would also result in the sequestration of CO_2 present in the injected gas stream.[10]

Low-NO_X burners for process heaters are expected to improve overall fuel efficiency. FGR would require additional electricity to recirculate the fuel gas into the heater. In SCR systems for process heaters, fans would be required to overcome the pressure drop through the catalyst bed. The fans would require electricity, with resultant increases in CO_2 to generate the electricity. In addition, spent catalyst would have to be changed periodically, producing an increase in solid waste disposal. [13]

5.4 Factor 4 – Remaining Equipment Life

Information was not available on the age of natural gas processing equipment in the WRAP region. The remaining lifetime of most equipment is expected to be longer than the projected lifetime of pollution control technologies which have been analyzed for this category. In the case of add-on technologies, the projected lifetime is 15 years.

If the remaining life of an emission source is less than the projected lifetime of a pollution control device, then the capital cost of the control device would have to be amortized over a shorter period of time, corresponding to the remaining lifetime of the emission source. This would cause an increase in the amortized capital cost of the pollution control option, and a corresponding increase in the total annual cost of control. This increased cost can be quantified as follows:

$$A_1 = A_0 + C \times \frac{1-(1+r)^{-m}}{1-(1+r)^{-n}}$$

where:

- A_1 = the annual cost of control for the shorter equipment lifetime ($)
- A_0 = the original annual cost estimate ($)
- C = the capital cost of installing the control equipment ($)
- r = the interest rate (0.07)
- m = the expected remaining life of the emission source (years)
- n = the projected lifetime of the pollution control equipment

5.5 References for Section 5

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6. Industrial Boilers

Industrial boilers encompass the category of boilers used in manufacturing, processing, mining, and refining or any other industry to provide steam, hot water, and/or electricity. There are no specific size definitions for an industrial boiler, however for the purposes of this document, the definition described in Subpart Db of 40 CFR Part 60, New Source Performance Standards (NSPS) for Industrial, Commercial, and Institutional Steam Generating Units will be used. This NSPS regulates steam generating units with a heat input capacity between 100 to 250 MMBtu/hr (29 - 73 MW). Steam generating units greater than 250 MMBtu/hr (73 MW) are subject to the requirements of Subpart D of 40 CFR Part 60.

An industrial boiler report[1] estimated that there are approximately 43,000 industrial boilers operating in the U.S. with an aggregate capacity of 1.5 million MMBtu/hr input. The report noted that approximately half of these industrial boilers are less than 10 MMBtu/hr in size, but account for only 7% of the total capacity. The 2002 WRAP stationary point source emissions tables[2] lists a total of 2,171 facilities with industrial boilers in the 102XXX Source Classification Code (SCC). The majority of the boilers are located at facilities in the food, paper, chemicals, refining and primary metals industries. The most common fuel used for combustion is natural gas with nearly 73% of the facilities in the WRAP region operating natural gas-fired industrial boilers.

Industrial boilers in the WRAP region are estimated to emit about 43,060 tons of NO_X and 28,155 tons of SO_2, based on the 2002 emissions inventory for the region.[3] These boilers utilize the combustion of fuel which includes; coal, oil, natural gas, waste, and wood, to produce steam. Coal-fired industrial boilers comprise of 15,920 tons of NO_X, or 37% of the total NO_X emissions, and 14,376 tons, or 51% of the total SO_2 emissions from industrial boilers in the WRAP region. Industrial boilers represent about 4.1% of the total point source emissions of NO_X, and about 3.4% of the total SO_2 point source emissions in the WRAP region.

Table 6-1 shows estimated emissions of NO_X, SO_2, PM_{10}, $PM_{2.5}$, and VOC from the WRAP emissions inventory, broken down by state and fuel. The table shows that PM_{10}, $PM_{2.5}$, and VOC emissions from industrial boilers are significantly lower than the NO_X and SO_2 emissions. Emissions of PM from these sources were not included in the inventory, but are expected to be much lower than the NO_X and SO_2 emissions. As the table shows, coal-fired boilers were the most significant source of NO_X, SO_2, and VOC emissions in the WRAP region. For NO_X, coal fired boilers accounted for about 56% of the emissions from point sources, and 41% of the total stationary source emissions in the WRAP region.

Table 6-2a lists potential control measures for NO_X, SO_2, PM_{10}, $PM_{2.5}$, EC, and OC emissions from coal-fired and oil-fired industrial boilers. Table 6-2b presents control options for natural gas boilers, and Table 6-2c provides control options for wood-fired industrial boilers for each of these pollutants. Uncontrolled emission rates were obtained from the respective AP-42 section for each of the fuels.[4] Control technology options were identified using information from industrial boiler control option studies.[5] The control options were divided into appropriate control technologies for each of the four fuels; coal, oil, natural gas, and wood.

Table 6-2d lists potential control options for NO_X, SO_2, PM_{10}, $PM_{2.5}$, EC, and OC coal-fired and oil-fired industrial boilers by age. These pollutants are regulated under the Clean Air Act (CAA) to attain and maintain National Ambient Air Quality Standards (NAAQS), reduce acidic deposition, and improve visibility under regional haze regulations. To attain and maintain the NAAQS, the EPA enacted the Prevention of Significant Deterioration (PSD) regulations to establish maximum pollution concentration levels to protect public health and welfare from harmful levels of pollutants. The PSD regulations require new major sources or major modifications at existing sources to install "Best Available Control Technology (BACT)" and conduct ambient air quality analyses to show that the new source or modification will not cause or contribute to a violation of any applicable NAAQS or PSD increment. Because PSD requirements are on a case-by-case basis, the age groups were segregated into using the New Source Performance Standards (NSPS) to show control options and emission levels for coal-fired and oil-fired industrial boilers. The age groups are designated as pre-NSPS, post-NSPS, and post CAA amendments of 1990.

Table 6-1. Emissions from Industrial Boilers in the WRAP Region

Emission source	AK	AZ	CA	CO	ID	MT	ND	NM	NV	OR	SD	UT	WA	WY	Tribes	Total
						NO_X emissions (tons/year)										
Coal-fired Boilers	1,823	0	1,366	336	3,268	366	1,264	0	0	0	0	2,412	49	5,036	0	15,920
Natural gas-fired Boilers	260	786	5,555	2,706	1,184	726	140	764	114	370	224	764	2,435	685	26	16,740
Oil-fired Boilers	67	7	86	44	42	118	0	0	26	41	0	78	478	5	10	1,004
Waste-fired Boilers	0	0	49	0	480	214	94	0	0	1	0	0	72	0	0	910
Wood-fired Boilers	0	0	2,089	7	349	1,999	0	0	0	70	89	0	2,988	10	525	8,126
Total	2,150	793	9,145	3,093	5,323	3,424	1,498	765	140	481	313	3,255	6,022	5,736	561	42,700
						SO_2 emissions (tons/year)										
Coal-fired Boilers	1,421	0	139	24	2,976	128	1,284	0	0	0	0	2,831	62	5,511	0	14,376
Natural gas-fired Boilers	7	5,668	969	138	6	1	3	9	11	2	497	435	1,113	544	0	9,403
Oil-fired Boilers	55	6	127	25	113	1,241	0	3	77	234	0	52	1,444	1	14	3,391
Waste-fired Boilers	0	0	2	0	8	46	14	0	0	16	0	0	5	0	0	91
Wood-fired Boilers	0	0	161	0	7	54	0	0	0	3	6	0	622	2	33	887
Total	1,483	5,674	1,396	187	3,109	1,470	1,301	12	89	255	503	3,319	3,245	6,058	47	28,147
						PM_{10} emissions (tons/year)										
Coal-fired Boilers	0	19	37	7	468	36	12	0	0	100	0	100	0	581	0	1,361
Natural gas-fired Boilers	11	5	82	22	14	2	2	8	5	13	3	13	19	7	0	207
Oil-fired Boilers	2	2	16	3	4	54	0	0	77	26	0	1	223	79	0	488
Waste-fired Boilers	0	0	0	0	44	136	0	0	0	33	0	0	25	0	0	238
Wood-fired Boilers	0	0	671	6	41	267	0	0	0	2,025	75	0	1,035	0	0	4,119
Total	13	26	806	38	571	495	14	8	82	2,196	79	115	1,302	667	0	6,413
						$PM_{2.5}$ emissions (tons/year)										
Coal-fired Boilers	0	3	28	1	255	27	2	0	0	63	0	43	0	123	0	543
Natural gas-fired Boilers	10	4	78	22	12	2	2	7	4	12	3	10	17	6	0	190
Oil-fired Boilers	2	1	14	3	3	45	0	0	49	2	0	1	149	49	0	318
Waste-fired Boilers	0	0	0	0	2	83	0	0	0	27	0	0	25	0	0	136
Wood-fired Boilers	0	0	625	4	41	229	0	0	0	1,776	12	0	646	0	0	3,333
Total	12	8	745	29	312	386	3	7	53	1,880	15	55	837	178	0	4,520
						VOC emissions (tons/year)										
Coal-fired Boilers	6	0	3	4	31	0	9	0	0	0	0	12	0	10	0	76
Natural gas-fired Boilers	11	205	316	193	44	14	5	33	15	11	15	39	80	19	1	1,001
Oil-fired Boilers	3	0	2	1	1	0	0	0	9	1	0	1	9	1	0	28
Waste-fired Boilers	0	0	5	0	116	59	31	0	0	0	0	0	62	0	0	273
Wood-fired Boilers	0	0	373	0	15	511	0	0	0	23	47	0	284	0	110	1,363
Total	21	205	697	198	208	583	46	33	24	35	62	53	435	30	111	2,741

Table 6-2a. Control Options for Coal-Fired and Oil-Fired Industrial Boilers

Source Type	Pollutant controlled	Control Technology	Uncontrolled emissions[1,2] (lb/MMBtu)	Estimated control efficiency (%)	Potential controlled emissions (lb/MMBtu)	References
Coal-fired	NO_X	LNB	1.3	50	0.63	4, 5, 7, 9
		LNB w/OFA	1.3	50 - 65	0.63 - 0.46	4, 5, 7, 9
		SNCR	1.3	30 - 75	0.91 - 0.33	4, 5, 7, 9
		SCR	1.3	40 - 90	0.78 - 0.13	4, 5, 7, 9
	SO_2	Physical coal cleaning	1.3	10 - 40	1.2 - 0.78	4, 5, 8, 9
		Chemical coal cleaning	1.3	50 - 85	0.63 - 0.20	4, 5, 8, 9
		Use lower sulfur fuel	1.3	20 - 90	1.0 - 0.13	4, 5, 8, 9
		Dry sorbent injection	1.3	50 - 90	0.63 - 0.13	4, 5, 8, 9
		Spray dryer absorber	1.3	90	0.13	4, 5, 8, 9
		Wet FGD	1.3	90	0.13	4, 5, 8, 9
	$PM_{2.5}$, PM_{10}, EC, OC	Fabric filter	1.5	99.3	0.011	4, 5, 9
		ESP	1.5	99.3	0.011	4, 5, 9
Oil-fired	NO_X	LNB	0.34	40	0.20	4, 5, 7, 9
		LNB w/ OFA	0.34	30 - 50	0.24 - 0.17	4, 5, 7, 9
		LNB w/ OFA and FGR	0.34	30 - 50	0.24 - 0.17	4, 5, 7, 9
		SNCR	0.34	30 - 75	0.24 - 0.085	4, 5, 7, 9
		SCR	0.34	40 - 90	0.20 - 0.034	4, 5, 7, 9
	SO_2	Use lower sulfur fuel	0.67	20 - 90	0.54 - 0.067	4, 5, 8, 9
		Spray dryer absorber	0.67	90	0.067	4, 5, 8, 9
		Wet FGD	0.67	90	0.067	4, 5, 8, 9
	$PM_{2.5}$, PM_{10}, EC, OC	Fabric filter	0.044	95.8	0.0018	4, 5, 9
		ESP	0.044	95.8	0.0018	4, 5, 9

[1] Uncontrolled coal-fired emission rates calculated using AP-42 emission factors for PC, dry bottom, wall-fired, bituminous Pre-NSPS. The emission factor was converted to lb/MMBtu assuming MT coal with a heat rate of 17.5 MMBtu/ton, a sulfur content of 0.62 weight percent sulfur, and an ash content of 11.5 percent.

[2] Uncontrolled oil-fired emission rates calculated using AP-42 emission factors for No. 6 oil fired, normal firing. The emission factor was converted to lb/MMBtu assuming a distillate oil heat content of 140,000 Btu/gal, and a sulfur content of 0.60 weight percent sulfur.

Table 6-2b. Control Options for Industrial Natural Gas-Fired Boilers

Source Type	Pollutant controlled	Control Technology	Uncontrolled emissions[1] (lb/MMBtu)	Estimated control efficiency (%)	Potential controlled emissions (lb/MMBtu)	References
Natural gas-fired	NO_X	LNB	0.27	40	0.16	4, 5, 7, 9
		LNB w/ OFA	0.27	40 - 60	0.11 - 0.16	4, 5, 7, 9
		LNB w/ OFA and FGR	0.27	40 - 80	0.05 - 0.16	4, 5, 7, 9
		SNCR	0.27	30 - 75	0.19 - 0.07	4, 5, 7, 9
		SCR	0.27	70 - 90	0.08 - 0.03	4, 5, 7, 9

[1] Uncontrolled natural gas-fired emission rates calculated using AP-42 emission factors for Large Wall-Fired Boilers, >100 MMBtu/hr, Uncontrolled (Pre-NSPS).

Table 6-2c. Control Options for Industrial Wood-Fired Boilers

Source Type	Pollutant controlled	Control Technology	Uncontrolled emissions[1] (lb/MMBtu)	Estimated control efficiency (%)	Potential controlled emissions (lb/MMBtu)	References
Wood-fired	NO_X	SNCR	0.49	30 - 75	0.12 - 0.34	4, 5, 7, 9
		SCR	0.49	40 - 90	0.05 - 0.29	4, 5, 7, 9
	$PM_{2.5}$, PM_{10}	Fabric filter	0.36	95.8	0.015	4, 5, 9
		ESP	0.36	95.8	0.015	4, 5, 9

[1] Uncontrolled wood-fired emission rates calculated using AP-42 emission factors for uncontrolled dry wood combustion.

Table 6-2d. Control Options for Industrial Coal-Fired and Oil-Fired Boilers

Source Type	Pollutant controlled	Control Technology	Uncontrolled emissions[1,2] (lb/MMBtu)	Estimated control efficiency (%)	Potential controlled emissions (lb/MMBtu)	References
Coal-fired (Pre PSD Regulations)[1]	NO_X	LNB	1.3	50	0.63	4, 5, 7, 9
		LNB w/OFA	1.3	50 - 65	0.63 - 0.46	4, 5, 7, 9
		SNCR	1.3	30 - 75	0.91 - 0.33	4, 5, 7, 9
		SCR	1.3	40 - 90	0.78 - 0.13	4, 5, 7, 9
	SO_2	Physical coal cleaning	1.3	10 - 40	1.2 - 0.78	4, 5, 8, 9
		Chemical coal cleaning	1.3	50 - 85	0.63 - 0.20	4, 5, 8, 9
		Use lower sulfur fuel	1.3	20 - 90	1.0 - 0.13	4, 5, 8, 9
		Dry sorbent injection	1.3	50 - 90	0.63 - 0.13	4, 5, 8, 9
		Spray dryer absorber	1.3	90	0.13	4, 5, 8, 9
		Wet FGD	1.3	90	0.13	4, 5, 8, 9
	$PM_{2.5}$, PM_{10}, EC, OC	Fabric filter	1.5	99.3	0.011	4, 5, 9
		ESP	1.5	99.3	0.011	4, 5, 9
Oil-fired (Pre PSD Regulations)[2]	NO_X	LNB	0.34	40	0.20	4, 5, 7, 9
		LNB w/ OFA	0.34	30 - 50	0.24 - 0.17	4, 5, 7, 9
		LNB w/ OFA and FGR	0.34	30 - 50	0.24 - 0.17	4, 5, 7, 9
		SNCR	0.34	30 - 75	0.24 - 0.085	4, 5, 7, 9
		SCR	0.34	40 - 90	0.20 - 0.034	4, 5, 7, 9
	SO_2	Use lower sulfur fuel	0.67	20 - 90	0.54 - 0.067	4, 5, 8, 9
		Spray dryer absorber	0.67	90	0.067	4, 5, 8, 9
		Wet FGD	0.67	90	0.067	4, 5, 8, 9
	$PM_{2.5}$, PM_{10}, EC, OC	Fabric filter	0.044	95.8	0.0018	4, 5, 9
		ESP	0.044	95.8	0.0018	4, 5, 9
Coal-fired (Post PSD Regulations)[3]	NO_X	LNB	0.69	50	0.34	4, 5, 7, 9
		LNB w/OFA	0.69	50 - 65	0.34 - 0.24	4, 5, 7, 9
		SNCR	0.69	30 - 75	0.48 - 0.17	4, 5, 7, 9
		SCR	0.69	40 - 90	0.41 - 0.069	4, 5, 7, 9
	SO_2	Physical coal cleaning	1.3	10 - 40	1.2 - 0.78	4, 5, 8, 9
		Chemical coal cleaning	1.3	50 - 85	0.63 - 0.20	4, 5, 8, 9
		Use lower sulfur fuel	1.3	20 - 90	1.0 - 0.13	4, 5, 8, 9
		Dry sorbent injection	1.3	50 - 90	0.63 - 0.13	4, 5, 8, 9
		Spray dryer absorber	1.3	90	0.13	4, 5, 8, 9
		Wet FGD	1.3	90	0.13	4, 5, 8, 9
	$PM_{2.5}$, PM_{10}, EC, OC	Fabric filter	1.5	99.3	0.011	4, 5, 9
		ESP	1.5	99.3	0.011	4, 5, 8
Oil-fired (Post PSD Regulations)[4]	NO_X	LNB	0.34	40	0.20	4, 5, 7, 9
		LNB w/ OFA	0.34	30 - 50	0.24 - 0.17	4, 5, 7, 9
		LNB w/ OFA and FGR	0.34	30 - 50	0.24 - 0.17	4, 5, 7, 9
		SNCR	0.34	30 - 75	0.24 - 0.085	4, 5, 7, 9
		SCR	0.34	40 - 90	0.20 - 0.034	4, 5, 7, 9
	SO_2	Use lower sulfur fuel	0.67	20 - 90	0.54 - 0.067	4, 5, 8, 9
		Spray dryer absorber	0.67	90	0.067	4, 5, 8, 9
		Wet FGD	0.67	90	0.067	4, 5, 8, 9
	$PM_{2.5}$, PM_{10}, EC, OC	Fabric filter	0.044	95.8	0.0018	4, 5, 9
		ESP	0.044	95.8	0.0018	4, 5, 9

Table 6-2d. Control Options for Industrial Coal-Fired and Oil-Fired Boilers (cont.)

Source Type	Pollutant controlled	Control Technology	Uncontrolled emissions[1,2] (lb/MMBtu)	Estimated control efficiency (%)	Potential controlled emissions (lb/MMBtu)	References
Coal-fired (Post Clean Air Act Amendments of 1990)[5]	NO_X	LNB	0.50	50	0.25	4, 5, 7, 9
		LNB w/OFA	0.50	50 - 65	0.25 - 0.18	4, 5, 7, 9
		SNCR	0.50	30 - 75	0.35 - 0.13	4, 5, 7, 9
		SCR	0.50	40 - 90	0.30 - 0.050	4, 5, 7, 9
	SO_2	Physical coal cleaning	0.20	10 - 40	0.18 - 0.12	4, 5, 8, 9
		Chemical coal cleaning	0.20	50 - 85	0.10 - 0.030	4, 5, 8, 9
		Use lower sulfur fuel	0.20	20 - 90	0.16 - 0.020	4, 5, 8, 9
		Dry sorbent injection	0.20	50 - 90	0.10 - 0.020	4, 5, 8, 9
		Spray dryer absorber	0.20	90	0.02	4, 5, 8, 9
		Wet FGD	0.20	90	0.02	4, 5, 8, 9
	$PM_{2.5}$, PM_{10}, EC, OC	Fabric filter	0.05	99.3	0.00035	4, 5, 9
		ESP	0.05	99.3	0.00035	4, 5, 9
Oil-fired (Post Clean Air Act Amendments of 1990)[5]	NO_X	LNB	0.20	40	0.12	4, 5, 7, 9
		LNB w/ OFA	0.20	30 - 50	0.14 - 0.10	4, 5, 7, 9
		LNB w/ OFA and FGR	0.20	30 - 50	0.14 - 0.10	4, 5, 7, 9
		SNCR	0.20	30 - 75	0.14 - 0.050	4, 5, 7, 9
		SCR	0.20	40 - 90	0.12 - 0.020	4, 5, 7, 9
	SO_2	Use lower sulfur fuel	0.50	20 - 90	0.40 - 0.005	4, 5, 8, 9
		Spray dryer absorber	0.50	90	0.050	4, 5, 8, 9
		Wet FGD	0.50	90	0.050	4, 5, 8, 9
	$PM_{2.5}$, PM_{10}, EC, OC	Fabric filter	0.044	95.8	0.0018	4, 5, 9
		ESP	0.044	95.8	0.0018	4, 5, 9

[1] Uncontrolled coal-fired emission rates calculated using AP-42 emission factors for PC, dry bottom, wall-fired, bituminous Pre-NSPS. The emission factor was converted to lb/MMBtu assuming MT coal with a heat rate of 17.5 MMBtu/ton, a sulfur content of 0.62 weight percent sulfur, and an ash content of 11.5 percent.

[2] Uncontrolled oil-fired emission rates calculated using AP-42 emission factors for No. 6 oil fired, normal firing. The emission factor was converted to lb/MMBtu assuming a distillate oil heat content of 140,000 Btu/gal, and a sulfur content of 0.60 weight percent sulfur.

[3] Uncontrolled coal-fired emission rates calculated using AP-42 emission factors for PC, dry bottom, wall-fired, bituminous Post-NSPS. The emission factor was converted to lb/MMBtu assuming MT coal with a heat rate of 17.5 MMBtu/ton, a sulfur content of 0.62 weight percent sulfur, and an ash content of 11.5 percent.

[4] Uncontrolled oil-fired emission rates calculated using AP-42 emission factors for No. 6 oil fired, normal firing. The emission factor was converted to lb/MMBtu assuming a distillate oil heat content of 140,000 Btu/gal, and a sulfur content of 0.60 weight percent sulfur.

[5] Uncontrolled Coal fired and oil-fired emission rates are base the the 40 CFR 60, Subpart Db limits for each of the fuels.

6.1 Factor 1 – Costs

Table 6-3 provides cost estimates for the emission control options which have been identified for each of the industrial boilers. For each option, the table gives an estimate of the capital cost to install the necessary equipment, and the total annual cost of control, including the amortized cost associated with the capital equipment cost. The capital cost values are expressed in terms of the cost per heat input (MMBtu/hr) to the boiler. The annual cost is presented in millions of dollars per year. The table shows a range of values for each cost figure, since the capital cost will depend on the rated heat input to the boiler and other factors. The lower ends of the capital and annual cost ranges typically reflect smaller sized boilers, and the higher ends of the capital and annual cost ranges reflect larger sized boilers. Table 3-3 also shows the estimated cost effectiveness for each control measure, in terms of the cost per ton of emission reduction. Lower cost effectiveness values generally reflect the larger heat input boiler sizes, whereas higher cost effectiveness values reflect lower heat input boilers sizes.

6.2 Factor 2 – Time Necessary for Compliance

Once a state decides to adopt a particular control strategy, up to 2 years will be needed to develop the necessary rules to implement the strategy. We have estimated that sources may then require up to a year to procure the necessary capital to purchase control equipment. The Institute of Clean Air Companies (ICAC) has estimated that approximately 18 months is required to design, fabricate, and install SCR or SNCR technology for NO_X control, and approximately 30 months to design, build, and install SO_2 scrubbing technology.[9] Additional time of up to 12 months may be required for staging the installation process if multiple boilers are to be controlled at a single facility. Based on these figures, the total time required to achieve emission reductions for industrial boilers is estimated at a total of 5½ years for NO_X strategies, and 6½ years for SO_2 strategies.

6.3 Factor 3 – Energy and Other Impacts

Table 6-4 shows the estimated energy and non-air pollution impacts of control measures for industrial boilers. The values were obtained from a report summarizing the applicability and feasibility of control options for industrial boilers.[8] In general, the combustion modification technologies (LNB, OFA, FGR) do not require steam or generate solid waste, wastewater, or additional CO_2. They also do not require additional fuel to operate, and in some cases may decrease fuel usage because of the optimized combustion of the fuel.

Retrofitting of a SNCR requires energy for compressor power and steam for mixing. This would produce a small increase in CO_2 emissions to generate electricity; however the technology itself does not produce additional CO_2 emissions.

Installation of SCR on an industrial boiler is not expected to increase fuel consumption. However additional energy is required to operate the SCR, which will produce an increase in CO_2 emissions to generate the electricity. In addition, spent catalyst would have to be changed periodically, producing an increase in solid waste disposal.

Table 6-3. Estimated Costs of Control for Industrial Boilers

Source Type	Control Technology	Pollutant controlled	Estimated control efficiency (%)	Estimated capital cost ($/MMBtu/hr)	Estimated annual cost ($M)	Cost effectiveness ($/ton)	References
Coal-fired	LNB	NO_X	50	3,435 - 6,856	0.175 - 0.317	344 - 4,080	5, 7, 9
	LNB w/OFA		50 - 65	4,908 - 9,794	NA	412 - 4,611	5, 7, 9
	SNCR		30 - 75	3,550 - 7,083	0.333 - 0.419	1,728 - 6,685	5, 7, 9
	SCR		40 - 90	9,817 - 19,587	0.738 - 1.32	1,178 - 7,968	5, 7, 9
	Physical coal cleaning	SO_2	10 - 40	NA	NA	70 - 563	5, 8, 9
	Chemical coal cleaning		50 - 85	NA	NA	1,699 - 2,561	5, 8, 9
	Use lower sulfur fuel		20 - 90	NA	NA		5, 8, 9
	Dry sorbent injection		50 - 90	11,633 - 36,096	NA	851 - 5,761	5, 8, 9
	Spray dryer absorber		90	27,272 - 73,549	7.93 - 9.26	3,885 - 8,317	5, 8, 9
	Wet FGD		90	40,203 - 86,410	10.10 - 11.71	4,687 - 10,040	5, 8, 9
	Fabric filter	$PM_{2.5}$, PM_{10}	99.3	20,065 - 30,287	0.82 - 1.39	406 - 592	5, 6, 9
	ESP		99.3	17,037 - 24,293	0.66 - 1.17	342 - 485	5, 6, 9
Oil-fired	LNB	NO_X	40	1,205 - 2,405	0.190 - 0.346	412 - 7,075	5, 7, 9
	LNB w/ OFA		30 - 50	1,722 - 3,435	NA	412 - 7,075	5, 7, 9
	LNB w/ OFA and FGR		30 - 50	2,690 - 5,368	NA	439 - 6,689	5, 7, 9
	SNCR		30 - 75	2,840 - 5,666	0.206 - 0.355	1,997 - 9,952	5, 7, 9
	SCR		40 - 90	5,399 - 10,773	0.484 - 0.831	1,022 - 24,944	5, 7, 9
	Use lower sulfur fuel	SO_2	20 - 90	NA	NA	5611	5, 8, 9
	Spray dryer absorber		90	119,731 - 270,514	7.72 - 8.80	4,947 - 10,887	5, 8, 9
	Wet FGD		90	36,930 - 73,660	9.85 - 11.29	6,008 - 13,156	5, 8, 9
	Fabric filter	$PM_{2.5}$, PM_{10}	95.8	17,205 - 26,291	0.72 - 1.20	7,298 - 10,889	5, 6, 9
	ESP		95.8	14,302 - 21,243	0.58 - 0.98	5,983 - 8,844	5, 6, 9
Natural gas-fired	LNB	NO_X	40	1,205 - 2,405	0.190 - 0.346	412 - 7,075	5, 7, 9
	LNB w/ OFA		40 - 60	1,722 - 3,435	NA	412 - 7,075	5, 7, 9
	LNB w/ OFA and FGR		40 - 80	2,690 - 5,368	NA	439 - 6,689	5, 7, 9
	SNCR		30 - 75	2,840 - 5,666	0.206 - 0.355	1,997 - 9,952	5, 7, 9
	SCR		70 - 90	5,399 - 10,773	0.484 - 0.831	1,022 - 24,944	5, 7, 9
Wood-fired	SNCR	NO_X	30 - 75	2,840 - 5,666	0.206 - 0.355	1,997 - 9,952	5, 7, 9
	SCR		40 - 90	5,399 - 10,773	0.484 - 0.831	1,022 - 24,944	5, 7, 9
	Fabric filter	$PM_{2.5}$, PM_{10}	95.8	17,205 - 26,291	0.72 - 1.20	7,298 - 10,889	5, 6, 9
	ESP		95.8	14,302 - 21,243	0.58 - 0.98	5,983 - 8,844	5, 6, 9

NA - Control cost not available.
Annual cost assumes 7.5% interest rate and 15-year project life.
Capital and annual costs are presented in 2007 dollars.

Table 6-4. Estimated Energy and Non-Air Environmental Impacts of Potential Control Measures for Industrial Boilers

			Energy and non-air pollution impacts (per ton of emission reduced)				
Source Type	**Control Technology**	**Pollutant controlled**	**Electricity requirement**	**Steam requirement**	**Solid waste produced**	**Wastewater produced**	**Additional CO_2 emitted**
Coal-fired	LNB	NO_X					
	LNB w/OFA	NO_X					
	SNCR	NO_X	1 - 2 kW/1000 acfm	0.25			
	SCR	NO_X	0.89	0.25	0.021		
	Physical coal cleaning	SO_2					
	Chemical coal cleaning	SO_2					
	Switch to lower sulfur fuel	SO_2					
	Dry sorbent injection	SO_2	2 - 4 kW/1000 acfm	0.25	0.021		
	Spray dryer absorber	SO_2	0.4		3.7	0.69	
	Wet FGD	SO_2	4 - 8 kW/1000 acfm				
	Fabric filter	$PM_{2.5}$, PM_{10}	1 - 2 kW/1000 acfm				
	ESP	$PM_{2.5}$, PM_{10}	0.5 - 1.5 kW/1000 acfm				
Oil-fired	LNB	NO_X					
	LNB w/ OFA	NO_X					
	LNB w/ OFA and FGR	NO_X	6.4				
	SNCR	NO_X	1 - 2 kW/1000 acfm	0.25			
	SCR	NO_X	0.89	0.25	0.021		
	Switch to lower sulfur fuel	SO_2					
	Spray dryer absorber	SO_2	0.4		3.7	0.69	
	Wet FGD	SO_2	4 - 8 kW/1000 acfm				
	Fabric filter	$PM_{2.5}$, PM_{10}	1 - 2 kW/1000 acfm				
	ESP	$PM_{2.5}$, PM_{10}	0.5 - 1.5 kW/1000 acfm				
Natural gas-fired	LNB	NO_X					
	LNB w/ OFA	NO_X					
	LNB w/ OFA and FGR	NO_X	6.4				
	SNCR	NO_X	1 - 2 kW/1000 acfm	0.25			
	SCR	NO_X	0.89	0.25	0.021		
	Water injection	NO_X					
Wood-fired	LNB w/ OFA	NO_X					
	LNB w/ OFA and FGR	NO_X	6.4				
	ULNB	NO_X					
	SNCR	NO_X	1 - 2 kW/1000 acfm	0.25			
	SCR	NO_X	0.89	0.25	0.021		
	Fabric filter	$PM_{2.5}$, PM_{10}	1 - 2 kW/1000 acfm				
	ESP	$PM_{2.5}$, PM_{10}	0.5 - 1.5 kW/1000 acfm				

NOTES:
A blank cell indicates no impact is expected.

For SO_2 control technologies, energy is required material preparation (e.g., grinding), materials handling (e.g., pumps/blowers), flue gas pressure loss, and steam requirements. Power consumption is also affected by the reagent utilization of the control technology, which also affects the control efficiency of the control technology.

PM control technologies require energy to operate compressors, heaters, and ash handling. In addition, an additional fan may be required to reduce the flue gas pressure loss by the ESP or FF. The ESP also requires energy to operate the transformer-rectifier. These energy requirements will produce an increase in CO_2 emissions to generate the required electricity.

6.4 Factor 4 – Remaining Equipment Life

Similar to Electric Generating Units (EGUs), industrial boilers do not have a set equipment life. Since many of the strategies are market-based reductions applied to geographic regions, it is assumed that control technologies will not be applied to units that are expected to be retired prior to the amortization period for the specific control equipment. Therefore, the remaining life of an industrial boiler is not expected to affect the cost of control technologies for industrial boilers.

6.5 References for Section 6

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9. NESCAUM (2009), *Applicability and Feasibility of NO_X, SO_2, and PM Emission Control Technologies for Industrial, Commercial, and Institutional (ICI) Boilers*.

10. Institute of Clean Air Companies (2006), *Typical Installation Timelines for NO_X Emissions Control Technologies on Industrial Sources*.

7. Cement Kilns

The main emission units of interest at cement plants are the cement kilns. There are two major types, wet and dry kilns; dry kilns are further categorized as long dry, preheater, or precalciner kilns. On the whole, wet kilns tend to produce more tons of cement (or "clinker") but also require more energy than dry process kilns. There was limited information on SO_2 controls for cement kilns, particularly for long wet kilns.[1] Process modification and replacement of a wet kiln with a dry process kiln are the most feasible options for SO_2 control.

Cement kilns at cement manufacturing facilities in the WRAP region are estimated to emit about 40,610 tons of NO_X; 6,230 tons of SO_2; 1,573 tons of $PM_{2.5}$; 4,245 tons of PM_{10} and 4,467 tons of VOC per year, based on the 2002 emissions inventory for the region and WRAP updates.[2] Most of the emissions from this category are from the kilns themselves; the remainder of the emissions is generated primarily from the transfer of clinker and the grinding and drying of the raw material. NO_X emissions from cement kilns represent approximately 4% of total point source emissions of NO_X in the WRAP region, and approximately 3% of all stationary source (point and area source) NO_X emissions in the region. SO_2 emissions from cement kilns represent approximately 0.75% of total point source emissions of SO_2 in the WRAP region, and approximately 0.68% of all stationary source (point and area source) SO_2 emissions in the region.

Table 7-1 shows estimated emissions of NO_X, SO_2, PM_{10}, $PM_{2.5}$ and VOC from the WRAP emissions inventory and updated data provided by the states, broken down by state and emission source. As the table shows, SO_2, PM_{10}, $PM_{2.5}$ and VOC emissions from cement kiln sources are much lower than NO_X emissions. Emissions of particulate matter from these sources were not included in the WRAP EDMS inventory – the emissions presented were gathered from the NEI. Long dry kilns produce over half of the NO_X emissions (54.8%) and most of the $PM_{2.5}$ and PM_{10} emissions (79.4 and 71.3%, respectively) generated by cement manufacturing in the WRAP region. Long wet kilns produce almost half of the SO_2 emissions generated by the cement manufacturing (48.4%), and precalciner kilns produce almost half of the VOC emissions generated by cement manufacturing (45.6%).

Table 7-2 lists potential control measures for NO_X emissions from cement kilns. A number of options were identified for cement kilns in an ACT guidance document written by the U.S. EPA in 1994.[6] Cement kilns use coal, waste products, tires, or natural gas for combustion fuel - this combustion generates primarily NO_X emissions but also produces SO_2 and PM emissions.[6] Controls can be broken into three categories: process modifications, combustion modifications and NO_X removal controls. Process modifications include fuel switching and the inclusion of steel slag into the raw kiln feed (also known as the CemStar(TM) process) which improves thermal efficiency. CemStar is currently used in TXI's Hunter and Midlothian, TX plants, TXI's Oro Grande, CA plant and Holcim's North Texas Cementer plant. TXI has also licensed CemStar out to RMC Pacific Materials, Inc. and to the Rio Grande Portland Cement Company.[3] Combustion modifications include low NO_X burners and mid-kiln firing. NO_X removal controls include SCR, SNCR, LoTOX™, and biosolids or sorbent injection. Low NO_X

burners reduce flame turbulence, delay fuel/air mixing and create fuel-rich zones for initial combustion, reducing the flame temperature and thus NO_X formation.[4] SCR introduces ammonia, presented as a catalyst, into the clinker making process to selectively reduce NO_X emissions from exhaust gases. SNCR, available to preheater or precalciner cement kilns[1,5,6], does not use a catalyst to reduce NO_X emissions. Instead, the process uses either ammonia or urea that is generated when reagents are injected into the kiln at specific temperatures. However, SNCR has been tested primarily in European facilities; there have been two demonstrations in the United States but no kilns have yet adopted the technology.[7,8,9,10,11]

In the LoTOx™ system, ozone is injected into the kiln which oxidizes NO_X. The resulting higher oxides of nitrogen can then be removed by a wet scrubber.[12] LoTOx is licensed by the BOC group and is currently being used on the Midlothian cement wet kilns in Texas.[1,12] Biosolid or absorbent injection is similar to SNCR, although instead of a catalyst either biosolids from wastewater treatment plants or limestone/hydrated lime are injected into the kiln.[7,13] Biosolid injection is being used in one kiln in Southern California where dewatered sewage sludge is injected into the mixing chamber where the flue gas streams from the kiln and the precalciner mix together. [14,15]

7.1 Factor 1 – Costs

Table 7-3 provides cost estimates for the emission control options which have been identified for cement kilns. For each option the table gives an estimate of the capital cost to install the necessary equipment and the total annual cost of control, including the amortized cost associated with the capital equipment cost. The capital and annual cost figures are expressed in terms of the cost per unit of clinker tonnage produced, or cubic feet per minute (cfm) for PM emission sources. The table shows a range of values for each cost figure since the cost per unit of clinker tonnage will depend on the amount of clinker produced and other factors. The lower ends of the cost ranges typically reflect smaller kilns and the higher ends of the cost ranges typically reflect larger kiln sizes. Table 7-3 also shows the estimated cost effectiveness for each control measure, in terms of the cost per ton of emission reduction.

7.2 Factor 2 – Time Necessary for Compliance

Once a state decides to adopt a particular control strategy, up to 2 years will be needed to develop the necessary rules to implement the strategy. We have estimated that sources may then require up to a year to procure the necessary capital to purchase control equipment. The ICAC has estimated that approximately 13 months is required to design, fabricate, and install SCR or SNCR technology for NO_X control.[16] However, state regulators' experience indicates that closer to 18 months is required to install this technology.[17] Additional time of up to 12 months may be required for staging the installation process if multiple sources are to be controlled at a single facility. Based on these figures, the total time required to achieve emission reductions for cement kilns is estimated at a total of 5½ years.

Table 7-1. Emissions from Cement Kilns in the WRAP Region

Emission Source	AK	AZ	CA	CO	ID	MT	ND	NM	NV	OR	SD	UT	WA	WY	Tribes	All
								NO_X emissions (tons/year)								
Wet Process Kiln	0	0	0	1136	461	1814	0	0	0	0	2966	0	2251	0	0	8,628
Dry Process Kiln	0	2476	11544	2162	0	0	0	804	0	1741	0	0.012	1213	2080	0	22,020
Clinker Transfer	0	0	601	0	0	0	0	0	0	0	0	0	0	0	0	601
Raw Material Grinding and Drying	0	0	78	12	0	0	0	0	0	0	0	0	0	0	0	91
Preheater/Precalciner Kiln	0	5066	1370	511	0	0	0	0	0	0	0	1322	0	0	0	8,269
Other	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	5
Total	0	7,542	13,598	3,821	461	1,814	0	804	0	1,741	2,966	1,322	3,464	2,080	0	39,613
								SO_2 emissions (tons/year)								
Wet Process Kiln	0	0	0	240	17	233	0	0	0	0	656	0	771	0	0	1,917
Dry Process Kiln	0	61	2101	18	0	0	0	15	0	38	0	0.001	188	207	0	2,628
Clinker Transfer	0	0	86	0	0	0	0	0	0	0	0	0	0	0	0	86
Raw Material Grinding and Drying	0	0	11	32	0	0	0	0	0	0	0	0	0	0	0	43
Preheater/Precalciner Kiln	0	9	1	378	0	0	0	0	0	0	0	58	0	0	0	446
Other	0	0	0.44	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	70	2,200	667	17	233	0	15	0	38	656	58	959	207	0	5,121
								$PM_{2.5}$ emissions (tons/year)								
Wet Process Kiln	0	0	14	0	3	0	0	0	0	0	91	6	6	0	0	121
Dry Process Kiln	0	0	1184	0	0	0	0	3	0	0	0	32	28	0	0	1,247
Clinker Transfer	0	0.48	105	3	0.47	0	0	0	0	0	0	1	0	0	0	110
Raw Material Grinding and Drying	0	0.26	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Preheater/Precalciner Kiln	0	74	2	15	0	0	0	0	0	0	0	5	0	0	0	95
Other	0	0	0	0	0.24	0	0	0	0	0	0	0	0	0	0	0.24
Total	0	75	1,305	18	4	0	0	3	0	0	91	44	34	0	0	1,573

Table 7-1. Emissions from Cement Kilns in the WRAP Region

Emission Source	AK	AZ	CA	CO	ID	MT	ND	NM	NV	OR	SD	UT	WA	WY	Tribes	All
							PM_{10} emissions (tons/year)									
Wet Process Kiln	0	0	20	75	4	376	0	0	0	0	185	17	14	0	0	691
Dry Process Kiln	0	0	2023	414	0	1	0	97	0	64	0	222	30	179	0	3,030
Clinker Transfer	0	1	163	5	2	0	0	0	0	0	0	4	0	0	0	175
Raw Material Grinding and Drying	0	0.47	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Preheater/Precalciner Kiln	0	132	5	26	0	0	0	0	0	0	0	14	0	0	0	178
Other	0	0	0	0	0.84	0	0	0	0	0	0	0	0	0	0	1
Total	0	134	2,211	521	7	377	0	97	0	64	185	257	44	179	0	4,075
							VOC emissions (tons/year)									
Wet Process Kiln	0	0	0	0	1	0	0	0	0	0	81	0	0	0	1	84
Dry Process Kiln	0	10	114	3	0	0	0	33	0	15	0	1	0	46	0	221
Clinker Transfer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Raw Material Grinding and Drying	0	1	0	125	0	0	0	0	0	0	0	0	0	0	0	126
Preheater/Precalciner Kiln	0	5	4	2	0	0	0	0	0	0	0	42	0	0	1,984	2,038
Other	0	6	1	0	0	0	0	2	0	0	4	0	0	0	1,986	1,999
Total	0	21	119	131	1	0	0	35	0	15	85	43	0	46	3,972	4,467

Table 7-2. Control Options for Cement Kilns

Source Type	Control Technology	Pollutant controlled	Baseline emissions	Estimated control efficiency (%)	Potential emission reduction (tons/year)	References
Long Wet Kiln	Low NOX burners	NO_X	8,628	20-30	1725 - 2588	1, 6
	Mid-kiln firing	NO_X	8,628	20-50	1725 - 4313	1, 6
	SCR with ammonia	NO_X	8,628	80-90	6902 - 7764	5, 6
	SNCR with ammonia or urea	NO_X	8,628	30-70	2588 - 6039	6
	Biosolid injection	NO_X	8,628	50	4313	7
	CemStar™ process	NO_X	8,628	20-60	1725 - 5176	1, 3, 7
	LoTOx™	NO_X	8,628	80-90	6902 - 7765	1, 5
	Dry ESP	PM_{10}	691	95-98	656 - 677	9
	Dry ESP	$PM_{2.5}$	121	95-98	114 - 118	9
	Dry ESP	EC	4	95-98	3	9
	Dry ESP	OC	15	95-98	14	9
	Fabric Filter	PM_{10}	691	80-99	656 - 677	9
	Fabric Filter	$PM_{2.5}$	121	80-99	114 - 118	9
	Fabric Filter	EC	4	80-99	3	9
	Fabric Filter	OC	15	80-99	14	9
	Absorbant Addition	SO_2	1,917	60-80	1150 - 1533	
	Wet FGD	SO_2	1,917	90-99	1725 - 1897	1
Long Dry Kiln	Low NOX burners	NOX	19541	40	7816	1, 6
	Mid-kiln firing	NOX	19541	11-55	2149 - 10747	1, 6
	SCR with ammonia	NOX	19541	80-90	1563 - 1758	6
	Biosolid injection	NOX	19541	50	9770	7
	LoTOx™	NO_X	19541	80 - 90	15,633 - 17,587	1, 5
	CemStar™ process	NOX	19541	20-60	3908 - 1172	1, 3, 7
	Dry ESP	PM10	3,030	95-98	2878 - 2969	9
	Dry ESP	PM2.5	1,247	95-98	1184 - 1221	9
	Dry ESP	EC	37	95-98	34 - 36	9
	Dry ESP	OC	158	95-98	150 - 155	9
	Fabric Filter	PM10	3,030	99	3000	9
	Fabric Filter	PM2.5	1,247	99	1234	9
	Fabric Filter	EC	37	99	36	9
	Fabric Filter	OC	158	99	156	9
	Wet FGD	SO2	2567	90-99	2310 - 2541	1
	Dry FGD	SO2	2567	90-95	2310 - 2438	1
	Sorbent injection	SO2	2567	60-80	1540 - 2053	

Table 7-2. Control Options for Cement Kilns

Source Type	Control Technology	Pollutant controlled	Baseline emissions	Estimated control efficiency (%)	Potential emission reduction (tons/year)	References
Preheater Kiln	Low NOX burners	NOX	3204	40	1281	1, 6
	Mid-kiln firing	NOX	3204	11-55	352 - 1762	1, 6
	SCR with ammonia	NOX	3204	85	2723	5, 6
	SNCR with urea	NOX	3204	35	1121	5, 6
	SNCR with ammonia	NOX	3204	35	1121	5, 6
	LoTOx^{TM}	NO_X	3204	80 - 90	2,563 - 2,884	1, 5
	CemStar^{TM} process	NOX	19541	Unknown[a]	Unknown[a]	1, 3, 7
	Biosolid injection	NOX	3204	23 - 50	736 - 1602	7, 9
	Dry ESP	PM10	178	95-98	169 - 174	9
	Dry ESP	PM2.5	95	95-98	90 - 93	9
	Dry ESP	EC	3	95-98	2	9
	Dry ESP	OC	12	95-98	11 - 11	9
	Fabric Filter	PM10	178	99	176	9
	Fabric Filter	PM2.5	95	99	94	9
	Fabric Filter	EC	3	99	2	9
	Fabric Filter	OC	12	99	11	9
	Wet FGD	SO2	436	90-99	392 - 431	1
	Dry FGD	SO2	436	90-95	392 - 414	1
	Sorbent injection	SO2	436	60-80	261 - 348	8
Precalciner Kiln	Low NOX burners	NOX	3204	30-40	961 - 1281	6
	Mid-kiln firing	NOX	3204	11-55	352 - 1762	1, 6
	SCR with ammonia	NOX	3204	85	2723	5, 6
	SNCR with urea	NOX	3204	35	1121	5, 6
	SNCR with ammonia	NOX	3204	35	1121	5, 6
	LoTOx^{TM}	NO_X	3204	80 - 90	2,563 - 2,884	1, 5
	CemStar^{TM} process	NOX	19541	Unknown[a]	Unknown[a]	1, 3, 7
	Biosolid injection	NOX	3204	50	1602	7
	Dry ESP	PM10	178	95-98	169 - 174	9
	Dry ESP	PM2.5	95	95-98	90. - 93.	9
	Dry ESP	EC	3	95-98	2.6 - 2.7	9
	Dry ESP	OC	12	95-98	11 - 11	9
	Fabric Filter	PM10	178	99	176	9
	Fabric Filter	PM2.5	95	99	94	9
	Fabric Filter	EC	3	99	2	9
	Fabric Filter	OC	12	99	11	9
	Wet FGD	SO2	436	90-99	392 - 431	1
	Dry FGD	SO2	436	90-95	392 - 414	1
	Sorbent injection	SO2	436	60-80	261 - 348	8

a The CemStar process has been analyzed for long wet and dry kilns only although the process is currently being used in long dry kilns and preheater/precalciner kilns at two facilities, one in Texas and one in California. It is unknown what the control efficiency is of the CemStar process in preheater or precalciner kilns.

7.3 Factor 3 – Energy and Other Impacts

Table 7-4 shows the estimated energy and non-air pollution impacts of control measures for cement kilns. In general in-combustion NO_X control technologies will increase energy efficiency of the cement production process since these technologies reduce excess air and burning.[18] SCR requires additional energy input since the process required a particular gas temperature, requiring the gas stream to be reheated. An additional 9.8 percent of the total energy required in cement manufacturing will be needed to utilize the SCR control technology.[18] In addition, spent catalyst would have to be changed periodically, producing an increase in solid waste disposal.[19]

7.4 Factor 4 – Remaining Equipment Life

Information was not available on the age of cement kilns in the WRAP region. Cement kilns have no set equipment life. The units, whether wet or dry, can be refurbished to extend their lives. In addition, it is assumed that controls will be not be applied to units that are expected to be retired prior to the amortization period for the control equipment. Therefore, remaining equipment life is not expected to affect the cost of control for cement kilns.

Table 7-3. Estimated Costs of Control for Cement Kilns

Source Type	Control Technology	Pollutant controlled	Estimated control efficiency (%)	Estimated capital cost ($1000/unit)	Estimated annual cost ($/year/unit)	Units	Cost effectiveness ($/ton)	References
Long Wet Kiln	Low NOX burners (indirect fired)	NOX	20-47	401 - 564	100,000 - 144,000	ton clinker	270 - 620	1, 6, 7
	Low NOX burners (direct fired)	NOX	20-47	1,910	376,000 - 343,500	ton clinker	855 - 1,005	1, 6, 7
	Mid-kiln firing	NOX	20-50	613 - 3,205	183,500 - (192,300	ton clinker	(460) - 730	1, 6, 7, 8
	SCR with ammonia	NOX	80-90	15,100	5,780 - 4,105,000	ton clinker	3,370	5, 6, 7
	LoTOx™	NOX	80 - 90	Not available[a]			3,155 - 3,891[c]	5
	CemStar™ process	NOX	20-60	1,176	220000	ton clinker	550	7
	Dry ESP	PM_{10}, $PM_{2.5}$, OC, EC	95-98	Not available[a]			40 - 250	9
	Fabric Filter	PM_{10}, $PM_{2.5}$, OC, EC	80-99	Not available[a]			117 - 148	9
	Wet FGD	SO2	90-99	Not available[a]			2,211 - 6,917	1, 8
Long Dry Kilns	Low NOX burners (indirect fired)	NOX	30 - 40	334 - 509	83,000 - 135,500	ton clinker	300 (3) - 620	1, 6, 7
	Low NOX burners (direct fired)	NOX	40	1,455	298,000 - 272,500	ton clinker	166 - 1,299	1, 6, 7
	Mid-kiln firing	NOX	11-55	455 - 3,180	89,830 - 144,000	ton clinker	(460) - 730	1, 6, 7, 8
	LoTOx™	NOX	80 - 90	Not available[d]				5
	CemStar™ process	NOX	20-60			Not available[b]		7
	SCR with ammonia	NOX	80-90	11,485	3,000,000	ton clinker	586 - 3,400	6, 7, 8
	Dry ESP	PM_{10}, $PM_{2.5}$, OC, EC	95-98	Not available[a]			40 - 250	9
	Fabric Filter	PM_{10}, $PM_{2.5}$, OC, EC	80-99	Not available[a]			117 - 148	9
	Wet FGD	SO2	90-99	5,610 - 84,000	10,000 - 30,571	ton clinker	2,000 - 4,000	1, 8
	Dry FGD	SO2	90-95	3,300 - 95,800	9,142 - 32,286	ton clinker	1,900 - 7,000	1
Preheater Kilns	Low NOX burners (indirect fired)	NOX	30 - 40	379 - 608	94,500 - 150,000	ton clinker	300 - 620	1, 6, 7
	Low NOX burners (direct fired)	NOX	40	1,765 - 1,800	351,500 - 330,000	ton clinker	175 - 1,201	1, 6, 7
	CemStar™ process	NOX	20-60			Not available[b]		
	SCR with ammonia	NOX	85	14,400	3,850,000	ton clinker	500 - 3,805	5, 6, 7, 8
	SNCR with urea	NOX	35	799	546500	ton clinker	(310) - 2,500	5, 6, 8
	SNCR with ammonia	NOX	35	1,595	635500	ton clinker	(310) - 2,500	5, 6, 8
	LoTOx™	NOX	80 - 90	Not available[d]				5
	Biosolids Injection	NOX	50	1,200	(322,000)	ton clinker	(310)	7
	Dry ESP	PM_{10}, $PM_{2.5}$, OC, EC	95-98	0.013	Not available[a]	cfm	40 - 250	9
	Fabric Filter	PM_{10}, $PM_{2.5}$, OC, EC	99	0.029	Not available[a]	cfm	117 - 148	9
	Wet FGD	SO2	90-99	3,710 - 54,000	2,714 - 15,857	ton clinker	2,000 - 64,600	1, 8
	Dry FGD	SO2	90-95	2,100 - 61,400	2,857 - 17,571	ton clinker	10,000 - 72,800	1
	Sorbent Injection	SO2	60 - 80	Not available[a]			2,031 - 7,379	8

Table 7-3. Estimated Costs of Control for Cement Kilns

Source Type	Control Technology	Pollutant controlled	Estimated control efficiency (%)	Estimated capital cost ($1000/unit)	Estimated annual cost ($/year/unit)	Units	Cost effectiveness ($/ton)	References
Precalciner Kilns	Low NOX burners (indirect fired)	NOX	30	406 - 863	101,000 - 188,500	ton clinker	245 - 620	6, 7
	Low NOX burners (direct fired)	NOX	30	1,945 - 2,235	382,500 - 393,500	ton clinker	920 - 985	6, 7
	CemStar™ process	NOX	20-60	Not available[b]				
	LoTOx™	NOX	80 - 90	Not available[a]			2,419 - 2,734[e]	5
	SCR with ammonia	NOX	85	21,950	6,240,000	ton clinker	4635	5, 6, 7
	SNCR with urea	NOX	35	1,105	709,000	ton clinker	(310) - 2,500	5, 6, 8
	SNCR with ammonia	NOX	35	1,880	779,500	ton clinker	(310) - 2,500	5, 6, 8
	Biosolids Injection	NOX	23 - 50	5,581	1,498	ton clinker	(310)	7, 8
	Dry ESP	PM_{10}, $PM_{2.5}$, OC, EC	99	0.013	Not available[a]	cfm	40 - 250	9
	Fabric Filter	PM_{10}, $PM_{2.5}$, OC, EC	99	0.029	Not available[a]	cfm	117 - 148	9
	Sorbent Injection	SO2	60-80	Not available[a]			2,031 - 7,379	8
	Wet FGD	SO2	90-99	3,710 - 54,000	2,714 - 15,857	ton clinker	2,211 - 6,917	8

a References discussing this particular control technology did not provide any capital or annual costs but only a cost effectiveness figure.

b The CemStar process has been costed for long wet kilns only although the process is currently being used in long dry kilns and preheater/precalciner kilns at two facilities, one in Texas and one in California.

c The cost effectivenes was calculated for a wet kiln that did not already have a scrubber system in place.

d Cost effectiveness figures for LoTOx were not determined for dry kilns or preheater kilns, but only for wet kilns (the kilns that currently use the system) and precalciner kilns (developed from vendor information).

e The cost effectiveness was calculated for a precalciner kiln that already has a scrubber system in place.

Table 7-4. Estimated Energy and Non-Air Environmental Impacts of Potential Control Measures for Cement Kilns

Source Type	Control Technology	Pollutant controlled	Potential emission reduction (tons/year)	Additional Fuel Requirement (%)	Energy and non-air pollution impacts: Additional electricity requirement (kW/ton reduced)	Steam requirement (tons steam/ton reduced)	Solid waste produced (tons waste/ton reduced)	Wastewater produced (million gallons/ton reduced)	Additional CO_2 emitted (tons/ton reduced)
Long Wet Kilns	Low NOX burners	NO_X	1725 - 2588	a	182				
	Mid-kiln firing	NO_X	1725 - 4313	a	182				
	SCR with ammonia	NO_X	6902 - 7764	9.8	57				Unknown[b]
	SNCR with ammonia or urea	NO_X	2588 - 6039		Unknown[b]				
	Biosolid injection	NO_X	4313	a					
	LoTOx™	NO_X	6902 - 7765		Unknown[c]				
	CemStar™ process	NO_X	1725 - 5176	a					
	Fabric Filter	PM_{10}, $PM_{2.5}$, EC, OC	1,898 - 1,958		Unknown[b]		1		
	Dry ESP	PM_{10}, $PM_{2.5}$, EC, OC	1,898 - 1,958		Unknown[b]		1		
	Wet FGD	SO_2	1725 - 1897		1,100	3.1	2.8	3.7	2.6
Long Dry Kilns	Low NOX burners	NO_X	7816	a	158				
	Mid-kiln firing	NO_X	2149 - 10747	a	158				
	SCR with ammonia	NO_X	1563 - 1758	9.8	48				Unknown[b]
	Biosolid injection	NO_X	9770						
	LoTOx™	NO_X	15,633 - 17,587		Unknown[c]				
	CemStar™ process	NO_X	3908 - 1172						
	Dry ESP	PM_{10}, $PM_{2.5}$, EC, OC	1,898 - 1,958		Unknown[b]		1		
	Fabric Filter	PM_{10}, $PM_{2.5}$, EC, OC	1,898 - 1,958		Unknown[b]		1		
	Wet FGD	SO_2	2310 - 2541		1,100	3.1	2.8	3.7	2.6
	Dry FGD	SO_2	2310 - 2438		Unknown[b]				

Table 7-4. Estimated Energy and Non-Air Environmental Impacts of Potential Control Measures for Cement Kilns

Source Type	Control Technology	Pollutant controlled	Potential emission reduction (tons/year)	Additional Fuel Requirement (%)	Energy and non-air pollution impacts: Additional electricity requirement (kW/ton reduced)	Steam requirement (tons steam/ton reduced)	Solid waste produced (tons waste/ton reduced)	Wastewater produced (million gallons/ton reduced)	Additional CO_2 emitted (tons/ton reduced)
Preheater Kilns	Low NOX burners	NO_X	1281	a	194				
	SCR with ammonia	NO_X	2723	9.8	59				Unknown[b]
	SNCR with urea	NO_X	1121		Unknown[b]				
	SNCR with ammonia	NO_X	1121		Unknown[b]				
	LoTOx™	NO_X	2,563 - 2,884		Unknown[c]				
	Biosolid injection	NO_X	736 - 1602	a					
	Sorbent injection	SO_2	261 - 348	a					
	Dry ESP	PM_{10}, $PM_{2.5}$, EC, OC	1,898 - 1,958		Unknown[b]		1		
	Fabric Filter	PM_{10}, $PM_{2.5}$, EC, OC	1,898 - 1,958		Unknown[b]		1		
	Wet FGD	SO_2	392 - 431		1,100	3.1	2.8	3.7	2.6
	Dry FGD	SO_2	392 - 414		Unknown[b]				
Precalciner Kilns	Low NOX burners	NO_X	961 - 1281	a	285				
	SCR with ammonia	NO_X	2723	9.8	89				Unknown[b]
	SNCR with urea	NO_X	1121		Unknown[b]				
	SNCR with ammonia	NO_X	1121		Unknown[b]				
	LoTOx™	NO_X	2,563 - 2,884		Unknown[c]				
	Biosolid injection	NO_X	1602	a					
	Sorbent injection	SO_2	60-80	a					
	Dry ESP	PM_{10}, $PM_{2.5}$, EC, OC	1,898 - 1,958		Unknown[b]		1		
	Fabric Filter	PM_{10}, $PM_{2.5}$, EC, OC	1,898 - 1,958		Unknown[b]		1		
	Wet FGD	SO_2	392 - 431		1,100	3.1	2.8	3.7	2.6
	Dry FGD	SO_2	392 - 414		Unknown[b]				

a - The measure is expected to improve fuel efficiency.

b - Impacts are expected, however there is no available information to quantify these impacts.

c - According to the ERG Report (reference 3) "electricity and oxygen costs are reported to be high" although there is no quantification given.

7.5 References for Section 7

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8. Sulfuric Acid Manufacturing Plants

Sulfuric acid manufacturing plants account for about 4,700 tons/year of SO_2 emissions in the WRAP region. These emissions are from a limited number of facilities, with facility-level SO_2 emissions ranging from about 100 tons/year to about 2,000 tons/year. Table 8-1 summarizes emissions from the sulfuric acid manufacturing plants, broken down by state, based on the WRAP emissions inventory and the NEI.[1] The table also shows the amounts of SO_2 emissions from facilities at different efficiency levels for the acid recovery process. As the table shows, reported emissions of NO_X, PM_{10}, $PM_{2.5}$, and VOC emissions are much lower than SO_2 emissions from sulfuric acid plants in the region.

Emissions of SO_2 from sulfuric acid manufacturing processes can be reduced by increasing the absorption efficiency of the acid recovery process. The NSPS emission level for sulfuric acid plants corresponds to an estimated recovery efficiency of 99.75%.[2] Based on the SCC used in the WRAP inventory, the recovery efficiency ranges from 93 to 99% for most of the emission sources in the WRAP region. Increasing the efficiency of sulfuric acid plants to the NSPS level would result in emission reductions 75 to 96.4% from the current baseline level of control. This increase in efficiency is achieved by adding more absorption stages to the acid recovery process. SO_2 emissions can also be controlled using tail gas treatment units.[3,4] Table 8-2 shows the estimated control efficiencies and emission reductions which could be achieved for sulfuric acid plants operating at different baseline levels of control.

8.1 Factor 1 – Costs

Table 8-3 provides cost estimates for the emission control options which have been identified for sulfuric acid manufacturing plants. For each option, the table gives an estimate of the capital cost to install the necessary equipment, and the total annual cost of control, including the amortized cost associated with the capital equipment cost. The capital and annual cost figures are expressed in terms of the cost per unit of gas treated, in actual cubic feet per minute (acfm).

Table 8-3 shows a range of values for each cost figure, since the cost per unit of throughput will depend on the process size and other factors. The lower ends of the cost ranges typically reflect larger processes, and the higher ends of the cost ranges typically reflect lower process sizes. The table also shows the estimated cost effectiveness for each control measure, in terms of the cost per ton of emission reduction.

Table 8-1. Emissions from Sulfuric Acid Manufacturing Plants in the WRAP Region

	CA	ID	WA	WY	Tribes	All
			NO_X emissions (tons/year)			
General	32	0	10	54	7	103
			SO_2 emissions (tons/year)			
Contact process						
99% efficient	710					710
98% efficient			105			105
93% efficient		364				364
Unspecified				2,012	897	2,909
Chamber process	600					600
Total	1,310	364	105	2,012	897	4,688
			VOC emissions (tons/year)			
General	2			23	2	27

Table 8-2. Control Options for Sulfuric Acid Manufacturing Plants

Source Type	Control Technology	Pollutant controlled	Baseline emissions	Estimated control efficiency (%)	Potential emission reduction (tons/year)	Refer-ences
Contact process						
99% baseline efficiency	Increase absorption efficiency to NSPS level	SO_2	710	75	530	2,3
	Tailgas treatment unit	SO_2	710	90	640	3,4
98% baseline efficiency	Increase absorption efficiency to NSPS level	SO_2	105	87.5	92	2,3
	Tailgas treatment unit	SO_2	105	95	100	3,4
93% baseline efficiency	Increase absorption efficiency to NSPS level	SO_2	3,273	96.4	3,200	2,3
	Tailgas treatment unit	SO_2	3,273	98.6	3,200	3,4
Chamber process	Tailgas treatment unit	SO_2	600	98.6	590	3,4

Table 8-3. Estimated Costs of Control for Sulfuric Acid Manufacturing Plants

Source Type	Control Technology	Pollutant controlled	Estimated control efficiency (%)	Estimated capital cost ($/unit)	Estimated annual cost ($/year/unit)	Units	Cost effectiveness ($/ton)	Refer-ences
Contact process								
99% baseline efficiency	Increase absorption efficiency to NSPS level	SO_2	75	55 - 96	23 - 29	acfm	6,800 - 7,000	2,3
	Tailgas treatment unit	SO_2	90	23 - 32	36	acfm	5,300 - 6,500	3,4
98% baseline efficiency	Increase absorption efficiency to NSPS level	SO_2	87.5				6,200	2,3
	Tailgas treatment unit	SO_2	95	48	38	acfm	3,375	3,4
93% baseline efficiency	Increase absorption efficiency to NSPS level	SO_2	96.4				1,600	2,3
	Tailgas treatment unit	SO_2	98.6	48	38	acfm	928	3,4
Chamber process	Tailgas treatment unit	SO_2	98.6	19	34	acfm	8,100	3,4

8.2 Factor 2 – Time Necessary for Compliance

Once a state decides to adopt a particular control strategy, up to 2 years will be needed to develop the necessary rules to implement the strategy. We have estimated that sources may then require up to a year to procure the necessary capital to purchase control equipment. In the CAIR analysis, EPA estimated that approximately 30 months is required to design, build, and install SO_2 scrubbing technology for a single emission source.[5] The analysis also estimated that up to an additional 12 months may be required for staging the installation process if multiple sources are to be controlled at a single facility. Based on these figures, the total time required achieve emission reductions for sulfuric acid manufacturing facilities is estimated at a total of 6½ years.

8.3 Factor 3 – Energy and Other Impacts

Table 8-4 shows the estimated energy and non-air pollution impacts of control measures for sulphuric acid plants. Additional absorption stages to increase acid plant efficiency would require additional electricity and steam,[2] as would a tailgas treatment unit.[4] This would result in increased CO_2 emissions to generate the electricity and steam.

8.4 Factor 4 – Remaining Equipment Life

Information was not available on the age of sulfuric acid plants in the WRAP region. However, industrial processes often refurbished to extend their lifetimes. Therefore, the remaining lifetime of most equipment is expected to be longer than the projected lifetime of pollution control technologies which have been analyzed for this category. In the case of add-on technologies, the projected lifetime is 15 years.

If the remaining life of an emission source is less than the projected lifetime of a pollution control device, then the capital cost of the control device would have to be amortized over a shorter period of time, corresponding to the remaining lifetime of the emission source. This would cause an increase in the amortized capital cost of the pollution control option, and a corresponding increase in the total annual cost of control. This increased cost can be quantified as follows:

$$A_1 = A_0 + C \times \frac{1-(1+r)^{-m}}{1-(1+r)^{-n}}$$

where:

A_1 = the annual cost of control for the shorter equipment lifetime ($)
A_0 = the original annual cost estimate ($)
C = the capital cost of installing the control equipment ($)
r = the interest rate (0.07)
m = the expected remaining life of the emission source (years)
n = the projected lifetime of the pollution control equipment

Table 8-4. Estimated Energy and Non-Air Environmental Impacts of Potential Control Measures for Sulfuric Acid Manufacturing Plants

				Energy and non-air pollution impacts (per ton of pollutant reduced)			
Source Type	**Control Technology**	**Pollutant controlled**	**Potential emission reduction (tons/year)**	**Additional electricity requirement (kW-hr)**	**Steam requirement (tons steam)**	**Solid waste produced (tons waste)**	**Additional CO_2 emitted (tons)**
Contact process							
99% baseline efficiency	Increase absorption efficiency to NSPS level	SO_2	530	2,450	29	<0.01	10
	Tailgas treatment unit	SO_2	640	1,470	27		8
98% baseline efficiency	Increase absorption efficiency to NSPS level	SO_2	92	1,050	13	<0.01	4
	Tailgas treatment unit	SO_2	100	700	12		4
93% baseline efficiency	Increase absorption efficiency to NSPS level	SO_2	3,200	270	3.2	<0.01	1
	Tailgas treatment unit	SO_2	3,200	190	3.5		1
Chamber process	Tailgas treatment unit	SO_2	590	2,450	29	<0.01	10

8.5 References for Section 8

1. WRAP (2008), *Emissions Data Management System, Western Regional Air Partnership*, Denver, CO, http://www.wrapedms.org/app_main_dashboard.asp.

2. EPA (1985), *Sulfuric Acid: Review of New Source Performance Standards for Sulfuric Acid Plants*, EPA/450/3-85/012, U.S. EPA, RTP, NC, http://nepis.epa.gov/.

3. E.H. Pechan & Associates (2005), *AirControlNET, Version 4.1 - Documentation Report*, U.S. EPA, RTP, NC, pp III-1223 through III-1276, http://www.epa.gov/ttnecas1/AirControlNET.htm.

4. EPA (2002), *EPA Air Pollution Control Cost Manual*, *6th ed.,* EPA/452/B-02-001, Section 5 - SO_2 and Acid Gas Controls, U.S. EPA, Office of Air Quality Planning and Standards, RTP, NC, pp 1-30 through 1-42, http://www.epa.gov/ttncatc1/products.html#cccinfo.

5. EPA (2005), *Boilermaker Labor Analysis and Installation Timing – Technical Support Document for the Final Clean Air Interstate Rule*, OAR-2003-0053, U.S. EPA, Washington, DC, www.epa.gov/cair/technical.html#final.

9. Pulp and Paper Lime Kilns

The pulp making process produces the largest amount of emissions in the pulp and paper industry, accounting for more than 75% of the sector's $PM_{2.5}$, SO_2, and NO_X emissions.[1] The role of lime kilns in the kraft pulping process is to produce white liquor and calcium carbonate.[2]

Lime kilns at pulp and paper manufacturing facilities in the WRAP region are estimated to emit about 828 tons of NO_X, 104 tons of SO_2, 603 tons of $PM_{2.5}$, 667 tons of PM_{10}, and 32 tons of VOC per year, based on the 2002 emissions inventory for the region.[3] The area source emissions estimates are derived from industrial, commercial, and institutional fuel consumption in the WRAP states. NO_X emissions from lime kilns represent approximately 0.08% of total point source emissions of NO_X in the WRAP region, and approximately 0.06% of all stationary source (point and area source) NO_X emissions in the region. SO_2 emissions from lime kilns represent approximately 0.01% of total point source emissions of SO_2 in the WRAP region, and approximately 0.01% of all stationary source (point and area source) SO_2 emissions in the region.

Table 9-1 shows estimated emissions of NO_X, SO_2, PM_{10}, $PM_{2.5}$ and VOC from the WRAP emissions inventory and updated data provided by the states, broken down by state and emission source. As the table shows, SO_2, PM_{10}, $PM_{2.5}$ and VOC emissions from lime kiln sources are much lower than NO_X emissions. PM emissions from these sources were not included in the WRAP EDMS inventory – the emissions presented were gathered from the 2002NEI.

Table 9-2 lists potential control measures for NO_X, SO_2, PM_{10} and $PM_{2.5}$ emissions from lime kilns. A number of options were identified for lime kilns in the AirControlNet documentation report written by Pechan in 2006.[4] Many of the controls listed are similar to those to control emissions from cement kilns (please see chapter 7). SCR and SNCR have been investigated as possible control technologies but have been found to be technically infeasible. Additionally, according to the NACAA, there are no technically feasible methods for controlling NO_X emissions from lime kilns.[1] Therefore NACAA discusses control options for PM emissions only.

9.1 Factor 1 – Costs

Table 9-3 provides cost estimates for the emission control options which have been identified for lime kilns used in the pulp and paper industry. For each option, the table gives an estimate of the capital cost to install the necessary equipment, and the total annual cost of control, including the amortized cost associated with the capital equipment cost. The capital and annual cost figures are expressed in terms of the cost per standard cubic feet per minute (scfm). The table shows a range of values for each cost figure, since the cost per scfm will depend on the

Table 9-1. Emissions from Lime Kilns in the WRAP Region

	AK	CA	CO	ID	MT	ND	NM	NV	OR	UT	WA	WY	Tribes	All
							NO_X emissions (tons/year)							
Total*	0	66	0	99	236	0	0	0	96	0	308	23	0	828
							SO_2 emissions (tons/year)							
Total*	0	1	0	3.3	2	0	0	0	57	0	40	0	0	104
							$PM_{2.5}$ emissions (tons/year)							
Total*	0	40	0	87	31	0	0	0	336	0	109	0	0	603
							PM_{10} emissions (tons/year)							
Total*	0	53	0	93	38	0	0	0	370	0	113	0	0	667
							VOC emissions (tons/year)							
Total*	0	0.28	0	5	20	0	0	0	2.18	0	4	0	0	32

* The majority of emissions produced in the pulp and paper lime kiln operations are generated from the kilns themselves. Thus the total emissions presented in this table are emissions from kilns.

Table 9-2. Control Options for Lime Kilns

Source Type	Control Technology	Pollutant controlled	Baseline emissions	Estimated control effieiency (%)	Potential emission reduction (tons/year)	References
Kiln	Low NOX burners	NO_X	828	30	248	4
	Mid-kiln firing	NO_X	828	30	248	4
	LoTOX	NO_X	828			
	SCR with ammonia	NO_X	828	60 - 80	496 - 662	4
	SNCR with ammonia or urea	NO_X	828	50	414	4
	Wet FGD	SO_2	104	50	51	4
	Dry ESP	PM_{10}	1271	95-98	1207 - 1245	4
	Dry ESP	$PM_{2.5}$	1271	95-98	1207 - 1245	4
	Dry ESP	EC	37	95-98	35 - 36	4
	Dry ESP	OC	161	95-98	153 - 158	4

kiln size and other factors. The lower ends of the cost ranges typically reflect smaller kilns, and the higher ends of the cost ranges typically reflect larger kilns. Table 9-3 also shows the estimated cost effectiveness for each control measure, in terms of the cost per ton of emission reduction.

9.2 Factor 2 – Time Necessary for Compliance

Once a state decides to adopt a particular control strategy, up to 2 years will be needed to develop the necessary rules to implement the strategy. We have estimated that sources may then require up to a year to procure the necessary capital to purchase control equipment. The ICAC has estimated that approximately 13 months is required to design, fabricate, and install SCR or SNCR technology for NO_X control.[5] However, state regulators' experience indicates that closer to 18 months is required to install this technology.[6] Additional time of up to 12 months may be required for staging the installation process if multiple sources are to be controlled at a single facility. Based on these figures, the total time required to achieve emission reductions for pulp and paper lime kilns is estimated at a total of 5½ years.

9.3 Factor 3 – Energy and Other Impacts

Table 9-4 shows the estimated energy and non-air pollution impacts of control measures for pulp and paper lime kilns. Low NO_X burners negatively affect efficiency and energy usage,[7] and staged combustion, while lowering NO_X emissions, can lead to increased SO_2 emissions. SCR and SNCR require, on average, 890 kilowatt-hour (kWh) of electricity per ton of pollutant reduced, and 0.25 tons of steam for every ton of pollutant reduced. Approximately one ton of CO_2 is produced per mWh of electricity generated.[8] In addition, spent catalyst from the SCR technology would have to be changed periodically, producing an increase in solid waste disposal.[9] Installation of SCR would also require an increase in fuel consumption, which would also produce an increase in CO_2 emissions to generate the electricity.

Fabric filters and ESP technologies, on average, generate approximately one ton of solid waste for every ton of pollutant reduced. It is also likely that there will be additional electricity usage for in-combustion and post-combustion technologies.

9.4 Factor 4 – Remaining Equipment Life

Information was not available on the age of reciprocating engines and turbines in the WRAP region. However, lime kilns, like cement kilns, have no set equipment life. These units can be refurbished to extend their lives. In addition, it is assumed that controls will be not be applied to lime kilns that are expected to be retired prior to the amortization period for the control equipment. Therefore, remaining equipment life is not expected to affect the cost of control for lime kilns.

Table 9-3. Estimated Costs of Control for Lime Kilns

Source Type	Control Technology	Pollutant controlled	Estimated control effieiency (%)	Estimated capital cost ($1000/unit)	Estimated annual cost ($/year/unit)	Units	Cost effectiveness ($/ton)	References
Kilns	Low NO_X burners	NO_X	30		Not available		560	4
	Mid-kiln firing	NO_X	30		Not available		460	4
	SCR with ammonia	NO_X	60 - 80		Not available		3370	4
	SNCR with ammonia or urea	NO_X	50		Not available		770 - 850	4
	Wet FGD	SO_2	50		Not available			4
	Dry ESP	$PM_{2.5}$	95	15 - 50	4 - 40	scfm		4
	Dry ESP	PM_{10}	98	15 - 50	4 - 40	scfm	40-250	4
	Dry ESP	EC	95	15 - 50	4 - 40	scfm		4
	Dry ESP	OC	95	15 - 50	4 - 40	scfm		4
	Wet ESP	$PM_{2.5}$	95		Not available			4
	Wet ESP	PM_{10}	99	30 - 60	6 - 45	scfm	55 - 550	4
	Wet ESP	EC	95		Not available			4
	Wet ESP	OC	95		Not available			4

Table 9-4. Estimated Energy and Non-Air Environmental Impacts of Potential Control Measures for Lime Kilns

				Energy and non-air pollution impacts					
Source Type	**Control Technology**	**Pollutant controlled**	**Potential emission reduction (tons/year)**	**Additional Fuel Requirement (%)**	**Additional electricity requirement (kW-hr/ton reduced)**	**Steam requirement (tons steam/ton reduced)**	**Solid waste produced (tons waste/ton reduced)**	**Wastewater produced (million gallons/ton reduced)**	**Additional CO_2 emitted (tons/ton reduced)**
Kilns	Low NOX burners	NO_X	30	Unknown	Unknown				
	Mid-kiln firing	NO_X	30		a				
	SCR with ammonia	NO_X	60 - 80	Unknown	890	0.25			1
	SNCR with ammonia or urea	NO_X	50	Unknown	890	0.25			1
	Wet FGD	SO2	90		1,100	3.1	2.8	3.7	2.6
	Dry ESP	PM10, PM2.5, EC, OC	95-98		Unknown		1		
	Fabric Filter	PM10, PM2.5, EC, OC	95-99		Unknown		1		

a - The measure is expected to improve fuel efficiency.

9.5 References for Section 9

1. NACAA (formerly STAPPA and ALAPCO) (2006), *Controlling Fine Particulate Matter Under the Clean Air Act: A Menu of Options,* National Association of Clean Air Agencies, Chapter 8, http://www.4cleanair.org/PM25Menu-Final.pdf.

2. Davis, W. (2000), *Air Pollution Engineering Manual: Second Edition*, Air & Waste Management Association.

3. WRAP (2008), *Emissions Data Management System, Western Regional Air Partnership*, Denver, CO, http://www.wrapedms.org/app_main_dashboard.asp.

4. E.H. Pechan & Associates (2005), *AirControlNET, Version 4.1 - Documentation Report*, U.S. EPA, RTP, NC, http://www.epa.gov/ttnecas1/AirControlNET.htm.

5 . Institute of Clean Air Companies (2006), *Typical Installation Timelines for NO_X Emissions Control Technologies on Industrial Sources*, http://www.icac.com/files/public/ICAC_NOx_Control_Installation_Timing_120406.pdf.

6 . Ghoreishi, Farrokh (2007), Personal communication, *Time required to install add-on control measures for NO_X*, Wisconsin Department of Natural Resource, April 27.

7. Northeast States for Coordinated Air Use Management (NESCAUM) (2005), *Assessment of BART-Eligible Sources: Steam Electric Boilers, Industrial Boilers, Cement Plants and Paper and Pulp Facilities*, http://bronze.nescaum.org/committees/haze/BART_Control_Assessment.pdf.

8. Keeth, R. et al. (2000), *Coal Utility Environmental Cost (CUECost) Workbook User's Manual Version 1.0*, Prepared for US EPA/Office of Research and Development, EPA Contract No. 68-D7-0001, http://www.epa.gov/ttn/catc/products.html.

9. EPA (2002), *EPA Air Pollution Control Cost Manual, 6th ed*., EPA/452/B-02-001, U.S. EPA, Office of Air Quality Planning and Standards, RTP, NC, http://www.epa.gov/ttncatc1/products.html#cccinfo.

10. Oil Refineries

Petroleum refineries in the WRAP region are estimated to emit about 25,000 tons of NO_X and 58,000 tons of SO_2, based on the WRAP emissions inventory. These emissions represent about 2% of stationary source (point and area source) NO_X emissions, and 6% of stationary source SO_2 emissions in the region. PM_{10} and $PM_{2.5}$ emissions from natural gas processing facilities are estimated to be an order of magnitude lower than NO_X and SO_2 emissions.

Table 10-1 summarizes estimated emissions from petroleum refineries in the WRAP region, broken down by state and by the various emission sources. These emissions estimates are based on the 2002 WRAP emissions inventory.[1] Major sources of NO_X and SO_2 emissions at refineries in the WRAP region include process heaters, catalytic cracking units, coking units and ancillary operations, flares and incinerators. Other sources include boilers, which have been discussed in Chapter 6, and reciprocating engines and turbines, which have been discussed in Chapter 3.

Emissions of OC and EC are not specifically quantified in either the WRAP inventory or the NEI, but can be estimated as a percentage of PM_{10} emissions using data from EPA's SPECIATE database.[2] EC and OC are estimated to comprise 0.07% and 0.014% of PM_{10} emissions from catalytic cracking units, respectively; 38.4% and 24.7% of natural gas combustion PM_{10} emissions; and 1% each in oil combustion PM_{10}.

Table 10-2 lists potential control measures for emissions of SO_2, NO_X, and PM at petroleum refineries. The table includes options for process heaters, fluid catalytic cracking units, fluid coking operation boilers, coke calcining boilers, and flares.

Most of the SO_2 emissions from process heaters result from the burning of refinery fuel gases containing hydrogen sulfide (H_2S). These emissions can be reduced by treating the refinery fuel gas to remove H_2S before the gas is burned. A number of options are available to reduce NO_X emissions from process heaters. Combustion modifications including LNB, ULNB, and FGR reduce the formation of NO_X. In addition, flue gases from the process heaters can be treated with SCR or SNCR to reduce NO_X emissions. These post-combustion controls can be used either alone or in conjunction with combustion controls.[3,4]

In catalytic cracking, the heavier fractions of crude petroleum are treated with a catalyst which breaks the petroleum molecules into lighter compounds. The catalyst is continuously cycled between the cracking and a separate regeneration reactor in order to burn off coke build-up. Since the catalyst coke contains relatively high levels of sulfur, the combustion products from this coke are an important source of SO_2 emissions. Uncontrolled SO_2 concentrations in the fluid catalytic cracking (FCC) regenerator exhaust stream range from 150 to 3000 parts per million by volume (ppmv). The FCC regenerator burner also emits NO_X and PM, including material abraded from the catalyst (catalyst fines). Uncontrolled NO_X emissions from the regenerator vent can range from 50 to 400 ppmv.[5]

Table 10-1. Emissions from Petroleum Refineries in the WRAP Region

	AK	CA	CO	MT	ND	NM	NV	OR	UT	WA	WY	Tribes	All
						NO_X emissions (tons/year)							
Process Heaters	573	7,778	349	1,072	864	783	48		615	3,088	192	1	15,362
Catalytic Cracking Units		1,179	239	463		193			245				2,319
Flares	102	942	12	191		7			261	57	9		1,582
Fluid Coking Units		122		25									147
Other	122	563	106	103		31		7	105	996	1,156	1,984	5,174
Total	797	10,583	707	1,854	864	1,014	48	7	1,226	4,141	1,358	1,985	24,584
						SO_2 emissions (tons/year)							
Process Heaters	62	2,093	338	628	4,592	1,268	93		715	2,330	363	10	12,491
Catalytic Cracking Units		5,567	1,197	4,649		2,044			671	2,645	379		17,152
Flares	8	4,940	2	380		31			313	936	139		6,750
Fluid Coking Units		5,937		282									6,219
Coke Calcining		3,642								186			3,828
Incinerators	41	29		183		457		1	2,105	44	629		3,489
Other	41	5,802	126	183		688		10	2,105	698	5,238	113	15,003
Total	111	24,340	1,663	6,122	4,592	4,030	93	10	3,804	6,609	6,120	122	57,615
						PM_{10} emissions (tons/year)							
Process Heaters	30	1,049	31	38		72			61	200	28		1,509
Catalytic Cracking Units		305	264	333		171			30	74			1,177
Flares	6	41	0						2	5	0		55
Fluid Coking Units		154		6									160
Other	7	51	193	2				3	280	70	536		1,142
Total	43	1,600	488	379	0	244	0	3	373	349	564	0	4,042
						$PM_{2.5}$ emissions (tons/year)							
Process Heaters	2	1,026				64			60	30			1,184
Catalytic Cracking Units		278				103			4				384
Flares		41							2	1			44
Fluid Coking Units		140											140
Other	0	54							3	2			60
Total	2	1,539	0	0	0	167	0	0	70	33	0	0	1,812
						VOC emissions (tons/year)							
Fugitive emissions	0	3,094	127	1,326	0	1,396	20	37	447	955	469	1	7,872
Wastewater treatment	1,018	960	13	531	0	221	5	2	139	344	94	0	3,327
Process heaters	9	418	67	27	161	30	1	1	22	101	2,613	10	3,461
Flares	130	2,311	17	33	0	5	0	0	63	117	27	0	2,703
Other	11	1,304	43	100	0	151	8	1	67	161	7	0	1,852
Total	1,167	8,086	268	2,017	161	1,802	34	41	738	1,678	3,210	12	19,215

Table 10-2. Control Options for Petroleum Refineries

Source Type	Control Technology	Pollutant controlled	Baseline emissions (1000 tons)	Estimated control effieiency (%)	Potential emission reduction (1000 tons/year)	Refer-ences
Process heaters	Fuel treatment to remove sulfur	SO_2	12	up to 90	0 - 11	5,13
	LNB	NO_X	15	40	6.1	3,6
	ULNB	NO_X	15	75 - 85	12 - 13	5,6,3
	LNB and FGR	NO_X	15	48	7.4	3,6
	SNCR	NO_X	15	60	9.2	3,5,3
	SCR	NO_X	15	70 - 90	11 - 14	3,5,3
	LNB and SCR	NO_X	15	70 - 90	11 - 14	3,5,3
Fluid catalytic cracking units	Catalyst additives for NO_X reduction	NO_X	2.3	46	1.1	5,7
	LoTOX™	NO_X	2.3	85	2.0	5,8
	SNCR	NO_X	2.3	40 - 80	0.93 - 1.9	5,7
	SCR	NO_X	2.3	80 - 90	1.9 - 2.1	8,7
	Catalyst additives for SO_2 absorbtion	SO_2	17	20 - 60	3.4 - 10	5,7
	Desulfurization of catalytic cracker feed	SO_2	17	up to 90	0 - 15	7,13
	Wet scrubbing	SO_2	17	70 - 99	12 - 17	5,6,9
	ESP	PM_{10}	1.2	95+	1.1 - 1.2	5,6,10
		$PM_{2.5}$	0.4	95+	0.4	
		EC	0.0008	95+	0.0008	
		OC	0.0002	95+	0.0002	
Coking or coke calcining boilers	Spray dryer absorber	SO_2	10	80 - 95	8 - 10	5
	Wet FGD	SO_2	10	90 - 99	9 - 10	5,11,12
Flares	Improved process control and operator training	SO_2		varies		5
	Expand sulfur recovery unit	SO_2		varies		5
	Flare gas recovery system	SO_2		varies		5

Many refineries use catalyst additives to reduce SO_2 and NO_X emissions from fluid catalytic cracking units. SO_2 emissions can also be reduced by treating the fluid catalytic cracker feed stream to remove sulfur compounds. Some refineries in the U.S. have also used SCR to control NO_X emissions from catalytic cracking units, and one refinery in Japan has also used SNCR.[6,7] In addition, the LoTOx™ process has been developed to control NO_X emissions in the catalytic cracking regenerator offgas. In this system, ozone is injected into the offgas to convert the nitrogen oxide (NO) and nitrogen dioxide (NO_2) which comprise NO_X into more highly oxidized forms of nitrogen such as dinitrogen pentoxide (N_2O_5). These more highly oxygenated compounds are more soluble in water, and are removed from the offgas stream in a wet scrubber. An emission control efficiency of 90% has been reported for this system.[5,8] However, the LoTOx™ system is more cost effective if used in conjunction with a wet scrubber to control SO_2 emissions. Wet scrubbers are often used for simultaneous control of PM, SO_2, and NO_X emissions from the catalyst regenerator.[9] In addition, cyclones and ESP are commonly used to control PM emissions in the catalyst regenerator offgas.[5,10]

SO_2 emissions from fluid coking and coke calcining operations result from the combustion of a portion of the coke in a coke burner. Wet scrubbers have been used to control SO_2 emissions from the coking unit, with reported efficiencies of 95% to over 99%.[11] The emission streams from a coke calciner incinerator and from the coke burner in a fluid coking unit are similar to the emission streams from a boiler.[11] Therefore, it is believed that NO_X emissions from these streams can be controlled using SCR or SNCR.[12,13]

Petroleum refineries use flares to burn combustible gases that must be vented from various processes and cannot be practically processed or recovered. These gases generally emanate from non-steady-state operations, such as start-up, shut-down, process maintenance, and process upsets. Some of these operations are predictable, and others are not. SO_2 emissions from flaring result from the flaring of sour gases or other gases which have high concentrations of sulfur compounds. These emissions can often frequently be reduced through the use of improved process controls or improved training of process operators. Emissions can also be reduced by expanding the sulfur recovery unit to handle all of the acid gases produced by the refinery, and by optimizing the performance of the sulfur recovery unit. All of these measures are designed to reduce the number of times that sulfur-containing gases are flared.[5]
A flare gas recovery system can also be used to capture waste gases before they are flared, and hold the gases until they can be treated to remove sulfur compounds.[5] NO_X emissions during flaring events can be mitigated by combustion controls such as steam injection.

10.1 Factor 1 – Costs

Table 10-3 provides cost estimates for the emission control options which have been identified for petroleum refineries. For each option, the table gives an estimate of the capital cost to install the necessary equipment, and the total annual cost of control, including the amortized cost associated with the capital equipment cost. The capital and annual cost figures are expressed in terms of the cost per unit process throughput.

Table 10-3. Estimated Costs of Control Petroleum Refineries

Source Type	Control Technology	Pollutant controlled	Estimated control effieiency (%)	Estimated capital cost ($1000/unit)	Estimated annual cost ($/year/unit)	Units	Cost effectiveness ($/ton)	Refer-ences
Process heaters	Fuel treatment to remove sulfur	SO_2	up to 90	3.4 - 10	28,000 - 36,000	Refinery capacity, 1000 barrels/day	1,300 - 1,700	5,13
	LNB	NO_X	40	2.7 - 7.6	290 - 810	MM-Btu/hr	650 - 2,800	3,6
	ULNB	NO_X	75 - 85	2.8 - 13	300 - 1,300	MM-Btu/hr	400 - 2,000	3,5,6
	LNB and FGR	NO_X	48	5.8 - 16	640 - 1,700	MM-Btu/hr	1,000 - 2,600	3,6
	SNCR	NO_X	60	5.2 - 22	570 - 2,400	MM-Btu/hr	890 - 5,200	3,5,6
	SCR[b]	NO_X	70 - 90	33 - 48	3,700 - 5,600	MM-Btu/hr	2,900 - 6,700	3,5,6
	LNB and SCR	NO_X	70 - 90	37 - 55	4,000 - 6,300	MM-Btu/hr	2,900 - 6,300	3,5,6
Fluid catalytic cracking units	Catalyst additives for NO_X reduction	NO_X	46		not available[a]			5,7
	LoTOX™	NO_X	85				1,700 - 2,000	5,8
	SNCR	NO_X	40 - 80				2500	5,7
	SCR	NO_X	80 - 90				2500	7,8
	Catalyst additives for SO_2 absorbtion	SO_2	20 - 60		not available[a]			5,7
	Desulfurization of catalytic cracker feed	SO_2	up to 90	23 - 54	190,000 - 250,000	Refinery capacity, 1000 barrels/day	6,200 - 8,000	7,13
	Wet scrubbing	SO_2	70 - 99				1,500 - 1,800	5,6,9
	ESP	$PM_{2.5}$, PM_{10}, EC,OC	95+				>10,000	5,6,10
Coking or coke calcining boiler offgas	Spray dryer absorber	SO_2	80 - 95				1,500-1,900	5
	Wet FGD	SO_2	90 - 99				1,500 - 1,800	5,11,12
Flares	Improved process control and operator training	SO_2	Varies		not available[a]			5
	Expand sulfur recovery unit	SO_2	Varies		not available[a]			5
	Flare gas recovery system	SO_2	Varies		not available[a]			5

[a]Costs of process modifications will depend on the specific refinery configuration.

[b]SCR cost estimates for SCR apply to mechanical draft heaters. Natural draft heaters would have to be converted to mechanical draft for installation of SCR. This would increase both the capital and annualized costs of control by about 10%.

Sulfur recovery units are believed to be more cost-effective than post-combustion controls for reducing SO_2 emissions from flares and incinerators at natural gas processing facilities. Recent analyses of controls for Regional Haze precursors have focused on add-on controls for SO_2, rather than such process modifications. However, costs of sulfur recovery units were estimated in an earlier study of model refineries in different size ranges.[14] These estimates have been updated to current dollars using the Chemical Engineering plant cost index.

Table 10-3 shows a range of values for each cost figure, since the cost per unit of throughput will depend on the process size and other factors. The lower ends of the cost ranges typically reflect larger engine or process sizes, and the higher ends of the cost ranges typically reflect smaller process sizes. The table also shows the estimated cost effectiveness for each control measure, in terms of the cost per ton of emission reduction.

10.2 Factor 2 – Time Necessary for Compliance

Once a state decides to adopt a particular control strategy, up to 2 years will be needed to develop the necessary rules to implement the strategy. We have estimated that sources may then require up to a year to procure the necessary capital to purchase control equipment. The ICAC has estimated that approximately 13 months is required to design, fabricate, and install SCR or SNCR technology for NO_X control.[15] However, state regulators' experience indicates that closer to 18 months is required to install this technology.[16] In the CAIR analysis, EPA estimated that approximately 30 months is required to design, build, and install SO_2 scrubbing technology for a single emission source.[17] The analysis also estimated that up to an additional 12 months may be required for staging the installation process if multiple sources are to be controlled at a single facility. Based on these figures, the total time required achieve emission reductions for oil refineries estimated at a total of 6½ years.

10.3 Factor 3 – Energy and Other Impacts

Table 10-4 shows the estimated energy and non-air pollution impacts of control measures for sources at petroleum refineries. Process modifications to desulfurize process gases burned in process heaters would generally require increases in catalytic hydrotreatment processing. These modifications may increase the generation of spent catalyst, which would need to be treated as a solid waste or a hazardous waste. Low NO_X burners for process heaters are expected to improve overall fuel efficiency.[3] FGR would require additional electricity to recirculate the fuel gas into the heater. In SCR systems for process heaters or other sources, fans would be required to overcome the pressure drop through the catalyst bed. The fans would require electricity, with resultant increases in CO_2 to generate the electricity. In addition, spent catalyst would have to be changed periodically, producing an increase in solid waste disposal.[10]

Catalyst additives for reducing NO_X and SO_2 emissions from fluid catalytic cracking units are likely to result in increased generation of spent catalyst, which would have to be disposed as hazardous waste. These catalyst additives may also result in increases in fuel consumption. However, information is not available to quantify these impacts. A LoTOx

Table 10-4. Estimated Energy and Non-Air Environmental Impacts of Potential Control Measures for Petroleum Refineries

Source Type	Control Technology	Pollutant controlled	Potential emission reduction (1000 tons/year)	Additional fuel requirement (%)	Energy and non-air pollution impacts (per ton of emission reduced)				
					Electricity requirement (kW-hr)	Steam requirement (tons steam)	Solid waste produced (tons waste)	Wastewater produced (1000 gallons)	Additional CO_2 emitted (tons)
Process heaters	Fuel treatment to remove sulfur	SO_2	0 - 11	b					b
	LNB	NO_X	6	a	e				
	ULNB	NO_X	12 - 13	a	e				
	LNB and FGR	NO_X	7.4		3,300				3.3
	SNCR	NO_X	9.2	0.16	460				3.2
	SCR	NO_X	11 - 14		8,400		0.073		8.4
	LNB and SCR	NO_X	11 - 14		8,400		0.073		8.4
Fluid catalytic cracking units	Catalyst additives for NO_X reduction	NO_X	1.1	d			d		
	LoTOX™	NO_X	2.0		d		d	d	
	SNCR	NO_X	0.93 - 1.9		460				3.2
	SCR	NO_X	1.9 - 2.1		8,400		0.073		8.4
	Catalyst additives for SO_2 absorbtion	SO_2	3.4 - 10	d			d		
	Desulfurization of catalytic cracker feed	SO_2	0 - 15	d		d	d		d
	Wet scrubbing	SO_2	12 - 17		1,100	3.1		3.7	2.6
	ESP	$PM_{2.5}$, PM_{10}, EC,OC	1.1 - 1.2		97		1		0.1
Coking or coke calcining boiler offgas	Spray dryer absorber	SO_2	8 - 10		400				1.1
	Wet FGD	SO_2	9 - 10		1,100	3.1		3.7	2.6
Flares	Improved process control and operator training	SO_2	Varies						
	Expand sulfur recovery unit	SO_2	Varies	d	d	d			d
	Flare gas recovery system	SO_2	Varies	d	d	d			d

NOTES:
blank indicates no impact is expected.
[a]The measure is expected to improve fuel efficiency.
[b]CO_2 from the generation of electricity would be offset by avoided emissions due to replacing the diesel engine
[c]EPA has estimated that the control measures used to meet Tier 4 standards will be integrated into the engine design so that sacrifices in fuel economy will be negligible.
[d]Some impact is expected but insufficient information is available to evaluate the impact.
[e]Some designes of low-NOX burners and ultralow-NOX burners require the use of pressurized air supplies. This would require additional electricity to pressurize the combustion

scrubbing system or wet scrubbing system applied to the fluidized catalytic cracking unit would require electricity to operate fans and other auxiliary equipment, and would produce a wastewater stream which would require treatment. In addition, sludge from the scrubber would require disposal as solid waste. SCR and SNCR systems would also require electricity for fans, and SCR systems would produce additional solid waste because of spent catalyst disposal. Dust captured by an ESP or fabric filter would also require disposal as a solid waste. The presence of catalyst fines in the dust may require treatment as a hazardous waste.

Sulfur recovery units require electricity and steam. Wet or dry scrubbers applied to incinerators and tail gas treatment units applied to sulfur recovery units would use electricity for the fan power needed to overcome the scrubber pressure drop. These systems would also produce solid waste, and wet scrubbers would produce wastewater which would require treatment.

10.4 Factor 4 – Remaining Equipment Life

Information was not available on the age of processes at petroleum refineries in the WRAP region. However, industrial processes often refurbished to extend their lifetimes. Therefore, the remaining lifetime of most equipment is expected to be longer than the projected lifetime of pollution control technologies which have been analyzed for this category. In the case of add-on technologies, the projected lifetime is 15 years.

If the remaining life of an emission source is less than the projected lifetime of a pollution control device, then the capital cost of the control device would have to be amortized over a shorter period of time, corresponding to the remaining lifetime of the emission source. This would cause an increase in the amortized capital cost of the pollution control option, and a corresponding increase in the total annual cost of control. This increased cost can be quantified as follows:

$$A_1 = A_0 + C \times \frac{1-(1+r)^{-m}}{1-(1+r)^{-n}}$$

where:

A_1 = the annual cost of control for the shorter equipment lifetime ($)
A_0 = the original annual cost estimate ($)
C = the capital cost of installing the control equipment ($)
r = the interest rate (0.07)
m = the expected remaining life of the emission source (years)
n = the projected lifetime of the pollution control equipment

10.5 References for Section 10

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Washington State Regional Haze State Implementation Plan

Appendix G

Western Regional Air Partnership's
Technical Support System Road Map

TSS Roadmap and Users Guide – *Working Draft*
February 22, 2010

LIST OF ACRONYMS to be added

EXECUTIVE SUMMARY – highlight major technical products, supporting WRAP products, and how they built and relate to one another - protocols, QAPPs, scope of work documents, templates, work plans, et cetera, which form the collective planning and support structure. Purpose is to address need is to look at regional technical and planning analyses across the depth and breadth of work products, rather than focusing on modeling – in support of the "big picture" that will need to be explained in a federal Technical Support Document.

INTRODUCTION

The purpose of the TSS Roadmap and Users Guide is to provide a reference guide for users of the Western Regional Air Partnership (WRAP) Technical Support System (TSS). Beginning with a description of the TSS in Section 1, summary information about the data sources, quality assurance, and analysis results is then discussed in Sections 2, 3, and 4. The TSS contains data, information, and analysis results to support state, federal, and tribal agencies with the planning requirements of the EPA Regional Haze Rule (RHR), through the collaborative efforts of the WRAP organization. Much of the data and regional analysis results are also suitable, and has been used for other air quality analysis and planning purposes. A significant amount of more detailed data and/or analysis results also exist in data support systems or projects that feed into the RHR planning support provided by the TSS. These systems or projects are listed and linked to on the Projects page of the TSS. Also, many related reports for specific source sectors, analysis of regional impacts to Class I areas, and control strategy analyses are found under individual Committees, Forums, and Workgroups on the WRAP website – these results are generally not found on the TSS, and may be applied by the appropriate regulatory jurisdiction for RHR planning as that agency wishes. The current WRAP website will move into archive status in early 2010, but the links will remain accessible.

As with other Help and reference documents on TSS, this document will exist on TSS as a HTML page. The links in the HTML document will "jump to" the appropriate section of the HTML document on the TSS website, and include "Navigation Notes" to TSS tools, similar to those already in place for the Monitoring, Modeling, and Apportionment "buttons" on the TSS Resources page. *Note there are currently no Navigation Notes for tools under the Emissions button*. The tools and datasets on the TSS have linked "Help" for the user, via the master TSS "Getting Started" document. Also, under TSS Resources, the Monitoring, Emissions, Modeling, and Apportionment sections contain Methods descriptions, identifying how datasets and analysis tools were used, *these are in the process of being updated in the first quarter 2010..*

WRAP Technical Support System – RHR Technical Planning Elements & Roadmap Section Location

	Roadmap Section Location		
Required Technical Elements on TSS for Regional Haze Implementation Plans	**Data Sources**	**Quality Assurance**	**Analyses**
Monitored baseline visibility conditions (2000-04)	**2.2**	**3.2**	**4.2**
Natural conditions (2064 target)	**2.2**	**3.2**	**4.2**
Uniform glide slope	**2.2**	**3.2**	**4.2**

Baseline emissions (2000-2004)	**2.3**	**3.3**	**4.3**
Projected 2018 emissions	**2.3**	**3.3**	**4.3**
Source apportionment – 2002 baseline/2018 projections	**2.4, 2.5**	**3.4, 3.5**	**4.4, 4.5**
Projected 2018 visibility conditions	**2.5**	**3.5**	**4.5**

1.0 TECHNICAL SUPPORT SYSTEM DESCRIPTION

The purpose of this section is to provide a description of the:

- Structure of the TSS website pages and their content;
- RHR technical planning resources available on the TSS; and
- Access to the data support systems or projects that feed data and analysis results into the TSS.

EPA staff please add "any and all" comments on this 2/22 draft here, listed by subsection of Section 1 by Friday March 5th

1.1 OVERVIEW

The Technical Support System (TSS) (http://vista.cira.colostate.edu/tss/) has been developed by the Western Regional Air Partnership (WRAP) to provide a single portal to technical data and analytical results prepared by WRAP Forums and Workgroups. The data, results, an methods displayed on the TSS are intended to support the air quality planning needs of western state and tribes, and will be maintained and updated to support both the implementation of regional haze plans and other Western air quality analysis and management needs. The concept for the TSS is based on the final recommendations of the Attribution of Haze Phase I project (http://wrapair.org/forums/aoh/ars1/report.html).

The primary purpose of the TSS is to provide key summary analytical results and methods documentation for the required technical elements of the Regional Haze Rule, to support the preparation, completion, evaluation, and implementation of the regional haze implementation plans. The TSS provides technical results prepared using a regional approach, including summaries and analyses of the comprehensive datasets used to identify the sources and regions contributing to regional haze in the WRAP region.

The secondary purpose of the TSS is to offer a one-stop-shop for access, visualization, analysis, and retrieval of the technical data and regional analytical results prepared by WRAP Forums and Workgroups in support of regional haze planning in the West. Specifically, the TSS summarizes results and consolidates information about air quality monitoring, meteorological and receptor modeling data analyses, emissions inventories and models, and gridded air quality/visibility regional modeling simulations. These large and diverse data sets are integrated for application to air quality planning purposes by prioritizing and refining key information and results into explanatory tools.

1.2 HOME PAGE

The TSS Home Page is accessible at: http://vista.cira.colostate.edu/tss/. Navigation from this page includes the left-hand navigation and the buttons with yellow arrows in the center of the page. System log-in and user account options are readily accessible, though users are not required to log in. TSS-related news items are also featured on the Home page. Figure 1 shows the layout of the Home page. From the Home Page, users can directly access the Resources Page and the Projects Page, which are summarized in the sections below.

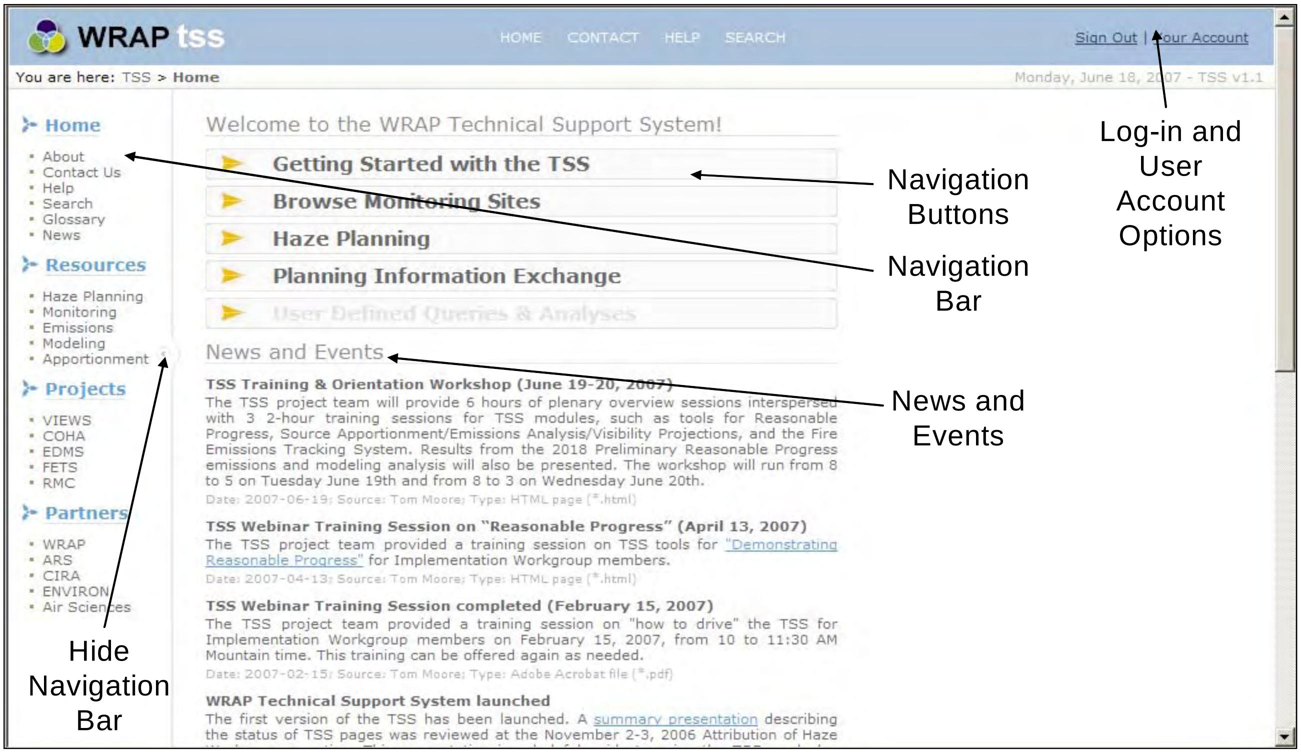


Figure 2-1. The TSS Home Page.

1.3 RESOURCES PAGE

The TSS Resources Page (http://vista.cira.colostate.edu/TSS/Results/Default.aspx) is the gateway to the site's analytical tools and methods documentation. From this page the user can choose to investigate the following topics:

- Haze Planning (http://vista.cira.colostate.edu/TSS/Results/HazePlanning.aspx) – This page integrates all of WRAP's major haze-related data sets and analyses, and provides review tools designed to support a reasonable progress demonstration. Detailed descriptions of these tools are presented in the on-line TSS Help Document (http://vista.cira.colostate.edu/TSS/Help/GettingStarted.aspx). Methods documentation for these tools and analyses can be found on the specific data type pages as indicated in the following bullets.

- Monitoring (http://vista.cira.colostate.edu/TSS/Results/Monitoring.aspx) – This page leads to monitoring data review tools and descriptive documents, including:
  - A detailed overview of the IMPROVE monitoring network;
  - An overview of WRAP data substitutions methods use for sites not meeting RHR data completeness guidelines;
  - An overview of how natural conditions were estimated for use with the revised IMPROVE algorithm;
  - A key to mapping parameters across monitoring, modeling, and emissions disciplines; and
  - Related monitoring data links.

- Emissions (http://vista.cira.colostate.edu/TSS/Results/Emissions.aspx) – This page leads to emissions data review tools and descriptive documents, including:
  - An overview of emissions inventory and processing activities;
  - Individual documents for each type of emissions inventory prepared for WRAP;
  - A key to mapping parameters across monitoring, modeling, and emissions disciplines; and
  - Related emissions data links.

- Modeling (http://vista.cira.colostate.edu/TSS/Results/Modeling.aspx) – This page leads to modeling review tools and descriptive documents, including:
  - A detailed overview of WRAP's air quality modeling;
  - An overview of WRAP's meteorological back trajectory modeling;

  - A key to mapping parameters across monitoring, modeling, and emissions disciplines; and
  - Related modeling links.

- Apportionment (http://vista.cira.colostate.edu/TSS/Results/SA.aspx) – This page leads to source apportionment analysis review tools and descriptive documents, including:
  - An overview of the PM Source Apportionment Technology (PSAT) air quality modeling technique used to trace Sulfur/SOx and Nitrate/NOx from source regions to Class I areas;
  - An overview of the Organic Aerosol Tracer technique used to distinguish between various types of organic aerosol modeled to arrive at Class I areas;
  - An overview of the Weighted Emissions Potential (WEP) technique, a qualitative analysis to investigate the potential for specific regional emissions to impact Class I areas; and
  - A key to mapping parameters across monitoring, modeling, and emissions disciplines.

Each of the documentation pages contains a link to the "Key to Monitoring-Modeling-Emissions Mapping" support file (http://vista.cira.colostate.edu/tss/help/parameterkey.aspx). This file summarized the often complex relationships among real-world visibility-related parameters and parameters defined by the IMPROVE program, the CMAQ and CAMx models, and WRAP emissions inventories. Specific parameter types, abbreviations, equations, and comments are presented. As an example, consider the following relationships among these disciplines for carbon species:

- **Organic Carbon (OC)** is measured by IMPROVE, but not modeled or directly represented in emissions inventories.
- **Organic Mass (OM or OMC)**, which is the sum total of all primary and secondary organic compounds, is calculated by IMPROVE from the OC measurement. Both models contain terms for specific OM constituents. OM is not directly represented in emissions inventories.
- **Primary Organic Aerosol (POA)**, which represents only organic carbon compounds emitted directly as particulates, cannot be distinguished in the IMPROVE measurements. However, both the models and the emissions inventories account for this portion of the total OM.
- **Volatile Organic Compounds (VOC)**, which are emitted in gaseous form but can condense to form particulate organic compounds, also cannot be directly accounted for by IMPROVE. VOCs are tracked in the models and emissions inventories.

1.4 PROJECTS PAGE

The TSS Projects Page (http://vista.cira.colostate.edu/TSS/Projects/Default.aspx) provides direct links to the key information resources, or data nodes that support WRAP's analyses. The value of the TSS is that it takes each of these separate data nodes and incorporates their key data sets, analysis results, and documentation. The data nodes currently supporting the TSS include:

- Visibility Information Exchange Web **System** (VIEWS) – VIEWS is an online exchange of air quality data, research, and ideas designed to support the Regional Haze Rule enacted by the U.S. EPA to reduce regional haze and improve visibility in national parks and wilderness areas.

- Causes of Haze Assessment (CoHA) **project** – The CoHA web site is an online report that answers questions about the chemical components that cause regional haze, relationships of haze to meteorology, the emissions that cause haze, and the effects of previous and future emissions reductions on the worst and best visibility levels.

- Emissions Data Management **System** (EDMS) – The WRAP EDMS is an emission inventory data warehouse and web-based application that provides a consistent approach to regional emissions tracking to meet the requirements for State Implementation Plan (SIP) and Tribal Implementation Plan (TIP) development and periodic review and updates.

- Fire Emissions Tracking **System** (FETS) – The FETS is a database with a web interface for planned and unplanned fire events. Users can view fire data on-screen with a mapping tool and query the database for downloads of data into model-ready formats and CSV or DBF formats.

- WRAP Regional Modeling Center (RMC) **project** – now, completed, the WRAP RMC assisted State and Tribal agencies in conducting regional haze analyses over the western U.S. by operating regional scale, three-dimensional, photochemical grid air quality models that simulate the emission, transformation, and transport of pollutants and the effects on visibility in WRAP Class I Areas.

The **systems** are ongoing efforts with periodic data and analysis results' updates, while the **projects** are fixed term efforts with no ongoing updates.

2.0 DATA SOURCES

2.1 OVERVIEW

For 'Visibility metrics' [e.g., the various IMPROVE equations for calculating scattering from aerosol measurements] & 'Natural conditions estimates', the Roadmap should discuss the range of options available on the TSS, provide links to the science behind each, and if WRAP provides a default or recommendation on the TSS, then provide the rational for that.

In the discussion of Emissions, describe:
- *how each emissions sector is defined,*
- *provide links to documentation on how each sector's inventory was built,*
- *provide links that describe how those sectors' inventories were modified for the various 2018 emissions inventories*
- *priority on covering the following emissions sectors: point, area, mobile, biogenic.*

In the Modeling section, should focus on providing the following information for each model:
- *model description,*
- *documentation on input parameters chosen and rational,*
- *documentation on the modeling protocols that were followed.*

The list of models is:
- *CMAQ,*
- *CAMx & PSAT,*
- *SMOKE,*
- *MM5,*
- *CALPUFF,*
- *WEP,*
- *PMF*
- *priority on covering the following models: CAMx & PSAT, CMAQ, MM5, SMOKE.*

EPA staff please add "any and all" comments on this 2/22 draft here, listed by subsection of Section 2 by Friday March 5th

2.2 MONITORING DATA

- IMPROVE network and protocols
- Visibility metrics
- Natural conditions estimates *(find Scott Copeland journal article)*

As noted in Appendix A, the Technical Analysis Forum recommends the use of the following monitoring metrics by states, tribes, and EPA to assist in regionally consistent assessments of reasonable progress at all 118 visibility-protected Class I Federal areas of the WRAP region in the foundational regional haze implementation plans:

1) Apply the revised IMPROVE light extinction equation as developed and approved in 2005 by the IMPROVE Steering Committee to convert from mass concentration measurements to light extinction for visibility analysis and regional haze planning at each WRAP region Class I area. This revised equation is available for haze planning nationwide on the VIEWS and TSS websites.

2) Use the alternative Natural Conditions Estimates in combination with the 2000-04 Best and Worst Days' metrics as developed and recommended by the Inter-RPO Monitoring & Data Analysis Discussion Group,

as calculated and reported by VIEWS and TSS, utilizing the revised IMPROVE equation, for visibility analysis and regional haze planning at each WRAP region Class I area. These alternative Natural Conditions Estimates are available for all Class I areas, nationwide.

3) Use the 2000-04 Best and Worst Days' metrics as calculated and reported by VIEWS and TSS. Missing data will be substituted using the procedure described later in this document. Similar data substitutions have been performed and documented on VIEWS, to produce regional haze baseline period metrics for all Class I areas, nationwide. Individual WRAP region states should review the data completeness for Class I areas in their state, and any data substitutions for their CIAs.

The following recommendation is specific to the WRAP region.

4) Use a variety of visibility projection techniques, including the EPA default and the 2 WRAP alternatives, to analyze and assess the best method(s) to assist in demonstrating and explaining reasonable progress. All of these projection methods are available on the TSS and will draw upon the 2000-04 Best and Worst Days' metrics as calculated and reported by VIEWS and TSS. These projection method options utilize the revised IMPROVE equation and alternative Natural Conditions Estimates to:

- Project, analyze, and assess 2018 visibility conditions for the overall deciview Haze Index and total light extinction; and
- Project, analyze, and assess IMPROVE species-specific contributions to 2018 visibility conditions, to better understand the relationships to natural and anthropogenic as well as controllable and uncontrollable emissions. The visibility impact of coarse material and sea salt are assumed to be constant 2000-04 to 2018.

2.3 EMISSIONS DATA

- Subsections for individual sectors
- To include assumptions used to project 2018 emissions (growth, controls, etc.)

2.4 MODELING RESULTS

- Models used
- Input parameter
- Visibility projections

2.5 MAPPING MONITORING, EMISSIONS, AND MODELING DATA PARAMETERS

- Discussion of "Rosetta" stone currently on TSS
- Considerations in assessing 2018 visibility projections using EPA guidance

As noted in Appendix A, the Technical Analysis Forum recommends the use of the following monitoring metrics by states, tribes, and EPA to assist in regionally consistent assessments of reasonable progress at all 118 visibility-protected Class I Federal areas of the WRAP region in the December 2007 regional haze implementation plans:

The following recommendation is specific to the WRAP region.

5) Use a variety of visibility projection techniques, including the EPA default and the 2 WRAP alternatives, to analyze and assess the best method(s) to assist in demonstrating and explaining reasonable progress. All of these projection methods are available on the TSS and will draw upon the 2000-04 Best and Worst Days' metrics as calculated and reported by VIEWS and TSS. These projection method options utilize the revised IMPROVE equation and alternative Natural Conditions Estimates to:

- Project, analyze, and assess 2018 visibility conditions for the overall deciview Haze Index and total light extinction; and
- Project, analyze, and assess IMPROVE species-specific contributions to 2018 visibility conditions, to better understand the relationships to natural and anthropogenic as well as controllable and uncontrollable emissions. The visibility impact of coarse material and sea salt are assumed to be constant 2000-04 to 2018.

Monitoring Metrics for BART Determinations

The WRAP's recommendations for use of the revised IMPROVE equation and alternative Natural Conditions Estimates for assessing current haze conditions and projecting future haze trends for regional haze planning should not be seen as an endorsement for their use by individual state air programs for evaluation of BART modeling results and BART control level determinations for technical and process reasons.

3.0 DATA QUALITY ASSURANCE

3.1 OVERVIEW

This section to emphasize processes to assure data used in haze planning is comprehensive, complete, and regionally consistent

In the emissions section, describe:

- documentation on quality assurance protocols employed throughout the emissions inventory development process for each emissions sector,
- documentation on quality assurance protocols for SMOKE model output.
- priority on covering the following emissions sectors: point, area, mobile, biogenic

For modeling, provide documentation for the following information for each model listed:

- performance metrics WRAP used to evaluate model output (MM5, CAMx, CMAQ),
- performance benchmarks used for each metric evaluated (MM5, CAMx, CMAQ) and the rationale behind those benchmarks,
- model performance results (MM5, CAMx, CMAQ),
- quality assurance protocols employed on model outputs (MM5, CAMx & PSAT, CMAQ, CALPUFF, WEP, PMF)
- priority on covering the following models: CAMx & PSAT, CMAQ, MM5, SMOKE.

For the ‘Key findings’ section, provide links to the documentation backing up the finding or, if appropriate, reference the appropriate section(s) of the Roadmap that have those document link(s).

EPA staff please add “any and all” comments on this 2/22 draft here, listed by subsection of Section 3 by Friday March 5th

3.2 MONITORING DATA

The Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring program collects speciated PM2.5, and total PM2.5 and PM10 mass. IMPROVE is a nationwide network which began in 1988 and expanded significantly in 2000 in response to the EPA’s Regional Haze Rule (RHR). The Regional Haze Rule specifically requires data from this program to be used by states and tribes to track progress in reducing haze. The network collects 24-hour integrated filter samples every three days (Wednesday and Saturday prior to 2000. Each monitoring location operates four samplers. Modules A through C employ PM2.5 size-cut devices, and Module D a PM10 size-cut device. An overview of the program with an emphasis on its application to the RHR can be found in the TSS document *IMPROVE Particle Monitoring* (http://vista.cira.colostate.edu/docs/wrap/Monitoring/IMPROVE_Particulate_Monitoring_May_2007.doc). Detailed information regarding the IMPROVE program, including history, sampling protocols, standard operating procedures, and data availability can be found on the IMPROVE web site (http://vista.cira.colostate.edu/improve/Default.htm) and the Visibility Information Exchange Web System (VIEWS) web site (http://vista.cira.colostate.edu/views/).

IMPROVE particulate data undergoes a variety of quality assurance procedures both at the laboratory level and at the data analysis level. The following sections provide a guide to specific quality assurance resources for the IMPROVE program.

3.2.1 Quality Assurance

There is a series of documents on the IMPROVE web site related to the program’s quality assurance procedures. These documents can be accessed from IMPROVE’s Home Page by clicking on the “Data Advisory, QA/QCX” icon under *IMPROVE Resources* (direct link: http://vista.cira.colostate.edu/improve/Data/QA_QC/qa_qc_Branch.htm). Figure 3-1 presents a view of this web page.

This quality assurance page provides the following information:

Data Advisories
http://vista.cira.colostate.edu/improve/Data/QA_QC/Advisory.htm

This page provides a collection of data advisories written primarily by laboratory or analyst staff who have discovered data anomalies, potential problems, or new uses for the IMPROVE data. Each advisory is a concise (typically 1-4 page) statement of the problem and recommended solution. Approximately half of the advisories affect the RHR baseline period of 2000-04.

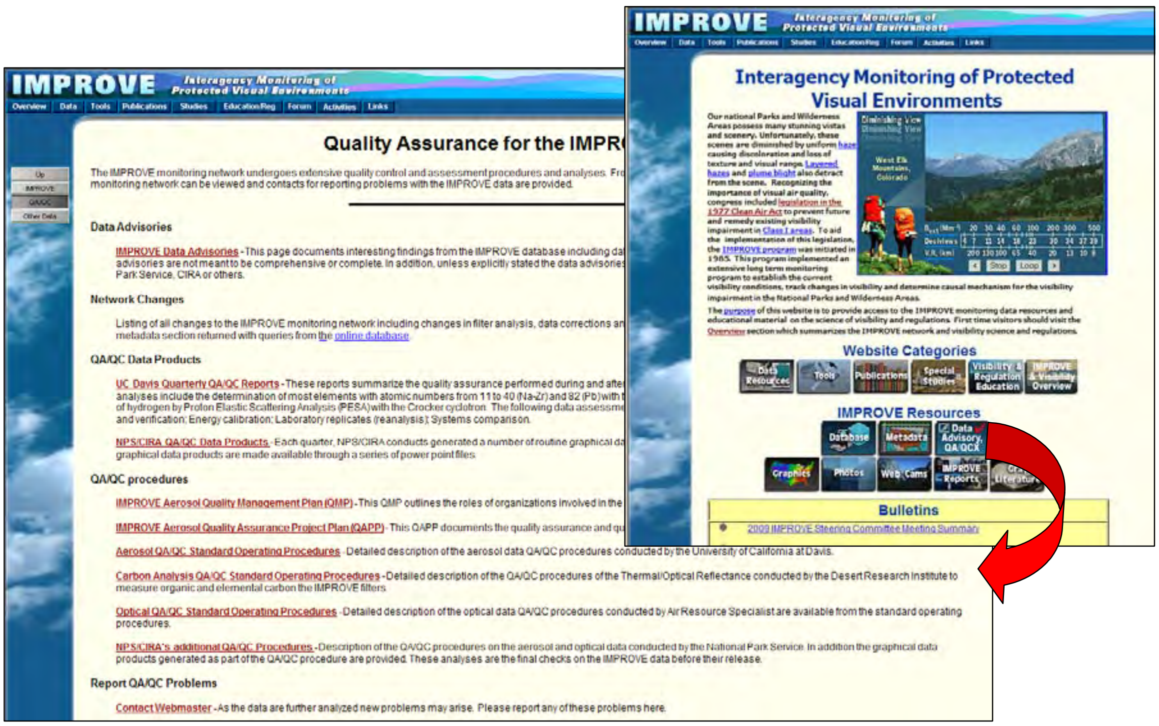


Figure 3-1. *Quality Assurance for the IMPROVE Network* page on the IMPROVE web site.

QA/QC Data Products
UC Davis reports: http://vista.cira.colostate.edu/improve/Data/QA_QC/QAQC_UCD.htm
NPS/CIRA reports: http://vista.cira.colostate.edu/improve/Data/QA_QC/QAQC_nps.htm

There pages provide a collection of routine QA/QC reports and data products prepared by UC Davis (the IMPROVE aerosol laboratory) and NPS/CIRA (the project data analysts). The UC Davis reports focus on QA for elemental analysis by XRF, beginning with 2005 data. The NPS/CIRA reports include an overview document which describes their QA procedures (http://vista.cira.colostate.edu/improve/Data/QA_QC/NPSProc/CIRA_QA_Overview.pdf) and a series of QA data products in the form of MS PowerPoint presentations. These reports cover data from 1988 to the present.

QA/QC Procedures

EPA requires monitoring programs to prepare several types of quality assurance/quality control documents, including a Quality Management Plan (QMP), a Quality Assurance Project Plan (QAPP), and Standard Operating Procedures (SOPs). These are considered living documents, and are updated periodically as instrument/laboratory procedures or configurations change. These documents for the IMPROVE program can be accessed from the *Quality Assurance* web page, but are also grouped together on the *IMPROVE Publications* page (http://vista.cira.colostate.edu/improve/Publications/publications.htm). Direct links to each set of documents is given below:

- **IMPROVE QMP** – describes the roles of each organization in the project. http://vista.cira.colostate.edu/improve/Publications/QA_QC/IMPROVEAerosolQMP_May2002.PDF
- **IMPROVE QAPP** – describes the specific steps taken by each organization to ensure data is collected and managed in a high quality manner. http://vista.cira.colostate.edu/improve/Publications/QA_QC/IMPROVE_QAPP_R0.pdf
- **IMPROVE SOPs** – describe in detail the steps followed to perform all activities in the monitoring program. http://vista.cira.colostate.edu/improve/Publications/IMPROVE_SOPs.htm

Note that there are SOPs for the particulate monitoring network (authored by UC Davis), carbon analysis (authored by Desert Research Institute), ion chromatography analysis (authored by Research Triangle Institute), and optical monitoring (authored by Air Resource Specialists).

3.2.1.1 IMPROVE Gray Literature

The *IMPROVE Gray Literature* page at:
http://vista.cira.colostate.edu/improve/Publications/GrayLit/gray_literature.htm offers a collection of ad-hoc analyses, reports and presentations conducted by members of the IMPROVE program and others. These documents contain important information concerning the monitoring, filter analysis, and data analysis that have not been formally published elsewhere.

3.2.2 Data Substitution Methods

Regional Haze Rule guidance outlines data completeness requirement designed to balance the need for data from individual days, seasons, and years to be reasonably representative of ambient aerosol concentrations at each monitoring site. For sites with incomplete data during the baseline years (fewer than 3 complete years), appropriate tracking metrics cannot be calculated. The WRAP, working with individual states, developed data substitution methods for sites that did not have the required baseline data. These methods were also applied at sites where incomplete years were desirable for modeling and planning purposes. Substitutions included estimating missing species from other on-site measurements, and appropriately scaling data collected from nearby donor sites which showed favorable long-term comparisons. Initially complete years were not changed, even though there may have been missing samples during those years. Multiple factors contributed to missing data at sites, including sampler installation late in the baseline period, the clogging of some modules (especially during fire events), and various equipment failures. In some cases, the bulk of individual species were available for the sites, and substitution for only minor components were required to complete individual days. A full description of the data substitution methods sanctioned by RHR guidance and WRAP's analyses, along with a list of WRAP sites requiring substitutions can be found in the TSS document *WRAP Data Substitution Methods* (http://vista.cira.colostate.edu/docs/wrap/Monitoring/WRAP_Data_Substitution_Methods_April_2007.doc).

3.3 EMISSIONS DATA

Overview of emissions applied in regional analysis scenarios for CMAQ/CAMx visibility modeling for Regional Haze Planning in the WRAP region

1. The table and links below provide an overview of the emissions analyzed and applied in the CMAQ and CAMx regional air quality models for regional haze planning in the WRAP region. These emissions data

are displayed on the TSS. Generally, emissions inputs were prepared by individual states and tribes for point, area, and most dust emissions categories. With input and review by states, tribes, and FLMs, WRAP Forums and Workgroups prepared consistent and comparable WRAP region emissions data for the mobile, fire, ammonia, area source oil and gas, eastern Pacific offshore shipping, some dust, and biogenics emissions categories. The WRAP Regional Modeling Center gathered the latest, best, and most representative emissions estimates at the time from the CENRAP, Eastern U.S., Canada, and Mexico regions in executing the sequence of modeling simulations summarized below. Boundary conditions reaching North America from the rest of the world were jointed prepared by all 5 RPOs from the GEOS-Chem global model.

Model Scenario & Date	**Emissions Input**	**Point**	**Area**	**Mobile (On- & Off-Road)**	**Fire**	**Ammonia, Dust, & Biogenics**	**Offshore shipping & remainder of North America**	**North American Domain Boundary Conditions**
Base02b (Spring 2006)	2002 best available actual data	SSJF/EF from state/tribal EIs[P1]	SSJF/EF from state/tribal EI[A1], Phase I O&G [A2]	EF project[M1]	FEJF - actual 2002[F1]			
Plan02c (Summer 2006)	2000-04 planning data (2002 data in WRAP region except fire)	SSJF/EF from state/tribal EIs[P1]	SSJF/EF from state/tribal EIs[A1], Phase I O&G[A2]	EF project[M1]	FEJF - average 2000-04[F2]			
Plan02d (October 2007)	2000-04 planning data (2002 data in WRAP region except fire)	SSJF/EF detailed state updates [P3]	SSJF/EF detailed state updates [A4], Phase II O&G [A5]	EF project[M1]	FEJF - average 2000-04[F2]			
Base18b (Summer 2006)	2018 Base Case data (see footnotes by sector)	SSJF/EF from state/tribal EIs[P2]	SSJF/EF from state/tribal EIs[A3], Phase I O&G [A2]	EF project[M1]	FEJF - average 2000-04[F3]			
Preliminary Reasonable Progress. Version A - PRP18a (June 2007)	2018 PRP Version A data (Base18b except for footnotes noted by sector)	SSJF/EF, detailed state updates [P4]	SSJF/EF detailed state updates [A6], Phase II O&G[A5]	EF project[M1]	FEJF - average 2000-04[F3]			

Preliminary Reasonable Progress – Version B PRP18b (July 2009)					FEJF - average 2000-04[F3]			
Preliminary Reasonable Progress – Version CMV sensitivity PRP18cmv (July 2009)					FEJF - average 2000-04[F3]			

Emissions Control Programs included in the WRAP region modeling scenarios

- Smoke Management Programs accounted for using Emissions Reduction Techniques applied to 2000-04 average Fire emissions
- New permits and state/EPA consent agreements since 2002 reviewed with each state
- Ozone and PM2.5 SIPs (California)
- State Oil and Gas Emissions control programs
- Mobile sources
  - Heavy Duty Diesel (2007) Engine Standard
  - Tier 2 Tailpipe
  - Large Spark Ignition and Recreational Vehicle Rule
  - Nonroad Diesel Rule
- Combustion Turbine and Industrial Boiler/Process Heater/RICE MACT
- VOC 2-, 4-, 7-, and 10-year MACT Standards
- In PRP18a, PRP18b, and PRP18cmv, known BART emissions rates by source by pollutant as determined at that time by State or EPA
- In PRP18a, presumptive SO2 BART emissions rates on EGUs where states and EPA had not yet determined SO2 BART emissions rates, no non-EGU SO2 BART assumptions, also no NOx BART assumptions on either EGUs or non-EGUs
- In PRP18b and PRP18cmv, limited application of presumptive SO2 and presumptive NOx BART emissions rates to a few EGU sources where BART was not yet determined

Point Sources – these projects were commissioned by the Stationary Sources Joint Forum and the Emissions Forum.

P1. 2002 actual data reported by states, locals, tribes, and EPA databases. See: http://www.wrapair.org/forums/ssjf/documents/eictts/docs/QA_of_the_2002_WRAP_Stationary_Sources_Emissions_Inventory.pdf.pdf

P2. http://wrapair.org/forums/ssjf/documents/eictts/docs/WRAP_2018_EI-Version_1-Report_Jan2006.pdf

P3. Plan02d memo to be added to WRAP website

P4. http://wrapair.org/forums/ssjf/documents/eictts/Projections/PRP18_EI_tech%20memo_061607.pdf

Area Sources – these projects were commissioned by the Stationary Sources Joint Forum and the Emissions Forum.

A1. 2002 actual data reported by states, locals, tribes, and EPA databases. See: http://www.wrapair.org/forums/ssjf/documents/eictts/docs/QA_of_the_2002_WRAP_Stationary_Sources_Emissions_Inventory.pdf.pdf

A2. http://wrapair.org/forums/ssjf/documents/eictts/OilGas/WRAP_Oil&Gas_Final_Report.122805.pdf

A3. http://wrapair.org/forums/ssjf/documents/eictts/docs/WRAP_2018_EI-Version_1-Report_Jan2006.pdf

A4. Plan02d memo to be added to WRAP website

A5. http://wrapair.org/forums/ssjf/documents/eictts/OilGas/2007-10_Phase_II_O&G_Final_Report_v10-07.pdf

A6. http://wrapair.org/forums/ssjf/documents/eictts/Projections/PRP18_EI_tech%20memo_061607.pdf

Mobile Sources – this project was commissioned by the Emissions Forum.

M1. This project prepared EPA Mobile6 and NONROAD emissions modeling results for 2002 and 2018, taking into account federal and state mobile emissions rules. The project also included emissions from airplanes landings and takeoffs, railroads, and road dust for the WRAP region. The emissions were calculated from state reports of activity data and profiles. The project is documented at: http://wrapair.org/forums/ef/UMSI/index.html. State-reported port activity and river shipping emissions are in the states' area source EIs.

Fire Emissions – these projects were commissioned by the Fire Emissions Joint Forum.

F1. This 2-phase project (Phases 1 and 2) collected 2002 actual fire emissions data from federal, state, and tribal databases. See: http://www.wrapair.org/forums/fejf/documents/WRAP_2002_PhII_EI_Report_20050722.pdf

F2. The Phase 3 project scaled 2002 actual data from their Phase 2 project by average fire activity data by state for the 2000-04 period, location and dates of fires in 2002 were held constant. See: http://www.wrapair.org/forums/fejf/documents/task7/Phase3-4EI/WRAP_Fire_Ph3-4_EI_Report_20070515.pdf

F3. The Phase 4 project built on Phase 3, to scale 2002 actual data by average fire activity data by state for the 2000-04 period, location and dates of fires in 2002 were held constant, then applying Emission Reduction Techniques to agricultural and prescribed fire by season and region across the WRAP region to represent implementation of Enhanced Smoke Management Programs. This project also produced three 2018 emissions scenarios, which have NOT been used in regional emissions analysis or regional modeling, as 2000-04 data are thought to be the most representative estimates of 2018 emissions for haze planning purposes. See: http://www.wrapair.org/forums/fejf/documents/task7/Phase3-4EI/WRAP_Fire_Ph3-4_EI_Report_20070515.pdf

Ammonia, Dust, & Biogenic Emissions – these projects were commissioned by the Dust Emissions Joint Forum and the Modeling Forum.

ADB1. RMC prepared land-use data-based fugitive ammonia, natural biogenics, and windblown dust emission inventories, driven by meteorological data from the CMAQ air quality model. See:

ADB2. Dust

Emissions from Pacific offshore shipping & remainder of North America – these projects were

Eastern Pacific Offshore Shipping –

Mexico –

Canada –

CENRAP and Eastern U.S. –

Boundary conditions reaching North America from the rest of the world – this project was

3.4 MODELING RESULTS

The WRAP Regional Modeling Center (RMC) was responsible for performing regional air quality modeling simulations for the contiguous WRAP region; the WRAP states and tribes then use the analytical results to develop SIPS or TIPs under the RHR. Key RMC visibility modeling work elements include the following:

1. Evaluation of the visibility model for a historical episode—in this case, for calendar year 2002. Output from the model simulation is compared with ambient air quality data for the historical episode as part of a model performance evaluation (MPE).

2. Development of visibility planning scenarios for the regional haze baseline period of 2000-04 and for the initial regional haze future projection period, calendar year 2018.

3. Modeling a variety of emissions sensitivity, emissions source apportionment, and emissions control strategies to assess whether planned future regional emissions reductions will be sufficient to demonstrate reasonable progress toward achieving visibility goals.

The RMC used MPEs to assess the suitability of two modeling systems for simulating air quality and visibility for the 2002 calendar year, so that the models could be used for subsequent planning, sensitivity, and emissions control strategy modeling. The two models are EPA's Community Multiscale Air Quality (CMAQ) modeling system and ENVIRON's Comprehensive Air quality Model with extensions (CAMx).

The visibility modeling work included developing emissions inventories for 2002, developing meteorology data for 2002 using a meteorology model, operating the air quality and visibility models, and developing tools and procedures for comparing the model results to ambient monitoring data as part of the model evaluation exercise.

3.4.1 Emissions Modeling

For the emissions modeling work conducted for WRAP the RMC used improved 2002 emissions data for the United States, Mexico, and Canada to create a final base 2002 annual emissions database that was used in the CMAQ and CAMx model performance evaluations. Sources for emissions inventory and ancillary modeling data included WRAP emissions inventory contractors, other Regional Planning Organizations (RPOs), and EPA. Building from the WRAP preliminary 2002 modeling cases completed earlier, the RMC integrated several updates to the inventories and ancillary data to create final 2002 emissions input files. The RMC used the Sparse Matrix Operator Kernel Emissions (SMOKE) version 2.1 processing system. RMC performed all modeling and quality assurance (QA) work based on the WRAP RMC emissions QA protocol (need link). http://pah.cert.ucr.edu/aqm/308/emissions.shtml, http://pah.cert.ucr.edu/aqm/308/cmaq.shtml, http://pah.cert.ucr.edu/aqm/308/docs.shtml

3.4.2 MM5 Modeling

Meteorology data are key input data required for running any air quality model. These data include information on wind speed and direction, atmospheric stability and vertical motion in the atmosphere, sunlight intensity, clouds and precipitation, and vertical mixing. For photochemical grid models, such as CMAQ and CAMx, meteorology data are typically developed by operating a prognostic numerical simulation model that solves the fundamental equations governing conservation of mass, energy, and momentum. For the WRAP modeling the RMC applied the Fifth-Generation Pennsylvania State University/National Center for Atmospheric Research (PSU/NCAR) Mesoscale Model (MM5) for both a 36-km continental domain and a fine-resolution, nested 12-km domain in the western U.S.

Based on the upper-air soundings, one of the most serious problems is the difficulty MM5 has in establishing the observed planetary boundary layer (PBL) structure. The model has trouble getting the PBL depth correct, particularly in the stable nocturnal case. Also, MM5's difficulty in simulating the observed fine structure of the dew point temperature profile and the overall level of saturation in the lower troposphere is cause for concern. It is important that the model produce cloud decks at the correct height. Errors in humidity and cloud prediction have a negative impact on the accuracy of downwelling solar radiation, cause errors in the temperature profile and the surface fluxes, affect the atmospheric chemistry, and make it difficult for the particulate matter (PM) model to perform properly.

The RMC concluded that the final 36-km and 12-km WRAP MM5 runs exhibited reasonably good performance and were within the bounds of other meteorological databases used for prior air quality modeling efforts, and that it was therefore reasonable to proceed with their use as inputs for the RMC visibility modeling. http://pah.cert.ucr.edu/aqm/308/mm5.shtml

3.4.3 Visibility Modeling

Visibility impairment occurs when fine particulate matter ($PM_{2.5}$) in the atmosphere scatters and absorbs light, thereby creating haze. $PM_{2.5}$ can be emitted into the atmosphere directly as primary particulates, or it can be produced in the atmosphere from photochemical reactions of gas-phase precursors and subsequent condensation to form secondary particulates. Examples of primary $PM_{2.5}$ include crustal materials and elemental carbon; examples of secondary PM include ammonium nitrate, ammonium sulfates, and secondary organic aerosols (SOA). Secondary $PM_{2.5}$ is generally smaller than primary $PM_{2.5}$, and because the ability of $PM_{2.5}$ to scatter light depends on particle size—with light scattering for fine particles being greater than for coarse particles—secondary $PM_{2.5}$ plays an especially important role in visibility impairment. Moreover, the smaller secondary $PM_{2.5}$ can remain suspended in the atmosphere for longer periods and transported long distances, thereby contributing to regional-scale impacts of pollutant emissions on visibility.

The sources of $PM_{2.5}$ are difficult to quantify because of the complex nature of their formation, transport, and removal from the atmosphere. This makes it difficult to simply use emissions data to determine which pollutants should be controlled to most effectively improve visibility. Photochemical air quality models provide a better understanding of the sources of $PM_{2.5}$ by simulating the emissions of pollutants and the formation, transport, and deposition of $PM_{2.5}$. If an air quality model performs well for a historical episode, the model may then be useful for identifying the sources of $PM_{2.5}$ and helping to select the most effective emissions reduction strategies for attaining future visibility goals.

The RMC compared two Eulerian air quality models, CMAQ and CAMx. Both models were operated for calendar year 2002 for the RPO Unified Continental 36-km Modeling Grid domain, shown in Figure 3-2. In addition, the RMC compared CMAQ results from the 36-km model domain with those from a high resolution, nested 12-km domain in the WRAP region.

For each of these model simulations, the RMC performed extensive comparisons of the model-simulated $PM_{2.5}$ with measured $PM_{2.5}$ from several ambient monitoring networks, including: speciated $PM_{2.5}$ data from IMPROVE, CASTNet, NADP/NTN, and STN; and gas-phase data from the AQS network.

RMC reports are available at: http://pah.cert.ucr.edu/aqm/308/cmaq.shtml and http://pah.cert.ucr.edu/aqm/308/docs.shtml.

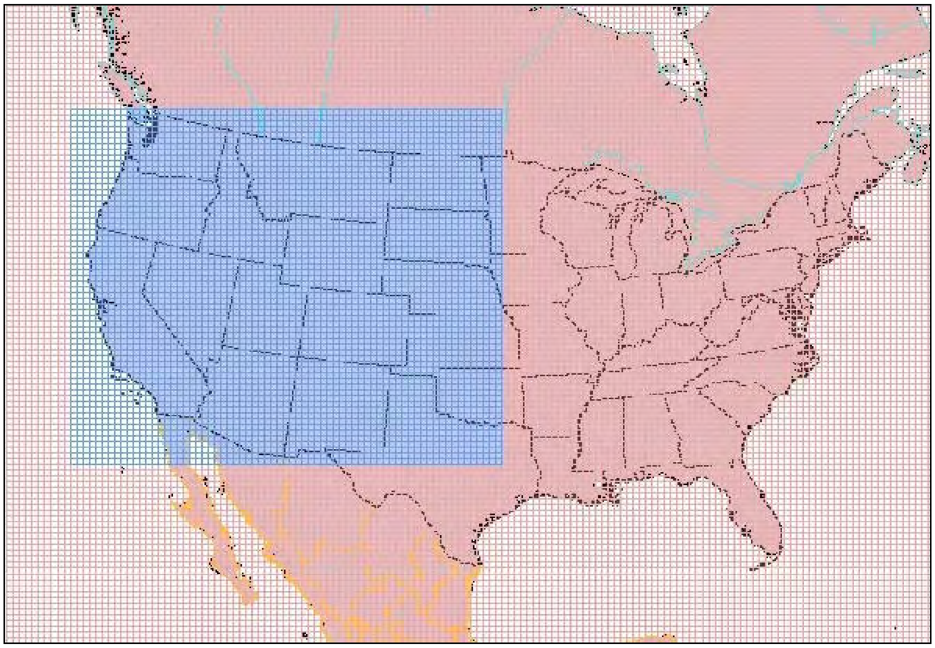


Figure 3-2. RPO Unified Continental 36-km Modeling Grid Domain.

3.4.x Key Findings From the Model Performance Evaluation Study

Key findings from the Model Performance Evaluation study include:

- Model performance does not appear to benefit significantly from using the finer-resolution grid for modeling the lower concentrations of $PM_{2.5}$ that typically occur in the Class I areas.
- The RMC did not recommend the routine application of additional 12-km modeling as part of the WRAP regional haze planning effort, due to the substantially higher resources and costs associated with performing high-resolution modeling.
- The 2002 model results are significantly improved compared to results from the Section 309 modeling that was performed for calendar year 1996.
- The CMAQ and/or the CAMx 36-km modeling can be used, in combination with the RRF approach, to evaluate the benefits of emissions reduction strategies for all PM species other than CM, in order to project visibility changes at Class I areas for regional haze planning purposes.
- Both CMAQ and CAMx are acceptable for visibility modeling. The choice of model should be based in part on factors other than model performance, such as computer run times, disk storage requirements, and source apportionment and/or sensitivity analysis needs.

3.5.x Visibility Projections From the Regional Photochemical Modeling

3.5.1.1 2018 Planning Milestone Visibility Projection Values

2018 visibility projections at Class I areas are used to assess visibility improvements and assist in the Reasonable Progress determination for the December 2007 Regional Haze Rule (RHR) Implementation Plans prepared by states, EPA, and possibly tribes. The model projected 2018 visibility is compared against a 2018 Uniform Rate of Progress (URP) goal that is obtained through construction of a linear Glide Path from the observed 2000-2004 Baseline Period to Natural Conditions in 2064 using the Haze Index metric in deciviews.

3.5.1.2 Difficult to Meet 2018 URP Goal at Western U.S. Class I Areas

2018 visibility projections at western Class I areas fail to achieve the URP goal for several reasons:

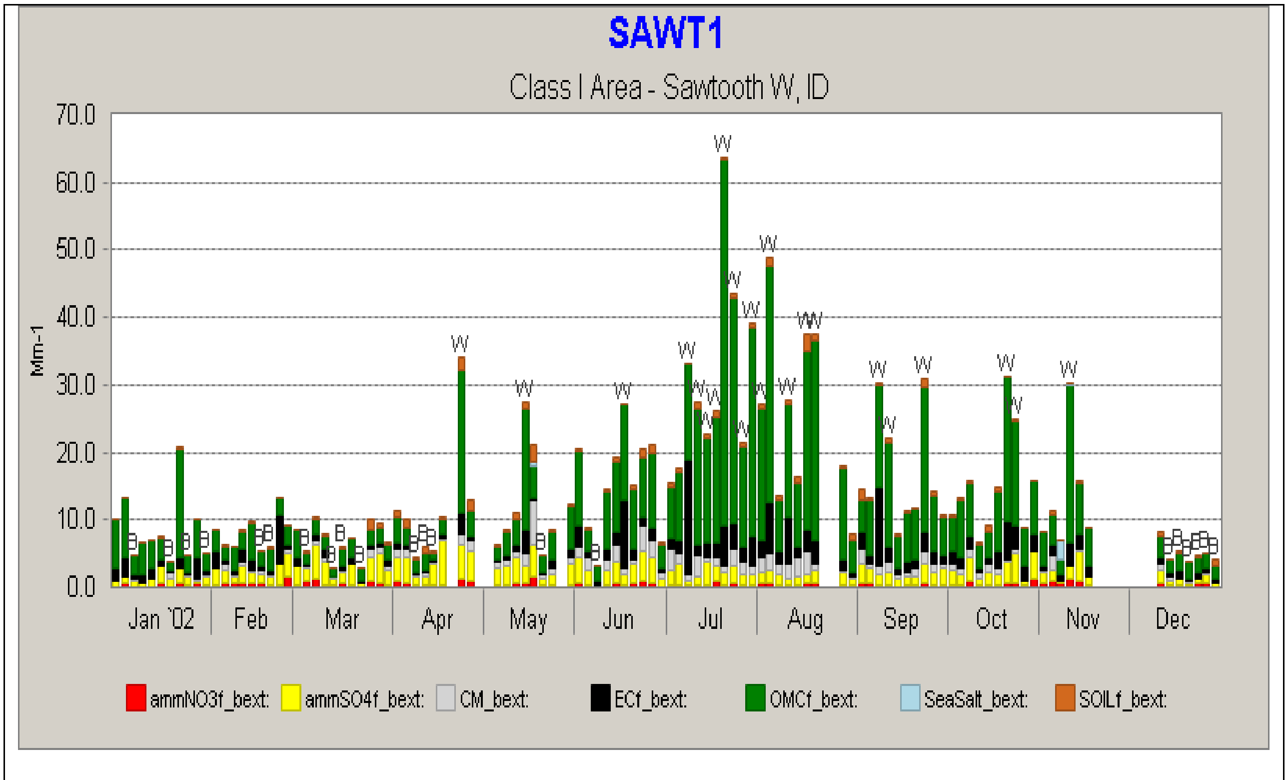
- High contributions from fires (EC and OC) at some Class I areas that are assumed to remain unchanged from 2002 to 2018.
- High contributions from dust (Soil and CM) at some Class I areas, especially in the Desert Southwest, much of which is natural and remains unchanged from 2002 to 2018 (e.g., wind blown dust).
- High contributions of International Transport (e.g., Canada, Mexico and Global) and Offshore Marine Vessels that are assumed unchanged.
- Relatively clean visibility conditions at many Class I areas where the contribution of United States anthropogenic sources is small.

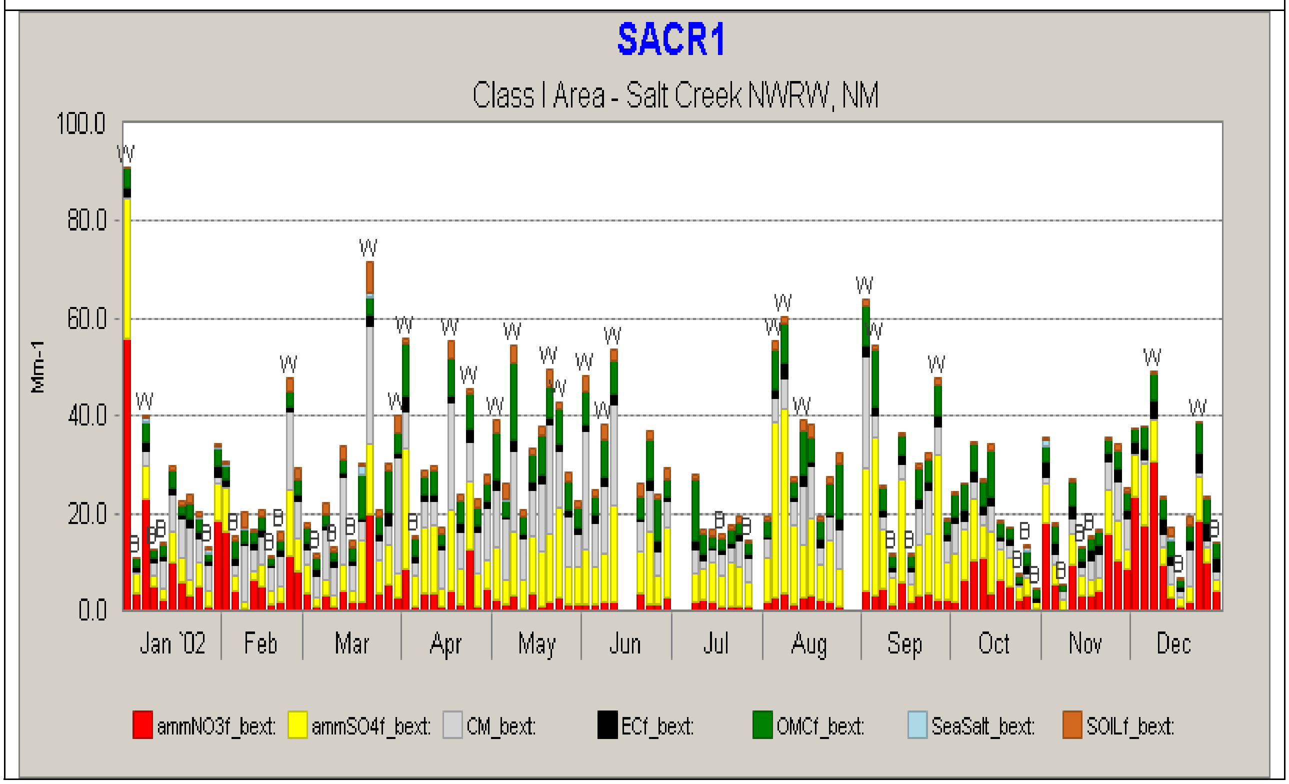
Most of these sources are uncontrollable, unpredictable and difficult to forecast. For example, Figure 10 displays the 2002 daily extinction at the Sawtooth, Idaho and Salt Creek, New Mexico Class I areas where the Worst 20% monitored visibility days are dominated by fires and dust, respectively. Because it is impossible to accurately forecast future-year emissions for these source categories, many of them were held constant from 2000-04 Baseline period to 2018 Base Case conditions:

- Biogenics;
- Natural Fires (wildfire, wildland fire use, and non-federal rangeland fire in the WRAP region);
- Wind blown dust (from WRAP model);
- Ammonia (from WRAP model);
- Mexico and Canada;
- Boundary Conditions (global transport from 2002 simulation of GEOS-CHEM global model); and
- Offshore Marine Vessels.

Thus, modeled visibility reductions would come from reductions in on-road and non-road mobile sources (NOx, EC, OC and SO2), controlled large stationary point sources (SO2 and NOx), potentially other sources in nonattainment areas (mainly NOx and VOC in California), and applying Emissions Reduction Techniques to anthropogenic prescribed and agricultural fire sources' 2000-04 activity patterns in the WRAP region (mainly OC and EC). Other source categories are assumed to remain relatively unchanged, or even increase in some cases due to increased activity between 2002 and 2018 (e.g., road dust, oil and gas, etc.).

Daily observed extinction at the Sawtooth (top) and Salt Creek (bottom) Class I area IMPROVE monitors for 2002 showing Worst 20% days that are dominated by fires (EC and OC) and dust (Soil and CM), respectively.





3.5.1.3 EPA Guidance for Projecting Visibility

EPA released revised guidance for using models to project future-year visibility as part of the RP determination in September 2006 (EPA, 2006). The EPA default guidance method is to use "2002 worst monitored days" (Worst 20 %) to develop scaling factors to project future visibility conditions in 2018. The RHR requires monitoring data from the 2000-04 Baseline period to be used as the basis of the regional haze implementation plans. The modeling results for the 2002 Base Case and 2018 emissions scenarios using the 2002 meteorology are used to project PM concentrations for each of the Worst 20 % days from the 2000-2004 5-year Baseline to obtain estimates of PM concentrations for the Worst 20 % days in 2018 from which visibility is estimated using the revised IMPROVE equation. The ratio of the 2018 to 2002 modeling results that are used to scale the observed PM concentrations for the Worst 20 % days from the 2000-04 Baseline are called Relative Response Factors (RRFs). EPA's default guidance for projecting future-year visibility is in the same document and is closely linked to guidance for interpreting the modeling results for $PM_{2.5}$ and 8-hour ozone National Ambient Air Quality Standard (NAAQS) attainment demonstrations is found at: http://www.epa.gov/scram001/guidance/guide/draft_pm.pdf. The purpose of applying the EPA guidance to develop the RRFs for future visibility conditions is based on the assumption that the air quality model is better at predicting relative changes in concentration than absolute concentrations.

Basic steps for applying the EPA RRF guidance to project visibility conditions in 2018 at each CIA (i.e., IMPROVE monitoring site associated with a CIA) are:

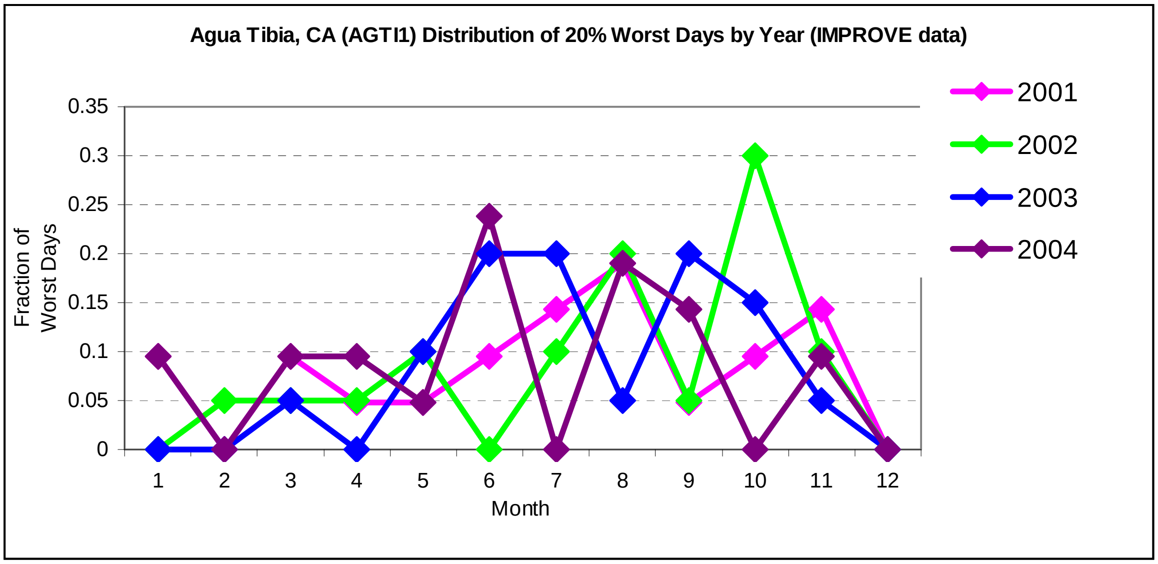
- Model species concentrations for a 2000-04 Baseline case;
- Model species concentrations for a 2018 emissions scenario;
- Determine a species-specific and CIA-specific RRF for the average of the Worst 20 % monitored days (selected from 2002 IMPROVE data), where, for example:
  - RRF sulfate = 2018 sulfate/2002 sulfate
- Using the RRFs based on the 2002/2018 modeling results for Worst 20 % days from 2002, apply the RRFs to the observed PM concentrations from the Worst 20 % days in the 2000-04 5-year Baseline to obtain the 2018 projected PM concentrations:
  - [2018 concentrations] = RRF x [2000-04 Baseline Worst 20 % days concentrations]
- Calculate projected 2018 visibility values for Worst 20 % days from the 5 years and for each Class I area using deciviews and compare the 2018 projected deciviews with the 2018 URP goal to assess how closely the URP goal is achieved.

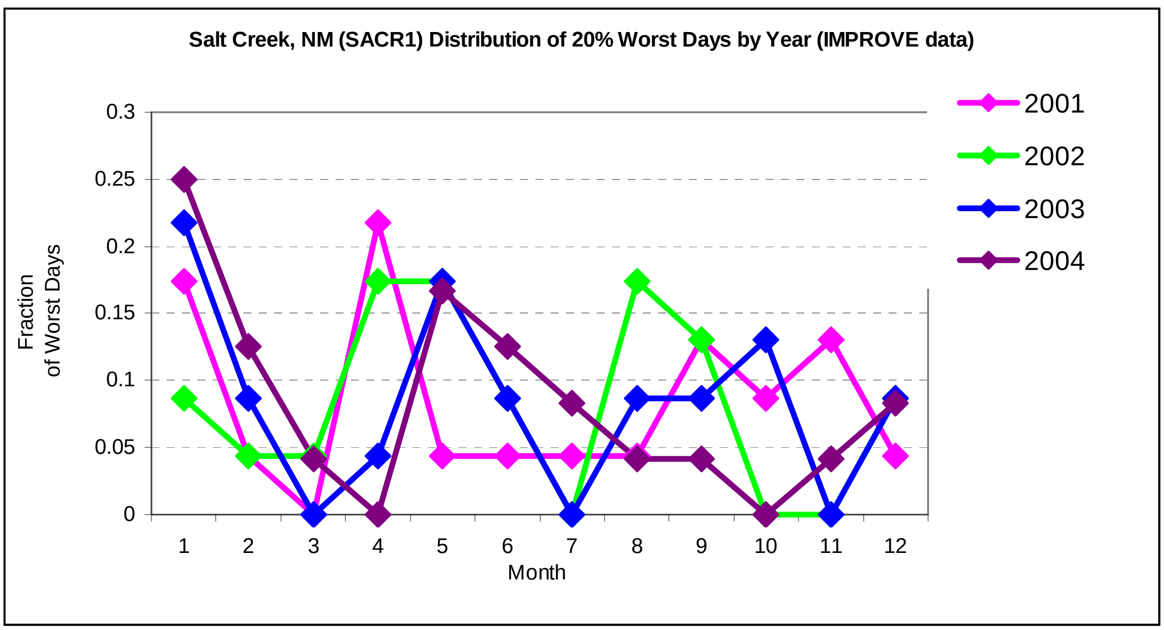
The 20% best visibility days are projected in the same manner, selecting the 20% best monitored days from 2002 IMPROVE data. Several issues with this approach are evident when analyzing the regional haze monitoring data and modeling results.

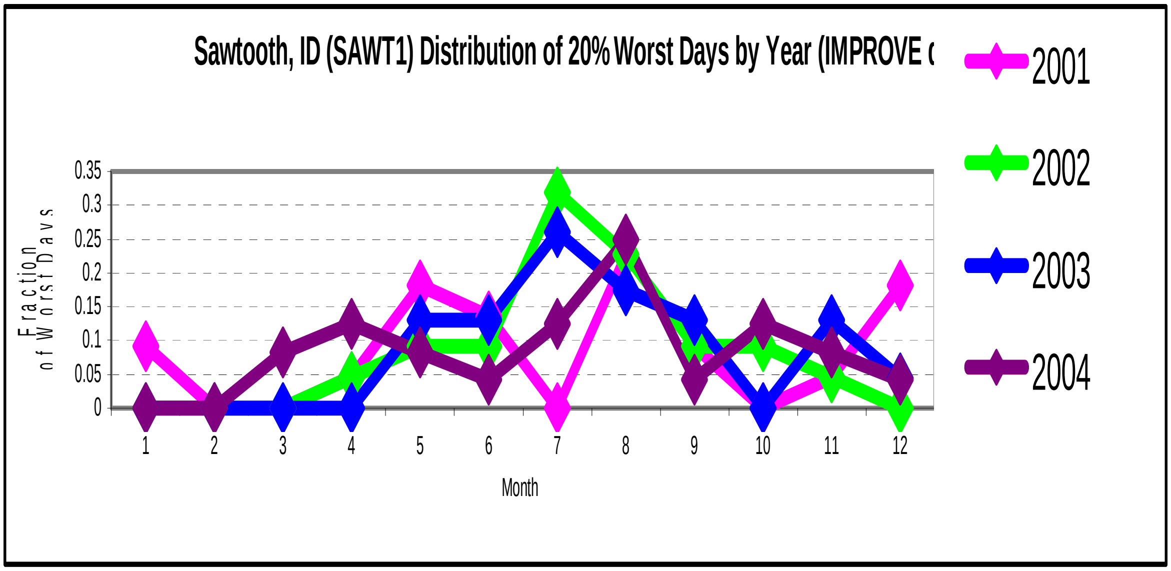
Representativeness of 2002 Worst 20 % Days for W20% Days for Other Years in the 2000-04 Baseline: The RRFs based on 2002 Worst 20% days may not be representative of Worst 20% days from other years in the 2000-04 Baseline period. For example, they may occur at different times of the year and represent different conditions and/or chemical constituents. For example, Figures 11 through 15 display the distribution of Worst 20 % days for the 2000-2004 Baseline at 5 CIAs. At Agua Tibia (Figure 11, top) we see that 30% of the Worst 20 % days in 2002 occur in October, but none did in 2004 and 10-15% did in 2001 and 2003. On the other hand, in June there are no Worst 20 % days in 2002 at Agua Tibia, yet there are 10% (2001) and 20% (2003 and 2004) of the Worst 20 % days in other years of the Baseline period. Similar seasonal variations in the Worst 20 % days for 2002 versus the other years in the Baseline are seen at Salt Creek, Badlands, Sawtooth, and Mount Rainier CIAs. Accounting for the differences of monthly and seasonal variations in the Worst 20 % days between 2002 and all 5 years in the Baseline period may be important in projecting 2018 visibility conditions.

Episodic Events: Another issue associated with the representativeness of the RRFs derived from the 2002 Worst 20 % days is the occurrence of episodic events that may dominate the Worst 20 %. For example, if fires dominate the Worst 20 % days in 2002 and they are kept constant in 2018 the resultant RRFs will be very stiff and project little change in future-year PM concentrations for all W20% days in the Baseline even though fires may not have dominated the Worst 20 % days in other years of the Baseline. Conversely, if fires occur in other years of the Baseline and not in 2002, then the RRFs will reflect changes in anthropogenic emissions that are applied to PM concentrations due to fires which is also not appropriate. Again, accounting for monthly or seasonal variations in the RRFs may help alleviate this issue since prescribed burns, agricultural burning and wild fires each generally occur during the same time periods of the year.

<u>Time Series of Monthly Variation in the Fraction Variation of the 20% Worst Monitored Days at randomly-selected WRAP region Class I areas.</u>






Sawtooth, ID (SAWT1) Distribution of 20% Worst Days by Year (IMPROVE d
2001
2002
2003
2004
Fraction of Worst Days
0.35
0.3
0.25
0.2
0.15
0.1
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1
2
3
4
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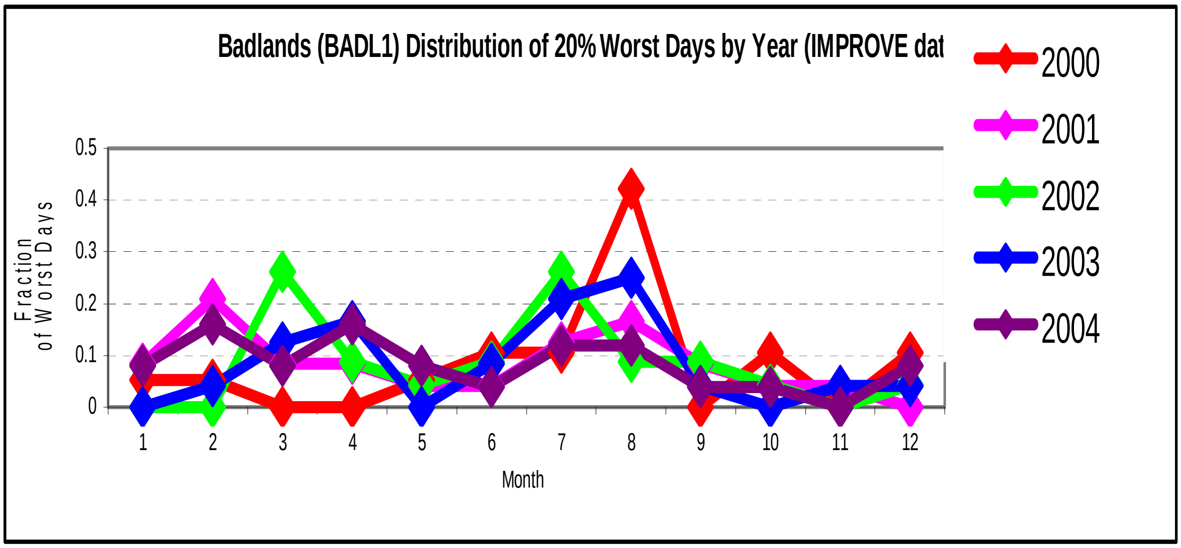
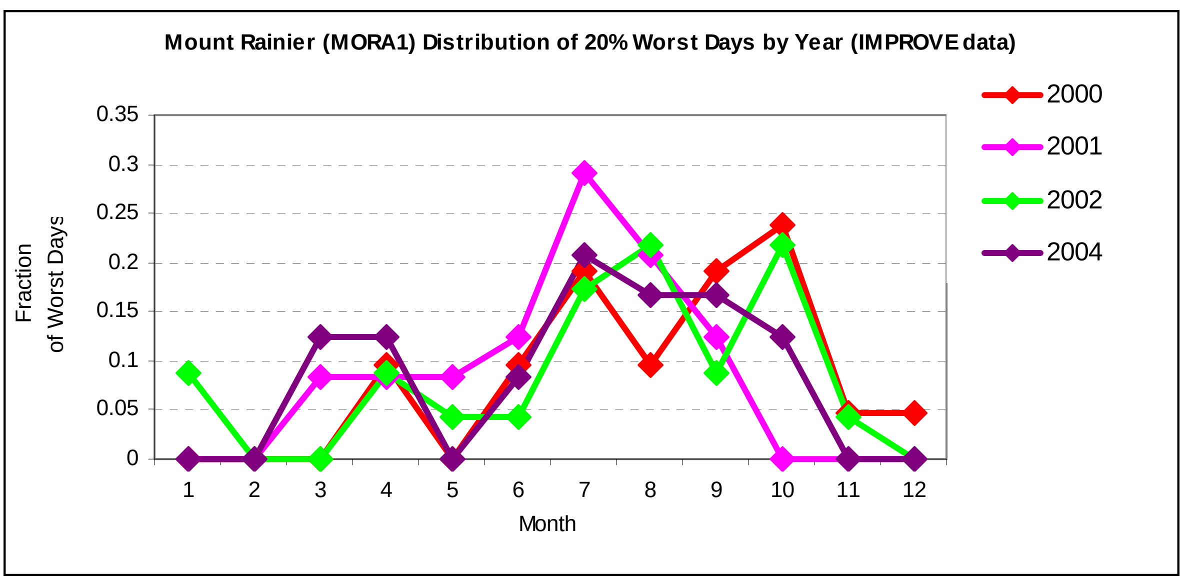
6
7
8
9
10
11
12
Month


Badlands (BADL1) Distribution of 20% Worst Days by Year (IMPROVE dat
2000
2001
2002
2003
2004
Fraction of Worst Days
0.5
0.4
0.3
0.2
0.1
0
1
2
3
4
5
6
7
8
9
10
11
12
Month


Mount Rainier (MORA1) Distribution of 20% Worst Days by Year (IMPROVE data)
2000
2001
2002
2004
Fraction of Worst Days
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1
2
3
4
5
6
7
8
9
10
11
12
Month

4.0 DESCRIPTION OF WRAP ANALYSES

EPA staff please add "any and all" comments on this 2/22 draft here, listed by subsection of Section 4 by Friday March 5th

4.1 OVERVIEW

The WRAP performed a series of analyses in support of regional haze implementation plans. These analyses were designed to directly or indirectly address topics posed by Regional Haze Rule guidance documents, and include:

- Class I Area Summary Table
- Glide Slope Analyses
- Visibility Projections
- Attribution Analyses

The following sections provide a guide to these analyses and resources containing further information about them.

4.2 CLASS I AREA SUMMARY TABLE

The Class I Area Summary Table (accessible via the TSS Haze Planning page: http://vista.cira.colostate.edu/tss/Results/HazePlanning.aspx) calculates metrics to support regional haze analysis by species, total light extinction, and deciview. The results presented with this tool are derived from many of the other Haze Planning tools. An example of a completed Class I Area Summary Table is presented in Figure 4-1 at the end of this section.

The summary data begins with monitored values on the left, and progresses through estimated and projected values moving toward the right. All species extinction values are calculated based on the revised IMPROVE algorithm (see the TSS document *IMPROVE Particulate Monitoring*: http://vista.cira.colostate.edu/docs/wrap/Monitoring/IMPROVE_Particulate_Monitoring_May_2007.doc). The data in each column are calculated as follows:

- **2000-04 Baseline Conditions (Mm^{-1}) [Monitored]** – This field is taken directly from the TSS Visibility Projections tool. It represents the monitored average Baseline extinction by aerosol species, total light extinction, and deciview for the selected site. A discussion of the selection of best and worst 20% IMPROVE days is presented in the EPA *Guidance for Tracking Progress Under the Regional Haze Rule* (http://www.epa.gov/ttn/oarpg/t1/memoranda/rh_tpurhr_gd.pdf).
- **2064 Natural Conditions (Mm^{-1}) [Estimated]** – This field is taken directly from the TSS Visibility Projections tool. It represents the estimated 2064 Natural Conditions. A discussion of the estimation of natural conditions is presented in the EPA *Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Rule* (http://www.epa.gov/ttn/oarpg/t1/memoranda/rh_envcurhr_gd.pdf). WRAP chose to refine the original EPA estimates for natural conditions, and a presentation of the revised approach is given in *Natural Haze Levels II: Application of the New IMPROVE Algorithm to Natural Species Concentrations Estimates* (http://vista.cira.colostate.edu/docs/wrap/Monitoring/NaturalHazeLevelsIIReport.ppt)
- **2018 Uniform Rate of Progress Target (Mm^{-1}) [Estimated]** – This field is taken directly from the TSS Visibility Projections tool. It represents the Uniform Rate of Progress estimated for 2018, based on the calculated glide slope between the 2000-04 Baseline period and 2064 Natural Conditions. A discussion of the uniform rate of progress and glide slope can be found in Section 4.3 of this document.
- **2018 Projected Visibility Conditions (Mm^{-1}) [Projected]** – This field is taken directly from the TSS Visibility Projections tool. It represents the projected extinction for each species, total light extinction, and

deciview for 2018, based on air quality model results combined with the Baseline visibility conditions. A discussion of the visibility projection analyses can be found in Section 4.4 of this document.

- **Baseline to 2018 Change In Statewide Emissions (tons / %) [Projected]** – This field is calculated from data in the TSS Emissions Review tool, and is the absolute and percentage difference between primary emissions estimated for 2018 and the Baseline period for the home state of the Class I Area under review. A negative number represents an estimated decrease in emissions by 2018. The emissions parameters (from the TSS Emissions Review tool) presented in this field include: sulfur oxides, nitrogen oxides, primary organic aerosol, elemental carbon, fine particulate matter, and coarse particulate matter. It is important to keep in mind that since this field represents the change in emissions for only a single state, it does not provide complete information on all impacts of changes in estimated emissions throughout WRAP and the modeling domain.
- **Baseline to 2018 Change In Upwind Weighted Emissions (%) [Projected]** – This field is calculated from data in the TSS Weighted Emissions Potential (WEP) tool, and is the percentage difference between meteorological back trajectory- and distance-weighted emissions estimated for 2018 and the Baseline period. A discussion of the WEP analysis can be found in Section 4.5 of this document. This field provides a semi-quantitative value for the change in emissions from across the entire modeling domain expected to impact the Class I Area under review. However, since the WEP analysis does not take into account emissions chemistry and removal processes its results should be used only in conjunction with other WRAP analyses.
- **Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions (%) [Projected]** – This field is calculated from data in the TSS Weighted Emissions Potential (WEP) tool, and is the percentage difference between meteorological back trajectory- and distance-weighted anthropogenic emissions estimated for 2018 and the Baseline period. These results are calculated in a manner identical to the previous field, but omitting the following natural emissions source categories: Natural Fires, Biogenic, and Wind Blown Dust.

The Class I Area Summary Table can be generated for the best and worst IMPROVE days based on several pre-defined pairs of emissions scenarios, and for multiple relative response factor calculation methods. For more information, use the TSS Help Document (http://vista.cira.colostate.edu/TSS/Help/GettingStarted.aspx).

Class I Area Summary Table

Class I Area Visibility Summary: Agua Tibia W, CA
Visibility Conditions: Worst 20% Days
RRF Calculation Method: Specific Days (EPA)
Emissions Scenarios: 2000-04 Baseline (plan02d) & 2018 PRPcmv (prp18cmv)

	Monitored	Estimated		Projected			
	2000-04 Baseline Conditions (Mm-1)	2064 Natural Conditions (Mm-1)	2018 Uniform Rate of Progress Target (Mm-1)[1]	2018 Projected Visibility Conditions (Mm-1)	Baseline to 2018 Change In Statewide Emissions (tons / %)	Baseline to 2018 Change In Upwind Weighted Emissions[2] (%)	Baseline to 2018 Change In Anthropogenic Upwind Weighted Emissions[2] (%)
Sulfate	31.82	0.99	20.62	19.98	-6,243 -8%	-40%	-46%
Nitrate	29.91	0.94	19.5	13.59	-591,119 -45%	-46%	-48%
Organic Carbon	17.55	2.98	13.11	16.28	-10,792 -7%	-5%	-14%
Elemental Carbon	6.37	0.26	4.68	3.59	-12,961 -28%	-28%	-49%
Fine Soil	1.25	0.83	1.15	1.36	250 0%	7%	9%
Coarse Material[3]	8.64	2.98	7.13	Not Applicable	29,666 13%	13%	16%
Sea Salt[3]	0.82	1.68	1.01		Not Applicable		
Total Light Extinction	107.36	21.66	73.56	75.25			
Deciview	23.5	7.64	19.8	19.93			

WRAP TSS - 12/01/2009

1) 2018 Uniform Rate of Progress Target for Best 20% Days is not defined.
2) Results based on Weighted Emissions Potential analysis using the 2000-04 Baseline (plan02d) & 2018 PRPcmv (prp18cmv) emissions scenarios.
3) Visibility projections not available due to model performance issues.

Figure 4-1. Example Class I Area Summary Table.

4.3 GLIDE SLOPE ANALYSES

The Regional Haze Rule program goals include remedy of the haziest days and protection of the cleanest days in Class I areas, or more specifically:

- For each Class I area, states are required to improve the visibility on the 20% haziest days in the baseline period (defined as 2000-2004) to so-called natural conditions by 2064.
- For each Class I area, states are required to ensure that the visibility on the 20% cleanest days in the baseline period does not degrade by 2064. (If the baseline cleanest days are dirtier than the determined natural conditions, they do not have to be improved.)

To characterize baseline conditions and track progress, states must follow a series of prescribed steps to assemble the IMPROVE aerosol data in such a way that daily extinction values can be calculated, and these extinction values converted to a Haze Index measured in deciviews. The Haze Index is the mandated visibility metric of the RHR. Once baseline and natural conditions are determined for a given Class I area, it is possible to generate a glide slope or glide path which graphically represents the progress in terms of the Haze Index necessary to achieve the RHR goal. The glide slope is calculated as a linear interpolation for each year between the baseline (represented by 2004) and natural conditions (2064). From the glide slope states can calculate the uniform rate of progress (URP), typically expressed in terms of "deciviews per decade." The point along the glide path at 2018 becomes the target or URP goal for improvement at the Class I area by that year. A glide slope schematic is presented in Figure 4-2 (taken from *Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Rule*, http://www.epa.gov/ttn/oarpg/t1/memoranda/rh_tpurhr_gd.pdf).

Note that EPA guidance defines the glide slope only for the Haze Index (deciviews) and not for any other parameter or unit of measure. The choice of deciviews is appropriate for several reasons:

- The deciview is approximately linear with respect to human perception.
- A given deciview change is the same on clean and dirty days, which allows for economic valuation studies to be performed.
- The deciview is simple for policy use and the public can understand it.

However, the Haze Index lumps all species' contributions to visibility degradation into a single number, thus hindering understanding of the relative impact of each species (and ultimately emission types). WRAP developed "species glide slopes" to allow a better understanding of species contributions. Species glide slopes "look and feel" like deciview glide slopes but are calculated somewhat differently: each baseline and natural conditions species extinction (expressed as Mm-1) undergoes a logarithmic transformation, interpolated values for intervening years (in 5 year increments) are calculated, then each value undergoes in inverse logarithmic transformation to return to units of Mm-1. The end result is a species glide slope this is similar though not identical in character to the deciview glide slope. The species glide slope carries no regulatory weight, but is very useful in characterizing each species impact on visibility and projected changes in visibility. Figure 4-3 presents example species glide slopes for several parameters at Bridger. Note that visibility projections for each species are also shown.

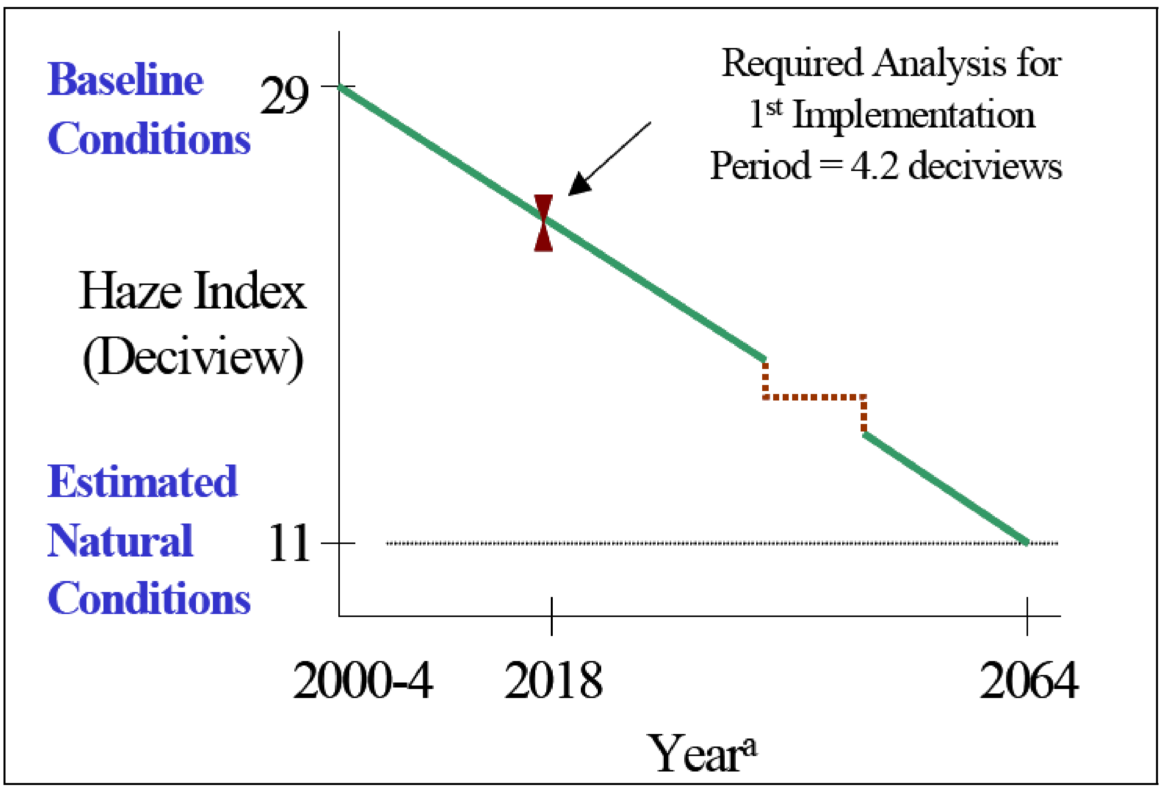


Figure 4-2. Glide slope schematic. (Source: *Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Rule*, EPA 2003.)

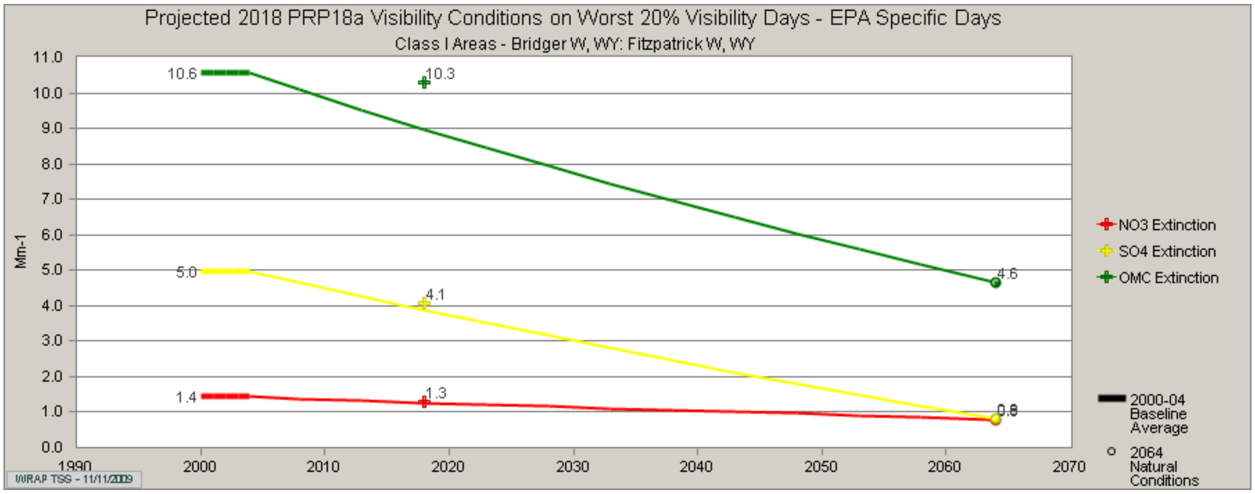


Figure 4-3. Example species glide slopes for several parameters at Bridger. Note that visibility projections for each species are also shown.

4.4 VISIBILITY PROJECTIONS

EPA regional haze guidance provides for a method to project future visibility metrics by combining air quality model results and monitored aerosol data. Since the absolute model results have been shown to contain biases with respect to monitoring data, it is not appropriate to use model results directly as future visibility projections. For example, modeled nitrate values may be only half of the monitored values, so any future projection based exclusively on the model results will imply a decrease in nitrate due to this bias. Instead, EPA guidance dictates using the ratio of model results from different years to serve as the basis for future projections. Using this method, a percent change in modeled nitrate between two different years becomes the indicator of the percent change expected in monitoring data over the same period. The EPA guidance document for using air quality model results for visibility projections *is ….. [need name and link for document]*

WRAP visibility projections are calculated by multiplying a species-specific relative response factor (RRF) by the Baseline period IMPROVE mass, and then converting to extinction and deciview. The RRF is defined as the ratio of future-to-current modeled mass. As an example, the projected sulfate extinction is calculated by the following generalized formulas:

- Sulfate RRF = [2018 Modeled Sulfate / Baseline Modeled Sulfate]
- Projected Sulfate Mass = Baseline IMPROVE Sulfate x Sulfate RRF
- Projected Sulfate Extinction = Conversion via IMPROVE Algorithm of Projected Sulfate Mass

The EPA method (also called "Specific Days" method on the TSS) for this calculation requires the selection of the observed (i.e., IMPROVE) best and worst 20% days in the Baseline period. Then the model results for the same days are averaged for the Baseline period and for 2018 to calculate the applicable RRFs. In an effort to potentially better capture the distribution of best and worst days as they appear in the model results (which may or may not coincide with IMPROVE best and worst days), WRAP defined two other methods for generating RRFs. The Quarterly Weighted method calculates quarterly RRFs based on the 20% best and worst IMPROVE days in each calendar quarter of the Baseline period, regardless of how those days compare to the over all annual best and worst days. The Monthly Weighted method calculates monthly RRFs based on the 20% best and worst days in each month, again, regardless of how those days compare to the overall annual best and worst days. A more detailed discussion of the visibility projection analysis and use of different RRF calculation methods can be found in Appendix A. 2018 visibility projections at Class I areas are used to assess visibility improvements and assist in the Reasonable Progress determination for the December 2007 Regional Haze Rule (RHR) Implementation Plans prepared by states, EPA, and possibly tribes. The model projected 2018 visibility is compared against a 2018 Uniform Rate of Progress (URP) goal that is obtained through construction of a linear Glide Path from the observed 2000-2004 Baseline Period to Natural Conditions in 2064 using the Haze Index metric in deciviews.

4.5 ATTRIBUTION ANALYSES

The WRAP performed five types of attribution analyses to visibility-related data in an effort to better understand source region impacts of emissions on visibility. Discussed in the following subsections, those analyses include:

- PM Source Apportionment Technology analysis
- Weighted Emissions Potential analysis
- Organic Aerosol Tracer analysis
- Positive Matrix Factorization analysis
- Causes of Dust analysis

4.5.1 PM Source Apportionment Technology

WRAP's Regional Modeling Center performed a source apportionment analysis using the CAMx air quality model and the PSAT (PM Source Apportionment Technology) tool. Results from this analysis provide information regarding which source regions and source categories are responsible for particulate aerosol modeled at a receptor. Due to resource limitations, this analysis was restricted to SOx and NOx emissions resulting in sulfate and nitrate mass. The results do not directly represent actual sulfate and nitrate measurements, nor can they accurately be transformed into extinction values. Therefore, these results should be viewed in relative terms among source regions and between emissions scenarios. An example of PSAT results from the TSS is provided in Figure 4-4. Further information regarding the PSAT modeling technique can be found in the TSS document *PM Source Apportionment Technology (PSAT)* (http://vista.cira.colostate.edu/docs/wrap/attribution/PSATMethods.doc).

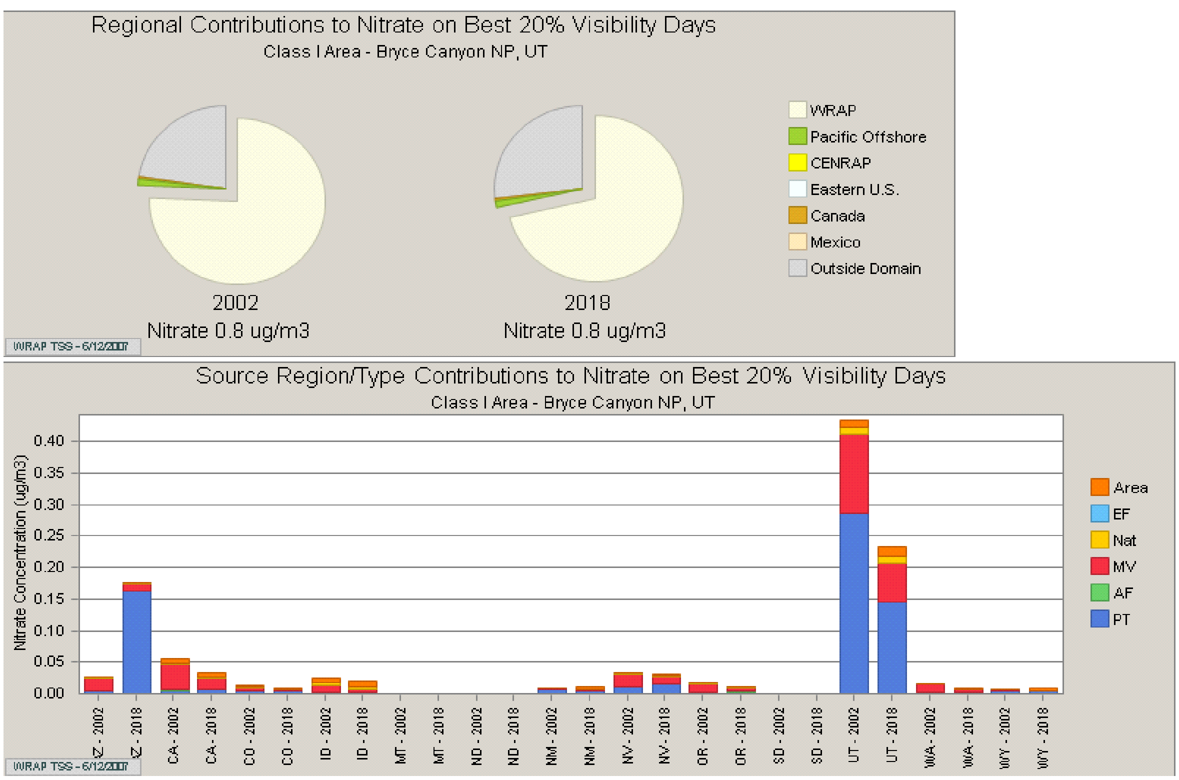


Figure 4-4. Example PSAT results for Bryce Canyon National Park, UT – annual nitrate concentrations by source region for best 20% IMPROVE days.

4.5.2 Weighted Emissions Potential

The Weighted Emissions Potential (WEP) analysis was developed as a screening tool for states to decide which source regions have the potential to contribute to haze formation at specific Class I areas, based on both the Baseline and 2018 emissions inventories. Unlike the PSAT analysis described above, this method does not account for chemistry and removal processes. Instead, the WEP analysis relies on an integration of gridded emissions data, meteorological back trajectory residence time data, a one-over-distance factor to approximate deposition, and a normalization of the final results. Residence time over an area is indicative of general flow patterns, but does not necessarily imply the area contributed significantly to haze at a given receptor. Therefore, users are cautioned to view the WEP analysis as one piece of a larger, more comprehensive weight of evidence analysis.

The WEP analysis was performed for the following six emissions categories: sulfur oxides, nitrogen oxides, organic carbon (primary), elemental carbon, fine particulate matter, and coarse particulate matter. An example of WEP results are provided as Figures 4-5 (source category bar chart) and 4-6 (series of WEP maps). Further information regarding the WEP analysis technique can be found in the TSS document *Weighted Emissions Potential Analysis* (http://vista.cira.colostate.edu/docs/wrap/attribution/WEPMethods.doc).

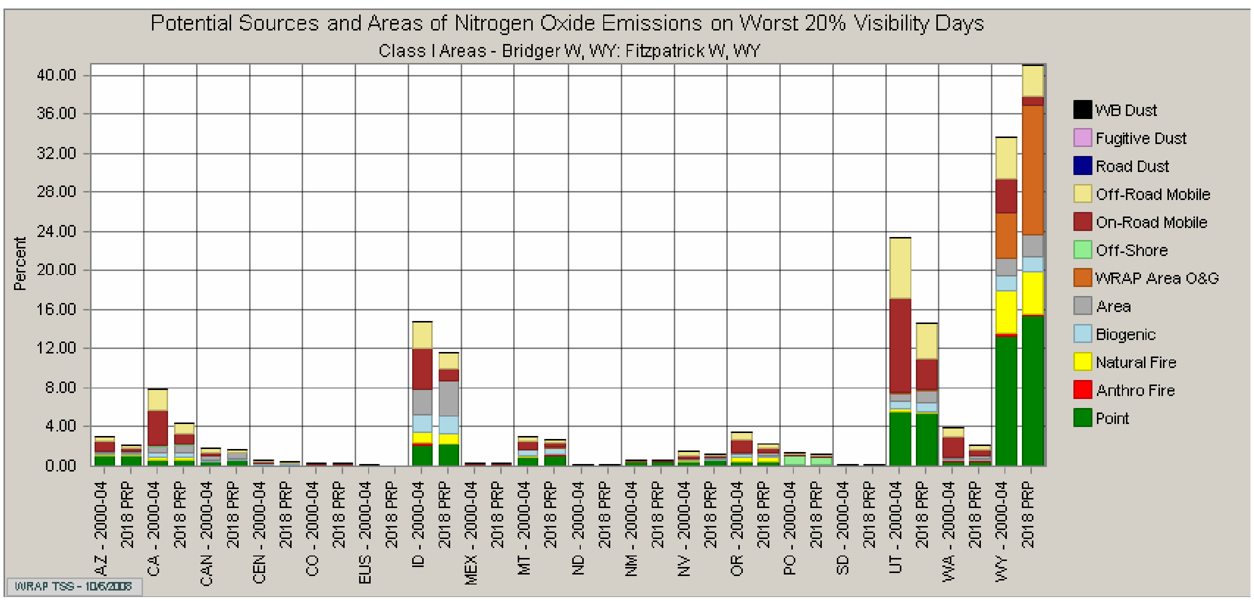
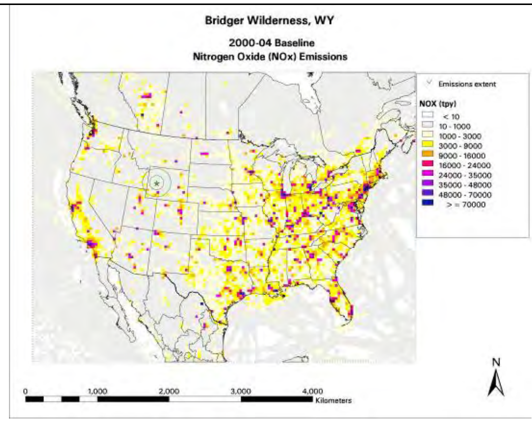
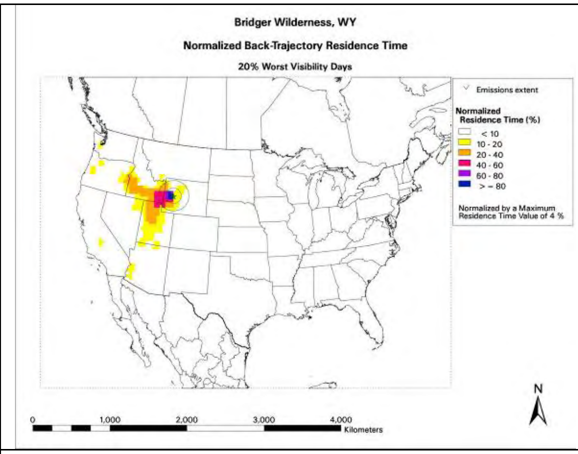
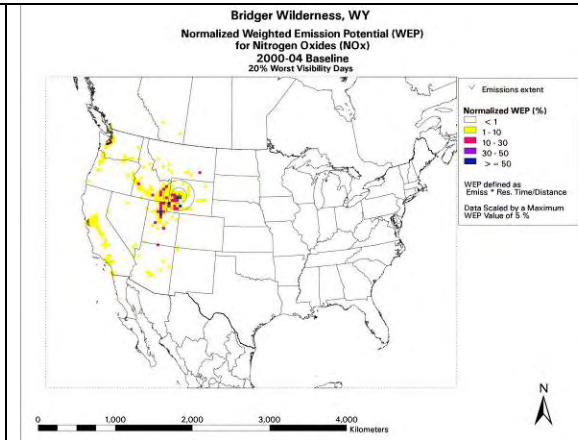


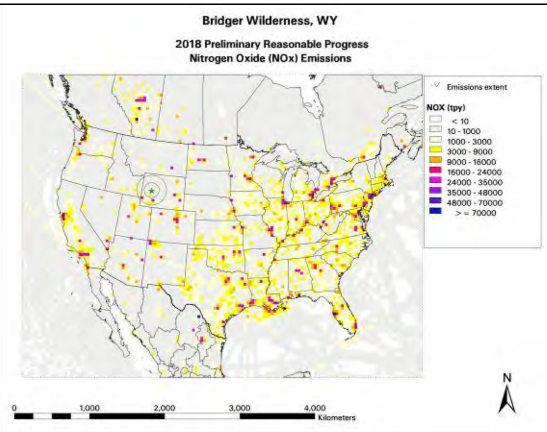
Figure 4-5. Example source category bar chart based on WEP analysis at Bridger Wilderness, WY. Since 2018 results are normalized to 2002 results, actual changes in weighted emissions between scenarios are evident.

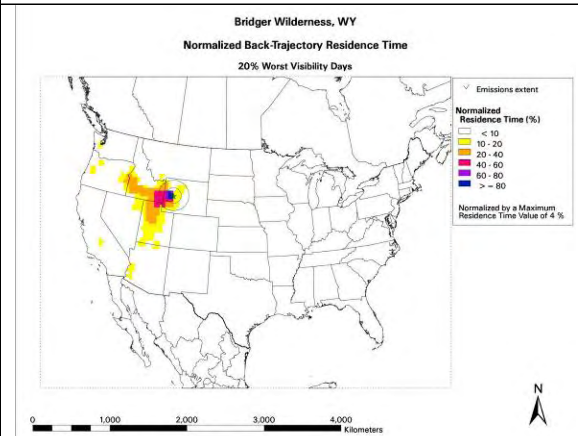


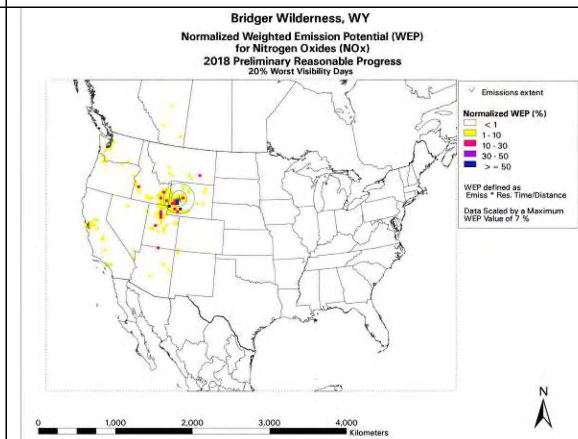




2002 NOx Emissions (TPY)	Residence Time Field, Worst 20% Monitored Days (2000-2005)	2002 NOx Emissions Weighted by Residence Time and One-Over-Distance







2018 NOx Emissions (TPY)	Residence Time Field, Worst 20% Monitored Days (2000-2005)	2018 NOx Emissions Weighted by Residence Time, One-Over-Distance, and 2002 Results

Figure 4-6. Example series of maps for WEP analysis at Bridger Wilderness, WY. From left to right: single-year annual emissions density map; five-year residence time map; emissions weighted by residence time, by one-over-distance, and normalized to the highest grid cell. Top row presents 2002 results, bottom row presents 2018 results.

4.5.3 Organic Aerosol Tracer

The CMAQ model results were analyzed to identify primary organic carbon aerosol source contributions as originating in one of three categories:

- Primary organics (anthropogenic and biogenic sources), resulting from direct organic aerosol emissions;
- Anthropogenic secondary organics, resulting from aromatic VOCs, such as xylene, toluene, and cresols; and
- Biogenic secondary organics, resulting from biogenic VOCs, such as terpenes.

This analysis did not include identification of emissions source regions or detailed source category information. An example of Organic Aerosol Tracer results is provided in Figure 4-7. Further information regarding the Organic Aerosol Tracer analysis technique can be found in the TSS document *xxx* (need link to final document).

Need additional description, to be based on final document.

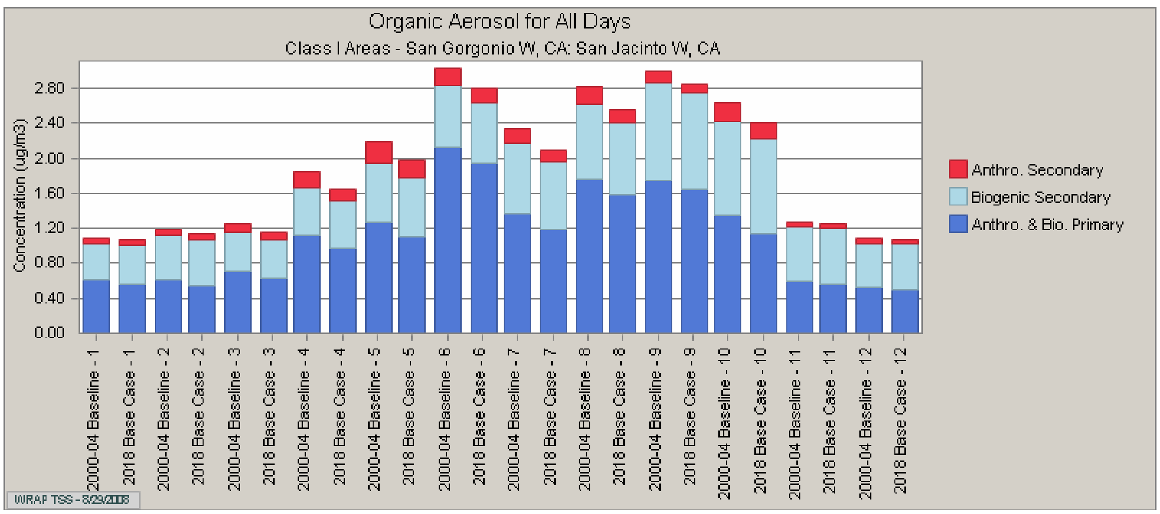


Figure 4-7. Example Organic Aerosol Tracer results for San Gorgonio Wilderness, CA. Monthly results for the Baseline and 2018 are shown.

4.5.4 Positive Matrix Factorization

As part of their Causes of Haze Analysis (CoHA) project for WRAP, Desert Research Institute (DRI) performed a Positive Matrix Factorization (PMF) analysis using the IMPROVE aerosol data set and meteorological back trajectories. The purpose of this analysis was to distinguish chemical source profiles which could describe aerosol contributions to IMPROVE monitoring sites within the WRAP region. Through a review of source profile characteristics, profiles were identified with general or specific emissions source categories, such as "Smoke" or "Urban/Diesel" or any of several other categories. Percent contributions of each profile to each IMPROVE site's aerosol concentrations were derived and compared with emissions inventories to evaluate the level of confidence in the results. Further information regarding the PMF analysis can be found on the CoHA web site (http://www.coha.dri.edu/web/general/tools_PMFModeling.html).

4.5.5 Causes of Dust Analysis

As part of their CoHA project for WRAP, DRI performed a Causes of Dust Analysis, designed to characterize aerosol sampling days when coarse mass and fine soil combined constituted the dominant aerosol extinction species. These dust events were described as belonging to one of four categories:

- Transcontinental transport from Asia
- Windblown dust (generated locally, nominally with 10 km of the site)
- Upwind transport (does not involve significant windblown dust from local sources)
- Unknown (does not fit into the above three categories)

In addition to categorizing dust events, the project was also able to identify a number of temporal trends. Further information regarding the Causes of Dust analysis can be found on the CoHA web site (http://www.coha.dri.edu/dust/index.html).

Appendix A

WESTERN REGIONAL AIR PARTNERSHIP

Technical Analysis Forum's
Technical Recommendations on Monitoring Metrics for Regional Haze Planning
March 2007

Executive Summary

The Technical Analysis Forum recommends the use of the following monitoring metrics by states, tribes, and EPA to assist in regionally consistent assessments of reasonable progress at all 118 visibility-protected Class I Federal areas of the WRAP region in the December 2007 regional haze implementation plans:

6) Apply the revised IMPROVE light extinction equation as developed and approved in 2005 by the IMPROVE Steering Committee to convert from mass concentration measurements to light extinction for visibility analysis and regional haze planning at each WRAP region Class I area. This revised equation is available for haze planning nationwide on the VIEWS and TSS websites.

7) Use the alternative Natural Conditions Estimates in combination with the 2000-04 Best and Worst Days' metrics as developed and recommended by the Inter-RPO Monitoring & Data Analysis Discussion Group, as calculated and reported by VIEWS and TSS, utilizing the revised IMPROVE equation, for visibility analysis and regional haze planning at each WRAP region Class I area. These alternative Natural Conditions Estimates are available for all Class I areas, nationwide.

8) Use the 2000-04 Best and Worst Days' metrics as calculated and reported by VIEWS and TSS. Missing data will be substituted using the procedure described later in this document. Similar data substitutions have been performed and documented on VIEWS, to produce regional haze baseline period metrics for all Class I areas, nationwide. Individual WRAP region states should review the data completeness for Class I areas in their state, and any data substitutions for their CIAs.

The following recommendation is specific to the WRAP region.

9) Use a variety of visibility projection techniques, including the EPA default and the 2 WRAP alternatives, to analyze and assess the best method(s) to assist in demonstrating and explaining reasonable progress. All of these projection methods are available on the TSS and will draw upon the 2000-04 Best and Worst Days' metrics as calculated and reported by VIEWS and TSS. These projection method options utilize the revised IMPROVE equation and alternative Natural Conditions Estimates to:

   - Project, analyze, and assess 2018 visibility conditions for the overall deciview Haze Index and total light extinction; and
   - Project, analyze, and assess IMPROVE species-specific contributions to 2018 visibility conditions, to better understand the relationships to natural and anthropogenic as well as controllable and uncontrollable emissions. The visibility impact of coarse material and sea salt are assumed to be constant 2000-04 to 2018.

These technical methods are or will be available on the WRAP TSS at: http://vista.cira.colostate.edu/tss/

Monitoring Metrics for BART Determinations

The WRAP's recommendations for use of the revised IMPROVE equation and alternative Natural Conditions Estimates for assessing current haze conditions and projecting future haze trends for regional haze planning should not be seen as an endorsement for their use by individual state air programs for evaluation of BART modeling results and BART control level determinations for technical and process reasons.

Technical Analysis Forum's
Technical Recommendations on Monitoring Metrics for Regional Haze Planning
March 2007

Background

This document summarizes the recommended monitoring metrics for application by states and tribes for regional haze planning, for the December 2007 plans' due date. The intent of this document is to identify the currently available best technical monitoring metrics and reasons for using them. The motivation behind this consensus product from the Technical Analysis Forum is to lay out a regionally consistent approach for applying the following monitoring metrics at each WRAP region Class I area:

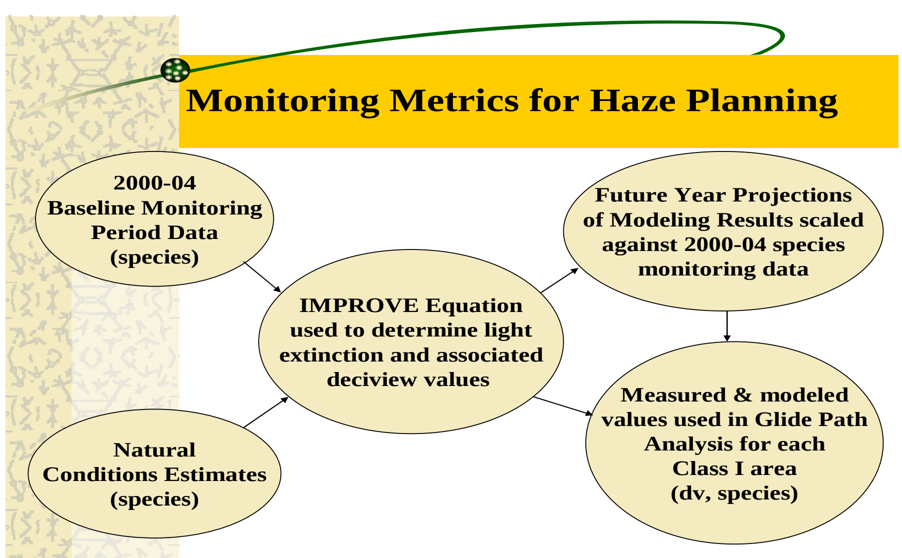
- The light extinction equation to convert from mass concentration measurements to visibility;
- Natural visibility conditions estimates – the 2064 goal to be defined in the 2007 haze plans;
- The 2000-04 baseline period visibility monitoring data; and
- The 2018 planning milestone projected visibility value (using the Relative Response Factor or RRF), a scaling factor from monitoring data to be applied to regional gridded air quality modeling results to assess the amount of visibility improvement expected from emissions reductions across all sources.

This document provides a protocol for applying the monitoring metrics, and can serve as a reference document for individual haze implementation plans.

Use of Monitoring Data in Support of Regional Haze Planning

The need for a consistent regional methodology for evaluating the WRAP region results from studying the nature and causes of light extinction and fundamental requirement to apply the best metrics to the regional haze planning process. Conceptually this process is shown in Figure 1.

Figure 1. Conceptual Diagram of Monitoring Metrics for Planning under the Regional Haze Rule



The Interagency Monitoring of PROtected Visual Environments (IMPROVE) national monitoring program has been designated by EPA to collect visibility impairment data representing the 156 Class I Federal areas (CIAs) with visibility protection under the Clean Air Act. More information about the IMPROVE monitoring program, the 110 monitoring sites across the nation selected to represent the 156 CIAs, and the Steering Committee managing the monitoring program in support of regional haze plans required of all 50 states under the EPA Regional Haze Rule (RHR) can be found at: http://vista.cira.colostate.edu/improve/Overview/Overview.htm. EPA has also published a broader guidance document on Visibility Monitoring, see: http://www.epa.gov/ttn/amtic/files/ambient/visible/r-99-003.pdf.

Light extinction theory

Based on aerosol research, the technical method to determine visibility impairment is to calculate the light extinction coefficient (bext). This is defined as the loss of image-forming light per unit distance due to scattering and absorption by particles and gases in the atmosphere. The light extinction coefficient is the sum of the scattering coefficient (bscat) and absorption coefficient (babs), which are similarly defined as the loss of light per unit distance by scattering and absorption mechanisms respectively. The light extinction coefficient can be represented mathematically as:

$$b_{ext} = b_{sg} + b_{ag} + b_{sp} + b_{ap} = b_{scat} + b_{abs} \quad ;$$

where s, a, g, and p refer to scattering and absorption by gases and particles, respectively.

Speciated Monitoring Data

To determine visibility impairment under the RHR, filter sampling data from IMPROVE aerosol monitors are collected and analyzed following Standard Operating Procedures, see: (http://vista.cira.colostate.edu/improve/Publications/SOPs/UCDavis_SOPs/IMPROVE_SOPs.htm). These resulting mass concentration data are then converted to light extinction using an algorithm referred to as the IMPROVE equation; this equation has been reviewed and changed during the last 2 years, (see: http://vista.cira.colostate.edu/improve/Publications/GrayLit/019_RevisedIMPROVEeq/RevisedIMPROVEAlgorithm3.doc), creating a ripple effect for the monitoring metrics required for use in regional haze planning.

Haze Index- The Deciview (dv)

The RHR also requires that the light extinction data from the IMPROVE equation be analyzed and presented in terms of a "haze index" value called the deciview (dv); the dv index is related to total light extinction, described at: http://vista.cira.colostate.edu/improve/Publications/NewsLetters/apr_93.pdf. As such, light extinction for regional haze planning could be analyzed in terms of its component contributors to light extinction as defined in the old and revised IMPROVE equations, and/or as the associated deciview values.

IMPROVE Light Extinction Equation – Original vs. Revised

The original IMPROVE light extinction equation was adopted by the Steering Committee and used in their principle publications (see: http://vista.cira.colostate.edu/improve/Publications/Principle_pubs.htm) since the early 1990s. The equation has also been widely evaluated and used in peer-reviewed journal articles as well as urban visibility studies. For those reasons, the EPA adopted this equation in their 2003 guidance document on Tracking Progress Under the Regional Haze Rule. See: http://www.epa.gov/ttn/oarpg/t1/memoranda/rh_tpurhr_gd.pdf.

The equation uses additive extinction by chemical species as measured by the IMPROVE aerosol monitor, combined with the effect of Relative Humidity (RH), to estimate the scattering of light by fine and coarse particles. The original IMPROVE equation, as adopted by EPA in their guidance document, is used to estimate total light extinction for the purposes of planning under the RHR:

$$b_{sp} = (3)f_{SO4}(RH)[SULFATE]$$
$$+(3)f_{NO3}(RH)[NITRATE]$$
$$+(4)f_{org}(RH)[OMC]$$
$$+(1)[SOIL]$$
$$+(0.6)[CM]$$

The brackets in this equation indicate the species concentration. The factors 3, 4, 1, and 0.6 are the m^2/g dry specific scattering efficiency for each of the respective species. Thus, a sulfate particle is three times more effective in scattering light than a particle of soil.

To account and control for relative humidity effects in the light extinction data to be used in regional haze planning, EPA sponsored a project to examine measured hourly relative humidity data over a 10-year period (1988-1997) within the United States to derive month-specific climatological mean humidity correction factors designed to represent each CIA. The hourly RH measurements from each site were converted to *f(RH)* values using a nonlinear weighting factor curve. Values above 95% RH were set equal to the *f(RH)* corresponding to 95% RH.

Appendix A of: http://www.epa.gov/ttn/oarpg/t1/memoranda/rh_tpurhr_gd.pdf presents these values. Determination of the humidity factors is described in section 3.6 of that document. Using over 370 humidity monitoring locations across the country, monthly *f(RH)* values were calculated. In most regions there is a seasonal cycle of relative humidity, which is accounted for by generating the appropriate monthly *f (RH)* values, as in Appendix A. The 12 monthly averaged *f (RH)* values are listed for each IMPROVE or IMPROVE protocol site and their corresponding Class I areas. The site-specific values are listed for each CIA and are recommended to be used for all visibility and tracking progress calculations for that CIA. These values are provided in Table A-2. A table of 12 monthly-averaged *f(RH)* values for each CIA is also provided in Table A-3 for informational purposes.

Overview of revised IMPROVE equation

The IMPROVE light extinction equation was analyzed, revised, and approved by the Steering Committee during 2005. A detailed discussion of the revised equation and the reasons for changing it can be found at: http://vista.cira.colostate.edu/improve/Publications/NewsLetters/IMPNews4thQtr2005.pdf. A summary of the differences between the original and revised equations follows.

The original IMPROVE equation produces reasonable estimates of light scattering over a broad range of conditions. However, it tends to underestimate the highest extinction values and overestimate the lowest extinction values. Since EPA adopted the equation for use in RHR planning, the original IMPROVE equation has been scrutinized carefully to assess deficiencies that could bias the implementation of the RHR. With those concerns identified, the IMPROVE Steering Committee initiated an internal review resulting in recommendations for revisions of the light extinction equation. The review team of scientists from the National Park Service and the Cooperative Institute for Research in the Atmosphere developed a revised algorithm that reduces biases in light extinction estimates and is as consistent as possible with the current scientific literature. Review of the original equation and suggested revisions are presented at:
http://vista.cira.colostate.edu/improve/Publications/NewsLetters/IMPNews2ndQtr2005.pdf.

In July 2005, the equation review results and proposed revisions were presented to the IMPROVE Steering Committee. A subcommittee was formed to further investigate the proposed equation. The subcommittee included scientists who worked on the initial review, as well as scientists who have been critical of the original IMPROVE equation. Their work resulted in the final version of the equation, which was again presented to the Steering Committee. In December 2005, the IMPROVE Steering Committee voted to adopt this revised equation for use by IMPROVE as an alternative to the current approach.

The revised equation splits ammonium sulfate, ammonium nitrate, and organic carbon compound concentrations into two size fractions: small and large. The revised equation for estimating the light extinction for the RHR is:

Bext = 2.2 x fs(RH) x [small sulfate] + 4.8 x fL(RH) x [large sulfate]
+ 2.4 x fs(RH) x [small nitrate] + 5.1 x fL(RH) x [large nitrate]
+ 2.8 x [small organic mass] + 6.1 x [large organic mass]
+ 10 x [elemental carbon mass]
+ 1 x [fine soil mass]
+ 1.7 x fss(RH) x [sea salt mass]
+ 0.6 x [coarse mass]
+ Rayleigh scattering (site-specific)
+ 0.33 x [NO2 (ppb)]

Though not explicitly shown, the organic mass concentration used is 1.8 times the organic carbon mass concentration, (changed from 1.4 times carbon mass the original equation uses). New terms have also been added for sea salt and for absorption by NO2. The apportionment of the total concentration of sulfate compounds into the concentrations of small and large size fractions is accomplished using the following equations:

$$[\textit{large sulfate}] = \frac{[\text{total sulfate}]}{20\ \mu g/m^3} \times [\text{total sulfate}],\ \text{for [total sulfate]} < 20\ \mu g/m^3$$

$$[\textit{large sulfate}] = [\textit{total sulfate}],\ \textit{for}\ [\textit{total sulfate}] \geq 20\ \mu g/m^3$$

$$[\textit{small sulfate}] = [\textit{total sulfate}] - [\textit{large sulfate}]$$

The same equations are used to apportion total nitrate and total organic mass into small and large size fractions. Sea salt is calculated as 1.8 x [*chloride*], or 1.8 x [*chlorine*] if the chloride measurement is below detection limits, missing, or invalid. The new equation contains three distinct water growth terms, designated fS, fL, and fSS for the small and large sulfate and nitrate fractions, and for sea salt, respectively.

Technical justification for revisions

The new IMPROVE equation for estimating light extinction for the RHR contains five major revisions from the original equation:

1) A sea salt term has been added. Sea salt is a particular concern for coastal locations where the sum of the major components of light extinction and mass has been deficient.
2) The assumed organic mass to organic carbon ratio has been changed from 1.4 to 1.8, to reflect more recent peer-reviewed literature on the subject.
3) The Rayleigh scattering factor has been changed from a network-wide constant to a site-specific value. This factor is based on the elevation and annual average temperature of individual monitoring sites.
4) A split component extinction efficiency model for sulfate, nitrate, and organic carbon components has been developed. The model includes new water growth terms for sulfate and nitrate to better estimate light extinction at the high and low extremes of the range of extinction.
5) An NO2 light absorption term has been added. This term can only be used at sites with available NO2 concentration data.

Comparison of original versus revised equation

One of the most compelling reasons for developing a revised equation was to reduce the biases in light scattering estimates at the extremes, when compared to nephelometer measurements a direct measure particle scattering. To assess the performance of the new equation, the fractional bias for each sample period was calculated as the difference in estimated aerosol light scattering divided by the measured light scattering using collocated nephelometers. These biases were then averaged into quintiles to indicate the bias in each of those five subsets of data. Analysis shows that the revised equation has lower fractional bias than the original equation, in all but the haziest conditions.

Scatter plots (Figures 2 and 3) of light scattering estimates from the original and revised equations versus nephelometer data for all available data at 21 monitoring sites were used to view the overall performance differences. These figures show bias at the extremes is reduced using the revised, compared to the original, equation (i.e., the points tend to be better centered on the one-to-one line). However, they also show the somewhat reduced precision of the revised equation compared to the original (i.e., points are more broadly scattered).

Figure 2. Scatter plot of the original IMPROVE equation-estimated particle light scattering versus measured particle light scattering.

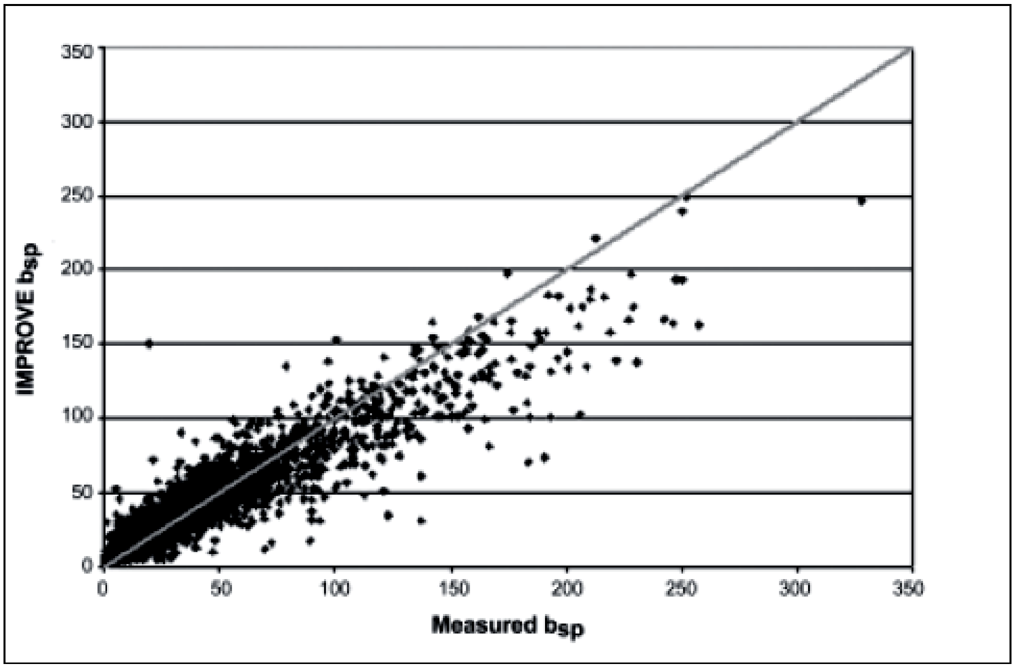
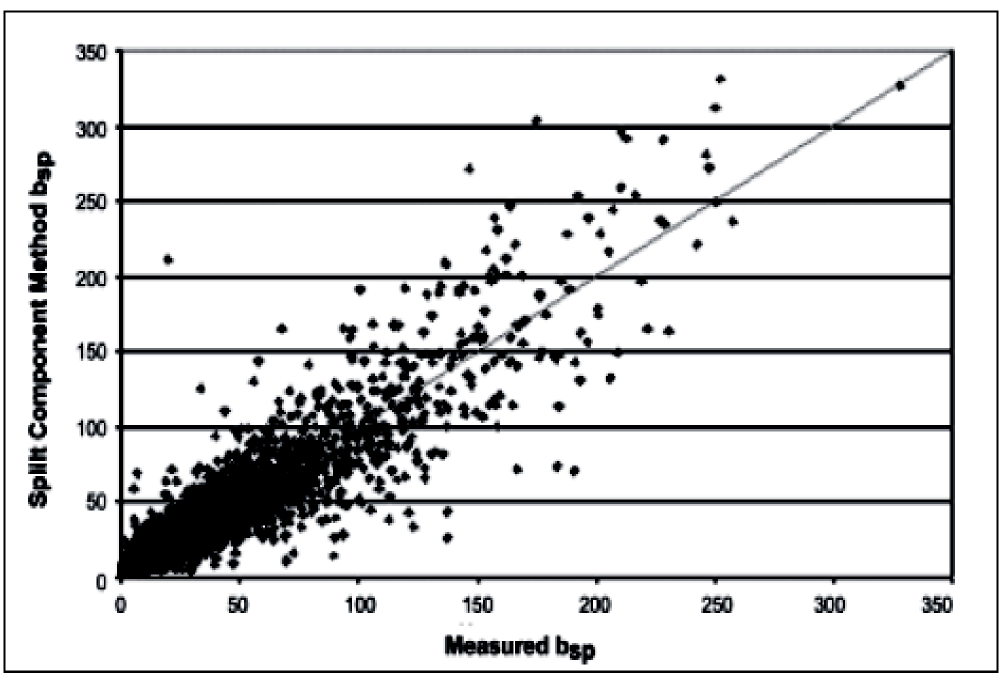


Figure 3. Scatter plot of the revised IMPROVE equation-estimated particle light scattering versus measured particle light scattering.



Directly measured light scattering data from collocated Optec NGN-2 nephelometers were used to evaluating the performance of the original IMPROVE equation, as well as for development and performance evaluation of several possible versions of the revised equation, leading to the final revised equation approved by the IMPROVE Steering Committee. The 21 nephelometer sites used in the evaluation were:

Acadia National Park, Maine
Big Bend National Park, Texas
Boundary Waters Canoe Area Wilderness, Minnesota
Columbia River Gorge National Scenic Area, Oregon
Dolly Sods Wilderness, West Virginia
Gila Wilderness, New Mexico
Grand Canyon National Park, Arizona
Great Gulf Wilderness, New Hampshire
Great Smoky Mountains National Park, Tennessee/North Carolina
Jarbidge Wilderness, Nevada
Lone Peak Wilderness, Utah
Lye Brook Wilderness, Vermont
Mammoth Cave National Park, Kentucky
Mount Rainier National Park, Washington
Mount Zirkel Wilderness, Colorado
Okefenokee National Wildlife Refuge, Georgia
Shenandoah National Park, Virginia
Shining Rock Wilderness, North Carolina
Snoqualmie Pass, Washington
Three Sisters Wilderness, Oregon
Upper Buffalo Wilderness, Arkansas

The revised IMPROVE equation reduces the biases compared to measurements at the high and low extremes, and is most apparent for the hazier eastern sites. The composition of “best and worst days” is very similar by the original and new equations. Most of the reduction of bias associated with the revised equation is attributed to the use of the split component extinction efficiency method for sulfate, nitrate, and organic components that permitted variable extinction efficiency depending on the component mass concentration. The revised equation also contains specific changes incorporating a better understanding of the atmosphere based on recent scientific literature. It reflects a more complete accounting for contributors to haze (e.g., sea salt and NO2 terms), and uses site-specific Rayleigh scattering terms to reduce elevation-related bias. EPA has prepared monthly average f(RH) terms for all IMPROVE monitoring sites for the revised equation. The revised equation has been added to the suite of data analysis tools on the Visibility Information Exchange (VIEWS - http://vista.cira.colostate.edu/views/) and the WRAP Technical Support System (TSS - http://vista.cira.colostate.edu/tss/Results/Monitoring.aspx) web sites. A complete discussion and report is available on the IMPROVE Web site at: http://vista.cira.colostate.edu/IMPROVE/Publications/GrayLit/019_RevisedIMPROVEeq/RevisedIMPROVEAlgorithm3.doc.

Effects on Regional Haze Planning in the WRAP Region: Original vs. Revised IMPROVE Equation

The effects of the revised IMPROVE equation on the data used for regional haze planning under the RHR have been evaluated by the AoH Workgroup on a December 9, 2005 call and in more detail at a Workgroup Meeting on January 24-25, 2006. The detailed presentation at: http://wrapair.org/forums/aoh/meetings/060124m/Review_of_New_IMPROVE_Equ_012406_ARS.pdf was the basis for the following observations from the AoH Workgroup. Analysis of the nature and causes of visibility impairment at the more than 100 CIAs in the WRAP region strongly suggests that control strategies for regional haze planning be evaluated using the revised IMPROVE equation, and that results be presented in units of both b_{ext} and dv.

For the purposes of regional haze planning, the revised IMPROVE equation has benefits, as it:

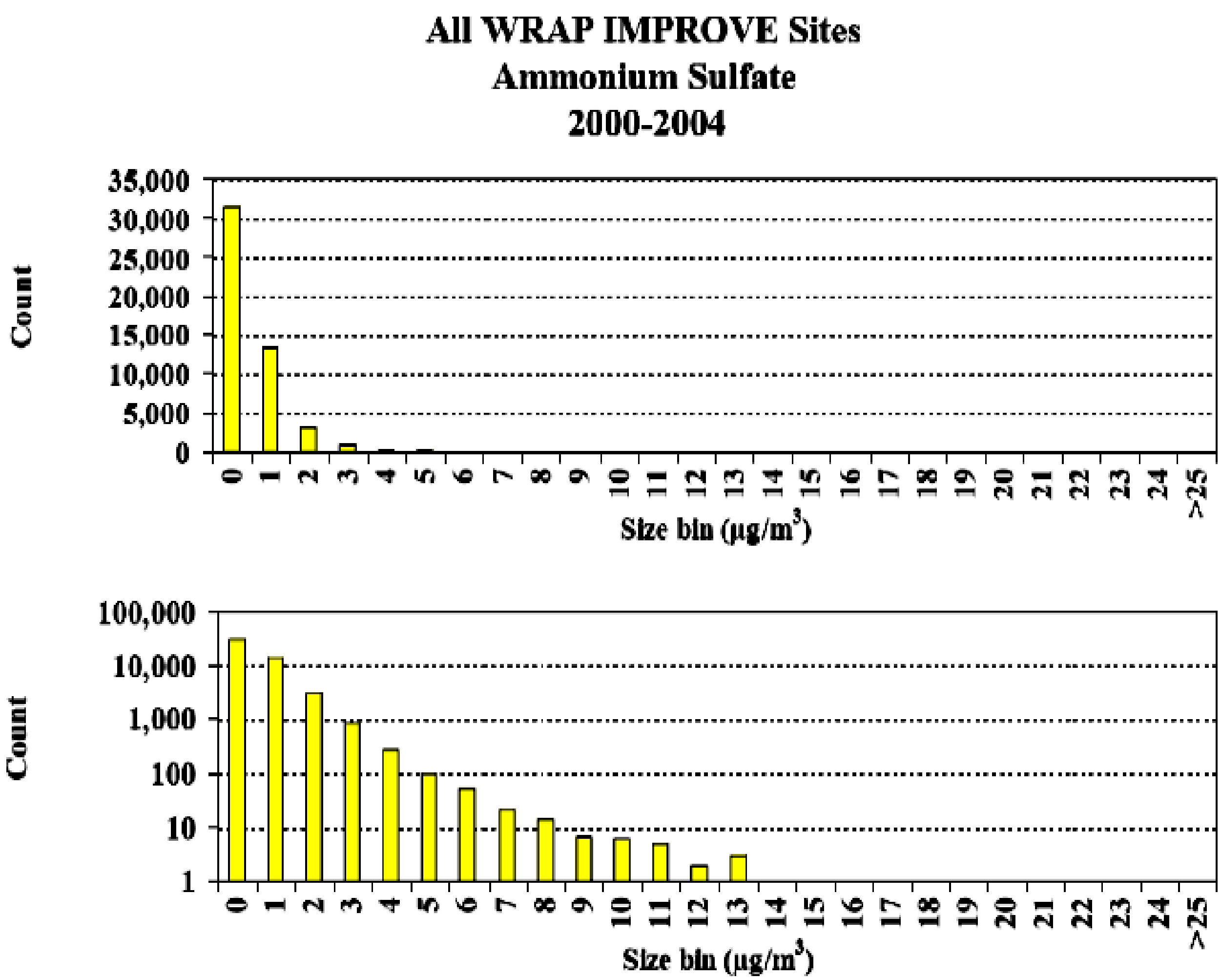
- incorporates new terms to more completely account for haze;
- uses updated research information;
- was developed by comparing to directly-measured optical light scattering data at collocated sites; and
- reduces known biases.

For regional haze planning purposes, using the revised IMPROVE equation has some tradeoffs, as it:

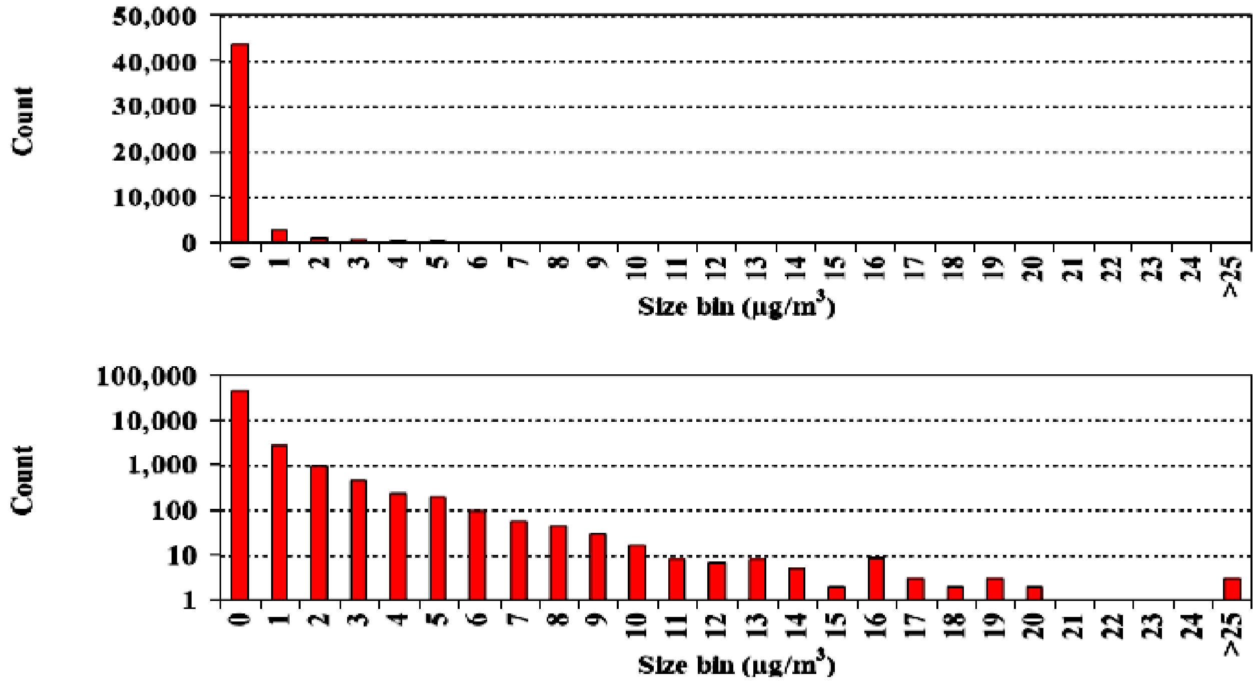
- is a national data analysis and addresses data distribution for the whole country, with the associated large sulfate impact dominating Eastern US visibility, and does not as directly address the mix of light extinction causes at Western Class I area monitoring sites;

- requires that in using the revised equation to the 2000-04 baseline monitoring period would also require that it be applied to as well to natural conditions estimates, to insure a consistent calculation of the glide path for each Class I area;
- has a somewhat greater uncertainty that causes it to mis-select the 20 % worst visibility days for the RHR a little more frequently, although little difference was observed with respect to the composition on those 20 % worst visibility days;
- chooses a "better fit" for all data across the distribution at the sites tested over the better precision of the original IMPROVE equation for individual data points in the middle of the distribution; and
- has less consequence for SO_4 and NO_3 light extinction in the WRAP region in terms of the revised IMPROVE "split component extinction efficiency method", as Figures 4 and 5 below show – Figure 6 shows that this new method for Organic Mass would have a more profound impact in the WRAP region, as expected from the episodic impacts of wildland fire emissions.

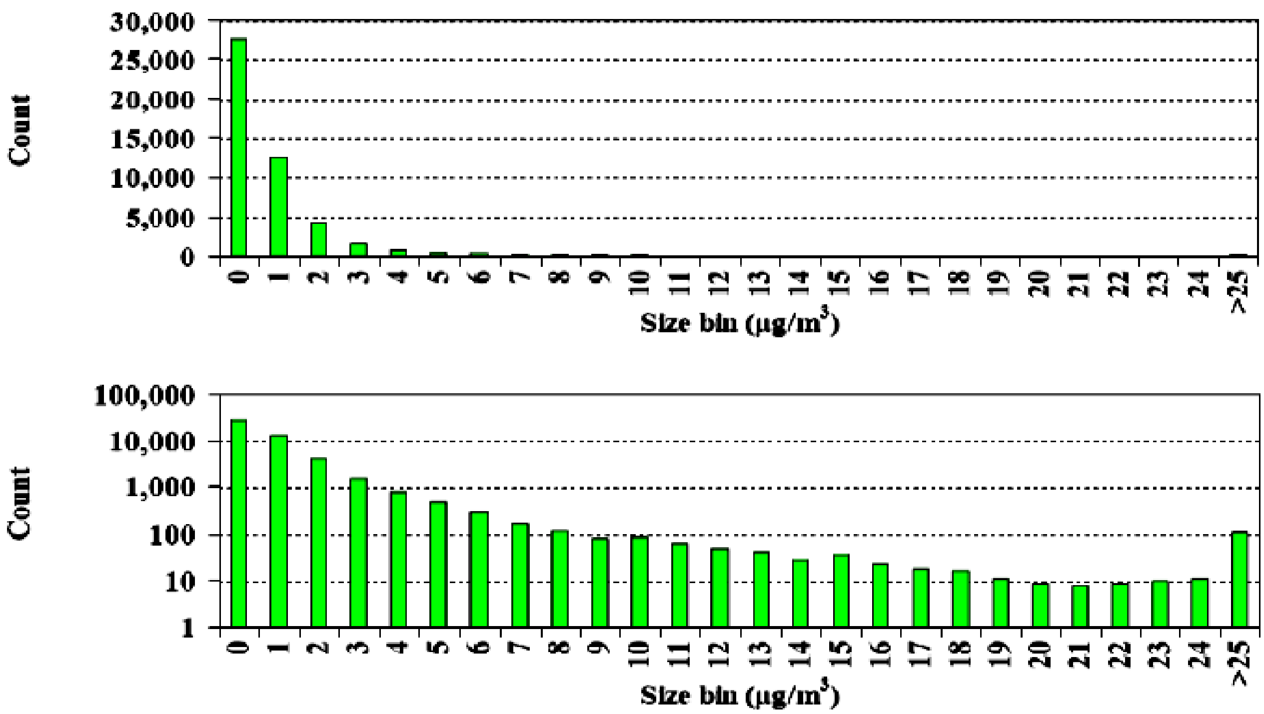
Figures 4, 5, 6. REWRITE Histograms of Sulfate, Nitrate, and Organic Mass concentration data from all IMPROVE sites for 2000-04 in the WRAP (same data in paired charts, lower charts logarithmic scale).



All WRAP IMPROVE Sites
Ammonium Nitrate
2000-2004



All WRAP IMPROVE Sites
Particulate Organic Mass
2000-2004



2064 Natural Visibility Conditions Estimates

Default natural visibility conditions estimates and the associated methodology was published by EPA in 2003 at: http://www.epa.gov/ttn/oarpg/t1/memoranda/rh_envcurhr_gd.pdf. This Estimating Natural Visibility Conditions Under the Regional Haze Rule guidance document was prepared prior to the review of the IMPROVE light extinction equation during 2005 and provided estimates of natural conditions in haze index units (deciviews) only. Numerous criticisms of these estimates have been noted, see the collection of documents at: http://www.wrapair.org/forums/aamrf/projects/NCB/index.html. These estimates are in terms of the original IMPROVE light extinction equation, and are not comparable to baseline period monitoring metrics calculated with the revised IMPROVE equation.

Regional haze planning in the WRAP region should separately assess reasonable progress toward the national visibility goal by IMPROVE light extinction species, due to the mixture of sulfate, nitrate, carbonaceous aerosols, and soil materials causing Western visibility impairment, along with the large amount of natural fire and dust emissions contributing to visibility impairment. For those reasons, Alternative Natural Conditions Estimates, in term of deciviews, total light extinction, and IMPROVE species light extinction have been developed, reviewed, and proposed for use in regional haze planning; see: http://vista.cira.colostate.edu/improve/Publications/NewsLetters/IMPNews2ndQtr2006.pdf.

Alternative Natural Visibility Conditions

EPA 2003 RHR guidance 2003 for tracking progress and estimating natural conditions were based on the original IMPROVE equation, providing a consistent set of instructions. see: http://vista.cira.colostate.edu/improve/Publications/GuidanceDocs/guidancedocs.htm. As noted earlier, a revised IMPROVE equation was developed and approved that mitigated some of the technical criticism of the original IMPROVE equation, especially as it applied to implementing the RHR through the regional haze implementation plans due in December 2007. Many of the regional planning organizations (RPOs) and states indicated their preference to use the revised equation, but to do so they need natural haze condition estimates for their CIAs determined in a consistent manner (i.e., by the new IMPROVE equation). The revised IMPROVE equation is described earlier in this document.

Estimates of natural haze levels using either equation involve applying the equation to estimates of natural species concentrations. The natural species concentration estimates used for this purpose come from the 1990 NAPAP State of Science Report 24 by John Trijonis, see: http://vista.cira.colostate.edu/improve/Publications/Principle/NAPAP_SOS/High%20Res/napap_(high).htm and are typical values for the eastern and western U.S. Some methodology is needed to adjust these typical values to estimate the 20% best and 20% worst values. A goal in developing the new values is to avoid problems identified in the EPA default approach. The Natural Haze Levels II Committee was established by the Inter-RPO Monitoring & Data Analysis Workgroup in Spring 2006 to review and refine, as appropriate, a methodology developed by Roger Ames (CIRA) for applying the new IMPROVE equation for estimating light extinction from aerosol concentrations to natural species concentration estimates. Ultimately this would provide natural haze estimates for the 20% best and 20% worst day for each of the CIAs covered by the RHR. The committee was composed of Marc Pitchford, NOAA; Bill Malm, NPS; Bruce Polkowsky, NPS; Pat Brewer, VISTAS; Tom Moore, WRAP; Ivar Tombach, consultant; John Vimont, NPS; Rich Poirot, Vermont; Roger Ames, CIRA; and Naresh Kumar, EPRI. The committee work has been summarized in an annotated presentation that is available at: http://vista.cira.colostate.edu/datawarehouse/improve/docs/naturalhazelevelsIIreport.ppt. This information was presented July 27, 2006 at the Attribution of Haze Workgroup meeting, see: http://wrapair.org/forums/aoh/meetings/060726den/NaturalHazeLevelsIIReport.ppt (the notes sections of each PPT slide contain additional information, if the PPT is downloaded on and displayed on your desktop) and on August 14 at the RPO Monitoring/Data Analysis Workgroup conference call. Comments received by August 25, 2006 were used to generate an approved approach that was forwarded to the individual RPOs for their consideration and use.

The alternative natural conditions estimates offer a number of advantages for regional haze planning, over the default estimates in EPA guidance. The alternative conditions are divided into the 6 measured IMPROVE light extinction species, and can still be totaled to estimate total visibility in light extinction or deciviews, using the revised IMPROVE equation. The alternative estimates are based on analyzing and estimating the natural fraction of the 2000-04 baseline period monitoring data at each IMPROVE monitoring site. At more than a dozen sites, the natural fractions estimated by the alternative method for the 2000-04 data were compared to the period of record (>15 years) data for the same sites, and the alternative method for the 2000-04 period is quite similar to the long period of record since the late 1980s.

Tables 1 through 4 below show example data summaries for regional haze planning use in documenting differences between EPA default and alternative methods of estimating natural conditions at each CIA.

Both EPA default and alternative natural conditions estimates represent 2064 target values for regional haze planning purposes; the true values are not known at this time, and more analysis is needed to refine these estimates for future regional haze planning cycles, as anthropogenic emissions are reduced and natural visibility conditions are better measured.

Table 1 – *EXAMPLE DATA TABLE* - Comparison of Natural Visibility Conditions Estimates using EPA Default and New Alternative Methods, including the change in Regional Haze Rule Uniform Rate of Progress 2018 Target Values

Mandatory Federal Class I Area	**State**	**Monitoring Site Code**	20% Best Days 2064 Natural Conditions		20% Worst Days 2000-04 Baseline Period Monitoring Data		20% Worst Days 2064 Natural Conditions		Uniform Rate of Progress: 2018 Haze Planning Milestone for 20% Worst Days		Uniform Rate of Progress: 2018 Visibility Improvement Increment for 20% Worst Days	
			Default method (dv)	Alt. method (dv)	Default method (dv)	Alt. method (dv)	Default method (dv)	Alt. method (dv)	Default method (dv)	Alt. method (dv)	Default method (dv)	Alt. method (dv)
Agua Tibia Wild. Area	CA	AGTI1										
Arches NP	UT	ARCH1										

Table 2 – *EXAMPLE DATA TABLE* - Light Extinction Component s of 20% Worst Visibility Days for 2064 Natural Visibility Conditions Estimates (revised IMPROVE light extinction equation & alternative method for estimating Natural Visibility Conditions)

Mandatory Federal Class I Area	**State**	**Monitoring Site Code**	20% Worst Days 2064 Natural Conditions Estimates (dv) (from Table 1)	20% Worst Days 2064 Natural Conditions Estimates (1/Mm)	Light Extinction Components of 20% Worst Days 2064 Natural Visibility Conditions Estimates					
					Sulfate (1/Mm)	Nitrate (1/Mm)	Organic Material (1/Mm)	Elemental Carbon (1/Mm)	Fine Soil (1/Mm)	Coarse Material (1/Mm)
Agua Tibia Wild. Area	CA	AGTI1								
Arches NP	UT	ARCH1								

Table 3 – *EXAMPLE DATA TABLE* - Light Extinction Components of 20% Best Visibility Days for 2064 Natural Visibility Conditions Estimates (revised IMPROVE light extinction equation & alternative method for estimating Natural Visibility Conditions)

Mandatory Federal Class I Area	**State**	**Monitoring Site Code**	20% Best Days 2064 Natural Conditions Estimates (dv) (from Table 1)	20% Best Days 2064 Natural Conditions Estimates (1/Mm)	Light Extinction Components of 20% Best Days 2064 Natural Visibility Conditions Estimates					
					Sulfate (1/Mm)	Nitrate (1/Mm)	Organic Material (1/Mm)	Elemental Carbon (1/Mm)	Fine Soil (1/Mm)	Coarse Material (1/Mm)
Agua Tibia Wild. Area	CA	AGTI1								
Arches NP	UT	ARCH1								

Table 4 - *EXAMPLE DATA TABLE* - Uniform Rate of Progress: 2018 Haze Planning Milestone for 20% Worst Days and 2018 Visibility Improvement Increment for 20% Worst Days, by light extinction component, using Alternative Natural Conditions Estimates

Mandatory Federal Class I Area	**State**	**Monitoring Site Code**	Uniform Rate of Progress: 2018 Haze Planning Milestone: Light Extinction Components on 20% Worst Days (1/Mm)						Uniform Rate of Progress: 2018 Visibility Improvement Increment: Light Extinction Components on 20% Worst Days (1/Mm)					
			Sulfate	Nitrate	Organic Material	Elemental Carbon	Fine Soil	Coarse Material	Sulfate	Nitrate	Organic Material	Elemental Carbon	Fine Soil	Coarse Material
Agua Tibia Wilderness Area	CA	AGTI1												
Arches NP	UT	ARCH1												

These completed data tables will be available for use in reasonable progress analysis in the VIEWS and TSS websites.

2000-04 Baseline Visibility Period Monitoring Data

The RHR requires that data from the IMPROVE monitoring sites representing CIAs for the 2000-04 baseline monitoring period is to be used to:

- Determine the current level of visibility impairment under the RHR;
- Quantify sources and pollutant species contributing to impairment;
- Assist in classifying natural and anthropogenic sources' contributions to impairment; and
- Develop regional haze implementation plans demonstrating reasonable progress across a 60-year timeline toward the Clean Air Act goal of no manmade visibility impairment in CIAs.

A short overview of the IMPROVE monitoring program operations is presented earlier in this document; additional information is at: http://vista.cira.colostate.edu/improve/.

Quality Assurance of IMPROVE Monitoring Data

The IMPROVE monitoring program has a Quality Assurance Project Plan (QAPP), see: http://vista.cira.colostate.edu/improve/Publications/QA_QC/IMPROVE_QAPP_R0.pdf, and a Quality Management Plan (QMP), see: http://vista.cira.colostate.edu/improve/Publications/QA_QC/IMPROVEAerosolQMP_May2002.PDF; both were published in 2002. The QMP and QAPP were prepared and the QA activities identified in that QMP and QAPP are executed by the laboratory and field operations contractor team for the IMPROVE aerosol sampler network, institutional members of the contractor team and locations are:

- Crocker Nuclear Laboratory – University of California, Davis, NC;
- Research Triangle Institute – Research Triangle Park, NC;
- Desert Research Institute – Reno, NV; and
- Environmental Protection Agency – coordinated by OAQPS, Research Triangle Park, NC.

Staff of the National Park Service, the U.S. Forest Service, and the Cooperative Institute for Research in the Atmosphere (CIRA) at Colorado State University all provide additional quality assurance checks for, and analyses of, the IMPROVE data from the contractor team. The continuity of contractor team members over time, the centralized QA efforts of the contractor team, as well as the additional QA and analytical efforts coordinated by CIRA all combine to provide a very high level of confidence in the IMPROVE data for regulatory planning purposes.

Quality Assurance of the 2000-04 Baseline Monitoring Period WRAP Region IMPROVE Data

Batches of IMPROVE aerosol sampler data are published through the VIEWS website, see: http://vista.cira.colostate.edu/views/. The publication goal for these data is quarterly, sometimes the data are published twice-yearly or an annual update is made depending when updated data are provided by Crocker Nuclear Laboratory. In October 2005, an update specific to the 2000-04 data was made, see: http://vista.cira.colostate.edu/improve/Publications/GrayLit/018_IMPROVEDataResubmission/DataRedeliverySummary2005.pdf.

Crocker Nuclear Laboratory resubmitted all of the IMPROVE aerosol data to VIEWS for the 2000-04 monitoring period in October 2005. The data were resubmitted to correct several errors and discrepancies in the data in order to provide the RHR analysts with the best available data set. There were four systematic changes that affected large blocks of data:

- New flow rate validation flags were assigned;

- Flow rates were recalculated to correct an error in the calculation that existed prior to January 2004;
- Spectral corrections were applied to sulfur and aluminum data collected beginning in December 2001, when Crocker changed the elemental analysis technique; and
- Carbon analysis data were resubmitted to correct a bias in the data.

In addition to these systematic changes, a number of site-specific data problems were resolved and the data were resubmitted as well. Examples included inadvertently swapped samples, backdated flow rate calibrations, samples requiring reanalysis, and equipment problems that were resolved after the original data had been submitted.

Attribution of Haze Workgroup Review of 2000-04 Baseline Period Monitoring Data

Data completeness was reviewed at the AoH Workgroup meeting of November 16-17, 2005, see: http://wrapair.org/forums/aoh/meetings/051116m/Summary_of_Regional_Haze_Baseline_Data_111605_ARS.pdf. This was a preliminary assessment, and the IMPROVE data have been updated since that time.

The RHR Tracking Progress guidance document published by EPA in 2003, see: http://www.epa.gov/ttn/oarpg/t1/memoranda/rh_tpurhr_gd.pdf, prescribes the method for calculating the Worst 20% and Best 20% Visibility Days' metrics to determine the baseline period values to be used in regional haze planning. The following steps to calculate these metrics are already complete in VIEWS and the TSS, using both the original and revised IMPROVE light extinction equations; specific steps are:

- Assemble daily speciated data and monthly f(RH) values from each IMPROVE site for each CIA;
- Perform allowed data substitutions as prescribed in Tracking Progress guidance, if warranted;
- Sites must have at least 3 of 5 years of "complete" data;
- Calculate daily extinction, convert to Haze Index (deciviews);
- Determine the average Haze Index of the 20% worst and best visibility days for each complete year, average these annual values for baseline period statistic; and
- Determine Glide Path by comparing the 2000-04 baseline value with natural conditions.

Five (5) WRAP region IMPROVE sites did not meet the Regional Haze Rule (RHR) 2000-04 baseline monitoring period data completeness criteria of at least 3 years of complete data. In addition, thirteen (13) WRAP region IMPROVE sites did not meet data completeness requirements for 2002. In consultation with the individual states completing regional haze planning for these sites, the following procedures will be followed in completing data substitutions at these sites.
MERGE?????
In the Western Regional Air Partnership (WRAP) states, data substitution was performed for nine IMPROVE monitoring sites to achieve RHR data completeness, or to fully populate 2002, WRAP's selected modeling year. These data substitutions included estimating missing species from other on-site measurements and appropriately scaling data collected at selected donor sites which had favorable long-term comparisons. This document outlines the data substitution methods used at these sites.

Data Completeness Requirements

Regional Haze Rule (RHR) guidance outlines IMPROVE aerosol data completeness requirements including the following conditions:

- Individual samples must contain all species required for the calculation of light extinction (sulfate, nitrate, organic carbon, elemental carbon, soil, coarse mass, and, for the new IMPROVE algorithm, chloride or chlorine)
- Individual seasons must contain at least 50% of all possible daily samples
- Individual years must contain at least 75% of all possible daily samples

- Individual years must not contain more than 10 consecutive missing daily samples
- The baseline period (2000-04) must contain at least 3 complete years of data

Further details can be found in the RHR guidance document for tracking progress: http://www.epa.gov/ttn/oarpg/t1/memoranda/rh_tpurhr_gd.pdf.

Routine Data Substitutions

RHR guidelines provide provisions to fill in missing data under specific circumstances. There are currently two methods routinely used in preparing the RHR data set to substitute data for missing samples:

- The use of a surrogate in the data set:
    - Total sulfate is generally determined as 3 times the sulfur measured on the A module filter. If sulfur is missing, the sulfur measurement from the B module filter is used to calculate sulfate.
    - For the new IMPROVE algorithm, sea salt is calculated from chloride measured on the B module filter. If chloride is missing or below detection limit, the chlorine measurement from the A module filter is used to calculate sea salt.

- The application of "patching" missing data described by the RHR guidance:
    - Missing samples not substituted using a surrogate as described above can be patched, or replaced, by a seasonal average if the patching exercise passes a series of tests outlined in the guidance document.

Once these methods have been applied to the data, the resulting complete years are eligible for use in calculation of baseline conditions and tracking progress under the Regional Haze Rule. These methods have been applied to all IMPROVE data.

Sites Not Meeting Data Completeness Requirements

After routine data substitutions were made, some WRAP sites still failed to meet data completeness requirements for the baseline period. These sites are listed in Table 1. Sites were candidates for substitution for two reasons:

- The sites had fewer than 3 complete years of data, thus RHR visibility metrics for the baseline period could not be calculated.

- The sites had at least 3 years of complete data, but were missing 2002, the year selected for regional modeling. If this year is missing, then the worst 20% visibility days from 2002 cannot be determined, and the relative response factors (RRFs), which are used to predict visibility metrics in 2018, cannot be calculated.

Sites that did not meet data completeness requirements were not necessary for submittal of State Implementation Plans (SIPs) are indicated with an asterisk (*) in Table 1. Additional data substitutions for these sites have not been applied.

Table 1
WRAP Sites Failing RHR Data Completeness Requirements

State	Site	<3 years	Missing 2002
AZ	BALD1	X	X

	INGA1*	X	X
	TONT1		X
CA	KAIS1	X	X
	RAFA1	X	X
	SEQU1		X
	TRIN1		X
MT	FLAT1*	X	X
	FOPE1*	X	X
	GLAC1		X
	NOCH1*	X	X
UT	CAPI1	X	X
WA	NOCA1	X	

* Indicates additional substitution is not required for a SIP.

Additional Data Substitutions

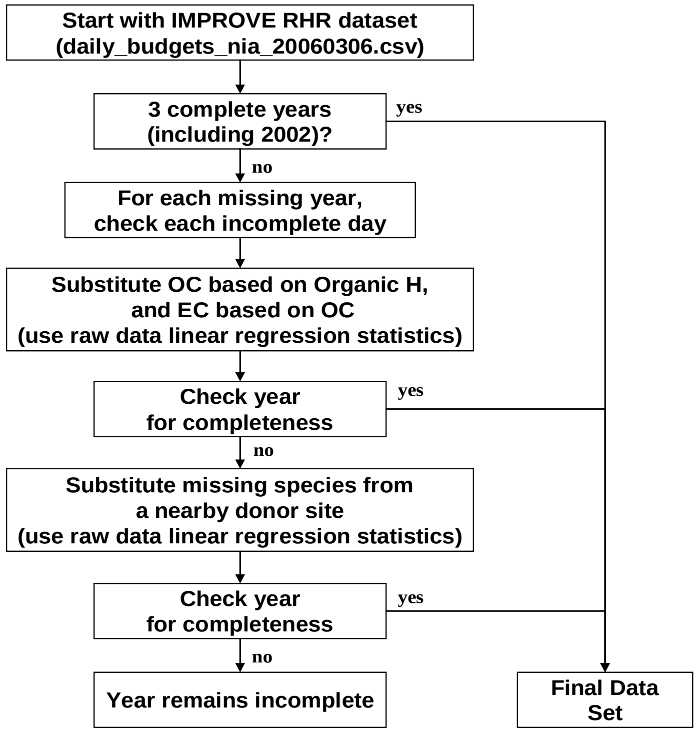
This section outlines WRAP methods for additional data substitutions designed to address problems at sites listed in Table 1. Similar methods were used at IMPROVE sites with incomplete data records in other RPOs.

Figure 1 presents a flow chart of the WRAP data substitution methods. The starting data set was the RHR IMPROVE data using the "New IMPROVE Algorithm," updated March 2006, (http://vista.cira.colostate.edu/views/Web/IMPROVE/SummaryData.aspx). This data set includes the routine surrogate and patched data substitutions allowed by RHR guidance. Note that only years deemed incomplete under RHR guidance were candidates for additional data substitutions. Years deemed complete were not changed, even thought there may have been missing samples during those years.

The first of the additional substitution methods used organic hydrogen as a surrogate for organic carbon, and resultant organic carbon as a surrogate for elemental carbon. If the carbon data substitution was not sufficient to complete the required years, measured mass for individual species from nearby IMPROVE sites with favorable long-term comparisons were scaled appropriately and used as surrogates. IMPROVE donor sites were selected in consultation with individual states. These methods are described in detail below.

Figure 1

Flow Chart of Data Substitution Methods Used



All substitutions were made using quarterly specific Kendall-Theil linear regressions statistics. These statistics were chosen because they are more resistant to outliers than the standard linear least squares statistics. Kendall-Theil slopes and intercepts were used to calculate substituted values from surrogates.

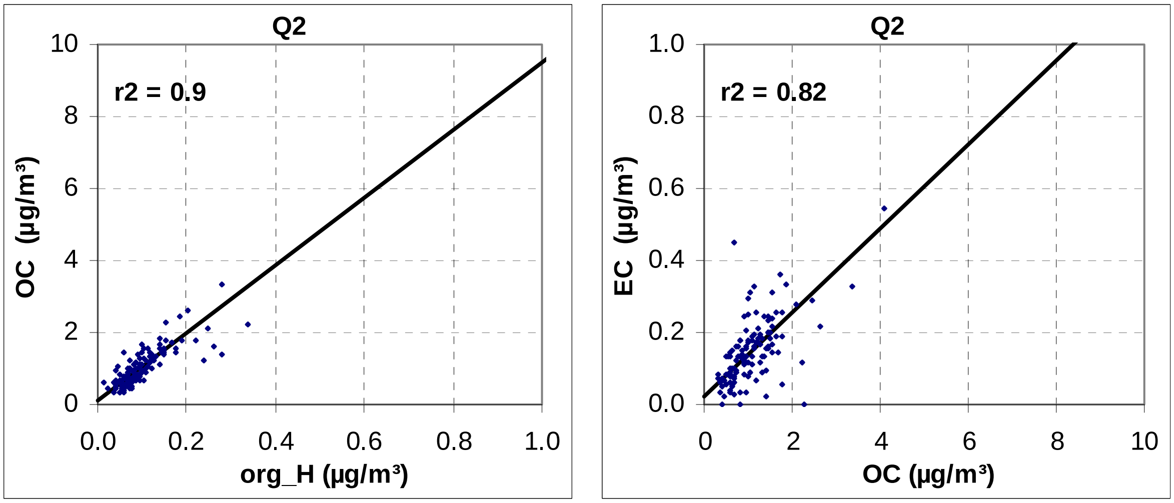
1. Carbon Substitutions

The first substitution method relied on using a surrogate for carbon mass measurements when the C module data is not available. Hydrogen (H) is measured on the A module filter, and is assumed to be primarily associated with organic carbon and inorganic compounds such as ammonium sulfate. Therefore, organic carbon (OC) can be estimated using the historical comparison between estimated organic H and OC. Organic H is estimated by subtracting the portion of H that is assumed to be associated with the inorganic compounds from the total H ($Org\_H = H - 0.24*S$).

Figure 2 presents a sample comparison for data collected at the Tonto National Monument site in Arizona during the second quarter between 2000-04 for OC and organic H. Once OC has been estimated using this method, elemental carbon (EC) mass is determined using long-term comparisons between OC and EC at the site. Statistics were calculated and applied quarterly to account for seasonal variations.

Figure 2

Comparison of OC and Estimated Organic H, and EC and OC at Tonto National Monument, AZ
Using Second Quarter Raw OC and Organic H Data, 2000-04



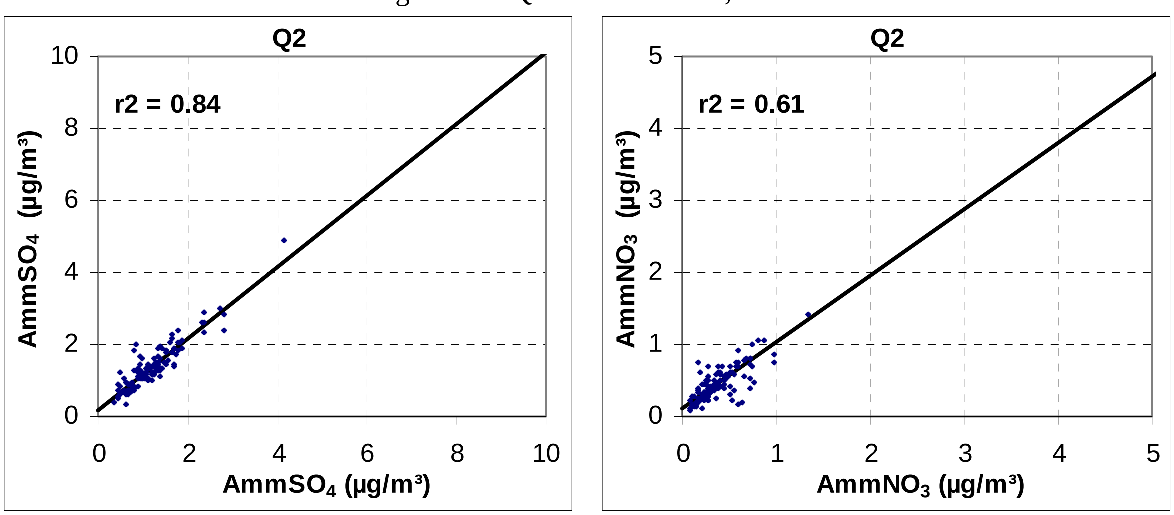
2. *Donor Site Substitutions*

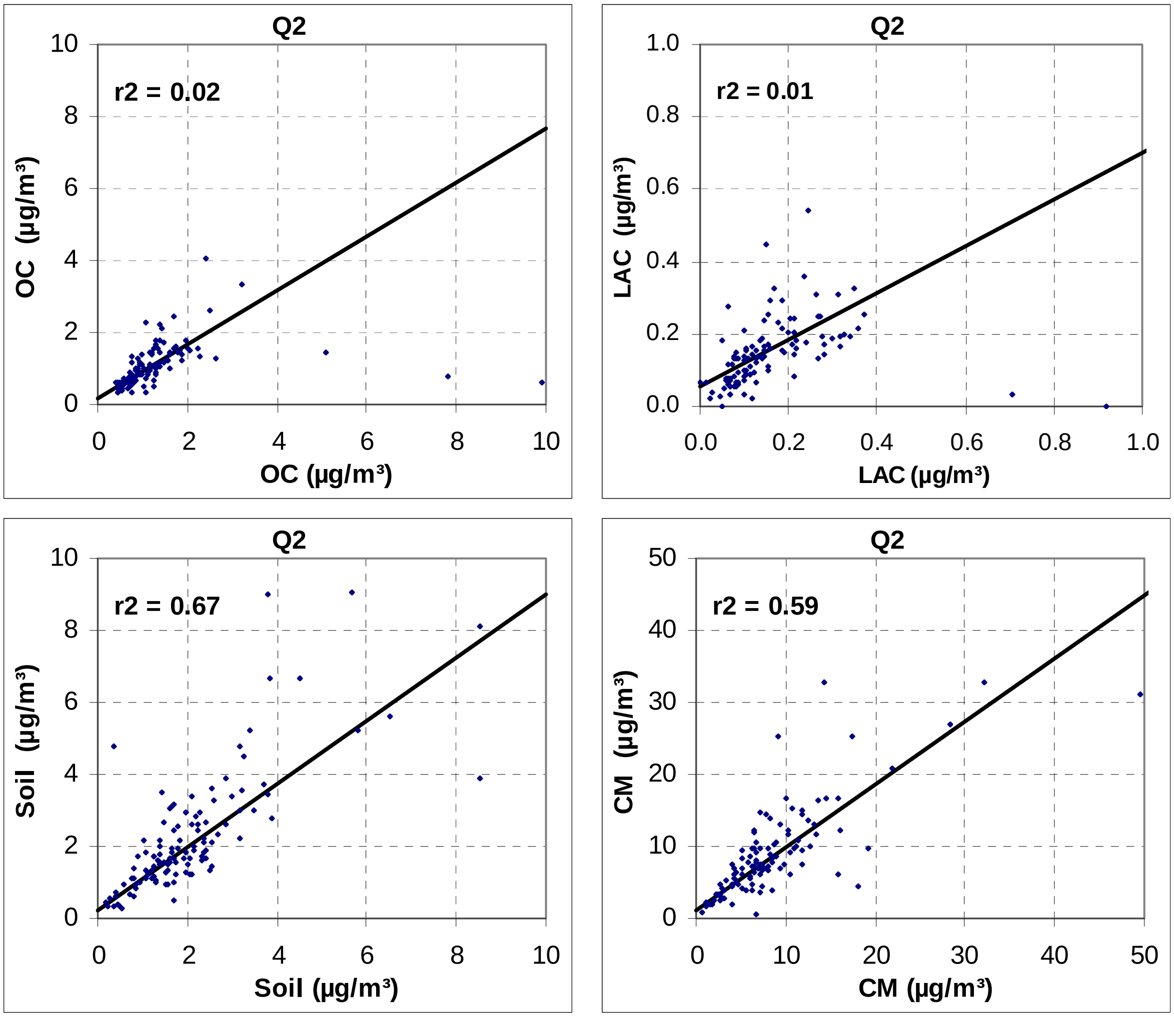
In the WRAP, the carbon data substitution methods were not sufficient to complete the required years. A second method involved identification of another nearby IMPROVE site which had favorable long-term comparisons and similar regional characteristics to be used as a donor site. Candidate sites were identified, and final donor sites for surrogate mass were selected in consultation with states.

Figure 3 presents a sample inter-site mass comparison by species for data collected during the second quarter, 2000-04, between the Tonto National Monument site and the Sierra Ancha site in Arizona. Component specific correlations were calculated and applied quarterly. Note that only species missing in a given sample were substituted based on donor site data. Species collected at the site under investigation were never replaced with data from a donor site.

Figure 3

Comparison of Aerosol Species Mass Between
Tonto National Monument, AZ (y-axis) and Sierra Ancha, AZ (x-axis)
Using Second Quarter Raw Data, 2000-04





2. *Data Completeness Following Substitutions*

Table 2 indicates which years required some degree of substitution, where a 2 indicates a substituted year, a 1 indicates the year was already complete under RHR guidelines, and dashes indicate the year did not meet RHR guidelines and no additional substitutions were made. The table also lists sites that were selected as donor sites.

The minimum data requirement of 3 complete years (including 2002) was met for each site, and additional substitutions beyond these requirements were made on a case by case basis in consultation with individual states. For example, at the KAIS1 site, substitutions were made only for the 2002 year even though substituted data (from the YOSE1 donor site) was available for other years. In this case, the years 2000 and 2001 had less than 50% of the original RHR data. In contrast, additional substitutions were applied for all incomplete years (2000-2002) at the RAFA1 site. For the RAFA1 site, the original RHR data was more substantial (73-86% available) and substitutions had less of an impact on the worst days' distributions.

Table 2
Data Completeness at WRAP Sites Following Data Substitution

State	Site	<3 years	Missing 2002	Donor	2000	2001	2002	2003	2004
AZ	BALD1	X	X	TONT1	--	2	2	1	1
	TONT1		X	SIAN1	--	1	2	1	1

CA	KAIS1	X	X	YOSE1	--	--	2	1	1
	RAFA1	X	X	PINN1	2	2	2	1	1
	SEQU1		X	DOME1	1	1	2	2	1
	TRIN1		X	LAVO1	--	1	2	1	1
MT	GLAC1		X	FLAT1	1	1	2	2	1
UT	CAPI1	X	X	CANY1	2	2	2	1	1
WA	NOCA1	X		SNPA1	--	1	1	2	2

-- indicates an incomplete year with no substitutions made
1 indicates a complete RHR year
2 indicates a year is considered complete with some substituted values

Availability and Archival of Data Sets

A dedicated page on the VIEWS database will act as the repository of all site-specific substitute data sets: http://vista.cira.colostate.edu/views/web/documents/substitutedata.aspx. Table 3 presents a key to the substituted data files. All materials prepared in the data substitution work (descriptive narrative, tables of regression statistics, graphics, etc.) will be posted on this site for review by states, tribes, and other data users. This information will also be made accessible through the TSS.

Table 3
Key to Substituted Data Files

Column Header	Description
site	IMPROVE site code
year	
month	
day	
QUARTER	1 = Jan. – Mar., 2 = Apr.-Jun., 3 = Jul. – Sept., 4 = Oct. – Dec.
date	
Group	10 = One of the 20% best visibility days; 90 = One of the 20% worst visibility days
good_year	0 = incomplete year, 1 = complete RHR year, 2 = complete year with substitutions
ss_rayleigh	Site specific Rayleigh value (clean air extinction)
fsrh	f(RH) value for small sulfate, nitrate and organic mass
flrh	f(RH) value for large sulfate, nitrate and organic mass
fssrh	f(RH) value for sea salt mass
Sea_Salt	Sea salt mass (µg/m3)
Soil	Soil Mass (µg/m3)
Amm_NO3	Ammonium nitrate mass (µg/m3)
OMC	Organic mass by carbon (µg/m3)
LAC	Light absorbing carbon (aka EC/Elemental Carbon) (µg/m3)
CM	Coarse mass (µg/m3)
Amm_SO4	Ammonium sulfate mass (µg/m3)
Large_OMC	Large organic mass (µg/m3)
Small_OMC	Small organic mass (µg/m3)
Large_Amm_SO4	Large ammonium sulfate mass (µg/m3)
Small_Amm_SO4	Small ammonium sulfate mass (µg/m3)
Large_Amm_NO3	Large ammonium nitrate mass (µg/m3)
Small_Amm_NO3	Small ammonium nitrate mass (µg/m3)
EAmm_SO4	Extinction due to ammonium sulfate (Mm-1)
EAmm_NO3	Extinction due to ammonium nitrate (Mm-1)
EOMC	Extinction due to organic carbon mass (Mm-1)
ELAC	Extinction due to light absorbing carbon mass (Mm-1)
ESoil	Extinction due to soil mass (Mm-1)
ECM	Extinction due to coarse mass (Mm-1)
ESea_Salt	Extinction due to sea salt mass (Mm-1)
RBext	Reconstructed aerosol extinction (Mm-1)
TBext	Reconstructed total extinction (Mm-1)
OC_SUB1	OC substituted using OC vs. organic H correlations

EC_SUB1	EC substituted using EC vs. OC correlations
(NH4)2SO4_SUB2	Ammonium sulfate substituted using site donor correlations
(NH4)NO3_SUB2	Ammonium nitrate substituted using site donor correlations
OM_SUB2	Organic mass substituted using site donor correlations
EC_SUB2	Elemental carbon (aka light absorbing carbon) substituted using site donor correlations
Soil_SUB2	Soil substituted using site donor correlations
CM_SUB2	Coarse mass substituted using site donor correlations
SeaSalt_SUB2	Sea salt substituted using site donor correlations

2018 Planning Milestone Visibility Projection Values

2018 visibility projections at Class I areas are used to assess visibility improvements and assist in the Reasonable Progress determination for the December 2007 Regional Haze Rule (RHR) Implementation Plans prepared by states, EPA, and possibly tribes. The model projected 2018 visibility is compared against a 2018 Uniform Rate of Progress (URP) goal that is obtained through construction of a linear Glide Path from the observed 2000-2004 Baseline Period to Natural Conditions in 2064 using the Haze Index metric in deciviews.

Difficult to Meet 2018 URP Goal at Western U.S. Class I Areas

2018 visibility projections at western Class I areas fail to achieve the URP goal for several reasons:

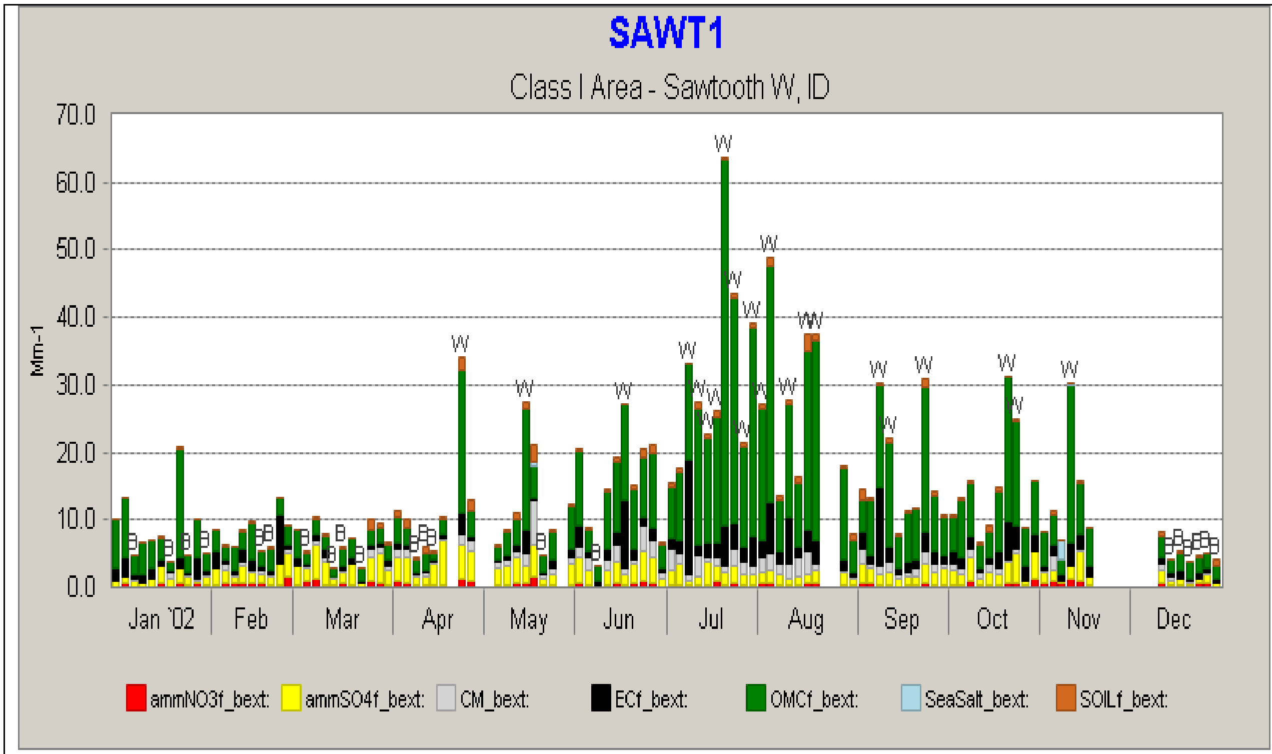
- High contributions from fires (EC and OC) at some Class I areas that are assumed to remain unchanged from 2002 to 2018.
- High contributions from dust (Soil and CM) at some Class I areas, especially in the Desert Southwest, much of which is natural and remains unchanged from 2002 to 2018 (e.g., wind blown dust).
- High contributions of International Transport (e.g., Canada, Mexico and Global) and Offshore Marine Vessels that are assumed unchanged.
- Relatively clean visibility conditions at many Class I areas where the contribution of United States anthropogenic sources is small.

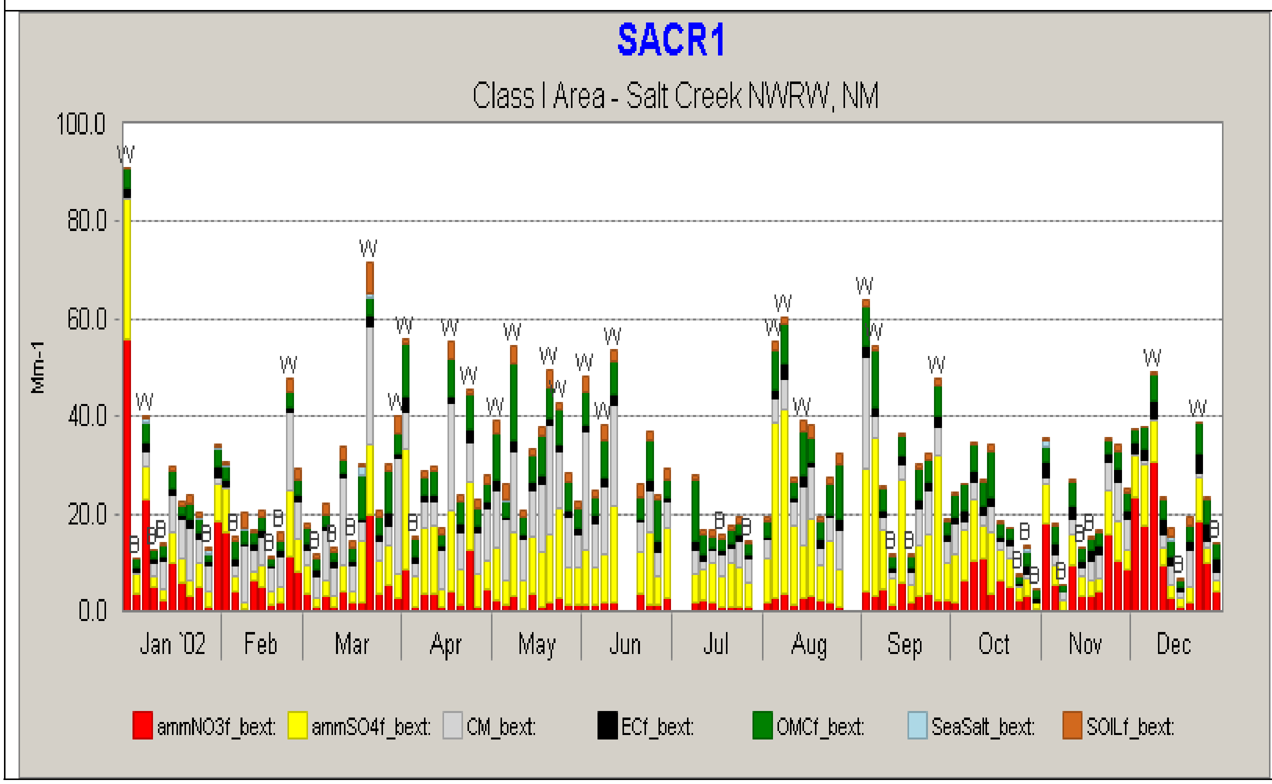
Most of these sources are uncontrollable, unpredictable and difficult to forecast. For example, Figure 10 displays the 2002 daily extinction at the Sawtooth, Idaho and Salt Creek, New Mexico Class I areas where the Worst 20% monitored visibility days are dominated by fires and dust, respectively. Because it is impossible to accurately forecast future-year emissions for these source categories, many of them were held constant from 2000-04 Baseline period to 2018 Base Case conditions:

- Biogenics;
- Natural Fires (wildfire, wildland fire use, and non-federal rangeland fire in the WRAP region);
- Wind blown dust (from WRAP model);
- Ammonia (from WRAP model);
- Mexico and Canada;
- Boundary Conditions (global transport from 2002 simulation of GEOS-CHEM global model); and
- Offshore Marine Vessels.

Thus, modeled visibility reductions would come from reductions in on-road and non-road mobile sources (NOx, EC, OC and SO2), controlled large stationary point sources (SO2 and NOx), potentially other sources in nonattainment areas (mainly NOx and VOC in California), and applying Emissions Reduction Techniques to anthropogenic prescribed and agricultural fire sources’ 2000-04 activity patterns in the WRAP region (mainly OC and EC). Other source categories are assumed to remain relatively unchanged, or even increase in some cases due to increased activity between 2002 and 2018 (e.g., road dust, oil and gas, etc.).

Figure 10. Daily observed extinction at the Sawtooth (top) and Salt Creek (bottom) Class I area IMPROVE monitors for 2002 showing Worst 20% days that are dominated by fires (EC and OC) and dust (Soil and CM), respectively.





EPA Guidance for Projecting Visibility

EPA released revised guidance for using models to project future-year visibility as part of the RP determination in September 2006 (EPA, 2006). The EPA default guidance method is to use "2002 worst monitored days" (Worst 20 %) to develop scaling factors to project future visibility conditions in 2018. The RHR requires monitoring data from the 2000-04 Baseline period to be used as the basis of the regional haze implementation plans. The modeling results for the 2002 Base Case and 2018 emissions scenarios using the 2002 meteorology are used to project PM concentrations for each of the Worst 20 % days from the 2000-2004 5-year Baseline to obtain estimates of PM concentrations for the Worst 20 % days in 2018 from which visibility is estimated using the revised IMPROVE equation. The ratio of the 2018 to 2002 modeling results that are used to scale the observed PM concentrations for the Worst 20 % days from the 2000-04 Baseline are called Relative Response Factors (RRFs). EPA's default guidance for projecting future-year visibility is in the same document and is closely linked to guidance for interpreting the modeling results for $PM_{2.5}$ and 8-hour ozone National Ambient Air Quality Standard (NAAQS) attainment demonstrations is found at: http://www.epa.gov/scram001/guidance/guide/draft_pm.pdf. The purpose of applying the EPA guidance to develop the RRFs for future visibility conditions is based on the assumption that the air quality model is better at predicting relative changes in concentration than absolute concentrations.

Basic steps for applying the EPA RRF guidance to project visibility conditions in 2018 at each CIA (i.e., IMPROVE monitoring site associated with a CIA) are:

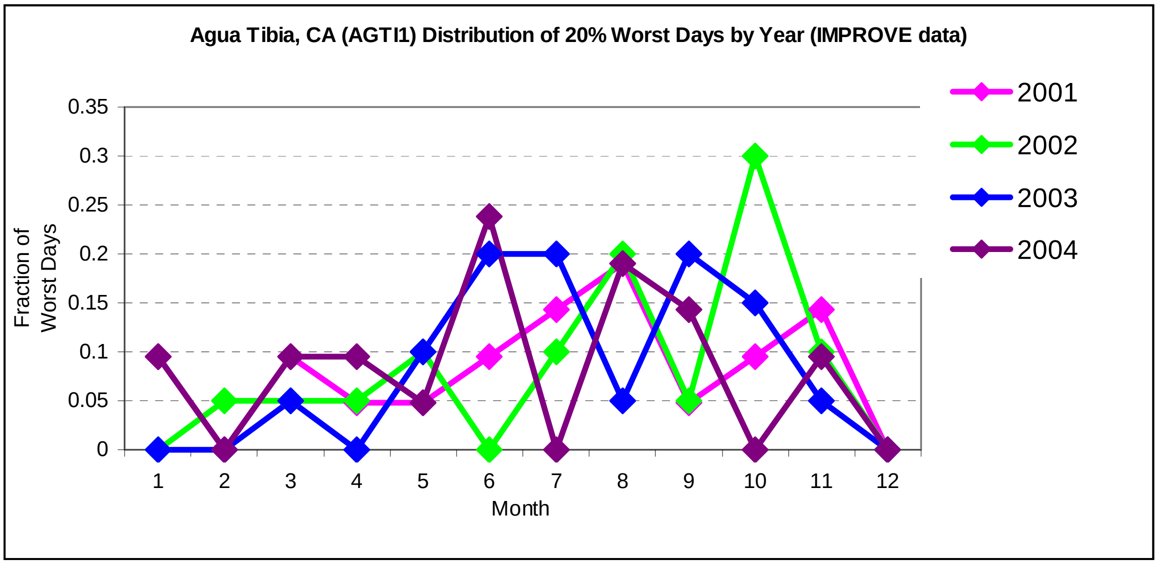
- Model species concentrations for a 2000-04 Baseline case;
- Model species concentrations for a 2018 emissions scenario;
- Determine a species-specific and CIA-specific RRF for the average of the Worst 20 % monitored days (selected from 2002 IMPROVE data), where, for example:
  - RRF sulfate = 2018 sulfate/2002 sulfate
- Using the RRFs based on the 2002/2018 modeling results for Worst 20 % days from 2002, apply the RRFs to the observed PM concentrations from the Worst 20 % days in the 2000-04 5-year Baseline to obtain the 2018 projected PM concentrations:
  - [2018 concentrations] = RRF x [2000-04 Baseline Worst 20 % days concentrations]
- Calculate projected 2018 visibility values for Worst 20 % days from the 5 years and for each Class I area using deciviews and compare the 2018 projected deciviews with the 2018 URP goal to assess how closely the URP goal is achieved.

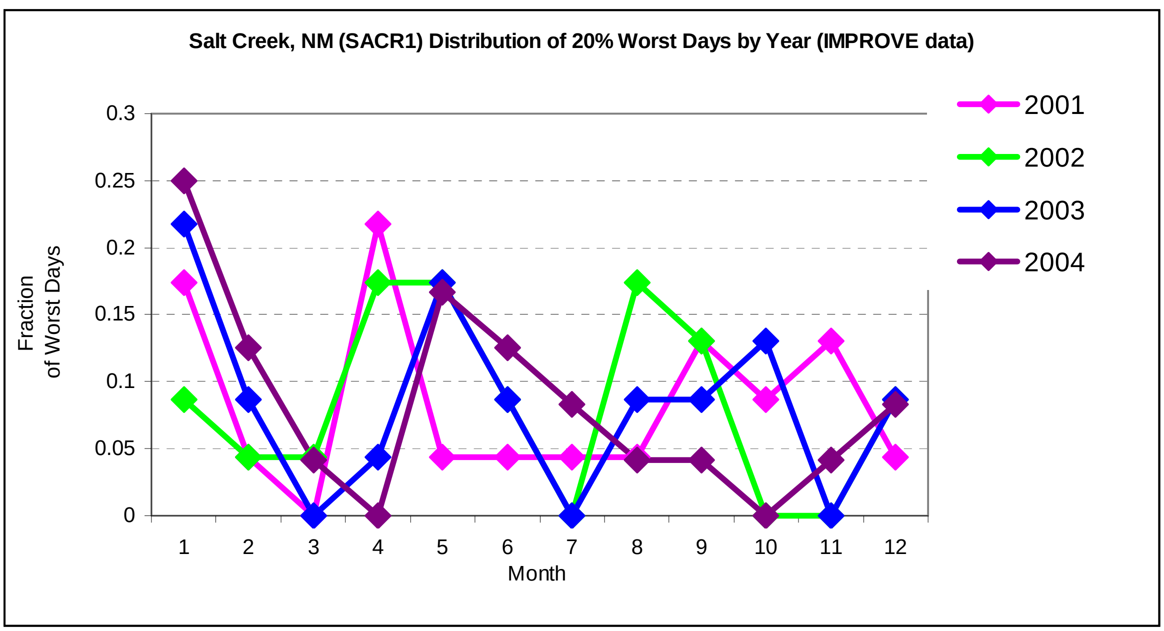
The 20% best visibility days are projected in the same manner, selecting the 20% best monitored days from 2002 IMPROVE data. Several issues with this approach are evident when analyzing the regional haze monitoring data and modeling results.

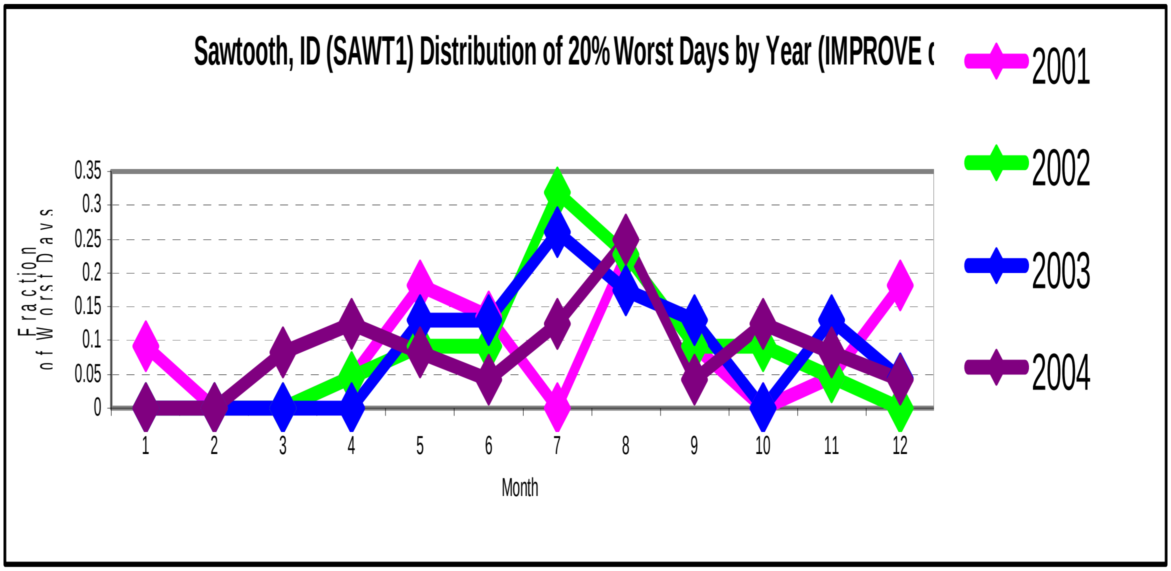
Representativeness of 2002 Worst 20 % Days for W20% Days for Other Years in the 2000-04 Baseline: The RRFs based on 2002 Worst 20% days may not be representative of Worst 20% days from other years in the 2000-04 Baseline period. For example, they may occur at different times of the year and represent different conditions and/or chemical constituents. For example, Figures 11 through 15 display the distribution of Worst 20 % days for the 2000-2004 Baseline at 5 CIAs. At Agua Tibia (Figure 11, top) we see that 30% of the Worst 20 % days in 2002 occur in October, but none did in 2004 and 10-15% did in 2001 and 2003. On the other hand, in June there are no Worst 20 % days in 2002 at Agua Tibia, yet there are 10% (2001) and 20% (2003 and 2004) of the Worst 20 % days in other years of the Baseline period. Similar seasonal variations in the Worst 20 % days for 2002 versus the other years in the Baseline are seen at Salt Creek, Badlands, Sawtooth, and Mount Rainier CIAs. Accounting for the differences of monthly and seasonal variations in the Worst 20 % days between 2002 and all 5 years in the Baseline period may be important in projecting 2018 visibility conditions.

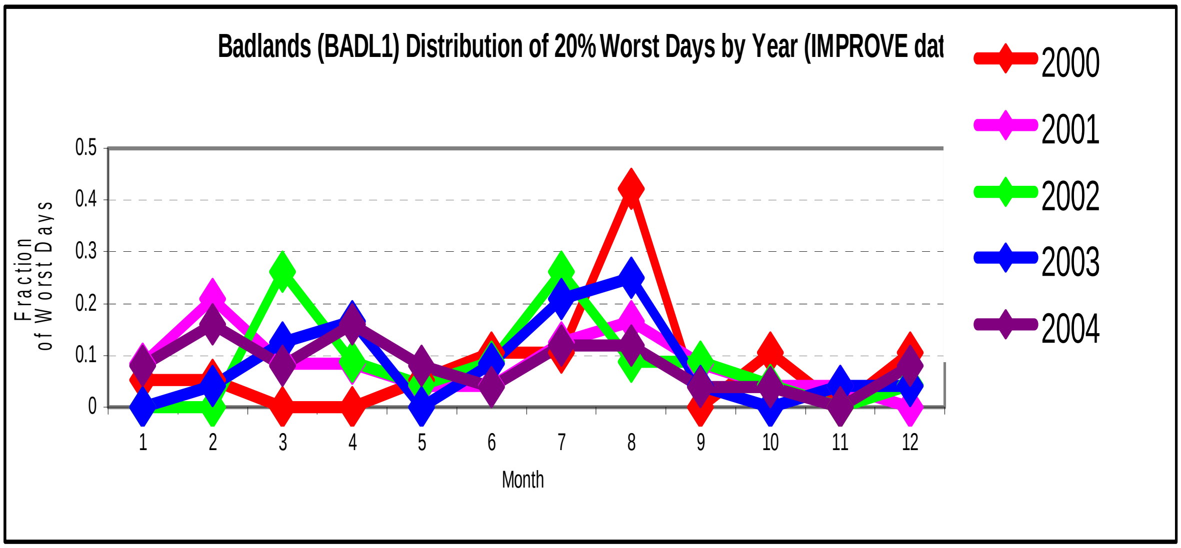
Episodic Events: Another issue associated with the representativeness of the RRFs derived from the 2002 Worst 20 % days is the occurrence of episodic events that may dominate the Worst 20 %. For example, if fires dominate the Worst 20 % days in 2002 and they are kept constant in 2018 the resultant RRFs will be very stiff and project little change in future-year PM concentrations for all W20% days in the Baseline even though fires may not have dominated the Worst 20 % days in other years of the Baseline. Conversely, if fires occur in other years of the Baseline and not in 2002, then the RRFs will reflect changes in anthropogenic emissions that are applied to PM concentrations due to fires which is also not appropriate. Again, accounting for monthly or seasonal variations in the RRFs may help alleviate this issue since prescribed burns, agricultural burning and wild fires each generally occur during the same time periods of the year.

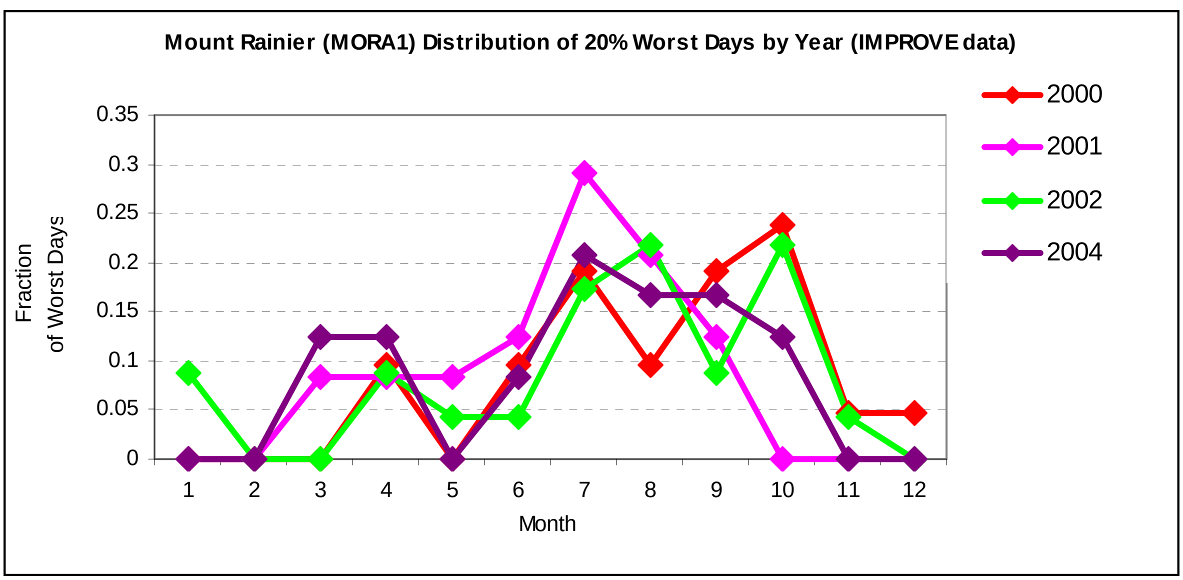
Figures 11, 12, 13, 14, 15. Time Series of Monthly Variation in the Fraction Variation of the 20% Worst Monitored Days at randomly-selected WRAP region Class I areas.






Sawtooth, ID (SAWT1) Distribution of 20% Worst Days by Year (IMPROVE d
Fraction of Worst Days
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1 2 3 4 5 6 7 8 9 10 11 12
Month
2001
2002
2003
2004


Badlands (BADL1) Distribution of 20% Worst Days by Year (IMPROVE dat
Fraction of Worst Days
0.5
0.4
0.3
0.2
0.1
0
1 2 3 4 5 6 7 8 9 10 11 12
Month
2000
2001
2002
2003
2004

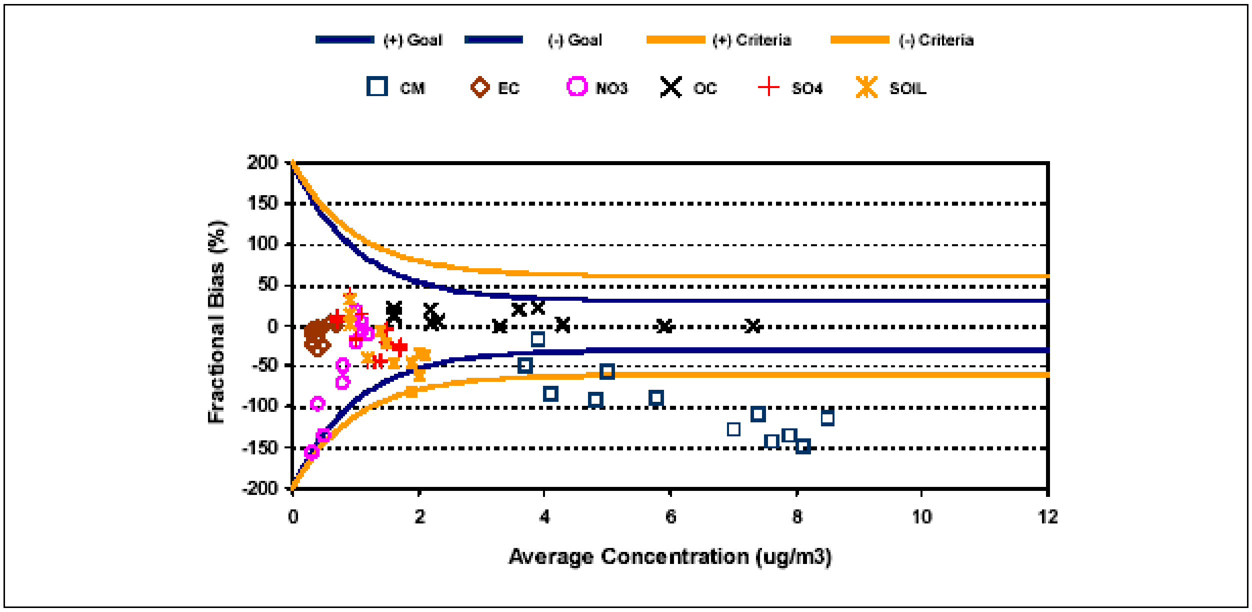

Mount Rainier (MORA1) Distribution of 20% Worst Days by Year (IMPROVE data)
Fraction of Worst Days
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1 2 3 4 5 6 7 8 9 10 11 12
Month
2000
2001
2002
2004

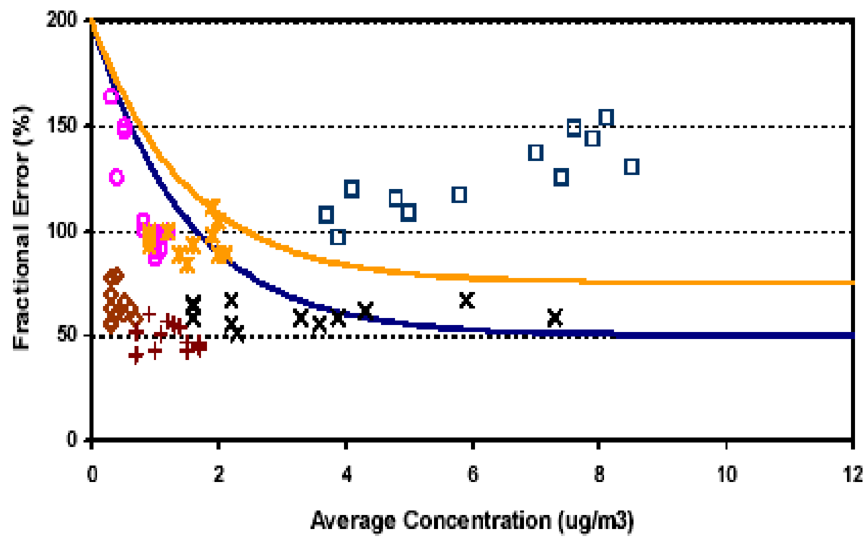
Missing IMPROVE Data: To date, 2018 visibility projections have not been made at 14 western Class I areas due to insufficient valid IMPROVE observations to satisfy the RHR data completeness criteria. Five sites did not have enough data to have at least 3 complete years from the 2000-2004 Baseline period, which is the minimal requirement in EPA guidance. 14 sites did not have sufficient data from 2002 to define the WORST 20 % days from which the RRFs are based (of these 14 sites with insufficient data in 2002, 4 were also included as the 5 sites without 3-years of complete data). This issue is being addressed using data substitution as described earlier in this document, and visibility projections will then be made using the substituted data in the projection algorithm.

Model Performance Issues: Air quality modeling in support of regional haze implementation planning is conducted by the WRAP Regional Modeling Center (RMC), see: http://pah.cert.ucr.edu/aqm/308/. The RMC uses state of the art, regional gridded photochemical models for aerosol modeling called CMAQ and CAMx. Extensive and numerous air quality modeling studies have been performed by the RMC over the past 6 years to support regional haze planning in the WRAP region.

The RMC has evaluated the CMAQ Actual Base02b model performance against available data (see: http://pah.cert.ucr.edu/aqm/308/cmaq.shtml#base02bvsbase02a36k). One of the conclusions of the RMC 2005 final report on the 2002 base case model performance of the CMAQ and CAMx models that they were performing sufficient well for most species to produce meaningful RRFs, with the exceptions of Coarse Matter (CM). Figure 16 displays "Bugle Plots" of PM species model performance in terms of fractional bias and error across IMPROVE sites in the western U.S. and compares them with model performance goals and criteria that are a function of average concentrations that allow for larger bias and error performance measures as the concentrations of the PM species approach zero under the assumption that model performance is not as important as the PM contribution becomes an insignificant component of the PM mass and extinction. As shown in Figure 16, the model performance goals and criteria are met for all PM species except CM, which is greatly underestimated by the model. This is believed to be in part for the inability of the regional model, using a 36 km grid, to capture the contributions of local CM sources on the monitored concentrations. To account for this CM model performance issue, the model derived RRFs for CM is not used and instead the CM RRFs are set to 1.0, which assumes that the CM measurements that occur in the 2000-2004 Baseline period will also occur in 2018.

Figure 16. CMAQ PM species model performance "Bugle Plots" across IMPROVE sites in the WRAP region and comparison with model performance goals and criteria.





Fire and dust air quality modeling results, and their projection using RRFs was considered at a WRAP workshop in May 2006, see: http://www.wrapair.org/forums/ioc/meetings/060523m/. Aerosol sampling at IMPROVE sites is 24 hours in duration, midnight to midnight, conducted every-3rd-day, and the hourly modeling results are summed and matched in time. The RMC models provide hourly estimates of visibility and aerosol species concentrations. The modeled gaseous and aerosol species are "mapped" to the IMPROVE and other networks' observational species, to calculate mass and aerosol light extinction in comparable terms. More information on RMC species mapping is shown in Tables 6 and 7 below.

Table 6. Mapping of Gaseous RMC Model Species to Gaseous Observational Species

Table 4-3a. Mapping of gaseous model species to gaseous observation species.

Compound	Observation Species			Model Species	
	IMPROVE	CASTNet	AQS	CMAQ	CAMx
Gaseous Species					
O_3			O3	O3	O3
CO			CO	CO	CO
NO			NO	NO	NO
SO_2			SO2	SO2	SO2
SO_2 ($\mu g/m^3$)		TOTAL_SO2		2617.6*SO2	2617.6*SO2
HNO_3				HNO3	HNO3
HNO_3 ($\mu g/m^3$)		NHNO3 (nylon filter)		2576.7*HNO3	2576.7*HNO3
NO_y				NO + NO2 + HONO + NO3 + 2*N2O5 + HNO3 + PAN + XNO2 + TPAN + HNO4	NO + NO2 + HONO + NXOY + HNO3 + PAN + NTR

Table 7. Mapping of Particulate RMC Model Species to Particulate Observational Species

Table 4-3b. Mapping of particulate model species to particulate observation species.

Compound	Observation Species				Model Species	
	IMPROVE	CASTNet	STN	NADP/ NTN	CMAQ	CAMx
Particulate Species						
SO_4	3*S	TSO4 (Teflon filter)	SO4	wSO4	ASO4J + ASO4I	PSO4
NO_3	NO3	TNO3 (Teflon filter)	NO3	wNO3	ANO3J + ANO3I	PNO3
Particulate NO_3+SO_4		0.29*TNO_3 + 0.375*TSO_4			0.29*(ANO3I + ANO3J) + 0.375*(ASO4I + ASO4J)	0.29*PNO3 + 0.375*PSO4
Total NO_3 (gas+particle)		TOTAL_NO_3			ANO3I + ANO3J + 0.9841*2576.7*HNO3	PNO3 + 0.9841*2576.7*HNO3
NH_4	0.375*SO4 + 0.29*NO3	TNH4 (Teflon filter)	NH4	wNH4	ANH4J + ANH4I	PNH4
OC	1.4*(OC1+ OC2 + OC3 + OC4 + OP)		OC		AORGAJ + AORGAI + AORGPAJ + AORGPAI + AORGBJ + AORGBI	POA + SOA1 + SOA2 + SOA3 + SOA4
EC	EC1 + EC2 + EC3 - OP		EC		AECJ + AECI	PEC
TCM			OC+EC			
SOIL	2.2*Al + 2.49*Si + 1.63*Ca + 2.42*Fe + 1.94*Ti				A25I +A25J	FCRS + FPRM
CM	MT - FM				ACORS + ASEAS + ASOIL	CCRS + CPRM
$PM_{2.5}$	FM		PM25		ASO4J + ASO4I + ANO3J + ANO3I + ANH4J + ANH4I+ AORGAJ + AORGAI + AORGPAJ + AORGPAI + AORGBJ + AORGBI + AECJ + AECI + A25J + A25I	PSO4 + PNO3 + PNH4 + POA + SOA1 + SOA2 + SOA3 + SOA4 + PEC + FCRS + FPRM
RCFM	1.375*SO4 + 1.29*NO3 + EC + OC + SOIL				1.375*(ASO4J + ASO4I) + 1.29*(ANO3J + ANO3I) + AORGAJ + AORGAI + AORGPAJ + AORGPAI + AORGBJ + AORGBI + AECJ + AECI + A25J + A25I	1.375*PSO4 + 1.29*PNO3 + POA + SOA1 + SOA2 + SOA3 + SOA4 + PEC + FCRS + FPRM
PM_{10}	MT				PM25 + CM	PM25 + CM

2018 URP Goal - One Element of Reasonable Progress

Section 169A of the Clean Air Act states that "Congress declares as a national goal the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory class I Federal areas which impairment results from manmade pollution." States are required to "make reasonable progress toward meeting the national goal" in each of the 10-year planning periods identified in the RHR. In determining whether a given regional haze implementation plan provides for reasonable progress, the following four factors shall be considered when evaluating controls on an existing facility:

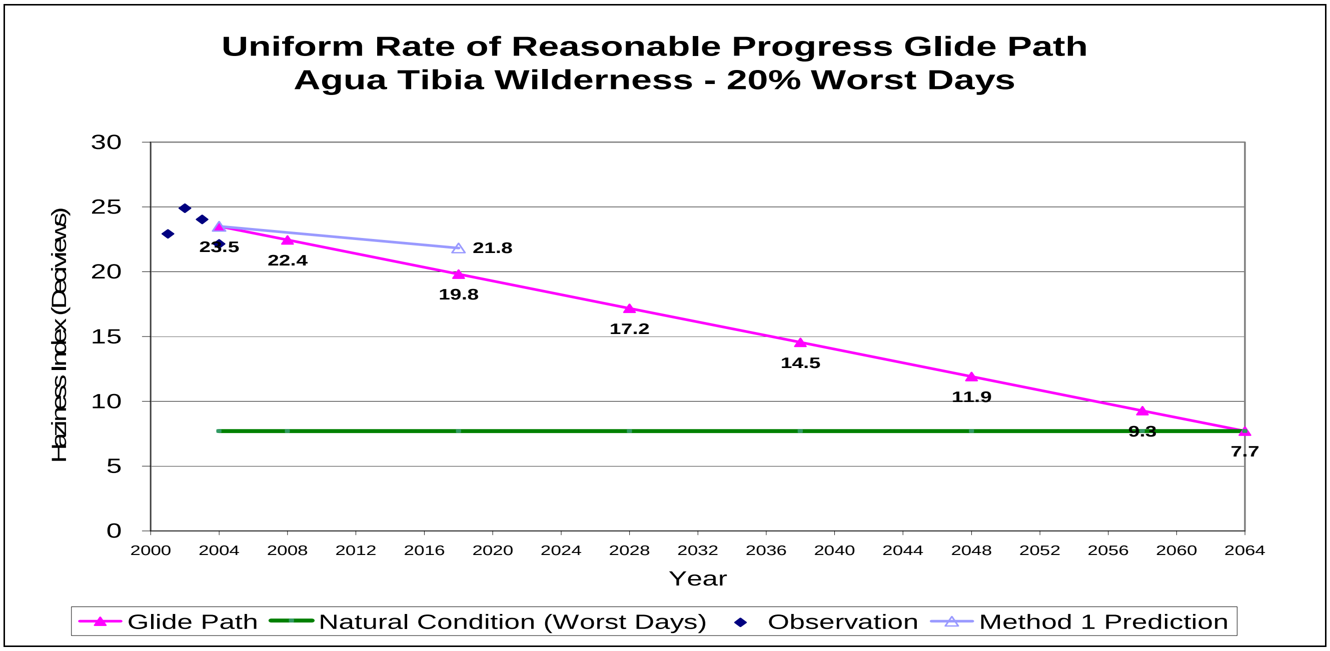
1. costs of compliance;
2. time necessary for compliance;
3. energy and non-air quality environmental impacts of compliance; and
4. remaining useful life of any existing source subject to such requirements.

In addition, EPA's 1999 visibility rule EPA required consideration of a fifth factor of whether visibility projections at a CIA achieves a uniform rate of progress (URP) toward natural conditions in 2064. Thus, the modeled achievement of the 2018 URP goal is just one element of Reasonable Progress and meeting it or not meeting it does not preclude the requirement for performing the four factor analysis to determine whether reasonable emissions controls are available for reducing visibility impairment at CIAs.

<u>EPA Default 2018 URP Goal Calculations</u>

Using the EPA default approach for RRFs (average modeling results across observed Worst 20 % days in 2002), no WRAP Class I area is projected to achieve the 2018 URP goal. Figure 17 shows examples of a linear Glide Path from the 2000-2004 Baseline to Natural Conditions in 2064 that defines the 2018 URP goal and the model projected visibility in 2018 for the Agua Tibia and Sawtooth CIAs. In both cases, the model projected 2018 visibility is substantially above 2018 URP goal derived from the Glide Path. For Agua Tibia, a 3.7 dv reduction (23.5-19.8) is needed from the 2000-2004 Baseline in order to achieve the 2018 URP goal yet only a 1.7 dv reduction (23.5-21.8) is modeled, thus Agua Tibia is projected to only achieve 46% of the 2018 URP goal. Similarly, for Sawtooth a 1.7 dv reduction from the Baseline is needed to achieve the 2018 URP goal and only a 0.5 dv reduction is projected in 2018, thus the Sawtooth CIA only achieves 29% of the 2018 URP goal. Expressing the 2018 projected visibility as a percent of achieving the 2018 URP goal is a useful metric for analyzing visibility projections across many CIAs or for different methods and is used in "DotPlot" displays in Figure 21 below.

<u>Figure 17. Haze Index linear Glide Path toward Natural Conditions in 2064 to define 2018 URP goal and model projected 2018 base case visibility using EPA default average Worst 20 % RRF approach for the Agua Tibia, CA (top) and Sawtooth, ID (bottom) CIAs.</u>



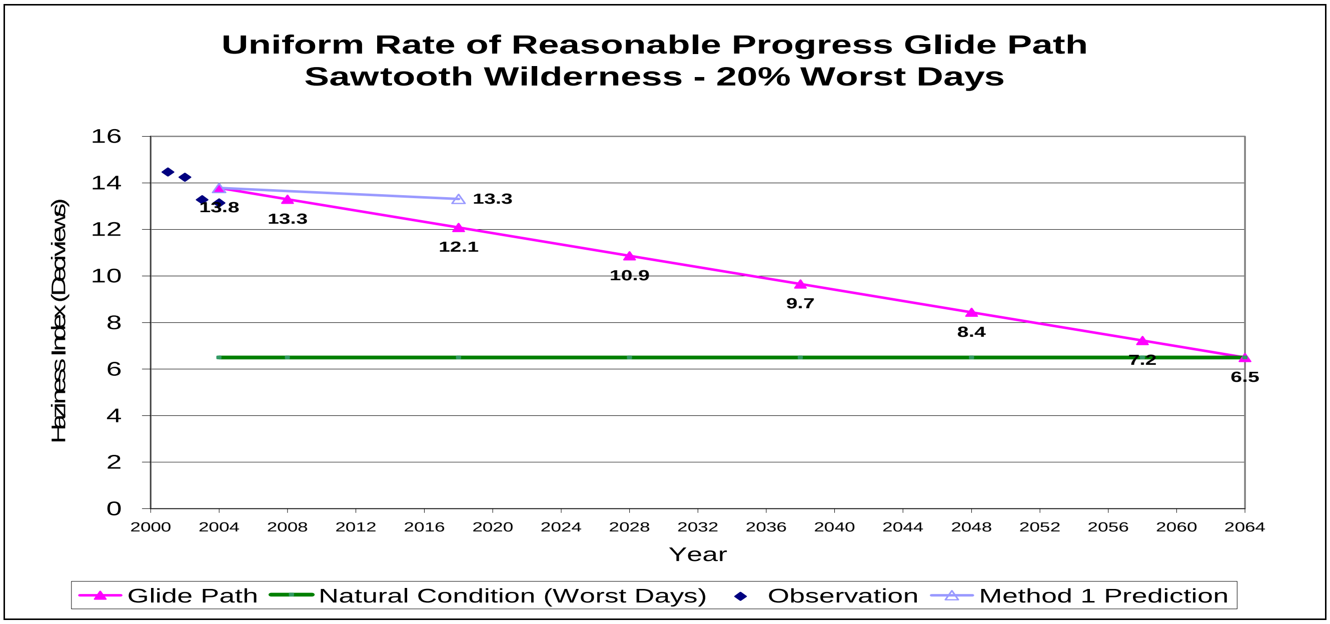
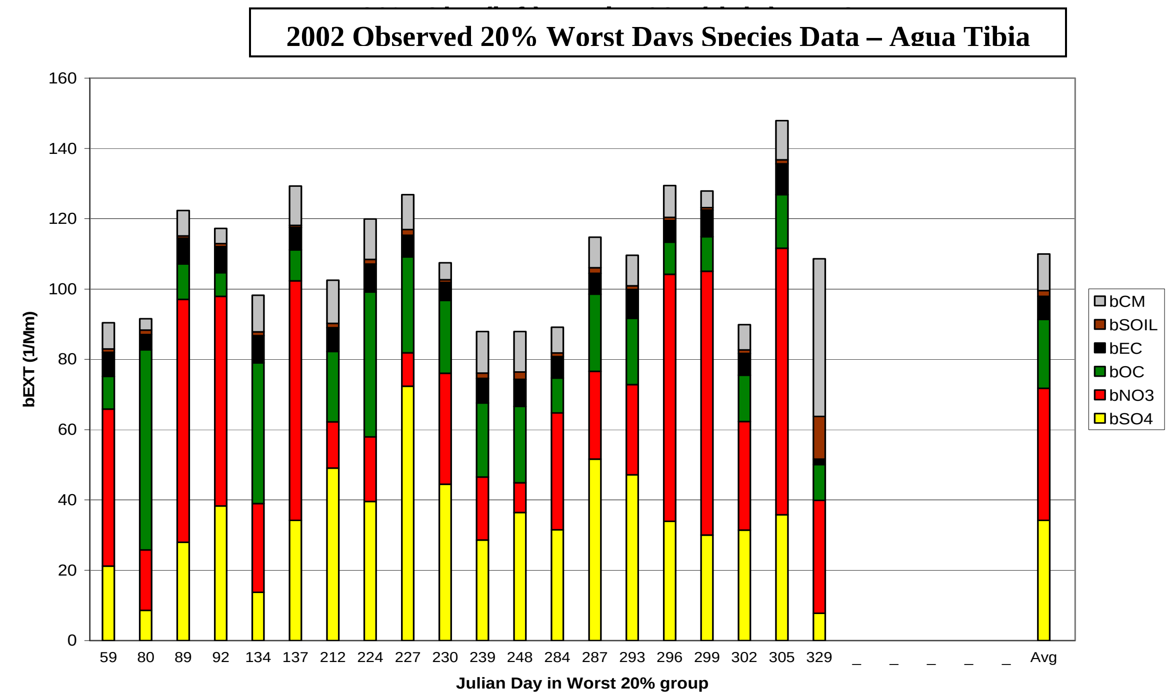


Figure 18 and 19 display the observed extinction and the model estimated reduction in extinction for the 2002 Worst 20 % days and their average for the Agua Tibia and Sawtooth CIAs, with the percent values for the average of the Worst 20 % days provided in Table 8. Most of the 2018 visibility benefits at Agua Tibia are due to reductions in NO3, there are also relatively large reductions in EC (-34%) but it is a smaller component of the extinction budget (6%). SO4 is a larger component of the extinction budget (31%) but exhibits little reduction (-4%). Figure 20 displays the CAMx PM Source Apportionment Technology (PSAT) results for Agua Tibia that shows most of the SO4 is due to off-shore marine vessels and boundary conditions (international transport) that are assumed to remain unchanged from 2002 to 2018. The largest estimated contributor to NO3 extinction at Agua Tibia for the Worst 20 % days in 2002 is California mobile sources that have large emission reductions. Since California does not have jurisdiction over controlling off-shore marine vessels or international transport it is not reasonable to expect them to achieve the 2018 URP goal with such a large component of the extinction budget remaining unchanged. At Sawtooth, OCM mainly from fires dominates the extinction budget for the average of the Worst 20 % days (70%), but there is very little reduction in OCM between 2002 and 2018 (-5%). Thus not meeting the 2018 URP goal is not unexpected given the large contribution of an uncontrollable source that has remained unchanged.

Figure 18. Observed extinction for the Worst 20 % days in 2002 and average for the Agua Tibia (top) and Sawtooth (bottom) CIAs (observed values from the entire 2000-2004 Baseline will be included on the TSS website)



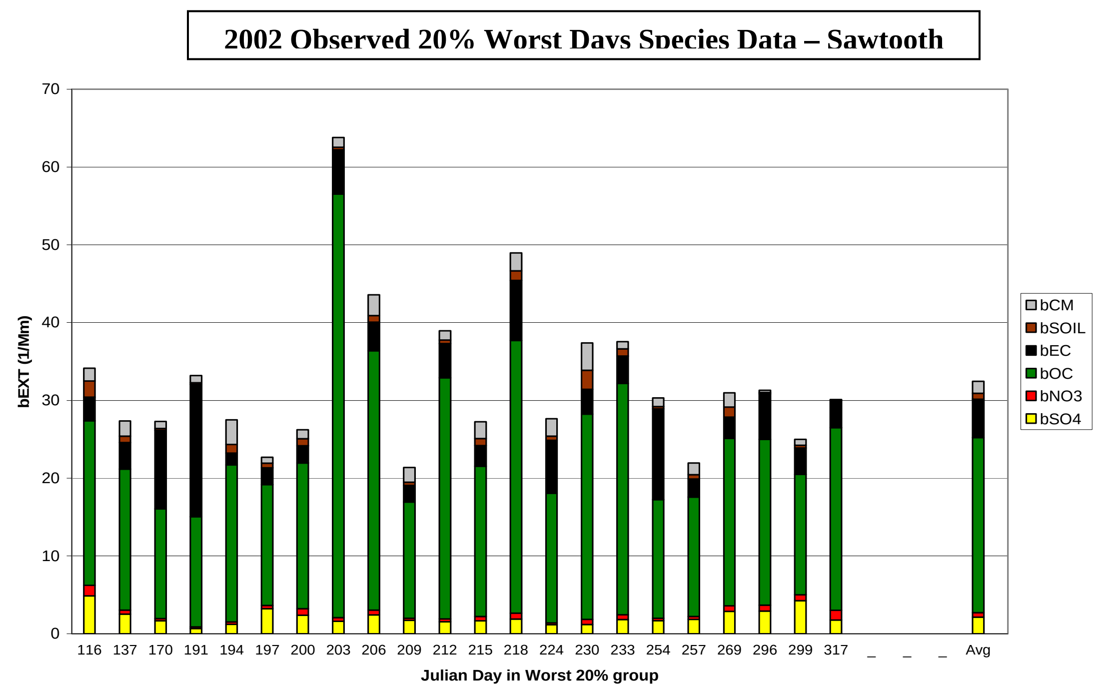


Figure 19. Modeled reduction in extinction (Plan02c to Base18b scenarios) for the 2002 Worst 20 % days and their average estimated by CMAQ between 2002 and 2018 for the Agua Tibia (top) and Sawtooth (bottom) CIAs.

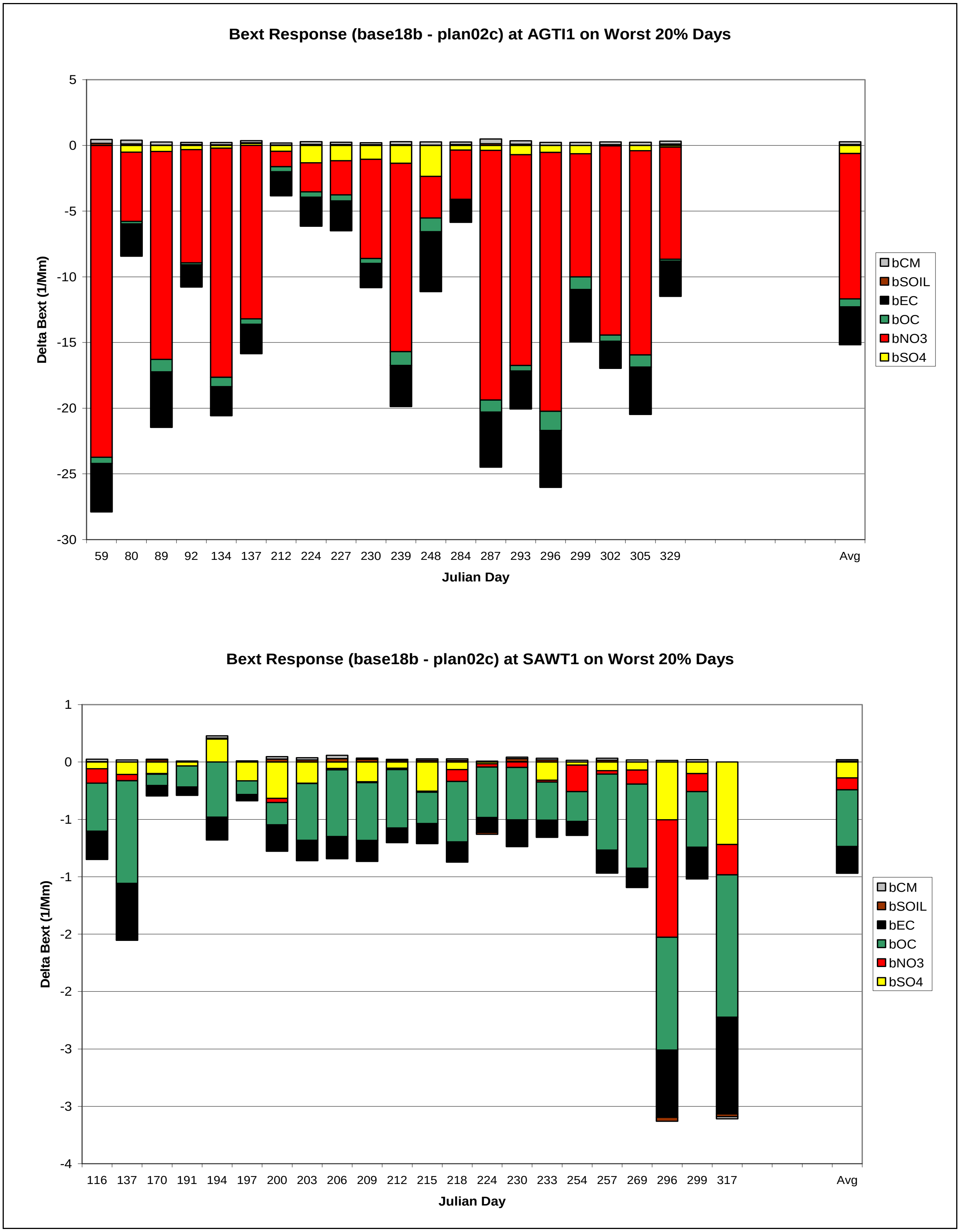
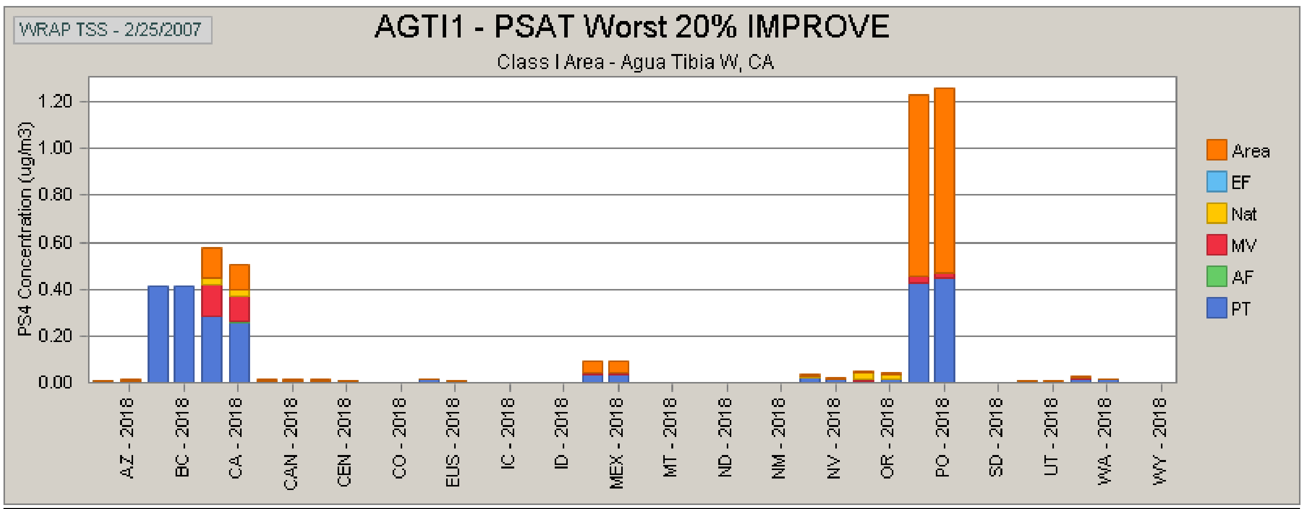
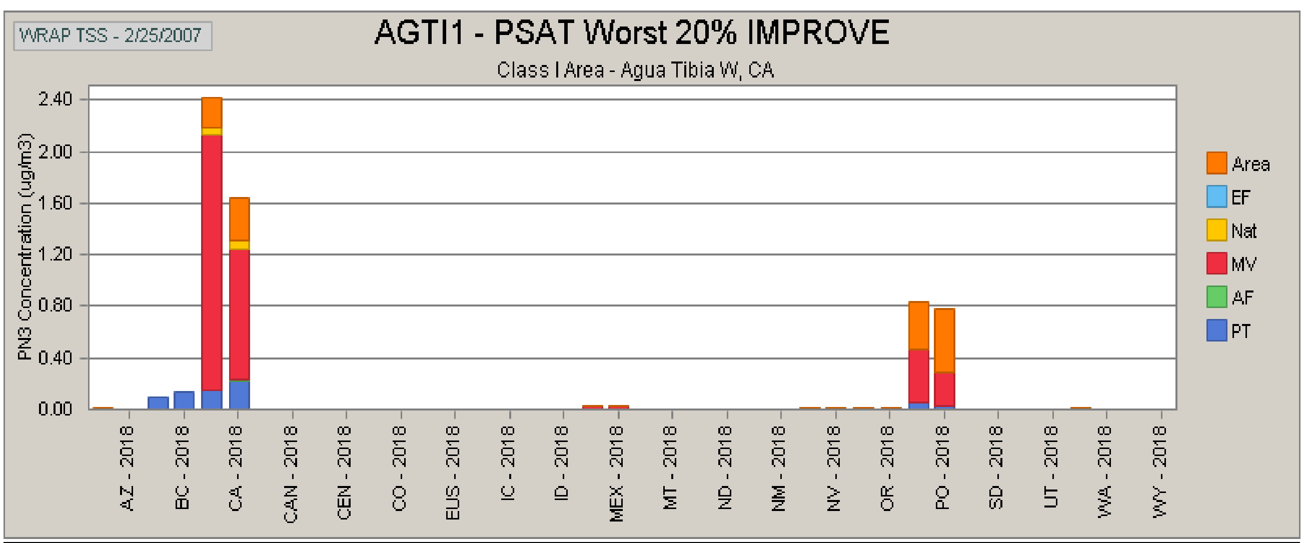


Table 8. Percent contribution to the observed average extinction for the Worst 20 % days in 2002 and model estimated percent reduction in the average extinction for the 2002 Worst 20 % days between 2002 and 2018.

	Agua Tibia CIA		Sawtooth CIA	
Light Extinction Species	**Average 20 % Worst Visibility Days (Measured % Contribution)**	**2002 to 2018 (Modeled 20 % Worst Days' Reduction)**	**Average 20 % Worst Visibility Days (Measured % Contribution)**	**2002 to 2018 (Modeled 20 % Worst Days' Reduction)**
bSO4	31%	-4%	6%	-6%
bNO3	34%	-38%	0%	-14%
BOCM	18%	-7%	70%	-5%
BEC	6%	-34%	15%	-10%
BSOIL	2%	+8%	2%	0%
BCM	9%	+15%	5%	0%

Figure 20. CAMx PM Source Apportionment Technology (PSAT) results for average Worst 20 % days measured in 2002 and the same days in 2018 at Agua Tibia for SO4 (top) and NO3 (bottom).





Alternative Model Projection Techniques

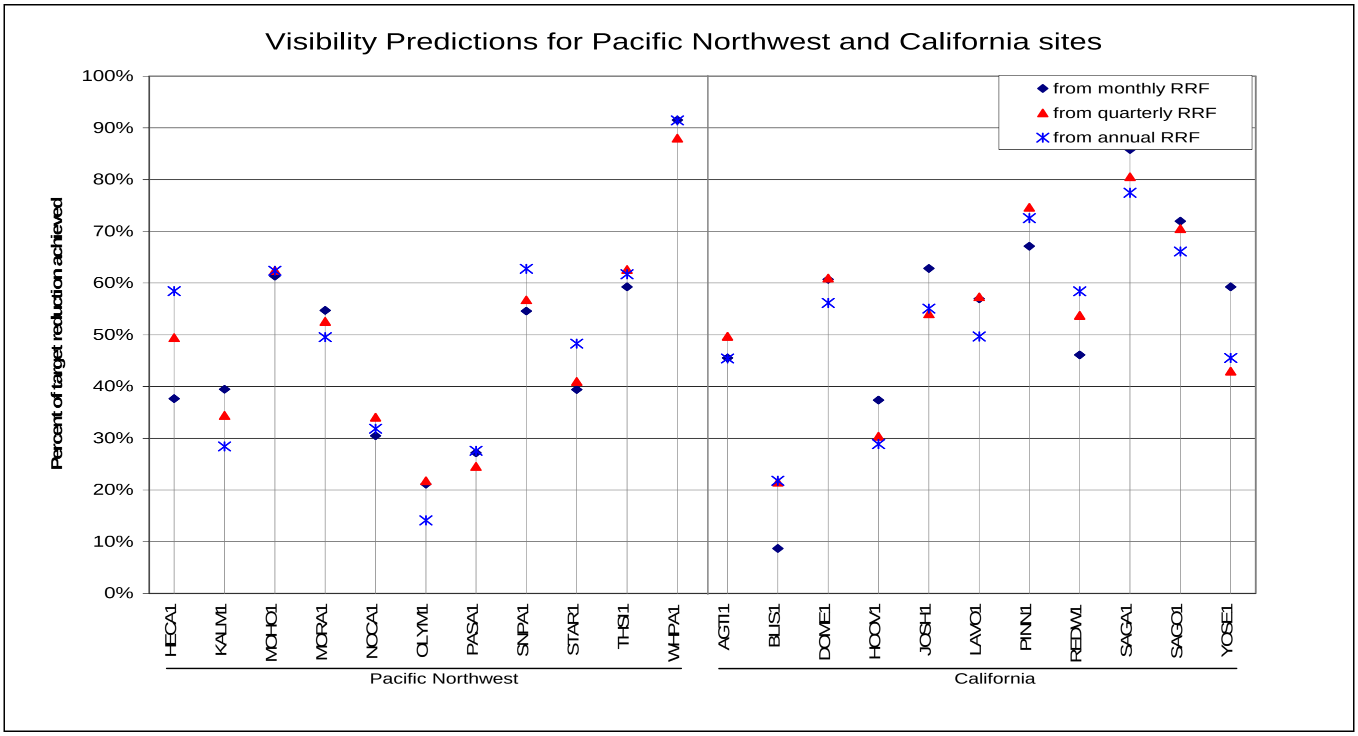
To address concerns that the EPA default modeled derived RRFs based on the average estimates from the site-specific Worst 20 % days for only 2002 (annual average Worst 20 %) may not represent the Worst 20 % days in other years of the 2000-2004 5-year Baseline period and may not represent seasonal variations, two alternative visibility projection techniques were analyzed:

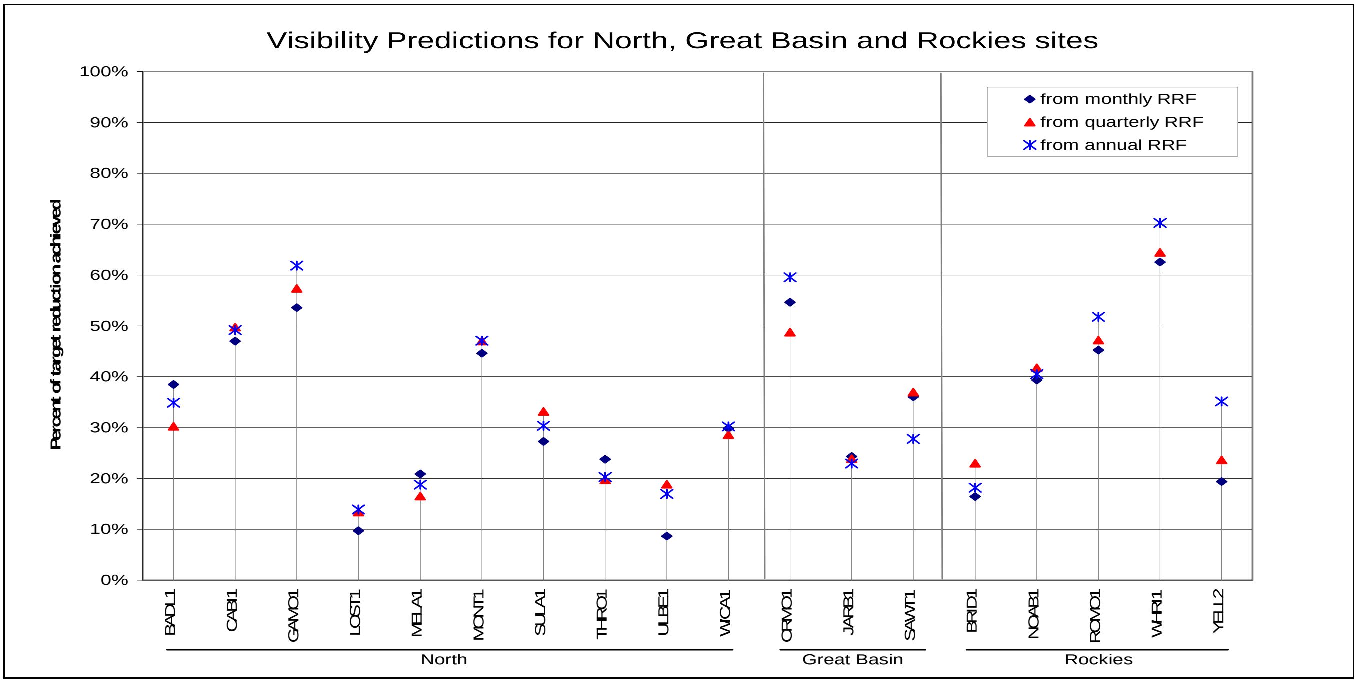
Quarterly Worst 20 %: RRFs are derived using the observed worst 20% visibility days from each quarter of 2002 and these quarterly RRFs are then applied to PM concentrations in the Worst 20 % days in the same quarter and the 2000-2004 Baseline.

Monthly Worst 20 %: Use RRFs based on the worst 20% days from each month in 2002 that are applied to the 2000-2004 Baseline Worst 20 % days in the same month.

The 2018 visibility projections at several WRAP CIAs using the three projection approaches (EPA default annual RRFs, quarterly RRFs and monthly RRFs) are shown in "DotPlots" in Figure 21. DotPlots display the 2018 visibility projections at a CIA as a percentage of achieving the 2018 URP goal with a value of 100% exactly achieving the URP goal and values below 100% not achieving the URP goal (above the Glide Slope). For example, using the EPA default annual RRFs for the Agua Tibia (AGTI) and Sawtooth (SAWT) CIAs, the DotPlots display values of 46% and 29%, respectively. Although there are some differences in the 2018 visibility projections using the alternative methods, the differences are generally small and do not change the fundamental conclusion that the 2018 URP goal is not achieved at western CIAs because of the large contribution to visibility impairment of unchanged emissions and transport from 2002 to 2018, many of which are uncontrollable.

Figure 21. "DotPlots" displaying percent of achieving 2018 URP goal reduction at Class I areas in the Pacific Northwest/California (top) and Northern/Great Basin/Rockies (bottom) CIAs projected using the EPA default annual average Worst 20 % days and alternative monthly and quarterly worst 20% days RRFs.





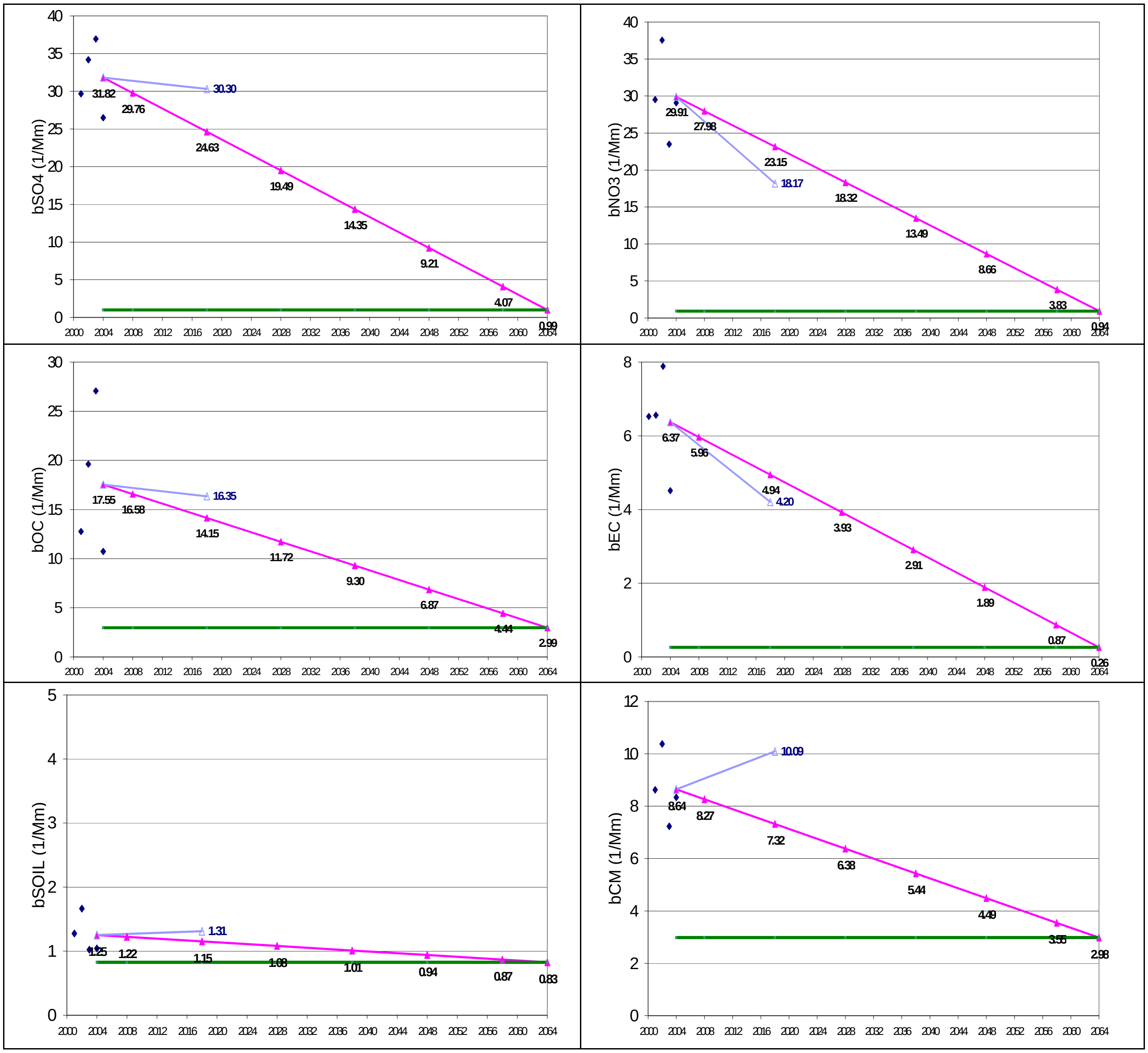
Alternative Model Reasonable Progress Metrics

There is a large contribution to visibility impairment for the Worst 20 % days at CIAs in the WRAP region due to emissions that are assumed to remain unchanged between 2002 and 2018. This has resulted in WRAP looking at alternative modeling metrics to the RHR Worst 20 % days Haze Index to evaluate reasonable progress. A RHR plan needs to demonstrate reasonable reductions of controllable emissions, at a reasonable rate toward the “zero controllable United States anthropogenic emission contribution to visibility impairment at CIAs in 2064” national visibility goal. The WRAP is suggesting that these alternative modeling metrics would be important information to include in a reasonable progress determination. Thus, as an alternative modeled URP test, species-specific visibility extinction Glide Paths toward Natural Conditions in 2064 have been developed, to compare the model projected 2018 species-specific extinction in 2018 with the species-specific 2018 URP goal.

Figure 22 displays example species-specific Glide Paths and model projected 2018 extinction due to the individual PM components for the Agua Tibia CIA discussed previously. In Figure 22 the Glide Paths are presented as linear extinction from the 2000-2004 Baseline to 2064 Natural Conditions; in reality these Glide Paths should be slightly curved reflecting the Haze Index logarithm of extinction using the total extinction that is the RHR metric. Such curvature will be included to these species-specific Glide Paths when implemented on the WRAP Technical Support System (TSS) website. SO4 extinction shows little reduction in 2018 reflecting the dominance of this component at Agua Tibia to sources that have been assumed to remain unchanged between 2002 and 2018 (off shore marine vessels and international transport, see above).

Visibility impairment due to NO3, on the other hand, shows large reductions that are below the linear extinction Glide Path owing to the large contribution of this component of light extinction due to controllable U.S. sources (California mobile sources, see above). Like NO3, the 2018 projected extinction due to EC is below the Glide Path reflecting large contributions from controllable U.S. sources (presumably California mobile sources), whereas extinction due to OC is above the Glide Path presumably due to contributions from unchanged sources (e.g., secondary organic aerosol from biogenics, international transport, etc.). The visibility extinction due to Soil and CM are projected to increase from 2000-2004 to 2018 due to growth and little or no controls in primary PM anthropogenic emissions and unchanged natural PM emissions (wind blown dust).

Figure 22. Example PM extinction (Mm-1) species-specific Glide Paths for SO4 (top left), NO3 (top right), OC (middle left), EC (middle right), Soil (bottom left) and CM (bottom left) at the Agua Tibia CIA (note: Glide Paths should be curved according to Haze Index logarithms of total extinction that will be done when implemented on the TSS website).



Modeling Metric Conclusions

WRAP recommends the use of both the EPA default and the WRAP-developed alternative projection techniques for assessing reasonable progress toward the national visibility goal at each Class I area. Analysis and assessment of the results from all 3 overall visibility projection techniques will assist haze planners in bounding and understanding reasonable progress analysis results. Specifically, the recommendations for projecting the overall visibility metric projections are as follows:

- Use the EPA default visibility projection method as the starting point - the default approach of annual average Worst 20 % visibility days' RRFs will enable all haze plans to assess progress in the same manner; AND
- Employ as desired the alternative projection techniques developed by WRAP in the Class I area-specific reasonable progress demonstration - the quarterly and monthly average Worst 20 % visibility days' RRFs.

The tools containing the necessary input data and results displays for these 3 methods are found at: http://vista.cira.colostate.edu/TSS/Tools/ModelingResults.aspx, select the "Model Projections (Scaled by RRFs)" tab.

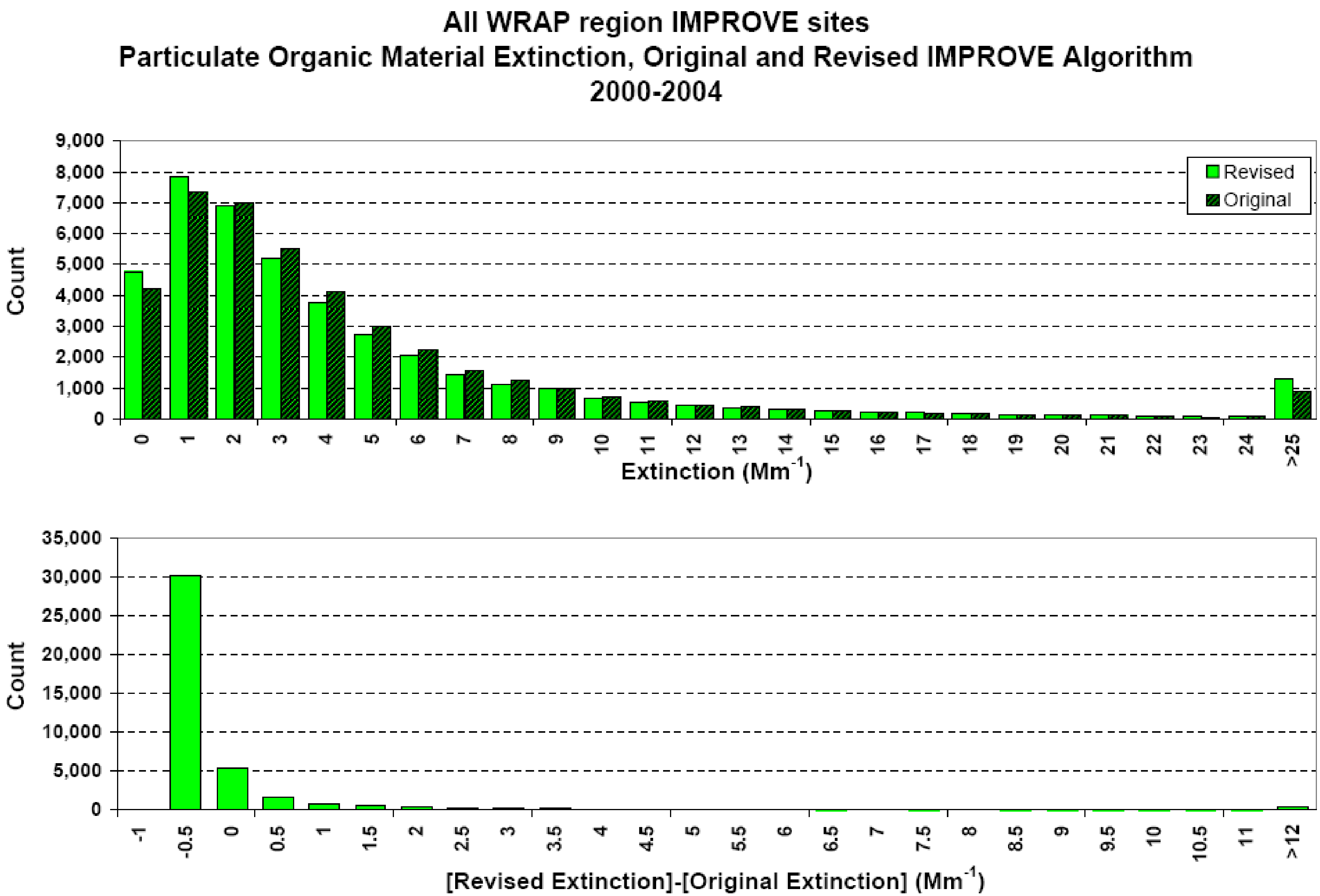
In addition to evaluating all 3 overall visibility projections metrics as described above, the WRAP recommends the assessment, analysis, and use of WRAP-developed alternative IMPROVE species-specific visibility projection metrics and "glide paths" for the Worst 20 % visibility days identified in the 3 overall visibility metric projections above. Specifically, the separate projection of each IMPROVE species is recommended to better understand the amount of visibility change expected in the overall reasonable progress demonstration, to be done as follows:

- Go to http://vista.cira.colostate.edu/TSS/Tools/ModelingResults.aspx, again select the "Model Projections (Scaled by RRFs)" tab, and isolate the individual IMPROVE light extinction species by selecting the species of interest using the Control key.

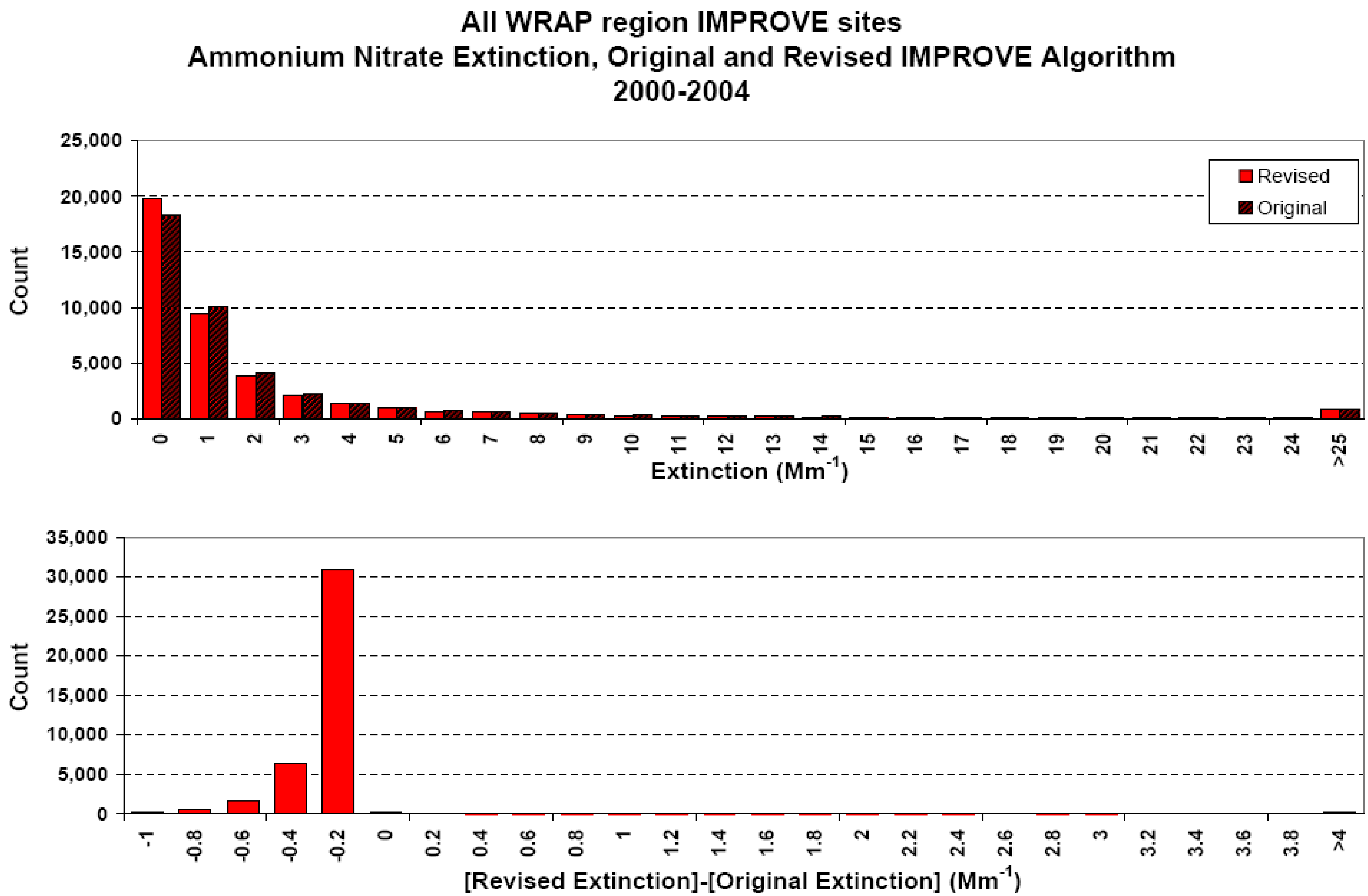
Assessment, analysis, and use of multiple overall visibility projection metrics and the IMPROVE species-specific projections and glide paths will provide haze planners with additional information and insight into the amount of reasonable progress that can be achieved by 2018. These alternative projections techniques and metrics have been implemented on the TSS website as further information to assist in regional haze planning. Beyond the "Model Projections (Scaled by RRFs)" tool, TSS users will be able to query additional modeling, emissions, and monitoring results for a given CIA to help understand the causes of and options for improving visibility impairment at a CIA.

The fractional monthly variation of the 20% Worst visibility days over the 2000-04 Baseline period is substantial and is likely to continue. For the following reasons, a variety of alternative projection techniques should be analyzed and used in preparing regional haze plans in the West.

- Missing data and/or incomplete data for worst and best days' monitored distributions from historic datasets, and operational limitations of these monitors, the future data completeness from year-to-year is likely to continue to affect many WRAP region sites;
- The 24-hour average data and systematic bias of the 1 in 3-day sampling frequency of the monitored observations;
- The episodic and/or substantial nature of dust, international, and fire impacts on individual IMPROVE samplers and CIAs from year-to-year; and
- These characteristics are likely to continue during the nominal 60-year implementation period of the RHR.



Place with explanatory text in Monitoring Metrics memo



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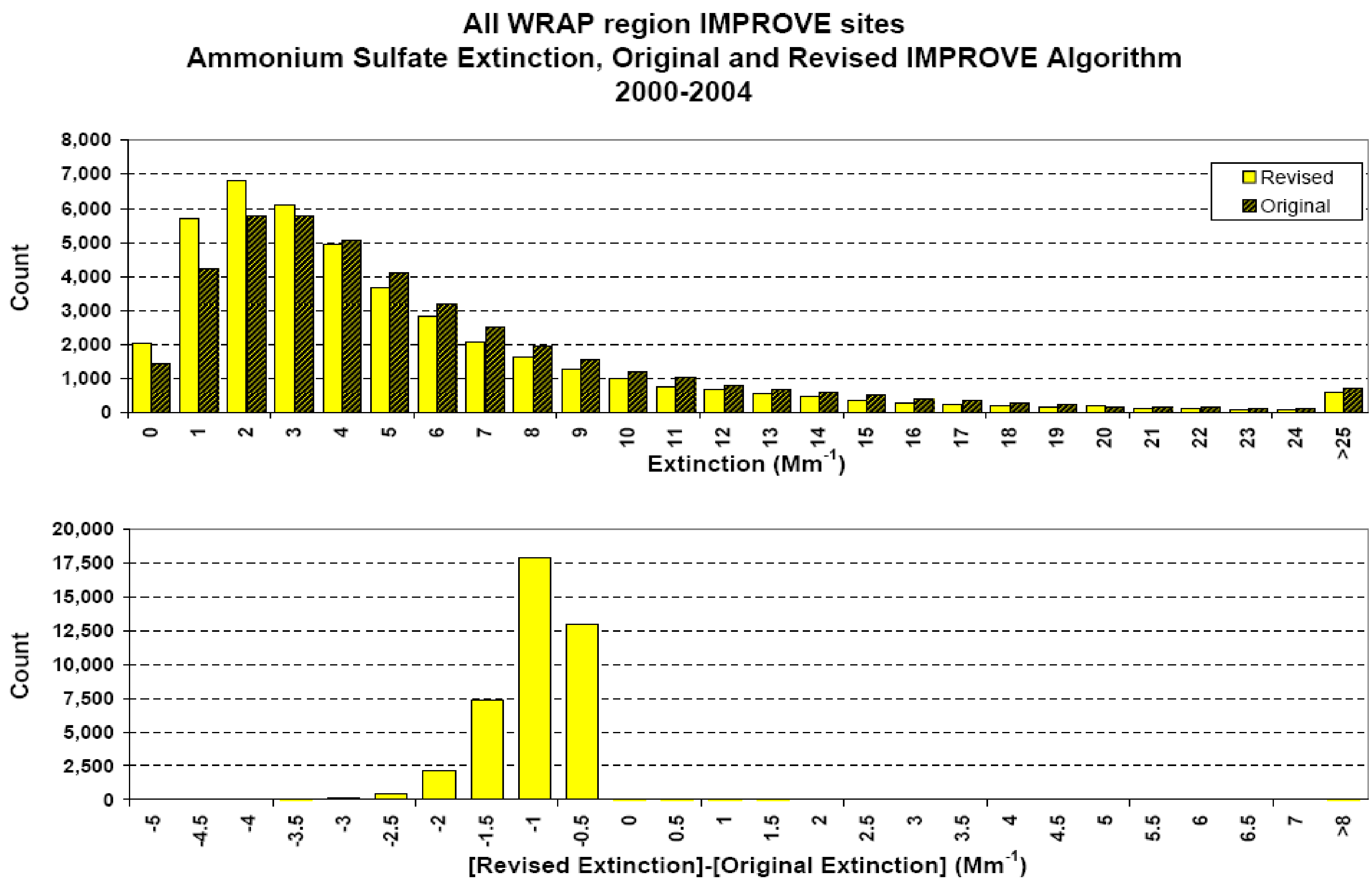

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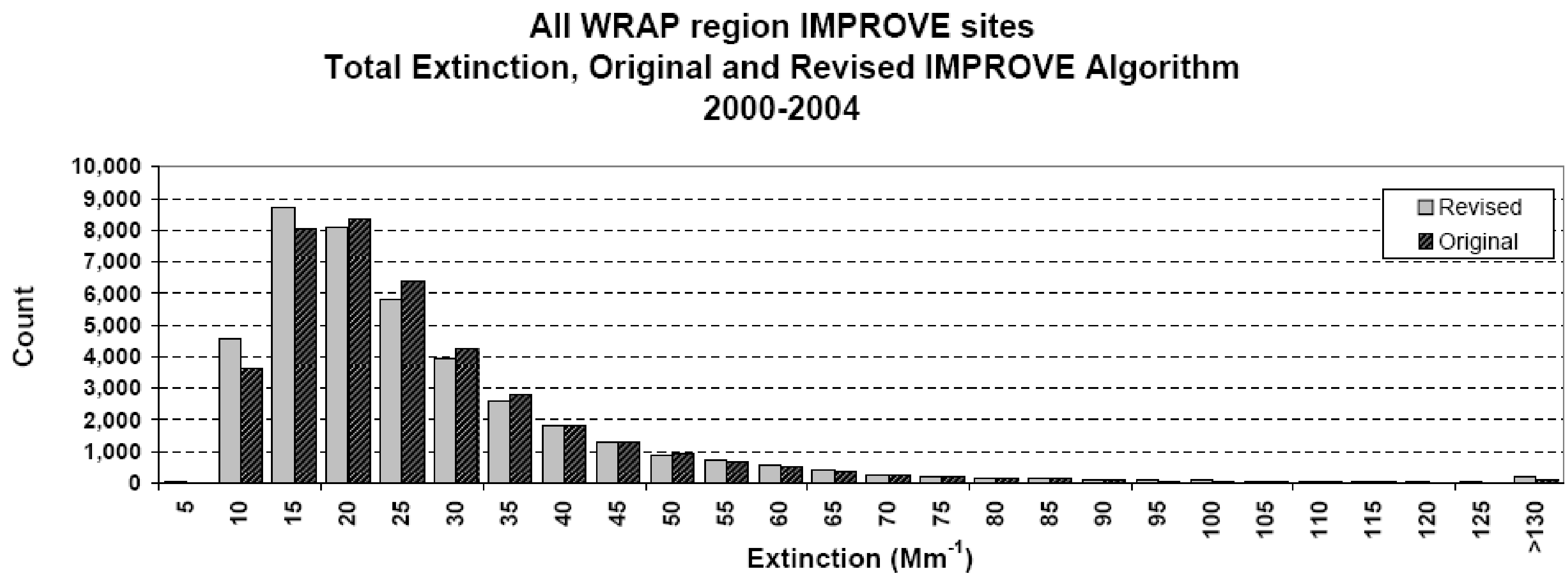

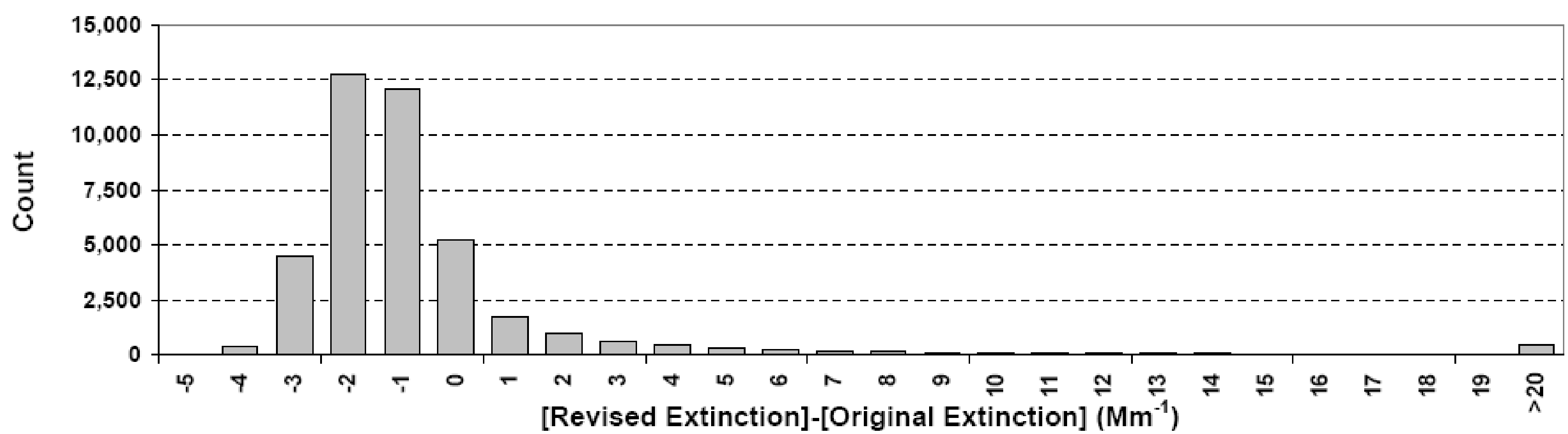

Place with explanatory text in Monitoring Metrics memo

Washington State Regional Haze State Implementation Plan

Appendix H

Best Available Retrofit Technology Modeling Protocol

Modeling Protocol for
Washington, Oregon, and Idaho:
Protocol for the Application of the CALPUFF Modeling System Pursuant to the Best Available Retrofit Technology (BART) Regulation

1. Introduction and Protocol Objective

1.1 *Background*

Under the Regional Haze Regulations, the U.S. Environmental Protection Agency (EPA) issued the final Guidelines for Best Available Retrofit Technology (BART) Determinations (July 6, 2005) (BART Guideline). According to the Regional Haze Rule, States are required to use these guidelines for establishing BART emission limitations for fossil fuel fired power plants having a capacity in excess of 750 megawatts. The use of these guidelines is optional for states establishing BART emission limitations for other BART-eligible sources. However, according to EPA, the BART Guideline was designed to help states and others do the following: (1) identify those sources that must comply with the BART requirement, and (2) determine the level of control technology that represents BART for each source.

This modeling protocol is a cooperative effort among Idaho Department of Environmental Quality (IDEQ), Oregon Department of Environmental Quality (ODEQ), and Washington Department of Ecology (WDOE) to develop an analysis that will be applied consistently to Idaho, Washington, and Oregon BART-eligible sources. The U.S. Fish and Wildlife Service, National Park Service, U.S. Forest Service, and U.S. EPA Region 10 were consulted during the development of this protocol (EPA 2006a, b, c). This protocol adopts the BART Guideline and addresses both the BART exemption modeling as well as the BART determination modeling. The three agencies are also collaborating on the development of a consistent three-year meteorological data set. Collaboration on the protocol and meteorological data set helps ensure modeling consistency and the sharing of resources and workload.

1.2 *Objectives*

The protocol describes the modeling methodology that will be used for the following purposes:

- **BART Exemption modeling** – Evaluating whether a BART-eligible source is exempt from BART controls because it is not reasonably anticipated to cause or contribute to impairment of visibility in Class I areas
- **BART Determination modeling** – Quantifying the visibility improvements of BART control options

The objectives of this protocol are to provide the following:

- A streamlined and consistent approach in determining which BART-eligible sources are subject to BART
- A clearly delineated modeling methodology
- A common CALMET/CALPUFF/POSTUTIL/CALPOST modeling configuration

2. Modeling Approach

2.1 *Bart-Eligible Source List*

BART-eligible source refers to the entire facility that has BART-eligible emission units.

Oregon, Washington, and Idaho are in the process of finalizing lists of BART-eligible sources. Table 1 presents the BART-eligible lists, as of July 21, 2006. Sources may be added/removed as additional information is reviewed.

Table 1. BART-eligible sources.

Washington	Oregon	Idaho
Intalco Aluminum	Amalgamated Sugar	Amalgamated Sugar – Nampa
Conoco-Phillips	PGE Boardman	Amalgamated Sugar – Paul
Centralia Powerplant (TransAlta)	Boise Cascade	Amalgamated Sugar – Twin Falls
Longview Fibre	Fort James	J.R. Simplot Don Siding Plant
Weyerhaeuser – Longview	Pope & Talbot	Potlatch Pulp and Paper
BP Cherry Point	Weyerhaeuser	Monsanto
Tesoro NW	PGE Beaver	NuWest (Agrium)
Lafarge	Georgia Pacific	
Georgia Pacific (Fort James) Camas	Smurfit	
Port Townsend Paper		
Simpson Tacoma Kraft		
Shell (Puget Sound Refining Co)		
Graymont Western		
Alcoa-Wenatchee		
Columbia		

2.2 *Class I Areas*

The mandatory Class I federal areas in Idaho, Oregon, and Washington, as well as neighboring states that could be impacted by BART-eligible sources, are presented in Appendix A. Figure A-1 graphically presents the BART-eligible source locations with respect to the Class I areas.

All federally mandatory Class I areas within 300 kilometers (km) of a BART-eligible source will be included in the BART exemption modeling analysis. Section 6.1(c) of the Guideline on Air Quality Models states, "It was concluded from these case studies that the CALPUFF dispersion model had performed in a reasonable manner, and had no apparent bias toward over or under prediction, so long as the transport distance was limited to less than 300km" (40 CFR 51, Appendix W). If the 300km extends into a neighboring state, visibility impairment shall also be quantified at those Class I areas. Furthermore, if it lies within the 300km radius, visibility impairment at the Columbia River Gorge Scenic Area will also be quantified for information purposes only.

2.3 *Pollutants to Consider*

The BART Guideline specifies that sulfur dioxide (SO_2), oxides of nitrogen (NO_x) and direct particulate matter (PM) emissions, including both PM_{10} and $PM_{2.5}$ should be included for both the BART exemption and BART determination modeling analyses.

The BART Guideline also discusses the inclusion of volatile organic compound (VOC), ammonia and ammonia compounds as visibility impairing pollutants. These pollutants will be included in the BART analysis if it is determined that they are reasonably anticipated to cause or contribute to visibility impairment. For sources that are selected to evaluate VOC emissions, the first criterion is the emission level. The VOC emissions will be included in the BART exemption analysis if the greater-than-six-carbon VOC gases exceed 250 tons-per-year. If speciation is not known, it will be conservatively assumed that 50% of the gas species within the total VOC emissions from a facility have greater than six carbon atoms. Idaho and Oregon have determined that there are no significant sources of VOC, ammonia, or ammonia compounds which require a full BART exemption analysis.

2.4 *Emissions and Stack Data*

The BART Guideline states, "*the emission estimates used in the models are intended to reflect steady-state operating conditions during periods of high capacity utilization.*" These emissions should not generally include start-up, shutdown, or malfunction emissions. The BART Guideline recommends that states use the 24-hour average actual emission rate from the highest emitting day of the meteorological period modeled. The meteorological period is 2003 – 2005.

Depending on the availability of emissions data, the following emissions information (listed in order of priority) should be used with CALPUFF for BART exemption modeling:

- 24-hour average actual emission rate from the highest emitting day within the modeling period (2003 – 2005) (preferred). Actual emissions may be calculated using emission factors specified in Title V permits or representative stack test; or
- Allowable emissions (maximum 24-hour allowable).

States will work with the BART-eligible sources to develop an appropriate emission inventory.

If plant-wide emissions from all BART eligible units for SO_2, NO_x, and PM_{10} are less than the significant emission rate (SER) used for Prevention of Significant Deterioration, emissions of that pollutant will not be included in the BART exemption modeling. However, if plant-wide emissions from all BART eligible units exceed the SERs for these pollutants, then all emissions of that pollutant from individual emission units will be evaluated even if emissions are below the SER for an individual emission unit.

The states have the option of determining how to include small emission units in the BART exemption analysis. Fugitive dust sources at a distance greater than 10km from any Class I area are exempt from the analysis. Emission units with emissions less than the SER will be quantified, if possible, and added to the stack emissions from an emission unit that is already being evaluated. Thus, the emissions from these small units will be included in the total from the plant, but will not have to be modeled separately.

2.5 *Natural Background*

The natural visibility background is defined as the 20% best days. This definition of natural background is consistent with the intent of the BART Guideline (Federal Register Vol. 70, No. 128, pf 39125). The natural background values for Class I areas used in this protocol are based on EPA's "Guidance for Estimating Natural Visibility Conditions under the Regional Haze Rule" (EPA 2003). The natural background for the Columbia River Gorge Scenic Area is based on IMPROVE monitoring data, and was supplied by Scott Copeland of CIRA (Cooperative Institute for Research in the Atmosphere). These background data for Class I areas and the Columbia River Gorge are presented in Appendix B. The option presented in EPA's guidance for refining the default visibility background is not to be used in this protocol.

2.6 *Visibility Calculation*

The CALPUFF modeling techniques presented in this protocol will provide ground level concentrations of visibility impairing pollutants. The concentration estimates from CALPUFF are used with the current FLAG equation to calculate the extinction coefficient, as shown below.

$$b_{ext} = 3\ f(RH)\ [(NH_4)_2SO_4] + 3\ f(RH)\ [NH_4NO_3] + 4[OC] + 1[Soil] + 0.6[Coarse\ Mass] + 10[EC] + b_{Ray}$$

As described in the IWAQM Phase 2 Report, the change in visibility for the BART exemption analysis is compared against background conditions. The delta-deciview, Δdv, value is calculated from the source's contribution to extinction, $b_{ext\ (source)}$, and background extinction, $b_{ext(bkg)}$, as follows:

$$\Delta dv = 10\ \mathit{ln}\ [\ (\ b_{ext(bkg)} + b_{ext\ (source)}\ )\ /\ (\ b_{ext(bkg)}\ )\ ]$$

2.7 *Model Execution*

2.7.1 BART Exemption Analysis

The BART exemption modeling determines which BART-eligible sources are reasonably anticipated to cause or contribute to visibility impairment at any Class I area. This protocol adopts Option 1 in Section III of the BART Guideline. This option is the Individual Source Attribution Approach. With this approach, each BART-eligible source is modeled separately and the impact on visibility impairment in any Class I area is determined. However, this protocol also allows the state or other authority to include all BART-eligible sources in a single analysis and determine whether or not all sources together are exempt from BART if the total impact on visibility impairment at any Class I area is below the "contribute" threshold.

Sources, or in some cases groups of sources, that exceed the threshold will be considered subject to BART. Sources or groups of sources with modeled impairment below the threshold will be exempt and excused from further analyses.

For determining the visibility threshold, the recommendations in the BART Guideline are followed to assess whether a BART-eligible source is reasonably anticipated to cause or contribute to any visibility impairment in a Class I area. According to the BART Guideline:

"A single source that is responsible for a 1.0 deciview change or more should be considered to "cause" visibility impairment; a source that causes less than a 1.0 deciview change may still contribute to visibility impairment and thus be subject to BART… As a general matter, any threshold that you used for determining whether a source "contributes" to visibility impairment should not be higher than 0.5 deciviews.

In setting a threshold for "contribution," you should consider the number of emissions sources affecting the Class I areas at issue and the magnitude of the individual sources' impacts. In general, a larger number of sources causing impacts in a Class I area may warrant a lower contribution threshold. States remain free to use a threshold lower than 0.5 deciviews if they conclude that the location of a large number of BART-eligible sources within the State and in proximity to a Class I area justify this approach."

As a result, this protocol has determined that if a single source causes a 0.5 deciview or greater change from natural background, then that source is determined to be reasonably anticipated to contribute to any visibility impairment in a Class I area and will be subject to BART. For this single source analysis, the BART exemption modeling will not consider the frequency, magnitude, and duration of impairment.

In addition, as suggested by the BART Guideline, if multiple BART-eligible sources impact a given Class I area on the same day, then a lower, individual, contribution threshold may be considered. For BART-eligible sources in Oregon and Washington, the following steps will be used to address this condition: 1) after all BART-eligible sources have completed their individual BART exemption modeling, the modeled visibility impairment from all sources will be aggregated for each Class I area receptor for each day; 2) if the total for any receptor exceeds 0.5 deciview, all sources responsible for visibility impairment at that receptor for that day will be considered for further evaluation. This evaluation will include an assessment of the magnitude, frequency, duration of impairment, and other factors that affect visibility for each of the sources in the multi-source group. The inclusion of these qualifying factors in the multi-source analysis follows the direction given in the BART Guideline for interpreting the refined modeling results in the determination phase of the BART process and recommendations for sources subject to PSD analyses given in the FLAG Phase I Final Report (FLAG 2000). There is no set individual source visibility threshold for these multi-source assessments. After the multi-source evaluation, a determination will be made as to which sources, if any, from a multi-source group will be considered to have contributed to visibility impairment and be subject to BART.

2.7.2 BART Determination Analysis

The BART Determination analysis determines the degree of visibility improvement for each control option. The BART Guideline states:

"Assess the visibility improvement based on the modeled change in visibility impacts for the pre-control and post-control emission scenarios. You have the flexibility to assess visibility improvement due to BART controls by one or more methods. You may consider the frequency, magnitude, and duration components of impairment."

In order to quantify the degree of visibility improvement due to BART controls, the modeling system is executed in a similar manner as for the BART exemption analysis. Model execution and results are needed for both pre-BART control and post-BART control scenarios to allow for comparison of CALPOST delta-deciview predictions for both scenarios. The only difference between the modeling runs will be modifications to the CALPUFF inputs associated with control devices (emissions, stack parameters). In contrast to the BART exemption analysis that predicts pre-control impacts from all BART-eligible units at a source together, BART determination analyses evaluates each emission unit independently of each other after control options are in place. As explained in the BART Guideline, the states may consider the frequency, magnitude, and duration of impairment for the determination analysis.

2.7.3 Implementing BART Modeling Analysis

Each state will implement the BART analysis separately, as follows:

- Idaho – DEQ will perform both the BART exemption and BART determination modeling, working closely with the facilities and providing the facilities with the modeling analysis if they too want to perform the analysis.

- Oregon – DEQ will perform the BART exemption analysis and the individual BART-subject facilities will perform the BART determination analysis. Oregon DEQ will perform any cumulative analysis required.

- Washington – The Washington BART-eligible sources will conduct the BART exemption modeling and the BART determination analysis. Ecology and EPA will conduct any cumulative analysis required.

3. Visibility Modeling System

In general, the BART exemption modeling using the CALPUFF suite of programs will follow the procedures and recommendations outlined in two documents: the IWAQM (Interagency Workgroup on Air Quality Models) and the FLAG (Federal Land Managers Air Quality Related Values Workgroup) reports (EPA 1998, FLAG 2000). Exceptions to these procedures are explicitly described in the appropriate sections below. Tables listing the modeling parameters for each CALPUFF module are located in the Appendices.

The specific CALPUFF programs and their version numbers that will be used in both the exemption modeling and determination modeling (control evaluation) are presented in Table 2.

The CALMET meteorological domain, as described below, covers the full three-state area. The computational domains, which will be unique for each source or group of sources undergoing modeling, will be a subset of the meteorological domain. As a result, a consistent meteorological data set will be used in all analyses, but the computational domains will be tailored to suit the modeling requirements for each individual source and the Class I areas within a radius of 300km.

Table 2. CALPUFF Modeling System

Program	Version	Level
CALMET	6.211	060414
CALPUFF	6.112	060412
CALPOST	6.131	060410
POSTUTIL	1.52	060412

3.1 *CALMET*

The dispersion modeling will use CALMET windfields for the three-year period 2003-2005. These windfields cover the three-state area of Washington, Oregon, and Idaho, and also extend into adjacent states sufficiently to encompass all Class I areas within 300km of any BART-eligible facility included in this analysis (Figure 1). As part of the three-state collaboration on a BART protocol, it was decided to support the development of a consistent meteorological data set for use in both the BART exemption and determination analyses. Therefore, the states contracted with a consulting firm, Geomatrix, to provide this set of meteorological data for use in CALPUFF for determining whether a BART-eligible source is reasonably anticipated to cause or contribute to haze in a Federal Class I area.

One of the deliverables of that contract is a final CALMET modeling protocol that provides details on the methodology used to develop the data sets. Therefore, this BART modeling protocol only summarizes the development of the CALMET data set. For additional detail, the reader is referred to the "*Modeling Protocol for BART CALMET Datasets*" in Attachment 1.

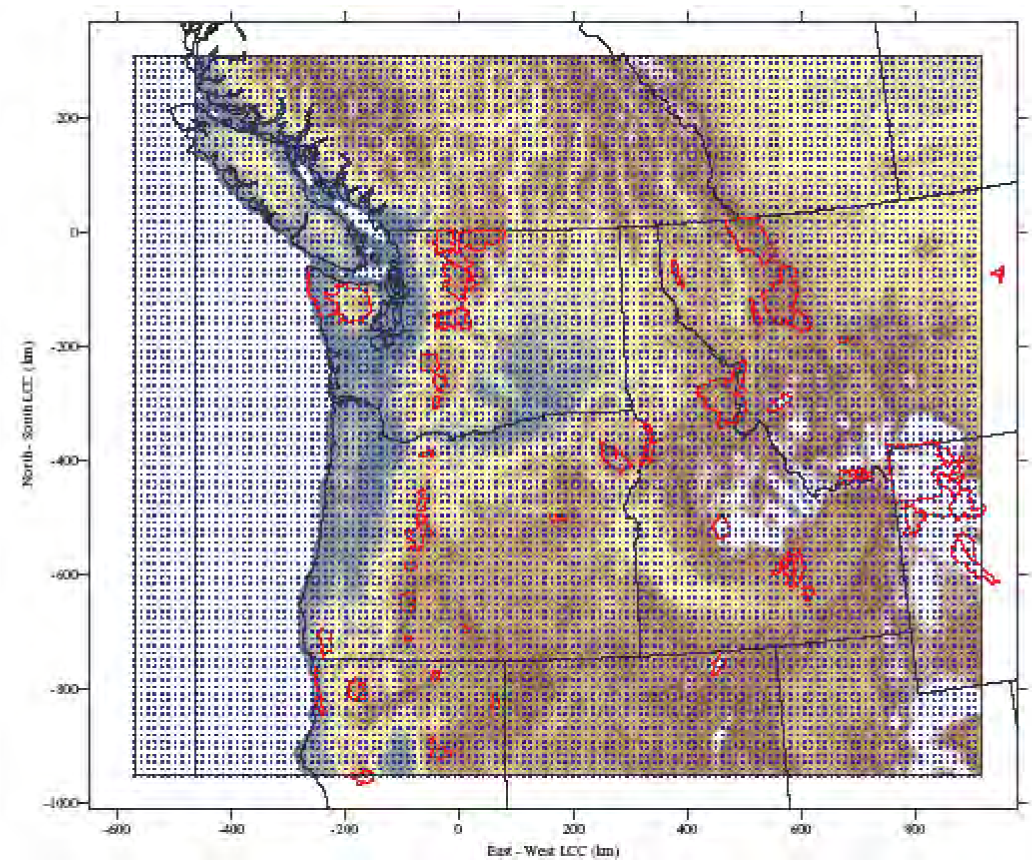

Figure 1. CALMET Meteorological Domain.

3.2 Meteorological Data

3.2.1 Mesoscale Model Data

It was the judgment of Idaho, Oregon, Washington, and EPA Region 10 that the use of three years of MM5 data developed by Western Regional Air Partnership (WRAP) would not adequately capture the meteorology in the Pacific Northwest. WRAP had run MM5 using 36-km and 12-km grids. The states and EPA Region 10 preferred a 4-km grid as it would more adequately capture the meteorology and the influences of complex terrain that characterizes the Region 10 area. Furthermore, WRAP had selected some physics options that are more appropriate for the dry southwest and not the wet northwest.

As a result, the three states contracted a consulting firm (Geomatrix) to process calendar year 2003 to 2005 forecast 12-km MM5 output files archived at the University of Washington (UW). The 12-km MM5 domain includes all of Idaho, Oregon and Washington. Portions of Montana, Wyoming, Utah, Nevada and California are also included in the domain so that BART-eligible sources near these state borders that could impact Class I areas outside of Region 10 are considered in the analysis.

The MM5 data was evaluated for model performance using the statistical evaluation tool METSTAT. CALMET Version 6.211, including a new over-water algorithm, was used to interpolate the 12-km data down to 4-km for the entire domain. The CALMET outputs were also evaluated to determine the model performance of the CALMET wind fields. At this time, METSTAT is unable to evaluate CALMET files. The statistical benchmarks listed in the WRAP Draft Final Report Annual 2002 MM5 Meteorological Modeling to Support Regional Haze Modeling of the Western United States (ENVIRON and UCR, 2005) served as a guide for the acceptability of the MM5 data and CALMET output.

CALMET allows the user to adjust the MM5 wind fields in varying degree by the introduction of observational data, including surface, over-water, and upper air data (using the so-called NOOBS parameter). Idaho, Oregon, and Washington have determined that the observed cloud cover should be used, but that observed surface and upper air winds should not be included in CALMET as they locally distort the MM5 wind fields and have no significant effect on long range transport. As a result, the three states have judged that the MM5 simulations more than adequately characterize the regional wind patterns. It should also be noted that CALMET uses the finer scale land use and digital elevation model (DEM) data to interpolate the MM5 winds down to 4km, which improve the wind flow patterns in complex terrain within the modeling domain.

3.2.2 CALMET Control File Settings

These CALMET wind fields will be used by all BART-eligible sources within the three states for both BART exemption and BART determination modeling. The wind fields have been computed by Geomatrix using CALMET Version 6.211. Details of the parameter settings in CALMET are provided in Appendix C; however, the major assumptions are summarized below.

1) The initial-guess fields used the 12-km MM5 outputs, forecast hours 13 – 24 from every 00Z and 12Z initialization, taken from UW archives, for the three years, January 2003 – December, 2005.

2) Both the BART exemption and determination modeling will utilize the wind fields at 4km resolution.

3) The meteorological data was evaluated in two stages using the extensive database of surface observations maintained by UW. First, the MM5 12-km data was evaluated prior to running CALMM5 using the METSTAT software program and secondly, the wind fields generated by CALMET was evaluated using standard statistical evaluation techniques.

4) There are 10 vertical layers with face heights of 0, 20, 40, 65, 120, 200, 400, 700, 1200, 2200, and 4000 meters.

5) CALMET was run using NOOBS = 1. Upper air, precipitation, and relative humidity data were taken from MM5.

6) The surface wind observations were ignored by setting the relative weight of surface winds to essentially zero (R1 = 1.0E-06). The only surface observation data that was effectively used in CALMET is cloud cover. This is essentially a no-observation approach. This method is specified in this protocol because previous modeling in the Pacific Northwest shows that the radius of influence of a typical surface wind observation must be set at a small number because of the presence of local topographic features. As a result, the adjustment to or distortion of wind fields by surface observations is extremely localized, on the order of 10-15km, and has no effect on long range transport to Class I areas.

7) Precipitation data was obtained from MM5, so MM5NPSTA = -1

8) No weighting of surface and upper air observations, and BIAS = 0, and ICALM = 0

9) The terrain scale factor TERRAD = 12

10) Land use and terrain data were developed using the North American 30-arc-second data

3.3 *CALPUFF*

The CALPUFF modeling will use Version 6.112. This protocol generally follows the recommendation of the IWAQM and FLAG guidance documents. Details of the parameter settings in CALPUFF are provided in Appendix D; however, the major features are summarized below:

1) The three-year CALMET input files will be developed by Geomatrix and be provided as input-ready to CALPUFF.

2) The BART exemption modeling will examine the visibility impairment on Class I areas within 300km of each single source. Where BART-eligible sources are grouped or where their emissions could collectively impair visibility in a Class I area, the exemption modeling will also group these sources in order to examine their cumulative impact. The computational modeling domain will be sufficient to include all Class I areas within a 300km radius of a source or sources.

3) Pasquill-Gifford Dispersion coefficients will be used.

4) MESOPUFF-II chemistry algorithm will be used.

5) Building downwash will be ignored for cases with source-to-receptor distances greater than 50km, as recommended by the Federal Land Managers (FLMs) (US Fish and

Wildlife, National Park Service, and U.S. Forest Service) who were consulted for this protocol.

6) Puff splitting will not be used, following the recommendations of the FLMs.

7) Source elevations that will be entered in CALPUFF will not use actual elevations but will be based on the modeled terrain surface used in CALMET for developing wind fields. The same algorithm in CALMET that determines the elevations of the observational stations will be used to make this calculation. These modified source elevations will be provided to the BART eligible sources.

3.3.1 Emissions

Section 2.4 above presents the emissions and stack data that is required from the facilities. This section only discusses the emissions estimates needed in CALPUFF.

Primary emission, species will include the input species PM, SO_2, SO_4, and NO_x; and the additional modeled species HNO_3 and NO_3. Emissions of H_2SO_4 will be included, if known, and used for estimation of SO_4 emissions. SO_2 emissions will be reviewed to ensure "double-counting" is avoided.

The primary PM species will be treated as follows:

- BART-eligible sources are required to include both filterable and condensable fractions of PM.

  Filterable:
  - Elemental Carbon (EC) (<2.5 µm)
  - PM Fine (PMF) (<2.5 µm)
  - PM Coarse (PMC) (2.5 – 10 µm)

  Condensable:
  - Organic Carbon (SOA)
  - Inorganic Aerosol (SO_4)
  - Non-SO_4 inorganic aerosol

- The condensable fraction will be treated as primary emissions in the CALPUFF input file and assumed to be 100% in the $PM_{2.5}$ fraction (see NPS Web site listed below).

The states will work with the individual BART-eligible sources to develop appropriate PM speciation and size fractions. The following information sources may be used in the development of the speciation and fractions:

- U.S. National Park Service (NPS) – the NPS has developed both PM speciation and size fractions for several source categories. The information is located at http://www2.nature.nps.gov/air/Permits/ect/index.cfm

- U.S. EPA – the EPA has developed generic PM speciation for all source categories located at http://www.epa.gov/ttn/chief/emch/speciation/.

- If size fraction is not known, the following default values, based on information in the CALPUFF User's Guide, CALPUFF GUI, and AP-42 will be used:

Pollutant	Mean diameter	Standard deviation
SO_4, NO_3, PMF, SOA, EC	0.50 microns	1.5
PMC	5.00 microns	1.5

3.3.2 Ozone Background

Due to the number of BART-eligible sources and Class I areas being analyzed, a single value of 60ppb (parts per billion) is used for all months and all three states. This value was determined based on a review of available ozone data for Idaho, Oregon, and Washington.

3.3.3 Ammonia Background

As with the ozone background, a single value of 17ppb is used for the ammonia background. This value is supported by measurements made in 1996 – 1997 at Abbotsford in the Frazier River Valley of British Columbia. This value has also been commonly used as background for Prevention of Significant Deterioration modeling in the Pacific Northwest and will ensure that for BART exemption modeling, conditions are not ammonia limited. It is recognized that ammonia values may be lower in Class I areas; however, the BART analysis must account for transport through ammonia-rich areas.

3.3.4 Receptor Locations

Visibility impacts will be computed at all Class I areas and the Columbia River Gorge Scenic Area if they lie within a 300-km radius of the BART eligible source. The geolocations of the receptor points and their elevations for the Class I areas that will be used in the modeling are available for download from the National Park Service Web site at http://www2.nature.nps.gov/air/Maps/Receptors/index.cfm>.

Receptor points and elevations for the Columbia River Gorge Scenic Area will be provided by Oregon and Washington.

3.4 CALPOST and VISIBILITY POST-PROCESSING

The following assumptions will be used in CALPOST and POSTUTIL to calculate the visibility impairment:

1) For the visibility calculation, Method 6 will be employed. This method uses monthly average relative humidity and f(RH) values for each Class I area as provided in Appendix B, which are based on the EPA Guidance for Regional Haze analysis (EPA 2003).

2) Particulate species for the visibility analysis will include SO_4, NO_3, EC, OC, PMF, and PMC, as reported in the CALPOST output files.

3) POSTUTIL will not be used to speciate modeled PM_{10} concentrations, as PM_{10} will be speciated into its components (PMF, PMC, SOA, EC, SO_4) and entered as primary emissions in CALPUFF. In addition, HNO_3/NO_3 partition option in POSTUTIL will not be used for ammonia limiting.

4) Natural background extinction calculations will use the 20% best days for each Class I area in the three-state region. The natural background for the 20% best days has been refined from that which is in "Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Rule" (EPA 2003). The extinction coefficients for the 20% best days have been calculated following the approach taken in the Draft Montana BART modeling protocol. This procedure uses the haze index (HI) in deciviews at the 10th percentile (median of the 20% best days) and an activity factor that is calculated for each Class I area. Tables providing the monthly f(RH) and 20% best days coefficients are provided in Appendix B, and are based on data from EPA (2003). For the exemption modeling, the Rayleigh scattering value will be 10 Mm-1 for all Class I areas.

   - The 98^{th} percentile value will be calculated for all BART-eligible sources at each mandatory Class I area.

5) The CALPOST "LST" output files will be used to determine the 98^{th} percentile of visibility impairment for each receptor in CLASS I areas.

6) The contribution threshold has the implied level of precision equal to the level of precision reported by CALPOST. Therefore, the 98^{th} percentile value will be reported to three decimal places.

4. Interpretation of Results

The change in visibility impairment for the BART exemption modeling is based on the increase in HI from a BART-eligible source or sources relative to natural background, defined as the 20% best visibility days for each Class I area. This definition of natural background is consistent with the intent of the BART guideline (Federal Register Vol. 70, No. 128, pf 39125).

The U.S. EPA recommends using the 98th percentile value from the distribution of values containing the highest modeled delta-deciview (Δdv) value for each day of the simulation from all modeled receptors at a given Class I area. The 98th percentile Δdv value will be determined in the following ways:

- The 8th highest value for each year modeled
- The 22nd highest value for the 3-year modeling period

Both methods will be used and the highest value of the two will be compared to the contribution threshold (Δdv≥0.5 dv). If there are more than 7 days with values greater than the contribution threshold in any single meteorological year for any Class I area, or more than 21 days in three years, then the source is considered Subject-to-BART.

5. References

40 CFR Part 51, Appendix W. *Guidelines on Air Quality Models*

ENVIRON and UCR 2005. Draft Final Report Annual 2002 MM5 Meteorological Modeling to Support Regional Haze Modeling of the Western United States. Available at http://pah.cert.ucr.edu/aqm/308/reports/mm5/DrftFnl_2002MM5_FinalWRAP_Eval.pdf. ENVIRON International Corporation and University of California Riverside). March, 2005.

EPA (U.S. Environmental Protection Agency) 1998. *Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts*, EPA-454/R-98-019, December 1998.

EPA 2003. *Guidance for Estimating Natural Visibility Conditions under the Regional Haze Rule*, EPA-454/B-03-005, September, 2003.

EPA 2006a. Conference call with Fish and Wildlife and U.S. EPA Region 10, and the states of ID, OR and WA. January 17, 2006.

EPA 2006b. Conference call with the Fish and Wildlife and U.S. EPA Region 10, National Park Service, and the states of ID, OR and WA. January 18, 2006.

EPA 2006c. Conference call with the Fish and Wildlife and U.S. EPA Region 10, and the states of ID, OR and WA. January 20, 2006.

Federal Land Managers' Air Quality Related Values Workgroup (FLAG) 2000. *Phase I Report*. December 2000.

Federal Register, Vol. 70, No. 128. *Regional Haze Regulations and Guidelines for Best Available Retrofit Technology (BART) Determinations*. pp. 39104 – 30172, July 6, 2005.

Appendix A

Mandatory Class I Federal Areas

and

Columbia River Gorge Scenic Area

Figure A-1

Map of BART-Eligible Sources and Class I Areas

Posted on Idaho DEQ's Regional Haze BART Website

http://www.deq.idaho.gov/air/prog_issues/pollutants/haze_bart.cfm.

Table 1. Federal Mandatory Class I Areas.

Class I Area	Federal Land Manager
Idaho	
Craters of the Moon National Monument	Park Service
Hells Canyon Wilderness	Forest Service
Sawtooth Wilderness	Forest Service
Selway-Bitterroot Wilderness	Forest Service
Yellowstone National Park	Park Service
Oregon	
Crater Lake National Park	Park Service
Diamond Peak Wilderness	Forest Service
Eagle Cap Wilderness	Forest Service
Gearhart Mountain Wilderness	Forest Service
Hells Canyon Wilderness	Forest Service
Kalmiopsis Wilderness	Forest Service
Three Sisters Wilderness	Forest Service
Mount Hood Wilderness	Forest Service
Mount Jefferson Wilderness	Forest Service
Mount Washington Wilderness	Forest Service
Mountain Lakes Wilderness	Forest Service
Strawberry Mountain Wilderness	Forest Service
Washington	
Alpine Lakes Wilderness	Forest Service
Goat Rocks Wilderness	Forest Service
Glacier Peak Wilderness	Forest Service
Mount Adams Wilderness	Forest Service
Mount Ranier National Park	Park Service
North Cascades National Park	Park Service
Olympic National Park	Park Service
Pasayten Wilderness	Forest Service
Neighboring States	
Anaconda-Pintler Wilderness (MT)	Forest Service
Bob Marshall Wilderness (MT)	Forest Service
Cabinet Mountains Wilderness (MT)	Forest Service
Gates of the Mountain Wilderness (MT)	Forest Service
Glacier National Park (MT)	Park Service
Missions Mountain Wilderness (MT)	Forest Service
Scapegoat Wilderness (MT)	Forest Service
Red Rock Lakes Refuge (MT)	Fish & Wildlife Service
Bridger Wilderness (WY)	Forest Service
Fitzpatrick Wilderness (WY)	Forest Service
Grand Teton National Park (WY)	Park Service
North Absaroka Wilderness (WY)	Forest Service
Teton Wilderness (WY)	Forest Service
Washakie Wilderness (WY)	Forest Service
Caribous Wilderness (CA)	Forest Service

Table 1. Federal Mandatory Class I Areas.

Class I Area	Federal Land Manager
Lassen Volcanic National Park (CA)	Park Service
Lava Beds National Monument (CA)	Park Service
Marble Mountain Wilderness (CA)	Forest Service
Redwood National Park (CA)	Park Service
South Warner Wilderness (CA)	Forest Service
Thousand Lakes Wilderness (CA)	Forest Service
Yolla Bolly-Middle Eel Wilderness (CA)	Forest Service
Jarbridge Wilderness (NV)	Forest Service

Hells Canyon is located in Idaho and Oregon.
Yellowstone is located in Idaho, Montana and Wyoming.

Appendix B

Natural Visibility Background

and

Monthly Relative Humidity f(RH)

Adjustment to speciated particulate (Western States) to reflect 20% Best Visibility Days conditions

Monthly f(RH) are from *Appendix A of Draft Guidance for Estimating Natural Visibility Conditions under the RHR (Sept. 2003*)**.**

Background extinction coefficients (20% Best Days) have been calculated using Annual Avg bext, Best 20% bext, and activity factors.

		CALPOST Input Group 2 Monthly extinction coefficients for hygroscopic species (RHFAC)												CALPOST Input Group 2 Background extinction coefficients (20% Best Days)					
Class I Area	State	Jan. f(RH)	Feb. f(RH)	Mar. f(RH)	Apr. f(RH)	May f(RH)	June f(RH)	July f(RH)	Aug. f(RH)	Sep. f(RH)	Oct. f(RH)	Nov. f(RH)	Dec. f(RH)	BKSO4 ug/m3	BKNO3 ug/m3	BKPMC ug/m3	BKOC ug/m3	SOIL ug/m3	BKEC ug/m3
CaribouWilderness	CA	3.69	3.13	2.83	2.45	2.37	2.17	2.07	2.13	2.20	2.38	3.01	3.41	0.048	0.040	1.20	0.188	0.200	0.008
LassenVolcanic	CA	3.81	3.19	2.91	2.53	2.42	2.19	2.09	2.14	2.23	2.43	3.13	3.53	0.048	0.040	1.21	0.189	0.201	0.008
Lava Beds NP	CA	3.98	3.36	3.07	2.70	2.62	2.43	2.31	2.34	2.42	2.72	3.52	3.81	0.050	0.042	1.26	0.197	0.210	0.008
MarbleMountain	CA	4.44	3.79	3.74	3.33	3.37	3.24	3.18	3.19	3.24	3.37	4.12	4.15	0.052	0.043	1.30	0.204	0.217	0.009
RedwoodNP	CA	4.42	3.91	4.56	3.91	4.50	4.70	4.86	4.72	4.31	3.66	3.81	3.40	0.054	0.045	1.34	0.210	0.224	0.009
SouthWarner	CA	3.62	3.08	2.72	2.35	2.29	2.12	1.90	1.92	1.97	2.30	3.05	3.44	0.048	0.040	1.21	0.190	0.202	0.008
ThousandLakes	CA	3.81	3.19	2.91	2.53	2.42	2.19	2.09	2.14	2.23	2.43	3.13	3.53	0.048	0.040	1.21	0.190	0.202	0.008
Yolla Bolly Middle Eel Wilderr	CA	3.95	3.35	3.14	2.76	2.68	2.47	2.44	2.50	2.56	2.70	3.31	3.62	0.049	0.041	1.24	0.194	0.206	0.008
Craters of the Moon	ID	3.13	2.74	2.28	2.02	2.01	1.81	1.43	1.42	1.57	1.97	2.77	3.04	0.046	0.038	1.15	0.180	0.192	0.008
HellsCanyon	ID	3.70	3.12	2.51	2.17	2.12	2.00	1.63	1.58	1.79	2.41	3.45	3.87	0.048	0.040	1.21	0.190	0.202	0.008
SawtoothWilderness	ID	3.34	2.87	2.32	2.01	2.00	1.84	1.43	1.40	1.50	1.96	2.94	3.31	0.046	0.039	1.16	0.182	0.193	0.008
Selway-BitterrootWilderness	ID	3.50	3.02	2.59	2.34	2.36	2.31	1.93	1.86	2.09	2.55	3.30	3.50	0.048	0.040	1.21	0.190	0.202	0.008
Anaconda-PintlerWilderness	MT	3.32	2.88	2.54	2.35	2.36	2.31	1.96	1.88	2.10	2.52	3.15	3.29	0.048	0.040	1.20	0.188	0.200	0.008
BobMarshall	MT	3.57	3.10	2.77	2.59	2.66	2.70	2.34	2.23	2.58	2.92	3.47	3.54	0.049	0.041	1.22	0.191	0.203	0.008
CabinetMountains	MT	3.81	3.27	2.85	2.61	2.66	2.68	2.30	2.18	2.56	2.98	3.70	3.86	0.050	0.041	1.24	0.195	0.207	0.008
Gates of the Mountain	MT	2.89	2.57	2.42	2.30	2.30	2.27	2.03	1.94	2.12	2.41	2.75	2.81	0.047	0.039	1.18	0.185	0.197	0.008
GlacierNP	MT	4.01	3.47	3.18	3.06	3.24	3.39	2.76	2.60	3.19	3.45	3.82	3.89	0.051	0.043	1.28	0.200	0.213	0.009
MissionMountain	MT	3.60	3.13	2.73	2.52	2.60	2.62	2.27	2.19	2.50	2.87	3.51	3.59	0.049	0.041	1.23	0.193	0.205	0.008
RedRock Lakes	MT	2.73	2.46	2.28	2.12	2.10	1.91	1.67	1.58	1.77	2.07	2.56	2.68	0.046	0.039	1.16	0.181	0.193	0.008
ScapegoatWilderness	MT	3.19	2.81	2.57	2.43	2.45	2.44	2.14	2.04	2.28	2.61	3.08	3.14	0.048	0.040	1.20	0.188	0.200	0.008
Crater Lake NP	OR	4.57	3.92	3.68	3.36	3.22	2.99	2.84	2.87	3.05	3.59	4.57	4.56	0.053	0.044	1.32	0.206	0.219	0.009
DiamondPeak	OR	4.52	3.96	3.64	3.66	3.16	3.12	2.90	2.93	3.05	3.67	4.55	4.57	0.053	0.044	1.33	0.208	0.222	0.009
Eagle Cap	OR	3.77	3.16	2.47	2.10	2.04	1.87	1.61	1.56	1.61	2.25	3.44	3.97	0.049	0.041	1.22	0.191	0.203	0.008
Gearhart Mountain	OR	3.96	3.38	3.06	2.75	2.65	2.48	2.28	2.30	2.38	2.84	3.65	3.84	0.050	0.042	1.25	0.196	0.208	0.008
Kalmiopsis Wilderness	OR	4.54	3.90	3.83	3.45	3.46	3.32	3.20	3.20	3.29	3.56	4.39	4.32	0.053	0.044	1.32	0.206	0.219	0.009
Mount Hood	OR	4.29	3.81	3.46	3.87	2.95	3.15	2.85	3.00	3.10	3.86	4.53	4.55	0.053	0.044	1.33	0.209	0.222	0.009
Mount Jefferson	OR	4.41	3.90	3.56	3.74	3.07	3.11	2.89	2.91	3.03	3.78	4.55	4.54	0.054	0.045	1.34	0.210	0.223	0.009
Mountain Lakes	OR	4.29	3.62	3.32	2.98	2.86	2.64	2.49	2.50	2.64	3.10	4.12	4.26	0.051	0.043	1.28	0.201	0.214	0.009
MountWashington	OR	4.44	3.93	3.58	3.73	3.09	3.11	2.98	2.91	3.02	3.76	4.56	4.56	0.054	0.045	1.36	0.213	0.227	0.009
StrawberryMountain	OR	3.89	3.33	2.75	2.93	2.27	2.39	1.98	1.97	1.87	2.63	3.69	4.07	0.050	0.042	1.26	0.197	0.210	0.008
ThreeSisters	OR	4.47	3.95	3.61	3.72	3.11	3.11	3.00	2.91	3.03	3.79	4.60	4.57	0.054	0.045	1.35	0.212	0.226	0.009
AlpineLakes	WA	4.25	3.79	3.47	3.90	2.93	3.22	2.92	3.12	3.25	3.91	4.47	4.51	0.054	0.045	1.35	0.212	0.225	0.009
GlacierPeak	WA	4.16	3.72	3.42	3.75	2.91	3.16	2.88	3.14	3.33	3.90	4.42	4.43	0.054	0.045	1.34	0.210	0.223	0.009
GoatRocks	WA	4.25	3.75	3.36	4.24	2.83	3.38	3.03	3.19	3.07	3.77	4.42	4.55	0.054	0.045	1.34	0.210	0.224	0.009
Mount Adams	WA	4.29	3.80	3.44	4.40	2.92	3.49	3.12	3.27	3.13	3.86	4.49	4.56	0.053	0.044	1.33	0.209	0.222	0.009
MountRainier	WA	4.42	3.96	3.64	4.65	3.06	3.69	3.30	3.50	3.40	4.11	4.66	4.66	0.055	0.045	1.36	0.214	0.227	0.009
NorthCascades NP	WA	4.10	3.69	3.43	3.74	2.93	3.20	2.93	3.23	3.45	3.93	4.39	4.38	0.053	0.044	1.33	0.209	0.222	0.009
OlympicNP	WA	4.51	4.08	3.82	4.08	3.17	3.46	3.12	3.48	3.71	4.38	4.83	4.75	0.054	0.045	1.36	0.213	0.226	0.009
PasaytenWilderness	WA	4.17	3.72	3.41	3.72	2.89	3.16	2.88	3.15	3.32	3.86	4.42	4.46	0.053	0.044	1.33	0.208	0.222	0.009
BridgerWilderness	WY	2.52	2.35	2.34	2.19	2.10	1.80	1.50	1.49	1.74	2.00	2.44	2.42	0.046	0.038	1.14	0.178	0.190	0.008
FitzpatrickWilderness	WY	2.51	2.33	2.24	2.13	2.09	1.80	1.51	1.46	1.73	1.98	2.39	2.44	0.046	0.038	1.14	0.179	0.190	0.008
Grand Teton NP	WY	2.62	2.39	2.24	2.10	2.06	1.79	1.52	1.47	1.72	2.00	2.43	2.55	0.046	0.038	1.14	0.178	0.190	0.008
NorthAbsaroka	WY	2.43	2.27	2.24	2.17	2.14	1.93	1.69	1.56	1.76	2.04	2.35	2.40	0.046	0.038	1.14	0.178	0.190	0.008
TetonWilderness	WY	2.53	2.35	2.24	2.12	2.10	1.85	1.59	1.51	1.74	2.02	2.40	2.48	0.046	0.038	1.14	0.178	0.190	0.008
WashakieWilderness	WY	2.50	2.34	2.23	2.12	2.11	1.84	1.56	1.49	1.75	2.00	2.38	2.46	0.046	0.038	1.14	0.179	0.190	0.008
YellowstoneNP	WY	2.54	2.36	2.27	2.16	2.15	1.94	1.69	1.59	1.79	2.08	2.45	2.51	0.046	0.038	1.15	0.180	0.192	0.008
JarbridgeWilderness	NV	2.95	2.60	2.08	2.12	2.21	2.17	1.58	1.40	1.35	1.63	2.44	2.80	0.046	0.038	1.14	0.179	0.190	0.008
Columbia River Gorge	OR-WA	5.03	5.03	2.59	2.59	2.59	2.11	2.11	2.11	3.51	3.51	3.51	5.03	0.569	0.231	4.85	1.05	0.217	0.205

Appendix C

CALMET Parameter Values

Appendix C
CALMET Parameter Values

Recommended CALMET parameters chosen by the Region 10 states for use in BART modeling				
Input Group	Variable	Description	Default Value	Recommended Value
0	DIADAT	Input file: preprocessed surface temperature data (DIAG.DAT)	User Defined	
0	GEODAT	Input file: Geophysical data (GEO.DAT)	User Defined	User Define
0	LCFILES	Convert file name to lower case	User Defined	
0	METDAT	Output file (CALMET.DAT)	User Defined	
0	METLST	Output file (CALMET.LST)	User Defined	
0	MM4DAT	Input file: MM4 data (MM4.DAT)	User Defined	
0	NOWSTA	Input files: Names of NOWSTA overwater stations	User Defined	0
0	NUSTA	Number of upper air data sites	User Defined	0
0	PACDAT	Output file: in Mesopuff II format (PACOUT.DAT)	User Defined	
0	PRCDAT	Input file: Precipitation data (PRECIP.DAT)	User Defined	
0	PRGDAT	Input file: CSUMM prognostic wind data (PROG.DAT)	User Defined	
0	SEADAT	Input files: Names of NOWSTA overwater stations (SEAn.DAT)	User Defined	
0	SRFDAT	Input file: Surface data (SURF.DAT)	User Defined	
0	TSTFRD	Output file (TEST.FRD)	User Defined	
0	TSTKIN	Output file (TEST.KIN)	User Defined	
0	TSTOUT	Output file (TEST.OUT)	User Defined	
0	TSTPRT	Output file (TEST.PRT)	User Defined	
0	TSTSLP	Output file (TEST.SLP)	User Defined	
0	UPDAT	Input files: Names of NUSTA upper air data files (UPn.DAT)	UPn.DAT	
0	WTDAT	Input file: Terrain weighting factors (WT.DAT)	User Defined	
1	CLDDAT	Input file: Cloud data (CLOUD.DAT)	User Defined	Not used
1	IBDY	Beginning day	User Defined	
1	IBHR	Beginning hour	User Defined	
1	IBMO	Beginning month	User Defined	
1	IBTZ	Base time zone	User Defined	8
1	IBYR	Beginning year	User Defined	
1	IRLG	Number of hours to simulate	User Defined	User Define
1	IRTYPE	Output file type to create (must be 1 for CALPUFF)	1	1
1	ITEST	Flag to stop run after Setup Phase	2	2
1	LCALGRD	Are w-components and temperature needed?	T	T
2	DATUM	WGS-G, NWS-27, NWS-84, ESR-S,…		NWS84
2	DGRIDKM	Grid spacing	User Defined	4
2	IUTMZN	UTM Zone	User Defined	User Define
2	LLCONF	When using Lambert Conformal map coordinates - rotate winds from true north to map north?	F	F
2	NX	Number of east-west grid cells	User Defined	373
2	NY	Number of north-south grid cells	User Defined	316
2	NZ	Number of vertical layers	User Defined	10
2	RLAT0	Latitude used if LLCONF = T	User Defined	49.0N
2	RLON0	Longitude used if LLCONF = T	User Defined	121.0W
2	XLAT0	Southwest grid cell latitude	User Defined	User Define
2	XLAT1	Latitude of 1st standard parallel	User Defined	30
2	XLAT2	Latitude of 2nd standard parallel	User Defined	60
2	XORIGKM	Southwest grid cell X coordinate	User Defined	-572
2	YLON0	Southwest grid cell longitude	User Defined	-956
2	YORIGKM	Southwest grid cell Y coordinate	User Defined	User Define
2	ZFACE	Vertical cell face heights (NZ+1 values)	User Defined	0,20,40,65,120,200,400, 700,1200,2200,4000
3	IFORMO	Format of unformatted file (1 for CALPUFF)	1	1
3	LSAVE	Save met. data fields in an unformatted file?	T	T
4	ICLOUD	Is cloud data to be input as gridded fields? (0 = No)	0	0
4	IFORMC	Format of cloud data (2 = formatted)	2	2
4	IFORMP	Format of precipitation data (2 = formatted)	2	2
4	IFORMS	Format of surface data (2 = formatted)	2	2

Recommended CALMET parameters chosen by the Region 10 states for use in BART modeling				
Input Group	Variable	Description	Default Value	Recommended Value
4	NOOBS	Use or non-use of surface, overwater, upper observations		1
4	NPSTA	Number of stations in PRECIP.DAT	User Defined	-1
4	NSSTA	Number of stations in SURF.DAT file	User Defined	115
5	ALPHA	Empirical factor triggering kinematic effects	0.1	0.1
5	BIAS	Surface/upper-air weighting factors (NZ values)	NZ*0	NZ*0
5	CRITFN	Critical Froude number	1	1
5	DIVLIM	Maximum acceptable divergence	5.00E-06	5.00E-06
5	FEXTR2	Multiplicative scaling factor for extrap surface obs to uppr layrs	NZ*0.0	
5	ICALM	Extrapolate surface calms to upper layers? (0 = No)	0	0
5	IDIOPT1	Compute temperatures from observations (0 = True)	0	0
5	IDIOPT2	Compute domain-average lapse rates? (0 = True)	0	0
5	IDIOPT3	Compute internally inital guess winds? (0 = True)	0	0
5	IDIOPT4	Read surface winds from SURF.DAT? (0 = True)	0	0
5	IDIOPT5	Read aloft winds from UPn.DAT? (0 = True)	0	0
5	IEXTRP	Extrapolate surface winds to upper layers? (-4 = use similarity theory and ignore layer 1 of upper air station data)	-4	-1
5	IFRADJ	Adjust winds using Froude number effects? (1 = Yes)	1	1
5	IKINE	Adjust winds using kinematic effects? (1 = Yes)	0	0
5	IOBR	Use O'Brien procedure for vertical winds? (0 = No)	0	0
5	IPROG	Using prognostic or MM-FDDA data? (0 = No)	0	14
5	ISLOPE	Compute slope flows? (1 = Yes)	1	1
5	ISTEPPG	Timestep (hours) of the prognostic model input data	1	1
5	ISURFT	Surface station to use for surface temperature (between 1 and NSSTA)	User Defined	98
5	IUPT	Station for lapse rates (between 1 and NUSTA)	User Defined	1
5	IUPWND	Upper air station for domain winds (-1 = 1/r**2 interpolation of all stations)	-1	-1
5	IWFCOD	Generate winds by diagnostic wind module? (1 = Yes)	1	1
5	KBAR	Level (1 to NZ) up to which barriers apply	NZ	10
5	LLBREZE	Use Lake Breeze module	F	F
5	LVARY	Use varying radius to develop surface winds?	F	F
5	METBXID	Station IDs in the region	User Defined	
5	NBAR	Number of Barriers to interpolation	User Defined	0
5	NBOX	Number of Lake Breeze regions	User Defined	0
5	NINTR2	Max number of stations for interpolations (NA values)	99	99
5	NITER	Max number of passes in divergence minimization	50	50
5	NLB	Number of stations in region	User Defined	0
5	NSMTH	Number of passes in smoothing (NZ values)	2, 4*(NZ-1)	1,2,2,3,3,4,4,4,4,4
5	R1	Relative weight at surface of Step 1 field and obs	User Defined	1.00E-06
5	R2	Relative weight aloft of Step 1 field and obs	User Defined	1.00E-06
5	RMAX1	Max surface over-land extrapolation radius (km)	User Defined	200
5	RMAX2	Max aloft over-land extrapolation radius (km)	User Defined	200
5	RMAX3	Maximum over-water extrapolation radius (km)	User Defined	200
5	RMIN	Minimum extrapolation radius (km)	0.1	0.1
5	RMIN2	Distance (km) around an upper air site where vertical extrapolation is excluded (Set to -1 if IEXTRP = ±4)	4	-1
5	RPROG	Weighting factor for CSUMM prognostic wind data	User Defined	0
5	TERRAD	Radius of influence of terrain features (km)	User Defined	12
5	XBBAR	X coordinate of Beginning of each barrier	User Defined	0
5	XBCST	X Point defining the coastline (straight line)	User Defined	0
5	XEBAR	X coordinate of Ending of each barrier	User Defined	0
5	XECST	X Point	User Defined	0
5	XG1	X Grid line 1 defining region of interest	User Defined	0
5	XG2	X Grid line 2	User Defined	0
5	YBBAR	Y coordinate of Beginning of each barrier	User Defined	0
5	YBCST	Y Point	User Defined	0
5	YEBAR	Y coordinate of Ending of each barrier	User Defined	0
5	YECST	Y Point	User Defined	0

Recommended CALMET parameters chosen by the Region 10 states for use in BART modeling				
Input Group	**Variable**	**Description**	**Default Value**	**Recommended Value**
5	YG1	Y Grid line 1	User Defined	0
5	YG2	Y Grid Line 2	User Defined	0
5	ZUPT	Depth of domain-average lapse rate (m)	200	200
5	ZUPWND	Bottom and top of layer for 1st guess winds (m)	1, 1000	1.,1000.
6	CONSTB	Neutral mixing height B constant	1.41	1.41
6	CONSTE	Convective mixing height E constant	0.15	0.15
6	CONSTN	Stable mixing height N constant	2400	2400
6	CONSTW	Over-water mixing height W constant	0.16	0.16
6	CUTP	Minimum cut off precip rate (mm/hr)	0.01	0.01
6	DPTMIN	Minimum capping potential temperature lapse rate	0.001	0.001
6	DSHELF	Coastal/shallow water length scale	0	0
6	DZZI	Depth for computing capping lapse rate (m)	200	200
6	FCORIOL	Absolute value of Coriolis parameter	1.00E-04	1.00E-04
6	HAFANG	Half-angle for looking upwind (degrees)	30	30
6	IAVET	Conduct spatial averaging of temperature? (1 = True)	1	1
6	IAVEZI	Spatial averaging of mixing heights? (1 = True)	1	1
6	ICOARE	Overwater surface fluxes method and parameters	10	10
6	ICOOL	COARE cool skin layer computation	0	0
6	ILEVZI	Layer to use in upwind averaging (between 1 and NZ)	1	1
6	ILUOC3D	Land use category ocean in 3D.DAT datasets	16	16
6	IMIXH	Method to compute the convective mixing height	1	1
6	IRAD	Form of temperature interpolation (1 = 1/r)	1	1
6	IRHPROG	3D relative humidity from observations or from prognostic data	0	1
6	ITPROG	3D temps from obs or from prognostic data?	0	2
6	ITWPROG	Option for overwater lapse rates used in convective mixing height growth	0	2
6	IWARM	COARE warm layer computation	0	0
6	JWAT1	Beginning landuse type defining water	999	55
6	JWAT2	Ending landuse type defining water	999	55
6	MNMDAV	Max averaging radius (number of grid cells)	1	1
6	NFLAGP	Method for precipitation interpolation (2 = 1/r**2)	2	2
6	NUMTS	Max number of stations in temperature interpolations	5	10
6	SIGMAP	Precip radius for interpolations (km)	100	12
6	TGDEFA	Default over-water capping lapse rate (K/m)	-0.0045	-0.0045
6	TGDEFB	Default over-water mixed layer lapse rate (K/m)	-0.0098	-0.0098
6	THRESHL	Threshold buoyancy flux required to sustain convective mixing height growth overland	0.05	0.05
6	THRESHW	Threshold buoyancy flux required to sustain convective mixing height growth overwater	0.05	0.05
6	TRADKM	Radius of temperature interpolation (km)	500	500
6	ZIMAX	Maximum over-land mixing height (m)	3000	3000
6	ZIMAXW	Maximum over-water mixing height (m)	3000	3000
6	ZIMIN	Minimum over-land mixing height (m)	50	50
6	ZIMINW	Minimum over-water mixing height (m)	50	50

Appendix D

CALPUFF Parameter Values

Appendix D
CALPUFF Parameter Values

Recommended CALPUFF Parameters chosen by EPA Region 10 states for use in BART modeling.						
Input Group	**Group Description**	**Sequence**	**Variable**	**Description**	**Default Value[a]**	**Recommended Value**
1	Run Control	1	METRUN	Do we run all periods (1) or a subset (0)?	0	
1		2	IBYR	Beginning year	User Defined	
1		3	IBMO	Beginning month	User Defined	
1		4	IBDY	Beginning day	User Defined	
1		5	IBHR	Beginning hour	User Defined	
1		5	IRLG	Length of run (hours)	User Defined	
1		5	NSECDT	Length of modeling time step (seconds)	3600	3600
1		6	NSPEC	Number of species modeled (for MESOPUFF II chemistry)	5	
1		7	NSE	Number of species emitted	3	
1		8	ITEST	Flag to stop run after Setup Phase	2	
1		9	MRESTART	Restart options (0 = no restart) allows splitting runs into smaller segments	0	
1		10	NRESPD	Number of periods in Restart	0	
1		11	METFM	Format of input meteorology (1 = CALMET, 2 = ISC)	1	
1		12	AVET	Averaging time lateral dispersion parameters (minutes)	60	60
1		13	PGTIME	PG Averaging time	60	60
2	Tech Options	1	MGAUSS	Near-field vertical distribution (1 = Gaussian)	1	1
2		2	MCTADJ	Terrain adjustments to plume path (3 = Plume path)	3	3
2		3	MCTSG	Do we have subgrid hills? (0 = No) allows CTDM-like treatment for subgrid scale hills	0	0
2		4	MSLUG	Near-field puff treatment (0 = No slugs)	0	0
2		5	MTRANS	Model transitional plume rise? (1 = Yes)	1	1
2		6	MTIP	Treat stack tip downwash? (1 = Yes)	1	1
2		7	MBDW	Method to simulate downwash (1=ISC,2=PRIME)		not used
2		8	MSHEAR	Treat vertical wind shear? (0 = No)	0	0
2		9	MSPLIT	Allow puffs to split? (0 = No)	0	0
2		10	MCHEM	MESOPUFF-II Chemistry? (1 = Yes)	1	1
2		11	MAQCHEM	Aqueous phase transformation	0	0
2		12	MWET	Model wet deposition? (1 = Yes)	1	1
2		13	MDRY	Model dry deposition? (1 = Yes)	1	1
2		13	MTILT	Plume Tilt (gravitational settling)	0	0
2		14	MDISP	Method for dispersion coefficients (2=micromet,3 = PG)	3	3
2		15	MTURBVW	Turbulence characterization? (Only if MDISP = 1 or 5)	3	3
2		16	MDISP2	Backup coefficients (Only if MDISP = 1 or 5)	3	3
2		16	MTAULY	Method for Sigma y Lagrangian timescale	0	0
2		16	MTAUADV	Method for Advective-Decay timescale for Turbulence	0	0
2		16	MCTURB	Method to compute sigma v,w using micromet variables	1	1
2		17	MROUGH	Adjust PG for surface roughness? (0 = No)	0	0
2		18	MPARTL	Model partial plume penetration? (0 = No)	1	1
2		19	MTINV	Elevated inversion strength (0 = compute from data)	0	0
2		20	MPDF	Use PDF for convective dispersion? (0 = No)	0	0
2		21	MSGTIBL	Use TIBL module? (0 = No) allows treatment of subgrid scale coastal areas	0	0
2		22	MBCON	Boundary conditions modeled	0	0
2		23	MFOG	Configure for FOG model output	0	0
2		24	MREG	Regulatory default checks? (1 = Yes)	1	1

Recommended CALPUFF Parameters chosen by EPA Region 10 states for use in BART modeling.						
Input Group	**Group Description**	**Sequence**	**Variable**	**Description**	**Default Value[a]**	**Recommended Value**
3	Species List	1	CSPECn	Names of species modeled (for MESOPUFF II must be SO2-SO4-NOX-HNO3-NO3)	User Defined	
3		2	Specie Names	Manner species will be modeled	User Defined	
3		3	Specie Groups	Grouping of species if any	User Defined	
3		4	CGRUP			
3		5	CGRUP			
4	MapProjection		XLAT1	Latitude of 1st standard parallel		
4			XLAT2	Latitude of 2nd standard parallel		
4			DATUM			NWS84
4		1	NX	Number of east-west grids of input meteorology	User Defined	
4		2	NY	Number of north-south grids of input meteorology	User Defined	
4		3	NZ	Number of vertical layers of input meteorology	User Defined	
4		4	DGRIDKM	Meteorology grid spacing (km)	User Defined	
4		5	ZFACE	Vertical cell face heights of input meteorology	User Defined	
4		6	XORIGKM	Southwest corner (east-west) of input User	Defined meteorology	
4		7	YORIGIM	Southwest corner (north-south) of input User	Defined meteorology	
4		8	IUTMZN	UTM zone	User Defined	
4		9	XLAT	Latitude of center of meteorology domain	User Defined	
4		10	XLONG	Longitude of center of meteorology domain	User Defined	
4		11	XTZ	Base time zone of input meteorology	User Defined	
4		12	IBCOMP	Southwest X-index of computational domain	User Defined	
4		13	JBCOMP	Southwest Y-index of computational domain	User Defined	
4		14	IECOMP	Northeast X-index of computational domain	User Defined	
4		15	JECOMP	Northeast Y-index of computational domain	User Defined	
4		16	LSAMP	Use gridded receptors? (T = Yes)	F	F
4		17	IBSAMP	Southwest X-index of receptor grid	User Defined	
4		18	JBSAMP	Southwest Y-index of receptor grid	User Defined	
4		19	IESAMP	Northeast X-index of receptor grid	User Defined	
4		20	JESAMP	Northeast Y-index of receptor grid	User Defined	
4		21	MESHDN	Gridded recpetor spacing = DGRIDKM/MESHDN	1	
5	Output Options	1	ICON	Output concentrations? (1 = Yes)	1	1
5		2	IDRY	Output dry deposition flux? (1 = Yes)	1	1
5		3	IWET	Output west deposition flux? (1 = Yes)	1	1
5		4	IT2D	2D Temperature	0	0
5		5	IRHO	2D Density	0	0
5		6	IVIS	Output RH for visibility calculations (1 = Yes)	1	1
5		7	LCOMPRS	Use compression option in output? (T = Yes)	T	T
5		8	ICPRT	Print concentrations? (0 = No)	0	0
5		9	IDPRT	Print dry deposition fluxes (0 = No)	0	0
5		10	IWPRT	Print wet deposition fluxes (0 = No)	0	0
5		11	ICFRQ	Concentration print interval (1 = hourly)	1	24
5		12	IDFRQ	Dry deposition flux print interval (1 = hourly)	1	24
5		13	IWFRQ	West deposition flux print interval (1 = hourly)	1	24
5		14	IPRTU	Print output units (1 = g/m**3; g/m**2/s; 3 = ug/m3, ug/m2/s)	1	3
5		15	IMESG	Status messages to screen? (1 = Yes)	1	2
5		16	LDEBUG	Turn on debug tracking? (F = No)	F	F
5		16	IPFDEB	First puff to track	1	1
5		17	NPFDEB	(Number of puffs to track)	(1)	1
5		18	NN1	(Met. Period to start output)	(1)	1

Recommended CALPUFF Parameters chosen by EPA Region 10 states for use in BART modeling.

Input Group	Group Description	Sequence	Variable	Description	Default Value[a]	Recommended Value
5		19	NN2	(Met. Period to end output)	(10)	10
7	Dry Dep Chem		Dry Gas Dep	Chemical parameters of gaseous deposition species	User Defined	defaults
8	Dry Dep Size		Dry Part. Dep	Chemical parameters of particulate deposition species	User Defined	defaults
9	Dry Dep Misc	1	RCUTR	Reference cuticle resistance (s/cm)	30	30
9		2	RGR	Reference ground resistance (s/cm)	10	10
9		3	REACTR	Reference reactivity	8	8
9		4	NINT	Number of particle-size intervals	9	9
9		5	IVEG	Vegetative state (1 = active and unstressed; 2=active and stressed)	1	1
10	Wet Dep		Wet Dep	Wet deposition parameters	User Defined	defaults
11	Chemistry	1	MOZ	Ozone background? (0 = constant background value; 1 = read from ozone.dat)	0	0
11		2	BCKO3	Ozone default (ppb) (Use only for missing data)	80	60
11		3	BCKNH3	Ammonia background (ppb)	10	17
11		4	RNITE1	Nighttime SO2 loss rate (%/hr)	0.2	0.2
11		5	RNITE2	Nighttime NOx loss rate (%/hr)	2	2
11		6	RNITE3	Nighttime HNO3 loss rate (%/hr)	2	2
11		7	MH2O2	H2O2 data input option	1	1
11		8	BCKH2O2	Monthly H2O2 concentrations	1	12*1
			BKPMF	Fine particulate concentration	12 * 1.00	not used
			OFRAC	Organic fraction of Fine Particulate	2*0.15, 9*0.20, 1*0.15	not used
			VCNX	VOC / NOX ratio	12 * 50.00	not used
12	Dispersion	1	SYTDEP	Horizontal size (m) to switch to time dependence	550	550
12		2	MHFTSZ	Use Heffter for vertical dispersion? (0 = No)	0	0
12		3	JSUP	PG Stability class above mixed layer	5	5
12		4	CONK1	Stable dispersion constant (Eq 2.7-3)	0.01	0.01
12		5	CONK2	Neutral dispersion constant (Eq 2.7-4)	0.1	0.1
12		6	TBD	Transition for downwash algorithms (0.5 = ISC)	0.5	0.5
12		7	IURB1	Beginning urban landuse type	10	10
12		8	IURB2	Ending urban landuse type	19	19
12		9	ILANDUIN	Land use type (20 = Unirrigated agricultural land)	20	20
12		10	ZOIN	Roughness length (m)	0.25	0.25
12		11	XLAIIN	Leaf area index	3.0	3.0
12		12	ELEVIN	Met. Station elevation (m above MSL)	0.0	0.0
12		13	XLATIN	Met. Station North latitude (degrees)	-999.0	-999.0
12		14	XLONIN	Met. Station West longitude (degrees)	-999.0	-999.0
12		15	ANEMHT	Anemometer height of ISC meteorological data (m)	10.0	10.0
12		16	ISIGMAV	Lateral turbulence (Not used with ISC meteorology)	1	1
12		17	IMIXCTDM	Mixing heights (Not used with ISC meteorology)	0	0
12		18	XMXLEN	Maximum slug length in units of DGRIDKM	1.0	1
12		19	XSAMLEN	Maximum puff travel distance per sampling step (units of DGRIDKM)	1.0	1
12		20	MXNEW	Maximum number of puffs per hour	99	99
12		21	MXSAM	Maximum sampling steps per hour	99	99
12		22	NCOUNT	Iterations when computing Transport Wind (Calmet & Profile Winds)	2	2
12		23	SYMIN	Minimum lateral dispersion of new puff (m)	1.0	1
12		24	SZMIN	Minimum vertical dispersion of new puff (m)	1.0	1
12		25	SVMIN	Array of minimum lateral turbulence (m/s)	6 * 0.50	6 * 0.50
12		26	SWMIN	Array of minimum vertical turbulence (m/s)	0.20,0.12,0.08, 0.06,0.03,0.016	

Recommended CALPUFF Parameters chosen by EPA Region 10 states for use in BART modeling.						
Input Group	**Group Description**	**Sequence**	**Variable**	**Description**	**Default Value[a]**	**Recommended Value**
12		27	CDIV (1), (2)	Divergence criterion for dw/dz (1/s)	0.01 (0.0,0.0)	0.0,0.0
12		28	WSCALM	Minimum non-calm wind speed (m/s)	0.5	0.5
12		29	XMAXZI	Maximum mixing height (m)	3000	3000
12		30	XMINZI	Minimum mixing height (m)	50	50
12		31	WSCAT	Upper bounds 1st 5 wind speed classes (m/s)	1.54,3.09,5.14, 8. 23,10.8	1.54,3.09,5.14,8. 23,10.8
12		32	PLX0	Wind speed power-law exponents	0.07,0.07,0.10, 0.15,0.35,0.55	0.07,0.07,0.10,0. 15,0.35,0.55
12		33	PTGO	Potential temperature gradients PG E and F (deg/km)	0.020,0.035	0.020,0.035
12		34	PPC	Plume path coefficients (only if MCTADJ = 3)	0.5,0.5,0.5,0.5, 0.35,0.35	0.5,0.5,0.5,0.5,0. 35,0.35
12		35	SL2PF	Maximum Sy/puff length	10.0	10.0
12		36	NSPLIT	Number of puffs when puffs split	3	3
12		37	IRESPLIT	Hours when puff are eligible to split	User Defined	
12		38	ZISPLIT	Previous hour's mixing height(minimum)(m)	100.0	100.0
12		39	ROLDMAX	Previous Max mix ht/current mix ht ratio must be less then this value for puff to split	0.25	0.25
12		40	NSPLITH	Number of puffs when puffs split horizontally	5	5
12		41	SYSPLITH	Min sigma-y (grid cell units) of puff before horiz split	1.0	1.0
12	12	42	SHSPLITH	Min puff elongation rate per hr from wind shear before horiz split	2.0	2.0
12		43	CNSPLITH	Min conc g/m3 before puff may split horizontally	1.0E-07	1.0E-07
12		44	EPSSLUG	Convergence criterion for slug sampling integration	1.00E-04	1.00E-04
12		45	EPSAREA	Convergence criterion for area source integration	1.00E-06	1.00E-06
12		46	DSRISE	Step length for rise integration	1.0	1.0
12		47	HTMINBC		500.0	500.0
12		48	RSAMPBC		10.0	10.0
12		49	MDEPBC		1	1
13	Point Source	1	NPT1	Number of point sources	User Defined	
13		2	IPTU	Units of emission rates (1 = g/s)	1	
13		3	NSPT1	Number of point source-species combinations	0	
13		4	NPT2	Number of point sources with fully variable emission rates	0	
13			Point Sources	Point sources characteristics	User Defined	
14	Area Source		Area Sources	Area sources characteristics	User Defined	
15	Volume Source		Volume	Volume sources characteristics	User Defined Sources	
16	Line Source		Line Sources	Buoyant lines source characteristics	User Defined	
17	Receptors		NREC	Number of user defined receptors	User Defined	
17			Receptor Data	Location and elevation (MSL) of receptors	User Defined	

Appendix E

CALPOST Parameter Values

Appendix E
CALPOST Parameter Values

Table F-1. Recommended CALPOST parameter values chosen by the Region 10 states for use in BART modeling

Input Group	Variable	Description	Default Value	Recommended Value
1	ASPEC	Species to process	VISIB	VISIB
1	ILAYER	Layer/deposition code (1 = CALPUFF concentrations; -3 = wet+dry deposition fluxes)	1	1
1	LBACK	Add Hourly Background Concentrations/Fluxes?	F	F
1	MFRH	Particle growth curve for hygroscopic species	2	2
2	RHMAX	Maximum relative humidity (%) used in particle growth curve	98	95
2	LDRING	Report results by Discrete receptor Ring, if Discrete Receptors used. (T = true)	T	
		Modeled species to be included in computing the light extinction		
2	LVSO4	Include SO4?	T	T
2	LVNO3	Include NO3?	T	T
2	LVOC	Include Organic Carbon?	T	T
2	LVPMC	Include Coarse Particles?	T	T
2	LVPMF	Include Fine Particles?	T	T
2	LVEC	Include Elemental Carbon?	T	T
2	LVBK	when ranking for TOP-N, TOP-50, and Exceedance tables Include BACKGROUND?	T	T
2	SPECPMC	Species name used for particulates in MODEL.DAT file: COARSE =	PMC	PMC
2	SPECPMF	Species name used for particulates in MODEL.DAT file: FINE =	PMF	PMF
		Extinction Efficiencies (1/Mm per ug/m**3)		
2	EEPMC	PM COARSE =	0.6	0.6
2	EEPMF	PM FINE =	1.0	1.0
2	EEPMCBK	Background PM COARSE	0.6	0.6
2	EESO4	SO4 =	3.0	3.0
2	EENO3	NO3 =	3.0	3.0
2	EEOC	Organic Carbon =	4.0	4.0
2	EESOIL	Soil =	1.0	1.0
2	EEEC	Elemental Carbon =	10.0	10.0
2	LAVER	Method used for 24-hr avg % change light extinction	F	F
2	MVISBK	Method used for background light extinction (2 = Hourly RH adjustment; 6 = FLAG seasonal f(RH))	2 or 6	6
2	RHFAC	Monthly RH adjustment factors from FLAG (unique for each Class I area)	Yes if 6	EPA
		Background monthly extinction coefficients (FLAG) unique for each Class I area		
2	BKSO4	Assume all hygroscopic species as SO4 (raw extinction value without scattering efficiency adjustment)		*see table*
2	BKNO3			*see table*
2	BKPMC			*see table*
2	BKOC			*see table*
2	BKSOIL	Assume all non-hygroscopic species as Soil		*see table*
2	BKEC			*see table*
2	BEXTRAY	Extinction due to Rayleigh scattering	10.0	10.0
		Averaging time(s) reported		
3	L1PD	Averaging period of model output	F	F
3	L1HR	1-hr averages	F	F
3	L3HR	3-hr averages	F	F
3	L24HR	24-hr averages	T	T
3	LRUNL	Run lengtyh (annual)	F	F
3	LT50	Top 50 table for each averaging time selected	T	F
3	LTOPN			1
3	NTOP			1
3	ITOP			

Washington State Regional Haze State Implementation Plan

Appendix I

Use of 0.5-km Grid Spacing to Evaluate the Impacts of Best Available Retrofit Technology-Eligible Units at Alcoa Wenatchee Works on the Alpine Lakes Wilderness

Use of 0.5-km Grid Spacing to Evaluate the Impacts of Best Available Retrofit Technology-Eligible Units at Alcoa Wenatchee Works on the Alpine Lakes Wilderness

As discussed in section 11.4.1, Alcoa Wenatchee Works proposed, and the Washington State Department of Ecology (Ecology) accepted, refinements to the Washington-Oregon-Idaho BART Modeling Protocol[1]. Specifically, Ecology accepted an alternative meteorological data file, which used a finer grid size than the default grid size specified by the protocol, and the use of an alternate version of CALPUFF. The reasons for accepting these refinements are discussed below.

Alcoa Wenatchee Works is an aluminum smelter located within the Columbia River Valley (Figure 1). About 20 kilometers (km) upstream from the smelter, the valley forks with one branch heading northwest toward the Alpine Lakes Wilderness while the other branch continues north along the Columbia River Valley. The topography allows southerly flow to be channeled from the smelter up the valley to the fork and then to the north and the northwest.

Terrain in this region is complex. Elevations vary from 200 meters (m) elevation mean sea level (MSL) in the vicinity of the smelter to 2500 m elevation at some peaks within the Alpine Lakes Wilderness (see Figure 6).

Alcoa Wenatchee Works initially followed the Washington-Oregon-Idaho BART Modeling Protocol and used 4-km meteorology to model the impacts from the aluminum smelter on nearby Class I Areas. However, close examination of the surface wind fields (for example, Figure 2) showed numerous locations where the modeled wind directions (indicated by the blue wind barb in the lower left corner of the 4-km grids) did not reflect the effects of the topography. Figure 3 shows a portion of Figure 2 in greater detail. It can be seen that the 4-km wind field attempts to cut across the terrain and fails to model the down-slope, down-valley flow normally observed early in the morning.

Alcoa Wenatchee Works believed that the apparent errors in the wind field were due to unresolved features of the complex terrain. Figure 4 shows terrain corresponding to a 4-km grid spacing. Alcoa Wenatchee Works proposed doing additional modeling at a higher grid resolution to improve the wind field for BART exemption modeling.

Ecology, through its membership in the Northwest Regional Modeling Center, has over a decade of daily experience with mesoscale meteorological models with grid spacing ranging from 36-km down to 1.3- km and occasionally in special studies down to 0.44-km. Ecology staff have seen the improvement in model performance that comes with refined grids and understand the conditions that require the smallest grid spacing.

Based on accumulated experience, Ecology was inclined to entertain a proposal to model with a finer grid. The characteristic scale of the terrain affecting transport of emissions from the Alcoa Wenatchee Works smelter to the Alpine Lakes Wilderness is on the same order as that encountered in the Columbia River Gorge. Additionally, like the Columbia River Gorge the

[1] The Washington-Oregon-Idaho Modeling Protocol may be found in Appendix H.

maximum impact occurs during the winter. Modeling wintertime flow through the Columbia River Gorge required the smallest grid spacing of 0.44 km to correctly characterize the flow[2].

After finding numerous references to analyses with CALPUFF using similar grid spacing in equally complex terrain between 1999 and 2007 and finding no mention of any lower limit to the acceptable meteorological grid spacing[3], Ecology concurred with Alcoa Wenatchee Works' proposal and notified the affected Federal Land Managers (FLMs). The horizontal grid spacing of the fine grid CALMET/CALPUFF modeling domain was 0.5-km. The domain covered an area of 209-km by 143-km (Figure 4). The domain includes the Alcoa Wenatchee Works, the Alpine Lakes Wilderness, and at least a 50-km buffer zone in each direction from the aluminum smelter and this Class I Area.

The revised BART exemption modeling followed the Washington-Oregon-Idaho BART modeling protocol except for a finer grid spacing of 0.5-km in the meteorological pre-processor and the use of CALPUFF version 5.8. EPA approved CALPUFF version 5.8 as a replacement for version 6.112 on June 28, 2007. The modeling used the same 3 years of 12-km mesoscale model wind fields as specified by the protocol.

The two years, 2007 and 2008, saw numerous changes in CALPUFF as one version after another became accepted as a guideline model only to be replaced by another. At the time Ecology made our decision to accept the 0.5-km grid modeling there were two model versions used for regulatory analyses: Version 5.8 for permitting (the Guideline model) and Version 6.112, accepted for BART analyses. Each analysis approved by Ecology was conducted according to the guideline or protocol in effect at the time.

Figures 2 and 3 compare the wind field computed at the 4 kilometer spacing with the wind field computed at the 0.5-km spacing. A measure of the frequency of misdiagnosed wind directions is depicted in Figure 2. The figure shows that ten of the 70 points on the 4-km grid shown in the figure had wind directions that failed to conform to the topography. These ten points are correctly modeled at the 0.5-km spacing.

Figure 3 is an enlargement of the area of Figure 2 outlined by a black box. Figure 3 shows in greater detail that the 4-km spacing produces a defective wind field that ignores the influence of the terrain or produces convergence on the slope of the valleys rather than at the bottom. The former is illustrated by the 4-km grid indicated by a blue barb inside a black box on the right side of the figure. The latter can be seen in two 4-km grids in the center of the figure. The 0.5-km wind field seems to accurately reflect the influence of topographic features.

A vertical cross section of the terrain elevation along the east-west line in Figure 5 is shown in Figure 6. The terrain elevation is shown for 4 different resolutions corresponding to grid spacings of 12, 4, 0.5, and 0.1-km. The 12-km grid spacing corresponds to that of the mesoscale

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[2] Sharp, J and C Mass, The Mesoscale Meteorology of the Columbia River Gorge, Ninth Conference on Mesoscale Processes, 2001.

[3] Chang, et al, 2003 used 0.25 km. State and Federal agencies and regional planning organizations have used the following grid spacing: Colorado - 0.5 km, VISTAS – 1 km, Georgia -1.5 km, EPA - 0.4 km, and California - 0.1 to 0.5 km.

model used for the input meteorological wind fields, the 4-km terrain corresponds to the CALMET grid used in the initial runs, and the 0.5-km terrain was used in the final runs. Terrain at the high resolution 0.1 km grid spacing is provided for comparison.

The cross section at 4-km (plotted in cyan) smoothes out the peaks and the valleys drastically. The highest elevation of 4-km terrain is only 1820 m, well below the maximum of 2340 m for 0.5 km terrain (plotted in magenta). Many ridges and valleys are not resolved at 4-km resolution. The effects of smoothing are even more pronounced at the 12-km spacing (plotted in red).

The similarity of the 0.5-km and 0.1-km profiles confirms that the 0.5-km spacing adequately represents the terrain for modeling purposes.

Figure 3 clearly demonstrates that the 0.5-km resolved terrain provides a much better representation of terrain features and the wind field than does the 4-km resolution. Figures 2 and 3 show that the finer resolution modeling provides a much more detailed spatial pattern in the winds which conforms more accurately to the terrain when compared with the wind fields from the lower resolution runs. It is clear from these plots that the lower resolution runs will miss much of the terrain channeling within the modeling domain. More importantly, the failure of the 4-km grid to accurately represent peaks will allow air to flow unimpeded through regions that would otherwise deflect it.

The Environmental Protection Agency (EPA) has commented on the use of finer grid spacing in BART exemption modeling for the Otter Tail Power generating facility in Big Stone, SD[4]. The Clearinghouse memo set forth two components that an argument must address to run the CALPUFF meteorological pre-processor at a smaller grid spacing than the input meteorological wind fields:

(1) The resolution of the mesoscale model is insufficient to correctly characterize the transport of emissions between their source and the receptors of concern.
(2) The diagnostic wind model, CALMET, can enhance the mesoscale model data sufficiently to adequately replicate the key meteorological features governing the transport of emissions between their source and the receptors of concern.

The first has been addressed above. The 4-km wind field, produced to meet the Washington-Oregon-Idaho Modeling Protocol, was strongly influenced by the input meteorological wind fields and has been shown to have a significant fraction of misaligned wind directions. The terrain analysis shown in Figure 6 satisfies the implied requirement of demonstrable terrain complexity stated in the Model Clearinghouse review of May 15, 2009.

The second is more difficult to satisfy directly in this analysis. There are no observations at sites along the path between the Alcoa Wenatchee Works and the Alpine Lakes Wilderness. Additionally, there were errors in the observations at Pangborn field in Wenatchee. Therefore there is no direct way to assess the improvement in the wind field by using the finer grid. An

[4] EPA, Model Clearinghouse Review of CALPUFF Modeling Protocol for BART, Memorandum from Tyler Fox, EPA-OAQPS, Research Triangle Park, NC, May 15, 2009.

indirect argument must be made by combining experience with close scrutiny of the wind fields computed at the 0.5-km grid spacing. Figure 3 seems to indicate that the wind field computed on the 0.5-km grid responds to the topography in a reasonable manner.

Figure I-7 shows the dates and changes of 98th percentile impacts at 4-km and 0.5-km grid spacings. The highest deciview impact, without regard to location within the Alpine Lakes Wilderness Area, was used to characterize the impact on every day at each of the two grid spacings used in the modeling. The 22 highest deciview values at each grid spacing constitute the upper two percent of the calculated impacts. Each of these 44 values is paired with the highest deciview value at the other grid spacing on the same day.

For example, taking the isolated red point in early 2003, the 0.5-km grid spacing run produced a slightly higher maximum impact to the Alpine Lakes Wilderness Area on one of the 22 days that make up the highest two percent of impacts than was computed using the 4-km spacing. It can also be seen that computed impacts using the 4-km spacing during the first part of 2003 were not in the highest two percent.

Note that the highest impacts are in the winter regardless of the grid spacing used. It can also be seen that ten of the 22 highest impacts on the 0.5 km grid (shown by red dots above the black horizontal line indicating zero change) were between 0 and 1 deciview larger than the impacts on the same days calculated using the 4 km grid. Ecology interprets this as meaning that modeling at the smaller grid spacing has also redistributed the plume from the smelter rather than simply increasing its dispersion. Changes of less than 1 deciview are generally not noticeable.

Figure 8 does show an important difference in the spatial location of impacts between the 4-km grid and the finer grid. Impacts occur at the eastern and southern boundaries of Alpine Lakes Wilderness during the winter for both the 4-km and 0.5-km grid spacings. Impacts occur at the western boundary, which is west of the Cascade Crest, only at the 4-km grid spacing. The spatial variation and differences in magnitude can be attributed to the different effect that the more highly resolved terrain has on the trajectories of emissions from the Alcoa Wenatchee Works aluminum smelter. Because the maximum impacts computed using the 0.5-km grid continue to occur during winter, we may conclude that the predicted maximum impacts will occur in similar meteorological conditions at both grid scales.

In summary, Ecology’s decision to accept Alcoa Wenatchee Works’ use of 0.5-km grid resolution and CALPUFF 5.8 for BART exemption modeling of the Alcoa Wenatchee Works facility was based on an analysis showing that the finer grid resolution provided a more accurate result, given the complex terrain surrounding the Alcoa Wenatchee Works aluminum smelter.

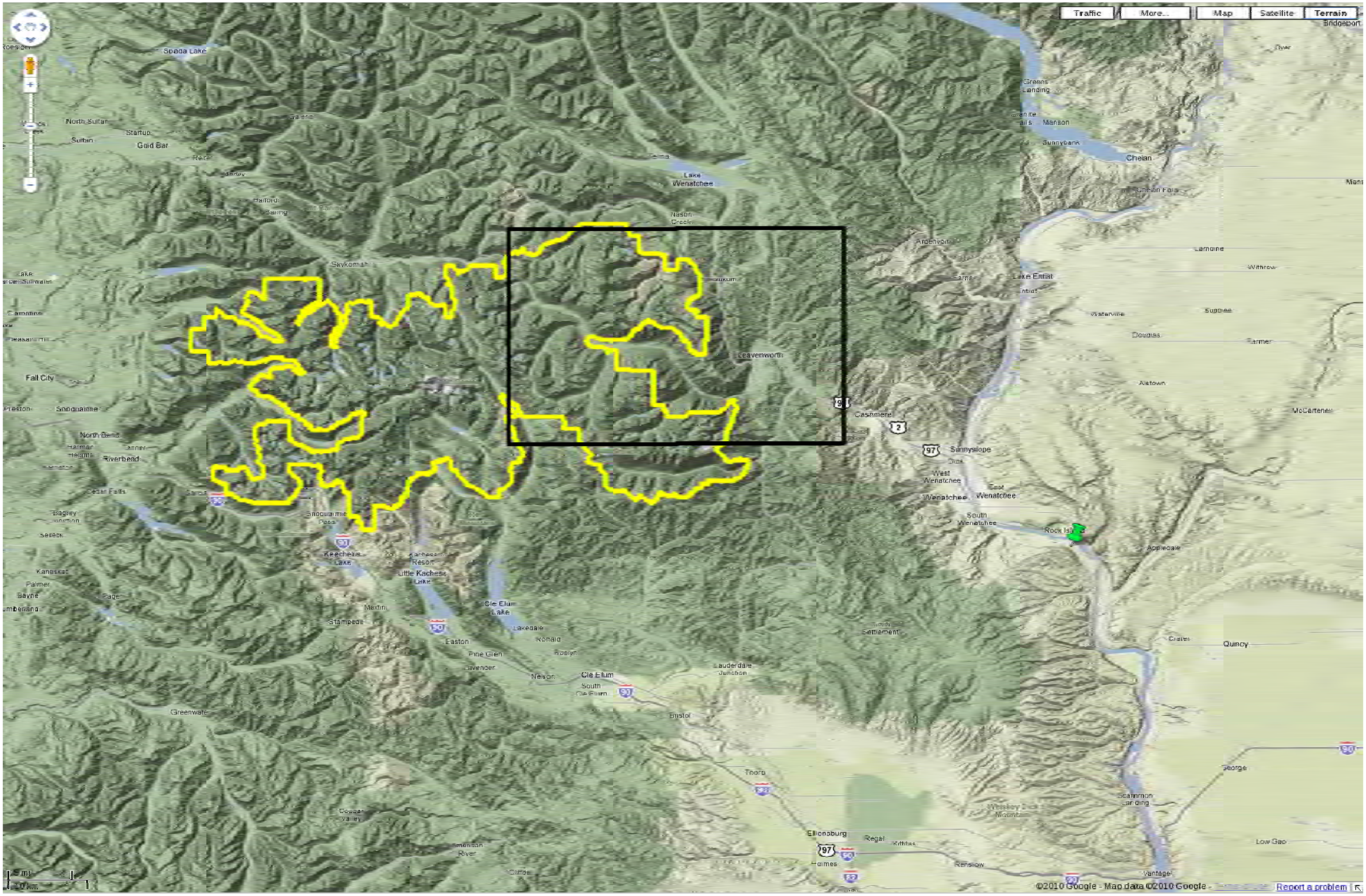

Figure I-1 Terrain near the Alcoa Wenatchee Works. The green pushpin marks the location of the Alcoa Wenatchee Works aluminum smelter in the Columbia River Valley. The Columbia River flows from north to south along the east side of the Cascade Mountains. The Valley branches upstream from the smelter at Olds with one branch heading northwest to the Alpine Lakes Wilderness, which is outlined in yellow. The black rectangle outlines the area shown in Figure 2. North is up on all maps in this appendix.

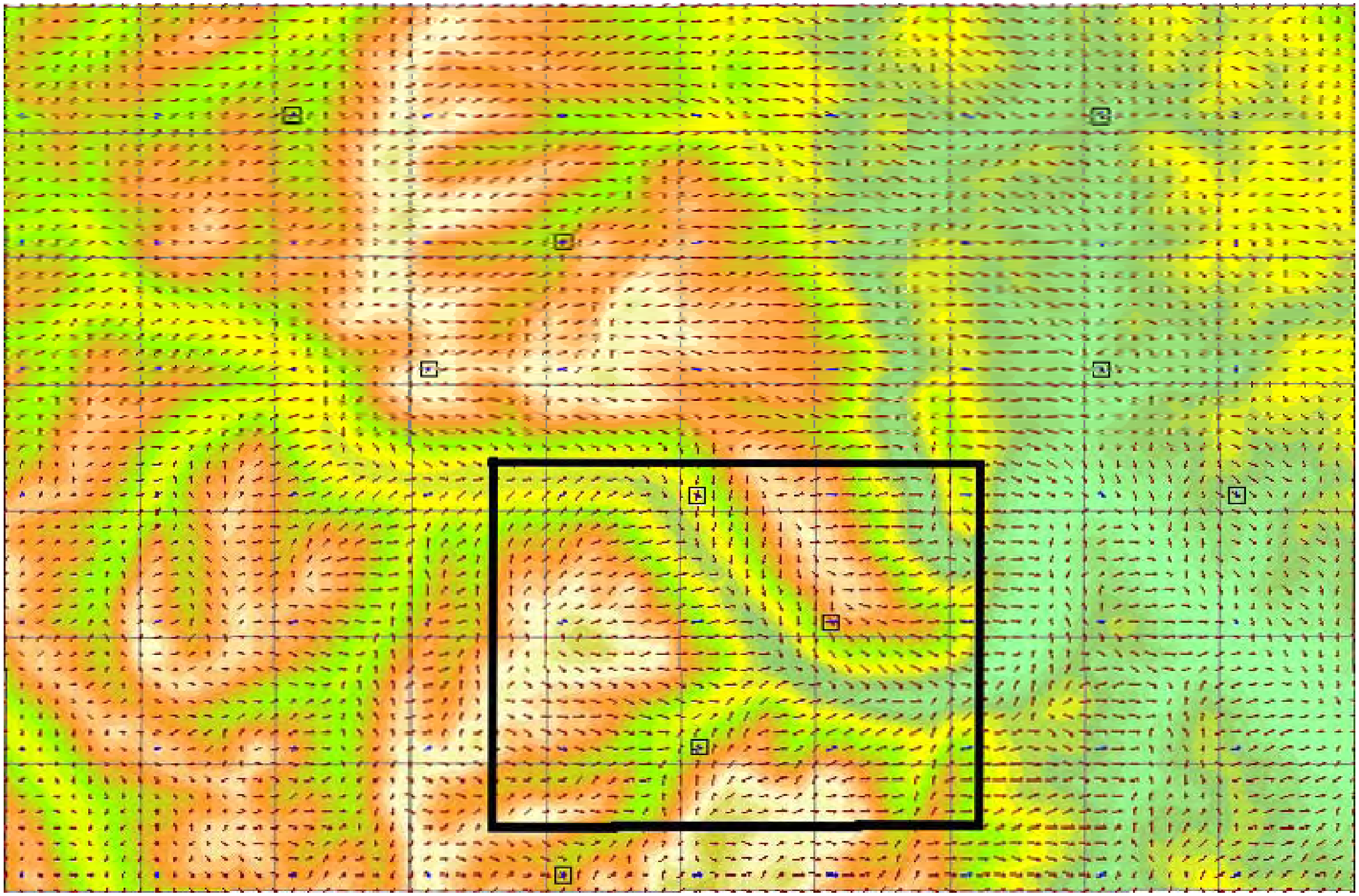

Figure I-2 Sample wind field (5 am on Jan 5, 2003. The ten small black squares show points where there is a significant difference in direction between the 4-km (blue barbs) and 0.5-km (red barbs) wind fields. The large black rectangle outlines the area shown in greater detail in Figure 3.

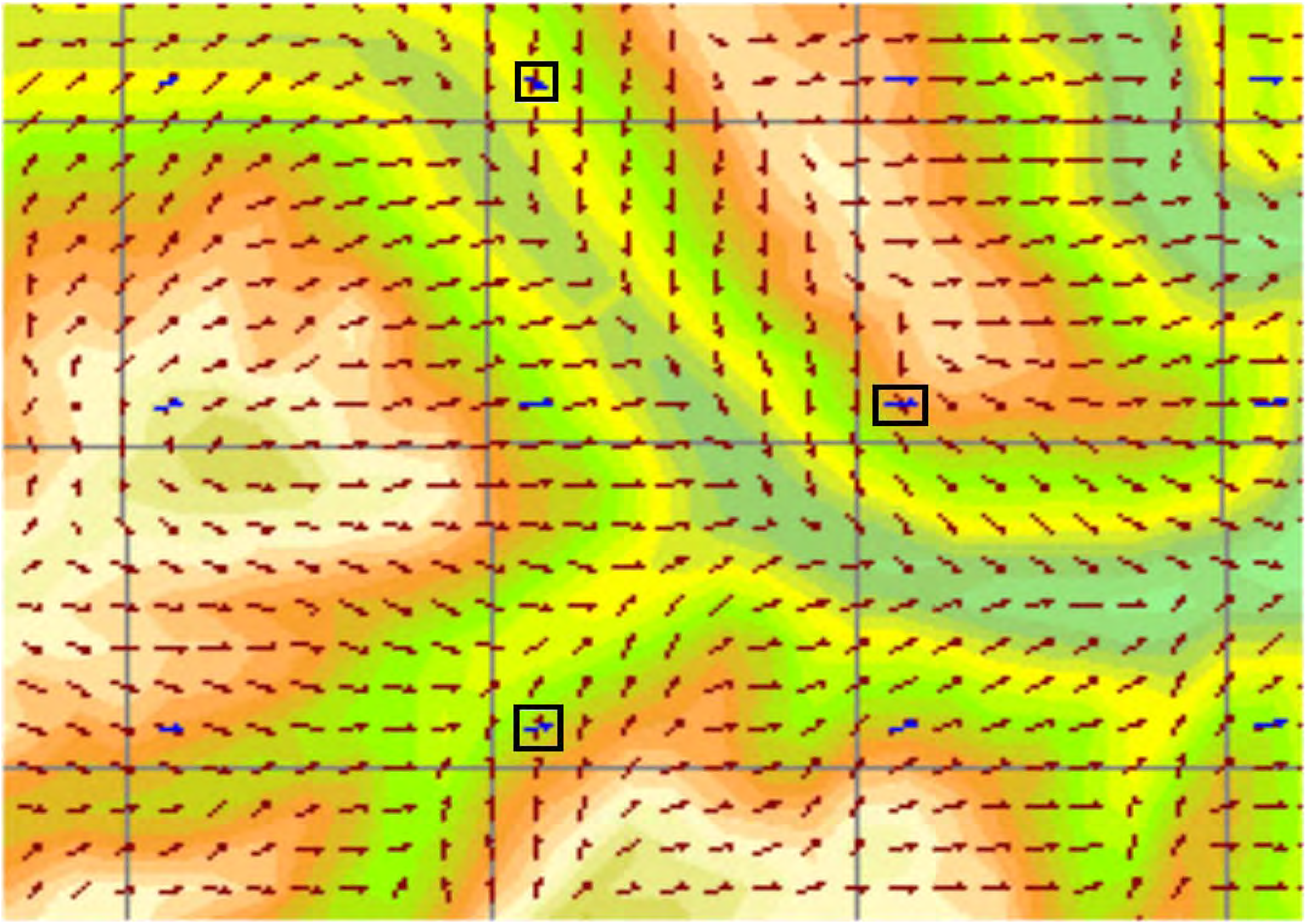

Figure I-3 Close-up of 0.5-km terrain with 4-km (blue barbs at lower left of each 4-km grid square) and 0.5- km (red barbs) wind fields. Small black squares are drawn to emphasize where there is a significant difference in the wind fields.

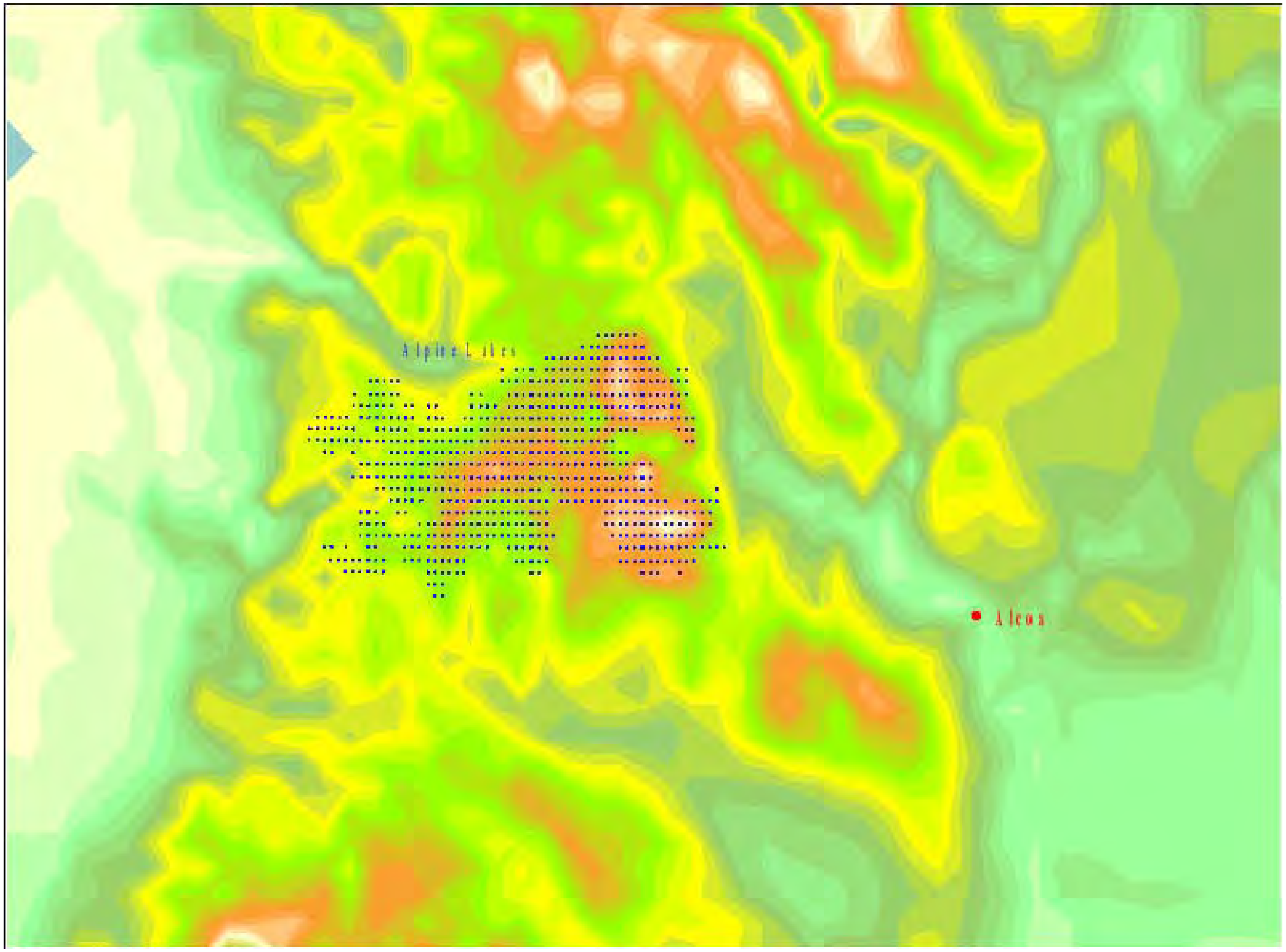

Figure I-4 Terrain at 4-km resolution with FLM-defined receptors in the Alpine Lakes Wilderness Class I Area. The location of the Alcoa Wenatchee Works aluminum smelter is marked by the red dot. Note the relative softness of the terrain compared with Figure 1. Many features that affect the transport of emissions into the Class I Area have been smoothed and are missing.

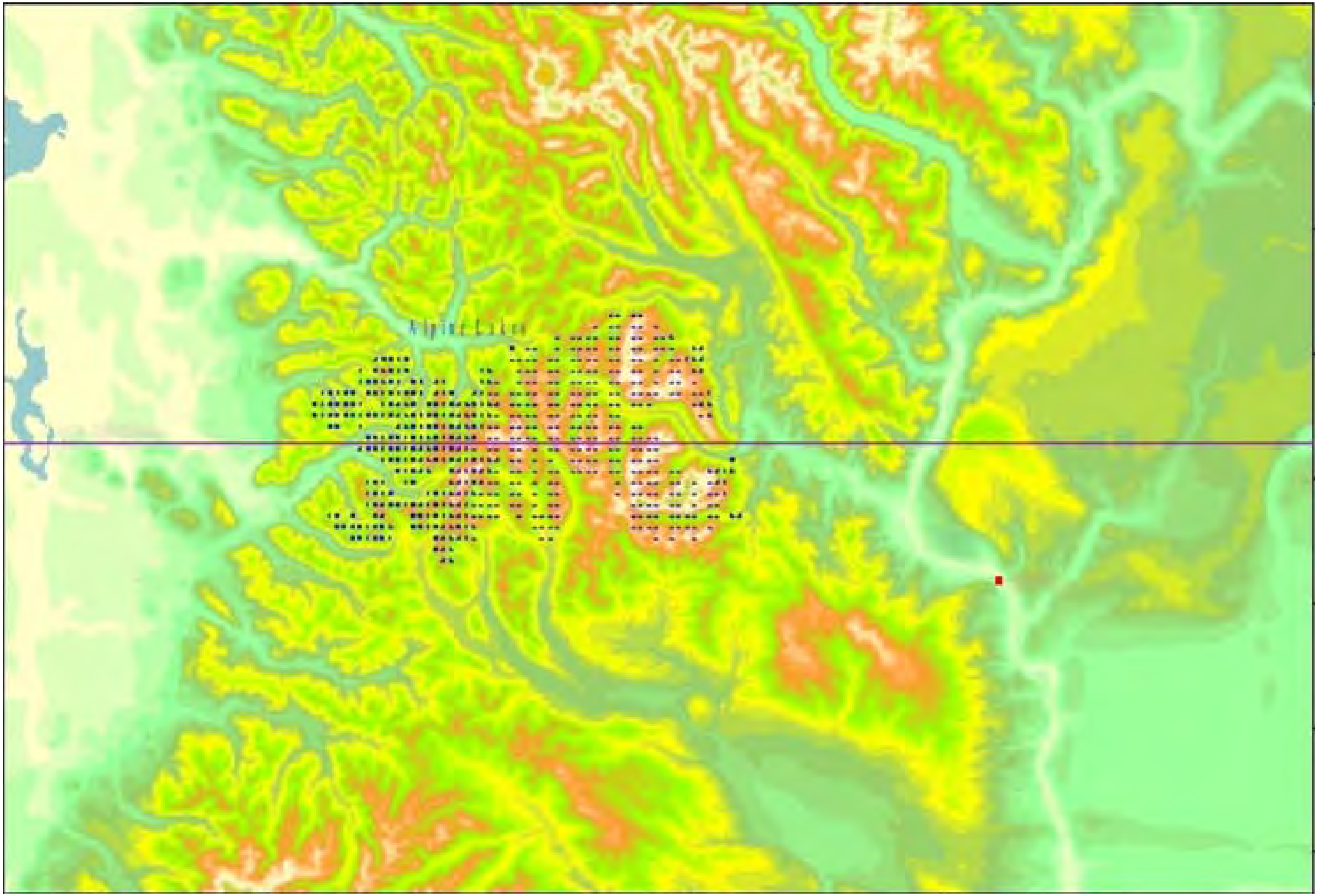

Figure I-5 Terrain at 0.5-km resolution with FLM-defined receptors in Alpine Lakes Wilderness Class I Area. The location of the Alcoa Wenatchee Works aluminum smelter is marked by the red dot. Note the better definition of terrain feature compared with Figure 4, especially valleys and side channels, which are important in defining the transport of emissions into the Class I Area.

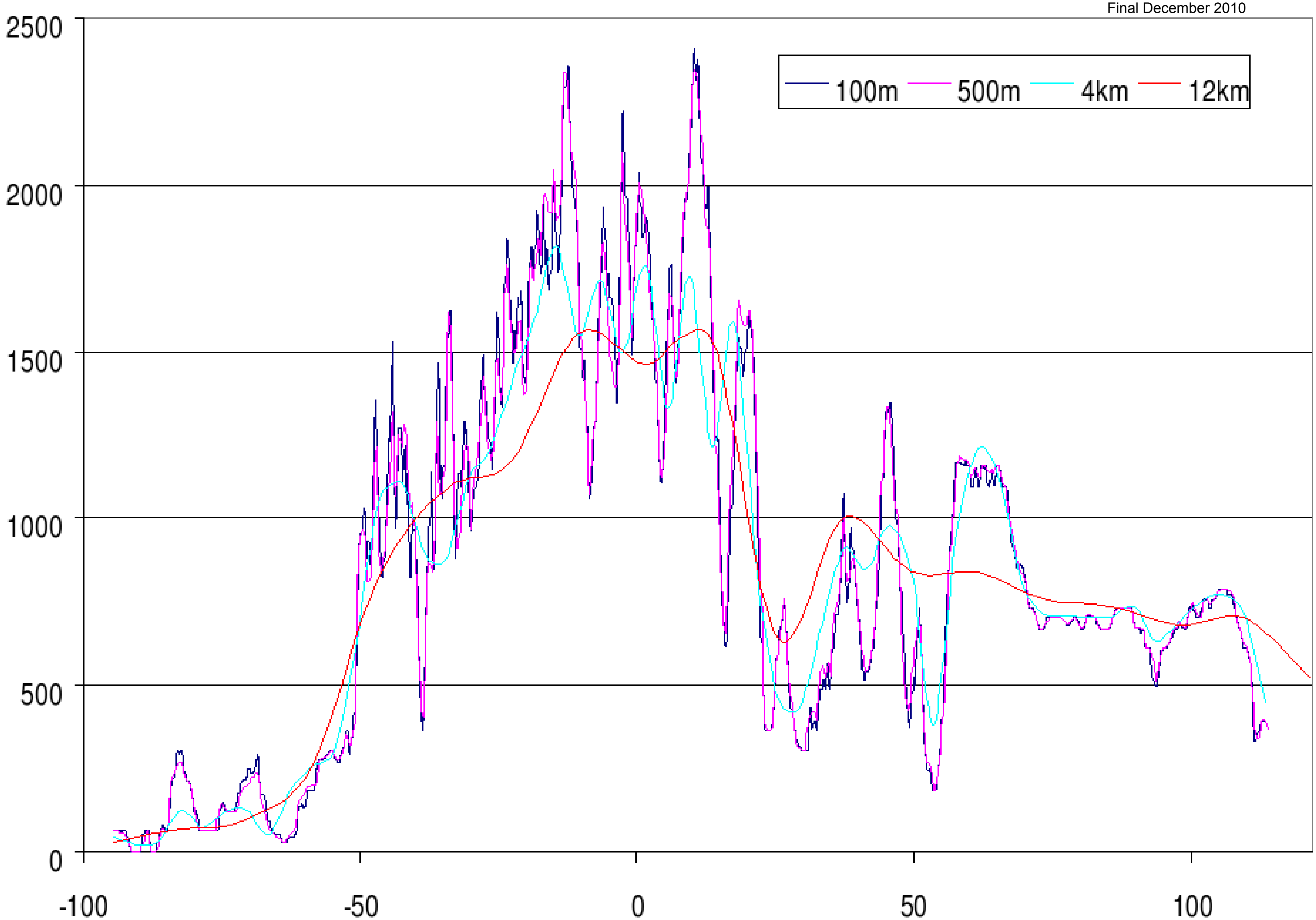

Figure I-6 Terrain profile at four different resolutions along the east-west line in Figure 5. Elevations are in meters and distances are in kilometers. The horizontal scale is approximately the same as Figure 5.

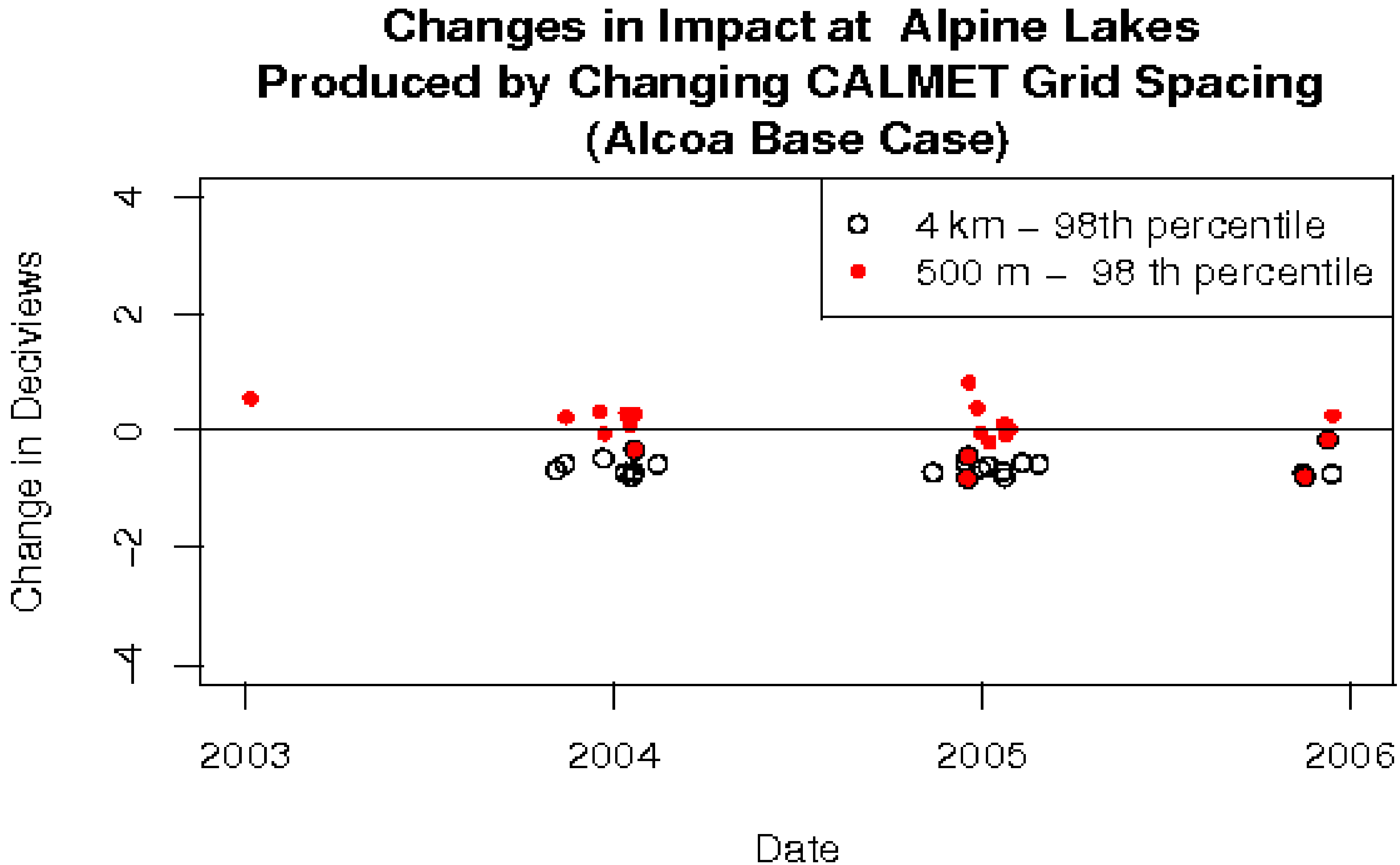

Figure I-7 Dates and changes of 98th percentile impacts at 4-km and 0.5-km grid spacings. The highest deciview, without regard to location within the Alpine Lakes Wilderness Area, was used to characterize the impact on every day at each of the two grid spacings used in the modeling. Each of the 44 values constituting the upper two percent of each distribution is paired with the highest deciview value at the other grid spacing on the same day. Ten of the 22 highest impacts on the 0.5 km grid (shown by red dots above the black horizontal line indicating zero change) were between 0 and 1 deciview larger than the impacts on the same days calculated using the 4 km grid. (See text for more explanation)

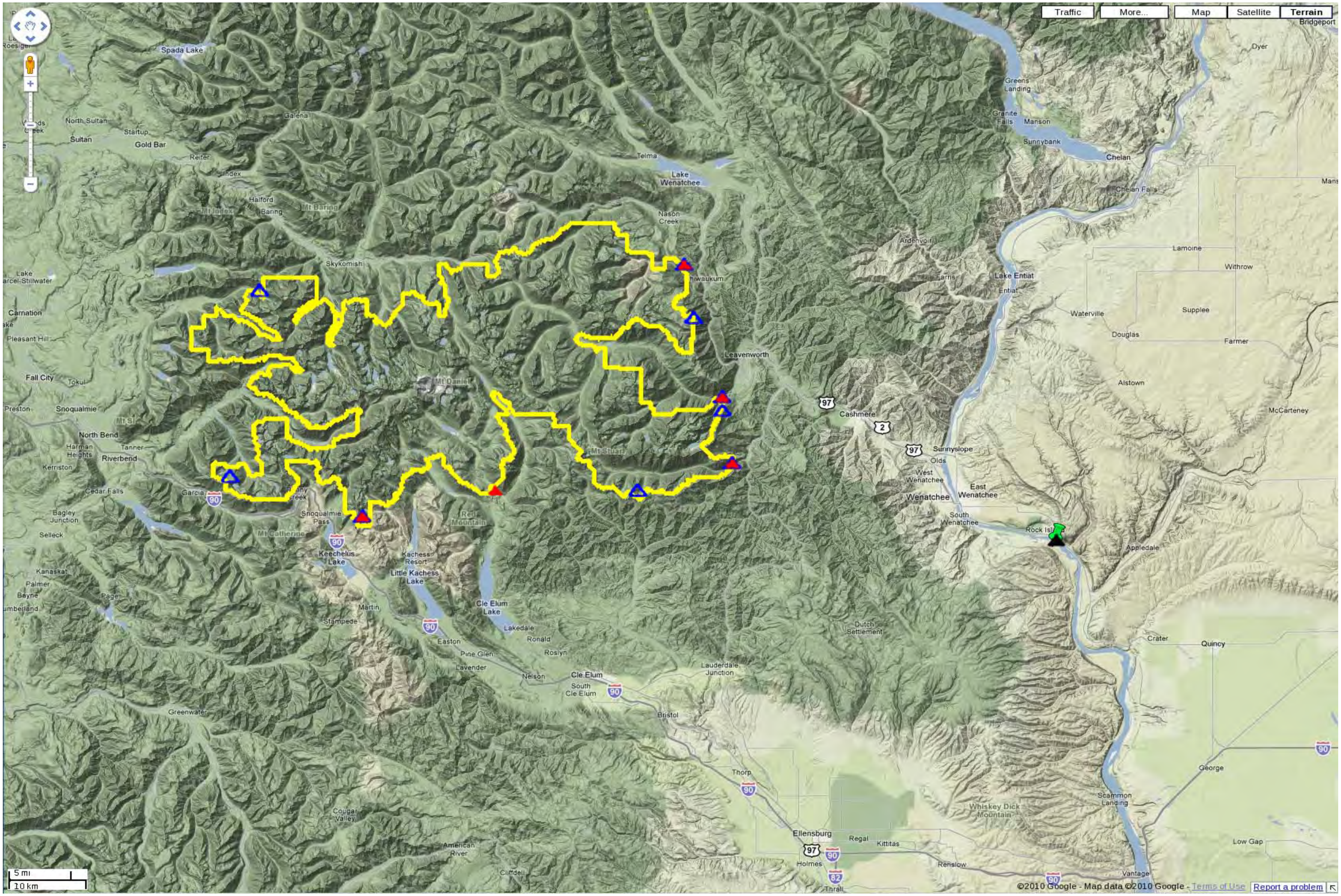

Figure I-8 Locations of the impacts in the highest two percent. The open purple symbols show locations from the 4-km run and the solid red symbols are locations from the 0.5-km run. The green pushpin shows the location of the Alcoa Wenatchee Works smelter. The Alpine Lakes Wilderness is outlined in yellow. Note that in addition to the impacted locations along the east and south wilderness boundary for both grid spacings, the 4-km run has high impacts along the west wilderness boundary, which is west of the crest of the Cascade Mountains.

Washington State Regional Haze State Implementation Plan

Appendix J

Annotated Version of Environmental Protection Agency Best Available Retrofit Technology Guidance

BEST AVAILABLE RETROFIT TECHNOLOGY Determinations Under the Federal Regional Haze Rule

Annotated with the views of the Department of Ecology on specific aspects of the BART process.

Issued June 12, 2007

Direct any questions or comments on the Draft to
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Guidelines for Best Available Retrofit Technology (BART) Determinations under the Regional Haze Rule

Table of Contents

The following guidance is based on 40 CFR Part 51, Appendix Y, Sections IV and V. The EPA guidance is presented in sections II and III of this document essentially as EPA published it. We have slightly revised the text to clarify which actions are the responsibility of the BART source owner, Ecology and the permitting authority, We have also made it clearer which views and opinions are those of EPA where we feel it is necessary to prevent those views and opinions being misinterpreted as those of Ecology.

Highlighted text identifies Ecology's preferred approach or viewpoint on specific aspects of the BART technology analysis and selection process described by EPA.

I. Introduction and Overview

A. What is the purpose of the guidelines?

The purpose of this guidance is to assist soruces and their consultants in developing BART technology analyses. The Guidance contained in sections II and III of this document are the Environmental Protection Agency's (EPA's) approach for determining BART technology and emission limitations for large fossil fueled power plants. The BART determination process described is recommended by EPA for states to use in making BART determinations for other BART eligible facilities. The federal guideline is annotated with the views and positions of Ecology where such information will clarify a requirement or express a preferred approach to an analysis.

Ecology is requiring the use of the control technology determination process in this guideline for all BART eligible sources in Washington, subject to the minor modifications that are noted in this document.

B. Who is the target audience for these guidelines?

This guidance is primarily for the benefit of the sources that are subject to BART and the consultants assisting those sources. Secondarily, they provide information on the content and considerations involved in the development of the BART technical analyses to be submitted to Ecology.

C. What is included in the guidelines?

1. Sections II and III of this document contain EPA's guidance on how to perform a BART determination and how a state is to require implementation of BART determinations.

2. The BART determination process is described in Section II. The section includes a discussion of various actions and evaluations necessary to complete the BART determination process. Ecology will be the final reviewer of the BART analyses submitted by the sources with emission units that are subject to BART. Ecology will make final BART determinations based on the BART analyses developed and submitted by the sources.

3. Section III of these guidelines covers compliance with the BART determination made by Ecology. EPA requires the states to establish federally enforceable emission limits based on the BART determination. The permit or order establishing the emission limitation must include a deadline for compliance, consistent with the BART determination process for each source subject to BART.

D. What is the format of this guidance?

EPA's guidance (40 CFR Part 51, Appendix Y), uses a question and answer format to make the guidelines simpler to understand. EPA recognized that States have the authority to require source owners to assume part of the analytical burden, and that there will be differences in how the supporting information is collected and documented.

Throughout this guideline, are questions starting like "How do I * * *?" and answer with phrases "you should * * *" or "you must * * *" In Washington, the "I" and "you" means the source conducting the analysis.

Note: In the EPA version of this guidance "you" refers to the state, not the source and we always refers to EPA. Ecology has clarified the text to be clear when the source, Ecology or EPA is being referenced.

E. Do the EPA regulations require the use of these guidelines?

Section 169A(b) of the fCAA requires EPA to issue guidelines for States to follow in establishing BART emission limitations for fossil-fuel fired power plants having a capacity in excess of 750 megawatts. Section IV and V of 40 CFR Part 51, Appendix Y fulfills that requirement. The guidelines establish an approach to implementing the requirements of the BART provisions of the regional haze rule. EPA believes that these procedures and the discussion of the requirements of the regional haze rule and the CAA should be useful to the States in evaluating BART for other categories of sources.

Ecology has chosen to adopt the EPA BART guidance for use by all sources that are subject to BART.

II. The BART Determination: Analysis of BART Options

This section describes the process for the analysis of control options for sources subject to BART.

A. What factors must I address in the BART review?

The visibility regulations define BART as follows:

> Best Available Retrofit Technology (BART) means an emission limitation based on the degree of reduction achievable through the application of the best system of continuous emission reduction for each pollutant which is emitted by . . . [a BART-eligible source]. The emission limitation must be established, on a case-by-case basis, taking into consideration the technology available, the costs of compliance, the energy and non-air quality environmental impacts of compliance, any pollution control equipment in use or in existence at the source, the remaining useful life of the source, and the degree of improvement in visibility which may reasonably be anticipated to result from the use of such technology.

The BART analysis identifies the best system of continuous emission reduction taking into account:

(1) The available retrofit control options,
(2) Any pollution control equipment in use at the source (which affects the availability of options and their impacts),
(3) The costs of compliance with control options,
(4) The remaining useful life of the facility,
(5) The energy and non-air quality environmental impacts of control options
(6) The visibility impacts analysis.

B. What is the scope of the BART review?

Once you have determined that the BART eligible emission units at your source are subject to BART for a particular pollutant, then for each BART eligible emission unit, you must establish BART for that pollutant. The BART determination must address air pollution control measures for each emissions unit or pollutant emitting activity subject to review.

> Example: Plantwide emissions from emission units within the listed categories that began operation within the "time window" for BART[1] are 300 tons/yr of NOX, 200 tons/yr of SO2, and 150 tons/yr of primary particulate. Emissions unit A emits 200 tons/yr of NOX, 100 tons/yr of SO2, and 100 tons/yr of primary particulate. Other emission units, units B through H, which began operating in 1966, contribute lesser amounts of each pollutant. For this example, a BART

[1] That is, emission units that were in existence on August 7, 1977 and which began actual operation on or after August 7, 1962.

review is required for NOX, SO2, and primary particulate, and control options must be analyzed for units B through H as well as unit A.

C. How does a BART review relate to Maximum Achievable Control Technology (MACT) Standards under CAA section 112, or to other emission limitations required under the CAA?

For VOC and PM sources subject to MACT standards, you may streamline the analysis by including a discussion of the MACT controls and whether any major new technologies have been developed subsequent to the MACT standards. Many VOC and PM sources are well controlled because they are regulated by MACT standards. For a few MACT standards, this may also be true for SO_2 emissions. Any source subject to MACT standards must meet a level that is as stringent as the best-controlled 12 percent of sources in the industry. Examples of these hazardous air pollutant sources which effectively control VOC and PM emissions include (among others) secondary lead facilities, organic chemical plants subject to the hazardous organic NESHAP (HON), pharmaceutical production facilities, and equipment leaks and wastewater operations at petroleum refineries. EPA anticipates that, in many cases, it will be unlikely that emission controls more stringent than the MACT standards are available that will be cost effective to implement on a particular emission unit. Unless there are new technologies subsequent to the MACT standards which would lead to cost-effective increases in the level of control, you may rely on the MACT standards for purposes of BART.

Compliance with MACT standards issued in the last 10 years are likely to represent the best available technology to control hazardous air pollutants. Many MACT rules use criteria (BART) air pollutants as surrogates for groups of hazardous air pollutants for compliance purposes. However, Ecology wants BART sources to evaluate whether there are available, technically feasible emission controls that are better at controlling the BART pollutants than the MACT level of control. If there are available, technically feasible controls that result in lower emissions than MACT, these controls must be evaluated for cost effectiveness per Steps 3 and 4.

EPA believes that the same rationale also holds true for emissions standards developed for municipal waste incinerators under CAA section 111(d), and for many NSR/PSD determinations and NSR/PSD settlement agreements. However, EPA does not believe that technology determinations from the 1970s or early 1980s, including new source performance standards (NSPS), should be considered to represent best control for existing sources, as best control levels for recent plant retrofits are more stringent than these older levels.

Where you are relying on these standards to represent a BART level of control, you should provide Ecology and the public with a discussion of whether any new technologies have become available subsequent to the time the controls were installed to meet these standards.

> Emission controls installed as a result of a recent state NSR or PSD determination or recent implementation of a consent decree or in response a compliance order are likely to be the BART level of control for that pollutant from that unit. However, you should provide a review of technically feasible controls as part of the BART analysis to support this assumption. If the analysis shows that your BART emission unit(s) are utilizing the best controls (top case) the remaining BART steps need not be completed for that unit.
>
> Ecology will not consider compliance with a NSPS standard as a BART level of control.

D. What Are the Five Basic Steps of a Case-by-Case BART Analysis?

The five steps are:

STEP 1--Identify All[2] Available Retrofit Control Technologies,
STEP 2-- Eliminate Technically Infeasible Options,
STEP 3-- Evaluate Control Effectiveness of Remaining Control Technologies,
STEP 4-- Evaluate Impacts and Document the Results, and
STEP 5--Evaluate Visibility Impacts.

STEP 1: How do I identify all available retrofit emission control techniques?

1. Available retrofit control options are those air pollution control technologies with a practical potential for application to the emissions unit and the regulated pollutant under evaluation. Air pollution control technologies can include a wide variety of available methods, systems, and techniques for control of the affected pollutant. Technologies required as BACT or LAER are available for BART purposes and must be included as control alternatives. The control alternatives can include not only existing controls for the source category in question but also take into account technology transfer of controls that have been applied to similar source categories and gas streams. Technologies which have not yet been applied to (or permitted for) full scale operations need not be considered as available; we do not expect the source owner to purchase or construct a process or control device that has not already been demonstrated in practice.

2. Where a NSPS exists for a source category (which is the case for most of the categories affected by BART), you should include a level of control equivalent to the

[2] In identifying "all" options, you must identify the most stringent option and a reasonable set of options for analysis that reflects a comprehensive list of available technologies. It is not necessary to list all permutations of available control levels that exist for a given technology--the list is complete if it includes the maximum level of control each technology is capable of achieving.

NSPS as one of the control options.[3] The NSPS standards are codified in 40 CFR Part 60. We note that there are situations where NSPS standards do not require the most stringent level of available control for all sources within a category. For example, post-combustion NOX controls (the most stringent controls for stationary gas turbines) are not required under subpart GG of the NSPS for Stationary Gas Turbines. However, such controls must still be considered available technologies for the BART selection process.

In no case should your proposed BART level of control be less stringent than the level of control for the visibility pollutants required by a NSPS or MACT standard that covers the particular emission unit and pollutant. BART eligible emission units that are replaced rather than being upgraded or having controls added are required to install a BACT level of control.

3. Potentially applicable retrofit control alternatives can be categorized in three ways.

- Pollution prevention: use of inherently lower-emitting processes/practices, including the use of control techniques (e.g. low-NOX burners) and work practices that prevent emissions and result in lower "production-specific" emissions (note that it is not EPA's intent to direct States to require sources to switch fuel forms, e.g. from coal to gas),
- Use of (and where already in place, improvement in the performance of) add-on controls, such as scrubbers, fabric filters, thermal oxidizers and other devices that control and reduce emissions after they are produced, and
- Combinations of inherently lower-emitting processes and add-on controls.

4. In the course of the BART review, one or more of the available control options may be eliminated from consideration because they are demonstrated to be technically infeasible or to have unacceptable energy, cost, or non-air quality environmental impacts on a case-by-case (or site-specific) basis. However, at the outset, you should initially identify all control options with potential application to the emissions unit under review.

5. We do not consider BART as a requirement to redesign the source when considering available control alternatives. For example, where the source subject to BART is a coal-fired electric generator, we do not require the BART analysis to consider building a natural gas-fired electric turbine although the turbine may be inherently less polluting on a per unit basis.

[3] In EPA's 1980 BART guidelines for reasonably attributable visibility impairment, EPA concluded that NSPS standards generally, at that time, represented the best level sources could install as BART. In the 20 year period since this guidance was developed, there have been advances in SO2 control technologies as well as technologies for the control of other pollutants, confirmed by a number of recent retrofits at Western power plants. Accordingly, EPA no longer concludes that the NSPS level of controls automatically represents "the best these sources can install."' Analysis of the BART factors could result in the selection of a NSPS level of control, but you should reach this conclusion only after considering the full range of control options.

Ecology recognizes that a source may be able to use the BART analysis as justification to replace an old inefficient unit with a new, more efficient unit that is inherently less polluting or capable of being installed with current emission controls. We encourage you to consider such an opportunity for old emission units.

If you choose to replace a BART emission unit with a new unit, the new unit will need to employ a BACT level of control and as noted in Section III, a schedule for removal of the old unit and installation of the replacement will be needed.

6. For emission units subject to a BART review, there will often be control measures or devices already in place. For such emission units, it is important to include control options that involve improvements to existing controls and not to limit the control options only to those measures that involve a complete replacement of control devices.

> Example: For a power plant with an existing wet scrubber, the current control efficiency is 66 percent. Part of the reason for the relatively low control efficiency is that 22 percent of the gas stream bypasses the scrubber. A BART review identifies options for improving the performance of the wet scrubber by redesigning the internal components of the scrubber and by eliminating or reducing the percentage of the gas stream that bypasses the scrubber. Four control options are identified: (1) 78 percent control based upon improved scrubber performance while maintaining the 22 percent bypass, (2) 83 percent control based upon improved scrubber performance while reducing the bypass to 15 percent, (3) 93 percent control based upon improving the scrubber performance while eliminating the bypass entirely, (this option results in a "wet stack" operation in which the gas leaving the stack is saturated with water) and (4) 93 percent as in option 3, with the addition of an indirect reheat system to reheat the stack gas above the saturation temperature. You must consider each of these four options in a BART analysis for this source.

7. You are expected to identify potentially applicable retrofit control technologies that represent the full range of demonstrated alternatives. Examples of general information sources to consider include:

- The EPA's Clean Air Technology Center, which includes the RACT/BACT/LAER Clearinghouse (RBLC);
- State and Local Best Available Control Technology Guidelines--many agencies have online information--for example South Coast Air Quality Management District, Bay Area Air Quality Management District, and Texas Natural Resources Conservation Commission;
- Control technology vendors;
- Federal/State/Local NSR permits and associated inspection/performance test reports;
- Environmental consultants;

- Technical journals, reports and newsletters, air pollution control seminars; and
- The EPA's NSR bulletin board--http://www.epa.gov/ttn/nsr;
- Department of Energy's Clean Coal Program--technical reports;
- The NOX Control Technology ``Cost Tool''-- Clean Air Markets Division Web page--http://www.epa.gov/airmarkets/arp/nox/controltech.html;
- Performance of selective catalytic reduction on coal- fired steam generating units--final report. OAR/ARD, June 1997 (also available at http://www.epa.gov/airmarkets/arp/nox/controltech.html);
  - Cost estimates for selected applications of NOX control technologies on stationary combustion boilers. OAR/ARD June 1997. (Docket for NOX SIP Call, A-96-56, item II-A-03);
- Investigation of performance and cost of NOX controls as applied to group 2 boilers. OAR/ARD, August 1996. (Docket for Phase II NOX rule, A-95-28, item IV-A-4);
- Controlling SO2 Emissions: A Review of Technologies. EPA-600/R-00-093, USEPA/ORD/NRMRL, October 2000; and
- The OAQPS Control Cost Manual.

In the above list, EPA has cited specific documents which do not reflect the current state of the art for emission controls for BART sources. Newer emission control information is available through EPA, the National Association of Clean Air Agencies, the Northeast States for Coordinated Air Use Management (NESCAUM), Western Regional Air Partnership (WRAP), Lake Michigan Air Directors Consortium (LADCO), National Council on Air and Stream Improvement (NCASI), Institute of Clean Air Companies, and other organizations have reports and other information which reflects current knowledge about the availability and use of emission controls for various source types and industries. Your review of controls system availability should reference these newer information sources. Ecology engineers reviewing the BART analyses will make use of these newer information sources in their reviews.

You are expected to compile appropriate information from these information sources.

8. There may be situations where a specific set of units within a fenceline constitutes the logical set to which controls would apply and that set of units may or may not all be BART-eligible. (For example, some units in that set may not have been constructed between 1962 and 1977.)

While you are required to evaluate and install BART controls on only those units that are BART eligible, there may be plant specific situations where expanding the number of individual emission units or emission points beyond the BART eligible units makes more process or economic sense. While we cannot require such an expanded evaluation, we encourage you to evaluate implementation of such control opportunities when they present themselves.

While reductions in emissions from non-BART emission units are not part of BART, these additional reductions are evidence of your facility going beyond the BART minimum and will be reflected in the Regional Haze Implementation Plan as part of our 'reasonable further progress' to reduce haze from non-BART emission units.

9. If you find that a BART eligible emission unit has controls already in place which are the most stringent controls available (note that this means that all possible improvements to any control devices have been made), then it is not necessary to comprehensively complete each following step of the BART analysis in this section. As long these most stringent controls available are or can be made federally enforceable for the purpose of implementing BART for that source, you may skip the remaining analyses in this section, including the visibility analysis in step 5. Likewise, if a source commits to a BART determination that consists of the most stringent controls available, then there is no need to complete the remaining analyses in this section.

Ecology will consider whether a recent BACT determination, compliance order, or Consent Order based limitation on a particular emission unit satisfies the BART requirements for that unit. You will need to document your rationale that the required controls are BART for that unit.

We encourage you to work with the appropriate Ecology staff during development of your BART analysis if you believe a BACT determination, compliance order, or Consent Order limit represents BART.

STEP 2: How do I determine whether the options identified in Step 1 are technically feasible?

In Step 2, you evaluate the technical feasibility of the control options you identified in Step 1. You should document a demonstration of technical infeasibility and should explain, based on physical, chemical, or engineering principles, why technical difficulties would preclude the successful use of the control option on the emissions unit under review. You may then eliminate such technically infeasible control options from further consideration in the BART analysis.

In general, what do we mean by technical feasibility?

Control technologies are technically feasible if either (1) they have been installed and operated successfully for the type of source under review under similar conditions, or (2) the technology could be applied to the source under review. Two key concepts are important in determining whether a technology could be applied: "availability" and "applicability." As explained in more detail below, a technology is considered "available" if the source owner may obtain it through commercial channels, or it is otherwise available within the common sense meaning of the term. An available technology is "applicable" if it can reasonably be installed and operated on the source type under consideration. A technology that is available and applicable is technically feasible.

What do we mean by ``available'' technology?

1. The typical stages for bringing a control technology concept to reality as a commercial product are:

- Concept stage;
- Research and patenting;
- Bench scale or laboratory testing;
- Pilot scale testing;
- Licensing and commercial demonstration; and
- Commercial sales.

2. A control technique is considered available, within the context presented above, if it has reached the stage of licensing and commercial availability. Similarly, we do not expect a source owner to conduct extended trials to learn how to apply a technology on a totally new and dissimilar source type. Consequently, you would not consider technologies in the pilot scale testing stages of development as "available" for purposes of BART review.

3. Commercial availability by itself, however, is not necessarily a sufficient basis for concluding a technology to be applicable and therefore technically feasible. Technical feasibility, as determined in Step 2, also means a control option may reasonably be deployed on or "applicable" to the source type under consideration.

Because a new technology may become available at various points in time during the BART analysis process, we believe that guidelines are needed on when a technology must be considered. For example, a technology may become available during the public comment period on the State's rule development process. Likewise, it is possible that new technologies may become available after the close of the public comment period on the State's BART determination, and before submittal of the SIP to EPA, or during EPA's review process on the SIP submittal. In order to provide certainty in the process, all technologies should be considered if available before the close of the BART determination's public comment period. You need not consider technologies that become available after this date. As part of Ecology's analysis, we must consider any technologies brought to our attention in public comments. If Ecology disagrees with public comments asserting that the technology is available, we will provide an explanation for the public record as to the basis for our conclusion.

The source owner need only consider technologies that are available as of the date you submit your BART analysis. You need not consider technologies that become available after your BART analysis is submitted to Ecology. However, Ecology must consider all information received during public comment that may affect its determination of BART for a particular source's emission unit(s).

What do we mean by "applicable"' technology?

You need to exercise technical judgment in determining whether a control alternative is applicable to the source type under consideration. In general, a commercially available control option will be presumed applicable if it has been used on the same or a similar source type. Absent a showing of this type, you evaluate technical feasibility by examining the physical and chemical characteristics of the pollutant-bearing gas stream, and comparing them to the gas stream characteristics of the source types to which the technology had been applied previously. Deployment of the control technology on a new or existing source with similar gas stream characteristics is generally a sufficient basis for concluding the technology is technically feasible barring a demonstration to the contrary as described below.

What type of demonstration is required if I conclude that an option is not technically feasible?

1. Where you conclude that a control option identified in Step 1 is technically infeasible, you should demonstrate that the option is either commercially unavailable, or that specific circumstances preclude its application to a particular emission unit. Generally, such a demonstration involves an evaluation of the characteristics of the pollutant-bearing gas stream and the capabilities of the technology. Alternatively, a demonstration of technical infeasibility may involve a showing that there are unresolvable technical difficulties with applying the control to the source (e.g., size of the unit, location of the proposed site, operating problems related to specific circumstances of the source, space constraints, reliability, and adverse side effects on the rest of the facility). Where the resolution of technical difficulties is merely a matter of increased cost, you should consider the technology to be technically feasible. The cost of a control alternative is considered later in the process.

2. The determination of technical feasibility is sometimes influenced by recent air quality permits. In some cases, an air quality permit may require a certain level of control, but the level of control in a permit is not expected to be achieved in practice (e.g., a source has received a permit but the project was canceled, or every operating source at that permitted level has been physically unable to achieve compliance with the limit). Where this is the case, you should provide supporting documentation showing why such limits are not technically feasible, and, therefore, why the level of control (but not necessarily the technology) may be eliminated from further consideration. However, if there is a permit requiring the application of a certain technology or emission limit to be achieved for such technology, this usually is sufficient justification for you to assume the technical feasibility of that technology or emission limit.

3. Physical modifications needed to resolve technical obstacles do not, in and of themselves, provide a justification for eliminating the control technique on the basis of technical infeasibility. However, you may consider the cost of such modifications in estimating costs. This, in turn, may form the basis for eliminating a control technology (see later discussion).

4. Vendor guarantees may provide an indication of commercial availability and the technical feasibility of a control technique and could contribute to a determination of technical feasibility or technical infeasibility, depending on circumstances. However, we do not consider a vendor guarantee alone to be sufficient justification that a control option will work. Conversely, lack of a vendor guarantee by itself does not present sufficient justification that a control option or an emissions limit is technically infeasible. Generally, you should make decisions about technical feasibility based on chemical, and engineering analyses (as discussed above), in conjunction with information about vendor guarantees.

5. A possible outcome of the BART procedures discussed in these guidelines is the evaluation of multiple control technology alternatives which result in essentially equivalent emissions. It is not our intent to encourage evaluation of unnecessarily large numbers of control alternatives for every emissions unit. Consequently, you should use judgment in deciding on those alternatives for which you will conduct the detailed impacts analysis (Step 4 below). For example, if two or more control techniques result in control levels that are essentially identical, considering the uncertainties of emissions factors and other parameters pertinent to estimating performance, you may evaluate only the less costly of these options. You should narrow the scope of the BART analysis in this way only if there is a negligible difference in emissions and energy and non-air quality environmental impacts between control alternatives.

If you consider limiting the number of control options evaluated in Step 3 based on these considerations in the preceding paragraph, discuss your approach and rationale with Ecology prior to proceeding with Step 3.

There may be situations where a greater total pollutant reduction in all pollutants may be achieved by one technology choice while greater visibility improvement may be achieved at a lower emission reduction for some pollutants with another technology. Since this program is to reduce visibility impairment in our Class I areas, it would be reasonable to propose the emission control technology resulting in the greatest visibility improvement as BART.

STEP 3: How do I evaluate technically feasible alternatives?

Step 3 involves evaluating the control effectiveness of all the technically feasible control alternatives identified in Step 2 for the pollutant and emissions unit under review.

Two key issues in this process include:

(1) Making sure that you express the degree of control using a metric that ensures an ``apples to apples'' comparison of emissions performance levels among options, and

(2) Giving appropriate treatment and consideration of control techniques that can operate over a wide range of emission performance levels.

What are the appropriate metrics for comparison?

This issue is especially important when you compare inherently lower-polluting processes to one another or to add-on controls. In such cases, it is generally most effective to express emissions performance as an average steady state emissions level per unit of product produced or processed.

Examples of common metrics:

- Pounds of SO_2 emissions per thousand pounds of Black Liquor Solids
- Pounds of SO_2 emissions per million Btu heat input, and
- Pounds of NOx emissions per ton of cement produced.

In all cases, emission rates are also to be reported as pounds or kilograms/hour to provide the information necessary for dispersion modeling.

How do I evaluate control techniques with a wide range of emission performance levels?

1. Many control techniques, including both add-on controls and inherently lower polluting processes, can perform at a wide range of levels. Scrubbers and high and low efficiency electrostatic precipitators (ESPs) are two of the many examples of such control techniques that can perform at a wide range of levels. It is not our intent to require analysis of each possible level of efficiency for a control technique as such an analysis would result in a large number of options. It is important, however, that in analyzing the technology you take into account the most stringent emission control level that the technology is capable of achieving. You should consider recent regulatory decisions and performance data (e.g., manufacturer's data, engineering estimates and the experience of other sources) when identifying an emissions performance level or levels to evaluate.

2. In assessing the capability of the control alternative, latitude exists to consider special circumstances pertinent to the specific source under review, or regarding the prior application of the control alternative. However, you should explain the basis for choosing the alternate level (or range) of control in the BART analysis. Without a showing of differences between the source and other sources that have achieved more

stringent emissions limits, you should conclude that the level being achieved by those other sources is representative of the achievable level for the source being analyzed.

3. You may encounter cases where you may wish to evaluate other levels of control in addition to the most stringent level for a given device. While you must consider the most stringent level as one of the control options, you may consider less stringent levels of control as additional options. This would be useful, particularly in cases where the selection of additional options would have widely varying costs and other impacts.

4. Finally, we note that for retrofitting existing sources in addressing BART, you should consider ways to improve the performance of existing control devices, particularly when a control device is not achieving the level of control that other similar sources are achieving in practice with the same device. For example, you should consider requiring those sources with electrostatic precipitators (ESPs) performing below currently achievable levels to improve their performance.

STEP 4: For a BART review, what impacts am I expected to calculate and report? What methods does EPA recommend for the impacts analysis?

After you identify the available and technically feasible control technology options, you are expected to conduct the following analyses when you make a BART determination:

- Impact analysis part 1: Costs of compliance,
- Impact analysis part 2: Energy impacts, and
- Impact analysis part 3: Non-air quality environmental impacts.
- Impact analysis part 4: Remaining useful life.

In this section, we describe how to conduct each of these analyses. You are responsible for presenting an evaluation of each impact along with appropriate supporting information. You should discuss and, where possible, quantify both beneficial and adverse impacts. In general, the analysis should focus on the direct impact of the control alternative.

In your BART analysis, identify any collateral emission increases in other regulated air pollutants resulting from use of a particular control technology. This analysis includes increases in the emissions of Toxic Air Pollutants regulated under Chapter 173-460 WAC. When analyzing alternative control technologies and levels at this point in the overall analysis, the collateral impacts need only be qualitatively analyzed.

If the emissions controls that you propose as BART results in collateral air pollutant increases, you must quantify the resulting emission change and identify the regulatory requirements that are triggered. The level of accuracy need not be equal to what would be required for a permit application, but must be accurate enough to determine whether permitting requirements are triggered.

To determine if the collateral emission increase is subject to the state Notice of Construction program, use the standard procedures used by your permitting authority.

To determine if the collateral emission increase is subject to the Prevention of Significant Deterioration program, use the calculation procedures in the rules for that program.

a. Impact analysis part 1: how do I estimate the costs of control?

1. To conduct a cost analysis, you:
   a. Identify the emissions units being controlled,
   b. Identify design parameters for emission controls, and
   c. Develop cost estimates based upon those design parameters.

2. It is important to identify clearly the emission units being controlled, that is, to specify a well-defined area or process segment within the plant. In some cases, multiple emission units can be controlled jointly. However, in other cases, it may be appropriate in the cost analysis to consider whether multiple units will be required to install separate and/or different control devices. The analysis should provide a clear summary list of equipment and the associated control costs. Inadequate documentation of the equipment whose emissions are being controlled is a potential cause for confusion in comparison of costs of the same controls applied to similar sources.

3. You then specify the control system design parameters. Potential sources of these design parameters include equipment vendors, background information documents used to support NSPS development, control technique guidelines documents, cost manuals developed by EPA, control data in trade publications, and engineering and performance test data. The following are a few examples of design parameters for two example control measures:

Control device	Examples of design parameters
Wet Scrubbers.................	Type of sorbent used (lime, limestone, etc.). Gas pressure drop. Liquid/gas ratio.
Selective Catalytic Reduction	Ammonia to NOx molar ratio. Pressure drop. Catalyst life.

4. The value selected for the design parameter should ensure that the control option will achieve the level of emission control being evaluated. You should include in your

analysis documentation of your assumptions regarding design parameters. Examples of supporting references would include the EPA OAQPS Control Cost Manual (see below) and background information documents used for NSPS and hazardous pollutant emission standards. If the design parameters you specified differ from typical designs, you should document the difference by supplying performance test data for the control technology in question applied to the same source or a similar source.

5. Once the control technology alternatives and achievable emissions performance levels have been identified, you then develop estimates of capital and annual costs. The basis for equipment cost estimates also should be documented, either with data supplied by an equipment vendor (i.e., budget estimates or bids) or by a referenced source (such as the OAQPS Control Cost Manual, EPA/452/B-02-001, January, 2002)[4]. In order to maintain and improve consistency, cost estimates should be based on the OAQPS Control Cost Manual, where possible[5]. The Control Cost Manual addresses most control technologies in sufficient detail for a BART analysis. The cost analysis should also take into account any site- specific design or other conditions identified above that affect the cost of a particular BART technology option.

This step in the BART determination process is where site specific design and other conditions that affect the cost to install and operate a particular control option are considered. The ability to evaluate site specific cost issues related to the retrofitting of an emission control on an existing emission unit is an extremely important aspect of the BART cost analysis.

Where site specific conditions exist that significantly affect the cost to utilize an emission control technique, clearly document the site specific conditions and rationale for the capital or annual costs related to that condition.

i. What do we mean by cost effectiveness?

Cost effectiveness, in general, is a criterion used to assess the potential for achieving an objective in the most economical way. For purposes of air pollutant analysis, "effectiveness" is measured in terms of tons of pollutant emissions removed, and "cost" is measured in terms of annualized control costs. We recommend two types of cost-effectiveness calculations--average cost effectiveness, and incremental cost effectiveness.

[4] The OAQPS Control Cost Manual is updated periodically. While this citation refers to the latest version at the time this guidance was written, you should use the version that is current as of when you conduct your impact analysis. This document is available at the following Web site: http://www.epa.gov/ttn/catc/dir1/cs1ch2.pdf .

[5] You should include documentation for any additional information you used for the cost calculations, including any information supplied by vendors that affects your assumptions regarding purchased equipment costs, equipment life, replacement of major components, and any other element of the calculation that differs from the Control Cost Manual.

ii. How do I calculate average cost effectiveness?

Average cost effectiveness means the total annualized costs of control divided by annual emissions reductions (the difference between baseline annual emissions and the estimate of emissions after controls), using the following formula:

Average cost effectiveness (dollars per ton removed) = Control option annualized cost[6] / (Baseline annual emissions--Annual emissions with Control option)

Because you calculate costs in (annualized) dollars per year ($/ yr) and because you calculate emissions rates in tons per year (tons/yr), the result is an average cost-effectiveness number in (annualized) dollars per ton ($/ton) of pollutant removed.

All cost analyses need to use 2006 dollars and a capital recovery factor of 7 %. Consider "average cost effectiveness" to be the same as "cost effectiveness" since this guideline does not indicate what is to be averaged.

To determine annualized cost, follow the procedures in the EPA Air Pollution Control Cost Manual, Sixth edition (EPA/452/B-02-001, January, 2002).

Unless there is a characteristic of the control technology that requires a different lifetime or the Control Cost Manual lists a different equipment lifetime, utilize a control equipment lifetime of at least 10 years. If a different lifetime is used, document your rationale for the use of the different lifetime.

iii. How do I calculate baseline emissions?

1. The baseline emissions rate should represent a realistic depiction of anticipated annual emissions for the source. In general, for the existing sources subject to BART, you will estimate the anticipated annual emissions based upon actual emissions from a baseline period.

2. When you project that future operating parameters (e.g., limited hours of operation or capacity utilization, type of fuel, raw materials or product mix or type) will differ from past practice, and if this projection has a deciding effect in the BART determination, then you must make these parameters or assumptions into enforceable limitations. In the absence of enforceable limitations, you calculate baseline emissions based upon continuation of past practice.

[6] Whenever you calculate or report annual costs, you should indicate the year for which the costs are estimated. For example, if you use the year 2000 as the basis for cost comparisons, you would report that an annualized cost of $20 million would be: $20 million (year 2000 dollars).

3. For example, the baseline emissions calculation for an emergency standby generator may consider the fact that the source owner would not operate more than past practice of 2 weeks a year. On the other hand, baseline emissions associated with a base-loaded turbine should be based on its past practice which would indicate a large number of hours of operation. This produces a significantly higher level of baseline emissions than in the case of the emergency/standby unit and results in more cost-effective controls. As a consequence of the dissimilar baseline emissions, BART for the two cases could be very different.

In general the baseline emissions should be the "actual emissions"[7] for the 2 year period preceding the BART analysis. A different 24 month period may be accepted by Ecology as more representative of normal operations. Examples of reasons to choose a different 24 month period to determine baseline emissions would be an extended unit or plant outage, a labor strike, raw material supply disruption, etc.

It is appropriate to adjust a unit's baseline emission rates to reflect the impact of recently installed modifications or emission control equipment that is not reflected in the baseline emissions determined based on the preceding paragraph.

Work with Ecology to define and document the basis for using a different 2 year period or adjusting baseline emission rates.

In the case of a fossil fueled power plant, the actual emissions for SO_2 and NOx emissions for each BART eligible unit will be based on the emissions during the most recent 8 calendar quarters reported to the EPA Clean Air Markets Division. A different time period may be used for a unit if the plant can demonstrate that one of those years was not representative of normal operation.

iv. How do I calculate incremental cost effectiveness?

1. In addition to the average cost effectiveness of a control option, you should also calculate incremental cost effectiveness. You should consider the incremental cost effectiveness in combination with the average cost effectiveness when considering whether to eliminate a control option. The incremental cost effectiveness calculation compares the costs and performance level of a control option to those of the next most stringent option, as shown in the following formula (with respect to cost per emissions reduction):

Incremental Cost Effectiveness (dollars per incremental ton removed) = (Total annualized costs of control option) - (Total annualized costs of next control option) / (Control option annual emissions) - (Next control option annual emissions)

[7] As defined in WAC 173-400-030(1).

Example 1: Assume that Option F on Figure 2 has total annualized costs of $1 million to reduce 2000 tons of a pollutant, and that Option D on Figure 2 has total annualized costs of $500,000 to reduce 1000 tons of the same pollutant. The incremental cost effectiveness of Option F relative to Option D is ($1 million - $500,000) divided by (2000 tons - 1000 tons), or $500,000 divided by 1000 tons, which is $500/ton.

Example 2: Assume that two control options exist: Option 1 and Option 2. Option 1 achieves a 1,000 ton/yr reduction at an annualized cost of $1,900,000. This represents an average cost of ($1,900,000/1,000 tons) = $1,900/ton. Option 2 achieves a 980 tons/ yr reduction at an annualized cost of $1,500,000. This represents an average cost of ($1,500,000/980 tons) = $1,531/ton. The incremental cost effectiveness of Option 1 relative to Option 2 is ($1,900,000 - $1,500,000) divided by (1,000 tons - 980 tons). The adoption of Option 1 instead of Option 2 results in an incremental emission reduction of 20 tons per year at an additional cost of $400,000 per year. The incremental cost of Option 1, then, is $20,000 per ton - 11 times the average cost of $1,900 per ton. While $1,900 per ton may still be deemed reasonable, it is useful to consider both the average and incremental cost in making an overall cost-effectiveness finding. Of course, there may be other differences between these options, such as, energy or water use, or non-air environmental effects, which also should be considered in selecting a BART technology.

2. You should exercise care in deriving incremental costs of candidate control options. Incremental cost-effectiveness comparisons should focus on annualized cost and emission reduction differences between "dominant" alternatives. To identify dominant alternatives, you generate a graphical plot of total annualized costs for total emissions reductions for all control alternatives identified in the BART analysis, and by identifying a "least-cost envelope" as shown in Figure 2. (A "least-cost envelope" represents the set of options that should be dominant in the choice of a specific option.)

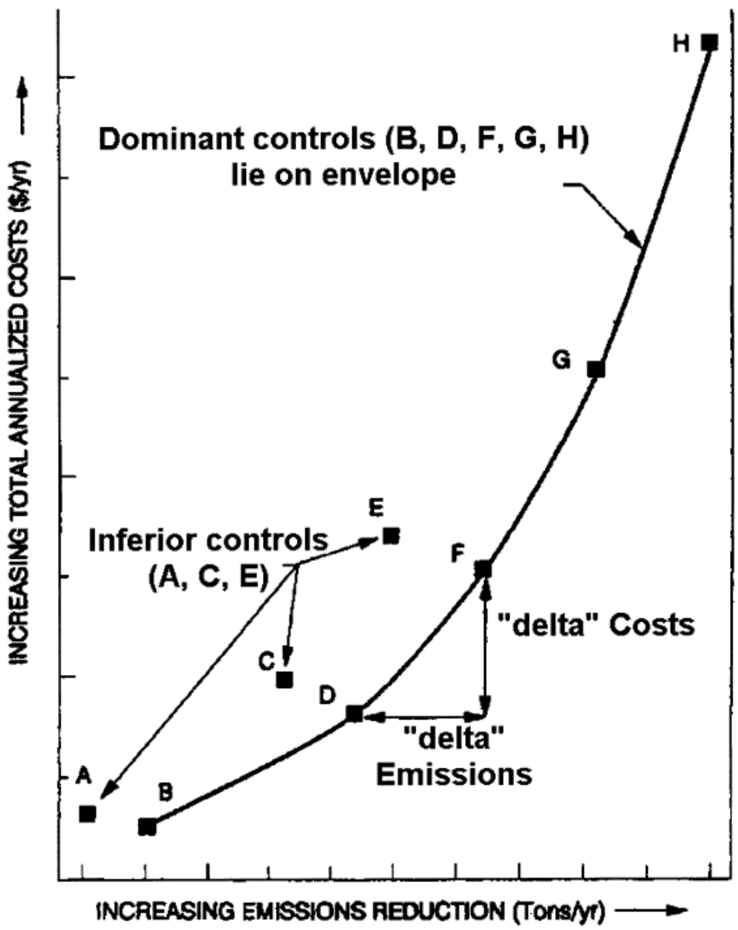

Figure 2. Least-cost Envelope.

Example: Eight technically feasible control options for analysis are listed. These are represented as A through H in Figure 2. The dominant set of control options, B, D, F, G, and H, represent the least-cost envelope, as we depict by the cost curve connecting them. Points A, C and E are inferior options, and you should not use them in calculating incremental cost effectiveness. Points A, C and E represent inferior controls because B will buy more emissions reductions for less money than A; and similarly, D and F will buy more reductions for less money than C and E, respectively.

3. In calculating incremental costs, you:

(1) Array the control options in ascending order of annualized total costs,

(2) Develop a graph of the most reasonable smooth curve of the control options, as shown in Figure 2. This is to show the "least- cost envelope" discussed above; and

(3) Calculate the incremental cost effectiveness for each dominant option, which is the difference in total annual costs between that option and the next most stringent option, divided by the difference in emissions, after controls have been applied, between those two control options. For example, using Figure 2, you would calculate incremental cost effectiveness for the difference between options B and D, options D and F, options F and G, and options G and H.

4. A comparison of incremental costs can also be useful in evaluating the viability of a specific control option over a range of efficiencies. For example, depending on the capital and operational cost of a control device, total and incremental cost may vary significantly (either increasing or decreasing) over the operational range of a control device. Also, the greater the number of possible control options that exist, the more weight should be given to the incremental costs vs. average costs. It should be noted that average and incremental cost effectiveness are identical when only one candidate control option is known to exist.

5. You should exercise caution not to misuse these techniques. For example, you may be faced with a choice between two available control devices at a source, control A and control B, where control B achieves slightly greater emission reductions. The average cost (total annual cost/total annual emission reductions) for each may be deemed to be reasonable. However, the incremental cost (total annual cost A - B/total annual emission reductions A - B) of the additional emission reductions to be achieved by control B may be very great. In such an instance, it may be inappropriate to choose control B, based on its high incremental costs, even though its average cost may be considered reasonable.

6. In addition, when you evaluate the average or incremental cost effectiveness of a control alternative, you should make reasonable and supportable assumptions regarding control efficiencies. An unrealistically low assessment of the emission reduction potential of a certain technology could result in inflated cost-effectiveness figures.

Ecology does not expect that you will develop a least cost envelope such as that shown in Figure 2 for each emission unit and pollutant. We anticipate that due to the top-down analysis approach of the BART technology analysis, the information necessary for you to propose a technology as BART will be adequate for Ecology to make a BART determination.

v. What other information should I provide in the cost impacts analysis?

You should provide documentation of any unusual circumstances that exist for the source that would lead to cost-effectiveness estimates that would exceed that for recent retrofits. This is especially important in cases where recent retrofits have cost-effectiveness values that are within what has been considered a reasonable range, but your analysis concludes that costs for the source being analyzed are not considered reasonable. (A reasonable range would be a range that is consistent with the range of cost effectiveness values used in other similar permit decisions over a period of time.)

> Example: In an arid region, large amounts of water are needed for a scrubbing system. Acquiring water from a distant location could greatly increase the cost per ton of emissions reduced of wet scrubbing as a control option.

vi. What other things are important to consider in the cost impacts analysis?

In the cost analysis, you should take care not to focus on incomplete results or partial calculations. For example, large capital costs for a control option alone would not preclude selection of a control measure if large emissions reductions are projected. In such a case, low or reasonable cost effectiveness numbers may validate the option as an appropriate BART alternative irrespective of the large capital costs. Similarly, projects with relatively low capital costs may not be cost effective if there are few emissions reduced.

There are some control technologies or techniques that control multiple visibility impairing pollutants. Where such a technology or technique is available, the cost effectiveness analysis should evaluate the technology for the total of all visibility impairing pollutants controls. This cost effectiveness would be compared the total effectiveness of the best pollutant specific technologies that can be operated together and control the same visibility impairing pollutants.

b. Impact analysis part 2: How should I analyze and report energy impacts?

1. You should examine the energy requirements of the control technology and determine whether the use of that technology results in energy penalties or benefits. A source owner may, for example, benefit from the combustion of a concentrated gas stream rich in volatile organic compounds; on the other hand, more often extra fuel or electricity is required to power a control device or incinerate a dilute gas stream. If such benefits or penalties exist, they should be quantified to the extent practicable. Because

energy penalties or benefits can usually be quantified in terms of additional cost or income to the source, the energy impacts analysis can, in most cases, simply be factored into the cost impacts analysis. The fact of energy use in and of itself does not disqualify a technology.

2. Your energy impact analysis should consider only direct energy consumption and not indirect energy impacts. For example, you could estimate the direct energy impacts of the control alternative in units of energy consumption at the source (e.g., BTU, kWh, barrels of oil, tons of coal). The energy requirements of the control options should be shown in terms of total (and in certain cases, also incremental) energy costs per ton of pollutant removed. You can then convert these units into dollar costs and, where appropriate, factor these costs into the control cost analysis.

3. You generally do not consider indirect energy impacts (such as energy to produce raw materials for construction of control equipment). However, if you determine that the indirect energy impact is unusual or significant and that the impact can be well quantified, you may consider the indirect impact.

4. The energy impact analysis may also address concerns over the use of locally scarce fuels. The designation of a scarce fuel may vary from region to region. However, in general, a scarce fuel is one which is in short supply locally and can be better used for alternative purposes, or one which may not be reasonably available to the source either at the present time or in the near future.

5. Finally, the energy impacts analysis may consider whether there are relative differences between alternatives regarding the use of locally or regionally available coal, and whether a given alternative would result in significant economic disruption or unemployment. For example, where two options are equally cost effective and achieve equivalent or similar emissions reductions, one option may be preferred if the other alternative results in significant disruption or unemployment.

Two options may be equally cost effective but result in differing regional haze improvements. The option with the best regional haze improvement may also be preferred over the other option.

Please document all assumptions utilized in calculating energy costs. As suggested above, include the energy costs in the overall cost effectiveness analysis.

c. Impact analysis part 3: How do I analyze "non-air quality environmental impacts?"

1. In the non-air quality related environmental impacts portion of the BART analysis, you address environmental impacts other than air quality due to emissions of the

pollutant in question. Such environmental impacts include solid or hazardous waste generation and discharges of polluted water from a control device.

2. You should identify any significant or unusual environmental impacts associated with a control alternative that have the potential to affect the selection or elimination of a control alternative. Some control technologies may have potentially significant secondary environmental impacts. Scrubber effluent, for example, may affect water quality and land use. Alternatively, water availability may affect the feasibility and costs of wet scrubbers. Other examples of secondary environmental impacts could include hazardous waste discharges, such as spent catalysts or contaminated carbon. Generally, these types of environmental concerns become important when sensitive site-specific receptors exist or when the incremental emissions reductions potential of the more stringent control is only marginally greater than the next most-effective option. However, the fact that a control device creates liquid and solid waste that must be disposed of does not necessarily argue against selection of that technology as BART, particularly if the control device has been applied to similar facilities elsewhere and the solid or liquid waste is similar to those other applications. On the other hand, where you can show that unusual circumstances at the proposed facility create greater problems than experienced elsewhere, this may provide a basis for the elimination of that control alternative as BART.

3. The procedure for conducting an analysis of non-air quality environmental impacts should be made based on a consideration of site-specific circumstances. If you propose to adopt the most stringent alternative, then it is not necessary to perform this analysis of environmental impacts for the entire list of technologies you ranked in Step 3. In general, the analysis need only address those control alternatives with any significant or unusual environmental impacts that have the potential to affect the selection of a control alternative, or elimination of a more stringent control alternative. Thus, any important relative environmental impacts (both positive and negative) of alternatives can be compared with each other.

4. In general, the analysis of impacts starts with the identification and quantification of the solid, liquid, and gaseous discharges from the control device or devices under review. Initially, you should perform a qualitative or semi-quantitative screening to narrow the analysis to discharges with potential for causing adverse environmental effects. Next, you should assess the mass and composition of any such discharges and quantify them to the extent possible, based on readily available information. You should also assemble pertinent information about the public or environmental consequences of releasing these materials.

The BART program does not contain a requirement to look at other air quality impacts, just non-air quality impacts. Ecology is requiring a review of collateral emission changes and (in a deferred way) the air quality impacts of a particular BART control technique.

We encourage you to evaluate air quality impacts of BART emission controls as part of the overall evaluation of what is BART for a specific emission unit.

d. Impact analysis part 4: What are examples of non-air quality environmental impacts?

The following are examples of how to conduct non-air quality environmental impacts:

(1) Water Impact
You should identify the relative quantities of water used and water pollutants produced and discharged as a result of the use of each alternative emission control system. Where possible, you should assess the effect on ground water and such local surface water quality parameters as ph, turbidity, dissolved oxygen, salinity, toxic chemical levels, temperature, and any other important considerations. The analysis could consider whether applicable water quality standards will be met and the availability and effectiveness of various techniques to reduce potential adverse effects.

(2) Solid Waste Disposal Impact
You could also compare the quality and quantity of solid waste (e.g., sludges, solids) that must be stored and disposed of or recycled as a result of the application of each alternative emission control system. You should consider the composition and various other characteristics of the solid waste (such as permeability, water retention, rewatering of dried material, compression strength, leachability of dissolved ions, bulk density, ability to support vegetation growth and hazardous characteristics) which are significant with regard to potential surface water pollution or transport into and contamination of subsurface waters or aquifers.

(3) Irreversible or Irretrievable Commitment of Resources
You may consider the extent to which the alternative emission control systems may involve a trade-off between short-term environmental gains at the expense of long-term environmental losses and the extent to which the alternative systems may result in irreversible or irretrievable commitment of resources (for example, use of scarce water resources).

(4) Other Adverse Environmental Impacts
You may consider significant differences in noise levels, radiant heat, or dissipated static electrical energy of pollution control alternatives. Other examples of non-air quality environmental impacts would include hazardous waste discharges such as spent catalysts or contaminated carbon.

There are many other non-air quality impacts that could be listed. If there are non-air quality impacts specific to your facility or the area around it that need to be minimized, we encourage you to include those impacts in your evaluation.

e. How do I take into account a project's "remaining useful life" in calculating control costs?

1. You may decide to treat the requirement to consider the source's "remaining useful life'' of the source for BART determinations as one element of the overall cost analysis. The "remaining useful life'' of a source, if it represents a relatively short time period, may affect the annualized costs of retrofit controls. For example, the methods for calculating annualized costs in EPA's OAQPS Control Cost Manual require the use of a specified time period for amortization that varies based upon the type of control. If the remaining useful life will clearly exceed this time period, the remaining useful life has essentially no effect on control costs and on the BART determination process. Where the remaining useful life is less than the time period for amortizing costs, you should use this shorter time period in your cost calculations.

If the remaining useful life is less than the time used to annualize/amortize the costs of the potential emission controls, you need to document why the useful life of the emission unit is shorter.

2. For purposes of these guidelines, the remaining useful life is the difference between:

(1) The date that controls will be put in place (capital and other construction costs incurred before controls are put in place can be rolled into the first year, as suggested in EPA's OAQPS Control Cost Manual); you are conducting the BART analysis; and

(2) The date the facility permanently stops operations. Where this affects the BART determination, this date should be assured by a federally- or State-enforceable restriction preventing further operation.

3. EPA recognizes that there may be situations where you intend to shut down a source (or emission unit) by a given date, but wishes to retain the flexibility to continue operating beyond that date in the event, for example, that market conditions change. Where this is the case, your BART analysis may account for this, but it must maintain consistency with the statutory requirement to install BART within 5 years. Where you choose to not accept a federally enforceable condition requiring the source (or emission unit) to shut down by a given date, it is necessary to determine whether a reduced time period for the remaining useful life changes the level of controls that would be required as BART.

If the reduced time period does change the level of BART controls, the state may identify, and include as part of the BART emission limitation, the more stringent level of control that would be required as BART if there were no assumption that reduced the remaining useful life. The state may incorporate into the BART emission limit this more stringent level, which would serve as a contingency should the source continue operating more than 5 years after the date EPA approves the relevant SIP. You would not be allowed to operate the source (or emission unit) after the 5-year mark without such controls. If you do operate the source (or emission unit) after the 5-year mark without BART in place, you will be considered to be in violation of the BART emissions limit for each day of operation.

When a source justifies a remaining lifetime of less than 5 years, Ecology intends to issue an enforceable order as described above.

Similarly if you propose to convert a primary unit to a back-up mode, an enforceable order will be issued establishing the date for the change to back-up mode and limiting the operation to the rate at which you demonstrated no additional emission controls constitute BART.

Timing for issuance of these orders is covered in Section III.

Step 5: How should I determine visibility impacts in the BART determination?

The following is an approach you may use to determine visibility impacts (the degree of visibility improvement for each source subject to BART) for the BART determination. Once you have determined that your source or sources are subject to BART, you must conduct a visibility improvement determination for the source(s) as part of the BART determination. When making this determination, EPA believes the state has flexibility in setting absolute thresholds, target levels of improvement, or de minimis levels since the deciview improvement must be weighed among the five factors, and the state is free to determine the weight and significance to be assigned to each factor. For example, a 0.3 deciview improvement may merit a stronger weighting in one case versus another, so one "bright line" may not be appropriate. [Note that if you have elected to apply the most stringent controls available, consistent with the discussion in section E. step 1. below, you need not conduct an air quality modeling analysis for the purpose of determining its visibility impacts.]

Use CALPUFF,[8] or other appropriate dispersion model to determine the visibility improvement expected at a Class I area from the potential BART control technology applied to the source. Modeling should be conducted for SO2, NOx, and direct PM emissions (PM2.5 and/or PM10). If the source is making the visibility determination, you

[8] The model code and its documentation are available at no cost for download from http://www.epa.gov/scram001/tt22.htm#calpuff.

should review and approve or disapprove of the source's analysis before making the expected improvement determination. There are several steps for determining the visibility impacts from an individual source using a dispersion model:

- Develop a modeling protocol.

Ecology the Oregon and Idaho Departments of Environmental Quality, and EPA Region 10 have developed the modeling protocol for you to utilize in all CALPUFF modeling performed for the BART determination process. The final protocol is available at http://www.deq.state.or.us/aq/haze/docs/bartprotocol.pdf or from Ecology.

The protocol incorporates specific considerations based on the cumulative experience of the 3 states and EPA in modeling visibility impacts in the northwestern US. The protocol and its referenced documents contain specific criteria and requirements for addressing direct PM emissions.

Some critical items to include in a modeling protocol are meteorological and terrain data, as well as source-specific information (stack height, temperature, exit velocity, elevation, and allowable and actual emission rates of applicable pollutants), and receptor data from appropriate Class I areas. We recommend following EPA's Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts[9] for parameter settings and meteorological data inputs; the use of other settings from those in IWAQM should be identified and explained in the protocol.

One important element of the protocol is in establishing the receptors that will be used in the model. The receptors that you use should be located in the nearest Class I area with sufficient density to identify the likely visibility effects of the source. For other Class I areas in relatively close proximity to a BART-eligible source, you may model a few strategic receptors to determine whether effects at those areas may be greater than at the nearest Class I area. For example, you might chose to locate receptors at these areas at the closest point to the source, at the highest and lowest elevation in the Class I area, at the IMPROVE monitor, and at the approximate expected plume release height. If the highest modeled effects are observed at the nearest Class I area, you may choose not to analyze the other Class I areas any further as additional analyses might be unwarranted.

You should bear in mind that some receptors within the relevant Class I area may be less than 50 km from the source while other receptors within that same Class I area may be greater than 50 km from the same source. As indicated by the Guideline on Air Quality Models, this situation may call for the use of two different modeling approaches

[9] Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts, U.S. Environmental Protection Agency, EPA-454/R- 98-019, December 1998.

for the same Class I area and source, depending upon the State's chosen method for modeling sources less than 50 km. In situations where you are assessing visibility impacts for source- receptor distances less than 50 km, you should use expert modeling judgment in determining visibility impacts, giving consideration to both CALPUFF and other EPA-approved methods.

Contact the state modeler for advice on approaches to evaluate regional haze impacts on Class I area receptors within 50 km of your source.

In developing your modeling protocol, you may want to consult with EPA and your regional planning organization (RPO). Up-front consultation will ensure that key technical issues are addressed before you conduct your modeling.

- For each source, run the model, at pre-control and post-control emission rates according to the accepted methodology in the protocol.

Use the 24-hour average actual emission rate from the highest emitting day of the meteorological period modeled (for the pre- control scenario). Calculate the model results for each receptor as the change in deciviews compared against natural visibility conditions. Post-control emission rates are calculated as a percentage of pre-control emission rates. For example, if the 24-hr pre-control emission rate is 100 lb/hr of SO_2, then the post control rate is 5 lb/hr if the control efficiency being evaluated is 95 percent.

As covered in the Modeling protocol, the actual emissions to use are those from each BART eligible unit. Where Ecology agreed to specific approaches to modeling your BART eligible units in the 'exemption modeling' step, you may use those same approaches in determining the effects of BART on your facility's regional haze impacts.

- Make the net visibility improvement determination.

The visibility improvement analysis need not be done for each control scenario evaluated for each BART eligible emission unit at your source. If the top case (lowest emission rate) emission control technology is proposed as BART, the next lower case need not be modeled. If you propose as BART emission controls that are less effective than the most effective, technically feasible controls, visibility improvement modeling of the proposed BART controls plus the most effective controls must be presented.

The visibility impact modeling is of the cumulative effect of BART controls you propose for all the BART eligible units at your facility.

If your facility is a power plant larger than 750 MW, Ecology will accept a BART analysis report that contains visibility improvement modeling completed for only the most effective, technically feasible control technology evaluated, and proposed as BART.

Assess the visibility improvement based on the modeled change in visibility impacts for the pre-control and post-control emission scenarios. You have flexibility to assess visibility improvements due to BART controls by one or more methods. You may consider the frequency, magnitude, and duration components of impairment. Suggestions for making the determination are:

• Use of a comparison threshold, as is done for determining if BART-eligible sources should be subject to a BART determination. Comparison thresholds can be used in a number of ways in evaluating visibility improvement (e.g. the number of days or hours that the threshold was exceeded, a single threshold for determining whether a change in impacts is significant, or a threshold representing an x percent change in improvement).

Ecology will not provide you with a comparison threshold for evaluating visibility improvement. We do not believe that the degree of visibility improvement alone should be a governing criterion in making a BART determination. As noted above, visibility improvement might be appropriate to use as a 'tie-breaker' between otherwise equivalent control technologies.

• Compare the 98th percent days for the pre- and post-control runs.

Note that each of the modeling options may be supplemented with source apportionment data or source apportionment modeling.

Ecology suggests making the comparison between the modeled 98th percentile days in the pre and post control scenarios to determine the degree of visibility improvement anticipated to occur due to the installation and operation of your proposed BART emission controls.

E. How do I select the ``best'' alternative, using the results of Steps 1 through 5?

1. Summary of the Impacts Analysis

From the alternatives you evaluated in Step 3, we recommend you develop a chart (or charts) displaying for each of the alternatives:

(1) Expected emission rate (tons per year, pounds per hour);
(2) Emissions performance level (e.g., percent pollutant removed, emissions per unit product, lb/MMBtu, ppm);
(3) Expected emissions reductions (tons per year);
(4) Costs of compliance--total annualized costs ($), cost effectiveness ($/ton), and incremental cost effectiveness ($/ton), and/or any other cost-effectiveness measures (such as $/deciview);

(5) Energy impacts;
(6) Non-air quality environmental impacts; and
(7) Modeled visibility impacts.

While not required as part of a BART analysis you should look at the air quality impacts resulting from the control technologies evaluated and use that as part of your determination of BART for a each emission unit (or collection of similar or identical units).

2. Selecting a ``best'' alternative

(1.) You have discretion to determine the order in which you should evaluate control options for BART. Whatever the order in which you choose to evaluate options, you should always (1) display the options evaluated; (2) identify the average and incremental costs of each option; (3) consider the energy and non-air quality environmental impacts of each option; (4) consider the remaining useful life; and (5) consider the modeled visibility impacts. You should provide a justification for adopting the technology that you select as the ``best'' level of control, including an explanation of the CAA factors that led you to choose that option over other control levels.

(2.) In the case where you are conducting a BART determination for two regulated pollutants on the same source, if the result is two different BART technologies that do not work well together, you could then substitute a different technology or combination of technologies.

3. In selecting a "best" alternative, should I consider the affordability of controls?

(1.) Even if the control technology is cost effective, there may be cases where the installation of controls would affect the viability of continued plant operations.

(2.) There may be unusual circumstances that justify taking into consideration the conditions of the plant and the economic effects of requiring the use of a given control technology. These effects would include effects on product prices, the market share, and profitability of the source. Where there are such unusual circumstances that are judged to affect plant operations, you may take into consideration the conditions of the plant and the economic effects of requiring the use of a control technology. Where these effects are judged to have a severe impact on plant operations you may consider them in the selection process, but you may wish to provide an economic analysis that demonstrates, in sufficient detail for public review, the specific economic effects, parameters, and reasoning. (We recognize that this review process must preserve the confidentiality of sensitive business information).

Any analysis may also consider whether other competing plants in the same industry have been required to install BART controls if this information is available.

4. Sulfur dioxide limits for utility boilers

A 750 MW or larger power plant must meet specific control levels for sulfur dioxide (SO_2) of either 95 percent control or 0.15 lbs/ MMBtu, for each EGU greater than 200 MW that is currently uncontrolled unless you determine that an alternative control level is justified based on a careful consideration of the statutory factors. Thus, for example, if the source demonstrates circumstances affecting its ability to cost-effectively reduce its emissions, you should take that into account in determining whether the presumptive levels of control are appropriate for that facility.

For a currently uncontrolled EGU greater than 200 MW in size, but located at a power plant smaller than 750 MW in size, such controls are generally cost- effective and could be used in your BART determination considering the five factors specified in CAA section 169A(g)(2). While these levels may represent current control capabilities, EPA expects that scrubber technology will continue to improve and control costs continue to decline. You should be sure to consider the level of control that is currently best achievable at the time that you are conducting your BART analysis.

For coal-fired EGUs with existing post-combustion SO2 controls achieving less than 50 percent removal efficiencies, we recommend that you evaluate constructing a new FGD system to meet the same emission limits as above (95 percent removal or 0.15 lb/ mmBtu), in addition to the evaluation of scrubber upgrades discussed below. For oil-fired units, regardless of size, you should evaluate limiting the sulfur content of the fuel oil burned to 1 percent or less by weight.

For those BART-eligible EGUs with pre-existing post-combustion SO_2 controls achieving removal efficiencies of at least 50 percent, your BART determination should consider cost effective scrubber upgrades designed to improve the system's overall SO_2 removal efficiency. There are numerous scrubber enhancements available to upgrade the average removal efficiencies of all types of existing scrubber systems. EPA recommends that as you evaluate the definition of "upgrade,'' you evaluate options that not only improve the design removal efficiency of the scrubber vessel itself, but also consider upgrades that can improve the overall SO_2 removal efficiency of the scrubber system. Increasing a scrubber system's reliability, and conversely decreasing its downtime, by way of optimizing operation procedures, improving maintenance practices, adjusting scrubber chemistry, and increasing auxiliary equipment redundancy, are all ways to improve average SO_2 removal efficiencies.

EPA recommends that as you evaluate the performance of existing wet scrubber systems, you consider some of the following upgrades, in no particular order, as potential scrubber upgrades that have been proven in the industry as cost effective means to increase overall SO_2 removal of wet systems:

(a) Elimination of Bypass Reheat;
b) Installation of Liquid Distribution Rings;
(c) Installation of Perforated Trays;
(d) Use of Organic Acid Additives;
(e) Improve or Upgrade Scrubber Auxiliary System Equipment;
(f) Redesign Spray Header or Nozzle Configuration.

We recommend that as you evaluate upgrade options for dry scrubber systems, you should consider the following cost effective upgrades, in no particular order:
(a) Use of Performance Additives;
(b) Use of more Reactive Sorbent;
(c) Increase the Pulverization Level of Sorbent;
(d) Engineering redesign of atomizer or slurry injection system.

You should evaluate scrubber upgrade options based on the 5 step BART analysis process.

5. Nitrogen oxide limits for utility boilers

Ecology must establish specific numerical limits for NOX control for each BART determination. For power plants with a generating capacity in excess of 750 MW currently using selective catalytic reduction (SCR) or selective non-catalytic reduction (SNCR) for part of the year, you should presume that use of those same controls year-round is BART. For other sources currently using SCR or SNCR to reduce NOX emissions during part of the year, you should carefully consider requiring the use of these controls year-round as the additional costs of operating the equipment throughout the year would be relatively modest.

For coal-fired EGUs greater than 200 MW located at greater than 750 MW power plants and operating without post-combustion controls (i.e. SCR or SNCR), we have provided presumptive NOX limits, differentiated by boiler design and type of coal burned. You may determine that an alternative control level is appropriate based on a careful consideration of the statutory factors. For coal-fired EGUs greater than 200 MW located at power plants 750 MW or less in size and operating without post-combustion controls, you should likewise presume that these same levels are cost-effective. You should require such utility boilers to meet the following NOX emission limits, unless you determine that an alternative control level is justified based on consideration of the statutory factors. The following NOX emission rates were determined based on a number of assumptions, including that the EGU boiler has enough volume to allow for installation and effective operation of separated overfire air ports. For boilers where these assumptions are incorrect, these emission limits may not be cost-effective.

Table 1.--Presumptive NOX Emission Limits for BART-Eligible Coal-Fired Units.[10] [11]

Unit type	Coal type	NOx presumptive limit (lb/mmbtu)[20]
Dry-bottom wall-fired	Bituminous	0.39
	Sub-bituminous	0.23
	Lignite	0.29
Tangential-fired	Bituminous	0.28
	Sub-bituminous	0.15
	Lignite	0.17
Cell Burners	Bituminous	0.40
	Sub-bituminous	0.45
Dry-turbo-fired	Bituminous	0.32
	Sub-bituminous	0.23
Wet-bottom tangential-fired	Bituminous	0.62

Most EGUs can meet these presumptive NOX limits through the use of current combustion control technology, i.e. the careful control of combustion air and low-NOX burners. For units that cannot meet these limits using such technologies, you should consider whether advanced combustion control technologies such as rotating opposed fire air should be used to meet these limits.

Because of the relatively high NOX emission rates of cyclone units, SCR is more cost-effective than the use of current combustion control technology for these units. The use of SCRs at cyclone units burning bituminous coal, sub-bituminous coal, and lignite should enable the units to cost-effectively meet NOX rates of 0.10 lbs/MMBtu. As a result, we are establishing a presumptive NOX limit of 0.10 lbs/MMBtu based on the use of SCR for coal-fired cyclone units greater than 200 MW located at 750 MW power

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[10] No Cell burners, dry-turbo-fired units, nor wet-bottom tangential-fired units burning lignite were identified as BART- eligible, thus no presumptive limit was determined. Similarly, no wet-bottom tangential-fired units burning sub-bituminous were identified as BART-eligible.

[11] These limits reflect the design and technological assumptions discussed in the technical support document for NOX limits for these guidelines. See Technical Support Document for BART NOX Limits for Electric Generating Units and Technical Support Document for BART NOX Limits for Electric Generating Units Excel Spreadsheet, Memorandum to Docket OAR 2002- 0076, April 15, 2005.

plants. As with the other presumptive limits established in this guideline, you may determine that an alternative level of control is appropriate based on your consideration of the relevant statutory factors. For other cyclone units, you should review the use of SCR and consider whether these post-combustion controls should be required as BART.

For oil-fired and gas-fired EGUs larger than 200MW, EPA believes that installation of current combustion control technology to control NOX is generally highly cost-effective and should be considered in your determination of BART for these sources. Many such units can make significant reductions in NOX emissions which are highly cost-effective through the application of current combustion control technology.[12]\

[12] See Technical Support Document for BART NOX Limits for Electric Generating Units and Technical Support Document for BART NOX Limits for Electric Generating Units Excel Spreadsheet, Memorandum to Docket OAR 2002-0076, April 15, 2005.

III. Enforceable Limits/Compliance Date

To complete the BART process, Ecology and your permitting authority must establish enforceable emission limits that reflect the BART requirements and require compliance within a given period of time. In particular, Ecology and your permitting authority must establish an enforceable emission limit for each subject emission unit at the source and for each pollutant subject to review that is emitted from the source. In addition, Ecology and your permitting authority must require compliance with the BART emission limitations no later than 5 years after EPA approves the Washington regional haze SIP. If technological or economic limitations in the application of a measurement methodology to a particular emission unit make a conventional emissions limit infeasible, Ecology and your permitting authority may instead prescribe a design, equipment, work practice, operation standard, or combination of these types of standards. Ecology and your permitting authority may consider allowing you to "average" emissions across any set of BART-eligible emission units within a fenceline, so long as the emission reductions from each pollutant being controlled for BART would be equal to those reductions that would be obtained by simply controlling each of the BART-eligible units that constitute BART-eligible source.

Ecology and your permitting authority must ensure that any BART requirements are written in a way that clearly specifies the individual emission unit(s) subject to BART regulation. Because the BART requirements themselves are "applicable" requirements of the CAA, they must be included as title V permit conditions according to the procedures established in 40 CFR part 70 or 40 CFR part 71.

Section 302(k) of the CAA requires emissions limits such as BART to be met on a continuous basis. Although this provision does not necessarily require the use of continuous emissions monitoring (CEMs), it is important that sources employ techniques that ensure compliance on a continuous basis. Monitoring requirements generally applicable to sources, including those that are subject to BART, are governed by other regulations. See, e.g., 40 CFR part 64 (compliance assurance monitoring); 40 CFR 70.6(a)(3) (periodic monitoring); 40 CFR 70.6(c)(1) (sufficiency monitoring). Note also that while EPA does not believe that CEMs would necessarily be required for all BART sources, the vast majority of electric generating units potentially subject to BART already employ CEM technology for other programs, such as the acid rain program. In addition, emissions limits must be enforceable as a practical matter (contain appropriate averaging times, compliance verification procedures and recordkeeping requirements).

In light of the above, the permit must:

- Be sufficient to show compliance or noncompliance (i.e., through monitoring times of operation, fuel input, or other indices of operating conditions and practices); and

- Specify a reasonable averaging time consistent with established reference methods, contain reference methods for determining compliance, and provide for adequate reporting and recordkeeping so that air quality agency personnel can determine the compliance status of the source; and
- For EGUS, specify an averaging time of a 30-day rolling average, and contain a definition of "boiler operating day'' that is consistent with the definition in the proposed revisions to the NSPS for utility boilers in 40 CFR Part 60, subpart Da.[13] You should consider a boiler operating day to be any 24-hour period between 12:00 midnight and the following midnight during which any fuel is combusted at any time at the steam generating unit. This would allow 30-day rolling average emission rates to be calculated consistently across sources.

Ecology will make the final BART determination and set the date(s) for your emission units to be in compliance with the BART emission limitations. We encourage you to propose both BART emission limits, and a schedule by which your BART units can come into compliance with the BART limit.

Ecology will coordinate with your permitting authority to issue any necessary Notice of Construction approvals and PSD permits to implement the BART determination. The BART Determination issued by Ecology will include the minimum amount of detail necessary to define the BART limits and associated monitoring, recordkeeping and reporting requirements. The Notice of Construction approvals issued by the local permitting authority would contain more detailed information reflecting the actual emission control equipment installed or work practices employed to comply with the BART determination.

The BART regulations[14] require states to require compliance with the BART limitations as expeditiously as possible, but in no case later than 5 years from the effective date of the SIP approval.

As of the date this document was finalized, we do not know when Ecology will submit our regional haze SIP to EPA or how long it will take them to approve it. We anticipate EPA approval of Washington's regional haze SIP approximately one year after it is submitted. As a result, you want you to propose a schedule that will achieve compliance with your proposed BART limitations as expeditiously as possible, but within 7 years of submitting your BART analysis.

If there are specific circumstances such as oil refinery major unit turnaround scheduling where such a timeframe will not allow compliance with BART for a specific emission unit to be achieved in the required timeframe, present your rationale for a differing schedule for that unit in your BART proposal.

[13] 70 FR 9705, February 28, 2005.
[14] 40 CFR 51.307(e)(1)(iv)

Washington State Regional Haze State Implementation Plan

Appendix K

Public Notices, Comments, and Ecology's Response to Comments on the Regional Haze State Implementation Plan

Contents

Overview of Appendix K

Appendix K has five major sections: (1) this overview, (2) Ecology's response to comments, (3) copies of written comments, (4) transcript of the September 28, 2010 public hearing and (5) public involvement notices for the public comment period and public hearing on the draft Regional Haze (RH) State Implementation Plan (SIP).

Two of the major requirements of any SIP are a public comment period and public hearing on the draft SIP.

The second section of this appendix contains a summary of the comments received during the public comment period and public hearing on the draft RH SIP along with Ecology's responses. Ecology accepted comments between August 25, 2010 and October 6, 2010. In cases where we received a number of comments on the same subject we provide representative examples.

The third section of this appendix contains copies of the written comments received.

The fourth section of this appendix contains the transcript from the public hearing on the draft RH SIP. The public hearing was held in Lacey, Washington on September 28, 2010.

The fifth section of this appendix contains copies of materials related to public involvement notices for the public comment period and public hearing. This includes:

- Affidavits of publication of the Notice for Opportunity for Public Comment in five Washington newspapers
- Notice of Opportunity for Public Comment published in the State Register on August 25, 2010
- August 23, 2010 Ecology News Release on the public comment period and public hearing
- September 23, 2010 Ecology News Release on the public hearing and public comment period
- Certification of Hearing

Ecology also held two public comment periods and public hearings on the initial draft Best Available Retrofit Technology (BART) technical support documents and draft BART Compliance Orders in October 2009. Information on the BART public comment periods and public hearings are located in Appendix L.

Response to Comments

A. General

Comment #1:

We received several comments asking us to protect Washington's National Parks and other natural resources. Two examples include:

- Please protect our most valuable asset – our beautiful Northwest Mountains and forests. We cannot do so without protecting the clear air.

- Please understand that air quality issues are currently serious enough that from Paradise, Mt Rainier National Park, on a bright sunny day, the summit of Mt Rainier is not clearly visible! I began hiking and climbing in the Cascades in the early 1970's. Over the years, visibility in Washington's high country has deteriorated to the point that rather than recreate here I go to Colorado or Utah. How sad!

Ecology Response:

Protecting the air quality in Washington State is an important component of air pollution control. Our National Parks and wilderness areas are part of what makes Washington a desirable place to live and visit. Having clear, unspoiled views of the scenery ensures all of us will continue to enjoy these special spaces.

Comment #2:

DOE's first phase of reducing haze-producing pollutants is a complex and critical part of reaching the long-term goals of the RH Plan. We have worked extensively with the Department of Environmental Quality in Oregon to provide input on strategy development for the Columbia River Gorge and on the RH Plan in Oregon. We would like the precedence of this staff-to-staff working relationship that was developed in Oregon, and proved helpful to all parties concerned, to help us develop a plan to work with the Department of Ecology. For it is through a transparent and productive working relationship, that the Yakama Nation can best ensure that our concerns and priorities are best represented in the development of air quality policy.

Ecology Response:

Ecology agrees that an effective staff-to-staff working relationship is critical to effective cooperation and ensuring that the Yakama Nation's concerns and priorities are represented in the development of air quality policy. Ecology looks forward to working with the Yakama Nation.

B. Northwest Pulp & Paper Association

Comment #3:

NWPPA's comments have to do with Chapter 10.3 "Plans for Further Controls on Visibility Impairing Pollutants." Specifically in that section you mention the pending plans to consider five industrial categories for technical analysis to determine if RACT rulemaking would be appropriate. It appears that the pulp and paper industry will be one of the categories selected for further analysis.

Given the timeframe outlined in the document, we would appreciate an opportunity to meet with you and discuss further your plans. In general we urge more outreach on the part of Ecology in connection with this task and the RH SIP in general.

Ecology Response:

Thank you for your comment. Ecology agrees with your observation on the need for outreach on regional haze planning.

The RH SIP identifies 5 source categories for technical evaluation of emission reduction opportunities for visibility-impairing pollutants and the potential development of Reasonably Available Control Technology (RACT) limits for 2 of the source categories. Ecology plans to meet with the affected sources or source owners to go over the rationale and scope of the evaluation.

C. Clean Coal

Comment #4:

We received several comments addressing clean coal technology. Examples include:

- There are exciting new state-of-the-art technologies in particulate control, emissions reduction, gasification technologies, Carbon Dioxide (CO_2) capture technologies (such as the Mountaineer Power Plant in New Haven, W VA) and even more emerging.

  On an immediate and local level, haze reduction can be achieved by a retrofit with full-scale air quality control systems. Many systems can be used, depending on the design and type of the plant, such as state-of-the-art scrubber/absorber systems, electrostatic precipitators, and absorber modules.

  Clean Coal Technology (CCT) – The Next Step!

  Washington State can be a world leader in this new technology. CCT is a term used to describe a number of different state-of-the-art processes being developed; oxy-fuel, pre-combustion, chemical looping combustion, post-combustion, etc. They all have the same goal- to reduce climate pollution on world-wide scale.

  Coal has played a huge role in building our nation. CCT with carbon capture/sequester can produce clean reliable energy that will be a model for the rest of the world to follow.

- The objectives of your SIP can be met without shutting down the Centralia steam power Plant. There are technologies at hand to reduce emissions that contribute to haze and thereby improve visibility in the years ahead. Maintaining the Centralia plant would create and preserve jobs at a time of high national and state unemployment, as well as help keep utility costs down by not increasing our dependency on natural gas. Furthermore, this would set an example for other coal power generating facilities to clean up their emissions, while continuing to lessen our dependency on foreign oil to meet our energy needs until new technologies are developed to provide affordable energy without adversely affecting our environment.

- I'm Joe Kramis, a retired Catholic priest and certainly sympathetic for boilermakers. I was a union member for many years as a younger lad and have a great love for union people and what they do and the service they give all of us. So their jobs are on the line, I know, with all of this, and that's an important consideration in how we address this issue.

  I noticed from their brochure that they are working very strongly on efforts to reduce their emissions that would clean up their coal. I don't know how far that technology has come along yet. I've got a cousin that works in the coal industry back East and I've got a call in to him to find out what they're doing at that level but, so far as I know, there hasn't been much in the area of reduction that needs to be addressed and taken care of.

  My hope is that with things like today they will be encouraged to do something more to make that happen.

- So it's not all this plant, although I will say it does put out a lot like everything else but every waste stream has a product that can be recovered and recycled. We need to start saying, "Yes, we're gonna look at how we can recover and recycle that and turn it into a marketable product." We don't have to just say, "No, we're not gonna have it."

- We have all kinds of technology so instead of just stomping and let's get together on this thing and make coal work. Coal is American and despite what is said, there's room for alternative energy absolutely, but we need American power, American power independence, we have the best craftsmen and we can do this.

Ecology Response:

Ecology shares the interest in instituting clean coal technologies. These technologies are all available and can be very cost effective on new coal fired power plants. Control technologies specific to reductions of visibility impairing pollutants are already in use at the TransAlta plant. While there are additional reductions in nitrogen oxides that could be accomplished at a low capital and operating cost for new plants, Ecology has determined these alternative emission reduction technologies are not appropriate for installation on this older existing plant at this time.

Ecology is also aware of the potential for clean coal technologies to decrease greenhouse emissions. Greenhouse gases are not haze-causing pollutants and, therefore, were not considered in the context of the RH SIP.

D. TransAlta BART Controls

Comment #5:

We received several comments requesting changes to the BART controls at the Trans Alta power plant. Examples include:

- Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.

  Washington must consider the total impact a pollution source like Trans Alta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.

  The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's Nitrogen Oxide (NO_x). Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourist, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

- I have to agree with the BART system. There are a lot of issues that need to be addressed and dealt with, I think, before we start worrying about tearing down or completely re-vamping an existing system.

- We encourage the Department of Ecology to take a strong leadership role similar to its sulfur dioxide actions in 1995, and require selective catalytic reduction technology for Centralia as part of the RH SIP. This would limit Centralia's emissions of NO_x to approximately 3,000 tons per year, or approximately 12,000 tons per year less than currently proposed. The Department of the Interior will make a final decision regarding the petitions for reasonably attributable visibility impacts pending the outcome of the Department of Ecology's control determination for RH.

  Like the reduction in Sulfur Oxides (SO_x), a reduction of NO_x would lead to a direct improvement in visibility at Mount Rainier National Park, as well as contribute to improved visibility and decreased health effects from fine particulate matter region-wide. While the focus of our concern is the NO_x emissions, we are also concerned with mercury deposition at Mount Rainer and throughout the region. Recent studies show elevated concentrations of mercury in snow, sediments, vegetation and fish collected in all three of our National Parks in Washington. We note that addition of Selective Catalytic Reduction (SCR) technology, if appropriately designed, would achieve additional emissions reductions of mercury.

  Please supplement the exhibits to the comments that Earthjustice submitted yesterday on behalf of NPCA, Sierra Club, and NEDC with the following FIP prepared by EPA Region 9 for the Four Corners coal-fired power plant. As you can see, EPA has determined that SCR technology is BART for Four Corners, further demonstrating that SCR should also be found BART for the TransAlta Centralia coal-fired power plant in Washington. Thank you. http://www.epa.gov/region9/air/navajo/pdfs/FCPP-Complete-Signed-Notice.pdf

- I AM TIRED OF BIG COAL GETTING A FREE PASS WHILE THEY POLLUTE OUR AIR.PLEASE APPLY THE SAME STANDARDS TO TRANSALTA THAT YOU WOULD FOR A NEW PLANT THAT IS JUST COMING ON LINE.

- Please put scrubbers in the coal plant stacks to clean the exhaust. This haze will continue to contribute to pollution and eventually start causing effects such as acid rain over the NW forests. We have already felt the effect of this over the eastern forests; please don't let it happen to our beautiful NW forests.

- As former residents and current home owners in Tenino, Washington, we feel that the health of the citizens of Lewis and Thurston counties is adversely affected by the air pollution emitted by the TransAlta coal plant near Centrailia. Pollution controls on this caustic plant must be aggressively strengthened to the fullest extent that is legally possible.

- Please strongly reconsider the measures that Washington will put into place to protect our air quality and beautiful natural resources. There is ample proven technology that can be applied to greatly improve the situation with the Centralia power plant.

- We demand action and cogent legislation to stop the dumping of pollution from coal on human populations and treasured public lands.

- If we're serious about clearing the air, we need some serious legislation.

- I am frustrated that the pollution from the TransAlta power plant in Centralia is not being adequately addressed. This plant should be immediately fitted with pollution controls to eliminate NO_x emissions to the greatest degree possible. I am particularly concerned about the TransAlta plant because it affects views in all parks in our area.

- This is the 21st century, not the early 1900's we already have viable, inexpensive energy alternatives, stop killing the earth and the people of the earth by allowing big business greed for money over all else.

- We have had too much pollution already, Walker Architects, as the inventor of CO_2 Energy Storage, knows and understands the technology to correct this damage, a solution exists and that it can be applied at the TranAlta Plant. It is simply a matter of the expense.

- Please make sure that all our scenic areas stay healthy for our out-door activities and enjoyment of nature, by improvement of pollution control at TransAlta and a better protection of our National Parks.

- There is no reason they can't install precipitators and scrubbers on those stacks and make a huge reduction in the pollutant emissions from that plant. I've witnessed it happening in our own area with one of the largest Pulp & Paper mills in the Pacific Northwest. All it took was a significant amount of PRESSURE, from the EPA. It does cost money but that’s why they charge money for the power they produce, they just aren't using it wisely.

- If we can't dispense with this polluting power plant entirely in the near term, we should at least see to it that it operates with as little pollution as is technologically feasible. The proposed plan doesn't come close to that standard.

- The final thing I want to address is that we hear a lot about all the different sources of haze. It kind of would have been nice to see a chart of maybe your plan that showed what the haze sources are and what you plan to do to deal with them, so just suggestion for next time. But one thing that I did find on-line is to look at the Lewis County pollution, the local pollution. The leading cause of NO_x in Lewis County is electricity generation from the TransAlta plant. Its 18,000 tons per square mile.

  The second leading cause is transportation but it's only 3,000 tons per mile. You could eliminate pollution from cars and still have 15,000 tons per square mile in Lewis County. Particulate matter is the wood combustion issue. Its 2,400 tons per square mile from the plant. The second leading cause is wood combustion of those stoves, 480 tons per square mile. It's – Julie you mentioned bang for the buck. This is the biggest leading contributor of pollution locally and in the state. Thank you very much.

Ecology Response:

Ecology's determination of flex fuels meets the BART requirements and will result in a 20% reduction in NO_x. Ecology's NO_x BART determination satisfies the six factors for a BART review required by 40 CFR Part 51 Appendix Y, Guidelines for BART determinations under the Regional Haze Rule (RHR). Ecology did evaluate alternatives that may have further reduced NO_x emissions. However, we concluded that those alternatives were not cost effective to implement on this existing plant.

The TransAlta plant already has controls for particulates and SO_2. State-of-the-art particulate control occurs through the use of electrostatic precipitators.

In 2000–2002, the TransAlta plant installed a SO_2 scrubbing system. The SO_2 emissions are controlled by wet limestone scrubbing system that provides over 95% removal of SO_2 while producing gypsum that is sold to a local wallboard manufacturing plant. This provides the wallboard plant with a cost effective alternative to gypsum mined in Mexico. Through the terms of the BART Compliance Order issued by Ecology, further reductions in allowable SO_2 emissions are required beyond the existing SO_2 limitations imposed by the Southwest Clean Air Agency.

Environmental Protection Agency (EPA) Region 9's proposed BART determination for the Four Corners Power Plant was issued too late to affect the Ecology's BART determination for TransAlta. By the time EPA Region 9 issued the proposal, Ecology had issued its BART Compliance Order to TransAlta.

E. Major Changes to the TransAlta Power Plant

Comment #6:

We received several comments requesting major changes to the Trans Alta power plant. Examples include:

- It simply must not be acceptable to trade away the quality of life of any person in exchange for the continued operation of a technologically obsolete coal plant simply because of the cost of correcting the problem. Close the plant!

- For the future of our environment get rid of coal burning for energy production.

- 1,500 megawatts is a lot. They've done a lot to clean it up and it's not just been TransAlta. They did a lot at PG&E and whatever, however, you know that this is what's changed our technology and a lot is happening and we've got a tremendous amount of coal in this country, a tremendous amount of coal. And the technology is coming that we can burn more. We just can't, in my mind, just shut everything down.

- My feeling is that if we cannot get a program that reduces TransAlta's level of pollution by 90% we should work toward converting the plant to geothermal heat as a source of energy.

  The U.S. Geological Survey has issued maps indicating that we are within a reasonable distance from accessible geothermal heat sources in the 300 degree centigrade range.

  Tapping that resource could conceivably provide us with a new source of power that uses no fuel and does no polluting. It may also be able to use the current TransAlta generating equipment.

  I will be happy to provide you with material in support of the above statements if you so wish.

- So if you're looking just at the NO_x equation you're missing the big picture because what you really realize when you roll up all of these costs the cheapest thing is to expeditiously transition off coal as fast as possible.

- I feel we need to convert TransAlta to gas immediately, and they have already made enough money to pay for gas conversion. Let's end NO_x pollution entirely.

- Personally, I believe it's time to phase out coal production entirely. It is too destructive-to the land and people-and is a finite source of energy, as is oil.

- And we just – we do have a common ground and we all want the same thing and I think we can do it without eliminating coal.

- Now is the time to act. The climate cannot wait any longer. Either can my lungs. As a person with asthma, I need you to do the right thing and close down Washington's one and only coal combustion plant. With what we now know about energy conservation we will have no trouble getting along without the substantial output from this very dirty source of electricity.

- It is way past time to get rid of coal as a source of energy. The stuff is the dirtiest of the dirty. If this were to occur, the haze and pollution problems throughout the US would be GREATLY reduced or eliminated! So, EPA, it's up to you to help bring this about!

- I believe polluters should not be allowed to pollute and wherever possible be stopped from polluting. I believe this is what needs to be done with the TransAlta coal plant. Enough is enough. Something should have been done about this flagrant polluter years ago. This has gone on long enough. Action needs to be taken by you to stop this pollution of our parks and other areas.

- Transalta hazes up my view of Mt Ranier from Seattle. Please cut down on whatever pollutants cause this problem to the max.

  Transalta should go away, but unfortunately, that's not what you are reviewing right now. But at least the haze problems can be made to go away.

- Please think seriously about shutting down this single coal plant here in Washington. The effects are devastating to all life. There are many states that have no other ways to obtain energy, but we here in Washington have other choices and we should limit our use to other resources, as well as work a lot harder and more seriously towards developing greener, healthier energy sources.

- We have reached a place in human history where we have got to stop burning coal. It's not even an option. And the rest of this is just politics and moving things around, and we are gonna pay a tremendous price, and certainly our children. We have to stop.

- We should expect more accountability for protecting our air and water from a company like TransAlta in the Evergreen State, and we should expect our state regulators and the governor to do everything in their power to incentivize a transition to cleaner fuels at TransAlta and not business as usual.

- I am opposed to the continued operation of Trans Alta Coal Fired Generation Plant. Washington State has the fourth lowest cost of power in the United States with the average cost per kilowatt hour just over 6 cents. We could and should convert the Trans Alta Coal Plant to burn natural gas.

  We would reduce Trans Alta CO_2 emissions by half and nearly eliminate mercury and SO_2 emissions. Our state has ample access to low cost natural gas either domestic or imported from Canada so that incremental increases in cost of power generation would be modest and reasonable considering the benefits of cleaner air and reduced Greenhouse Gas (GHG) as emissions.

  It is my understanding that the governor negotiated a secret deal with Trans Alta to allow continued coal burning without application of cleaner air emissions standards. We should submit a request for public disclosure of the negotiation documents with the Governor's office in an attempt to bring some degree of transparency to this issue.

  In summary, an unbiased economic analysis of the impact of converting Trans Alta from coal to cleaner burning natural gas would do much to inform the decision making. This would allow us to make an informed decision as to the "cost" of conversion including assurance to TransAlta employees and stockholders that they would be made whole and would not suffer economic hardship as a result of conversion to natural gas.

- If we were to ramp up the amount of natural gas from these relatively idle natural gas plants we could close – we could shut down one boiler at TransAlta overnight.

Ecology Response:

The RH Program is not a mechanism for requiring the closing of facilities. The RH Program does contain a process for reducing haze causing emissions from older existing sources. Ecology's NO_x BART determination satisfies the six factors for a BART review required by 40 CFR Part 51 Appendix Y, Guidelines for BART determinations Under the RHR.

Greenhouse gases are not regulated pollutants for purposes of RH and therefore were not considered for purposes of meeting RH requirements. However, Ecology, Department of Commerce, and the Governor's Office are on a separate track to work with TransAlta to transition the Centralia plant away from coal, thereby greatly reducing the plant's GHG emissions. Any agreement to transition off coal would also lead to significant reductions in emissions of pollutants that do cause RH.

F. Comments from the United States Environmental Protection Agency

Comment #7:

Establish Reasonable Progress Goals (RPGs) for each Class I area that provide for an improvement in visibility for the most impaired days, as required by the RHR (20 CFR 51.308(d)(1)). In the draft SIP Ecology is only committing to "no degradation" at North Cascades National Park and Glacier Peak Wilderness.

Ecology Response:

Ecology established a RPGs of 15.62 Deciview (dv) for North Cascades National Park and Glacier Peaks Wilderness in the final RH SIP. Ecology found the Western Regional Air Partnerships (WRAP) projected 2018 visibility impairment at these Class I Areas did not include major existing SO_2 emission reductions at 3 large oil refineries and was heavily influenced by the extraordinarily high fire year of 2003. WRAP contractor Air Resource Specialists, Inc. calculated a revised 2018 visibility projection that Ecology is using as the RPG for these 2 Class I Areas. Additional information is available in Chapter 9 and Appendix E.

Comment #8:

Please further describe how the state has satisfied the requirement to consider the emission reductions that would be required to achieve the Uniform Rate of Progress (URP) for each Federal Class I area for the period covered by the implementation plan in 40 CFR 51.308(d)(1)(B). Additional analysis is needed to demonstrate whether sources identified in the Four Factor Analysis could be controlled to achieve the URP for each Class I Area.

Ecology Response:

Ecology completed a Four Factor Analysis for the public review draft of the RH SIP. The Four Factor Analysis identified 5 source categories as candidates for future Sulfur Oxides (SO_x) and NO_x controls. Since Ecology needs to comply with the requirements of state law to develop controls on existing sources, as a best case Ecology could complete rules requiring additional controls on 2 source categories over a 5-year period. As a result additional controls are not reasonable as part of this RH SIP. Please see Appendix F and Chapter 9 for additional information.

Comment #9:

BART for TransAlta Centralia. Please explain why you did not conclude that Flex Fuel plus Selective Non-catalytic Reduction (SNCR) is BART for Centralia.

Ecology Response:

Ecology's BART determination concluded that flex fuels plus SNCR was not cost-effective based on cost estimates provided by TransAlta. Subsequent to the public comment period on the proposed BART determination, TransAlta was requested to supply additional information on the use and cost of SNCR at this facility. The company had its contractor supply additional information related to the basis of its SNCR cost estimates. This additional detail is contained in a March 31, 2010 report from CH2M Hill to Mr. Richard Griffith (Appendix G to the BART Technical Support Document). The March 31, 2010 report contains more accurate cost estimates.

Applying both Flex Fuels and SNCR substantially increases the cost per ton of NO_x removed. This combined cost of requiring Flex Fuels plus SNCR rules out this approach as a cost effective means of reducing Nitrogen Dioxide (NO_2) emissions. Retrofit costs to incorporate SNCR at this facility are higher than for other similarly sized facilities due to an extremely tight boiler outlet configuration, limited available space for new equipment, probable modifications to boiler tubes to accommodate the urea injection lances, construction access difficulties to install SNCR injection equipment, and location of urea storage and solution preparation equipment.

Comment #10:

Please provide an analysis of the effects on visibility of Flex Fuels plus SCR.

Ecology Response:

As part of the BART analysis, Ecology evaluated the costs associated with SCR. The CH2M Hill costs provided by the source are higher than Ecology costs based on EPA's Control Cost Manual. Whether CH2M Hill's or Ecology's costs are used, SCR is still ruled out as a cost effective means of reducing nitrogen dioxide emissions. Cost information from both CH2M Hill and Ecology is located in Appendix L of the RH SIP.

Applying both Flex Fuels and SCR substantially increases the cost per ton of NO_x removed and rules out this approach as a cost effective means of reducing NO_2 emissions. Since Ecology concluded that SCR alone was not cost effective, SCR plus Flex Fuels would be less cost effective, Ecology concluded that a visibility analysis for the SCR plus Flex Fuels scenario was not warranted.

G. Comments from the United States Department of the Interior National Park Service

Comment #11:

Ecology did not address our questions regarding differences in emissions projections for specific point sources between the PRP18a and PRP18b inventories. We asked Ecology to investigate the differences in emissions between the two inventory versions to determine which emissions best represented actual controls. Ecology did not answer this question but identified emissions reductions from three refineries totaling 9000 tons as the basis for revising the RPGs for North Cascades National Park and Glacier Peak Wilderness Area. If the emissions estimates reported in 2018 PRPb are more accurate, Ecology could demonstrate greater visibility improvement than shown by the earlier 2018 PRPa inventory.

Ecology Response:

Only the 2018a inventory was available when Ecology began developing the state's RH SIP. By the time the WRAP PRP18b inventory and modeling were available, Ecology did not have time or resources to redo its analysis or conduct additional analyses. Ecology found that the PRP18a inventory did not include major existing SO_2 emission reductions at 3 large oil refineries. Ecology did look at the PRP18b inventory and learned that it did not include the major existing SO_2 emission reductions at 3 large oil refineries either.

Comment #12:

Chapter 8 BART. We continue to request that Ecology re-consider its BART determination for TransAlta's Centralia power plant. Ecology and TransAlta have not provided a complete BART analysis of NO_x controls for the Centralia power plant. We believe that a valid "top-down" approach to reducing NO_x demonstrates that addition of SCR is BART for Centralia.

Ecology Response:

Ecology believes that its BART analysis is complete and meets the regulatory criteria. Ecology considered the six factors required by the BART regulation and used the top-down approach to evaluating emission controls required by the BART regulation for determining BART for power plants over 750 MW site output. Under the top-down approach the facility starts with all control options that are available and technically feasible and ranks them by control effectiveness (most effective to least effective). Then the applicant/state analyzes the impacts (principally cost effectiveness in $/ton removed) and selects the most effective control that could not be 'defeated' due to feasibility, cost, or any of the other 6 BART criteria.

Comment #13:

We continue to recommend that Ecology require controls on Tesoro by 2018. The controls have been demonstrated to be cost-effective if installed in 2018. Ecology should require controls by 2018 under reasonable progress.

Ecology Response:

Tesoro identified three heaters or groups of heaters for which replacement of the original conventional design burners with new low or ultra low NO_x burners was both technically and economically feasible. One heater, which is subject to BART, will have controls installed by 2015. The BART required heater burner replacement will reduce plant NO_x emissions by 62 tons per year.

Due to the time needed for the design approval process and the major maintenance cycle at the oil refinery, the installation of NO_x controls on other emissions units was determined to not to meet BART requirements. This determination is detailed in the Technical Support Document for the Tesoro BART Determination in Appendix L.

Ecology agrees that additional reductions from the Tesoro facility may be necessary to continue reasonable progress toward natural visibility conditions. Additional NO_x controls would be applied under future RACT requirements.

Comment #14:

Port Townsend Paper Corporation Mill

- Ecology should have included evaluations of upgrades to existing control equipment.
- Ecology must evaluate the visibility impacts of switching to lower sulfur fuels.
- Ecology should consider the visibility improvements that would occur at all of the Class I areas within 300 km of the BART source.
- A Residual Fuel Oil (RFO) limit of 0.5% sulfur should be considered as the default presumption for SO_2 BART.
- Addition of a wet ESP to control Course Particulate Matter (PM_{10}) emissions from the Power Boiler#10 is cost-effective and represents BART.
- Ecology must re-evaluate all of the technically–feasible and proposed options against the proposed BART limits.

Ecology Response:

The initial modeling of the facility covered all Class I Areas within 300 km of the plant. That modeling showed that emissions from the plant exceeded the contribute threshold only at the Olympic National Park. In order to save resources, we focused all subsequent modeling data analyses only on the effects at Olympic National Park, though the modeling domain still contained all the other Class I areas.

Ecology and Port Townsend Paper Company evaluated upgrades and improvements to the existing emission control equipment on the power boiler and recovery furnace as part of the project.

Ecology evaluated the costs of switching to lower sulfur fuel oil in addition to the work done by the company in its analysis. The evaluation is documented in the Technical Support Document and in supporting materials from the company posted on our BART web page, specifically BART Analysis, 2nd Addendum. As demonstrated in our Technical Support Document, the cost of switching to a lower sulfur fuel oil is excessive on a $/ton basis. Since the SO_2 reduction option was not cost effective, we determined that it did not need to have the visibility benefits from using it evaluated.

Ecology evaluated the visibility for the only 2 options that possibly were cost effective for implementation at the facility. As such, the evaluation is complete in accordance with the requirements of the BART guidance.

Ecology respectfully disagrees with the National Park Service that adding a wet electrostatic precipitator to Power Boiler #10 is cost effective.

Ecology notes that subsequent to the BART determination, Port Townsend Paper Corporation has received a Notice of Construction permit (NOC Order No. 7850) from the Department of Ecology's Industrial Section for a cogeneration project. Through the addition of a variety of new and state-of-the-art control equipment, this project will result in significant emission reductions from the facility over and above those contained in the BART order.

Comment #15:

Intalco Works primary aluminum smelter.

- Intalco and Ecology should better explain its rejection of seawater and sodium-based scrubbing (versus Limestone Forced Oxidation (LSFO)) for potline SO_2 emissions.
- Intalco appears to have overestimated costs for LSFO scrubbing. Intalco and Ecology should have used the EPA Control Cost Manual to estimate costs, or better document and justify costs that deviate from the Cost Manual approach. Intalco should justify the need for a redundant scrubbing module, or revise its estimates to eliminate it.
- Intalco and Ecology should provide modeling results for all Class I areas within 300 km for the base case as well as the 95% potline SO_2 removal case. Ecology should explain how it objectively evaluated the resulting visibility benefits to all of those Class I areas. We believe that, when Ecology does so, it will conclude that 95% SO_2 scrubbing of potline emissions is BART at Intalco.

Ecology Response:

Sea water scrubbing and sodium based scrubbing both result in a need to discharge wastewater. The source of sea water and the location for discharges requires the installation of new water intakes or outfalls in or adjacent to a marine protection area, the Cherry Point Aquatic Reserve. In 2000, the state-owned aquatic lands not already under a lease agreement were designated by the Washington State Department of Natural Resources (DNR) as part of this reserve to ensure long-term environmental protection of herring spawning and rearing grounds. Herring are an important source of food for salmon (which include endangered species) which in turn are an important source of food for resident Orca whales.

The effect of designating the aquatic lands at Cherry Point as a reserve was to withdraw the lands from further leasing. DNR, the state agency responsible for protecting this area, will not allow permits for new water intake or discharges within or near the protection area. This significantly limits the feasible options and eliminates the seawater scrubbing option.

The Ecology and Intalco's cost evaluation in the Technical Support Document includes a one scrubbing vessel option. The costs presented by Alcoa utilized the concepts in the EPA Control Cost Manual, and Ecology separately used a newer EPA model to estimate the capital cost of a wet scrubbing system. That analysis is also included in the Technical Support Document.

The modeling results for all Class I areas within 300 km of the facility are included in the modeling done by the company and presented by Ecology in the support document. The modeling results were considered by Ecology along with the other 5 BART factors in making the BART determination.

Please see the Technical Support Document located in Appendix L.

Comment #16:

We continue to disagree with Ecology that the non-protocol California Meteorological Model (CALMET) modeling is suitable for exempting the Alcoa Wenatchee facility from BART. Even using the non-protocol approach, the visibility impacts from Alcoa were significant. We recommend that Ecology conduct a focused four factor analysis for Alcoa Wenatchee Works (costs of a wet scrubber were estimated generally in the materials presented in Appendix F) and require controls on the facility in the current five-year review period under reasonable progress.

Ecology Response:

As discussed in Appendix I, the finer grid modeling used for the Alcoa Wenatchee Works BART analysis is technically defensible and, given the complex terrain found in the vicinity of Alcoa Wenatchee Works, provides more realistic results for the impacts of the facility on the Alpine Lakes Wilderness (the most heavily impacted Class I area). As shown in Table 11-3, impacts from the BART eligible emission units at Alcoa Wenatchee Works on the Alpine Lakes Wilderness area were below the 0.5 dv threshold for contributing to visibility impairment and thus the facility was not required to perform a BART engineering analysis

Ecology's Four-Factor Analysis in Appendix F evaluates the potential for controls at Alcoa Wenatchee Works.

Comment #17:

We encourage Ecology to complete more rigorous source specific four factor analyses.

We believe that Ecology should commit to complete within two years a detailed technical analysis of control options as discussed in Chapter 10 Long Term Strategy (LTS) and commit within the first five-year review period (by 2015) to implement controls for specific sources or source categories.

Ecology Response:

Ecology completed a Washington specific Four Factor Analysis for the public review draft of the RH SIP. The Four Factor Analysis identified 5 source categories as candidates for future SO_x and NO_x controls. Since Ecology needs to comply with the requirements of state law to develop controls on existing sources, Ecology as a best case could complete rules requiring additional controls on 2 source categories over a 5-year period. As a result additional controls are not reasonable as part of this first RH SIP. Please see Appendix F and Chapter 9 for additional information.

Comment #18:

Ecology should provide a stronger weight of evidence to support the revised RPG for North Cascades National Park and Glacier Peak Wilderness. The Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring data for the Class I areas for the period 2000-2008 should be presented to demonstrate that visibility has been maintained or improved compared to the 2000-2004 baseline. The 2008 emissions data (data available from the draft 2008 National Emissions Inventory for Washington) should be presented similar to Table 5-1 to establish that overall emissions are being reduced during the period 2002 to 2008. California Puff Model (CALPUFF) modeling could be applied to each refinery to demonstrate the relative magnitude of visibility changes after emissions reductions from these sources.

Ecology Response:

Ecology established a RPG of 15.62 dv for North Cascades National Park and Glacier Peaks Wilderness in the final RH SIP. Ecology found the WRAP's projected 2018 visibility impairment at these Class I Areas did not include major existing SO_2 emission reductions at 3 large oil refineries and was heavily influenced by the extraordinarily high fire year of 2003. WRAP contractor Air Resource Specialists, Inc. calculated a revised 2018 visibility projection that Ecology is using as the RPG for these 2 Class I Areas. Additional information is available in Chapter 9 and Appendix E.

Comment #19:

We remain concerned that the RPGs for several Class I Areas do not demonstrate significant improvement in visibility. Ecology should be more proactive in reducing its emissions contributions to these Class I Areas.

Ecology Response:

Ecology has a specific regulatory process it must follow to require new emission controls on existing sources. We anticipate that we can complete 2 of these rulemaking processes in the next 5 years. Additional information on Ecology's approach and timelines for further controls is located in Chapter 10.

Comment #20:

Ecology should set RPGs consistent with the WRAP modeling results that represent visibility benefits from existing controls. It is not consistent to set a RPG for the Most Impaired Days that use better visibility than projected by WRAP modeling and then set a RPG for the Least Impaired Days that is less visibility improvement than projected by the WRAP modeling.

Ecology Response:

We quote the preamble to EPA's RH rule published on July 1, 1999 (64 FR 35714) to address the differences between RPGs for the Most Impaired Days and RPGs for the Least Impaired Days.

> *Today's final rule requires the States to determine the rate of progress for remedying existing impairment [Most Impaired Days] that is reasonable, taking into consideration the statutory factors, and informed by input from the stakeholders (64 FR at 35731).*
>
> *The final rule maintains the approach used in the proposed rule, which established a goal of no degradation for the best visibility days [Least Impaired Days]. The EPA believes this approach is consistent with the national goal in that it is designed to prevent future impairment, a fundamental concept of section 169A of the CAA.…under the final rule, the clean days for most Class I areas are expected to improve over time (64 FR at 3733).*

H. Comments from the United States Department of Agriculture Forest Service

Comment #21:

The rate of progress in improving visibility in the Class I Areas analyzed in your draft RH SIP is much slower than the URP, yet Ecology is proposing no actions other than BART to remedy this. The rate of progress achieved through BART alone is inadequate to meet the requirements of the RHR and the expectations of citizens for excellent visibility conditions in the Class I Areas of this state.

Ecology Response:

First, let us all recognize that Reasonable Progress does not depend solely on BART. The RPGs also reflect rules on the books, generally through 2006.

Secondly, Ecology has a specific regulatory process it must follow to require new emission controls on existing sources. We anticipate that as a best case, we can complete 2 of these rulemaking processes in the next 5 years.

Finally, there are new rules such as International Maritime Organization (IMO) rules for commercial marine shipping and EPA's corresponding commercial marine vessel rules which will come into effect before the end of the first visibility control period in 2018.

Additional information on Ecology's approach and timelines for further controls is located in Chapter 10.

Comment #22:

The BART analysis and selection of control requirements for TransAlta Centralia is not adequate. Post-combustion NO_x controls are appropriate as BART for TransAlta Centralia coal-fired power plant. SCR was never adequately evaluated for BART. Once properly evaluated, if Flex Fuels plus SCR is not economically reasonable, Flex Fuels plus SNCR should be selected as BART.

Ecology Response:

It is Ecology's opinion that it has done a proper evaluation of BART for the Centralia Plant and has issued a BART Compliance Order that requires the emission control process that meets the BART criteria and regulation. Please see the information in section 4 of the BART Technical Support Document along with the supplemental materials related to this facility which are located in Appendix L.

Comment #23:

Ecology has inappropriately exempted Alcoa Wenatchee Aluminum Works from BART based upon a technically flawed modeling analysis. A BART analysis for this facility is needed, or the facility must take federally enforceable limits to reduce its contribution to haze in the Alpine Lakes Wilderness.

Ecology Response:

As described in Appendix I, Ecology is confident in the technical basis of the BART modeling for the Alcoa Wenatchee Works facility. This modeling showed that the BART eligible units at Alcoa Wenatchee facility do not cause or contribute to visibility impairment above the 0.5 dv threshold at any Class I area (see Table 11-3), so a BART analysis of this facility is not required by the RHR.

Ecology's Four-Factor Analysis in Appendix F evaluates the potential for controls at Alcoa Wenatchee Works.

I. Comments from Earth Justice

Comment #24:

Ecology must conduct a proper evaluation of BART for the Centralia plant and require the installation of a SCR system is BART for the NO_x emissions at the TransAlta Centralia Plant.

Ecology Response:

It is Ecology's opinion that it has done a proper evaluation of BART for the Centralia Plant and has issued a BART Compliance Order that requires the emission control process that meets the BART criteria.

Comment #25:

Ecology has proposed a NO_x emission limit for the Centralia plant of 0.24 lb/MMBtu 30-day rolling average with both units averaged together. This is well in excess of EPA's presumptive NO_x BART limit for similar boiler and coal types. Indeed, the fact that Ecology's determination of NO_x emission limits achievable with current NO_x controls is 60% higher than EPA's presumptive BART limit for similar boiler and coal types dictates the addition of post-combustion controls for NO_x removal in the BART analysis.

Ecology Response:

The presumptive BART limitation proposed by EPA is not a requirement, but a preliminary evaluation based on a limited number of facilities of what should be attainable through the use of combustion controls only. If a source cannot meet the presumptive BART limitation, the state can determine appropriate BART controls based on the six criteria in BART regulation.

Comment #26:

The burning of Powder River Basin coal at Centralia should simply be considered part of base case emissions in the BART evaluation. The "Flex Fuels" technology is the plant's current mode of operation and has been since at least 2006 if not earlier, it fails to conform to presumptive BART limits, and thus it does not meet the haze reduction requirements of the Clean Air Act (CAA) or EPA regulation.

Ecology Response:

Ecology does not agree with the commenter's characterization of the Flex Fuels project. The Flex Fuels project required the installation of boiler modifications so that TransAlta's boilers could burn low sulfur coal full-time. The lower sulfur content of PRB or similar coals contains less fuel bound nitrogen and higher net energy content compared to coal from the Centralia coal field. TransAlta's boilers were originally designed to burn coal mined from Centralia, which has lower energy content than low sulfur coal from the PRB.

Low sulfur coal provides more energy per pound burned. Because less coal is burned to meet the same boiler energy input requirements, less NO_x is emitted. The Flex Fuels project will provide at least a 20% reduction in NO_x emissions from previously permitted levels at the facility.

The Flex Fuels project is already installed, and Ecology has observed the reduction in NO_x emissions. In combination with the existing combustion controls, the average NO_x emissions for calendar 2008 from the TransAlta facility are approximately 0.21 lbs NO_x/MMBtu, a rate that is more than a 25% reduction from the previously permitted level of 0.30 lb/MMBtu (the baseline emissions for conducting the BART analysis). The presumptive BART limitation proposed by EPA is not a requirement, but a preliminary evaluation based on a limited number of facilities of what should be attainable through the use of combustion controls only.

TransAlta will still impact visibility at Class I areas from its NO_x emissions even with the Flex Fuel project. In fact, TransAlta will impact these Class I areas from its SO_2 and Particulate Matter (PM) emissions, even though TransAlta has been determined by EPA to meet BART for those pollutants due to its existing controls. The evaluation and application of BART under the RHR does not require that a facility have no residual impact on visibility at Class I areas. BART instead requires a multiple factor analysis of a facility for emission reductions. Ecology has completed this analysis and use of PRB or similar coal meets the six BART criteria.

Comment #27:

Ecology should have required TransAlta to evaluate various combustion control techniques to reduce NO_x emissions from the TransAlta Centralia Plant boilers and also should have required evaluation of those combustion control techniques along with SCR at the Trans Alta Centralia Plant.

Ecology Response:

It is Ecology's opinion that it has done a proper evaluation of BART for the Centralia Plant and has issued a BART Compliance Order that requires the emission control process that meets the BART criteria and regulation. Please see the information in section 4 of the BART Technical Support Document located in Appendix L of the RH SIP.

Comment #28:

TransAlta appears to have overstated the cost of hot-side SCR installation at the TransAlta Centralia Plant units. Total capital costs are higher than reported by others. TransAlta and Ecology used an improper cost method. TransAlta underestimated the NO_x emission reductions that can be obtained with SCR.

Ecology Response:

Please see the fourth section of the Appendix L which contains additional information on the SCR costs at this facility. Whether costs are based on TransAlta's information or EPA's Control Cost Manual, SCR is not cost effective.

Comment #29:

Ecology must require that the BART analysis of SCR at the Centralia units be based on achievable NO_x emission rates, which would be lower than the 0.07 lb/MMBtu emission rate assumed by TransAlta. NO_x emission rates of 0.03 lb/MMBtu should be achievable at the Centralia units given the current NO_x emission rate, which is below 0.24 lb/MMBtu. The ceiling for the NO_x BART limit evaluated should be no higher than 0.05 lb/MMBtu, which should be readily achievable with SCR at the Centralia units.

Ecology Response:

Review of most power plant BART determinations in western states indicate that for the few facilities required (or volunteering) to install SCR for BART, none have an emission limitation below 0.07 lb/MMBtu.

Comment #30:

Neither TransAlta nor Ecology evaluated the cost-effectiveness of SCR in a low dust or tail end location. Ecology's BART analysis for Centralia is deficient without a cost analysis of alternative SCR locations.

Ecology Response:

Ecology did request TransAlta evaluate locating an SCR system after the Electrostatic Precipitators (ESPs). As indicated on the plant layout drawings submitted in March 2010, there is limited space to install the SCR catalyst and the flue gas will require reheating. It is not clear that reheating could be provided by a bypass of the ESPs, and still is able to meet the plant particulate limit and gypsum sales contract requirements. The information submitted in March 2010 is on our web page (http://www.ecy.wa.gov/programs/air/TransAlta/TransAltaAgreement.html). It is also available in the supplemental materials related to this facility which are located in Appendix L.

Comment #31:

If the TransAlta Centralia Plant were subject to the best control technology for NO_x reductions, *i.e.*, SCR (along with Powder River Basin coal and current or upgraded combustion controls), as compared to continuing with the current status quo at the TransAlta Plant, significant environmental benefits would be obtained. Those benefits must be considered by Ecology in determining BART for NO_x at the TransAlta Centralia Plant.

Ecology Response:

Ecology believes that its BART analysis is complete and meets the regulatory criteria. Ecology considered the six factors required by the BART regulation and used the top-down approach to evaluating emission controls required by the BART regulation for determining BART for power plants over 750 MW site output. Under the top-down approach the facility starts with all control options that are available and technically feasible and ranks them by control effectiveness (most effective to least effective). Then the applicant/state analyzes the impacts (principally cost effectiveness in $/ton removed) and selects the most effective control that could not be 'defeated' due to feasibility, cost, or any of the other 6 BART criteria.

Comment #32:

Ecology cannot adopt its regional haze plan and finalize BART requirements for the TransAlta Centralia Plant without requiring analysis of the visibility benefits of Flex Fuels plus SCR at both the TransAlta Centralia Plant unit. Ecology has failed to require a modeling analysis that would show the benefits to RH in the state's national parks and wilderness areas due to installation of SCR along with the burning of Powder River Basin coal at the TransAlta Centralia Plant units. With that analysis, Ecology could then assess BART in terms of $/dv of improvement, which would be a fair way to compare BART costs among different sources. Based on the available information, Conservation Organizations submit that such an analysis would further demonstrate that SCR is the appropriate requirement for BART.

Ecology Response:

Ecology believes that its BART analysis is complete and meets the regulatory criteria. Ecology considered the six factors required by the BART regulation and used the top-down approach to evaluating emission controls required by the BART regulation for determining BART for power plants over 750 MW site output. We also note that we could find no state that utilized the $/dv metric in making a BART determination.

Comment #33:

Ecology cannot justify allowing the Tesoro refinery to avoid having to meet BART for NO_x simply because the compliance deadline does not fit the refinery's preferred maintenance cycle. At a minimum, Ecology should require Tesoro to install new low NO_x burners in 2017 during the normal turnaround time for the CO boiler 2 (F-304) and the F6650 to F6653 heaters. Yet, Ecology has not specified any reasonable progress requirements for this (or any other) facility. There is simply no excuse for Ecology's failure to require the installation of cost-effective NO_X controls at these units as part of its regional haze plan. The NO_x and SO_2 BART determinations for the Tesoro Refinery are inadequate. Given that the SIP does not provide for reasonable progress toward the national visibility goal, it is imperative that Ecology require installation of cost effective pollution controls as BART, or at the minimum, to meet reasonable progress requirements.

Ecology Response:

Tesoro identified three heaters or groups of heaters for which replacement of the original conventional design burners with new low or ultra low NO_x burners was both technically and economically feasible. One heater, which is subject to BART, will have controls installed by 2015. The BART required heater burner replacement will reduce plant NO_x emissions by 62 tons per year.

Due to the time needed for the design approval process and the major maintenance cycle at the refinery, the installation of NO_x controls on other emissions units was determined not to meet BART requirements. This determination is detailed in the Technical Support Document for the Tesoro BART Determination in Appendix L.

Ecology agrees that additional reductions from the Tesoro facility may be necessary to continue reasonable progress toward natural visibility conditions. Additional NO_x controls would be applied under future RACT requirements.

Comment #34:

Until approval for the use of a non-guideline model is obtained from EPA, Ecology cannot assume that the Alcoa Wenatchee Works plant is exempt from BART. Ecology should have evaluated BART options for this facility.

Ecology Response:

The fine grid modeling of Alcoa Wenatchee emissions used the newly accepted guideline version of CALPUFF. The modeling showed no contribution to visibility impairment at Alpine Lakes Wilderness above the contribution threshold of 0.5 dv used the newly accepted guideline version of CALPUFF.

Comment #35:

As the modeling for Washington's Class I areas shows, there is no way the state can show reasonable progress toward the national visibility goal without the adoption of additional emission reduction measures.

Ecology Response:

Ecology believes that it has established RPGs for 2018 under the regulatory criteria required by the CAA and the RHR. The RHR requires Washington to establish RPGs (expressed in dv) for the 8 mandatory Class I Areas within the state. The RPGs are to provide for an improvement in visibility on the Most Impaired Days and ensure no degradation in visibility on the Least Impaired Days.

The establishment of the RPGs for the Most Impaired Days under the RHR requires Washington to consider both the uniform rate of progress needed to attain natural conditions by 2064 and the four factors required by the CAA to determine Reasonable Progress. These four statutory factors are costs of compliance, the time necessary for compliance, energy and non-air impacts of compliance, and the remaining useful life of any potentially affected sources. Please see Chapter 9 for additional information.

Under the RHR, Ecology must set new RPGs in 2018 to define Reasonable Progress for the next 10 years and repeat the establishment of new RPGs every 10 years thereafter.

J. Comments from Tesoro

Comment #36:

Tesoro: Tesoro suggested changes to the following sections of the SIP:

- Chapter 9, Section 9.2.2, Table 9-2 & p. 9-13, 2nd paragraph
- Chapter 11, Section 11.4.2, Table 11-4
- Chapter 11, Section 11.5.2, 2nd paragraph
- Chapter 11, Section 11.5.2, 5th paragraph, 2nd & 3rd sentences
- Chapter 11, Section 11.5.2, Table 11-13
- Chapter 11, Section 11.6, Tables 11-16 & 11-17
- Appendix F, Page 2, Table 1
- Appendix F, page 13, Table 6
- Appendix F, page 14, Last paragraph, last sentence
- Appendix F, page 15, table

Tesoro also questioned the need for the data presented in the "Maximum dv impact on any one day in a 3 year period" column of Table 11.4. Tesoro pointed out the appropriate modeling result for comparison to the visibility impact contribution threshold is the 98th percentile value in the 3 year modeling period. The 98th percentile result is used because of the recognition that modeling results often produce higher "spikes" that are often data anomalies. Therefore, providing maximum visibility impact value is this table most likely represents an overestimation of the visibility impact.

Ecology Response:

We have made many of the suggested edits. We agree with the comments regarding the maximum dv impact on any one day in a 3 year period. The US Department of Agriculture, Forest Service (USDA-FS) and US Department of the Interior, National Park Service (USDI-NPS) requested that information on maximum dv impacts be included with the BART modeling for each facility subject to BART.

K. TransAlta

Comment #37:

The Centralia Plant BART Order's coal sulfur content limit actually achieves "greater reasonable progress." The Centralia Plan's BART Order complies with EPA's RH Regulations as an "alternative measure." The 2668 lb/hr reduction in SO_2 emissions from baselines emissions is "greater" than the 984 lb/hr in NO_x from adding SNCR to the Flex Fuels Projects. SO_2 contributes significantly more than nitrogen oxide emissions to visibility impairment at Washington Class 1 areas. The BART Order Support Document currently references the sulfur content limit as providing visibility benefits beyond those of the NO_x limit but does not characterize the SO_2 emission reductions as a BART alternative.

TransAlta requests that Ecology review the proposed RH SIP and request EPA's approval of the Centralia Plant BART Order on two alternative grounds: First, the BART order NO_x limits comply with the BART requirement. Second, the BART Order's coal sulfur content limit exceeds the BART requirement for SO_2 and achieves "greater reasonable progress" compared to the NO_x control scenario of Flex Fuels Project plus SNCR. The BART order also qualifies for approval as an alternative BART measure.

Ecology Response:

Ecology agrees that the SO_2 reduction coming from the requirement to use PRB or similar coal goes beyond EPA's 2002 SO_2 BART determination. This reduction results from an approximately 50% reduction in the sulfur content of the coal when the average sulfur content in Centralia mine coal is compared with PRB coal from the Jacobs Ranch.. The reduced sulfur content of the coal results in a 'less stressed' wet scrubber system and a lower concentration of SO_2 in the flue gas. The lower concentration of SO_2 in the flue gas entering the scrubber directly translates to less SO_2 emitted from the stack and being converted into secondary particulates that impair visibility. The end result is greater reasonable progress toward the natural condition visibility goal than would be achieved by BART alone.

Comment #38:

The remaining useful life will be nine years or less if EPA approves the RH SIP in 2011 and new controls would not be installed and operations until 2016. TransAlta requests that the following statement be added to the Support Document: "When an enforceable agreement to implement Executive Order 09-05 is completed, Ecology will update the BART cost-effectiveness analysis. Under an agreement consistent with the Executive Order, SNCR and SCR will be significantly less cost-effective than under the current useful life assumption."

Ecology Response:

EPA requires a federally enforceable order to shutdown the plant by a specific date for any limitation on the lifetime of a facility. Without an enforceable order, Ecology must assume that there is no restriction on the lifetime of the facility.

Comment #39:

TransAlta recommends that the Mohave Study be referenced in the RH SIP with the following comment: "The Mohave Study is the only study of the actual visibility impacts of reducing emissions from a major power plant by 100 percent. The Study supports the conclusion that CALPUFF may overstate visibility benefits from emission reductions by the Centralia Plant. The Mohave Study should be a consideration when evaluating the modeled visibility benefits of emission reductions.

Ecology Response:

The commenter refers to a scientific paper by Jonathan Terhorst and Mark Berman, "Effect of coal-fired power generation on visibility in a nearby national park" published in Atmospheric Environment 44 (2010), p. 2524-2531.

Ecology determined visibility benefits from CALPUFF modeling in compliance with EPA's regulatory guidelines for BART determinations and a three state protocol that was developed in coordination with EPA. Ecology believes that it conducted the appropriate modeling for this facility.

Comment #40:

TransAlta encourages the Department of Ecology to respond to the National Parks Conservation Association's (NPCA's) letter by stating in the RH SIP or a separate letter that the Clean Air Act authorizes the states to exercise their discretion in tailoring BART determinations for individual sources and that "national consistency" should not be a significant factor in EPA's review and approval of the RH SIP.

Ecology Response:

Ecology developed its BART determinations based on the six criteria and other requirements of EPA's regulatory guidelines for BART determinations. While all states across the country should be following EPA's regulatory guidelines for BART determinations, Ecology expects that each state will tailor its individual BART determinations to each individual BART source.

L. Comments from Port Townsend Paper Corporation

Comment #41:

PTPC asks Ecology to revise Order No. 7839 to build some monitoring flexibility into the order, so that the deletion of obsolete monitoring methods does not require a SIP amendment. We do not propose that Ecology should give itself authority to weaken the monitoring requirements for BART-eligible process units. We seek only to give Ecology the flexibility to approve changes that maintain or enhance the stringency of the monitoring, without amending the SIP.

Ecology Response:

The request is reasonable in light of the forthcoming Boiler Maximum Available Control Technology (MACT) and Commercial and Industrial Solid Waste Incinerator (CISWI) rules from

EPA and the various new monitoring requirements contained in the proposed rules and what can be anticipated in the final rule. We have issued a revised Compliance Order to allow substitution of the monitoring recordkeeping and reporting to with methods that will provide equal or better information on emissions and compliance status.

M. Regulation of Regional Haze

Comment #42:

We received several comments encouraging us to regulate RH. A few examples include.

- Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.

- As a 25 year volunteer fire lookout for the Forest Service I am speaking here from bitter personal experience regarding air quality. As each week went by during fire season, my ability to spot fires diminished due to continually degrading air quality until finally I was actually guessing if I was seeing a smoke or not. The fire season began in late June or early July at my lookout, Suntop, just North of Mt. Rainier, and the skies were clear, clean, sweet and blue. As the season progressed we would first see the colors of the sunsets begin to change from red to a bronze/gold color, very pretty but an indication of chemicals in the air. Then we would see a wall of brown air to the west. Daily it would edge closer and closer until finally there was no more blue sky to the west, but, east of the Cascade Mountains the air was still clear and blue, as the muck was held back by the Cascades.

  Then a few days later streaks of muck began flowing Eastward across the Cascades, then quickly there were no more blue skies. Just slowly roiling muck rendering visibility very difficult, and breathing nasty tasting. This needs to be stopped!

- Washington’s plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.

- Washington’s plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

- Plans to reduce haze in Olympic National park must be implemented on a timetable that will allow my children to appreciate them – significant reduction in the next fifty years at least.

- My husband and I were just up on Hurricane Ridge the other day, along with people from all over the country and world. If pollution from the coal plant obscures the view there, no one will come. What a shame, since the Olympic Peninsula is ever so worth protecting!

- With regards to the plan according to National Parks and Conservation Association analysis it will cause the air pollution to increase, not decrease over the next decade. The goal for Washington is to completely eliminate haze in Olympia National Park by 2064. This plan actually allows hazy air in the Olympics for 323 more years.

One of the reasons that we heard that the State couldn't put forward a plan that would adequately deal with the pollution is that it would end up being too expensive for the company but we see this as putting corporate profits against – ahead of protecting our cherished national parks.

We also hear a lot of talk about communities and strong economy and jobs. According to the NPCA, the National Park sites and Class 1 Air Sheds like Mount Rainier National Park on the Olympic Peninsula in Washington support 3,800 local jobs and saw more than 4.2 million recreation visits. In the same year park visitors and staff contributed more than $160 million to local economies. Those are jobs and that's an economy structure that can't be out-sourced.

Across the state travel and tourism spending in 2008 supported more than 150,000 local jobs, contributed $15.4 billion to the Washington economy and generated $1.1 billion in state and local taxes. I think that has to be taken into consideration when the economics are considered.

Ecology Response:

Protecting visibility in Washington State's National Parks and wilderness areas is an important component of air pollution control. These areas are part of what makes Washington a desirable place to live and visit. Having clear, unspoiled views of scenery ensures all of us will continue to enjoy these special spaces. The same pollutants that cause haze also harm human health and the environment. This is another important reason for regulating haze-causing pollutants.

Comment #43:

We also received several comments asking us not to regulate RH. A few examples include:

- You are going to regulate Haze now!

  How are you going to avoid forest fires cut down all the trees and pave over the mountains?

  I bet 90 percent of the haze is caused by the fires set buy lightening how are you going to fine God or mother nature.

  Thank you I guess I needed to vent and you where the first government agency to ask me for my opinion in a long time... sorry I don't think your idea is a good one.

- We do not need another rule that further reduces our personal freedoms enacted by far away bureaucrats who will be completely unaffected with the restrictions created by said rule.

  Any proposed rules regulating home heating, wood stoves, and fireplaces merely hurts people in this area without any affect air quality because most of the pollution comes on the winds from far-off places.

Please concern yourself with real pollution…. Say that pollution that comes from cars in the Seattle area. Once you have your house cleaned up, you have my permission to consider mine.

- If there are problems with man-made pollutants they are being generated by the people who are competing with us (USA) in the world (primarily China and India) of industry. I suggest you get them to clean up their acts. The DOE can stop destroying forest roads. When we have the inevitable wild fires in our wild places, DOE's radical insane policies will be one of the factors resulting in a very large amount of air pollutants.

Ecology Response:

In 1977, the U S Congress amended the CAA to include provisions to protect scenic vistas in National Parks and wilderness areas. The objectives of these amendments are to remedy existing visibility impairment caused by man-made sources and prevent any future degradation of visibility by man-made sources. The RH Regulations require each state to adopt a RH SIP that focuses on improving the haziest days and protecting the clearest days. This RH SIP was developed to identify both man-made and natural sources of haze and to reduce man-made emissions that contribute to haze.

N. Prescribed Fire

Comment #44:

We received several comments concerned with the effects the SIP would have on prescribed fires. A few examples include:

- The Cle Elum Ranger District will once again burn 800 acres and slash piles through the district in September. There will be smoke visible from HW 97, I-90, and the Kittitas Valley. In addition to spending my tax dollars on this effort, I will have to pay for medications and natural remedies to stave off the “secondhand” smoke from this ban. Why aren’t there controls on the practice of slash burning?

- One of the best ways to help with haze-reduction is to have controls on slash burning. This includes the burns allowed by the Forest Service in the national parks. The carcinogenic smoke settles in Cle Elum’s and Roslyn’s valley and will not dissipate before the ‘forest fires” begin in August and September. We have our air polluted for the whole spring, summer and fall. It is the burning of slash that pollutes the air and causes health issues. We need to become a true SMOKE FREE STATE!

- Entiat community suffers from the harmful effects of wildfire-created poor air quality almost every summer. Entiat community prefers smoke from prescribed fire which is restoring or maintaining ecosystems rather than wildfire smoke. We ask that DOE recognize their responsibility as the ESB 2514 lead agency and the ongoing partnership with the Entiat Watershed Planning Unit by classifying prescribed fire in the Entiat Watershed that is covered by one of the above plans as ‘natural’.

We think the onerous bureaucratic permitting requirements of anthropogenic prescribed fires may doom the success of our plans which are being enthusiastically implemented. Entiat community has counted on and prided itself on its collaboration with DOE water resources. We truly understand that cost that effective collaboration takes. Entiat landowners have donated/volunteered thousands of hours working on these plans and securing community acceptance of them. I would not be happy if DOE air resources decisions sabotaged our grass-roots plans.

- Eastern Washington forests are in bad shape, as a result of fire suppression. Trees that would have been naturally thinned out, by wild fire survive. The result is thickets of small diameter unhealthy trees.

  When a fire occurs under dry windy conditions, all of the trees over large areas get wiped out- and a huge amount of smoke pours into the air. In prescribed fire, managers pick their time for a fire to occur. The intent is to reduce the fuel under ideal conditions. There is also a benefit in that many shrubs that provide forage for wildlife are rejuvenated by fire.

  Any intent to curtail prescribed fire due to smoke concerns ignores the fact that every acre of eastern Washington forest is going to burn sooner or later. The choice is between little fires and big fires. There will be smoke no matter what policy is in place.

  Please leave prescribed fire off the list of activities you intend to regulate.

- Based on the foregoing in reference to the RH Reduction Implementation Plan we respectfully submit that prescribed burning be segregated from other "anthropogenic" pollution sources and as such that prescribed burning, and emissions there from, be managed as an ecosystem service that sustains fire dependent ecosystems, reduces negative environmental, ecological, economic, and social impacts.

  Further we request that prescribed burning emissions be considered "natural" emissions. Despite the ignition source, pyrolysis or fire in its natural environment, i.e., fire dependent ecosystems, is a natural process.

Ecology Response:

The federal RHR requires states to consider multiple factors in developing a long-term strategy. One of these factors is smoke management techniques for forestry management purposes.

Under state law the Washington State Department of Natural Resources serves as the Smoke Management Plan (SMP) administrator and is responsible for managing smoke emissions from silvicultural forest burning. The SMP "applies to all persons, landowners, companies, state and federal land management agencies, and others who do outdoor burning in Washington State on lands where Washington DNR provides fire protection or where such burning occurs on federally managed, unimproved forestlands and tribal lands of participating Indian nations in the state" (1998 Smoke Management Plan, page 5).

The WRAP is a voluntary organization of western states, tribes, and federal agencies that worked collaboratively to address visibility impairment in mandatory Class I Areas. In 1998 WRAP established a Fire Emissions Joint Forum (FEJF) is to make recommendations to the WRAP and related WRAP forums on policies and methodologies for categorizing natural and human-caused emissions from fire.

Washington's RH SIP was developed following the RHR and the policy recommendations developed by the WRAP's FEJF.

O. Emissions from Ships

Comment #45:

Particularly while at anchor ships continue to discharge visible exhaust. In calm weather especially, the exhaust of one ship can cause a visible layer of haze covering much of the harbor and adjacent foothills.

Based on my frequent observations of shipping in Port Angeles harbor and passing the entrance of the harbor, the level of emissions and related haze must be tremendous. Taken cumulatively over the area of the Strait and Puget Sound, this influence is potentially affecting several of the National Parks and wilderness areas in this project.

I have no way of quantifying the amount or degree of this problem other than my personal, visual observations. I don't know if stopping or mitigating emissions from ships is possible in the short-term, especially while those that are in motion. But ships at anchor, and especially those at dock, should be required to shut down if they are to remain for a certain period.

Ecology Response:

The impact of visibility impairment from ship emissions on mandatory Class I areas has been evaluated and can be a noticeable portion of the emissions. Some adopted rules, which will lead to emission reductions and visibility improvement, are too recent to have been taken into account in the 2018a inventories or the PRP18a modeling used for Washington State's RH SIP. These include the following:

- Marine Diesel Emission Standards for engines with a cylinder displacement of less than 30 liters
- IMO rules reducing NO_2 and SO_2 emissions from commercial marine vessels
- Corresponding EPA rules for Category 3 Marine Diesel Engines with a cylinder displacement equal to or greater than 30 liters
- Some of Washington's ports are providing electricity to ships at dock.

P. Emissions from Biomass

Comment #46:

We received several comments regarding regulation of biomass emissions. A few examples include:

- My concerns regarding air quality include the current plans for bringing dozens of biomass plants to Washington State. Allowing these plants without size limits and maximum pollutant control standards will further destroy our air quality.

- Please NOTE that particulate emissions from biomass burning have been documented as higher than from coal. PLEASE ensure that all pollution controls include emissions from all sizes of biomass incinerators.

  The several proposed biomass incinerators in the South Sound area will add considerably to the health hazards as well as to the haze over our beautiful Olympic Peninsula.

- We the people, through our elected and appointed officials should be doing everything possible to ensure that the proposed Biomass Plants don't happen or are prevented from Hazing our Parks, which they will, my opinion. This is a dirty technology that will further pollute the air and make us all less healthy, and the Polluters are looking to get paid by the Taxpayers of America through Stimulus Money Grants. This is shameful.

Ecology Response:

Ecology has conducted a four-factor analysis on existing wood-fired boilers. The four factor analysis concluded there may be individual existing units where cost-effective emission controls can be installed. Additional information is located in Appendix F.

Starting in January 2011 existing wood-fired boilers are expected to be subject to requirements of new federal regulations. These new requirements are anticipated to result in reductions of particulate matter and other pollutants from existing boilers.

New wood fired boilers are required to implement BACT for all pollutants. The level of control required to meet this level of control is very stringent. Starting in January 2011, these units will also have to meet more stringent requirements than existing wood fired boilers.

Q. Health Effects

Comment #47:

We received several comments concerned with health effects. A few examples include:

- Let's not forget the long-term effects on human health and those who suffer from bronchial and asthmatic issues. This haze has to blow somewhere, and into the cities it goes!

- Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

- Haze pollution harms public wilderness areas and hurts public health. Please stop it.

- I am a licensed physician residing in Wenatchee, WA. While I am completely in favor of improving air quality for the restoration of visibility, and for reducing global warming, I would also like to remind you of the adverse health effects of air pollution. These affect all of us, not just those suffering from lung disease. The impact of open burning in the Wenatchee valley is evident whenever the air is stagnant and visibility is reduced to a few miles. Less tangible but possible to calculate would be the increased hospital admissions and the added premium of health care expenses during these events. It is also very likely that the agricultural burning contributes to the dispersion of exotic pollutants which are carcinogens as well. Needless to say, there is no regulation of agricultural burning so long as there is no enforcement. It is my opinion that WA State efforts to improve air quality should be accelerated as rapidly as possible.

- Haze pollution damages our health and his horrible for young lungs. TransAlta is shameful. BURNING COAL? COME ON!! HEART AND LUNG DISEASE? PREMATURE DEAHTS? For WHAT? PROFIT?

- As an ex-worker at the Centralia steam plant for over 23 year, I have seen the what has happened to my health and other workers health from working at the plant. It is time to shut it down before more people become as ill as I am.

- The same pollutants that cause haze are also damaging our human health here in Washington. As the largest source of NO_x pollution in our state the Centralia generation facility owned by TransAlta is contributing to the known health impacts of nitrogen oxide which include impaired lung development, which often leads to asthma and COPD, and asthma exacerbation, and unfortunately as I think was mentioned here, the people most vulnerable to these impacts are children and the elderly and the already sick. I would like to testify in support of a strong plan to reduce these haze-causing pollutants.

- In our state our biggest concern is the coal plant in Centralia. I'm sorry to say that the plan in front of you, the NO_x Plan for the State of Washington is not one that we find makes an improvement in the situation. For us the issue is human health, the toxics that affect newborns, the toxics that affect old people, the pollution that is harmful not only to our glaciers but also to the poorest who can't get healthcare for the illnesses that they face. So we ask not just for protection from haze but also protection from the mercury, from the coal ash and from the carbon pollution that this plant creates.

Ecology Response:

The same pollutants that cause haze also harm human health and the environment. This is another reason for regulating haze-causing pollutants.

R. Other

Comment #48:

It is my understanding that the TransAlta plant is also a major source of mercury pollution. I believe that the Department of Ecology should take steps to reduce putting that hazardous element into the environment.

Ecology Response:

Mercury emissions are not visibility-impairing pollutants and thus are not addressed in the RH SIP. There is a separate agreement between Ecology and TransAlta that will result in the plant reducing its mercury emissions by at least 50% by January 2012. Based on testing by the company, it is anticipated that the actual reduction achieved will be between 70 and 80%.

Comment #49:

The League of Women Voters maintains that restricting GHG emissions from coal fired power plants is one of the most important steps that we can take to counter global climate change. Coal is the largest source of global warming pollution in the United States.

Ecology Response:

GHGs are not regulated pollutants for purposes of RH and therefore were not considered for purposes of meeting RH requirements. However, Ecology, Department of Commerce, and the Governor's Office are on a separate track to work with TransAlta to transition the Centralia plant away from coal, thereby greatly reducing the plant's greenhouse gas emissions.

Comment #50:

We received the following comments regarding the public process for the development of the RH SIP:

- Looking at all the problems with the coal plant really lacked public process. That is why today the Sierra Club hosted a number of events where we had hundreds of people coming out across the state from Vancouver to Spokane, to Kent, to Seattle, to Olympia, as well as other smaller events and smaller locations across the state because there has been such a lack of public process.

  We can't honestly assess and engage the public and assess the problems unless we do many more of these forums and because we have lacked so many forums over the past year and a half we've had to go out and create our own forums to bring the public into this part of the equation.

- Last year as we all remember being here for the hearing was a chance for the public to comment on the initial step of this process, we submitted letters, a united message from environmental groups, faith groups, health groups saying that the draft that was put forth was completely inadequate.

  We generated and talked with folks across the state representing those constituencies and more than 1,200 comments were entered into the record along those lines. According to analysis and the review that we've seen there has been no substantial improvement to the plan based on all that public input. So we're looking at this process, this one evening hearing here and hoping that this testimony will weigh in a lot more and maybe have some more influence than perhaps all that previous comment had.

Ecology Response:

Ecology conducted formal public participation on the RH SIP in two stages. Each stage included a formal public comment period and a public hearing. In October 2009 Ecology held two hearings on its preliminary determinations for controls on certain older sources of visibility-impairing pollutants. On September 28, 2010, Ecology held a public hearing on the entire RH SIP and specifically on the other two major requirements of the RHR, RPGs and the Long-Term Strategy (LTS) for Visibility Improvement.

Ecology reviews all comments received during a comment period and makes changes to the documents open for comment as appropriate, given the regulatory requirements.

Comment #51:

I would like to share one comment regarding "haze". I have camped in 3 campgrounds recently. The problem I see is smoke from campfires in the campgrounds. It gets so bad I cannot keep our windows open in our small RV or walk in the area during the evening or when major fires are burning. People bring in or buy huge amounts of wood, build very large fires and burn all day (often leaving them going and going inside their RVs to cook and eat meals). They burn fires and get groups together drinking and making noise until late. Then go to bed and let fires smolder. I propose 1. limiting hours of burning to 2 hours for morning meals and 2 at night 5-7 pm to cook meals (and enforcing the time). 2. discouraging campfires by teaching people better and not featuring fires in all the literature about camping such as the newspapers. 3. Teaching people to stop burning garbage in fires. 4. Raise prices on campfire wood sold or stopping the sale of wood. 4. Having "no burn" sections in campground to phase out campfires.

I know this is something that people associate with camping, but we can change attitudes and behaviors, it has been done with many things before such as cutting wood in the campgrounds or feeding wildlife.

The second comment I have is that we need to discourage driving by getting some shuttles in place, especially natural gas or electric buses. I love parks that have these in place. Some parks allow no driving in some areas and it works for them, parts of Olympic National Park could do this also including Hurricane Ridge area.

Ecology Response:

These are all good ideas that should be brought up with the campground owners/operators such as the National Park Service, US Forest Service, Washington State Parks, and private campground owners.

Comment #52:

Ecology received some comments on ways to reduce air pollution.

- I highly recommend reducing "regional haze" in Bellingham and Whatcom County through hybrid heat pump installations perhaps funded by federal stimulus "green shoots" dollars.

- I have a plan and drawings for a project that could provide a world wide effort to clean our air and put many people to work. This would save our race from airborne toxins and low visibility.

- Pursue clean energy such as water turbine/dams, solar, wind and geothermal. Not biomass! That too produces air pollution!

Ecology Response:

Thank you for your comments. Ecology is always looking at ways to reduce air pollution.

S. Commenter Index

The table below lists the names of organizations or individuals who submitted a comment on the rule proposal and where you can find Ecology's response to the comment(s). We listed the names in the table in alphabetical order of last names.

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Copies of all written comments

United States Department of the Interior
NATIONAL PARK SERVICE
Air Resources Division
P.O. Box 25287
Denver, CO 80225

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:

October 6, 2010

N3615 (2350)

Stuart Clark
Manager, Air Quality Program
Department of Ecology
P.O. Box 47600
Olympia, Washington 98504-7600

Dear Mr. Clark:

On September 3, 2010, we received notice of availability of Washington's revised regional haze implementation plan for public review. We appreciate that the Department of Ecology (Ecology) has made substantive revisions to the draft plan since our previous review. The discussions of pollutant contributions, emissions inventory, air quality model performance, and projected visibility by 2018 are much improved. However, the reasonable progress analysis, Best Available Retrofit Technology (BART) determinations, and long- term strategy still lack a substantial commitment to reduce emissions to improve visibility in the impacted Class I national parks and wilderness areas in Washington and Oregon. The reasonable progress goals proposed by Ecology demonstrate only small improvements in visibility by 2018. To demonstrate reasonable progress we encourage Ecology to make specific commitments to complete robust four factor analyses and to require controls within the first five-year review period (by December 2015).

Please refer to our June 11, 2010, comments on Ecology's proposed BART determinations. The nitrogen oxide (NO_x) BART determination for TransAlta's Centralia power plant remains incomplete. The analyses for low NO_x burners and Selective Non-Catalytic Reduction included the currently operating Flex-Fuel, but the analysis for Selective Catalytic Reduction (SCR) did not include Flex-Fuel. As a result, the benefits of SCR were underestimated. In addition, the costs of SCR were overestimated. We continue to believe that SCR is feasible and cost-effective when cumulative impacts to twelve Class I areas are considered. We also have concerns with other BART determinations as described in our previous comments, and summarized in the enclosed follow-up comments.

We appreciate the opportunity to work with Ecology to improve visibility in our Class I national parks and wilderness areas, and we look forward to resolving these outstanding issues before you finalize the visibility protection plan. If you have questions, please contact Pat Brewer of my staff, at (303) 969-2153.

Sincerely,

John Bunyak

John Bunyak
Acting Chief, Air Resources Division

Enclosure

cc:
Rick Albright
Director, Office of Air, Water, and Toxics
U.S. EPA Region 10
1200 Sixth Avenue
Seattle, Washington 98101

National Park Service Comments
Revised Washington Regional Haze Implementation Plan
October 6, 2010

General Comments:
The National Park Service submitted written comments on Washington's draft regional haze implementation plan on June 11, 2010, and provided oral testimony at the September 28, 2010, public hearing on the draft plan. The comments below supplement our previous comments.

The Department of Ecology (Ecology) has made substantive revisions to the draft regional haze implementation plan. The discussions of pollutant contributions, emissions inventory, air quality model performance, and projected visibility by 2018 are much improved. However, the reasonable progress analysis, Best Available Retrofit Technology (BART) determinations, and long-term strategy still lack a substantive commitment to reduce emissions to improve visibility in the impacted Class I areas in Washington and Oregon. Several of our previous comments were not addressed in the revised draft plan and are reiterated in the specific comments below.

Chapter 6 Emissions Inventory
The discussion of the emissions inventories used by Ecology for 2002 and 2018 is much improved. However, Ecology did not address our questions regarding differences in emissions projections for specific point sources between the 2018 PRPa and 2018 PRPb inventories. The 2018 PRPb inventory reports 12,000 fewer tons of sulfur dioxide (SO_2) than the 2018 PRPa inventory used by Ecology. We asked Ecology to investigate the differences in emissions between the two inventory versions to determine which emissions best represented actual controls. Ecology did not answer this question but identified emissions reductions from three refineries totaling 9000 tons as the basis for revising the reasonable progress goal for North Cascades National Park and Glacier Peak Wilderness Area. If the emissions estimates reported in 2018 PRPb are more accurate, Ecology could demonstrate greater visibility improvement than shown by the earlier 2018 PRPa inventory.

Chapter 8 Best Available Retrofit Technology (BART)

Because Ecology has not adequately addressed our June 11, 2010, BART comments, we are summarizing them below and again requesting appropriate responses.

TransAlta Centralia Generation

We continue to request that Ecology re-consider its BART determination for TranAlta's Centralia power plant. Ecology and TransAlta have not provided a complete BART analysis of nitrogen oxide (NO_x) controls for the Centralia power plant. We believe that a valid "top-down" approach to reducing NO_x demonstrates that addition of Selective Catalytic Reduction (SCR) is BART for Centralia.

- Ecology did not consider other, potentially less-expensive, locations for SCR.
- Ecology has underestimated the ability of modern NO_x control systems. SCR is capable of reducing emissions below Ecology's target, and the amount of the reductions will increase.
- Ecology's SCR costs are overestimated and unsubstantiated. EPA guidance advises that its Control Cost Manual should be used; Ecology should follow this guidance.
- Ecology has not properly evaluated the impact upon visibility of adding SCR to the existing Flex Fuel configuration.
- Ecology should consider the cumulative effects of improving visibility across all of the 12 Class I areas affected.

Tesoro Refining and Marketing Company's Anacortes refinery We continue to recommend that Ecology require controls on Tesoro by 2018. The controls have been demonstrated to be cost-effective if installed in 2018. Ecology should require controls by 2018 under reasonable progress.

Port Townsend Paper Corporation Mill

- Ecology should have included evaluations of upgrades to existing control equipment.
- Ecology must evaluate the visibility impacts of switching to lower sulfur fuels.
- Ecology should consider the visibility improvements that would occur at all of the Class I areas within 300 km of the BART source.
- A RFO limit of 0.5% sulfur should be considered as the default presumption for SO_2 BART.
- Addition of a wet ESP to control PM_{10} emissions from the Power Boiler #10 is cost-effective and represents BART.
- Ecology must re-evaluate all of the technically-feasible and proposed options against the proposed BART limits.

Alcoa's Intalco Works primary aluminum smelter

- Intalco and Ecology should better explain its rejection of seawater and sodium-based scrubbing (versus LSFO) for potline SO_2 emissions.
- Intalco appears to have overestimated costs for LSFO scrubbing. Intalco and Ecology should have used the EPA Control Cost Manual to estimate costs, or better document and justify costs that deviate from the Cost Manual approach. Intalco should justify the need for a redundant scrubbing module, or revise its estimates to eliminate it.
- Intalco and Ecology should provide modeling results for all Class I areas within 300 km for the base case as well as the 95% potline SO_2 removal case. Ecology should explain how it objectively evaluated the resulting visibility benefits to all of those Class I areas. We believe that, when Ecology does so, it will conclude that 95% SO_2 scrubbing of potline emissions is BART at Intalco.

Alcoa Wenatchee facility

We continue to disagree with Ecology that the non-protocol CALMET modeling is suitable for exempting the Alcoa Wenatchee facility from BART. Even using the non-protocol approach, the visibility impacts from Alcoa were significant. We recommend that Ecology conduct a focused four factor analysis for Alcoa Wenatchee Works (costs of a wet scrubber were estimated generally in the materials presented in Appendix F) and require controls on the facility in the current five-year review period under reasonable progress.

Chapter 9: Reasonable Progress Goals

The discussion of pollutant contributions at each of the Class I areas is improved.

Four Factor Analysis

Ecology refers the reader to Appendix F for a description of the required Four Factor Analysis. In Appendix F, Ecology cites the four factor analysis done by the contractor for the Western Regional Air Partnership (WRAP). These analyses provided general analyses for several source categories. We encourage Ecology to complete more rigorous source-specific four factor analyses.

We refer Ecology to the reasonable progress analyses performed by Colorado, Oregon, and Wyoming as examples of states that are requiring controls under reasonable progress to improve visibility at Class I areas. Colorado set a threshold of $5,000 per ton and 0.2 dv visibility improvement in evaluating cost-effectiveness of controls. Oregon has determined that $7,300 per ton is reasonable for BART. Oregon and Wyoming are requiring addition of SCR to certain electric generating units under reasonable progress.

As discussed above for the BART determinations, Alcoa Wenatchee and Tesoro were not required to install controls under BART, yet both sources have significant emissions that could be controlled for reasonable progress. In Appendix F, Ecology estimates that a wet scrubber for Alcoa Wenatchee could cost $5,000-7,500 per ton. No supporting documentation was provided.

In the BART analysis for Tesoro, Ecology reported that NO_x controls were feasible by 2018 but were not considered BART because the controls could not be implemented cost-effectively by 2015. NO_x controls for Tesoro are feasible and cost-effective and should be required in this SIP to be installed as expeditiously as possible.

In addition, BART-eligible sources listed in Table 11-3 that had visibility impacts below 0.5 dv should be evaluated for reasonable progress.

Reasonable Progress Goals

Ecology has revised the reasonable progress goals for the 20% worst visibility days at North Cascades National Park and Glacier Peak Wilderness Area to maintain visibility at baseline 2000-2004 levels. In the previous draft plan Ecology projected degradation in visibility by 2018 compared to the 2000-2004 baseline, based on WRAP air quality modeling. Ecology has documented additional reductions in sulfur dioxide emissions by 2006 from three refineries that are located near these two Class I areas. These reductions were not included in the WRAP 2018 emissions inventory and air quality modeling. We agree that these reductions should reduce sulfate concentrations and the visibility impact from sulfate at these two Class I areas, but the magnitude of response is not known.[1]

Ecology should provide a stronger weight of evidence to support the revised goal. The IMPROVE monitoring data for the Class I areas for the period 2000-2008 should be presented to demonstrate that visibility has been maintained or improved compared to the 2000-2004 baseline. The 2008 emissions data (data available from the draft 2008 National Emissions Inventory for Washington) should be presented similar to Table 6-1 to establish that overall emissions are being reduced during the period 2002 to 2008. CALPUFF modeling could be applied to each refinery to demonstrate the relative magnitude of visibility changes after emissions reductions from these sources.

We remain concerned that the reasonable progress goals for several Class I areas do not demonstrate significant improvement in visibility. Ecology should be more proactive in reducing its emissions contributions to these Class I areas.

In Section 9.3 Ecology reports that the WRAP modeling projects that visibility on the 20% best visibility days will improve by 2018 compared to the 2000-2004 baseline. Yet Ecology sets the reasonable progress goals for the 20% best visibility days the same as the baseline. This does not meet the requirement at CFR 51.308.d.vi:

> "The State may not adopt a reasonable progress goal that represents less visibility improvement than is expected to result from implementation of other requirements of the Clean Air Act during the applicable planning period."

Ecology should set reasonable progress goals consistent with the WRAP modeling results that represent visibility benefits from existing controls. It is not consistent for Ecology to set a reasonable progress goal for 20% worst days at North Cascades National Park and Glacier Peak Wilderness Area that is better visibility than projected by the WRAP modeling and then set a reasonable progress goal for the 20% best days at the same Class I areas that is less visibility improvement than projected by the WRAP modeling.

Chapter 10: Long Term Strategy

We believe that Ecology should commit to complete within two years a detailed technical analysis of control options as discussed in Chapter 10 Long Term Strategy and commit within the first five-year review period (by 2015) to implement controls for specific sources or source categories. As written, there is no commitment to follow through on controls by a specific schedule.

[1] Deciview is a logarithmic measure of visibility. It is not appropriate to assume that a linear percentage reduction will yield a linear percentage change in visibility as measured by the deciview metric.

NORTHWEST
PULP&PAPER

Northwest Pulp & Paper Association
7900 S.E. 28th Street, Suite 304
Mercer Island, WA 98040
(206) 414-7290, Fax (206) 414-7297

October 6, 2010

Doug Schneider
Department of Ecology Air Quality Program
P.O. Box 47600 Olympia, WA 98504-7600
AQcomments@ecy.wa.gov

RE: Washington State Regional Haze SIP – draft

Dear Doug,

NWPPA appreciates the opportunity to review the Department of Ecology's draft "Washington State Regional Haze State Implementation Plan (SIP)."

NWPPA's comments have to do with Chapter 10.3 "Plans for Further Controls on Visibility Impairing Pollutants." Specifically in that section you mention the pending plans to consider five industrial categories for technical analysis to determine if RACT rulemaking would be appropriate. It appears that the pulp and paper industry will be one of the categories selected for further analysis.

Given the timeframe outlined in the document, we would appreciate an opportunity to meet with you and discuss further your plans. In general we urge more outreach on the part of Ecology in connection with this task and the Regional Haze SIP in general.

Thank-you and I look forward to meeting with you soon.

Sincerely,

Llewellyn Matthews

Llewellyn Matthews.
Executive Director

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

OFFICE OF
AIR, WASTE AND TOXICS

October 6, 2010

Mr. Doug Schneider
Air Quality Program
WA Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Mr. Schneider:

We have reviewed the draft Washington Regional Haze State Implementation Plan ("WA RH SIP") that was released for public comment on September 1, 2010. The intent of providing these comments is to improve the RH SIP so that it will meet all requirements of the Region Haze Rule ("RH Rule") and applicable EPA guidance:

1. Reasonable Progress.
   a. Establish Reasonable Progress Goals (RPGs) for each Class I area that provide for an *improvement* in visibility for the most impaired days, as required by RH Rule (40 CFR 51.308 (d)(1)). *"For each mandatory Class I Federal area located within the State, the State must establish goals (expressed in deciviews) that provide for reasonable progress towards achieving natural visibility conditions. The reasonable progress goals must provide for an improvement in visibility for the most impaired days over the period of the implementation plan and ensure no degradation in visibility for the least impaired days over the same period."* Based on the draft WA RH SIP, Ecology is only committing to "no degradation" on the 20% worst days in the North Cascades National Park and Glacier Peak Wilderness Class I areas in 2018. The proposed SIP fails to address the need to provide for improvement in visibility on the most impaired days. Additional analysis is necessary in this RH SIP to demonstrate whether or not further controls on BART sources, or non-BART sources identified in the four-factor analysis, could achieve this goal. For example, there are certain industrial source categories identified in the four-factor analysis where significant emission reductions could potentially be achieved cost-effectively. According to Appendix F of the WA RH SIP, Ecology concludes:
      i. Petroleum Industry Process Heaters: "Based on the above [evaluation], it is Ecology's opinion that further investigations into the ability to further reduce SO2 emissions and NOx emissions from process heaters should be performed. If cost- effective reductions are available, rules should be developed to limit emissions."
      ii. Petroleum Industry Catalytic Cracking Units: "Based on the above [evaluation] , it is Ecology's opinion further reductions in SO2 and NOx from FCCU systems should be further evaluated to determine if cost effective emission reductions are available on either a category basis or for a specific facility."

iii. Industrial External Combustion Boilers-Residual Oil. "Based on the above [evaluation], it is Ecology's opinion that there may be individual units where cost-effective emission controls can be installed. The units affected and the control options will depend upon the adopted rule requirements."

b. EPA notes that the regional haze regulations require the state to consider the emission reductions that would be required to achieve the uniform rate of progress for each Federal Class I area for the period covered by the implementation plan. See 40 C.F.R. 51.308(d)(1)(B). Please further describe how the state has satisfied this requirement in the WA RH SIP.

2. <u>Best Available Retrofit Technology (BART) for TransAlta Centralia</u>.

a. Based on Ecology's BART Determination Supporting Documentation for Centralia (WA RH SIP, Appendix L) it is apparent that the combination of Flex Fuel and Selective Non-Catalytic Reduction (SNCR) at Centralia will: 1) achieve a NOx emission rate of 0.18lbs/MMBtu, which is close to the presumptive NOx limit (0.15lbs/MMBtu) for that type of boiler, as specified in the RH Rule, 2) is technically feasible, 3) is cost-effective at about $2,100/ton, and a cumulative visibility improvement in all impacted 12 Class I areas of $1.4M/dv, 4) will not cause any significant energy or non-air quality effects, and 5) would result in a visibility improvement in the three most heavily impacted Class I areas due to NOx reductions by an additional 1.9 deciviews (dv) on the 98th percentile day, and at the least impacted Class I areas, the improvement would be 0.8 to 1.0 dv, which would provide further reasonable progress towards the 2018 visibility improvement target in all 12 impacted Class I areas. It is unclear why these reasons do not support a BART determination of Flex Fuel plus SNCR. Please explain why these reasons do or do not support a determination that Flex Fuel and SNCR is BART for Centralia.

b. The National Park Service (NPS) sent a letter to Ecology, dated June 11, 2010, on the FLM draft version of the WA RH SIP. This letter included information that indicates that Flex Fuel plus Selective Catalytic Reduction (SCR) may be technically feasible and cost effective in reducing NOx emissions from Centralia. Based on this new information, EPA requested (in a letter dated 6/30/10 from Keith Rose to Doug Schneider) that Ecology conduct a BART analysis of Flex Fuels plus SCR. EPA requested that this BART analysis should include modeling of the visibility impairment in each of 12 impacted Class I areas, a determination of the capital cost, annual operating costs, and cost effectiveness of these combined technologies. EPA again requests that this analysis be provided. This additional analysis should show a level of detail similar to the analysis conducted for the combination of Flex Fuel plus SNCR scenario. Estimates of capital and annualized operating costs for SCR and Flex Fuel should be based on the OAQPS Control Cost Manual. The BART guidelines state that the OAQPS Control Cost Manual should be used where possible (see 70 FR 39166):

"Once the control technology alternatives and achievable emissions performance levels have been identified, you then develop estimates of capital and annual costs. The basis for equipment cost estimates also should be documented, either with data supplied by an equipment vendor (*i.e.*, budget estimates or bids) or by a referenced source (such as the *OAQPS Control Cost Manual,* Fifth Edition, February 1996, EPA 453/B–96–001). In order to maintain and improve consistency, cost estimates should be based on the *OAQPS Control Cost Manual,* where possible. The *Control Cost Manual* addresses most control technologies in sufficient detail for a BART analysis. The cost analysis should also take into account any site-specific design or other conditions identified above that affect the cost of a particular BART technology option. "

Please contact Keith Rose at 206-553-1949 if you have any question on these comments.

Sincerely,

Debra M Suzuki

Debra Suzuki, Acting Manager
State and Tribal Air Programs Unit

Cc: Gina Bonifacino, OAWT
Andrew Green, Ecology

Lynn D. Westfall
Senior Vice President,
External Affairs and Chief Economist

TESORO

Tesoro Companies, Inc.
19100 Ridgewood Parkway
San Antonio, TX 78259
210 626 4697
210 626 4018 Fax

October 1, 2010

Mr. Doug Schneider
Department of Ecology
Air Quality Program
P.O. Box 47600
Lacey, WA 98504-7600

Sent via Email: AQcomments@ecy.wa.gov

Re: Tesoro Refining and Marketing Company Comments on the Proposed Washington State Regional Haze State Implementation Plan (SIP)

Dear Mr. Schneider:

Tesoro Refining and Marketing Company (Tesoro) has reviewed the Proposed Regional Haze State Implementation Plan (Regional Haze SIP) information posted on the Washington State Department of Ecology's (Ecology's) website.[1] Based upon this review, Tesoro is providing the following comments and requested corrections.

Chapter 9, Section 9.2.2, Table 9-2 & Page 9-13, 2nd Paragraph – The table and paragraph notes that Tesoro has installed a "Wet Gas Scrubber (WGS)" and a "Flue Gas Scrubber (FGS)" on the Catalytic Cracking Unit (CCU), in addition to a Sulfur Recovery Unit (SRU). Tesoro installed a WGS in 2005; however, there was not an additional FGS installed on the CCU as noted in these sections. In addition, while Tesoro made changes to the refinery in 2007 to allow for additional H_2S treatment and handling, an SRU was not installed as noted in these sections.

Chapter 11, Section 11.4.2, Table 11-4 – For the Tesoro row within this table, the *"# of Units Subject to BART"* column should reflect fourteen (14) emission units.

In addition, Tesoro questions the need for the data presented in the *"Maximum dv impact on any one day in a 3 year period"* column of this table. The appropriate modeling result for comparison to the visibility impact contribution threshold is the 98th percentile value in the 3 year modeling period. The 98th percentile result is used because of the recognition that modeling results often produce higher "spikes," that are often data anomalies. Therefore, providing maximum visibility impact value in this table most likely represents and overestimation of the visibility impact and is the result of a modeling data anomaly.

Chapter 11, Section 11.5.2, 2nd Paragraph – The first sentence of this paragraph states the following:

[1] Located at: http://www.ecy.wa.gov/programs/air/globalwarm_RegHaze/RH_SIP/RH_SIP_Document_Table.pdf

Page 2

> *"Due to time needed for the design approval process and the major maintenance cycle at the refinery, Tesoro does not plan to replace the other two heaters until 2018."*

During the Best Available Retrofit Technology (BART) process, it was determined that NO_x reductions will be required for one process heater (F-103) at the Tesoro refinery. The installation of NO_x controls on certain other emissions units was determined to not constitute BART because the reductions could not be achieved within the required BART timeline. It is assumed that this sentence is referencing this BART conclusion; however, Tesoro requests the language of this paragraph to be changed to the following:

> *"Due to **the** time needed for the design approval process and the major maintenance cycle at the refinery, **the installation of NO_x controls on other emission units was determined to not be required as BART. This determination** is detailed in the Technical Support Document for the TESORO BART Determination in Appendix L."*

Chapter 11, Section 11.5.2, 5th Paragraph, 2nd & 3rd Sentences – Tesoro requests that these sentences be replaced with the following language in order to reflect the appropriate averaging periods of the refinery fuel gas sulfur limits:

> *"A new refinery gas hydrogen sulfide (H_2S) content limitation reduced the allowable H_2S content to 1,000 ppm (365-day rolling average) from the previous 10,000 ppm (hourly average) level, and required installation of a continuous refinery gas hydrogen sulfide continuous emission monitoring system. The refinery gas system modifications reduced the typical actual daily average H_2S content of the refinery gas to 70 – 100 ppm from over 2,000 ppm previously."*

Chapter 11, Section 11.5.2, Table 11-13 – This table does not accurately demonstrate the reductions Tesoro has (or will) achieve through the BART process. It appears this table was derived from data presented in Tesoro's BART visibility modeling report. The modeling analysis was developed at the beginning of the BART review process and does not reflect the final BART determination. In addition, the annual emission estimates in this table appear to be based upon the maximum short-term emissions for each pollutant and assuming that maximum amount is emitted every day for a year. It was appropriate to use a maximum short-term emission rate for the purpose of performing visibility modeling because the impact thresholds were based upon a 24-hour average. However, using this maximum short-term data to reflect annual emissions from the refinery is not appropriate and greatly overestimates emissions.

Tesoro suggests that Ecology delete Table 11-13. However if Ecology elects to maintain a tabulated comparison of emissions, Tesoro requests to work together with Ecology prior to the Regional Haze SIP being finalized to discuss the best method to represent a comparison. After this discussion and if needed, Tesoro can provide an updated Table 11-13 that more accurately reflects the expected refinery emission reductions due to the BART process.

Page 3

Chapter 11, Section 11.6, Tables 11-16 & 11-17 – The columns in these tables that represent data from Tesoro's BART visibility modeling analysis contains a footnote that states the following:

> *"Includes effect of proposed reasonable progress limits"*

Tesoro has not agreed to any limits beyond what it reflected in the final BART Regulatory Order. In addition, there are no other limits proposed to be placed on Tesoro in the Regional Haze SIP. Therefore, to accurately represent the current status, this footnote reference must be removed from the table.

Appendix F, Page 2, Table 1 – Chapter 9 of the proposed Regional Haze SIP document (see Page 9-10 and Table 9-2) notes that the Western Regional Air Partnership's (WRAP's) 2018 projected SO_2 emission inventories do not reflect a significant amount of additional point source SO_2 emission reductions identified by Ecology. For example, WRAP projected a 360 ton/year decrease in SO_2 emissions in 2018, and Ecology's analysis shows a 9,826 ton/year decrease in SO_2 emissions. It is unclear if the Table 1 data reflects this discrepancy. Tesoro requests that this table either be updated to account for this difference or a footnote be added to note that the data presented is based upon higher than expected future SO_2 emission estimates.

Appendix F, Page 13, Table 6 – Ecology has indicated several times in the Regional Haze SIP document that Appendix F is setting the stage for future Reasonably Available Control Technology (RACT) determinations. Therefore, Tesoro is concerned that the information presented in this table will be used for future RACT determinations, but contains pollution control cost information that is not accurate. For SO_2 reductions from refinery process heaters, Table 6 reflects a cost/ton reduced range of $1,300 - $1,700. It appears that this range was taken from a WRAP technology study. The ability or reasonableness to install additional refinery gas sulfur reduction or possibly SO_2 controls is refinery specific, and costs vary significantly. For example, Tesoro has previously determined through the BART review process that any significant and reliable additional reductions in H_2S content of the refinery fuel gas would require the installation of an SRU, at an estimated cost of approximately $14,000 - $16,000/ton reduced. This cost estimate was even considered conservatively low because it did not consider the annual operating costs of a new SRU.

As another example, Table 6 represents a cost/ton of Selective Non-Catalytic Reduction (SNCR) to be $890 - $5,200. Tesoro has determined through a detailed technical evaluation and the cost/ton to adding SNCR to a process heater can be at least $18,000/ton.

Because the data in this table is setting the stage for possible future RACT determinations, Tesoro requests that the cost/ton information be removed since the costs of control technology evaluations can vary significantly depending upon the site specific application.

Appendix F, Page 14, Last Paragraph, Last Sentence – Tesoro requests that this sentence be updated to reflect that Tesoro installed a Wet Gas Scrubber in 2005 as well. The sentence should be updated as follows:

Page 4

> *The Shell* ***and Tesoro refineries*** *installed SO_2 reduction technology on* ***their*** *FCCU/CO* ***boilers*** *in 2005 to comply with the MACT requirements for FCCU catalyst regenerators.*

Appendix F, Page 15, Table 7 – As noted above, Ecology has indicated several times in the Regional Haze SIP document that Appendix F is setting the stage for future RACT determinations. Therefore, Tesoro is concerned that the information presented in this table will be used for future RACT determinations, but is reflecting pollution control cost information that may not be accurate. For NO_x reductions from FCCU/CO boiler systems using a LoTOx technology, Table 7 reflects a cost/ton reduced range of \$1,700 - \$2,000. Tesoro considers this range of estimates to vastly underestimate the cost of installing LoTOx. Tesoro has previously determined through the BART review process that installation of a LoTOx system on the refinery's FCCU would cost at least \$15,000/ton NO_x reduced. Because the data in this table is setting the stage for possible future RACT determinations, Tesoro requests that the cost/ton information be removed since the costs of control technology evaluations can vary significantly depending upon the site specific application.

Tesoro appreciates the opportunity to review and comment on the Proposed Regional Haze State Implementation Plan. Please contact Rebecca Spurling at (360) 293-1664 with any questions or if you require additional information.

Sincerely,

Lynn D. Westfall

Lynn D. Westfall
Senior Vice President
External Affairs and Chief Economist

cc: Rebecca Spurling
Chris Drechsel
Rob Gronewold

International Brotherhood of

BOILERMAKERS • IRON SHIP BUILDERS **BLACKSMITHS • FORGERS & HELPERS**

New Brotherhood Building *Kansas City, Kansas 66101*

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October 4, 2010

To: Doug Schneider
Department of Ecology
Air Quality Program
P.O. Box 476000
Olympia, WA 98504-7600
Aqcomments@ecg.wa.gov

Subject: Washington Plan to Reduce Regional Haze in our "8 Mandatory Class 1 Areas" by drafting a State Implementation Plan (SIP) thereby formulating Washington's Fundamental SIP for 2005 through 2018.

Attention all who are involved with SIP,

Having attended the hearing held on September 28, 2010 at your headquarter in Lacey, I feel compelled to write this letter, since so many of those who testified were not doing so in the spirit of the objective of the hearing.

The objectives of this initial SIP, as stated, are to:

- determine the Baseline Visibility for the "8 Class 1 Areas" in Washington,
- determine the natural and manmade sources of the haze,
- set up goals (reasonable progress) to reduce haze production by 2018 and beyond,
- long term strategies for improving visibility.

It seemed that the hearing in September became a "coal-bashing" forum with the intent of shutting down Centralia Steam Power Plant. This sentiment affected me at many levels and left me conflicted. As a boilermaker, I am concerned about future financial opportunities performing annual maintenance at the Centratlia plant. As a native Washingtonian, I am apprehensive about the current and future air and water quality of our state. Additionally, I am troubled by poor air and water quality affecting the natural beauty of the region and the health of all of us living here.

As an electricity consumer and person who is concerned with my utility rate, I am worried about eliminating coal as a source of generating electricity to meet our growing demand in Washington. The thirty to fifty percent of power generated by coal could not merely be replaced by conservation, wind farms and solar panels. Eliminating coal will increase our dependency on natural gas and our rates will further spike. Finally, as an American, at a time when we are trying to lessen our dependency on foreign oil, it is difficult to ignore a 200 year supply of coal and not utilize it as a natural resource.

Where does this leave us?

The objectives of your SIP can be met without shutting down the Centralia Steam Power Plant. There are technologies at hand to reduce emissions released from the combustion of coal. The existing facility in Centralia can be upgraded to reduce emissions that contribute to haze and thereby improve visibility in the years ahead. Maintaining the Centralia plant would create and preserve jobs at a time of high national and state unemployment, as well as help keep utility costs down by not increasing our dependency on natural gas. Furthermore, this would set an example for other coal power generating facilities to clean up their emissions, while continuing to lessen our dependency on foreign oil to meet our energy needs until new technologies are developed to provide affordable energy without adversely affecting our environment.

Sincerely,

Dale Mason, representing all Boilermakers of Local 502
Assistant Business Manager Local 502

From: Vanassa Lundheim
To: ECY RE AQComments;
Subject: RE: Comment on Washington"s Proposed Regional Haze State Implementation Plan
Date: Wednesday, October 06, 2010 9:08:25 PM

Oct 6, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Mrs. Vanassa Lundheim
5304 Beverly Ln
Everett, WA 98203-3144

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of James MClure [dmcclure@colfax.com]
Sent: Tuesday, October 05, 2010 10:40 PM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 6, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

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Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being excessively weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Dr. James MClure
108 W James St
Colfax, WA 99111-1714

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Michael Parkis [mpparkis@gmail.com]
Sent: Sunday, October 03, 2010 7:27 PM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 3, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

My feeling is that if we cannot get a program that reduces TransAlta's level of pollution by 90% we should work toward converting the plant to geothermal heat as a source of energy.

The U.S. Geological Survey has issued maps indicating that we are within a reasonable distance from accessible geothermal heat sources in the 300 degree centigrade range.

Tapping that resource could conceivably provide us with a new source of power that uses no fuel and does no polluting. It may also be able to use the current TransAlta generating equipment.

I will be happy to provide you with material in support of the above statements if you so wish.

Sincerely,

Mr. Michael Parkis
5406 SW 244th St
Vashon, WA 98070-8122

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Raymond Williams [maxrwilliams@aol.com]
Sent: Tuesday, October 05, 2010 3:26 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 5, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater. Why worry about the national debt and its effect on our grndchildren if they can't breath the air.

Sincerely,

Raymond Williams
3920 Road 105

Pasco, WA 99301-6750

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Marian Schwarzenbach [marianschwarzenbach@yahoo.com]
Sent: Monday, October 04, 2010 9:24 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 4, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Washington's coal-fired electical plant near Centralia puts out as much air pollution as ALL the CARS in Washington state. It needs to go.

Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Marian Schwarzenbach
4542 Stanford Ave NE
Seattle, WA 98105-2149

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of raymond benish [rjbenish@hotmail.com]
Sent: Monday, October 04, 2010 5:54 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 4, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

I am opposed to the continued operation of Trans Alta Coal Fired Generation Plant.
Washington State has the fourth lowest cost of power in the United States with the average cost per kilowatt hour just over 6 cents. We could and should convert the Trans Alta Coal Plant to burn natural gas. We would reduce Trans Alta CO2 emissions by half and nearly eliminate mercury and sulfur dioxide emissions. Our state has ample access to low cost natural gas either domestic or imported from Canada so that incremental increases in cost of power generation would be modest and reasonable considering the benefits of cleaner air and reduced greenhouse gas emissions.
It is my understanding that the governor negotiated a secret deal with Trans Alta to allow continued coal burning without application of cleaner air emissions standards. We should submit a request for public disclosure of the negotiation documents with the Governor's office in an attempt to bring some degree of transparency to this issue.
In summary, an unbiased economic analysis of the impact of converting Trans Alta from coal to cleaner burning natural gas would do much to inform the decision making. This would allow us to make an informed decision as to the "cost" of conversion including assurance to Trans Alta employees and stockholders that they would be made whole and would not suffer economic hardship as a result of conversion to natural gas.

Raymond Benish, BPI Certified Energy Auditor
23127 13th PL W
Bothell, WA 98021

Sincerely,

raymond benish
23127 13th Pl W
Bothell, WA 98021-9467

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Ellen Aagaard [ellaag@yahoo.com]
Sent: Monday, October 04, 2010 8:54 AM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 4, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

Tourists, hikers and climbers visiting Mt. Rainier; cyclists riding the southeast roads of Washington; people and animals, not only who live nearby the coal plant but throughout southeast Washington; we are all affected by the current and unacceptable levels of nitrous oxide emitted by TransAlta.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Ellen Aagaard
5322 NE 67th St
Seattle, WA 98115-7755

(206) 527-9302

Blain, Lindsay (ECY)

From:	Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Dave Nichols [pugetsoundsailer@yahoo.com]
Sent:	Monday, October 04, 2010 7:53 AM
To:	ECY RE AQComments
Subject:	Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 4, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

The new age clean energy movement is here like it or NOT, the sooner we get going on making the change to clean renewable energy the cheaper and more effective it will be. Plus think of the jobs and the revitalization to our dead economy it will bring, and maybe just maybe we'll have pride in our country again..DO IT !!!!!!!!

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Dave Nichols
PO Box 56
Sedro Woolley, WA 98284-0056

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Sally Jacky [stardancer323@msn.com]
Sent: Sunday, October 03, 2010 10:52 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 4, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

I wish to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms our treasured national parks and wilderness areas and hurts our public health. Federal law requires the state to create a plan to reduce haze pollution. However, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze-causing nitrogen oxide pollution.

We must preserve our treasured public lands and protect public health. Washington state must require pollution controls for TransAlta to reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas. The National Park Service specifically cites the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and protect our public health by revising the Regional Haze State Implementation Plan. Reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Sally Jacky
2411 Lexington St
Steilacoom, WA 98388-2707

Blain, Lindsay (ECY)

From:	Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of nita hildenbrand [omaanna1@comcast.net]
Sent:	Sunday, October 03, 2010 3:22 PM
To:	ECY RE AQComments
Subject:	Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 3, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Why is it that you find it such a trauma to do your job and KEEP THE AIR CLEAN.

Nita Hildenbrand

Sincerely,

nita hildenbrand
13211 97th Ave NE
Kirkland, WA 98034-1948

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of David & Ann Cordero [corderoa@teleport.com]
Sent: Sunday, October 03, 2010 2:53 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 3, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. We observed such haze yesterday at Mt. Rainier National Park on an otherwise clear and beautiful day. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

David & Ann Cordero
2814 Lilac St

Longview, WA 98632-3529

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Elisabeth Robson [bethfreeman@gmail.com]
Sent: Sunday, October 03, 2010 1:52 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 3, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Do you want your kids to be able to breathe and enjoy the outdoors and nature? If so, please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Elisabeth Robson
495 Robinwood Dr NE

Bainbridge Island, WA 98110-1967

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Mary Ferm [dferm@bainbridge.net]
Sent: Sunday, October 03, 2010 5:25 PM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 3, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

As a Washington State resident for the past 30 years, I am dismayed by the increasing haze and smog I have noticed in the Puget Sound Trough.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Mrs. Mary Ferm
5062 New Sweden Rd NE
Bainbridge Island, WA 98110-3118

Blain, Lindsay (ECY)

From:	Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Cole Monnahan [cmonnahan@gmail.com]
Sent:	Sunday, October 03, 2010 1:23 PM
To:	ECY RE AQComments
Subject:	Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 3, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

I endorse the efforts and subsequent message by the Sierra Club:

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Cole Monnahan

616 N 47th St
Seattle, WA 98103-6450

Blain, Lindsay (ECY)

From:	Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Donna Hampton [donnahampton@comcast.net]
Sent:	Sunday, October 03, 2010 1:22 PM
To:	ECY RE AQComments
Subject:	Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 3, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

To preserve our treasured public lands and protect public health, Washington must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the pollution controls at TransAlta as being too weak.

Nitrogen oxide pollution is a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plant to reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or more.

Sincerely,

Donna Hampton
2139 277th Ave SE
Sammamish, WA 98075-4121

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Erin Fox [ehranfox@yahoo.com]
Sent: Sunday, October 03, 2010 12:51 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 3, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Before this message gets into its message, I do want to say something. I was born in a suburb of LA, and born with asthma. I actually had to breathe off a machine when I lived down there, but moved up to WA, and was relieved with much cleaner air. Although, since I'm particularly sensitive to the air pollution I notice when there's bad days in seattle. It becomes hard to breathe and my eyes burn. I believe it is crucial that we have clean air, not only for the planet but for people to simply breathe. We need to be aggressive in pollution control, and stop large contributors.

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Erin Fox
1106 Pike St Apt 311
Seattle, WA 98101-1968

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Fran Post [franpost254@gmail.com]
Sent: Sunday, October 03, 2010 11:51 AM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 3, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

First, I would like to thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. That said, I must say that we cannot afford to fool around any longer. Really, we are out of time and must begin to impose some strict regulations, for our health, for the health of generations to come.

Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Fran Post
254 Woodland Ave
Port Townsend, WA 98368-5059
(360) 554-0417

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Donna Briggie [dbriggie@yahoo.com]
Sent: Sunday, October 03, 2010 11:51 AM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 3, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

I personally fear for the future of our planet if the state and federal government do not do more to save our environment.The proposed plan is insufficient and does not do enough to regulate TransAlta which emits over 10,000 tons of nitrogen oxide pollution. It needs to be cut by 90% of proposed.In order to preserve our treasured public lands and protect public health,urrent proposal.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Donna Briggie
10822 3rd Ave S
Seattle, WA 98168-1410
(206) 244-7360

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Gail Barton [gailshooting_star@hotmail.com]
Sent: Sunday, October 03, 2010 9:22 AM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 3, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater. We must stop Big Business from manipulating for profit in exchange for health hazards for the rest of us- the population of human beings

Sincerely,

Gail Barton

1010 Old River Rd
Naches, WA 98937-9419

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Roxanna Davila [rox1@comcast.net]
Sent: Saturday, October 02, 2010 10:50 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 3, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for letting us comment on haze & the problems associated with it. With what we've learned about it's harmful effects, this has truly become not just an environmental concern, but a health & social justice concern as well.

Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution. We're falling well short of any truly meaninful policy on this.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal. Our policies need teeth, and without that - we're just pissing into the wind, plain and simple.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Roxanna Davila
2519 Minor Ave E
Seattle, WA 98102-3205
(206) 310-3820

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Rob Lee [ebob4@yahoo.com]
Sent: Saturday, October 02, 2010 3:20 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

The Port Townsend Paper mill is one of the worst offenders of local air quality. Driving into Port Townsend from the South East always makes my throat and sinuses raw and my eyes burn. I have developed chemical sensitivity since living here, part time, for the last 5 years. I can no longer take the pharmaceutical pain medication and muscle relaxers needed to control my chronic back pain. My pain level has escalated. So. consequently, I have difficulty sleeping now. Going with out sleep as often as three times a week.

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health

from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Rob Lee
80 E Shore Dr
Grapeview, WA 98546-9726

Blain, Lindsay (ECY)

From:	Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Robert Wolf [robert_wolf@hmc.edu]
Sent:	Saturday, October 02, 2010 2:50 PM
To:	ECY RE AQComments
Subject:	Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 2, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

It's time to recognize and acknowledge that coal is too polluting to burn, too dangerous to mine, and too contributing of CO2 and Global Waring to allow use of it as a fuel source in a world crowded with more than 6 billion people. Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Robert Wolf
551 Lakeside Dr
Sedro Woolley, WA 98284-9588

Blain, Lindsay (ECY)

From:	Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Lucy Weinberg [laweinberg@comcat.net]
Sent:	Saturday, October 02, 2010 2:20 PM
To:	ECY RE AQComments
Subject:	Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 2, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

For the future of our environment get rid of coal burning for energy production.

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Lucy Weinberg
4220 NE 107th St
Seattle, WA 98125-6952

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Margaret Rivard [mollyrivard@yahoo.com]
Sent: Sunday, October 03, 2010 12:52 PM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 3, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Without clean air how can we have healthy children/people to contribute to a good life in Washington State? We need to put in place strong pollution controls.
Sincerely,
Margaret Rivard
Port Angeles, WA

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90

percent or greater.

Sincerely,

Ms. Margaret Rivard
1036 W 8th St
Port Angeles, WA 98363-5708

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Cathy Nguyen [toyotathy@yahoo.com]
Sent: Saturday, October 02, 2010 1:50 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

One world, one love.

Sincerely,

Cathy Nguyen

818 S 11th St Apt 216
Tacoma, WA 98405-4528

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of gary bennett [garyeunicebennett@msn.com]
Sent: Saturday, October 02, 2010 12:50 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

The continuation human species depends upon the legislative bodies at local, state and federal levels to move, move in a progressive direction to clean up the environment and address global warming instead of leaving it to future generations to clean up our wastes and shit.

Sincerely,

gary bennett
1436 Toledo St
Bellingham, WA 98229-5301

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Terry Walker [walkerarchitects@gmail.com]
Sent: Saturday, October 02, 2010 12:50 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

The failure to stop dumping pollution into the air and damaging human populations is exactly the same as a decision to continue dumping pollution and damaging the health and welfare of human populations.

We thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. It is essential to stop the pollution now. Haze pollution harms people and it harms the built environment including treasured national parks and wilderness areas. Statistics demonstrate that it also damages people and hurts the general public health.

For this reason federal law requires the state to create a plan to reduce haze pollution. The State Implementation Plan as proposed is unacceptably weak, human populations would still be inflicted with damaging pollution, the plan proposed fails to create any meaningful pollution controls for the TransAlta coal plant. This single plant is our state's largest point source of haze causing nitrogen oxide pollution.

In order to protect the public welfare, preserve our treasured public lands and safeguard public health, Washington state must stop allowing pollution from this plant to damage human populations, we must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal. We demand positive action to bring a swift correction of the problem.

Every year, TransAlta dumps a wide range of different types of pollution including mercury but emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands and human populations that dwell in this same area. The National Park Service has openly criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak. We demand action and cogent legislation to stop the dumping of pollution from coal on human populations and treasured public lands.

Nitrogen oxide pollution is a significant threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. Continuation of such pollution is unacceptable. Exposure to such pollution will cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease, to a predictable percentage of any human population. It simply must not be acceptable to trade away the quality of life of any person in exchange for the continued operation of a technologically obsolete coal plant simply because of the cost of correcting the problem. Close the plant!

We have had too much pollution already, Walker Architects, as the inventor of CO2 Energy Storage, know's and understands the technology to correct this damage, a solution exists and that it can be applied at the TranAlta Plant. It is simply a matter of the expense. Please protect the people and our treasured wilderness areas. Please safeguard and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater. No legislator wants the death of any citizen on their hands. Take action today, stop trading away quality of life in exchange for dollars..

Sincerely,

Terry Walker
21712 21st Ave W
Brier, WA 98036-8186
(206) 718-6782

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of chris covert-bowlds [c.covertbowlds@comcast.net]
Sent: Saturday, October 02, 2010 12:50 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

As a family doctor treating adults and children with asthma, emphysema, and heart disease worsened by poor air quality, I thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

chris covert-bowlds

523 N 84th St
Seattle, WA 98103-4309
(206) 883-8989

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of albert bechtel [bigjbechtel4711@msn.com]
Sent: Saturday, October 02, 2010 12:50 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.   This has got to stop. Why are we allowing polluters their way when it come's to pollution ? Why are we letting them get away with this ? Do people have to get sick and die because you refuse to act in this situation. heaven, help us if that's the case.

Sincerely,

albert bechtel
4131 11th Ave NE
Apt 109
Seattle, WA 98105-6319
(206) 834-0204

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Dustin Shane Collings [dustinocoileain@yahoo.com]
Sent: Saturday, October 02, 2010 12:50 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

With the Metropolitan Tract in downtown Seattle out of the hands of the University of Washington Board of Regents and in the hands, I am told, of Chase Manhattan Bank, financial and political opposition to clean air in our state probably took a major blow. This is just our opinion.

Sincerely,

Dustin Shane Collings
4111 11th Ave NE
208
Seattle, WA 98105-6305
(206) 547-1253

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Betsy Potts [betsy@gokubi.com]
Sent: Saturday, October 02, 2010 9:19 AM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

This comment is on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and our health. Federal law requires the state to create a plan to reduce haze pollution. Washington state's Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

TransAlta emits over 10,000 tons of nitrogen oxide pollution annually, causing haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution has been linked to heart and lung disease. It can cause respiratory problems -- asthma, emphysema and bronchitis -- and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order to reduce in a significant amont the TransAlta coal plant's nitrogen oxide pollution.

Sincerely,

Betsy Potts
4118 N 38th St
Tacoma, WA 98407-5619
(253) 752-4644

Blain, Lindsay (ECY)

From:	Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Jean Thomas [jean.thomas1@comcast.net]
Sent:	Saturday, October 02, 2010 8:49 AM
To:	ECY RE AQComments
Subject:	Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 2, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution hurts public health and harms treasured national parks and wilderness areas. Although Federal law requires the state to create a plan to reduce haze pollution, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, Washington's largest point source of haze causing nitrogen oxide pollution.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution also threatens public health. This type of pollution has been linked to heart and lung disease and in some cases contributes to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal. The Regional Haze State Implementation Plan must be revised to protect our health and preserve our public lands.

Sincerely,

Jean Thomas
3715 NE 180th St
Lake Forest Park, WA 98155-4219

Blain, Lindsay (ECY)

From:	Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Sharla Matthews [mjs@whidbey.com]
Sent:	Saturday, October 02, 2010 6:19 AM
To:	ECY RE AQComments
Subject:	Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 2, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Please do what you can to eliminate haze pollution. Having grown up in California, I watched as the orchards gave way the the San Gabriel Mountains just disappeared from sight. Please do not let that happen to our beautiful state.

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Sharla Matthews
4907 Lakeside Dr
Langley, WA 98260-8259

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Gary Larson [garbltoo@gmail.com]
Sent: Saturday, October 02, 2010 6:19 AM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, but the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant. That plant is our state's largest point source of haze-causing nitrogen oxide pollution.

Tto preserve our treasured public lands and protect public health, Washington must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Nitrogen oxide pollution is a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan to reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Gary Larson
6723 35th Ave SW
Seattle, WA 98126-3044

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Paul Swetik [pswetik@hotmail.com]
Sent: Sunday, October 03, 2010 11:18 AM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 3, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

I am *so* tired of coal plants. Stop this nonsense.

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Mr. Paul Swetik

16226 N Sands Rd
Mead, WA 99021-7831

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Richard Fox [frt1@q.com]
Sent: Saturday, October 02, 2010 4:49 AM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution. However, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order to reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Richard Fox
511 E Roy St
Apt 413

Seattle, WA 98102-5959

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Kathleen and Peter Koprivec and Martin [pkmartin@whidbey.com]
Sent: Saturday, October 02, 2010 1:19 AM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Dear Mr. Newman,Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. The State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Sincerely, Kathleen & Peter Martin

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Kathleen and Peter Koprivec and Martin
2965 Hi Crest Rd
Langley, WA 98260-9768

(360) 321-4883

Blain, Lindsay (ECY)

From:	Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Ed and Ann Marie Frodel [annfrodel@mac.com]
Sent:	Saturday, October 02, 2010 12:49 AM
To:	ECY RE AQComments
Subject:	Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 2, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order to reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

As a family with asthma sufferers, we'd hope to be able to enjoy the out of doors anywhere in our state without having to worry about a possible health crisis brought on by unclean air. It's long past time to be implementing plans to eliminate this form of pollution and all others, once and for all.

Thanks for listening.

Sincerely,

Ed and Ann Marie Frodel
PO Box 342
Poulsbo, WA 98370-0342
(360) 779-4301

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Jody Fox [foxjod@gmail.com]
Sent: Saturday, October 02, 2010 12:19 AM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms our treasured national parks and wilderness and hurts public health. Federal law requires the state to create a plan to reduce haze pollution. However, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state MUST require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution causing haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta for being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Washington is known for it's naturally green surroundings. It's time to extend that same notoriety to our power supply as well and haze reduction plan as well.

Thank you for considering my comments.

Sincerely,

Jody Fox
310 Bellevue Ave E Apt C
Seattle, WA 98102-5226
(720) 308-5119

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Gerald Patterson [jerrysvx@aol.com]
Sent: Saturday, October 02, 2010 12:19 AM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

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Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease. My Parents died from cancer. Both had lung cancer which metastisized. Air polution was the probable cause.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Gerald Patterson

4208 Glasgow Way
Anacortes, WA 98221-1111
(360) 299-8832

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Anthony Bencivengo [anthonylawerencebencivengo@msn.com]
Sent: Friday, October 01, 2010 11:48 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

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Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order to reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater. TransAlta won't be happy, but we will be safer.

Sincerely,

Anthony Bencivengo
12516 37th Ave NE
Seattle, WA 98125-4655

(206) 363-6347

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Joseph Lebitz [joepeggykc@yahoo.com]
Sent: Friday, October 01, 2010 11:19 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

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Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.
It's the right thing to
do.

Sincerely,

Joseph Lebitz

2551 Captains Ct
Ferndale, WA 98248-8541

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Robert Moore [jobobmoore@gmail.com]
Sent: Friday, October 01, 2010 10:18 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak. Personally, I am particularly concerned about the effects TransAlta is having on the ecosystem at Mount Rainier National Park, both in terms of the effects on plant and animal habitat and as the haze affects the views for human tourists, both looking up at the mountain and looking west over the Puget Sound toward Olympic National Park (where there may also be ecosystem effects when the winds blow west.)

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Robert Moore
14727 39th Ave NE
Lake Forest Park, WA 98155-7810

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Dan & Pat Montague [montague30@comcast.net]
Sent: Friday, October 01, 2010 9:48 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

This is the right action to take for liveability of humans, other animals and plants in our state.

Sincerely,

Dan & Pat Montague
647 73rd Ave NE
Olympia, WA 98506-9772

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of David Yao [davidc.yao@comcast.net]
Sent: Friday, October 01, 2010 9:48 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

Please take this threat to public health seriously. It should be a higher priority than the profits of rich foreign investors.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

David Yao
1538 N 128th St
Seattle, WA 98133-7700
(206) 784-2869

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of A.E. White [aw95@comcast.net]
Sent: Sunday, October 03, 2010 12:46 AM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 3, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

A.E. White

Blain, Lindsay (ECY)

From:	Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Jack Putnam [jdpjkg@earthlink.net]
Sent:	Friday, October 01, 2010 9:48 PM
To:	ECY RE AQComments
Subject:	Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution. I have just returned from China, an example of the impact of the threat of coal pollution upon personal and public health.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Jack Putnam

26405 7th Ave S
Des Moines, WA 98198-9303
(206) 941-7308

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Cindy Cole [cindy48@comcast.net]
Sent: Friday, October 01, 2010 9:19 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

I appreciate the opportunity to comment on Washington's Regional Haze State Implementation Plan. In my opinion the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant. The TransAlta plant is our state's largest point source of haze causing nitrogen oxide pollution.

Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.
TransAlta emits over 10,000 tons of nitrogen oxide pollution yearly, which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas. their report specifically cites the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health and has been linked to heart and lung diseases. Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Cindy Cole
9802 45th Ave SW
Seattle, WA 98136-2711

Blain, Lindsay (ECY)

From:	Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of bob fisher [bfisher99@gmail.com]
Sent:	Friday, October 01, 2010 9:19 PM
To:	ECY RE AQComments
Subject:	Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

I lived a 100 - 200 feet east of I - 5 on San Diego 40 years ago. I could clean the apartment and wipe fossil fuel dust of my table within hours that would be black. My bare feet were black with one trip across the living room. My family lost the family farm in southern Ohio in the mid 80 along with all there neighbors. Our farm had been in the family

100 years or more. Now there are mountains of coal ash from the coal fired power plant where there was once productive land. I have lived in 12 states covering the west,east gulf coast and three in the middle. Killer plants and there more toxic wastes have to go.

Sincerely,

bob fisher
PO Box 3151
Bellingham, WA 98227-3151

Blain, Lindsay (ECY)

From:	Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of James Rosenthal [canyon@olympus.net]
Sent:	Friday, October 01, 2010 9:18 PM
To:	ECY RE AQComments
Subject:	Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

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Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

It is my understanding that the TransAlta plant is also a major source of mercury pollution. I believe that the Department of Ecology should take steps to reduce putting that hazardous element into the environment.

Sincerely,

James Rosenthal
PO Box 601
Port Townsend, WA 98368-0601
(360) 385-9980

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of charlie martof [cmartof@gmail.com]
Sent: Friday, October 01, 2010 8:48 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks including Mount Rainier NP and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

charlie martof
14290 Madison Ave NE
Bainbridge Island, WA 98110-4135

Blain, Lindsay (ECY)

From:	Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Larry Warner [lwarner1285@fairpoint.net]
Sent:	Friday, October 01, 2010 8:18 PM
To:	ECY RE AQComments
Subject:	Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

As a ex-worker at the Centralia steam plant for over 23 year ,I have seen the what has happened to my health and other workers health from working at the plant . It is time to shut it down before more people become as ill as I am . Thanks Larry Warner

Sincerely,

Larry Warner
PO Box 996
403 Rochester St W
Rainier, WA 98576-9556

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Dorothy Burkhart [dorothybu1@harbornet.com]
Sent: Friday, October 01, 2010 8:18 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.
We must save the earth one move at a time, and now is the time to close down all the polution that TransAlta is spreading here in Washington State.
Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Dorothy Burkhart

934 S Fairview Dr
Tacoma, WA 98465-1422

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Nigeala Nigrath [niamhor@clearwire.net]
Sent: Friday, October 01, 2010 7:48 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

As one of thousands of Washington State ciizens suffering from asthma, this issue is of great personal concern to me. As you may already be aware, the incidence and prevalence of asthma in both children and adults is at unprecedented heights. Pollution from particulates, such as that caused by coal, is a primary cause of this very serious chronic illness.

I appreciate the opportunity to comment, in particular, on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Nigeala Nigrath
201 Shore Dr
Apt 309
Bremerton, WA 98310-4804

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Grant Sawyer [gsawyer44@gmail.com]
Sent: Friday, October 01, 2010 7:48 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Now is the time to act. The climate can not wait any longer. Either can my lungs. As a person with asthma I need you to do the right thing and close down Washington's one and only coal combustion plant. With what we now know about energy conservation we will have no trouble getting along without the substantial output from this very dirty source of electricity.

Sincerely,

Grant Sawyer
191 Hawks View Rd
Woodland, WA 98674-9247
(360) 225-7321

Blain, Lindsay (ECY)

From:	Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Lew Sikes [lewnpat@msn.com]
Sent:	Friday, October 01, 2010 7:48 PM
To:	ECY RE AQComments
Subject:	Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

As members of my family suffer from Asthma I thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Lew Sikes
PO Box 122

Grapeview, WA 98546-0122
(360) 275-5649

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Michael and Mrs. Evie Parks [parkspga@msn.com]
Sent: Sunday, October 03, 2010 12:16 AM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 3, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Mr. Michael and Mrs. Evie Parks
4638 193rd Pl SE
Issaquah, WA 98027-9310

Blain, Lindsay (ECY)

From:	Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Larry Neilson [larryneilson@yahoo.com]
Sent:	Friday, October 01, 2010 7:18 PM
To:	ECY RE AQComments
Subject:	Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

I take keyboard in hand to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms our treasured national parks and wilderness areas. Moreover, it hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the proposed State Implementation Plan is too weak. The proposed framework fails to create any meaningful pollution controls for the TransAlta coal plant -- Washington state's single largest point-source of haze-causing nitrogen oxide pollution.

In order to preserve our prized public lands and protect our public health, Olympia must require pollution controls for TransAlta. Effective control requires reduction of NOx pollution by 90% or more over DOE's current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution, causing haze damage to twelve designated protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas. In making this charge, the NPS specifically cited the unacceptably weak pollution controls on TransAlta as a principal worry.

Nitrogen oxide pollution is also a threat to public health. It has been linked to heart and lung disease. In some cases it contributes to premature death. This type of pollution can cause such respiratory problems as asthma, emphysema, and bronchitis. Further, it can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order to decrease the TransAlta coal plant's nitrogen oxide pollution by 90% or more.

Sincerely,

Larry Neilson
4906 Rainier Ave S
Seattle, WA 98118-1744

Blain, Lindsay (ECY)

From:	Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Larry Neilson [larryneilson@yahoo.com]
Sent:	Friday, October 01, 2010 7:18 PM
To:	ECY RE AQComments
Subject:	Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

I take keyboard in hand to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms our treasured national parks and wilderness areas. Moreover, it hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the proposed State Implementation Plan is too weak. The proposed framework fails to create any meaningful pollution controls for the TransAlta coal plant -- Washington state's single largest point-source of haze-causing nitrogen oxide pollution.

In order to preserve our prized public lands and protect our public health, Olympia must require pollution controls for TransAlta. Effective control requires reduction of NOx pollution by 90% or more over DOE's current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution, causing haze damage to twelve designated protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas. In making this charge, the NPS specifically cited the unacceptably weak pollution controls on TransAlta as a principal worry.

Nitrogen oxide pollution is also a threat to public health. It has been linked to heart and lung disease. In some cases it contributes to premature death. This type of pollution can cause such respiratory problems as asthma, emphysema, and bronchitis. Further, it can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order to decrease the TransAlta coal plant's nitrogen oxide pollution by 90% or more.

Sincerely,

Larry Neilson
4906 Rainier Ave S
Seattle, WA 98118-1744

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Daryl Bulkley [methreesee@yahoo.com]
Sent: Friday, October 01, 2010 6:18 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

I live in Port Townsend, and I have to tolerate our local paper mill's emissions which has at times caused sore throat, and a bronchial infection. At that time I did complain to the ecology department. Now the paper mill is buying a larger, instrument for burning biomass. I do not know what this entails for the health of the population, and at this point, it is all being kept rather quiet from the public.

I find it disappointing that when I do a yearly cleaning of all the window screens, I am met with a black, sticky residue. I cannot wonder if this is something that is gradually finding its way into our lungs, my lungs!

Port Townsend gives the false impression that we have fresh, sea breezes, but sadly I fear those 'fresh, sea breezes' are blowing the pollution from the Seattle area, but then who am I to know? Anyway, read on.................

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Daryl Bulkley
619 Clay St
Port Townsend, WA 98368-5800
(360) 379-1002

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Eileen Lamar [eflamar@q.com]
Sent: Friday, October 01, 2010 6:18 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

When one sees the haze in the distance, we know the pollution is bad, and we see it too often in our area.

Thank you for your time and attention.

Sincerely,

Eileen Lamar
832
Lacey, WA 98516-6256
(360) 413-1211

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Lee Greenawalt [lgreenawalt@msn.com]
Sent: Friday, October 01, 2010 6:18 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Washington State's plan for implemation of the haze reduction plan is unacceptably weak. One example : It fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution.

Sincerely,

Lee Greenawalt
3122 141st Street Ct NW
Gig Harbor, WA 98332-9203
(253) 514-8393

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of William Conable [conable.1@osu.edu]
Sent: Friday, October 01, 2010 5:48 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease. It killed my brother.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

William Conable
815 Villard St
Cheney, WA 99004-1222

(509) 270-7492

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Gene Ayres [ayresgene@gmail.com]
Sent: Friday, October 01, 2010 5:48 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. I am also writing assuming that a Department of Ecology is for the purpose of preserving and protecting same, not exploiting it for commercial purposes. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Gene Ayres

19230 Forest Park Dr. NE
G-222
Lake Forest Park, WA 98155

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Brian Edmondson [bhedmondson@hotmail.com]
Sent: Friday, October 01, 2010 4:48 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

I am writing to comment on our Regional Haze State Implementation Plan.

For those who are paying attention, we are losing the battle to save our environment for our grandchildren and the grandchildren that follow them. What will they think of us when they look back in history?

Haze pollution harms our national parks and wilderness areas. It damages our health and his horrible for young lungs.

The State Implementation Plan as proposed is weak and does NOT create any meaningful pollution controls for the TransAlta coal plant, a polluter of embarrassing proportion. We should set the examples for others to follow. WA State should be the leaders.

WE FAIL if we do NOT require pollution controls the reduce nitrogen oxide pollution by AT LEAST 90% over its current proposal. Can we go farther? Do we have that courage?

But, I feel we need to convert TransAlta to gas immediately, and they (TA) have already made enough money to pay for gas conversion. Let's end nitrogen oxide pollution entirely. TransAlta is shameful. BURNING COAL? COME ON!! HEART AND LUNG DISEASE? PREMATURE DEATHS? For WHAT? PROFIT?

Please do the right thing and protect our treasured wilderness areas and public health. START by revising the Regional Haze State Implementation Plan. Reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or MORE. MORE would be BETTER, right? Thank you!!!

Sincerely,

Brian Edmondson
516 Summit Ave N
Kent, WA 98030-4710

Blain, Lindsay (ECY)

From:	Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Jane Valentine [javautha@comcast.net]
Sent:	Wednesday, October 06, 2010 7:57 AM
To:	ECY RE AQComments
Subject:	Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 6, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater

My father was a coalminer, I grew up playing on the coal slags because we were never told how dangerous coal was. My mother died of emphysema and I have developed breathing problems. I know first hand the irreversable damage coal and it's by-products cause. This id the 21st century, not the early 1900's we already have viable, inexpensive energy alternatives, stop killing the earth and the people of the earth by allowing big business greed for money over all else. Remeber you live on this planet too, you are as much a caretaker of the earth as the rest of us.

Sincerely

Jane Valentine

Sincerely,

Jane Valentine
PO Box 6103
Vancouver, WA 98668-6103
(360) 573-9159

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Martha Jackson [mkjackson@zipcon.com]
Sent: Friday, October 01, 2010 7:41 PM
To: ECY RE AQComments
Subject: Comment on WA's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Haze pollution harms public wilderness areas and hurts public health.
Please stop it.

Thank you from an asthma sufferer.

Sincerely,

Ms. Martha Jackson
911 NW 122nd St
Seattle, WA 98177-4324

Blain, Lindsay (ECY)

From:	Earthjustice [info@earthjustice.org] on behalf of Michele Shimizu [simizu@konan-wu.ac.jp]
Sent:	Saturday, October 02, 2010 11:16 PM
To:	ECY RE AQComments
Subject:	RE: Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 3, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Ms. Michele Shimizu
32 Grove St
Boston, MA 02114-3523

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Boni Biery [birdsbeesfishtrees@gmail.com]
Sent: Saturday, October 02, 2010 1:11 AM
To: ECY RE AQComments
Subject: RE: Proposed Regional Haze Implementation Plan

Categories: General Comment

Oct 2, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the our state's largest point source of haze causing nitrogen oxide pollution; the TransAlta coal plant.

To protect public health and preserve our treasured public lands, Washington State must require pollution controls for TransAlta that will reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution. This causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan, specifically citing the lack of pollution controls at TransAlta and for it's general failure to provide strong protections for our pristine wilderness areas.

Nitrogen oxide pollution is also a threat to public health. It causes respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease. This type of pollution has also been linked to heart and lung disease and in some cases can contribute to premature death.

Please protect both our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Ms. Boni Biery
903 N 188th St
Shoreline, WA 98133-3906

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Richard Voget DDS [rvoget@w-link.net]
Sent: Saturday, October 02, 2010 10:16 PM
To: ECY RE AQComments
Subject: Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 3, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

I AM TIRED OF BIG COAL GETTING A FREE PASS WHILE THEY POLLUTE OUR AIR. PLEASE APPLY THE SAME STANDARDS TO TRANSALTA THAT YOU WOULD FOR A NEW PLANT THAT IS JUST COMING ON LINE.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

Sincerely,

Dr. Richard Voget DDS
1615 N 41st St
Seattle, WA 98103-8211

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Deborah Filipelli, Ph. D. [dfilipelli@mcn.org]
Sent: Wednesday, October 06, 2010 10:00 AM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 6, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

The following represents my position in support of revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is the state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Deborah Filipelli, Ph. D.

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Bruce Scott [bruce@aria.ac]
Sent: Saturday, October 02, 2010 5:46 PM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

As part of the state's review of controls on haze pollution, as required by federal law, Washington state must create laws that force our largest air-polluter, TransAlta coal plant, to reduce their output of nitrogen oxide by 90% or more. Please take note of the National Parks Service which has criticized the state's proposed plan for not doing enough to protect our pristine wilderness areas, specifically citing the pollution controls at TransAlta as being insufficient and weak.

Sincerely,

Mr. Bruce Scott
12819 SE 38th St # 228
Bellevue, WA 98006-1326

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Kay Ellison [ellisonka@yahoo.com]
Sent: Saturday, October 02, 2010 3:15 PM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Wow, I can't believe that it is being considered to lower standards for haze pollution! Especially in our own state, where we take pride in the beauty of our environment. Please, would you help our air be cleaner for the health of our people, animals and plants?

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Mrs. Kay Ellison
4303 NE 14th Ave
Vancouver, WA 98663-3606

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Cynthia Wilson [dwellerpt@yahoo.com]
Sent: Saturday, October 02, 2010 3:15 PM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease. The latter matters much to me as I suffer from COPD and am already on oxygen 24 hrs a day. So, obviously, anything that can be done to insure good air quality would be of crucial importance to me.

Please protect our much treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Ms. Cynthia Wilson
101 Maple Dr
Port Townsend, WA 98368-9422

Blain, Lindsay (ECY)

From:	Earthjustice [info@earthjustice.org] on behalf of Sandra Guenette [sandra_guenette13 @yahoo.com]
Sent:	Tuesday, October 05, 2010 4:21 PM
To:	ECY RE AQComments
Subject:	RE: Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 5, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease. PREVENT DISEASED AIR-POLLUTION THAT ALL LIFE BREATHES!

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Ms. Sandra Guenette

13 Village Dr Apt 102
Saugerties, NY 12477-2326

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Janice Holkup [jholkup@gmail.com]
Sent: Saturday, October 02, 2010 3:15 PM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

We all share one earth that provides us with all we need for life--if we don't damage or destroy it. We can't live without it--Earth.

Sincerely,

Janice Holkup
1147 N 93rd St
Seattle, WA 98103-3303

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Roger Sauer [loupgris@gmx.com]
Sent: Saturday, October 02, 2010 2:45 PM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

WA

Sincerely,

Mr. Roger Sauer
7853 SE 27th St
E406
Mercer Island, WA 98040-2982

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Lucy Weinberg [laweinberg@comcast.net]
Sent: Saturday, October 02, 2010 2:15 PM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

It is time for humans to change the way we effect our world; we must not longer damage the environment in our day to day activities. Coal based enery must go.

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Ms. Lucy Weinberg
4220 NE 107th St
Seattle, WA 98125-6952

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Cathy Nguyen [toyotathy@yahoo.com]
Sent: Saturday, October 02, 2010 1:45 PM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

One world, one love.

Sincerely,

Ms. Cathy Nguyen

818 S 11th St Apt 216
Tacoma, WA 98405-4528

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of albert bechtel [bigjbechtel4711@msn.com]
Sent: Saturday, October 02, 2010 11:45 AM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

I believe polluters shoud not be allowed to pollute and wherever possible be stopped from polluting. I believe this is what needs to be done with the TransAlta coal plant. Enough is enough. Something should have been done about this flagrant polluter years ago. This has gone on long enough. Action needs to be taken by you to stop this pollution of our parks and other areas.

Sincerely,

Mr. albert bechtel
4131 11th Ave NE
Apt 109
Seattle, WA 98105-6319

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Jeff Smith [builditinfo@yahoo.com]
Sent: Saturday, October 02, 2010 11:15 AM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

My wife has COPD, my mother in law had COPD before she died that contributed to her untimely death, my father died of lung cancer, I have asthma, my sister in law has Chronic Bronchitis and has been told by her doctor she needs to stop constantly breathing smoke or she will soon have emphysema. Not one of us smokes cigarettes. We all have lived where wood and coal smoke is pumped into our air daily. Smoke pollution kills people. Put a stop to it now. Pursue clean energy such as water turbine/dams, solar, wind and geothermal. Not biomass! That too produces air pollution!

Sincerely,

Mr. Jeff Smith
Done Send Me Mail
Poulsbo, WA 98370

Blain, Lindsay (ECY)

From:	Earthjustice [info@earthjustice.org] on behalf of Richard Easterly Debra Salstrom [seebotanical@comcast.net]
Sent:	Saturday, October 02, 2010 10:45 AM
To:	ECY RE AQComments
Subject:	RE: Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 2, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

As former residents and current home owners in Tenino Washington, we feel that the health of the citizens of Lewis and Thurston counties is adversely effected by the air pollution emitted by the TransAlta coal plant near Centrailia. Pollution controls on this caustic plant must be aggressively strengthened to the fullest extent that is legally possible.

Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90

percent or greater.

Sincerely,

Mr. Richard Easterly Debra Salstrom
1225 Verona St
Bellingham, WA 98229-2220

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of J Smith [mushroomlane@yahoo.com]
Sent: Saturday, October 02, 2010 10:45 AM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

My Dad has COPD, my mom had COPD before she died that contributed to her untimely death, my father in law died of lung cancer, I have asthma, my sister has Chronic Bronchitis and has been told by her doctor she needs to stop constantly breathing smoke or she will soon have emphysema. Not one of us smokes cigarettes. We all have lived where wood and coal smoke is pumped into our air daily. Smoke pollution kills people. Put a stop to it now. Pursue clean energy such as water turbine/dams, solar, wind and geothermal. Not biomass! That too produces air pollution!

Sincerely,

Mr. J Smith
Dont Send Letters
Poulsbo, WA 98370

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of M Meadows [mmeadows1_2000@yahoo.com]
Sent: Saturday, October 02, 2010 9:44 AM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

My Dad has COPD, my mom had COPD before she died that contributed to her untimely death, my father in law died of lung cancer, I have asthma, my sister has Chronic Bronchitis and has been told by her doctor she needs to stop constantly breathing smoke or she will soon have emphysema. Not one of us smokes cigarettes. We all have lived where wood and coal smoke is pumped into our air daily. Smoke pollution kills people. Put a stop to it now. Pursue clean energy such as water turbine/dams, solar, wind and geothermal. Not biomass! That too produces air pollution!

Sincerely,

Ms. M Meadows
Dont Send Letters
Poulsbo, WA 98370

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Richard Champlin [richard_champlin2003@yahoo.com]
Sent: Saturday, October 02, 2010 8:44 AM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

There is no excuse for allowing air pollution in Mt. Rainier National Park. TransAlta is responsible for a large percentage of this pollution, which affects all of us who drive through or visit the lands surrounding Mt. Rainier. It is time for TransAlta official to start taking responsibility for the damage they cause. I'll be damned if we should let the Cascades turn into the Appalachians. If I wanted to live where coal is king, I would move to West Virginia. For me to have to say that is inexcusable.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater, or step down from your position.

Sincerely,

Mr. Richard Champlin
4203 SW Hill St Apt 21
Seattle, WA 98116-2071

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Valerie Lyson [lysonv@peacemail.com]
Sent: Tuesday, October 05, 2010 11:47 AM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 5, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

As a native Washingtonian, I care deeply about the state of our environment here. Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Ms. Valerie Lyson
7427 Corliss Ave N

Seattle, WA 98103-4932

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of John D Leith [jdleith@verizon.net]
Sent: Saturday, October 02, 2010 8:44 AM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is Washington's largest point source of nitrogen oxide pollution. These oxides drift far and harm the health of thousands or perhaps millions of people, and they contribute to acid rain which harms trees and other plants. Eventually, they add acid to our oceans, impacting on algal growth and ocean systems.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Dr. John D Leith
162 Islington Rd
Auburndale, MA 02466-1012

Blain, Lindsay (ECY)

From:	Earthjustice [info@earthjustice.org] on behalf of Michael Foster [michael.foster2@comcast.net]
Sent:	Saturday, October 02, 2010 8:44 AM
To:	ECY RE AQComments
Subject:	RE: Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 2, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Living in Seattle, the haze is thick enough already. New electric cars will shift a tiny bit of that burden to power plants, solar, wind, hydro, and TransAlta.

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Mr. Michael Foster
3808 Carr Pl N
Seattle, WA 98103-8126

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Kathleen Parker [nannyksparker@yahoo.com]
Sent: Saturday, October 02, 2010 8:14 AM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

I CONTINUE TO WONDER WHY, WHEN EVERYOE IS AWARE OF THE DAMAGE THAT HAS BEEN DONE TO OUR AIR QUALITY, A BLIND EYE IS ALWAYS TURNED WHEN IT COMES TO AIR POLLUTION FROM LARGE COAL PLANTS? I find it hard to believe in our advanced technology, we cannot seem to move beyon the use of coal. THERE MUST BE OPTIONS. COMPANYS THAT MUCK UP THE VERY AIR WE BREATHE MUST BE CALLED TO TASK, AND HELD RESPONSIBLE. Big air polluting companys must begin to think beyond themselves, and into ways that improve our air quality, and begin to repair the damage, that all living creatures can breathe sweet clean air. THE TIME IS NOW!! tH LIVES THEY SAVE MAY BE THEIR OWN, OR THIER CHILDRENS.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is UNACCETABLY WEAK and FAILS to create any MEANINGFUL pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

PLEASE, LETS SAVE THE AIR WE BREATHE. NOTHING IS MORE IMPORTANT THEN THE AIR QUALITY. WHY IS THERE THIS BLIND EYE?
In order to preserve our treasured public lands and protect public health, Washington State MUST require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.
ALL OUR LIVES ARE AT RISK.....NOT JUST PUBLIC LANDS...DIRTY AIR IS NOT SELECTIVE!!

Nitrogen oxide pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please DO WHAT IS RIGHT by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Ms. Kathleen Parker
29023 46th Pl S
Auburn, WA 98001-2816

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of S Rulifson Miles [srulifson@gmail.com]
Sent: Saturday, October 02, 2010 7:43 AM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health.

Actually I live about 10 miles north in the pollution stream, I have livestock, and I am greatly concerned about particulates and so forth in the soil, including disease.

Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Ms. S Rulifson Miles
1420 Wright Rd SE
Tenino, WA 98589-9459

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of David Rousseau [daver@clarkston.com]
Sent: Saturday, October 02, 2010 6:12 AM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

There is no reason they can't install precipitators and scrubbers on those stacks and make a huge reduction in the polutant emissions from that plant. I've witnessed it happening in our own area with one of the largest Pulp & Paper mills in the Pacific Northwest. All it took was a significant amount of PRESSURE, from the EPA. It does cost money but thats why they charge money for the power they produce, they just aren't using it wisely.

Sincerely,

Mr. David Rousseau

Clarkston, WA 99403-3101

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Spencer Selander [spencerselander@yahoo.com]
Sent: Saturday, October 02, 2010 5:12 AM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficient.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

If we can't dispense with this polluting power plant entirely in the near term, we should at least see to it that it operates with as little pollution as is technologically feasible. The proposed plan doesn't come close to that standard.

Sincerely,

Mr. Spencer Selander
P O Box 363
341 Pioneer Ave NE
Castle Rock, WA 98611-9233

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Richard Francisco [7cisco@gmail.com]
Sent: Saturday, October 02, 2010 4:42 AM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

As an avid hiker and recreational user of Washington's great outdoors, I can attest to the ultimate affect of the discharges from the Centralia plant. I have experienced the haze moving over the White Pass and south along the Cascade crest, as well as seen the haze coming direct towards Mount Rainier from the soiuthwest.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Mr. Richard Francisco
159 Rubley Rd
Greenbank, WA 98253-6222

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Arthur Mink [mink3@readysetsurf.com]
Sent: Saturday, October 02, 2010 2:11 AM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Mr. Arthur Mink
3731 SW Donovan St
Seattle, WA 98126-3627

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Yovonne Autrey-Schell [sulien_1 @hotmail.com]
Sent: Saturday, October 02, 2010 1:11 AM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. As someone with a sensitivity to particulate matter in the air, I am gravely concerned with the amount of pollution put out by this coal fired power plant.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Ms. Yovonne Autrey-Schell
360 Duck Lake Dr NE
Ocean Shores, WA 98569-9452

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Virginia Velez [boricuavv@gmail.com]
Sent: Saturday, October 02, 2010 12:41 AM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. I live on the coast Puget Sound. When I'm lucky, I can see Mt. Rainier. When it's cloudy, or smoggy, I can't.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Ms. Virginia Velez
4759 Lynwood Center Rd NE

Unit 2B
Bainbridge Island, WA 98110-3240

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Francis Moulton [fmoulton@zensearch.com]
Sent: Monday, October 04, 2010 3:54 PM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 4, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution. Why is this?

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Mr. Francis Moulton
PO Box 65
Cheney, WA 99004-0065

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Emily Willoughby [emilya57@comcast.net]
Sent: Saturday, October 02, 2010 12:41 AM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution. We the residents, as well as those who visit, deserve better pollution control.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak. In case you don't feel inclined to listen to people,then listen to the National Park Service.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease. Since it can cause such a lot of damage, why not control it?

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater. Thank you.

Sincerely,

Ms. Emily Willoughby
17000 53rd Ave S
Tukwila, WA 98188-3250

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Allison Ostrer [aostrer@hotmail.com]
Sent: Friday, October 01, 2010 11:11 PM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 2, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

End Transalta's smog!

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Ms. Allison Ostrer

1107 E Denny Way
Seattle, WA 98122-2453

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Richard Ellison [richard_ellison@hotmail.com]
Sent: Friday, October 01, 2010 9:41 PM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

As a biologist and college professor, I know haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Mr. Richard Ellison

8003 28th Ave NE
Seattle, WA 98115-4639

Blain, Lindsay (ECY)

From:	Earthjustice [info@earthjustice.org] on behalf of Joseph and Diane Williams [dwilliams3880@aol.com]
Sent:	Friday, October 01, 2010 9:11 PM
To:	ECY RE AQComments
Subject:	RE: Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 1, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater. This is crucial to protect our state, its residents, land, water and air. Our parks are priceless. They deserve protection now. Thanks.

Sincerely,

Mr. Joseph and Diane Williams
3880 Stikes Dr SE
Lacey, WA 98503-8207

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Andrea Faste [amfaste@comcast.net]
Sent: Friday, October 01, 2010 9:11 PM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater. Ideally, let's close the coal operation entirely and get our power from renewable sources as soon as possible.

Sincerely,

Ms. Andrea Faste
7713 11th Ave NW

Seattle, WA 98117-4134

Blain, Lindsay (ECY)

From:	Earthjustice [info@earthjustice.org] on behalf of Steve Mashuda [smashuda@earthjustice.org]
Sent:	Friday, October 01, 2010 8:41 PM
To:	ECY RE AQComments
Subject:	RE: Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 1, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution. But the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

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Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Mr. Steve Mashuda
1000 25th Ave E

Seattle, WA 98112-3649

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Fiona Humphrey [fionaih@comcast.net]
Sent: Friday, October 01, 2010 8:41 PM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health.
I have asthma; have had asthma all my life but I still enjoy being out in our beautiful northwest! Toxic chemicals in our air affect my health and everyone elses too. Why do we disregard the health of people and the environment in favor of a big company?

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Ms. Fiona Humphrey
302 NE 133rd Cir
Vancouver, WA 98685-2803

Blain, Lindsay (ECY)

From:	Earthjustice [info@earthjustice.org] on behalf of Dan Hosking [dan_98011@yahoo.com]
Sent:	Friday, October 01, 2010 8:41 PM
To:	ECY RE AQComments
Subject:	RE: Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 1, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Please protect our health and our wilderness areas by reducing TransAlta's coal plant nitrogen oxide emissions by 90 percent or more. Thank you!

Sincerely,

Mr. Dan Hosking
6207 NE 152nd St
Kenmore, WA 98028-4361

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Daniel Weise [earthjustice@weises.org]
Sent: Friday, October 01, 2010 8:11 PM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Transalta hazes up my view of Mt Ranier from Seattle. Please cut down on whatever pollutants cause this problem to the max.

Transalta should go away, but unfortunately, that's not what you are reviewing right now. But at least the haze problems can be made to go away.

Sincerely,

Daniel Weise
6619 132nd Ave NE
PMB 218
Kirkland, WA 98033-8627

Blain, Lindsay (ECY)

From:	Earthjustice [info@earthjustice.org] on behalf of Donna Brady [DBradypar@aol.com]
Sent:	Friday, October 01, 2010 7:41 PM
To:	ECY RE AQComments
Subject:	RE: Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 1, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

WA

Sincerely,

Ms. Donna Brady
3803 14th Ave SE Apt D3
Lacey, WA 98503-2221

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Felicity Devlin [felicitydevlin@yahoo.com]
Sent: Monday, October 04, 2010 11:48 AM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 4, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater. The costs are too great to allow continued pollution from TransAlta.

Sincerely,

Ms. Felicity Devlin
2417 N Washington St

Tacoma, WA 98406-5839

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Tina Mulcahy [haleiwa47@hotmail.com]
Sent: Friday, October 01, 2010 7:41 PM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Please think seriously about shutting down this single coal plant here in Washington. The effects are devasting to all life. There are many states that have no other ways to obtain energy, but we here in Washington have other choices and we should limit our use to other resources, as well as work a lot harder and more seriously towards developing greener, healthier energy sources.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

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Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90

percent or greater.

Sincerely,

Ms. Tina Mulcahy
24219 15th Pl SE
Bothell, WA 98021-8875

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Gayle Janzen [cgjanzen@comcast.net]
Sent: Friday, October 01, 2010 7:11 PM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

It's astounding that WA state which is known for it's pro-environmental agenda, is so lax on regulating the TransAlta coal plant. Why? I don't think most of us realize that this coal plant has been putting out so much pollution since we get most of our energy from dams. We're sick and tired of air pollution and haze which is detrimental to both the environment and peoples' health. Please make sure that you strengthen your plan to make some meaningful pollution controls as your proposed weak solution will do nothing.

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

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Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health

from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Ms. Gayle Janzen
11232 Dayton Ave N
Seattle, WA 98133-8611

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Maria Trevizo [cedarcircle@earthlink.net]
Sent: Friday, October 01, 2010 7:11 PM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

The image of Washington as The Evergreen State, juxtaposed with a coal plant is so incongruent. Make it stop.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

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Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Ms. Maria Trevizo
PO Box 11458
Olympia, WA 98508-1458

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Wendolyn Herman [wjoy@centurytel.net]
Sent: Friday, October 01, 2010 7:11 PM
To: ECY RE AQComments

Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Living on the Key Peninsula, with views east to the Cascades and Mt. Rainier for over 25 years, there are too many days where the haze pollution blurs the mountains. This is harmful to all of us in the area and action must be taken now.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

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Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Ms. Wendolyn Herman
PO Box 326
1403 S Head Avenue Kp S
Lakebay, WA 98349-8634

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Randi Rohde [wordtrix@comcast.net]
Sent: Friday, October 01, 2010 7:11 PM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

I grew up in Southern California where smog created headaches and upper respiratory illnesses in myself and family. It also made the skyline really ugly. Please don't let this happen to Western Washington.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

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Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Ms. Randi Rohde
2320 46th Ave SW
Seattle, WA 98116-2417

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Nancy H. Wagner [olamay@hotmail.com]
Sent: Friday, October 01, 2010 7:11 PM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

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Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Last summer, on a trip to Montana, we saw many long trains going west loaded with coal.   I could not understand where they were headed, since I believed most of our power in Washington was hydroelectric. Now I know. They were headed for Centralia.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Ms. Nancy H. Wagner
10809 NE 157th St
Bothell, WA 98011-6229

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Thom Peters [voice4wild@aol.com]
Sent: Friday, October 01, 2010 6:41 PM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

I live in Snohomish. My understanding, as well as expierence, of over 65 years of living here, indicates I have lost upwards of 40% of the time Mt. Ranier used to be visiible thru my picture window. This is disheartening. Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

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Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Mr. Thom Peters
7725 Riverview Rd
Snohomish, WA 98290-5884

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Steve Hamm [steveh@olypen.com]
Sent: Friday, October 01, 2010 6:41 PM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

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In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak. The National Park Service has ranked this plant as the third most damaging to national park vistas in the U.S. The Clean Air Act requires old coal plants like TransAlta to be cleaned up so that we and our parks have the clean, clear, healthy air.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Mr. Steve Hamm
PO Box 82
Nordland, WA 98358-0082

Blain, Lindsay (ECY)

From:	Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Frank I Backus, MD [frankbackus@comcast.net]
Sent:	Friday, October 01, 2010 4:48 PM
To:	ECY RE AQComments
Subject:	Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms our treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution. However, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please revise the Regional Haze State Implementation Plan to reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Frank I Backus, MD
12737 20th Ave NE
Seattle, WA 98125-4118
(206) 365-3348

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Kathleen Mckeehen [kmckeehen@centurytel.net]
Sent: Friday, October 01, 2010 4:48 PM
To: ECY RE AQComments

Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

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Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.
If we're serious about clearing the air, we need some serious legislation.

Kathleen McKeehen
PO Box 481
Indianola, WA 98342

Sincerely,

Kathleen Mckeehen
PO Box 481
Indianola, WA 98342-0481
(360) 297-8858

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of joel mulder [joel_mulder@msn.com]
Sent: Monday, October 04, 2010 11:23 AM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 4, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Air pollution and the haze it produces harm the wilderness and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Mr. joel mulder
1818 Bigelow Ave N Apt 102
Seattle, WA 98109-2620

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Judy Butler [bjudy90@yahoo.com]
Sent: Friday, October 01, 2010 4:18 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. As a chronic asthma sufferer I appreciate clean air.

Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Judy Butler

10202 E Ferret Dr
Spokane Valley, WA 99206-9277

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Eric Johnson, R.N.,R.R.T. [eric_h_johnson@yahoo.com]
Sent: Friday, October 01, 2010 4:18 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Eric Johnson, R.N.,R.R.T.
2509 E Denny Way
Seattle, WA 98122-3027

Blain, Lindsay (ECY)

From:	Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Martha Atkinson [marcieatkinson@hotmail.com]
Sent:	Friday, October 01, 2010 4:18 PM
To:	ECY RE AQComments
Subject:	Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

As a former backcountry ranger at Mt. Rainier National Park, I am in complete agreement with the following message from the Sierra Club:

Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Martha Atkinson
4161 Deer Creek Rd

Valley, WA 99181-9718

Blain, Lindsay (ECY)

From:	Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Lawrence Schuchart [schuchart@q.com]
Sent:	Friday, October 01, 2010 4:18 PM
To:	ECY RE AQComments
Subject:	Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

JUST DO IT!!!

Sincerely,

Lawrence Schuchart

6204 N Morton St
Spokane, WA 99208-3649

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Gerald Myers [myersgm@plu.edu]
Sent: Friday, October 01, 2010 4:18 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Plants like this should not be allowed to spew their junk in the air for the rest of us to breathe.

Sincerely,

Gerald Myers
539 Cedar Ave S
Renton, WA 98057-6046

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of James Clark [jimclark@ieee.org]
Sent: Friday, October 01, 2010 4:18 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Many people may not value clean air in Washington simply because it is far cleaner than areas such as the Central Valley in California. Having lived near Fresno until 2006 where the air is brown and 1 out 6 children have asthma, the poor environmental air quality was a primary driver for why our family (with children ages 1 and 3 back in 2006) moved from the Fresno area to Washington state. Every child should be able to go outside and freely breathe the air without health concerns. Washington state should remain vigilant and proactive to at least maintain, if not improve, its current air quality.

Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

James Clark
3493 111th Dr NE
Lake Stevens, WA 98258-8156
(425) 609-3660

Blain, Lindsay (ECY)

From:	Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Marilyn Smith [masmith034@cableone.net]
Sent:	Friday, October 01, 2010 4:18 PM
To:	ECY RE AQComments
Subject:	Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

This level of pollution must be curtailed for the health of our people and our planet.

Sincerely,

Marilyn Smith
1415 8th St
Clarkston, WA 99403-2733

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Michael Foster [michael.foster2@comcast.net]
Sent: Friday, October 01, 2010 4:18 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Because I drive an electric car to reduce my carbon footprint, where my electricity comes from really matters to me. Nissan Chevrolet and other automakers will begin selling plug-in cars in Washington this year, helping more people make the choice to reduce or eliminate tailpipe emissions. Those people are going to need a clean green source of electricity to power those cars too. The increased demand for power from the grid to drive electric cars will inevitably collide with the demand for cleaner power sources.

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health

from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Michael Foster
3808 Carr Pl N
Seattle, WA 98103-8126

Blain, Lindsay (ECY)

From:	Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Ruth Elaine Sanders [elaine45birds@yahoo.com]
Sent:	Friday, October 01, 2010 4:18 PM
To:	ECY RE AQComments
Subject:	Comment on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant,

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta.

Nitrogen oxide pollution is also a threat to public health.
I and my father are suffering from pulmonary fibrosis, which causes scarring of the lung tissue. This disease is progressive & fatal, often within the median 3 years from diagnosis. Although not a proven cause, nitrogen oxide most probably contributes to the difficulty breathing that sufferers endure.
This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Ruth Elaine Sanders
PO Box 328

McCleary, WA 98557-0328

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Lyz Kurnitz-Thurlow [lyzkurnitz@harbornet.com]
Sent: Friday, October 01, 2010 3:48 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

I have breathing problems. Mine are not nearly as bad as those of many people. Think of all the children with asthma who cannot run and play - or even breathe. We must reduce the pollutants in our air. And this is where YOU are the ones who can make a difference. Please do.

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Lyz Kurnitz-Thurlow
5559 Beverly Ave NE
Tacoma, WA 98422-1402
(253) 924-0288

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Edwin Crayton [edharvardstreet@aol.com]
Sent: Monday, October 04, 2010 11:22 AM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 4, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

The Wild needs protection. And people do too. Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington State must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90 percent or more over its current proposal.

Every year, TransAlta emits more than 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Parks Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Edwin Crayton
218 Second Street
Natchitoches, LA 71457

Sincerely,

Mr. Edwin Crayton
218 2nd St
Natchitoches, LA 71457-4304

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of John Stifter [johnnystifter@gmail.com]
Sent: Friday, October 01, 2010 3:48 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

John Stifter
1509 E 27th Ave
Spokane, WA 99203-3815

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Arthur Mink [artmink3@gmail.com]
Sent: Friday, October 01, 2010 3:48 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Arthur Mink
3731 SW Donovan St
Seattle, WA 98126-3627
(206) 328-8512

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Ron Good [ronportergood@gmail.com]
Sent: Friday, October 01, 2010 3:48 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

This summer, I was in Olympic National Park (almost every day from June through September). And, I want to be sure that the Park's air is not degraded even more by ongoing pollutants from coal fired power plants like TransAlta. Olympic NP is a CLASS 1 clean air area, and it needs to be protected -- just like Mt. Rainier National Park and North Cascades NP.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90%

or greater.

Sincerely,

Ron Good
PO Box 862
Port Townsend, WA 98368-0862

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Trula Thompson [tjthompsonmd@centurytel.net]
Sent: Friday, October 01, 2010 3:48 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Once our natural resource base is gone or destroyed, it will not be replacable by edit nor any amount of funding. Please, leave a clean and healthy planet for us and for future generations to enjoy. Do what is right and in the long run most economically beneficial and sustainable by supporting this plan to reduce coal burning as a way of life on this increasingly fragile planet.

Sincerely,

Trula Thompson
PO Box 1178
Gig Harbor, WA 98335-3178
(253) 858-7024

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Jerry Barr [wabarrs@comcast.net]
Sent: Friday, October 01, 2010 3:48 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

This letter is appeal to you to do what you can to keep TransAlta and other polluters from contributing so heavily to our ongoing air pollution.

We appreciate the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms treasured national parks and wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Jerry Barr
22910 90th Ave W Unit C303
Edmonds, WA 98026-9413

Blain, Lindsay (ECY)

From: Sierra Club Membership Services [membership.services@sierraclub.org] on behalf of Ethan Bergerson [ethan.bergerson@apps.sierraclub.org]
Sent: Friday, October 01, 2010 2:18 PM
To: ECY RE AQComments
Subject: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 1, 2010

Mr. Alan Newman
P. O. Box 47600
Olympia, WA 68504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan. Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution, however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

In order to preserve our treasured public lands and protect public health, Washington state must require pollution controls for TransAlta that would reduce nitrogen oxide pollution by 90% or more over its current proposal.

Every year, TransAlta emits over 10,000 tons of nitrogen oxide pollution which causes haze damage to twelve protected public lands. The National Park Service has criticized the state's proposed plan for not doing enough to protect these pristine wilderness areas, specifically citing the lack of pollution controls at TransAlta as being insufficiently weak.

Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90% or greater.

Sincerely,

Ethan Bergerson
180 Nickerson St
Seattle, WA 98109-1631
(206) 378-0114

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Sincerely,

Ethan Bergerson
180 Nickerson St
Seattle, WA 98109-1631
(206) 378-0114

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Janet Bautista [janetb@ccsww.org]
Sent: Monday, October 04, 2010 11:01 AM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 4, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

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Nitrogen oxide pollution is also a threat to public health. This type of pollution has been linked to heart and lung disease and in some cases can contribute to premature death. It can cause respiratory problems such as asthma, emphysema and bronchitis and can damage lung tissue and aggravate existing heart disease.

Personally, I believe it's time to phase out coal production entirely. It is too destructive-to the land and people-and is a finite source of energy, as is oil.

Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Ms. Janet Bautista
6225 64th Ave W
University Pl, WA 98467-4950

Blain, Lindsay (ECY)

From: Earthjustice [info@earthjustice.org] on behalf of Eugene Ayres [geneayres@juno.com]
Sent: Monday, October 04, 2010 10:22 AM
To: ECY RE AQComments
Subject: RE: Comment on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Oct 4, 2010

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Department of Ecology,

As a Washington resident I am increasingly dismayed by the worsening browning of Mt. Rainier and hazing of our once lovely landscape. This is simply unacceptable, and must be not only stopped, but reversed to the pristine condition that made our region so special and habitable to begin with.

Haze pollution harms public wilderness areas and hurts public health. Federal law requires the state to create a plan to reduce haze pollution; however, the State Implementation Plan as proposed is unacceptably weak and fails to create any meaningful pollution controls for the TransAlta coal plant, which is our state's largest point source of haze causing nitrogen oxide pollution.

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Please protect the our treasured wilderness areas and public health from harm by revising the Regional Haze State Implementation Plan in order reduce the TransAlta coal plant's nitrogen oxide pollution by 90 percent or greater.

Sincerely,

Mr. Eugene Ayres

Lake Forest Park, WA 98155-2479

EARTHJUSTICE

ALASKA CALIFORNIA FLORIDA MID-PACIFIC NORTHEAST NORTHERN ROCKIES
NORTHWEST ROCKY MOUNTAIN WASHINGTON, DC INTERNATIONAL

October 5, 2010

Email: AQComments@ecy.wa.gov
Doug Schneider
Department of Ecology
Air Quality Program
P.O. Box 47600
Olympia, WA 98504-7600

**RE: Washington Proposed Regional Haze State Implementation Plan
Comments by National Parks Conservation Association, Sierra Club, and
Northwest Environmental Defense Center**

Dear Mr. Schneider:

Earthjustice submits these comments on the Washington Department of Ecology's ("Ecology") Regional Haze State Implementation Plan ("Haze Plan") on behalf of the National Parks Conservation Association, Sierra Club—Cascade Chapter, and Northwest Environmental Defense Center (collectively "Conservation Organizations").

The National Parks Conservation Association ("NPCA") is a national organization whose mission is to protect and enhance America's National Parks for present and future generations. NPCA performs its work through advocacy and education. NPCA has over 340,000 members nationwide with its main office in Washington, D.C. and 24 regional and field offices. NPCA's regional Northwest office is located in Seattle where is works on a variety of issues affecting Northwest National Parks such as North Cascades, Olympic, and Mt. Rainier National Parks. NPCA is active nation-wide in advocating for strong air quality requirements in our parks, including submission of petitions and comments relating to visibility issues, regional haze State Implementation Plans, global warming and mercury impacts on parks, and emissions from individual power plants and other sources of pollutants affecting National Parks. NPCA's members live, work, and recreate in all the National Parks of the Northwest, including those directly affected by the TransAlta coal-fired power plant in Centralia, Washington.

The Sierra Club is a national organization founded in 1892, with more than 60 chapters throughout the U.S., including the Cascade Chapter located in Seattle Washington. The Cascade Chapter's membership resides and recreates throughout the state. Sierra Club is devoted to the study and protection of the earth's scenic and ecological resources—mountains, wetlands, woodlands, wild shores and rivers, deserts, plains, and their wild flora and fauna. An important part of Sierra Club's current work, at both the national and chapter level, is its Beyond Coal campaign which, among other things, focuses on retiring and reforming old coal-fired power plants that are significant contributors to health-harming soot and smog pollution, global warming pollutants, and hazardous pollutants such as mercury.

705 SECOND AVENUE, SUITE 203 SEATTLE, WA 98104-1711
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The Northwest Environmental Defense Center ("NEDC") is a regional non-profit organization, based in Portland, Oregon. NEDC works to protect the environment and natural resources of the Pacific Northwest, by providing legal support to individuals and grassroots organizations with environmental concerns, and engaging in litigation independently or in conjunction with other environmental groups. NEDC also provides valuable hands-on experience for students seeking to enhance their education in environmental law. NEDC is regularly involved in efforts to maintain or enhance the air quality of the Pacific Northwest, by serving as a watchdog over Oregon's Department of Environmental Quality, Washington's Department of Ecology and each state's respective permitting processes. Student volunteers regularly comment on proposals for new air permits and permit modifications, monitor current permits in search of violations, and stay on top of major air quality issues, such as changes in administrative regulations.

Ecology's proposed Regional Haze SIP fails to meet the legal requirements of the Clean Air Act and federal regulations, and fails to adequately control emissions that cause haze pollutions. As detailed below, the Conservation Organizations respectfully request that the proposed Haze Plan be revised to adequately control these pollutants.

BACKGROUND

Regional haze results from small particles in the atmosphere that impair a viewer's ability to see long distances, color, and geologic formations. While some haze-causing particles result from natural processes, most result from anthropogenic sources of pollution. Haze-forming pollutants, including sulfur dioxide (SO2), nitrogen oxides (NOx), particulate matter (PM), volatile organic compounds (VOCs), and ammonia (NH3), contribute directly to haze or form haze after breaking down in the atmosphere. These air pollutants contribute to the deterioration of air quality and reduced visibility in our national parks and wilderness areas. Visibility impairment is measured in deciviews, which is a measure of the perceptible change in visibility. The higher a deciview value is, the worse the visibility impairment.

The same pollutants that contribute to visibility impairment also harm public health. The fine particulates that cause regional haze, PM2.5, are a major public health concern because they can be inhaled deep into the lungs. Fine particulate can cause decreased lung function, aggravate asthma, and premature death in people with heart or lung disease. NOx and VOCs can also be precursors to ground level ozone, or smog. Ground level ozone is associated with respiratory diseases, asthma attacks, and decreased lung function.[1] The U.S. Environmental Protection Agency (EPA) has found that in 2015, the Regional Haze Rule also will provide substantial health benefits valued at $8.4 – $9.8 billion annually—preventing 1,600 premature deaths, 2,200 non-fatal heart attacks, 960 hospital admissions, and over 1 million lost school and work days.

[1] *See* http://www.nature.nps.gov/stats/index.cfm.

The total annual cost will range from 1.4 – 1.5 billion dollars.[2] These benefits are estimated under the assumption that the Regional Haze Rule will be implemented as intended. Unfortunately, these public health benefits will not be realized for the citizens of Washington if the State of Washington does not revise its plan to meet regional haze protection goals and requirements as set forth below.

Congress declared as the national goal, the "prevention of any future, and the remedying of any existing, impairment of visibility in the mandatory class I Federal areas which impairment results from manmade air pollution." 42 U.S.C. §7491(a)(1). "Manmade air pollution" is defined as "air pollution which results directly or indirectly from human activities." 42 U.S.C. §7491(g)(3). Congress adopted the visibility protection program to protect the "intrinsic beauty and historical and archeological treasures" of specific public lands.[3] To protect these treasures, the regional haze program establishes a regulatory floor and requires states to design and implement programs at least as stringent as the national floor to curb haze causing emissions located within their jurisdictions. In order to meet this goal, a state is required to design an implementation plan to reduce, and ultimately eliminate, haze from air pollution sources within its borders that may reasonably be anticipated to cause or contribute to visibility impairment for any protected area located within or beyond that state's boundaries. In creating and implementing the plan, a state has an unparalleled opportunity to protect and restore regional air quality by curbing visibility impairing emissions from some of its oldest and most polluting facilities.

Each state implementation plan ("SIP") must provide emission limits, schedules of compliance and other measures as may be necessary to make reasonable progress towards meeting the national goal. 42 U.S.C. § 7491(b)(2). Two of the most critical features of a SIP are requirements for (1) the installation of BART for delineated major stationary sources of pollution and (2) a long-term strategy for making reasonable progress towards the national visibility goal. 42 U.S.C. § 7491(b)(2)(A) & (B).

THE WASHINGTON HAZE PLAN IS LEGALLY AND TECHNICALLY DEFICIENT

The Washington Haze Plan fails to require sufficient reductions in visibility-impairing pollutants from major polluting sources, falls far short of meeting reasonable progress goals, and fails to provide a long term strategy that would meet reasonable progress goals. Washington's Haze Plan shows visibility actually *degrading* at North Cascades National Park and Glacier Peak

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[2] EPA, Fact Sheet, *Final Regional Haze Regulations for Protection of Visibility in National Parks and Wilderness Areas* (June 2, 1999) at http://www.epa.gov/visibility/fs_2005_6_15.html.

[3] *See* H.R. REP. NO. 95-294, at 203–04 (1977).

Wilderness Area by the first 2018 milestone. Thus, the Haze Plan utterly fails to reflect *any* progress toward cleaning up visibility at these two Class I areas.

The plan also fails to provide for adequate reasonable progress toward cleaning up visibility impairment at most of its other Class I areas. Ecology found that, at the rate of emission reductions planned for or required by the state regional haze plan, it would take Olympic National Park *323* years to reach natural visibility conditions.[4] Ecology projects it would take *87* years for the Alpine Lakes Wilderness Area to reach natural visibility conditions and *86* years for Mount Rainier National Park.[5] And, amazingly, Ecology predicts it would take the Pasaytan Wilderness *698* years to reach natural visibility conditions.[6] These rates of progress are so ridiculously slow, they are not progress at all, much less reasonable progress.

As addressed below, the State can and must achieve much greater emission reductions in haze causing pollution with available control technologies and/or by imposing more stringent emission limits reflective of the best level of continuous emission reduction in its Best Available Retrofit Technology (BART) determinations. While it may be true that some of the pollution responsible for haze in the State's Class I areas is due to sources outside of Washington's control, that does not relieve Washington from the requirement to subject industrial sources within Washington to BART emission limits reflective of the best degree of continuous emission reduction achievable, nor does it relieve the State from adopting other measures to improve visibility in Washington.

In addition, the long-term strategy must ensure appropriate BART requirements and other measures are implemented to improve visibility in Washington and other downwind states' Class I areas to ensure that the Haze Plan will attain the goal of meet its share of the emission reductions needed to meet the reasonable progress goals for the area. Such additional measures must include consideration of source retirement and replacement. *See* 40 C.F.R. § 51.308(d)(3)(v)(D).

The National Park Service has submitted extensive comments to Ecology detailing the deficiencies in its regional haze plan on June 11, 2010 and on November 20, 2009.[7] Earthjustice submitted comments to Ecology on its Proposed Ecology/TransAlta Settlement Agreement

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[4] *See* Washington Proposed Regional Haze Plan, Chapter 9 at 9-7.

[5] *Id.* at 9-19 and 9-22.

[6] *Id.* at 9-30. Again, the requirement in the law is to reach natural conditions by 2064, 32 years sooner than Ecology apparently intends for Mt. Rainier National Park and 644 years sooner than Ecology apparently intends for the Pasayten Wilderness.

[7] *See* Exhibits 1 and 2 to this letter.

regarding best available retrofit technology (BART) requirements for the TransAlta-owned Centralia coal-fired power plant as well as mercury, and included expert comments by Dr. Ranajit Sahu that discussed the deficiencies in the BART requirements for the TransAlta Centralia Power Plant (the "TransAlta Centralia Plant").[8] EPA also submitted a comment letter to Ecology on June 30, 2010 identifying several deficiencies in the Washington Haze Plan and proposed BART requirements.[9] Ecology has failed to respond adequately to the majority of these comments. Those previous comments are incorporated herein and provide the following additional comments and information to Ecology regarding their deeply-flawed Haze Plan.

I. BEST AVAILABLE RETROFIT TECHNOLOGY REQUIREMENTS ARE NOT MET IN THE WASHINGTON HAZE PLAN.

States are required to submit SIPs if they host federally protected areas or the emissions of a facility located within a State "may be reasonably be anticipated to cause or contribute to any impairment of visibility" for a protected area located beyond their borders. 42 U.S.C. § 7491 (b)(2). A SIP must contain "emission limits, schedules of compliance and other measures as may be necessary to make reasonable progress towards meeting the national goal…," including BART requirements for all eligible sources and a long-term strategy for making reasonable progress towards meeting the national goal. 42 U.S.C. § 7491(b)(2)(A) &(B).

BART is defined as an emission limitation:

> **. . .based on the degree of reduction achievable through the application of the best system of continuous emission reduction for each pollutant which is emitted by an existing stationary facility.** The emission limitation must be established, on a case-by-case basis, taking into consideration the technology available, the costs of compliance, the energy and non-air quality environmental impacts of compliance, any pollution control equipment in use or in existence at the source, the remaining useful life of the source, and the degree of improvement invisibility which may reasonably be anticipated to result from the use of such technology.

40 C.F.R. §51.301 (emphasis added).

BART limits are required for major stationary sources that were in existence on August 7, 1977 and began operating after August 7, 1962 and that emit air pollutants that may reasonably be anticipated to cause or contribute to any impairment of visibility in a Class I area.

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[8] A copy of our November 9, 2009 comment letter is included as Exhibit 3, and a copy of Dr. Sahu's expert report is included as Exhibit 4.

[9] See Exhibit 5 to this letter.

42 U.S.C. § 7491(b)(2)(A). The term "major stationary source" is defined as a source that has the potential to emit 250 tons or more of any pollutant and falls within one of 26 categories of industrial sources defined by the Act. 42 U.S.C. § 7491(g)(7). A BART-eligible source is one that meets the above criteria and is responsible for an impact on visibility in a Class I area of 0.5 deciview or more. 40 C.F.R. Part 51, Appendix Y. BART must be installed and operated no later than five years after the SIP approval. 40 C.F.R. § 51.302(c)(4)(iv).

As discussed in detail below, Washington has clearly not required emissions controls and limits that reflect BART for the BART-eligible sources.

A. BART for the TransAlta Centralia Coal-Fired Power Plant.

The TransAlta Centralia Plant is the largest emitter of regional haze pollutants of all of Washington's BART-eligible sources. Nonetheless, Ecology proposes nothing more than the status quo as BART at this facility. Given that the Washington regional haze plan so woefully fails to even come close to meeting its 2018 reasonable progress goals for any of its Class I areas, Ecology must conduct a proper evaluation of BART for the Centralia plant and require the installation of a selective catalytic reduction (SCR) system is BART for the NOx emissions at the TransAlta Centralia Plant.

1. The NOx BART determination for the TransAlta Centralia Plant is not at least as stringent as the presumptive NOx BART limits for tangentially–fired boilers.

Pursuant to 40 C.F.R. § 51.308(e)(1)(ii)(B), the determination of BART for fossil-fuel fired power plants with more than 750 MW generating capacity, such as the TransAlta Centralia Plant, must be made in accordance with the EPA's Guidelines for BART Determinations Under the Regional Haze Rule in 40 C.F.R. Part 51, Appendix Y. The EPA's BART Guidelines include presumptive BART limits for SO2 and for NOx. Therefore, these presumptive BART limits do not take the place of a case-by-case BART analysis. EPA has determined that these levels of emissions should be cost-effective, but lower emission limits may also be cost-effective. EPA's presumptive limit simply sets the minimum. For tangentially-fired boilers burning Powder River Basin coal, such as the TransAlta Centralia Plant's boilers, EPA's BART Guidelines identify 0.15 lb/MMBtu as the presumptive BART level for NOx. See 40 C.F.R. Part 51, Appendix Y, Table 1. Yet Ecology has proposed a NOx emission limit for the Centralia plant of 0.24 lb/MMBtu 30-day rolling average with both units averaged together. This is well in excess of EPA's presumptive NOx BART limit for similar boiler and coal types. Indeed, the fact that Ecology's determination of NOx emission limits achievable with current NOx controls is 60% higher than EPA's presumptive BART limit for similar boiler and coal types dictates the addition of post-combustion controls for NOx removal in the BART analysis.

2. The NOx BART analysis improperly took into account costs of the "Flex Fuels" project.

Ecology's BART determination for the TransAlta Centralia Plant treats the "Flex Fuels" project as one of the BART controls to be evaluated for costs. While it is true that the change to Powder River Basin coal appears to have lowered the TransAlta Centralia Plant's NOx emission rate, Ecology should not have considered the coal switch as a NOx BART option to be evaluated, because it should have been considered part of the base case for NOx control at the TransAlta Centralia Plant. Further, the costs of switching to Powder River Basin coal at the TransAlta Centralia Plant should not have been considered by Ecology at all in its BART determination.

TransAlta did not switch to Powder River Basin coal to meet BART. Rather, a clear record of evidence shows that the company switched to Powder River Basin coal because the Centralia coal mine was at the end of its economic life. According to a November 27, 2006 statement from TransAlta:

> "After exhausting all alternatives, we have made the difficult but necessary decision to stop mining at Centralia," said Steve Snyder TransAlta President and Chief Executive Officer. "The maturity of the Centralia mine, its rapidly deteriorating mining conditions and escalating costs from excessive overburden have combined to make the mine uneconomic. In order to produce competitively priced electricity from our Centralia coal-fired plant, we have to meet the fuel requirements for our plant from a more predictable and economic source."

See November 27, 2006 TransAlta press release entitled: "TransAlta Stops Mine Operations At Centralia, Switches To Powder River Basin Coal, And Announces Intention To 'Write Down' Centralia Gas Fired Plant."[10] TransAlta's press release did not indicate that this decision was made to meet regional haze requirements or to lower air emissions. The press release makes clear that the decision was economic one made independently of the BART requirements.

Until TransAlta's November 2008 submittal supplementing its BART analysis for the TransAlta Centralia Plant, the company did not include any discussion of its switch to Powder River Basin coal as an emission reduction project to meet BART. Instead, its earlier BART submittals simply stated that the units burn Powder River Basin coal. For example, TransAlta's July 2008 BART submittal simply states under the heading "Coal Characteristics" that "[t]he main source of fuel burned at CPP is being transitioned to be exclusively western sub-bituminous

[10] Copy attached as Exhibit 6; see also http://www.transalta.com/newsroom/news-releases/2006-11-27/transalta-stops-mine-operations-centralia-switches-powder-river-ba.

coal from the Wyoming Powder River Basin (PRB) by 2013."[11] In fact, based on the November 27, 2006 TransAlta press release discussed above, TransAlta had already secured Powder River Basin coal contracts with Rio Tinto Energy America and Peabody Energy's subsidiary COALSALES, LLC., as well as rail transportation contracts with BNSF Railway Company, by November 2006.[12]

Moreover, the fact that TransAlta had to make numerous changes to the boiler to accommodate the coal cannot be considered in a cost determination for the BART analysis. The following describes the reasoning for the boiler changes at Centralia with the switch to Powder River Basin coal:

> The boiler changes will reduce the boiler susceptibility to ash deposition. The major individual pressure part changes include: (a) reheater replacement to maximize sootblower cleaning effectiveness on the tube assembly surface areas, and (b) additional low temperature superheater and economizer heat transfer surface area to result in a lower flue gas exit temperature. Miscellaneous safety and nonpressure boiler changes include: (a) twenty new retractable steam sootblowers and eight new steam wallblowers for each unit to help reduce the slagging and fouling in the boiler furnace and convective heat transfer surfaces; (b) hydrojets cleaning system to maintain heat transfer effectiveness inside the furnace and lower the flue exhaust gas temperature.

See TransAlta's November 2008 Supplement to the BART Analysis for the TransAlta Centralia Power Plant at 1.

Most, if not all, of TransAlta's equipment replacement at the TransAlta Centralia Plant was due to the company's economic decision to switch to Powder River Basin coal and for the need to extend the life of the boilers. The TransAlta Centralia Plant's boilers were commissioned in 1971 and 1972. The components of the boilers , in particular the reheater and the sootblowers, were at the end of their useful life. While these components may have been replaced in part to help the boilers better utilize the Powder River Basin coal, it is entirely inappropriate to include the costs of life-extension work as the cost of a BART "Flex Fuels" project. TransAlta and Ecology are misleading the public through their representations that TransAlta is spending a significant amount of money to reduce NOx. Rather, TransAlta made

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[11] *See* BART Analysis for Centralia Power Plant, prepared for TransAlta by CH2MHill, Revised July 2008, at ES-3.

[12] *See* November 27. 2006 TransAlta news release entitled: "TransAlta stops mine operations at Centralia, switches to Powder River Basin coal, and announces intention to 'write down' Centralia gas fired plant," Exhibit 6.

the business decisions to switch to Powder River Basin coal and to replace worn out components of the boiler in order to extend the life of the boilers another 20 years or more.

Ecology also misrepresents its rationale for the NOx decrease with the switch to Powder River Basin coal by stating that there would be less fuel burned because of the higher heat value of the Powder River Basin coal.[13] Given that the characteristics of Powder River Basin coal increase the heat rate of the boiler[14] (i.e., the amount of Btu heat input it takes to produce one kW-hr), the tons of coal burned will not likely decrease with the change to Powder River Basin coal. Depending on the amount of increased heat rate with Powder River Basin coal, the total amount of coal burned at the Centralia units could even increase above the amounts of Centralia mine coal burned in prior years.

Thus, for all of the above reasons, Ecology cannot properly conclude that the "Flex Fuels" project constitutes BART for NOx at Centralia. Although the switch to Powder River Basin coal at Centralia did reduce NOx emissions to some extent, the reductions come nowhere near to what EPA has identified as presumptive BART levels for this plant. Instead the burning of Powder River Basin coal at Centralia should simply be considered part of base case emissions in the BART evaluation. The "Flex Fuels" technology is the plant's current mode of operation, and has been since at least 2006 if not earlier, it fails to conform to presumptive BART limits and thus it does not meet the haze reduction requirements of the Clean Air Act or EPA regulation.

3. Ecology failed to consider state of the art combustion controls, including Selective NonCatalytic Reduction (SNCR) and Selective Catalytic Reduction (SCR).

Neither Ecology nor TransAlta evaluated any upgrades to the Centralia units' low NOx burners that were installed between 2000-2002 or any additional combustion controls that could be used to reduce NOx at the boilers. Ecology has proposed a plantwide NOx BART emission limit with the unit's existing combustion controls of 0.24 lb/MMBtu (30-day average, both units averaged together). State-of-the-art combustion controls can achieve much lower NOx emissions with Powder River Basin coal.

For example, the W.A. Parish Unit 6 facility was retrofitted with DRB-4Z™ ultra-low NOx burners with interlaced overfire air in 2000, and has achieved post-retrofit NOx emissions

[13] *See* Washington Regional Haze Plan, Appendix L at 8.

[14] *Id.* at 7.

of 0.17 lb/MMBtu or lower.[15] The W.A. Parish facility was emitting NOx at a rate of 0.40 lb/MMBtu before the retrofit.[16]

In addition, at Plant Scherer Units 3 and 4 which burn 100% Powder River Basin coal and are approximately 900 MW in size each, modifications were made to add separated overfire air ports and openings to provide deeper staging capabilities and distance from the combustion zone. Unit 3 had baseline NOx emissions of 0.22 to 0.33 lb/MMBtu and its post change NOx emissions decreased to 0.12 to 0.14 lb/MMBtu.[17] Unit 4 achieved even lower NOx emissions – 0.10 to 0.13 lb/MMBtu.

As discussed in Dr. Sahu's November 4, 2009 comments on the TransAlta Preliminary BART Determination, another option to further reduce NOx is the use of neural net controls such as NueCo. See Exhibit 4, ¶ 14. Dr. Sahu also provided examples of several existing Powder River Basin coal fired electrical generating units achieving NOx emission rates lower than Centralia through the use of combustion controls. *Id.*, Tables 1-6.

With more effective combustion controls, the TransAlta Centralia Plant could likely at least reduce its NOx emissions to meet presumptive BART limit of 0.15 lb/MMBtu. Further, with lower levels of NOx emitted from the boiler, the size of SCR equipment can be reduced because less catalyst would be required to remove NOx, meaning lower capital and operational costs. Thus, Ecology should have required TransAlta to evaluate various combustion control techniques to reduce NOx emissions from the TransAlta Centralia Plant boilers and also should have required evaluation of those combustion control techniques along with SCR at the TransAlta Centralia Plant.

4. TransAlta appears to have overstated the cost of hot-side SCR installation at the TransAlta Centralia Plant units.

As discussed in the National Park Service's comment letters from November 2009 and June 2010, as well as in EPA's June 2010 comment letter to Ecology, the determination of costs for SCR installation at the TransAlta Centralia Plant appears to be greatly overstated in TransAlta's BART analysis.

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[15] See Bryk, S.A. et al., First Commercial Application of DRB-4Z™ Ultra Low NOx Coal-Fired Burner, presented to POWER-GEN International 2000, November 14-16, 2000, Orlando, FL. (Exhibit 7).

[16] *Id.*

[17] *See* Whitfield, T. et al., Comparison of NOx Emission Reductions with PRB and Bituminous Coal in 900 MW Tangentially Fired Boilers, presented to EPRI-DOE-EPA-AWMA Mega Symposium, May 19-22, 2003, at 6. (Exhibit 8).

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a. Total capital costs are higher than reported by others.

Capital costs for pollution control equipment are commonly reported on a dollar per kilowatt of capacity basis. TransAlta estimated the capital costs for SCR installation at each TransAlta Centralia Plant unit to be $580,290,872.[18] At 702.5 MW each, this equates to $413/kW based on the net MW production of each unit. Yet five industry studies conducted between 2002 and 2007 have reported the installed unit capital cost of SCRs,[19] or the costs actually incurred by owners, expressed in dollars per kilowatt. These actual costs are lower than estimated for the TransAlta Centralia Plant, and they call TransAlta's estimates into serious question.

The first study evaluated the installed costs of more than 20 SCR retrofits from 1999 to 2001. The installed capital cost ranged from **$116 to $233/kW,** converted to 2008 dollars.[20] It should be noted that 2008 dollars are used in these comparisons because of the fact that theCH2MHill Centralia BART cost analysis are in 2008 dollars.[21] Costs are escalated through using the Chemical Engineering Plant Cost Index (CEPCI).

Similarly, the second survey of 40 installations at 24 stations reported a cost range of **$83 to $265/kW**, converted to 2008 dollars.[22] The third study, by the Electric Utility Cost Group, surveyed 72 units totaling 41 GW, which represents 39% of installed SCR systems in the U.S. The study reported a cost range of **$145/kW to $321/kW**, converted to 2008 dollars.[23] A fourth

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[18] *See* July 2008 TransAlta BART Analysis, Appendix A, Table entitled "Capital Costs for Both Units 1 and 2."

[19] J. Edward Cichanowicz, Current Capital Cost and Cost Effectiveness of Power Plant Emissions Control Technologies, June 2007. Exhibit 9.

[20] Bill Hoskins, Uniqueness of SCR Retrofits Translates into Broad Cost Variations, Power Engineering, May 2003. Exhibit 10. The reported range of $80 to $160/kW $123 - $246/kW was converted to 2008 dollars ($116 - $233/kW) using the ratio of CEPCI in 2008 to 2002: 575.4/395.6.

[21] *See* July 2008 TransAlta BART Analysis at ES-3.

[22] J. Edward Cichanowicz, Why are SCR Costs Still Rising?, Power, April 2004, Exhibit 11; Jerry Burkett, Readers Talk Back, Power, August 2004, Exhibit 12. The reported range of $56/kW - $185/kW was converted to 2008 dollars ($83 - $265/kw) using the ratio of CEPCI for 2008 to 1999 (575.4/.390.6) for lower end of the range and 2008 to 2003 (575.4/401.7) for upper end of range, based on Figure 3.

[23] M. Marano, Estimating SCR Installation Costs, Power, January/February 2006. Exhibit 13. The reported range of $100 - $221/kW was converted to 2008 dollars ($130 - $286/kW) using the ratio of CEPCI for 2008 to 2004: 575.4/444.2.
http://findarticles.com/p/articles/mi_qa5392/is_200602/ai_n21409717/print?tag=artBody;col1

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study, presented in a course at PowerGen 2005, reported an upper bound range of **$197/kW to $221/kW**, converted to 2008 dollars.[24] A fifth summary study reports recent applications that either become operational in 2006 or were scheduled to start up in 2007 or 2008 cost in excess of $200/kW on a routine basis, with the highest one slated for startup in 2009 at $300/kW.[25]

Thus, the overall range for these industry studies is **$83/kW to $300/kW**. The upper end of this range is for highly complex retrofits with severe space constraints, such as Belews Creek, reported to cost **$290/kW**,[26] or Cinergy's Gibson Units 2-4. Gibson, a highly complex, space-constrained retrofit in which the SCR was built 230 feet above the power station using the largest crane in the world,[27] only cost $275/kW in 2008 dollars.[28]

Further, the Centralia SCR cost estimates are much higher than other recent estimates. Wisconsin Electric estimated the cost to retrofit SCR on Oak Creek Units 5-8 to be **$205/kW**[29] for a cold-side SCR. This cost was certified in July 2008 for construction by the Wisconsin Public Services Commission.[30] Wisconsin Power and Light estimated the cost to

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[24] PowerGen 2005, Selective Catalytic Reduction: From Planning to Operation, Competitive Power College, by Babcock Power, Inc. and LG&E Energy, December 2005, Exhibit 14. The reported range of $160 - $180/kW) was converted to 2008 dollars ($197 - $221/kW) using the ratio of CEPCI for 2008 to 2005 (575.4/468.2).

[25] J. Edward Cichanowicz, Current Capital Cost and Cost-Effectiveness of Power Plant Emissions Control Technologies, June 2007, pp. 28-29, Figure 7-1 (Exhibit 9).

[26] Steve Blankinship, SCR = Supremely Complex Retrofit, Power Engineering, November 2002, Exhibit 15. The unit cost: ($325,000,000/1,120,000 kW)(608.8/395.6) = $290/kW. http://pepei.pennnet.com/display_article/162367/6/ARTCL/none/none/1/SCR-=-Supremely-Complex-Retrofit/

[27] Standing on the Shoulder of Giants, Modern Power Systems, July 2002, Ex. 8.

[28] McIlvaine, NO_X Market Update, August 2004, Exhibit 17. SCR was retrofit on Gibson Units 2-4 in 2002 and 2003 at $179/kW. Assuming 2002 dollars, this escalates to ($179/kW)(608.8/395.6) = $275.5/kW.
http://www.mcilvainecompany.com/sampleupdates/NoxMarketUpdateSample.htm

[29] Wisconsin Electric Power Company's Application to Install Wet Flue Gas Desulfurization and Selective Catalytic Reduction Facilities and Associated Equipment on Oak Creek Power Plant Units 5, 6, 7 & 8 for Control of Sulfur Dioxide and Nitrogen Oxide Emissions, Appendix C, Emission Reduction Study, Volume 1, Addendum August 20, 2007. Unit cost = ($190,500,000/1,135,000 kW)(608.8/499.6) = $204.5 kW

[30] Certificate and Order, Application to Install Wet Flue Gas Desulfurization and Selective Catalytic Reduction Facilities and Associated Equipment on Oak Creek Power Plant Units 5, 6, 7

retrofit SCR on the 430-MW Edgewater Unit 5 to be **$324/kW** in January 2008.[31] The Edgewater project is pending before the Wisconsin Public Services Commission. Similarly, American Electric Power (AEP) estimated that the average capital cost to install SCRs to remove 85-93% of the NOx from many of its units was **$162/kW**.[32]

The data from these studies and examples indicates that CH2MHill's estimates of capital cost to retrofit SCR at Centralia **($413/kW**) are higher than actual installment costs for SCR retrofits, including very difficult retrofits (which TransAlta and Ecology claim without support, will be the case with the TransAlta Centralia Plant).

b. TransAlta and Ecology used an improper cost method.

There are several ways to estimate cost, depending upon intended use. Costs for BART analyses typically use the total annual cost approach.[33] The total annual cost approach has been used for BACT cost effectiveness analyses since about 1977. That approach estimates costs of various control options by calculating costs equalized annually over the life of the control. These costs are real or constant-dollar estimates in that the effect of inflation has been removed.

A standardized approach is used to assure a level playing field and consistency in estimating costs, as the significance of cost effectiveness values is determined by comparing the costs for a given project to costs at other similar sources. This method was selected by EPA because it determines the "economic" cost of air pollution control, i.e., the true cost to society, it is simple to use, and it allows comparison of alternative control systems with different economic lives. EPA has adopted this approach for BART determinations, with the BART guidance specifically recommending the use of the EPA Control Cost Manual, which uses the total annual cost approach.[34]

& 8 for Control of Sulfur Dioxide and Nitrogen Oxide Emissions, Case 6630-CE-299, July 10, 2008.

[31] Wisconsin Power & Light Co., Certificate of Authority Application, Edgewater Generating Station Unit 5 NOx Reduction Project, Project Description and Justification, November 2008, PSC Ref#: 105618, p. 11. Exhibit 18. The unit cost was calculated from the total project cost minus escalation divided by gross generating capacity or: ($153,944,000 - $14,695,000)/430 MW = $323.8/kW.

[32] AEP, 2008 Fact Book, 43rd Financial Conference, Phoenix, AZ, p. 94. Exhibit 19.

[33] This method is also called the equivalent uniform annual cost method. See 70 Fed. Reg. 39104, 39166 - 39167 (July 6, 2005) which notes the EPA Control Cost Manual should be used where possible. This Manual uses the total annual cost approach.

[34] 70 Fed. Reg. at 39166.

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TransAlta did not use the total annual cost approach, and thus its cost effectiveness values are not relevant for purposes of determining cost effectiveness of the various BART options, especially SCR. Further, TransAlta included costs for items that are not to be addressed according to OAQPS's Control Cost Manual.[35]

For example, TransAlta included 8% sales tax in its SCR costs, improperly inflating its costs by $26.8 million.[36] Pollution control equipment is typically exempt from property and sales taxes, which are usually assumed to be zero.[37]

TransAlta also improperly included an additional 10% of the capital costs as "owner's costs."[38] Owner's costs are not included in EPA's Control Cost Manual. Owners do not manage and implement capital projects, but rather retain engineering firms, called the "owner's engineer," to perform these functions. Other owner activities would be part of its overhead. Cost factors used to estimate capital costs are ordinarily reported, and would include these costs. Further, these costs, if not directly part of the project, are outside of the battery limits of a control project and would be part of the owner's overhead. Thus, they are not usually included in cost effectiveness analyses as a separate additional cost.

In addition, TransAlta included a general category of "contingency" and added 15% to the capital costs of SCR at both units.[39] It is not clear what TransAlta intended to fall under this category, and it is questionable whether the inclusion of an addition 15% to the capital costs for unspecific "contingency" is legitimate. TransAlta also included a cost category of "margin" and further added 10% to the capital cost of the SCR installations.[40] TransAlta failed to explain or justify either cost category.

TransAlta further included the cost of lost generation at $20/MWhr and 42 days per unit for SCR installation in the capital cost.[41] This is not one of the allowable items included in the Control Cost Manual. Further, it appears that TransAlta assumed the units would operate at a

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[35] See CH2MHill March 11, 2010 Submittal to Ecology, Table A.

[36] *See* July 2008 Centralia BART Supplement, Appendix A.

[37] OAQPS Control Cost Manual, 2002, Section 4.2, p. 2-48 ("In many cases property taxes do not apply to capital improvements such as air pollution control equipment...")

[38] *See* July 2008 TransAlta BART Analysis, Appendix A, Table entitled "Capital Costs for Both Units 1 and 2."

[39] *Id.*

[40] *Id.*

[41] *Id.*

95% capacity factor during those 42 days. Outages are generally scheduled for slow periods when demand is at the lowest. Also, due to hourly fluctuations in demand, units ramp down during evening hours and rarely would operate at 95% capacity. In addition, it appears that the cost of replacement power did not consider the reduction in the TransAlta Centralia Plant's operating costs during the shutdown for SCR installation. TransAlta identified the capacity factor of the TransAlta Centralia Plant units as 78% of TransAlta's NOx BART cost analysis, plainly an overstatement.[42]

In addition, TransAlta included "Allowance for Funds During Construction" ("AFDUC.") in the capital costs [43] This is not allowed by the EPA Control Cost Manual.

It also appears that TransAlta only assumed a 15-year life of the SCRs in its cost analysis.[44] The default useful life for an SCR system in EPA's Control Cost Manual is 20 years.

The overall result of TransAlta's free use of inflated figures not allowed by the Control Cost Manual is a gross overstatement of the costs of SCR pollutant control technology. The National Park Service raised many of these issues, in addition to other problems with the TransAlta SCR cost analysis, in its November 20, 2009 letter and attachments and in its June 11, 2010 comment letter and attachments. We incorporate those comments by reference into these comments and also have included these comments as Exhibits 1 and 2 to this letter.

c. TransAlta underestimated the NOx emission reductions that can be obtained with SCR.

TransAlta assumed that the installation of SCR for the Centralia units would only achieve a NOx emission rate of 0.07 lb/MMBtu and a 72% NOx removal rate, a rate far below the pollutant reductions SCR can achieve.[45] However, 90% NOx removal with an SCR system is readily achievable. With the current NOx rates the Centralia units are achieving (i.e., lower than

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[42] *See* July 2008 TransAlta BART Analysis, Appendix A, Table entitled "Input Calculations for Both Units 1 and 2."

[43] *See* July 2008 TransAlta BART Analysis, Appendix A, Table entitled "Capital Costs for Both Units 1 and 2."

[44] *See* July 2008 TransAlta BART Analysis, Appendix A, Table entitled "Input Calculations for Both Units 1 and 2." TransAlta assumed a 15 year "Plant Economic Life."

[45] *Id.* Note that Ecology incorrectly states in its BART Determination for TransAlta that the company evaluated 95% NOx removal in its SCR cost analysis. *See* Ecology's BART Determination Document for TransAlta's Centralia Power Plant, revised April 2010, in Appendix L of Washington Regional Haze Plan, at 12.

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0.24 lb/MMBtu) and a 90% effective SCR, the units could meet a NOx BART limit as low as 0.03 lb/MMBtu. Achieving these lower levels would represent an additional 57% reduction in NOx emissions that could readily be achieved with SCR, as compared to the meager emission reductions evaluated in TransAlta's SCR analysis.

A review of recent SCR retrofits at other power plants definitively proves that very high levels of NOx removal are being achieved by recent SCR retrofit installations. NOx emission rates less than 0.05 lb/MMBtu are routinely achieved, and NOx removal efficiencies are typically around 90%.[46] Permitting agencies have required lower NOx limits in recent BACT determinations, with many proposed and required BACT limits of 0.05-0.06 lb/MMBtu. For example, the Plant Washington PSD permit, issued in April 2010, requires that unit to meet a 0.03 lb/MMBtu annual average NOx limit as BACT.[47] The Desert Rock PSD permit includes a NOx BACT limit as low as 0.035 lb/MMBtu.[48]

According to TransAlta's calculations, NOx emissions from the two TransAlta Centralia Plant units combined would decrease from 10,910 tpy to 3,055 tpy, for a reduction of 7,855 tpy based on an assumed NOx rate of 0.07 lb/MMBtu and a 72% NOx control efficiency with SCR.[49] Had TransAlta more appropriately assumed a NOx rate of 0.03 lb/MMBtu, which reflects 87.5% removal from current NOx emission rates, the NOx emissions from the units in total would decrease to 1,309 tpy for a reduction of 9,601 tpy from TransAlta's assumed base case emission level of 10,910 tpy. This level would reflect approximately 1,900 additional tons of NOx removed above and beyond the levels assumed in TransAlta's cost analyses. Without adjusting any of the other flaws in TransAlta's SCR cost analysis described above and in the attached exhibits, it is apparent that when more accurate assumptions for NOx emission reductions are evaluated, the cost of SCR at both units would decrease to $7,436/ton of NOx removed (as compared to TransAlta's estimate of $8,205/ton of NOx removed). When the costs of SCR installation at the Centralia units are more appropriately determined, the cost per ton will be even lower.

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[46] *See* Erickson, Clayton A. et al., Selective Catalytic Reduction System Performance and Reliability Review, The 2006 MEGA Symposium, Paper # 121, Exhibit 20.

[47] A copy of the Plant Washington permit is included as Exhibit 21.

[48] The Desert Rock Energy Facility permit requires the facility to achieve, after a NOx optimization period, a NOx emission rate of 0.035 lb/MMBtu on a 365 day rolling average and an emission rate of 0.05 lb/MMBtu on a 30-day rolling average. Exhibit 22. *See also* the National Park Service spreadsheet on BACT limits for New PC Power Plants, Exhibit. 23.

[49] *See* July 2008 TransAlta BART Analysis, Appendix A, Table entitled "Input Calculations for Both Units 1 and 2."

The National Park Service re-calculated the cost effectiveness of SCR at Centralia based on the Control Cost Manual and an assumed NOx emission rate of 0.05 lb/MMBtu in its November 20, 2009 comments and June 11, 2010 comments to Ecology. Those costs are much lower than the inflated capital and annual costs provided by TransAlta. Specifically, the National Park Service's recalculated cost effectiveness of SCR installation at both Centralia units of $5,622./ton which they found it to be a reasonable cost based on the cost of BART installation at other coal-fired electrical generating units.[50]

Ecology must require that the BART analysis of SCR at the Centralia units be based on achievable NOx emission rates, which would be lower than the 0.07 lb/MMBtu emission rate assumed by TransAlta. NOx emission rates of 0.03 lb/MMBtu should be achievable at the Centralia units given the current NOx emission rate, which is below 0.24 lb/MMBtu. The ceiling for the NOx BART limit evaluated should be no higher than 0.05 lb/MMBtu, which should be readily achievable with SCR at the Centralia units.

5. Neither TransAlta nor Ecology evaluated the cost-effectiveness of SCR in a low dust or tail end location.

TransAlta's NOx BART analysis raised issues with the tight space and duct arrangement for installation of SCR units at Centralia. Thus, TransAlta assessed the arrangement of the SCRs physically on top of the existing electrostatic precipitators, which they claimed "exponentially increased the capital costs."[51] Alternative arrangements include: an outboard arrangement; a low-dust SCR (located after the particulate control device); and a tail-end SCR located at the tail end, following all pollution control devices. These latter alternative arrangements are attractive as the SCR is located downstream of the air preheater, thus avoiding the space-constrained area between the boiler outlet and the inlet to the air preheater. Subsets of these alternatives include ducting together two or more units. There is no evidence that any alternative arrangements were considered by Ecology or TransAlta.

Only a high-dust SCR was evaluated for costs. However, retrofitting of a low- dust or tail-end SCR may be a more cost-effective retrofit—especially if combined with upgraded particulate matter controls for these units. Recently, for example, Wisconsin Energies decided it was more cost effective to retrofit Oak Creek Units 5-8 with low dust/tail-end SCRs, rather than

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[50] *See* June 11, 2010 National Park Service Followup Comments on Washington Department of Ecology's (Ecology's) Proposed Best Available Retrofit Technology (BART) Determination for TransAlta Centralia Generation (Exhibit 1) at 12. *See also* the National Park Service spreadsheet of NOx BART Limits and Costs (Exhibit 24).

[51] *See* July 2008 TransAlta BART Analysis at 3-9.

the more traditional high-dust SCRs.[52] Tail-end SCR units can be smaller than high dust units, have longer catalyst life, and can use less expensive catalysts.[53]

Ecology's BART analysis for Centralia is deficient without a cost analysis of alternative SCR locations.

6. Neither TransAlta nor Ecology adequately evaluated the other environmental benefits of SCR installation at the TransAlta Centralia Plant units.

As described above, if TransAlta were to install SCR systems along with combustion controls at the Centralia units, it could reduce NOx emissions by 90%. Not only would such installation improve visibility in the region's Class I areas, it would also likely improve the region's ozone pollution (i.e. O3) due to the fact that NOx is a precursor to ozone. One monitor in King County, to the north of Centralia, shows that emissions are violating the 2008 ozone NAAQS of 0.075 ppm, and Ecology has indicated they will recommend that area for nonattainment designation.[54] Further, data provided with EPA's January 2010 proposed revisions to the ozone NAAQS, which EPA has proposed to lower from 0.075 ppm to 0.060 to 0.070 ppm (8-hour average) (see 75 Fed. Reg. 2938, January 19, 2010), indicates that King County, Pierce County, and Thurston County could be in nonattainment for ozone depending on the level of the final ozone NAAQS that EPA adopts.[55] Reductions in NOx, which are achievable at the Centralia Plant with SCR, would likely help address those counties' ozone problems. Since vegetation damage has been found to occur even where ozone concentrations are below the ozone NAAQS, greater reductions in NOx emissions from the Centralia Plant, as would be obtained by the installation of SCR controls, could also benefit the vegetation of the region's Class I areas.

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[52] See August 24, 2007 letter from Wisconsin Energies to the Public Service Commission regarding the Oak Creek Power Plant, Appendix C August 20, 2007 Addendum Emission Reduction Study, and Appendix C NOx/SO2 Emission Reduction Study. These document are all included as Exhibit 25 to this letter.

[53] See January 2009 FGD and DeNOx Newsletter. Exhibit 26.

[54] *See* March 5, 2009 letter from Ecology to EPA, available at http://www.epa.gov/ozonedesignations/2008standards/rec/letters/10_WA_rec.pdf.

[55] *See* EPA Map Entitled "Counties with Monitors Violating Primary 8-hour Ground-level Ozone Standards 0.060 – 0.070 parts per million," available at http://www.epa.gov/air/ozonepollution/pdfs/20100104maps.pdf.

In addition, nitrogen deposition is also a significant environmental issue in the region. The significant adverse impacts of nitrogen deposition, which are caused by wet and dry deposition of nitrates derived from NOx emissions, on ecological systems is well known. Critical loads (*i.e.*, the amount of nitrogen deposition that an ecosystem can tolerate, above which the system become adversely impacted) are likely to soon be formally used to inform policy developments (*e.g.*, NADP-CLAD Meeting, Pensacola, FL Spring 2009). Further, National Park Service data shows significant concerns with nitrogen deposition in Mt. Rainier National Park, the closest Class I area to the TransAlta Centralia Plant, as well as in Olympic and North Cascades National Parks.[56] Thus, the potential to reduce nitrogen deposition-forming emissions is another compelling reason for requiring installation of the top NOx control measures as BART at the TransAlta Centralia Plant.

Reductions in NOx emissions achievable with SCR would also result in reduced fine particulate emissions. The use of ammonia injection before the electrostatic precipitator ("ESP") has also been shown to reduce sulfate formation by high levels, which would further benefit visibility as well as sulfate deposition and fine particulate concentrations.[57]

Finally, the use of SCR controls helps to oxidize the mercury emitted so it is more readily captured in a particulate control device.[58] SCR catalysts can act to oxidize elemental mercury (*e.g.*, to $HgCl_2$) making it easier to capture downstream in wet FGD systems or particulate matter collection devices. Currently, several industry improvements in SCR technology are being developed that would enhance mercury oxidation across an SCR catalyst for all coal types.[59] SCR would help TransAlta do much better mercury removal than the anemic 50% reduction goals that it has agree to with the state.

In summary, if the TransAlta Centralia Plant were subject to the best control technology for NOx reductions, *i.e.*, SCR (along with Powder River Basin coal and current or upgraded combustion controls), as compared to continuing with the current status quo at the TransAtla

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[56] *See* National Park Service's Air Quality in National Parks, 2008 Annual Performance and Progress Report at 10, available at http://www.nature.nps.gov/air/Pubs/pdf/AQ_Trends_In_Parks_2008_Final_Web.pdf

[57] R.K.Srivastava et al., Emissions of Sulfur-Trioxide from Coal-Fired Power Plants, *J. Air & Waste Manage. Assoc.*, 54: 750-762 at 758-759, June 2004, Exhibit 27.

[58] *See* EPA's Performance and Cost of Mercury and MultiPollutant Emission Control Technology Applications on Electric Utility Boilers, EPA-600/R-03-110, October, 2003, at 5, 9-15. Exhibit 28.

[59] June 29, 2004 letter from ICAC to EPA, pp. 15-17. Exhibit 29.

Plant, significant environmental benefits that would be obtained. Those benefits must be considered by Ecology in determining BART for NOx at the TransAlta Centralia Plant.

7. Ecology must determine the visibility benefits of the SCR plus Flex Fuels BART option.

Neither TransAlta nor Ecology modeled the visibility impacts of the Flex Fuels project (i.e., the lower SO2 emissions due to the lower sulfur coal) in addition to SCR at the TransAlta Centralia Plant units. Instead, TransAlta only modeled the visibility impacts based on a NOx emission rate of 0.07 lb/MMBtu with SCR, but keeping SO2 emissions at the level prior to the Flex Fuels change.[60] This is factually unsupportable. Rather than perform the required visibility analysis for this significant BART option, Ecology simply offered a qualitative statement that "…there would be additional visibility improvements were PRB coal continued to be used by the facility and SCR added."[61] Ecology has not fully evaluated the SCR option without such a visibility analysis, which is mandated by the Clean Air Act and EPA's regional haze regulations. *See* 40 C.F.R. §§51.301 (definition of "best available retrofit technology," 51.308(e)(1)(ii), Appendix Y, Section F.2.(c) and under Step 5; *see also* 42 U.S.C. §7492(g)).

Ecology's assumption that TransAlta would revert to burning Centralia mine coal if SCR was installed is faulty and unsupported. As Ecology has indicated in its BART analysis, he units have been physically modified to more efficiently burn Powder River Basin coal. The company has agreements in place to obtain coal from Powder River Basin mines. Such coal supply contracts cannot be readily cancelled. Thus, TransAlta cannot readily revert to burning Centralia coal.

EPA recently informed Ecology that a complete modeling analysis of the visibility impacts due to SCR along with use of Powder River Basin coal at the Centralia units is necessary in order for the Centralia BART analysis to be considered complete.[62] Yet, Ecology has not required or performed this modeling.

The modeling that TransAlta did for Flex Fuels plus SNCR is not adequate to represent the visibility assessment for Flex Fuels plus SCR. TransAlta only assumed a 25% reduction in NOx emissions with SNCR beyond the NOx levels achieved with Flex Fuels. SCR can achieve 90% NOx removal, which would mean 3-4 times more NOx removed or an additional 8,000-

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[60] *See* BART Determination Support Document for TransAlta Centralia Generation, LLC, Power Plant, Washington Department of Ecology, Revised April 2010, in Appendix L of Proposed Washington Regional Haze Plan, at 17.

[61] *Id.*

[62] *See* June 30, 2010 letter from EPA to Ecology, Exhibit 5.

9,0000 tpy of NOx removed with SCR plus Flex Fuels as compared to SNCR plus Flex Fuels. Such a big decrease in NOx emissions would have a significant impact on visibility.[63]

Ecology cannot adopt its regional haze plan and finalize BART requirements for the TransAlta Centralia Plant without requiring this analysis of the visibility benefits of Flex Fuels plus SCR at both the TransAlta Centralia Plant units.

For all of the above reasons, the BART analysis for the TransAlta Centralia Plant is flawed and incomplete. The Flex Fuels project, in which TransAlta switched to burning Powder River Basin coal for economic reasons, does not constitute BART because it essentially reflects the status quo for Centralia. Given that the Washington Regional Haze SIP does not show that improvements in visibility will be on track to meet the national visibility goal by 2064 at most of the state's Class I areas, the BART determination for the Centralia Power Plant (the largest source of regional haze pollution in the state) must reflect the best system of continuous emission reduction for NOx. TransAlta greatly overestimated the costs for SCR installation and failed to follow EPA requirements for conducting such cost analyses in a BART review. Further, TransAlta underestimated the NOx reductions achievable with SCR and the use of Powder River Basin coal.

The National Park Service analyzed costs of SCR at Centralia in its November 20, 2009 and its June 11, 2010 comments to Ecology using conservative assumptions and more reasonable emission rates, but following EPA's Control Cost Manual. The costs calculated by National Park Service are much lower than those provided by TransAlta. Specifically, the National Park Service's recalculated cost effectiveness of SCR installation at both Centralia units of $5,622./ton which they found it to be a reasonable cost based on the cost of BART installation at other coal-fired electrical generating units.[64]

Ecology has failed to require a modeling analysis that would show the benefits to regional haze in the state's national parks and wilderness areas due to installation of SCR along with the burning of Powder River Basin coal at the TransAlta Centralia Plant units. With that analysis, Ecology could then assess BART in terms of $/deciview of improvement, which would be a fair way to compare BART costs among different sources. Based on the available

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[63] *See* BART Determination Support Document for TransAlta Centralia Generation, LLC, Power Plant, Washington Department of Ecology, Revised April 2010, in Appendix L of Proposed Washington Regional Haze Plan, at 16.

[64] *See* June 11, 2010 National Park Service Followup Comments on Washington Department of Ecology's (Ecology's) Proposed Best Available Retrofit Technology (BART) Determination for TransAlta Centralia Generation (Exhibit 1) at 12.

information, Conservation Organizations submit that such an analysis would further demonstrate that SCR is the appropriate requirement for BART.

B. BART for Tesoro Refining.

The Tesoro Refinery in Anacortes, WA had the highest visibility impacts to Olympic National Park and in North Cascades National Park.[65] Ecology determined that the current emission controls and emission limitations for the Tesoro Refinery, with the exception of one heater, which will obtain new low NOx burners, constitute BART.[66] Ecology's reasoning for not requiring NOx BART installation at any other unit at the Tesoro Refinery was "[d]ue to time needed for the design approval process and the major maintenance cycle at the refinery…."[67] Specifically, for the CO Boiler 2 (F-304) and the catalytic reformer heaters F-6650 through F6653, Ecology determined that it was not cost effective for these units to install new ultra low NOx burners by the BART compliance date (5 years from the date EPA approves the regional haze plan).[68] Ecology determined it would be cost effective for these units to install new low NOx burners by the next scheduled turnaround in 2017.[69] These units are also scheduled for turnaround in 2012. Ecology did not explain why new low NOx burners could not be installed on these units in 2012.

Tesoro has had plenty of notice that BART would be required, and that compliance would be required as expeditiously as practicable, and no later than five years from the date EPA approves the regional haze SIP. EPA promulgated the regional haze rules, including the BART requirements, over 10 years ago. Tesoro first submitted its BART analysis to Ecology in February 2008, 4 years before the 2012 turnaround. Thus, both Tesoro and Ecology could have planned for the installation of low NOx burners at these units in 2012, if not by 2015. In addition, at this point, the BART compliance deadline could reasonably extend to the middle of 2016 if not later because EPA will not likely approve the Tesoro BART requirements any earlier than June of 2011.

In fact, Ecology has simply decided to give Tesoro an exemption from NOx BART, rather than require that Tesoro either change its turnaround schedule for these units (bumping it up by 6 months to year) or require Tesoro to install low NOx burners by 2012. Given that the

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[65] *Id.* at 11-11.

[66] *See* Proposed Washington Regional Haze plan, Chapter 11 at 11-15.

[67] *Id.* at 11-16.

[68] *See* Ecology's BART Support Document, Tesoro Refining and Marketing Company, Revised February 22, 2010, in Appendix L of Proposed Washington Regional Haze Plan, at 38.

[69] *Id.* at 39.

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Washington Regional Haze plan utterly fails to meet reasonable progress milestones, showing visibility actually *degrading* in the North Cascades National Park in 2018[70] and estimating that it will take 323 years for Olympic National Park to reach the national visibility goal[71], Ecology cannot justify allowing the refinery to avoid having to meet BART for NOx simply because the compliance deadline does not fit the refinery's preferred maintenance cycle. At a minimum, Ecology should require Tesoro to install new low NOx burners in 2017 during the normal turnaround time for the CO boiler 2 (F-304) and the F6650 to F6653 heaters. Yet, Ecology has not specified *any* reasonable progress requirements for this (or any other) facility. There is simply no excuse for Ecology's failure to require the installation of cost-effective NOx controls at these units as part of its regional haze plan.

Further, Ecology did not require a complete evaluation of BART for SO2 emitted from the Tesoro refinery. Tesoro identified as a control option plantwide SO2 control by removing sulfur from refinery gas via a refinery gas sulfur removal system (which has already been installed at the facility) and recovering the sulfur via a sulfur recovery unit. The sulfur recovery unit currently used by the refinery is operating at capacity, so a new unit would need to be installed. Ecology did not require this control method to meet SO2 emissions. Ecology did not adequately explain the basis for rejecting the SO2 BART controls. If it rejected this control due to the costs, such rejection is not supported. The cost of the sulfur recovery unit evaluated for Tesoro was for a 50 ton per day unit. The BART analysis indicated between 395 to 451 tons per year of SO2 would be reduced from the facility.[72] A 50 ton-per-day sulfur recovery unit can recover 50 tons of sulfur per day, which would equate to a reduction of about 97 tons of SO2 removed *per day*. Yet, the BART analysis inexplicably indicates that 395 to 451 tons of SO2 would be removed *per year*. Thus, the sulfur recovery unit assessed is greatly oversized for the SO2 removal it has to obtain, and a larger sulfur recovery unit will have a higher capital cost than a smaller sulfur recovery unit. Also, based on the annual costs of $6,359,500/year,[73]stated for the assumed $58 million capital cost of a sulfur recovery unit, it appears the annual costs relied a higher interest rate than 7% and/or a shorter life of the sulfur recovery unit than 30 years.[74]

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[70] Washington Proposed Regional Haze Plan, Chapter 9 at 9-8

[71] *Id.* at 9-7.

[72] *See* Ecology's BART Support Document, Tesoro Refining and Marketing Company, Revised February 22, 2010, in Appendix L of Proposed Washington Regional Haze Plan, at 16.

[73] This was determined by multiplying the $14,100/ton cost by the 451 tons of SO2 reduced, as provided in Ecology's BART Support Document for Tesoro at 16.

[74] To annualize capital costs, the capital costs are multiplied by a Cost Recovery Factor. The Cost Recovery Factor is given by the following equation: CRF - $[\, i(1+i)^n]/[(1+i)^n -1\,]$

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In addition, not only was the cost overestimated due to the size of the Sulfur Recovery Unit, but the stated cost even of a 50 ton-per-day unit seems high. In 2005, the capital cost for a 50 ton-per-day unit was approximately $15 million dollars.[75] That would be $16.5 million in 2008 dollars, which is significantly lower than the $58 million stated as the cost in the Tesoro BART analysis. A 10 ton-per-day sulfur recovery unit, which would still be oversized for the required SO2 removal, would cost only $7.8 million in 2005 dollars.[76] This would be $8.6 million in 2008 dollars. Applying a cost recovery factor assuming 7% interest and 30-year life equates to an annualized cost of $687,982 per year. If 451 tons of SO2 are removed per year, this equates to $1,525/ton of SO2 removed. This should be considered to be a reasonable cost of SO2 removal.

In summary, the NOx and SO2 BART determinations for the Tesoro Refinery are inadequate. As with the TransAlta Centralia Plant, Ecology has determined that the status quo constitutes BART, with the exception of one heater that will be required to install low NOx burners as BART. No additional SO2 controls have been proposed as BART, nor to meet reasonable progress requirements. Given that the SIP does not provide for reasonable progress toward the national visibility goal, it is imperative that Ecology require installation of cost effective pollution controls as BART, or at the minimum, to meet reasonable progress requirements.

C. BART for Alcoa-Wenatchee Works.

Ecology has proposed to find that the Alcoa plant in Wenatchee is not subject to BART because it does not significantly impact visibility in any Class I area. Unfortunately, Ecology's determination is based on a non-guideline model. EPA has informed Ecology that it must first obtain EPA approval for use of this non-guideline model.[77] The National Park Service "strongly disagree[s]" with the use of an ultra-fine modeling grid to exempt Alcoa Wenatchee from

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where i is the interest rate and n is the life of the pollution control equipment. In essence, annualization establishes an annual payment sufficient to finance the capital investment for its entire life. *See* EPA Control Cost Manual, January 2002, Section 1, p. 2-21. For the Sulfur Recovery Unit at Tesoro, assuming 7% interest and a 30 year life, the annualized costs should be $4,640,000.

[75] *See* Gary, James H. et al., Petroleum Refining, Technology and Economics, 5th Edition, 2007, Figure 13.8 at 288. An excerpt from this book with Figure 13.8 is included as Exhibit 30 to this letter.

[76] *Id.*

[77] *See* June 30, 2010 Letter from EPA to Ecology at 1 (Exhibit 5).

BART.[78] Until such approval for the use of a non-guideline model is obtained from EPA, Ecology cannot assume that the Alcoa Wenatchee Works plant is exempt from BART. Ecology should have evaluated BART options for this facility.

II. THE HAZE PLAN MUST PROVIDE FOR REASONABLE PROGRESS.

The Haze Plan must also provide a long-term strategy for achieving reasonable progress toward meeting natural visibility conditions at mandatory Class I areas by 2064. 40 C.F.R. § 51.308(d)(1)(i)(B). If a state's reasonable progress goals do not anticipate restoring visibility to natural conditions by 2064 the state must demonstrate why the goal of attaining natural conditions by the established date is unreasonable. 40 C.F.R. § 51.308(d)(1)(ii). The Haze Plan must provide for improved visibility on the most impaired days and ensure no degradation in visibility for the least impaired days. 40 C.F.R. § 51.308(d)(1)(i)(B). The long-term strategy is typically a 10-15 year plan containing enforceable measures designed to meet regional progress goals. In developing its plan, the State must document the technical basis for the SIP, including monitoring data, modeling, and emission information, including the baseline emission inventory upon which its strategies are based. 40 C.F.R. § 51.308(d)(3)(iii).

In developing its long-term strategy, a state must consider all anthropogenic sources of visibility impairment and evaluate different emission reduction strategies beyond those prescribed by the BART provisions. 40 C.F.R. §51.308(d). A state should consider "major and minor stationary sources, mobile sources and area sources." *Id.* At a minimum, a state must consider the following elements:

> (A) Emission reductions due to ongoing air pollution control programs, including measures to address reasonably attributable visibility impairment;
> (B) Measures to mitigate the impacts of construction activities;
> (C) Emissions limitations and schedules for compliance to achieve the reasonable progress goal;
> (D) Source retirement and replacement schedules;
> (E) Smoke management techniques for agriculture and forestry management purposes including plans as currently exist within the State for these purposes;
> (F) Enforceability of emission limitations and control measures; and
> (G) The anticipated net effect on visibility due to projected changes in point, area, and mobile emissions over the period addressed by the long-term strategy.

40 C.F.R. 51.208(d)(3)(v)(A)-(G).

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[78] *See* June 11, 2010 Letter from NPS to Ecology, Attachment Entitled "Washington Draft State Implementation Plan for Regional Haze at 5 (Exhibit 1).

In addition to its failure to adequately assess and require BART, including SCR for the TransAlta Centralia Plant, Washington has not required any source emission reductions or source retirements other than its inadequate, proposed BART requirements to meet reasonable progress requirements. Regardless of its failure to properly assess BART of impacts that other sources outside of Washington may have on regional haze in Washington's Class I areas, Washington has a responsibility under the federal regional haze requirements to reduce haze-causing emissions from its own sources of air emissions in order to fulfill its legal duty to meet the reasonable progress goals. Under the Long Term Strategy regulations, Washington is required to demonstrate that "it has included in its implementation plan *all* measures necessary to obtain its share of the emission reductions needed to meet the progress goals for the area" even when sources from outside the state contribute to visibility impairment in the State's Class I areas. 40 C.F.R. § 51.308(d)(3)(ii) (emphasis added). Further, Washington has a responsibility to reduce emissions from Washington sources that are reasonably anticipated to impact visibility in other states' Class I areas. Idaho and Oregon are such states. Therefore, Washington must impose SCR on the TransAlta Centralia Plant and BART on Tesoro and Alcoa Wenatchee in order to meets is obligations on reasonable progress in Class I areas.

CONCLUSION

For all of the reasons given above, and as supported in the attached exhibits, the proposed Washington regional haze state implementation plan is technically and legally deficient. Conservation Groups urge Ecology to re-evaluate BART for the Centralia Power Plant and for the Tesoro Refinery, to require additional emission reductions beyond what these facilities are currently emitting. As the modeling for Washington's Class I areas shows, there is no way the state can show reasonable progress toward the national visibility goal without the adoption of additional emission reduction measures.

Thank you for considering these comments.

Sincerely,

Janette K. Brimmer
Earthjustice
Counsel for Conservation Organizations

Attachments
cc: Keith Rose, EPA Region 10

Exhibits to Earthjustice Letter to Ecology on WA Regional Haze Plan

Exhibit Number	Description
1	June 11, 2010 National Park Service Letter to Ecology, Including Attachments
2	November 20, 2009 National Park Service Letter to Ecology, Including Attachments
3	November 9, 2009 letter from Earthjustice to Ecology on Ecology/TransAlta Settlement Agreement, Including Attachments.
4	Ranajit Sahu, Comments on TransAlta Coal-fired Power Plant, Centralia, Washington, Preliminary BART Determination for NOx and Proposed Voluntary Mercury Reduction, November 4, 2009.
5	June 30, 2010 Letter from EPA to Ecology and Attachment.
6	November 27. 2006 TransAlta news release entitled: “TransAlta stops mine operations at Centralia, switches to Powder River Basin coal, and announces intention to ‘write down’ Centralia gas fired plant
7	Bryk, S.A. et al., First Commercial Application of DRB-4Z™ Ultra Low NOx Coal-Fired Burner, presented to POWER-GEN International 2000, November 14-16, 2000, Orlando, FL.
8	Whitfield, T. et al., Comparison of NOx Emission Reductions with PRB and Bituminous Coal in 900 MW Tangentially Fired Boilers, presented to EPRI-DOE-EPA-AWMA Mega Symposium, May 19-22, 2003.
9	J. Edward Cichanowicz, Current Capital Cost and Cost Effectiveness of Power Plant Emissions Control Technologies, June 2007.
10	Bill Hoskins, Uniqueness of SCR Retrofits Translates into Broad Cost Variations, Power Engineering, May 2003.
11	J. Edward Cichanowicz, Why are SCR Costs Still Rising?, Power, April 2004.
12	Jerry Burkett, Readers Talk Back, Power, August 2004.
13	M. Marano, Estimating SCR Installation Costs, Power, January/February 2006.
14	PowerGen 2005, Selective Catalytic Reduction: From Planning to Operation, Competitive Power College, by Babcock Power, Inc. and LG&E Energy, December 2005.
15	Steve Blankinship, SCR = Supremely Complex Retrofit, Power Engineering, November 2002.
16	Standing on the Shoulder of Giants, Modern Power Systems, July 2002.
17	McIlvaine, NO_X Market Update, August 2004.

18	Wisconsin Power & Light Co., Certificate of Authority Application, Edgewater Generating Station Unit 5 NOx Reduction Project, Project Description and Justification, November 2008, PSC Ref#: 105618.
19	AEP, 2008 Fact Book, 43rd Financial Conference, Phoenix, AZ.
20	Erickson, Clayton A. et al., Selective Catalytic Reduction System Performance and Reliability Review, The 2006 MEGA Symposium, Paper # 121.
21	Plant Washington Air Permit issued April 2010.
22	Desert Rock PSD Permit.
23	National Park Service spreadsheet on BACT limits for New PC Power Plants.
24	National Park Service spreadsheet of NOx BART Limits and Costs.
25	August 24, 2007 letter from Wisconsin Energies to the Public Service Commission regarding the Oak Creek Power Plant, Appendix C August 20, 2007 Addendum Emission Reduction Study, and Appendix C NOx/SO2 Emission Reduction Study.
26	January 2009 FGD and DeNOx Newsletter
27	R.K.Srivastava et al., Emissions of Sulfur-Trioxide from Coal-Fired Power Plants, *J. Air & Waste Manage. Assoc.*, 54: 750-762 at 758-759, June 2004.
28	EPA's Performance and Cost of Mercury and MultiPollutant Emission Control Technology Applications on Electric Utility Boilers, EPA-600/R-03-110, October, 2003.
29	June 29, 2004 letter from ICAC to EPA.
30	Gary, James H. et al., Petroleum Refining, Technology and Economics, 5th Edition, 2007, Figure 13.8 at 288.

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 49

[EPA-R09-OAR-2010-0683; FRL-____]

Source Specific Federal Implementation Plan for Implementing Best Available Retrofit Technology for Four Corners Power Plant: Navajo Nation

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed Rule

SUMMARY: The Environmental Protection Agency (EPA) is proposing to promulgate a source specific Federal Implementation Plan (FIP) requiring the Four Corners Power Plant (FCPP), located on the Navajo Nation, to achieve emissions reductions required by the Clean Air Act’s Best Available Retrofit Technology (BART) provision. In this action, EPA is proposing to require FCPP to reduce emissions of oxides of nitrogen (NO_x) and particulate matter (PM). These pollutants are significant contributors to visibility impairment in the numerous mandatory Class I Federal areas surrounding FCPP. For NO_x emissions, EPA is proposing to require FCPP to meet an emission limit of 0.11 lb/MMBtu, representing an 80% reduction from current NO_x emissions. This NO_x limit is achievable by installing and operating Selective Catalytic Reduction (SCR) technology on Units 1 - 5. For PM, EPA is proposing to require FCPP to meet an emission limit of 0.012 lb/MMBtu for Units 1 – 3 and 0.015 lb/MMBtu for Units 4

and 5. These emissions limits are achievable by installing and operating any of several equivalent controls on Units 1 - 3, and through proper operation of the existing baghouse on Units 4 and 5. EPA is proposing to require FCPP to meet a 10% opacity limit on Units 1 – 5 to ensure proper operation of the PM controls. EPA is requesting comment on whether APS can satisfy BART on Units 1 – 3 by operating the existing venturi scrubbers to meet an emission limit of 0.03 lb/MMBtu with a 20% opacity limit. EPA is also proposing to require FCPP to comply with a 20% opacity limit on its coal and material handling operations.

DATES: Comments on this Notice of Proposed Rulemaking (NPR) must be submitted no later than [*insert date 60 days from date of publication in FR*].

ADDRESSES: Submit comments, identified by docket number EPA-R09-OAR-2010-0683, by one of the following methods:

Federal eRulemaking Portal: www.regulations.gov. Follow the on-line instructions.

E-mail: r9air_fcppbart@epa.gov.

Mail or deliver: Anita Lee (Air-3), U.S. Environmental Protection Agency Region IX, 75 Hawthorne Street, San Francisco, CA 94105-3901.

Instructions: All comments will be included in the public docket without change and may be made available online at www.regulations.gov, including any personal information provided, unless the comment includes Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Information that you consider CBI or otherwise protected should be clearly identified as such and should not be submitted through www.regulations.gov or e-mail. www.regulations.gov is an "anonymous access" system, and EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send e-mail directly to EPA, your e-mail address will be automatically captured and included as part of the public comment. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment.

Hearings: EPA intends to hold public hearings in two locations in New Mexico to accept oral and written comments on the proposed rulemaking. EPA anticipates these hearings will occur in Shiprock and Farmington. EPA will provide notice and additional details at least 30 days prior to the hearings in the Federal Register, on our website, and in the docket.

Docket: The index to the docket for this action is available electronically at www.regulations.gov and in hard copy at EPA Region IX, 75 Hawthorne Street, San Francisco, California. While all documents in the docket are listed in the index, some information may be publicly available only at the hard copy location (e.g., copyrighted material), and some may not be publicly available in either location (e.g., CBI). To inspect the hard copy materials, please schedule an appointment during normal business hours with the contact listed in the **FOR FURTHER INFORMATION CONTACT** section.

FOR FURTHER INFORMATION CONTACT: Anita Lee, EPA Region IX, (415) 972-3958, r9air_fcppbart@epa.gov.

SUPPLEMENTARY INFORMATION: Throughout this document, “we”, “us”, and “our” refer to EPA.

Table of Contents

I. Background

A. Statutory and Regulatory Framework for Addressing Visibility

Part C, Subpart II, of the Act, establishes a visibility protection program that sets forth “as a national goal the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory class I Federal areas which impairment results from manmade air pollution.” 42 U.S.C. §7491A(a)(1). The terms “impairment of visibility” and “visibility impairment” are defined in the Act to include a reduction in visual range and atmospheric discoloration. Id. §7491A(g)(6). A fundamental requirement of the visibility protection program is for EPA, in consultation with the

Secretary of the Interior, to promulgate a list of “mandatory Class I Federal areas” where visibility is an important value. Id. §7491A(a)(2). These areas include national wilderness areas and national parks greater than six thousand acres in size. Id.§7472(a).

On November 30, 1979, EPA identified 156 mandatory Class I Federal areas where visibility is an important value, including for example: Grand Canyon National Park in Arizona (40 C.F.R. §81.403); Mesa Verde National Park and La Garita Wilderness Area in Colorado (Id. §81.406); Bandelier Wilderness Area in New Mexico (Id. §81.421); and Arches, Bryce Canyon, Canyonlands and Capitol Reef National Parks in Utah (Id. §81.430). These mandatory Class I Federal areas are within an approximately 300 km (or 186 mile) radius of FCPP.

On December 2, 1980, EPA promulgated the first phase of the required visibility regulations, codified at 40 CFR §§51.300-307. 45 FR 80084. The 1980 regulations deferred regulating regional haze from multiple sources finding that the scientific data were inadequate at that time. Id. at 80086.

Congress added Section 169B to the Act in the 1990 CAA Amendments, requiring EPA to take further action to reduce visibility impairment in broad geographic regions. 42 U.S.C. §7492. In 1993, the National Academy of Sciences released a comprehensive study required by the 1990 Amendments concluding that "current scientific knowledge is adequate and control technologies are available for taking regulatory action to improve and protect visibility." Protecting Visibility in National Parks and Wilderness Areas, Committee on Haze in National Parks and Wilderness Areas, National Research Council, National Academy Press (1993).

EPA promulgated regulations to address regional haze on April 22, 1999. 64 FR 35765. Consistent with the statutory requirement in 42 U.S.C. §7491(b)(2)(a), EPA's 1999 regional haze regulations include a provision requiring States to require certain major stationary sources "in existence on August 7, 1977, but which ha[ve] not been in operation for more than fifteen years as of such date" which emit pollutants that are reasonably anticipated to cause or contribute to any visibility impairment to procure, install and operate BART. In determining BART, States are required to take into account five factors identified in the CAA and EPA's regulations. 42 U.S.C. §7491(g)(2) and 40 CFR 51.308.

B. Statutory and Regulatory Framework for Addressing Sources Located in Indian Country

When the Clean Air Act was amended in 1990, Congress included a new provision, Section 301(d), granting EPA authority to treat Tribes in the same manner as States where appropriate. See 40 U.S.C. §7601(d). Congress also recognized, however, that such treatment may not be appropriate for all purposes of the Act and that in some circumstances, it may be inappropriate to treat tribes identically to states. Therefore, Section 301(d)(2) of the Act directed EPA to promulgate regulations "specifying those provisions of [the CAA] for which it is appropriate to treat Indian tribes as States." Id. §7601(d)(2). In addition, Congress provided that "[i]n any case in which [EPA] determines that the treatment of Indian tribes as identical to States is inappropriate or administratively infeasible, the Administrator may provide, by regulation, other means by which the Administrator will directly administer such provisions so as to achieve the appropriate purpose." Id. §7601(d)(4).

In 1998, EPA promulgated regulations at 40 CFR Part 49 (which have been referred to as the Tribal Authority Rule or TAR) relating to implementation of CAA programs in Indian Country. See 40 C.F.R. Part 49; see also 59 FR 43956 (Aug. 25, 1994)(proposed rule); 63 FR 7254 (Feb. 12, 1998)(final rule); *Arizona Public Service Company v. EPA*, 211 F.3d 1280 (D.C. Cir. 2000), *cert. den.,* 532 U.S. 970 (2001)(upholding the TAR). The TAR allows EPA to treat eligible Indian Tribes in the same manner as States "with respect to all provisions of the [CAA] and implementing regulations, except for those provisions [listed] in § 49.4 and the [EPA] regulations that implement those provisions." 40 CFR §49.3. EPA recognized that Tribes were in the early stages of developing air planning programs known as Tribal Implementation Plans (TIPs) and that Tribes would need additional time to develop air quality programs. 62 FR 7264-65. Thus, EPA determined that it was not appropriate to treat Tribes in the same manner as States for purposes of those provisions of the CAA imposing air program submittal deadlines. See 59 FR at 43964-65; 63 FR at 7264-65. Similarly, EPA determined that it would be inappropriate to treat Tribes the same as States for purposes of the related CAA provisions establishing sanctions and federal oversight mechanisms where States fail to meet applicable air program submittal deadlines. Id. Thus, one of the CAA provisions that EPA determined was not appropriate to apply to Tribes is Section 110(c)(1). See 40 CFR § 49.4(d). In particular, EPA found that it was inappropriate to impose on Tribes the provisions in Section 110(c)(1) for EPA to promulgate a FIP within 2 years after a State fails to make a required plan submission.

Although EPA determined that the requirements of CAA section 110(c)(1) were not applicable to Tribes, EPA also determined that under other provisions of the CAA it has the discretionary authority to promulgate "such federal implementation plan provisions as are necessary or appropriate to protect air quality" when a Tribe has not submitted a TIP.

40 CFR §49.11. EPA determined in promulgating the TAR that it could exercise discretionary authority to promulgate FIPs based on Section 301(a) of the CAA, which authorizes EPA to prescribe such regulations as are necessary to carry out the Act, and Section 301(d)(4), which authorizes EPA to directly administer CAA provisions for which EPA has determined it is inappropriate or infeasible to treat Tribes as identical to States. 40 CFR §49.11. See also 63 FR at 7265. Specifically, 40 CFR §49.11(a) provides that EPA

> [s]hall promulgate without unreasonable delay such Federal implementation plan provisions as are necessary or appropriate to protect air quality, consistent with the provisions of sections 301(a) and 301(d)(4), if a tribe does not submit a tribal implementation plan or does not receive EPA approval of a submitted tribal implementation plan.

EPA has previously promulgated FIPs under the TAR to regulate air pollutants emitted from the two coal fired electric generating facilities on the Navajo Nation, FCPP and Navajo Generating Station (NGS). In 1991, EPA also revised an existing FIP that applied to Arizona to include a requirement for NGS to substantially reduce its SO_2 emissions by installing scrubbers based on finding that the SO_2 emissions were contributing to visibility impairment at the Grand Canyon National Park. 56 FR 50172 (Oct. 3, 1991); *see also Central Arizona Water Conservation District v. United States Environmental Protection Agency*, 990 F.2d 1531 (9th Cir. 1993).

In 1999, after several years of negotiations, EPA proposed concurrent but separate FIPs for FCPP and NGS. Those FIPs proposed to fill the regulatory gap that existed because permits and SIP rules by New Mexico (for FCPP) and Arizona (for NGS) were not applicable or enforceable on the Navajo Nation, and the Tribe had not sought approval of a TIP covering the plants. 64 FR 48731 (Sept. 8, 1999).

Before EPA finalized the 1999 FIPs, the operator of FCPP began negotiations to reduce SO_2 emissions from FCPP by making upgrades to improve the efficiency of its SO_2 scrubbers. The negotiations resulted in an agreement for FCPP to increase the SO_2 control from a 72% reduction of the potential SO_2 emissions to an 88% reduction. As a result of this increased scrubber efficiency, FCPP's SO_2 emissions decreased by a total of 57% from the historical levels. The parties to the negotiations requested EPA to make those SO_2 reductions enforceable through a source specific FIP. Therefore, EPA proposed new FIPs for FCPP and NGS in September 2006. 71 FR 53631 (Sept. 12, 2006). In these concurrent but separate FIPs, EPA proposed to make emissions limits contained in State permits or rules that had previously been followed by FCPP and NGS federally enforceable. In addition, for FCPP, EPA proposed to establish a significantly lower SO_2 emissions limit based on the increased scrubber efficiency, resulting in a reduction of approximately 22,000 tons of SO_2 per year. EPA indicated in the final FIP for FCPP that the new SO_2 emissions limits were close to or the equivalent of the emissions reductions that would have been required in a BART determination. 72 FR 25698 (May 7, 2007). The FIP also required FCPP to comply with a 20% opacity limit on both the combustion and fugitive dust emissions coal handling operations. EPA finalized the FIP for FCPP in May 2007. Id.

APS, the operator of FCPP, and the Sierra Club each filed Petitions seeking judicial review of EPA's promulgation of the 2007 FIP for FCPP, on separate grounds. APS argued that EPA did not have authority to promulgate a source-specific FIP for FCPP without its consent. APS also argued that EPA did not have authority to promulgate a 20% opacity standard on the combustion equipment unless we provided an exemption for malfunctions. Finally, APS argued that EPA had not established an adequate basis for requiring a 20% opacity limit on the fugitive dust from the coal handling operations. In contrast, Sierra Club argued that EPA could not promulgate a "gap filling" FIP that did not include modeling and an analysis to show continued attainment of the NAAQS.

The Court of Appeals for the Tenth Circuit rejected both Petitions. With respect to the Sierra Club's arguments, the Court considered the regulatory language in 40 C.F.R. §49.11(a) and concluded that "[t]his language does not impose upon the EPA the duty the Environmentalists propose. It provides the EPA discretion to determine what rulemaking is necessary or appropriate to protect air quality and requires the EPA to promulgate such rulemaking." *Arizona Public Service v. EPA*, 562 F.3d 1116, 1125 (10th Cir. 2009). The Court also rejected arguments by APS that EPA could not impose a continuous opacity limitation during operations, provided EPA set forth a reasonable basis for its decision. *Id.* at 1129 ("That APS does not agree with the EPA's rejection of the substance of its proposed 0.2% allowance is irrelevant; as long as EPA's decision making process may reasonably be discerned, we will not set aside the federal plan on account of a less-than-ideal explanation." [citation omitted]). The Court agreed with EPA's request for a voluntary remand of the opacity limit for the fugitive dust for the material handling operations and remanded that narrow aspect of the 2007 FIP. *Id.* at 1131.

The FIP that EPA is proposing today is promulgated under the same authority in 40 CFR §49.11(a). EPA is proposing to find that it is necessary or appropriate to establish BART requirements for NO_x and PM emissions from FCPP, and is proposing specific NO_x and PM limits as BART. EPA is proposing to establish a 10% opacity limit from Units 1 – 5 to ensure continuous compliance with the PM emissions limit. EPA is also proposing a 20% opacity limit to apply to FCPP's material handling operations in response to the remand from the 2007 FIP.

C. Statutory and Regulatory Framework for BART Determinations

When Congress enacted Section 169A of the CAA to protect visibility, it directed EPA to promulgate regulations that, inter alia, would require applicable implementation plans to include a determination of BART for certain major stationary sources. 42. U.S.C. §7491(b)(2)(A) & (g). These major stationary sources are fossil-fuel fired steam electric plants of more than 250 MMBtu/hr heat input, kraft pulp mills, Portland cement plants and other listed industrial sources that came into operation between 1962 and 1977 and are "reasonably anticipated to cause or contribute to any impairment of visibility in any [Class I area]." Id. EPA guidelines must be followed in making BART determinations for fossil fuel fired electric generating plants larger than 750 MW. See 40 CFR Part 51, Appendix Y.

FCPP and NGS are the only eligible BART sources located on the Navajo Nation. See Western Regional Air Partnership, http://www.wrapair.org/forums/ssjf/bart.html, XLS Spreadsheet, Line 184, 185, Column N. An eligible BART source with a predicted impact of 0.5 dv or more of impairment in a Class I area “contributes” to visibility impairment and is subject to BART. 70 FR 39104, 39121 (July 6, 2005). FCPP contributes to impairment at many surrounding Class I areas well in excess of this threshold.

EPA’s guidelines for evaluating BART for such sources are set forth in Appendix Y to 40 C.F.R. Part 51. See also 40 CFR §51.308(e)(1)(ii)(A). Consistent with statutory and regulatory requirements, the Guidelines require consideration of “five factors” in making BART determinations. Id. at IV.A. Those factors, from the Act’s statutory definition of BART, which are applied to all technically feasible control technologies, are: (1) the costs of compliance, (2) the energy and non-air quality environmental impacts of compliance, (3) any pollution control equipment in use or in existence at the source, (4) the remaining useful life of the source, and (5) the degree of improvement in visibility which may reasonably be anticipated to result from the use of such technology. 40 C.F.R. §51.308(e)(1)(ii)(A).

In this proposed action, EPA has taken into consideration each of the five factors after identifying feasible control technologies for FCPP’s NO_x and PM emissions.

D. Factual Background

1. Four Corners Power Plant

FCPP is a privately owned and operated coal-fired power plant located on the Navajo Nation Indian Reservation near Farmington, New Mexico. Based on lease agreements signed in 1960, FCPP was constructed and has been operating on real property held in trust by the Federal government for the Navajo Nation. The facility consists of five coal-fired electric utility steam generating units with a total capacity of 2060 megawatts (MW). Units 1, 2, and 3 at FCPP are owned entirely by Arizona Public Service (APS), which serves as the facility operator, and are rated to 170 MW (Units 1 and 2) and 220 MW (Unit 3). Units 4 and 5 are each rated to a capacity of 750 MW, and are co-owned by six entities: Southern California Edison (48%), APS (15%), Public Service Company of New Mexico (13%), Salt River Project (SRP) (10%), El Paso Electric Company (7%), and Tucson Electric Power (7%).

Based on 2009 emissions data from the EPA Clean Air Markets Division[1], FCPP is the largest source of NO_x emissions in the United States (over 40,000 tons per year (tpy) of NO_x). FCPP, located near the Four Corners region of Arizona, New Mexico, Utah, and Colorado, is approximately 300 kilometers (km) from sixteen mandatory Class I Federal areas: Arches National Park (NP), Bandelier National Monument (NM), Black Canyon of the

[1] “Clean Air Markets - Data and Maps: http://camddataandmaps.epa.gov/gdm/

Gunnison Wilderness Area (WA), Canyonlands NP, Capitol Reef NP, Grand Canyon NP, Great Sand Dunes NP, La Garita WA, Maroon Bells-Snowmass WA, Mesa Verde NP, Pecos WA, Petrified Forest NP, San Pedro Parks WA, West Elk WA, Weminuche WA, and Wheeler Park WA.

APS provided information relevant to a BART analysis to EPA on January 29, 2008. The information consisted of a BART engineering and cost analysis conducted by Black and Veatch (B&V) dated December 4, 2007 (Revision 3), a BART visibility modeling protocol prepared by ENSR Corporation (now called AECOM and referred to as AECOM throughout this document) dated January 2008, a BART visibility modeling report prepared by AECOM dated January 2008, and a document titled APS BART Analysis conclusions, dated January 29, 2008. APS provided supplemental information on cost and visibility modeling in correspondence dated May 28, 2008, June 10, 2008, November 2008, March 16, 2009, October 29, 2009, and April 22, 2010. All of these documents are available in the docket for this proposal.

2. Relationship of NO_x and PM to Visibility Impairment

Particulate matter less than 10 microns (millionths of a meter) in size (PM_{10}) interacts with light. The smallest particles in the 0.1 to 1 micron range interact most strongly as they are about the same size as the wavelengths of visible light. The effect of the interaction is to scatter light from its original path. Conversely, for a given line of sight, such as between a mountain scene and an observer, light from many different original paths is scattered into that line. The scattered light appears as whitish haze in the line of sight, obscuring the view.

PM emitted directly into the atmosphere, also called primary PM, is emitted both from the boiler stacks and from material handling. Of primary PM emissions, those in the smaller particle size range, less than 2.5 microns, tend to have the most impact on visibility. PM emissions from the boiler stacks can have varying particle size makeup depending on the PM control technology. PM from material handling, though, tends to be coarse, i.e. around 10 microns, since it is created from the breakup of larger particles of soil and rock.

PM that is formed in the atmosphere from the condensation of gaseous chemical pollutants, also called secondary PM, tends to be fine, i.e. smaller than 1 micron, since it is formed from the buildup of individual molecules. This *secondary* PM tends to contribute more to visibility impairment than primary PM because it is in the size range where it most effectively interacts with visible light. NO_x and SO_2 emissions from coal fired power plants are two examples of gaseous chemical pollutants that react with other compounds in the atmosphere to form secondary PM. Specifically, NO_x is a gaseous pollutant that can be oxidized to form nitric acid. In the atmosphere, nitric acid in the presence of ammonia forms particulate ammonium nitrate. The formation of particulate ammonium nitrate is dependent on temperature and relative humidity, and therefore, varies by season. Particulate ammonium nitrate can grow into the size range that effectively interacts with light by coagulating together and by taking on additional pollutants and water. The same principle applies to SO_2 and the formation of particulate ammonium sulfate.

In air quality models, secondary PM is tracked separately from primary PM because the amount of secondary PM formed depends on weather conditions and because it can be six times more effective at impairing visibility. This is reflected in the equation used to calculate visibility impacts from concentrations measured by the Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring network covering Class I areas[2].

II. EPA’s Proposed Action On the Five Factor Test

A. A BART Determination for FCPP is Necessary or Appropriate

[2] Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Rule, U.S. Environmental Protection Agency", EPA-454/B-03-005, September 2003; http://www.epa.gov/ttn/oarpg/t1pgm.html.

The numerous Class I areas that surround FCPP are sometimes known as the Golden Circle of National Parks. See http://www.nps.gov/history/history/online_books/nava/adhi/adhi4e.htm. Millions of tourists visit these areas, many visiting from other countries to view the unique vistas of the Class I areas in the Four Corners region.

As Congress recognized, visibility is an important value and must be protected in these areas. Yet, air quality and visibility are impaired in the 16 Class I areas surrounding FCPP. The National Park Service noted in 2008 that "[v]isibility is impaired to some degree at all units where it is being measured and remains considerably higher than the target national conditions in many places, particularly on the haziest days." Air Quality in National Parks, 2008 Annual Performance & Progress Report, National Resource Report NPS/NRPC/ARD/NRR – 2009/151, September 2009, p. 30. Mesa Verde, Grand Canyon, Bryce Canyon and Canyonlands are among the areas the Park Service is monitoring. Id. Table 3, p. 19. Although not directly related to visibility, NO_x is also a precursor to ozone formation and the National Park Service also determined that ozone concentrations in Mesa Verde appears to be trending upward over the 1994-2007 period and the Park's annual 4th-highest 8-hour ozone concentrations "are approaching the [NAAQS] standard." Id. at 16. FCPP, which emitted over 42,000 tons of

NO_x in 2009,[3] was built roughly four decades ago and has not installed any new NO_x controls since the 1990's, including modern combustion technology such as post-2000 low-NO_x burners (LNB) or separated overfire air.

Based on the importance of visibility as a value in this Golden Circle of National Parks, and the substantial NO_x and PM emissions generated by operating FCPP, EPA is proposing to find that BART emission limits are necessary or appropriate.

B. Summary of Proposed BART Emissions Limits

On August 28, 2009, EPA published an Advanced Notice of Proposed Rulemaking (ANPRM) concerning two of the five factors in the BART analysis: cost of compliance and anticipated visibility improvement. 74 FR 44314. EPA received numerous comments on the ANPRM, including comments from the Navajo Nation, APS, National Park Service and environmental groups. EPA has considered relevant comments we received on the ANPRM in determining which NO_x and PM emission limitations we are proposing today as BART for FCPP.

Based on the available control technologies and the five factors discussed in more detail below, EPA is proposing to require FCPP to meet a NO_x emission limit on Units 1 – 5 of 0.11 lb/MMBtu. EPA is proposing a PM emission limit on Units 1 – 3

[3] Clean Air Markets Division – Data – Maps.

of 0.012 lb/MMBtu and on Units 4 and 5 of 0.015 lb/MMBtu as BART. EPA is taking comment on an alternative PM emissions limit for Units 1 – 3 described in more detail in Section II.D.

EPA is not proposing to require each unit to achieve the specified NO_x emission limit. EPA is proposing to require FCPP to meet a plant-wide heat input weighted 30-day rolling average emission limit of 0.11 lb/MMBtu for NO_x for Units 1 – 5. For PM, we are proposing a BART emission limit of 0.012 lb/MMBtu from Units 1 – 3 on a 6-hour average basis and 0.015 lb/MMBtu averaged over a 6-hour period for Units 4 and 5, which should be achievable with proper operation of the existing baghouses. EPA is also proposing that Units 1 - 5 meet a 10% opacity limit which will reasonably assure continuous compliance with the PM emission limits. EPA is taking comment on an alternative PM emission limit for Units 1 – 3.

The available control technologies and EPA's evaluation of each of the five factors supporting our proposed BART emissions limits for NO_x and PM are discussed in more detail below and in EPA's accompanying Technical Support Document (TSD).

C. Available and Feasible Control Technologies and Five Factor Analysis for NO_x Emissions

APS identified sixteen options as available retrofit technologies to control NO_x. Generally, NO_x control techniques use: 1) combustion control to reduce the production of NO_x from fuel-bound nitrogen and high temperature combustion; 2) post-combustion add-on control to reduce the amount of NO_x emitted in flue gas by converting NO_x to diatomic nitrogen (N_2); or 3) a combination of combustion and post-combustion controls. EPA approached the five factor analysis using a top-down method. A top-down analysis entails ranking the control options in descending order starting with the most stringent option. The top control option is evaluated and if eliminated based on one of the five factors, the next most stringent option is considered, and so on. The top option for NO_x control is a combination of a post-combustion add-on control, i.e., selective catalytic reduction (SCR), and combustion controls, i.e., low-NO_x burners plus overfire air (LNB + OFA). SCR without LNB + OFA represents the next most stringent option, and LNB + OFA without SCR represents a low-mid level of control. As described in detail below, EPA believes LNB + OFA are not likely to be effective control technologies at FCPP due to the inherent limitations of the existing boilers on all units. Therefore, EPA started our top-down analysis of the five factors with SCR without combustion controls. More details on the control options are provided in Section 2 of the TSD.

As described in our ANPRM, APS has claimed that combustion controls (i.e., low-NO_x burners (LNB) on Units 1 and 2 and low NO_x burners plus overfire air (LNB + OFA) on Units 3 – 5) would provide NO_x reductions sufficient to meet the presumptive limits for NO_x identified in the BART Guidelines (40 CFR Part 51 Appendix Y). Table 1 shows the presumptive NO_x limits for boilers burning either sub-bituminous or bituminous coal and the emission limits APS considers achievable for Units 1 – 5. APS submitted NO_x emission limits it considers achievable to EPA in January 2008, March 2009, and October 2009. The coal burned at FCPP has historically been classified as sub-bituminous. APS, however, in its BART analysis has claimed that the coal is bituminous.

Table 1: Presumptive NO_x Limits[4] and NO_x Emissions (in lb/MMBtu) from LNB (Units 1 and 2) LNB + OFA (Units 3 – 5) claimed achievable by APS

	Bituminous Coal	Sub-bituminous Coal	Emissions after LNB or LNB+OFA (Jan 2008[5])	Emissions after LNB or LNB+OFA (Oct 2009[6])
Unit 1	N/A	N/A	0.48	0.40
Unit 2	N/A	N/A	0.48	0.40

[4] Presumptive limits for Unit 3 based on dry-bottom wall-fired boiler and Units 4 and 5 on cell burner boilers. Presumptive limits do not apply to Units 1 and 2 because they are smaller than 200 MW.

[5] From “2008-01_APS_4_Corners_BART_Analysis_Conclusions.pdf”.

[6] From APS’s Comment Letter to EPA dated October 28, 2009.

Unit 3	0.39	0.23	0.39	0.32
Unit 4	0.40	0.45	0.40	0.35
Unit 5	0.40	0.45	0.40	0.35

EPA, however, disagrees with APS's contention that EPA should rely only on presumptive limits for BART for NO_x and with APS's claim that LNB and LNB + OFA will be effective at achieving NO_x emissions lower than the presumptive BART emissions limits.

EPA's presumptive BART limits were not intended to supplant a case-by-case BART determination. For NO_x, for most types of boilers, EPA's presumptive BART limits were intended to indicate what should generally be achievable with combustion modifications such as modern LNB with OFA for a given type of boiler firing either bituminous or sub-bituminous coal. In establishing the presumptions, EPA concluded that these controls were highly cost-effective at large power plants generally and that installation of such controls would result in meaningful visibility improvement at any 750 MW power plant. Thus, these controls are required at a minimum at these facilities unless there are source-specific circumstances that would justify a different conclusion. EPA did not consider the question of what more stringent control technologies might be appropriately determined to be BART, however, especially in the case where the visibility benefits may be substantial. A full case-by-case BART analysis is required for each facility. In this instance, given the fact that FCPP is the largest source of NO_x emissions in the United States and that it is surrounded by 16 mandatory Class I areas, EPA considers it appropriate to carefully consider NO_x emission limits based on a full analysis of the five BART factors. In this rulemaking, EPA is undertaking a complete BART analysis for the FCPP for the first time, an analysis that is specific to FCPP and that takes into consideration the five factors set forth in the CAA.

Because EPA is relying on the five-factor analysis and not the presumptive NO_x levels in the BART guidelines, it is not necessary for EPA to make a determination on the classification of coal used by APS as bituminous or sub-bituminous. EPA is taking the coal characteristics into account in establishing the NO_x BART emission limit, but the classification as bituminous or sub-bituminous is only relevant for choosing presumptive limits, which we are not doing in this proposal. Although the emissions level claimed by APS for LNB + OFA retrofit of Units 4 and 5 are below the presumptive limits for both sub-bituminous coal and bituminous coal, we note that the presumptive levels of 0.40 and 0.45 lb/MMBtu provide little reduction of baseline NO_x emissions (0.49 lb/MMBtu) from these units.

In our ANPRM, EPA questioned the ability of LNB and LNB + OFA to result in the magnitude of NO_x reductions being claimed as achievable by APS. APS has submitted two different reports concerning the potential for NO_x reductions at FCPP. The first report written by Andover Technology Partners[7] (Andover Report) was submitted by APS by letter dated August 7, 2009, prior to the publication of the ANPRM[8]. The Andover Report outlined the considerable challenges associated with LNB and OFA retrofits on each unit, including boiler design and size, and FCPP coal characteristics. Although four different technology suppliers claimed they could achieve NO_x reductions with burner retrofits, the Andover Report concluded that LNB retrofits were not likely to be beneficial for the boilers at FCPP because the risk of adverse operational side effects outweighed the potentially modest improvement in emissions performance.

The fireboxes for Units 1, 2 and 3 are considered to be too small to effectively use modern approaches to low NO_x combustion,

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[7] "Assessment of Potential for Further NO_x Reduction by Combustion-Based Control at the Four Corners Steam Electric Station", April 5, 2004.

[8] EPA received the Andover Report only a few days prior to signature of the ANPRM. Therefore the report was not considered in the ANPRM or made available in the ANPRM docket. APS claimed the report Confidential Business Information (CBI) and on July 9, 2010, EPA's Regional Counsel determined this report was not CBI.

which require separated OFA. Unit 2 was retrofitted with a 1990-designed LNB and, according to APS, had considerable operational problems subsequent to this retrofit. Units 1 and 2 are identical boilers. Thus due to operational difficulties following the Unit 2 retrofit, APS did not attempt a retrofit on Unit 1, which continues to emit NO_x at a concentration as high as 0.8 lb/MMBtu.

Units 4 and 5 were originally designed and operated with cell burners. This type of combustion burner inherently creates more NO_x than conventional wall-fired burners. Although the type of burners in the cell boilers were replaced in the 1980s, the design of a cell boiler limits the NO_x reduction that can be achieved with modern low NO_x combustion techniques. EPA set different presumptive levels of 0.40 lb/MMBtu or 0.45 lb/MMBtu for the expected achievable NO_x reductions for cell burner boilers with combustion modifications due to this design limitation. Thus, the efficacy of LNB + OFA on Units 4 and 5 will also be limited by their inherent design. Even if retrofit of Units 4 and 5 results in some improvement in NO_x performance (approaching 0.40 lb/MMBtu), the Andover Report did not recommend burner retrofits because potential operational problems on the two largest units at FCPP were not worth the small incremental reduction in NO_x emissions.

A subsequent report prepared by APS and submitted to EPA as Attachment J of its October 28, 2009 comment letter on the ANPRM, indicated that Units 1 and 2 could achieve 0.40 lb/MMBtu with LNB retrofit, Unit 3 could achieve 0.32 lb/MMBtu and Units 4 and 5 could achieve 0.35 lb/MMBtu with a combination of LNB + OFA retrofit. See Table 1 above. APS cited examples of several boilers with LNB or LNB + OFA retrofits that achieve emission rates of 0.4 lb/MMBtu or below.

EPA Clean Air Markets Division (CAMD) evaluated the boiler examples from Attachment J to assess the emissions reductions that have been achieved with modern combustion modification retrofits. CAMD concluded that other boilers have achieved NO_x emissions of approximately 0.4 lb/MMBtu, but could not determine if Units 3 – 5 at FCPP were indeed comparable to those boilers. APS did not provide enough information in Attachment J to assess the level of similarity. Based on information provided in the Andover Report and the EPA CAMD review of Attachment J provided by APS, EPA determined that combustion controls are not likely to be effective control technologies at FCPP due to the inherent limitations of the existing boilers on all units. Therefore, EPA rejected the top control option, SCR in combination with LNB + OFA, and focused our five factor analysis on the next most stringent technology, SCR without LNB + OFA, which can reduce NO_x emissions by 80%.

i. Factor 1: Cost of Compliance

The cost effectiveness of controls is expressed in cost per ton of pollutant reduced ($/ton). 40 CFR Part 51, App. Y, IV.D.4.c. Cost effectiveness is calculated by first estimating the total capital and annual costs of the BART controls. The second step requires calculating the amounts of the pollutants which will be reduced by the control technology selected as BART. This second step compares the uncontrolled baseline emissions (i.e. emissions from current operations) to the proposed BART emissions limits. Id.

APS submitted cost estimates for all feasible control options in January 2008 and submitted revised cost estimates for SCR on March 16, 2009 to reflect higher costs of construction services and materials. In our August 28, 2009 ANPRM, we presented APS's cost estimates for emissions controls for NO_x, which included the revised SCR costs submitted in March 2009, and cost estimates from the National Park Service (NPS). In the ANPRM, EPA revised the annual operating cost estimates submitted by APS based on the ratio of annual to capital costs from other facilities in the western United States. NPS conducted an independent analysis strictly adhering to the *EPA Control Cost Manual* and calculated significantly lower cost effectiveness. In subsequent comments on the ANPRM, NPS submitted revised cost estimates for each unit. All of these cost estimates are described in detail in the TSD.

Subsequent to the ANPRM, APS submitted revised cost estimates for the NO_x control technologies. APS provided these revised cost estimates to EPA via electronic mail on April 22, 2010, in a report dated February 10, 2010. Costs estimated for Unit 1 – 3 were dated May 2008, whereas revised cost estimates were provided for Units 4 and 5 were dated February 2010. All cost estimates in the 2010 submission were lower than those submitted previously. The report updated cost estimates for Units 4 and 5 in 2010 dollars and provided cost estimates for Units 1 – 3 in 2008 dollars that are lower than the costs APS submitted in March 2009 upon which the ANPRM relied. Because APS only recently withdrew a claim of confidentiality for the 2010 cost estimates, however, this proposal is based on the costs submitted in March 2009. The TSD also contains a further discussion of these costs.

For this NPR, EPA evaluated the capital and annual cost estimates APS submitted in March 2009 against the *EPA Control Cost Manual.* Although EPA has generally accepted the costs estimates APS submitted, we have eliminated any line item costs that are not explicitly included in the *EPA Control Cost Manual* and we have revised the costs where EPA determined alternate costs were more appropriate, e.g., cost of catalysts, or interest rates. Additional detailed information and the results of our revisions to the cost estimates are included in Table 13 of the TSD. EPA's cost effectiveness estimates and those estimated by NPS and APS are shown in Table 2.

Table 2: EPA, NPS, and APS Cost Effectiveness for SCR on Units 1 – 5

	EPA Cost Effectiveness ($/ton)	**NPS Cost Effectiveness ($/ton)**	**APS Cost Effectiveness ($/ton)**
Unit 1	$2,515	$1,326	$4,887
Unit 2	$3,163	$1,882	$6,170
Unit 3	$2,678	$1,390	$5,142
Unit 4	$2,622	$1,453	$5,197
Unit 5	$2,908	$1,598	$5,764

EPA's cost effectiveness calculations in this NPR are lower than we presented in the ANPRM. The estimates continue to be lower than those estimated by APS but higher than those estimated by NPS. The range of cost effectiveness that EPA has calculated and upon which this proposal is based, from $2,515 - $3,163/ton of NO_x removed, is lower than or within the range of other BART evaluations. Some BART analyses for other electric generating facilities evaluated SCR with a range of costs: Pacificorps Jim Bridger Units 2 – 4: $2,256 - $4,274/ton of NO_x removed; Pacificorps Naughton Units 1 - 3: $2,751 - $2,830/ton of NO_x removed; PGE Boardman: $3,096/ton of NO_x removed; M.R. Young Units 1 and 2: $3,950 - $4,250/ton of NO_x removed; and Centralia Power Plant Units 1 and 2: $9,091/ton of NO_x removed. San Juan Generating Station in Farmington, New Mexico, is a nearby coal fired power plant that was built shortly after FCPP and uses coal with almost identical characteristics. On June 21, 2010, the New Mexico Environmental Department proposed requiring SCR as BART for the four units at San Juan Generating Station based on cost-effectiveness calculations ranging from $5,946/ton NO_x reduced to $7,398/ton NO_x reduced.

EPA considers its revised cost-effectiveness estimates of $2,515 - $3,163/ton of NO_x removed to be more accurate and representative of the actual cost of compliance. However, even if EPA had decided to accept APS's worst-case cost estimates of $4,887 – $6,170/ton of NO_x removed, EPA considers that estimate to be cost effective for the purpose of proposing an 80% reduction in NO_x, achievable by installing and operating SCR as BART at FCPP.

ii. Factor 2: Energy and Non-Air Quality Impacts

The Navajo Nation has expressed concerns that requiring additional controls at FCPP could result in lost Navajo employment and royalties if FCPP were to shut down or curtail operations. EPA has received no definitive information indicating that FCPP intends to shut down or curtail operations, but to assess the possibility that today's proposed BART limits could have such an effect, EPA conducted an economic analysis that looked at the impact of requiring SCR on FCPP.

Based on an economic analysis of the increase in electricity generation costs as a result of SCR compared to the estimated cost to purchase electricity on the wholesale market, FCPP is expected to remain competitive relative to the wholesale market, suggesting that the incremental cost increase for SCR alone should not force FCPP to shut down. This analysis estimates that the average cost of electricity generation over the 20 year amortization period as a result of SCR implementation will increase by 22%, or $0.00740/kWh.

Retail electricity consumers however, pay more than just the generation costs of power. Retail rates include the cost to transmit and distribute electricity as well as generate electricity. Additionally, for APS customers, for example, the generation cost increase on FCPP due to SCR would flow into a broader retail rate impact calculation based on the entire portfolio of APS generation assets and purchases power contracts, which include coal (of which FCPP is only a portion of APS' total coal portfolio), natural gas, nuclear, and some renewables. For these reasons, EPA expects the potential rate increase to APS rate payers resulting from SCR on FCPP to be significantly lower than 22%. This topic is discussed in more detail in the TSD.

In addition to concerns about possible facility shut down, EPA received comments regarding potential impacts of increased transportation emissions associated with urea deliveries to FCPP for SCR and concerns of the affect of SCR on salability of fly ash. EPA conducted an analysis to evaluate any increase in health risks resulting from increased diesel truck traffic to and from FCPP and determined that the increase in cancer and non-cancer health risks associated with transportation emissions in the most impacted census block in San Juan County, New Mexico, are well below background levels and will not result in a significant health risk.

The Salt River Pima Maricopa Indian Community expressed concern about the impact of SCR on their Phoenix Cement Company fly ash business unit at FCPP. Ammonia adsorption (resulting from ammonia injection from SCR or selective noncatalytic reduction – SNCR) to fly ash is generally less desirable due to odor but does not impact the integrity of the use of fly ash in concrete. However, other NO_x control technologies, including LNB, also have undesirable impacts on fly ash. LNBs increase the amount of unburned carbon in the fly ash, also known as Loss of Ignition (LOI), which does affect the integrity of the concrete. Commercial-scale technologies exist to remove ammonia and LOI from fly ash. Therefore, EPA has determined that the impact of SCR on the fly ash at FCPP is smaller than the impact of LNB on the fly ash, and in both cases, the adverse effects can be mitigated.

EPA concludes that the energy and non-air quality impacts of SCR do not warrant elimination of SCR as the top control option for NO_x.

iii. Factor 3: Existing Controls at the Facility

There are some existing controls at FCPP for NO_x. APS has installed a variety of LNB on Units 2 – 5 although these controls are all about 20 years old and there have been significant advances in the technology for most EGU boilers. Unit 1 does not have any NO_x controls. The controls that APS is operating at FCPP for NO_x do not result in the magnitude of NO_x emissions reduction that are consistent with BART and do not represent current control technologies.

iv. Factor 4: Remaining Useful Life of Facility

The remaining useful life of the facility can be relevant if the facility may shut down before the end of the amortization period used to annualize the costs of control for a technology. In its analysis, APS used an amortization period of 20 years, the standard amortization period recommended by EPA, and indicated that it anticipated that the remaining useful life of Units 1 – 5 is at least 20 years. As it appears that the FCPP facility will continue to operate for at least 20 years, EPA agrees with the use of an amortization period of 20 years to estimate costs.

v. Factor 5: Degree of Visibility Improvement

The fifth factor to consider under EPA's BART Guidelines is the degree of visibility improvement from the BART control options. See 59 FR at 39170. The BART guidelines recommend using the CALPUFF air quality dispersion model to estimate the visibility improvements of alternative control technologies at each Class I area, typically those within a 300 km radius of the source, and to compare these to each other and to the impact of the baseline (i.e., current) source configuration. APS included sixteen Class I Areas in its modeling analysis; fifteen are within 300 km of FCPP and one Class I area, Grand Canyon National Park, is just beyond 300 km from FCPP. These areas are listed in Table 22 of the TSD.

The BART guidelines recommend comparing visibility improvements between control options using the 98th percentile of 24-hour delta deciviews, which is roughly equivalent to the facility's 8th highest visibility impact day. The "delta" refers to the difference between total deciview impact from the facility plus natural background, and deciviews of natural background alone, so "delta deciviews" is the estimate of the facility's impact. Visibility is traditionally described in terms of visual range in kilometers or miles. However, the visual range scale does not correspond to how people perceive visibility because how a given increase in visual range is perceived depends on the starting visibility against which it is compared. Thus, an increase in visual range may be perceived to be a big improvement when starting visibility is poor, but a relatively small improvement when starting visibility is good.

The "deciview" scale is designed to address this problem. It is linear with respect to perceived visibility changes over its entire range, and is analogous to the decibel scale for sound. This means that a given change in deciviews will be perceived as the same amount of visibility change regardless of the starting visibility. Lower deciview values represent better visibility and greater visual range, while increasing deciview values represent increasingly poor visibility. In the BART guidelines, EPA noted that a 1.0 deciview impact from a source is sufficient to "cause" visibility impairment and that a source with a 0.5 deciview impact must "contribute" to visibility impairment. Generally, 0.5 deciviews is the amount of change that is just perceptible to a human observer.

Under the BART guidelines, the improved visibility in deciviews from installing controls is determined by using the CALPUFF air quality model. CALPUFF, generally, simulates the transport and dispersion of FCPP emissions, and the conversion of SO_2 emitted from FCPP to particulate sulfate and NO_x to particulate nitrate, at a rate dependent on meteorological conditions and background ozone concentration. These concentrations are then converted to delta deciviews by the

CALPOST post-processor. The CALPUFF model and CALPOST post-processing are explained in more detail in the TSD.

The “delta deciviews” estimated by the modeling represents the facility’s impact on visibility at the Class I areas. Each modeled day and location in the Class I area will have an associated delta deciviews. For each day, the model finds the maximum visibility impact of all locations (i.e., receptors) in the Class I area. From among these daily values, the BART guidelines recommend use of the 98th percentile, which is roughly equivalent to the 8^{th} highest day for a given year, for comparing the base case and the effects of various controls. The 98^{th} percentile is recommended rather than the maximum value to avoid undue influence from unusual meteorological conditions. Meteorological conditions are modeled using the CALMET model.

APS conducted modeling for FCPP according to a modeling protocol submitted to EPA. See BART Visibility Modeling Protocol for the Arizona Public Service Four Corners Power Plant, ENSR Corporation, January 2008. APS’s modeling used the CALMET and CALPUFF versions recommended by EPA but in blending in meteorological station wind observations, APS used a lower radius of influence for stations. This change resulted in smoother wind fields. After initial input from the Federal Land Managers, EPA requested APS to change certain other CALMET option settings. These changes resulted in a more refined approach that is more consistent with approaches used in PSD permit application modeling. Further details about the CALPUFF and CALMET modeling are in the TSD, and the relevant CALMET settings are listed in Table 23.

In addition to the different CALPUFF emission rates described above, EPA's evaluation of anticipated visibility improvement used revised post-processor settings from those originally used by APS. The USFS informed EPA that the ammonia background concentrations modeled by APS in January 2008 were lower than observed concentrations[9]. The USFS recommended a method of back-calculating the ammonia background based on monitored values of sulfate and nitrate. EPA's ANPRM provided results based on using the USFS's back-calculation methodology.

The visibility modeling supporting today's proposal, however, uses a constant ammonia background of 1 ppb, which is the default value recommended for western areas. *IWAQM Phase 2* document[10]. The TSD contains supplemental modeling using back-

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[9] Letter from Rick Cables (Forest Service R2 Regional Forester) and Corbin Newman (Forest Service R3 Regional Forester) to Deborah Jordan (EPA Region 9 Air Division Director) dated March 17, 2009.

[10] Interagency Workgroup On Air Quality Modeling (IWAQM) Phase 2 Summary Report And Recommendations For Modeling Long Range Transport Impacts (EPA-454/R-98-019), EPA OAQPS, December 1998, http://www.epa.gov/scram001/7thconf/calpuff/phase2.pdf

calculated ammonia concentrations, a thorough discussion of the back-calculation methodology and the sensitivity results based on selecting different concentrations of background ammonia.

The background values of ammonia are important because it is a precursor to particulate ammonium sulfate and ammonium nitrate, both of which degrade visibility. Ammonia is present in the air from both natural and anthropogenic sources. The latter may include livestock operations, fertilizer application associated with farming, and ammonia slip from the use of ammonia in SCR and SNCR technologies to control NO_x emissions. Sensitivity of the model results to other ammonia assumptions are discussed in the TSD, and do not change the ranking of control options for evaluating visibility improvement, or the overall conclusions of the visibility analysis.

In our modeling input for ammonia, EPA assumed that the remaining ammonia in the flue gas following SCR reacts to form ammonium sulfate or ammonium bisulfate before exiting the stack. This particulate ammonium is represented in the modeling as sulfate (SO_4) emissions. Thus, EPA addressed ammonia solely as a background concentration.

In the supplemental sensitivity analyses using different ammonia values described in the TSD, ammonia concentrations for Mesa Verde National Park were not based on the back-calculation method, but instead were derived from measured ammonia concentrations in the Four Corners area, as described in Sather et al., (2008)[11]. Monitored data were available within Mesa Verde NP, but because particulate formation happens within a pollutant plume as it travels, rather than instantaneously at the Class I area, EPA also examined data at locations outside Mesa Verde NP itself. Monitored 3-week average ammonia at the Substation site, some 30 miles south of Mesa Verde, were as high as 3.5 ppb, though generally levels were less than 1.5 ppb. Maximum values in Mesa Verde were 0.6 ppb, whereas other sites' maxima ranged from 1 to 3 ppb, but generally values were less than 2 ppb. EPA used values estimated from Figure 5 of Sather et al., (2008), in the mid-range of the various stations plotted. The results ranged from 1.0 ppb in winter to 1.5 ppb in summer. See TSD, Table 33.

The BART determination guidelines recommend that visibility impacts should be estimated in deciviews relative to natural background conditions. CALPOST, a CALPUFF post-processor, uses background concentrations of various pollutants to calculate the natural background visibility impact. EPA used background concentrations from Table 2-1 of “Guidance for Estimating

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[11] Mark E. Sather et al., 2008. "Baseline ambient gaseous ammonia concentrations in the Four Corners area and eastern Oklahoma, USA". Journal of Environmental Monitoring, 2008, 10, 1319-1325, DOI: 10.1039/b807984f

Natural Visibility Conditions Under the Regional Haze Rule"[12]. Although the concentration for each pollutant is a single value for the year, this method allows for monthly variation in its visibility impact, which changes with relative humidity. The resulting deciviews differ by roughly 1% from those resulting from the method originally used by APS.

To assess results from the CALPUFF model and post-processing steps, in addition to considering deciview changes directly, EPA used a least-squares regression analysis of all visibility modeling output from the 2001 – 2003 modeling period to determine the percent improvement in FCPP's visibility impact (in delta deciviews) resulting from the application of control technologies compared to the FCPP's baseline impacts.

As outlined in the 1999 Regional Haze rule (64 FR 35725, July 1, 1999), a one deciview change in visibility is a small but noticeable change in visibility under most circumstances when viewing scenes in a Class I area. Table 3 presents the visibility impacts of the 98th percentile of daily maxima for

[12] U.S. Environmental Protection Agency, EPA-454/B-03-005, September 2003, on web page http://www.epa.gov/ttn/oarpg/t1pgm.html, with direct link http://www.epa.gov/ttn/oarpg/t1/memoranda/rh_envcurhr_gd.pdf

each Class I area for each year, averaged over 2001 – 2003[13]. The modeled visibility improvement at all Class I areas exceeds 0.5 deciviews and at most Class I areas exceeds 1 deciview.

Table 3: EPA Modeling Results – 8th High Delta dv Improvement and Percent Change in Delta Deciview (dv) Impact From NO_x Controls Compared to Baseline Impacts from 2001 – 2003 using 1 ppb Ammonia Background Scenario

Class I Area	**Distance to FCPP**	**Baseline Impact**	**Improvement From LNB/LNB+OFA**		**Improvement From SCR**	
	Kilometers (km)	Delta dv	Delta dv	%	Delta dv	%
Arches National Park	245	4.11	0.87	18	2.40	55
Bandelier Wilderness Area	216	2.90	0.54	21	1.62	57
Black Canyon of the Gunnison WA	217	2.36	0.46	23	1.42	60
Canyonlands NP	214	5.24	0.79	16	2.81	51
Capitol Reef NP	283	3.23	0.77	18	1.87	52
Grand Canyon NP	345	1.63	0.34	20	0.88	55
Great Sand Dunes NM	279	1.16	0.31	25	0.67	62
La Garita WA	202	1.72	0.44	25	1.05	62
Maroon Bells Snowmass WA	294	1.04	0.27	26	0.64	63
Mesa Verde NP	62	5.95	0.62	13	2.43	45
Pecos WA	258	2.16	0.52	23	1.15	58

[13] EPA did not average the 98th percentiles from each year as did APS, rather EPA used the 98th percentile from all three years taken together. This does not significantly affect the overall results.

Petrified Forest NP	224	1.40	0.27	21	0.65	56
San Pedro Parks WA	160	3.88	0.68	19	2.02	53
Weminuche WA	137	1.87	0.49	25	1.19	62
West Elk WA	245	2.76	0.65	23	1.70	60
Wheeler Peak WA	265	1.53	0.37	24	0.84	59
Total Delta dv or Average % Change in Delta dv		42.94	8.39	21	23.34	57

Because installation and operation of SCR at FCPP to reduce NO_x emissions by 80% will provide perceptible and significant visibility improvements at all of the surrounding Class I areas, and because LNB will result in much less visibility improvement than SCR, EPA is proposing to require FCPP to reduce NO_x by 80% by meeting a plant-wide emissions limit of 0.11 lb/MMBtu, which is achievable with SCR. Our analysis also shows that the visibility improvement from the emissions reductions achieved with LNB are significantly lower.

D. Available and Feasible Control Technologies and Five Factor Analysis for PM Emissions

For PM, APS identified seven options as available retrofit technologies that would rely on post-combustion capture of the emissions. APS determined three options were technically feasible for PM control on Units 1 – 3: wet electrostatic precipitators (ESPs), dry ESPs, and pulse jet fabric filters (PJFF or baghouses). These three control options were determined to all have similar levels of PM control of 99.9%. One control option, called the GE-MAX-9 hybrid, which is an ESP using a fabric filter collection bag, is estimated to have a PM control efficiency of 99.999% and has been used in a demonstration project, but has not been demonstrated on larger units. Therefore, EPA considered the other top three options, wet and dry ESP and baghouses, for PM control at FCPP.

APS has been operating venturi scrubbers on Units 1 – 3 at FCPP since the 1970s resulting in PM reductions as well as SO_2 reductions. PM is controlled on Units 4 and 5 with baghouses. Venturi scrubbers have been used by large coal fired electric generating units (EGUs), but since promulgation of the New Source Performance Standards, have largely been replaced by more advanced technology that can achieve better PM reductions and provide better compliance assurance. Units 1 – 3 at FCPP are the last EGUs in Region 9 to continue to operate venturi scrubbers. The other EGUs in Region 9 have generally been retrofit with baghouses.

In this NPR, EPA is proposing to require APS to upgrade its PM controls as described below to meet an emission limit of 0.012 lb/MMBtu and 10% opacity on Units 1 – 3, which is achievable either through installing baghouses or ESPs. Because of the high incremental cost of both options, however, EPA is also asking for comment on whether APS can satisfy BART by operating the existing venturi scrubbers to meet an emissions limit of 0.03 lb/MMBtu with a 20% opacity limit to demonstrate continuous compliance. EPA is proposing to require APS to operate the existing baghouse for Units 4 and 5 to meet an emissions limit of 0.015 lb/MMBtu and 10% opacity.

i. Factor 1: Cost of Compliance

EPA is proposing to require APS to install ESPs (wet or dry) or PJFFs for Units 1 – 3 to comply with an emissions limit of 0.012 lb/MMBtu and a 10% opacity limit. For Units 4 and 5, APS would not need to install any controls in addition to the baghouses currently in place but would be required to operate the baghouses to meet an emission limit of 0.015 lb/MMBtu and a 10% opacity limit.

The wet-membrane ESP is the lowest cost approach to meeting the proposed PM BART limit of 0.012 lb/MMBtu for Units 1 - 3, but a wet membrane ESP would result in a very high cost effectiveness value for incremental cost because the existing venturi scrubbers are removing much of the PM. In other words, any control device, such as an ESP, placed downstream of the venturi scrubbers will result in a high incremental cost because the denominator (tons removed) of the cost effectiveness calculation will be relatively small.

Alternatively, APS could install baghouses on Units 1 – 3 at FCPP upstream of the venturi scrubbers. The baghouses would be the most likely choice for APS for PM control if APS also wants to achieve significant mercury ("Hg") reduction from these units. Installing baghouses would make those controls the primary PM control device (i.e. the downstream venturi scrubbers would primarily control SO_2 emissions) and the cost effectiveness for Units 1 - 3 would average less than $110 per ton of PM removed. These costs are discussed further in Section 3 of the TSD.

Baghouses have already been installed on the four other coal fired EGUs in Region 9 that had historically used venturi scrubbers for PM control, including the only other venturi scrubber owned and operated by APS at its Cholla Unit 1. NV Energy Reid Gardner offered to install baghouses at Units 1, 2, and 3 as extra injunctive relief in a settlement agreement. Those baghouses are installed and operating (despite the high incremental dollars per ton of PM removed) to allow the units to achieve continuous compliance with PM and opacity limits and to prepare for the upcoming utility MACT regulation of Hg.

EPA considers installation of either ESPs (wet or dry) or baghouses as reasonable-cost technology capable of achieving the proposed BART emission limit of 0.012 lb/MMBu for Units 1 – 3. However, because of the high incremental costs associated with ESPs or baghouses, EPA is also asking for comment on whether APS can satisfy BART by continuing to operate the venturi scrubbers on Units 1 – 3, demonstrating compliance with an emissions limit of 0.03 lb/MMBtu with a continuous opacity limit of 20%. EPA's basis for establishing a PM emissions limit of 0.03 lb/MMBtu is consistency with NSPS Subpart Da, which has been the applicable emissions limit for any boiler placed into service after 1978. We believe that an emissions limit that has been in place for over 35 years should be achievable with the venturi scrubbers. We provide further discussion of this issue in Subsection D.3 below and the TSD.

ii. Factor 2: Energy and Non-Air Quality Impacts

EPA is not aware of any energy and non-air quality impacts associated with any of the technologies discussed above that would eliminate them from consideration as BART.

iii. Factor 3: Existing Controls at the Facility

Units 1 - 3 are controlled by venturi scrubbers, which also are used for SO_2 control. These scrubbers operate at pressure drops less than 10 inches of water. Venturi scrubbers have not been installed for PM pollution control on any coal fired EGU in Region 9 since the early 1970s. Venturi scrubbers have not been in use since that time principally due to concerns over the ability of venturi scrubbers to continuously meet the 0.10 lb/MMBtu standard established by a New Source Performance Standard in 1971. See 40 CFR Part 60 Subpart D. Fossil fuel fired boiler standards for coal fired units were revised for units built after 1978 and the PM limit was lowered to 0.03 lb/MMBtu. See 40 CFR Part 60 Subpart Da. Most current coal fired boilers now use baghouses which are capable of meeting PM limits of about 0.01 to 0.012 lb/MMBtu.

As mentioned earlier in the cost discussion, baghouses have already been installed on the four other coal fired EGUs in Region 9 that had historically used venturi scrubbers for PM control, including APS's Cholla Unit 1. These baghouses were installed, despite the very high incremental dollars per ton of PM removed, to allow the companies to continue to operate the units in continuous compliance with their PM and opacity limits.

EPA notes that Units 1 – 3 at FCPP were operated with a re-heat of the scrubber exhaust. This allows the use of Continuous Opacity Monitors (COMs) in their stacks and provides an ongoing measurement of the opacity compliance. EPA understands that these three units originally installed and operated a re-heat system, but FCPP discontinued its use. EPA Region 9 is not aware of when APS discontinued using the re-heat system. The three venturi-equipped units, Units 1 – 3, do not have COMs or opacity limits, which are required on all other EGUs in Region 9 and likely all across the U.S. because SIPs, such as Arizona's, generally include a 20% opacity standard. Opacity standards are a regulatory tool that allows agencies and the public to ensure continuing compliance for PM.

Over the past several years the PM source testing for Units 1 and 2 have consistently complied with the PM limit of 0.03 lb/MMBtu by operating the venturi scrubbers. Unit 3 exceeded the limit in 2007 but after subsequent source tests averages an emission rate of below 0.03 lb/MMBtu.

EPA is requesting comment on allowing APS to continue to operate the venturi scrubbers on Units 1 – 3 provided it can demonstrate compliance with an emissions limit of 0.03 lb/MMBtu (as required by the NSPS Subpart Da for all post 1978 units) and a continuous opacity limit of 20%.

iv. Factor 4: Remaining Useful Life of Facility

As with NO_x, EPA is assuming that the remaining useful life of the facility is 20 years.

v. Factor 5: Degree of Visibility Improvement

The modeled visibility improvements resulting from additional PM control are relatively small. See Table 4.

Table 4: EPA Modeling Results – 8th High Delta dv Improvement and Percent Change in Delta Deciview (dv) Impact From PM Control Compared to Baseline Impacts from 2001 – 2003 using 1 ppb Ammonia Background Scenario

Class I Area	**Distance to FCPP**	**Baseline Impact**	**Improvement From PM Control**

	Kilometers (km)	Delta dv	Delta dv	%
Arches National Park	245	4.11	0.01	0
Bandelier Wilderness Area	216	2.90	0.01	0
Black Canyon of the Gunnison WA	217	2.36	0	0
Canyonlands NP	214	5.24	0.02	0
Capitol Reef NP	283	3.23	0.01	0
Grand Canyon NP	345	1.63	0.01	0
Great Sand Dunes NM	279	1.16	0	0
La Garita WA	202	1.72	0	0
Maroon Bells Snowmass WA	294	1.04	0	0
Mesa Verde NP	62	5.95	0.02	1
Pecos WA	258	2.16	0.01	0
Petrified Forest NP	224	1.40	0.01	0
San Pedro Parks WA	160	3.88	0.02	1
Weminuche WA	137	1.87	0	0
West Elk WA	245	2.76	0	0
Wheeler Peak WA	265	1.53	0.01	0
Total Delta dv or Average % Change in Delta dv		42.94	0.13	0

However, this factor may be somewhat misleading because the model does not include consideration of the visibility impairing plume that is almost always present after the steam plume from Units 1 - 3 evaporates. The term EPA uses for this plume is a “secondary visible plume”. This secondary visible plume often stretches for over 20 miles from FCPP and is most apparent in the early mornings when the typical inversions cap the dispersion of the secondary visible plume. EPA does not have any information as to whether this secondary visible plume can be seen from Mesa Verde National Park, the closest Class 1 area to FCPP. EPA Region 9 staff has observed this secondary visible plume in New Mexico out as far as Aztec and Bloomfield en route to Farmington from Albuquerque. Therefore, EPA is specifically seeking information on this secondary visible plume, its frequency and persistence, and whether or not it affects or can be observed from any Class 1 area.

In the TSD, EPA discusses this secondary visible plume and whether it is related to the poor control of fine particulates by the venturi scrubbers. EPA is also seeking information as to whether this plume has been observed from Units 4 and 5. Although the modeled visibility improvements from requiring additional PM controls are small, EPA considers eliminating the secondary visible plume from Units 1 – 3 to be important for visibility in the area. EPA is proposing to require APS to install either ESPs (wet or dry) or baghouses to meet an emissions limit of 0.012 lb/MMBtu with a 10% opacity limit. EPA is also taking comment on whether BART can be satisfied by allowing APS to continue to operate its existing venturi scrubbers on Units 1 - 3 to demonstrate compliance with an emissions limit of 0.03 lb/MMBtu with a 20% opacity limit.

III. EPA Proposed Action on Material Handling Limits

EPA is also proposing dust control requirements for FCPP. These requirements were included in the FIP that EPA finalized in 2007. APS appealed this portion of the 2007 FIP and EPA agreed to a voluntary remand of the dust control requirements to provide further justification in the record.

FCPP receives approximately 10 million tons of coal per year for combusting in the Units 1 – 5. This material moves by conveyor belt across the property line through numerous transfer points before being loaded to the storage silos that feed the individual Units. Each of these transfer points along with the conveyor belts has the potential for PM emissions. The PM can be minimized by collecting devices or dust suppression techniques such as covered conveyors or spraying devices at the transfer points.

After combustion, FCPP has a very large amount of ash that needs to be handled properly to prevent PM emissions to the air. The coal APS combusts at FCPP has as much as 25% ash. This means that there are over a million tons of ash that must be properly transported within the plant and then disposed. Some of this ash is stored in ash silos and is sold to companies that use it as an additive for making concrete. Much of the ash is currently disposed at a relatively new onsite ash landfill. All of this ash, which has the potential to become airborne PM, must be properly handled to prevent PM_{10} NAAQS issues.

FCPP's property line abuts the coal mine property and the entire coal handling and fly ash storage is within close proximity to Morgan Lake which is a recreational lake just beyond the FCPP's property line. EPA has received numerous complaints from Navajo Tribal members concerning excess dust generated from the new landfill. For these reasons, EPA considers it necessary or appropriate for dust/PM suppression measures to be enforceable to protect the ambient air quality.

EPA is proposing to require APS to implement a dust control plan and a 20% opacity standard for all material handling operations. The dust plan must provide measures to ensure that the coal handling, ash handling and disposal and general dust generating sources do not exceed 20% opacity. Dust control measures at coal fired power plants are important for maintaining the PM_{10} NAAQS in the areas adjacent to the power plant properties. Most coal fired power plants that are grandfathered from the NSPS Subpart Y (40 CFR Part 60) and from Prevention of Significant Deterioration (PSD) case by case BACT determinations are covered by general SIP rules regulating emissions and have associated opacity standards to assure proper operation of dust control or suppression measures during the times when stack testing is not conducted. Grandfathered facilities usually were subject to process weight PM limits under SIPs. These limits used an exponential equation approach to setting the allowable lb/hr PM based on the amount of material processed per hour. The limits typically become more stringent as a ratio of the allowable emissions to the throughput as the amount of material throughput increases. The SIPs also apply a general opacity limit to these PM emitting units.

Because FCPP is located on the Navajo Reservation where generally applicable limits that often are included in SIPs do not exist, and because dust control measures at coal fired power plants are important for maintaining the PM_{10} NAAQS in the areas adjacent to the power plant properties, EPA finds that it is necessary or appropriate to impose measures to limit the amount of PM emissions from these material handling emission sources. EPA recently imposed similar dust control requirements at the Navajo Generating Station which is also on the Navajo Nation Reservation.

IV: Administrative Requirements

A. Executive Order 12866: Regulatory Planning and Review

This proposed action is not a “significant regulatory action” under the terms of Executive Order (EO) 12866 (58 FR 51735, October 4, 1993) because it is a proposed rule that applies to only one facility and is not a rule of general applicability. This proposed rule, therefore, is not subject to review under EO 12866. This action proposes a source-specific FIP for the Four Corners Power Plant on the Navajo Nation.

B. Paperwork Reduction Act

This proposed action does not impose an information collection burden under the provisions of the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq*. Under the Paperwork Reduction Act, a "collection of information" is defined as a requirement for "answers to . . . identical reporting or recordkeeping requirements imposed on ten or more persons . . . ." 44 U.S.C. 3502(3)(A). Because the proposed FIP applies to a single facility, Four Corners Power Plant, the Paperwork Reduction Act does not apply. *See* 5 CFR 1320(c).

Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information;

search data sources; complete and review the collection of information; and transmit or otherwise disclose the information.

An agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR Part 9.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's proposed rule on small entities, small entity is defined as: (1) a small business as defined by the Small Business Administration’s (SBA) regulations at 13 CFR 121.201; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of this proposed action on small entities, I certify that this proposed action will not have a significant economic impact on a substantial number of small entities. The FIP for Four Corners Power Plant being proposed today does not impose any new requirements on small entities. *See Mid-Tex Electric Cooperative, Inc. v. FERC*, 773 F.2d 327 (D.C. Cir. 1985)

D. Unfunded Mandates Reform Act (UMRA)

This proposed rule, if finalized, will impose an enforceable duty on the private sector owners of FCPP. However, this rule does not contain a Federal mandate that may result in expenditures of $100 million (in 1996 dollars) or more for State, local, and tribal governments, in the aggregate, or the private sector in any one year. EPA's estimate for the total annual cost to install and operate SCR on all five units at FCPP and the cost to install and operate new PM controls on Units 1 - 3 does not exceed $100 million (in 1996 dollars) in any one year. Thus, this rule is not subject to the requirements of sections 202 or 205 of UMRA. This proposed action is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments. This rule will not impose direct compliance costs on the Navajo Nation, and will not preempt Navajo law. This proposed action will, if finalized, reduce the emissions of two pollutants from a single source, the Four Corners Power Plant.

E. Executive Order 13132: Federalism

Under section 6(b) of Executive Order 13132, EPA may not issue an action that has federalism implications, that imposes substantial direct compliance costs on State or local governments, and that is not required by statute, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by State and local governments, or EPA consults with State and local officials early in the process of developing the proposed action. In addition, under section 6(c) of Executive Order 13132, EPA may not issue an action that has federalism implications and that preempts State law, unless the Agency consults with State and local officials early in the process of developing the proposed action.

EPA has concluded that this proposed action, if finalized, may have federalism implications because it makes calls for emissions reductions of two pollutants from a specific source on the Navajo Nation. However, the proposed rule, if finalized, will not impose substantial direct compliance costs on the Tribal government, and will not preempt Tribal law. Thus, the requirements of sections 6(b) and 6(c) of the Executive Order do not apply to this action.

Consistent with EPA policy, EPA nonetheless consulted with representatives of Tribal governments[14] early in the process of developing the proposed action to permit them to have meaningful and timely input into its development.

F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

Executive Order 13175, entitled “Consultation and Coordination with Indian Tribal Governments” (65 Fed. Reg. 67249, Nov. 9, 2000), requires EPA to develop “an accountable process to ensure meaningful and timely input by tribal officials in the development of regulatory policies that have tribal implications.” Under Executive Order 13175, to the extent practicable and permitted by law, EPA may not issue a regulation that has tribal implications, that imposes substantial direct compliance costs on Indian tribal governments, and that is not required by statute, unless the Federal government provides the funds necessary to pay direct compliance costs incurred by tribal governments, or EPA consults

[14] “Representatives of State and local governments” include non-elected officials of State and local governments and any representative national organizations not listed in footnote 3.

with tribal officials early in the process of developing the proposed regulation and develops a tribal summary impact statement. In addition, to the extent practicable and permitted by law, EPA may not issue a regulation that has tribal implications and pre-empts tribal law unless EPA consults with tribal officials early in the process of developing the proposed regulation and prepares a tribal summary impact statement.

EPA has concluded that this proposed rule, if finalized, may have tribal implications because it will require emissions reductions of two pollutants by a major stationary source located and operating on the Navajo reservation. However, this proposed rule, if finalized, will neither impose substantial direct compliance costs on tribal governments nor pre-empt Tribal law because the proposed FIP imposes obligations only on the owners or operator of the Four Corners Power Plant.

EPA has consulted with officials of the Navajo Nation in the process of developing this proposed FIP. EPA had an in-person meeting with Tribal representatives prior to the proposal and will continue to consult with Tribal officials during the public comment period on the proposed FIP. In addition, EPA provided Navajo Nation and other tribal governments additional time to submit formal comments on our Advanced Notice of Proposed Rulemaking. Several tribes, including the Navajo, submitted comments which EPA considered in developing this NPR.

Therefore, EPA has allowed the Navajo Nation to provide meaningful and timely input into the development of this proposed rule and will continue to consult with the Navajo Nation and other affected Tribes prior to finalizing our BART determination.

G. Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risks

Executive Order 13045: *Protection of Children from Environmental Health Risks and Safety Risks* (62 FR 19885, April 23, 1997), applies to any rule that: (1) is determined to be economically significant as defined under Executive Order 12866, and (2) concerns an environmental health or safety risk that EPA has reason to believe may have a disproportionate effect on children. If the regulatory action meets both criteria, the Agency must evaluate the environmental health or safety effects of the planned rule on children, and explain why the planned regulation is preferable to other potentially effective and reasonably feasible alternatives considered by the Agency.

This proposed rule is not subject to Executive Order 13045 because it requires emissions reductions of two pollutants from a single stationary source. Because this proposed action only applies to a single source and is not a proposed rule of general applicability, it is not economically significant as defined under Executive Order 12866, and does not have a disproportionate effect on children. However, to the extent that the rule will reduce emissions of PM and NO_x, which contributes to ozone formation, the rule will have a beneficial effect on children's health be reducing air pollution that causes or exacerbates childhood asthma and other respiratory issues.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not subject to Executive Order 13211 (66 FR 28355 (May 22, 2001)), because it is not a significant regulatory action under Executive Order 12866.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (NTTAA), Pub L. No. 104-113, 12 (10) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards (VCS) in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. VCS are technical standards (e.g., materials specifications, test methods, sampling procedures and business practices) that are developed or adopted by the VCS bodies. The NTTAA directs EPA to provide Congress, through annual reports to OMB, with explanations when the Agency decides not to use available and applicable VCS.

Consistent with the NTTAA, the Agency conducted a search to identify potentially applicable VCS. For the measurements listed below, there are a number of VCS that appear to have possible use in lieu of the EPA test methods and performance specifications (40 CFR Part 60, Appendices A and B) noted next to the measurement requirements. It would not be practical to specify these standards in the current proposed rulemaking due to a lack of sufficient data on equivalency and validation and because some are still under development. However, EPA's Office of Air Quality Planning and Standards is in the process of reviewing all available VCS for incorporation by reference into the test methods and performance specifications of 40 CFR Part 60, Appendices A and B. Any VCS so incorporated in a specified test method or performance specification would then be available for use in determining the emissions from this facility. This will be an ongoing process designed to incorporate suitable VCS as they become available. EPA is requesting comment on other appropriate VCS for measuring opacity or emissions of PM and NO_x.

Particulate Matter Emissions - EPA Methods 1 though 5

Opacity - EPA Method 9 and Performance Specification Test 1 for Opacity Monitoring

NO_x Emissions - Continuous Emissions Monitors

J. Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629, February 16, 1994), establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this proposed rule, if finalized, will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population. This proposed rule requires emissions reductions of two pollutants from a single stationary source, Four Corners Power Plant.

AUTHORITY: 42 U.S.C. 7401 *et seq.*

10-6-10

Dated:

Jared Blumenfeld,

Regional Administrator, Region IX

Title 40, chapter I of the Code of Federal Regulations is proposed to be amended as follows:

PART 49--[AMENDED]

1. The authority citation for part 49 continues to read as follows:

Authority: 42 U.S.C. 7401, et seq.

2. Part 49 is proposed to be amended by revising Section 49.23 to read as follows:

Section 49.23 Federal Implementation Plan Provisions for Four Corners Power Plant, Navajo Nation

h. Regional Haze Best Available Retrofit Technology limits for this plant are in addition to the requirements above. All definitions and testing and monitoring methods of this rule apply to these limits except as indicated below. Within 180 days of the effective date of this regulation, the owner or operator shall submit a plan to the Regional Administrator that identifies the control equipment and schedule for complying with this regulation. The owner or operator shall amend and submit this amended plan to the Regional Administrator as changes occur. The interim limits for each unit shall be effective 180 days after re-start of the unit after installation of SCR controls for that unit and until the plant-wide limit goes into effect. The plant-wide NO_x limit shall be effective no later than 5 years after the effective date of this rule. APS may elect to meet the plant-wide limit early to remove the individual unit limits. Particulate limits for Units 1, 2, and 3 shall be effective 180 days after re-start of the units after installation of the PM controls but no later than 5 years after the effective date of this regulation. Particulate limits for Units 4 and 5 shall be effective 180 days after re-start of the units after installation of the SCR controls.

(1) Particulate Matter for units 1, 2, and 3 shall be limited to 0.012 lb/MMBtu for each unit as measured by the average of 3 test runs with each run collecting a minimum of 60 dscf of sample gas and with a duration of at least 120 minutes. Sampling shall be performed according to 40 CFR Part 60 Appendix A, Methods 1 through 4 and Method 5 or Method 5e. The averaging time for any other demonstration of the Particulate Matter compliance or exceedence shall be based on a 6 hour average. Particulate testing shall be performed annually as required by

e(3) above. This test with 2 hour test runs may be substituted and used to demonstrate compliance with the particulate limits in d(2) above.

(2) Particulate Matter from units 4 and 5 shall be limited to 0.015 lb/MMbtu for each unit as measured by the average of 3 test runs with each run collecting a minimum of 60 dscf of sample gas and with a duration of at least 120 minutes. Sampling shall be performed according to 40 CFR Part 60 Appendix A, Methods 1 through 4 and Method 5 or Method 5e. The averaging time for any other demonstration of the particulate matter compliance or exceedence shall be based on a 6 hour average.

(3) No owner or operator shall discharge or cause the discharge of emissions from the stacks of Units 1, 2, 3, 4 or 5 into the atmosphere exhibiting greater than 10% opacity, excluding uncombined water droplets, averaged over any six (6) minute period.

(4)

i. The plantwide nitrogen oxide limit, expressed as nitrogen dioxide, shall be 0.11 lb/MMbtu as averaged over a rolling 30 calendar day period. NO_2 emissions for each calendar day shall be determined by summing the hourly emissions measured in pounds of NO_2 for all operating units. Heat input for each calendar day shall be determined by adding together all hourly heat inputs, in millions of BTU, for all operating units. Each day the thirty day rolling average shall be determined by adding together that day and the preceding 29 days pounds of NO_2 and dividing that total pounds of NO_2 by the sum of the heat input during the same 30 day period. The results shall be the 30 day rolling pound per million BTU emissions of NO_x.

ii. The interim NO_x limit for each individual boiler with SCR control shall be as follows:

A. Unit 1 shall meet a rolling 30 calendar day NO_x limit of 0.21 lb/MMBtu,

B. Unit 2 shall meet a rolling 30 calendar day limit of 0.17 lb/MMBtu,

C. Unit 3 shall meet a rolling 30 calendar day limit of 0.16 lb/MMBtu,

D. Units 4 and 5 shall meet a rolling 30 calendar day limit of 0.11 lb/MMBtu, each.

iii. Testing and monitoring shall use the Part 75 monitors and meet the Part 75 quality assurance requirements. In addition to these part 75 requirements, relative accuracy test audits shall be performed for both the NO_2 pounds per hour measurement and the heat input measurement. These shall have relative accuracies of less than 20%. This testing shall be evaluated each time the Part 75 monitors undergo relative accuracy testing.

iv. If a valid NO_x pounds per hour or heat input is not available for any hour for a unit, that heat input and NO_x pounds per hour shall not be used in the calculation of the 30 day plant wide rolling average.

v. Upon the effective date of the plantwide NO_x average, the owner or operator shall have installed CEMS and COMS software that complies with the requirements of this section.

i. Dust.

Each owner or operator shall operate and maintain the existing dust suppression methods for controlling dust from the coal handling and ash handling and storage facilities. Within ninety (90) days after promulgation of this section, the owner or operator shall develop a dust control plan and submit the plan to the Regional Administrator. The owner or operator shall comply with the plan once the plan is submitted to the Regional Administrator. The owner or operator shall amend the plan as requested or needed. The plan shall include a description of the dust suppression methods for controlling dust from the coal handling and storage facilities, ash handling, storage and landfilling, and road sweeping activities. Within 18 months of promulgation of this section each owner or operator shall not emit dust with opacity greater than 20 percent from any crusher, grinding mill, screening operation, belt conveyor, or truck loading or unloading operation.

From: Jenny Clark
To: ECY RE AQComments;
Subject: Comments on Washington"s Proposed Regional Haze State Implementation Plan
Date: Wednesday, October 06, 2010 7:30:40 PM

Oct 6, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Jenny Clark
1516 243rd Pl SE
Bothell, WA 98021-8877

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Mike Schmidt [mikesch@microsoft.com]
Sent: Monday, September 13, 2010 9:46 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

When I learned about this I was surprised there is such a significant source of air polution affecting Washington's national parks. The state is known for it's energy generated by water power but this plant in Centralia is a reminder how significant a single major outdated or poorly performing source of energy generation can be to our overall air quality. Please strongly reconsider the measures that Washington will put into place to protect our air quality and beautiful natural resources. There is ample proven technology that can be applied to greatly improve the situation with the Centralia power plant.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. Mike Schmidt
903 E Lake Sammamish Shore Ln SE
Sammamish, WA 98075-7494

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Marilyn Darilek [rmdarilek@asisna.com]
Sent: Sunday, September 19, 2010 10:14 AM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 19, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

I want to comment on Washington's Regional Haze State Implementation Plan (SIP). There is great need to address haze pollution, especially that which is emitted by TransAlta's coal-fired power plant in Centralia, Washington. I financially support our national parks as a user and regular monthly contributor, believing firmly that these public lands are of immense and irreplaceable value. While it is increasingly true that some of the air pollution travels from locations aroung the world into our airspace, it is also true that we have a responsibility to inact and practice policy that protects our state and regional air and water quality to the highest standards achievable by current technology. The beauty and restoration of pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks is imperative and must be the goal of a strong SIP. Policy makers have a mandate to protect these and other treasured public spaces.

The currently proposed SIP is unacceptably weak. The state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should assure that the air quality in North Cascades National Park and Glacier Peak Wilderness does not get worse.
--Washington must enact pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require comprehensive emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064. Proactive, aggresive policy action can improve air quality and reduce haze sooner, but as currently written the plan will allow hazy air at Olympic for 323 more years! Where is the leadership and political will to do the right thing?!?!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come, diminshing esthetic and tourist values in the state of Washington and our regional national parks far longer than necessary.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mrs. Marilyn Darilek
1814 W Briarcliff Ln
Spokane, WA 99208-8983

Blain, Lindsay (ECY)

From:	Site Administrator [npca@npca.org] on behalf of Linda Dittmar [skoklrd@msn.com]
Sent:	Monday, September 13, 2010 7:16 PM
To:	ECY RE AQComments
Subject:	Comments on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

The National Park System is America's Crown Jewels. As a resident of Washington I frequently enjoy these parks throughout the seasons for hiking, cross country skiing or showshoeing. I also am proud to share our National Parks with visiting relatives and friends.
Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.
Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our

national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mrs. Linda Dittmar
PO Box 61
Shelton, WA 98584-0061

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Sheri Staley [staleyagate@peoplepc.com]
Sent: Tuesday, September 14, 2010 8:17 AM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 14, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

My concerns regarding air quality include the current plans for bringing dozens of biomass plants to Washington State. Allowing these plants without size limits and maximum pollutant control standards will further destroy our air quality.

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to

reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mrs. Sheri Staley
6052 E Pickering Rd
Shelton, WA 98584-8848

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Holly Schue [holly73@mikeandholly.net]
Sent: Monday, September 13, 2010 1:16 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

I live in Bend, OR and travel to WAshington state occassionally to enjoy the North Cascades and especially Mt. Rainier. Please do what you can to save the air quality and scenery vistas of your great state.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to

reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mrs. Holly Schue
2197 NE Kim Ln
Bend, OR 97701-6054
(541) 617-0086

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Cathy Wyatt [gcjawyatt@msn.com]
Sent: Monday, September 13, 2010 1:15 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

I am from Bainbridge Island WA and love to visit our national parks. Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of

Washington and the beloved parks in the region. As a park visitor, nurse, and mother of two children with asthma, I am asking for cleaner air at the national parks.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Cathy Wyatt
9790 NE Beach Crest Dr
Bainbridge Island, WA 98110-1366
(206) 842-1053

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of John Woolley, president [woolley@tfon.com]
Sent: Monday, September 13, 2010 1:16 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Please strengthen SIP. As proposed it lacks the necessary components to make progress on air pollution. We have to be more serious.

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

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--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
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The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our

national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. John Woolley, president
Olympic Forest Coalition OFCO
1606 E Sequim Bay Rd
Sequim, WA 98382-7649
(360) 683-0724

Blain, Lindsay (ECY)

From:	Site Administrator [npca@npca.org] on behalf of Barbara Romine [romines580@msn.com]
Sent:	Monday, September 13, 2010 1:45 PM
To:	ECY RE AQComments
Subject:	Comments on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

thank you for caring about our environment and trying to preserve it for Generations to come. I really apprecaite it as we love camping and spending time outdoors.
Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

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The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our

national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mrs. Barbara Romine
1343 Rafael St N
Keizer, OR 97303-6240

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Patricia Sharp [trishsharp55@yahoo.com]
Sent: Monday, September 13, 2010 2:15 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.
I have spent most of my 55 years in the pacific northwest. Please read about this implementation plan. Help save our natural beauty for generations to come.
Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter

tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Miss Patricia Sharp
15743 SE Washington Ct
Portland, OR 97233-3286

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Terry Cook [salmonriverflash@comcast.net]
Sent: Monday, September 13, 2010 1:45 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Washington state is under attack! Pollution from the coal-fired plant in Centralia is wreaking ecological havoc on our beautiful parks and mountain ranges. I am taking this opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter

tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Terry Cook
6718 Palatine Ave N
Seattle, WA 98103-5232

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Carolyn Morillo [cmorillo@olympus.net]
Sent: Monday, September 13, 2010 3:45 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

I live on the Olympic Peninsula and grew up in the shadow of Mt Rainier. I have hiked and backpacked in both parks and treasure the great views to be had. Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades as well as Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter

tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Carolyn Morillo
91 Chinook Ln
Port Angeles, WA 98363-9606

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Jack Stansfield [jacks8981@verizon.net]
Sent: Monday, September 13, 2010 1:15 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

As a veteran teacher, a parent, and a grandparent who wants to leave a clearer Northwest to our children and our grandchildren, I want to thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter

tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. Jack Stansfield
16314 62nd Ave NW
Stanwood, WA 98292-8981

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Barbara Hetrick [barbarahetrick@charter.net]
Sent: Monday, September 13, 2010 1:45 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington.

I live and work in Washington State and often access its wild areas. I am appalled to wind my way up a remote mountain trail to a vista where my view is clouded by smog and particulates, and to realize that I've been breathing in the same "sludge" that blunts my view of nature's glory.

While we transition to renewable energy sources, we must be extremely careful to not embrace unhealthy emissions. Having lived in Ohio for my first 26 years, I have seen the direct effects of acid rain and the rates of asthma and emphysema in those old coal states. And believe me, there is no such thing as "clean coal" -- that's like saying there's no soot from a fireplace!! Don't let these word games fool you -- you can paint a pig purple, but it's still a pig!

In order to preserve our parks and our lands for present and future generations, the state must revise its proposed Regional Haze State Implementation Plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impacts and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections! Make decisions based upon facts.
--Washington's plan must get rid of haze pollution in Olympic National

Park by no later than 2064, but as currently written the plan will virtually never get us there.

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, including me and my family, from visiting the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Barbara Hetrick
395 Yellowhawk St
Walla Walla, WA 99362-7725

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Cesia Kearns [cesia.kearns@sierraclub.org]
Sent: Monday, September 13, 2010 1:15 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

The beauty and solace offered by the Northwest's special places are very important to me, but sadly they are being threatened by dirty coal.

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal

plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Cesia Kearns
623 NE Thompson St
Portland, OR 97212-3847

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Pamela Beason [psbeason@comcast.net]
Sent: Monday, September 13, 2010 4:46 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

I appreciate this opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution, including that emitted by TransAlta's coal-fired power plant in Centralia, Washington.

I am a national park lover and advocate for our national parks. We are so blessed in Washington state with the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks. With a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

However, the proposed SIP is unacceptably weak. To preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. The SIP should be improved in the following ways:

--Washington's plan should not permit the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.

--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.

--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it affects, and the state must require emission reductions to protect all twelve of these areas.

--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. On what scientific basis is this statement made? This statement is inconsistent with actual projections.

--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064. However, as currently written, the plan will allow hazy air at Olympic National Park for 323 more years!

The Clean Air Act requires power plants to reduce haze-causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At the very least, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come. This will deter tourists from coming to the state of Washington to see our parks, and will also deter citizens such as myself from visiting my beloved parks as often.

Thank you for considering my comments. My comments will also be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Pamela Beason
3301 Brandywine Ct
Bellingham, WA 98226-3877

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Kathy Sagmiller [kathykpt@bainbridge.net]
Sent: Monday, September 13, 2010 2:46 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.
As a Washington resident on the Olympic Peninsula the health of the land and citizens who call this home, urge you to consider our opinions.
Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter

tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Kathy Sagmiller
2630 NE Mary Ct
Poulsbo, WA 98370-9007

Blain, Lindsay (ECY)

From:	Site Administrator [npca@npca.org] on behalf of Rodney Woodman [rwoody20042000 @yahoo.com]
Sent:	Monday, September 13, 2010 9:46 PM
To:	ECY RE AQComments
Subject:	Comments on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

It is time for the government of the state and nation make decisions for the benefit of the citizens, not the corporations and lobbyists.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal

plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. Rodney Woodman
50 E Nikki Ln
Belfair, WA 98528-8598

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Nancy A Holmes [nholmes105@yahoo.com]
Sent: Monday, September 13, 2010 1:15 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, for over 70 years, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

More over, it is an opportunity to protect valuable principles inherent in elements of the National Parks agency.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our

national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Nancy A Holmes
1520 Cooper St
Seaside, OR 97138-7848

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Sally Mackey [sallynmnmac@comcast.net]
Sent: Monday, September 13, 2010 1:16 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

There are many reasons to be against TransAlta's emissions and this is one. I'm happy to support this petition.Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter

tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mrs. Sally Mackey
2127 SW 162nd St
Burien, WA 98166-2654

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Jane Martin [jvmartin@seanet.com]
Sent: Monday, September 13, 2010 3:16 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Our National Parks will probably be the only place we can experience anything approaching wilderness soon, given the current population explosion, overbuilding, and general degradation of our environment everywhere. Please protect what little we have left. Air quality at our National Parks including those to the east of us, like Glacier and Yellowstone, is degrading fast. I used to live in the parks, since my father was a civil engineer with the Park Service. And air quality is suffering, as well as the natural silence I used to experience, overwhelmed now by helicopters, jet skis, planes, cars, etc. Please protect the air quality of our parks.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter

tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Jane Martin
13713 16th Ave SW
Burien, WA 98166-1038

Blain, Lindsay (ECY)

From:	Site Administrator [npca@npca.org] on behalf of Brenda Sullivan [sullivan.brenda99 @gmail.com]
Sent:	Monday, September 13, 2010 2:46 PM
To:	ECY RE AQComments
Subject:	Comments on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a resident of Washington State, a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks. The view of Rainier from my neighborhood is outstanding - on a clear day! I recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our

national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Brenda Sullivan
1654 SW 168th St
Normandy Park, WA 98166-2758

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Marie Marrs [marie.heroncove@gmail.com]
Sent: Monday, September 13, 2010 9:16 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

I would like to thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces. I grew up on property adjacent to Olympic and have hiked many of her trails in my lifetime.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter

tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mrs. Marie Marrs
111 Heron Cove Rd
Port Angeles, WA 98363-7133

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Jennifer Wells [jenfinity@hotmail.com]
Sent: Monday, September 13, 2010 9:16 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover, clean air lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces. Additionally, we have the opportunity to protect air quality for the residents of Washington.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter

tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Jennifer Wells
108 NW 43rd St
Vancouver, WA 98660-1732

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Ezma Hanschka [ezma@chamberscable.com]
Sent: Tuesday, September 14, 2010 12:46 AM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 14, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces. IT'S ONLY RESPONSIBLE! IT'S A MUST FOR OUR FUTURE HEALTH AND HAPPINESS. NATURE IS WHAT GROUNDS US....ESPECIALLY WHEN WE CAN SEE IT, IF EVEN FROM AFAR (OR NEAR, AS THE CASE MAY BE).

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects: WE CAN DO BETTER!

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them. FOR SURE!
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections. ALL YOU HAVE TO DO IS LOOK OUT THE WINDOW TO SEE HOW MUCH IT HAS INCREASED. AND FOR THOSE OF US WHO LOVE THE OUT-OF-DOORS AND HAVE PHOTOS TO SHOW IT OVER THE YEARS, WE CAN PROVE IT!
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades, AND BE RESPONSIBLE! At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region. AS AN OREGONIAN, I COULDN'T AGREE MORE!

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mrs. Ezma Hanschka
PO Box 4536
Sunriver, OR 97707-1536

Blain, Lindsay (ECY)

From:	Site Administrator [npca@npca.org] on behalf of Jennifer Pech Cinnamon [jencinnamon@hotmail.com]
Sent:	Monday, September 13, 2010 4:46 PM
To:	ECY RE AQComments
Subject:	Comments on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington.

Here in Washington, we have some of the most untouched and pristine wild areas in the United states. As a frequent visitor and advocate for our national parks, I treasure the beauty and air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal

plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mrs. Jennifer Pech Cinnamon
706 Belmont Ave E Apt 201
Seattle, WA 98102-5978

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Dean Webb [dm_webb@msn.com]
Sent: Monday, September 13, 2010 9:46 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come. Please understand that air quality issues are currently serious enough that from Paradise, Mt Rainier National Park, on a bright sunny day, the summit of Mt Rainier is not clearly visible! I began hiking and climbing in the Cascades in the early 1970's. Over the years, visibility in Washington"s high country has deteriorated to the point that rather than recreate here I go to Colorado or Utah. How sad! And while referring to TransAlta, Washington Department of Ecology should revoke their draft wastewater permit. Follow the law!

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Dr. Dean Webb
4522 36th Ave W
Seattle, WA 98199-1154

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Jamie Curtis [black-widow@qwest.net]
Sent: Tuesday, September 14, 2010 11:17 AM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 14, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Speaking as a concerned citizen and a grandparent concerned for future generations, I want to thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of

Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mrs. Jamie Curtis
PO Box 25505
Eugene, OR 97402-0457

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of David Harrison [harrirad@yahoo.com]
Sent: Monday, September 13, 2010 1:45 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

As Conservatio Chair of the Salem Audubon Society, I am writing to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. I worked on trails as a college student in North Cascades National Park, and have enjoyed vacations in Mount Rainier and Olympic National parks. I love the beauty and pristine air quality of these parks, and recognize that with a strong SIP the state of Washington has a unique opportunity to protect these and other treasured public lands.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of

Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Dr. David Harrison
585 Washington St S
Salem, OR 97302-5152

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Kiburi Robinson [cuhraz_k@yahoo.com]
Sent: Wednesday, September 15, 2010 5:20 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 15, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution. I was born & practically raised in Seattle & currently reside in Everett. The beauty & majesty of our region is something that ceases to take my breath away. I have chosen to raise my family in this area for precisely this reason. I am willing to do my part to maintain & protect this majesty & ask that you take this task as seriously as I do.

I am in agreement with the following statement & strongly urge you to take these suggestions to heart as you move forward:

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our

national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Miss Kiburi Robinson
13013 42nd Ave SE
Everett, WA 98208-5689

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of A Adams [audrey55@comcast.net]
Sent: Monday, September 13, 2010 7:16 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

I appreciate the opportunity to comment on Washington's Regional Haze SIP to address haze pollution.

It is paramount that we protect all aspects of our state and national parks, particularly Mt Rainier, the North Cascades and the Olympics. I have lived in Washington all 55 years of my life and have been camping, hiking and/or skiing for the majority of those years.

I am an avid user and lover of Mt Rainier National Park, having just hiked from Paradise to Panoramic Point two weeks ago and I expect pristine air quality for myself as well as for my grandbabies.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.

--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.

--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.

--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.

--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

THIS IS APPALLING!!!!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. A Adams
10939 SE 183rd Ct
Renton, WA 98055-7170

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Gay Kramer-Dodd [dodd7720@comcast.net]
Sent: Monday, September 13, 2010 5:46 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover, advocate for our national parks, former employee at Mt. Rainier National Park, and a native of Washington, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of

Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Gay Kramer-Dodd
372 Lodenquai Ln
Eugene, OR 97404-1605

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Valerie Lyson [lysonv@peacemail.com]
Sent: Wednesday, September 15, 2010 8:49 AM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 15, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

I care deeply about the land and the environment in Washington. Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of

Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Valerie Lyson
7427 Corliss Ave N
Seattle, WA 98103-4932

Blain, Lindsay (ECY)

From:	Site Administrator [npca@npca.org] on behalf of William Ostrander, Jr. [ostranderjr@peoplepc.com]
Sent:	Monday, September 13, 2010 1:45 PM
To:	ECY RE AQComments
Subject:	Comments on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I think everyone treasures the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognizes that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of

Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. William Ostrander, Jr.
1117 37th St
Bellingham, WA 98229-3131
(360) 734-4945

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Sheri Archey [soho2west@yahoo.com]
Sent: Monday, September 13, 2010 6:16 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a resident of the Pacific Northwest and park lover, including national, and an advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of

Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Sheri Archey
1111 SE 3rd Ave
Unit 41
Canby, OR 97013-4538

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Kevin DeFields [kdefields@comcast.net]
Sent: Tuesday, September 28, 2010 8:38 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 28, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington.

I spent the greater part of 2010 preparing to climb Mt. Rainier as a participant in the Climb for Clean Air, a fundraiser for the American Lung Association in Washington. Along with 44 others, most of us first time climbers, we raised over $200,000 for the American Lung Association and had a successfully got 32 team members to the summit of Mt. Rainier. As a long time asthma sufferer, this cause was near and dear to my heart.

As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. Kevin DeFields
5623 N 45th St
Tacoma, WA 98407-2808

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Larry Baxter [mthiker57@yahoo.com]
Sent: Monday, September 13, 2010 7:46 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover, hiker and backpacker in these national parks, and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of

Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. Larry Baxter
671 Trillium Pl
Camano Island, WA 98282-6629

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Mary Lou Hanley [mhanleylou@yahoo.com]
Sent: Tuesday, September 14, 2010 8:48 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 14, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and one that visits often, I would like to see the air protected for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of

Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Mary Lou Hanley
611 S 32nd St
Renton, WA 98055-5099

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Jennie Tanzi [jtanzi79@comcast.net]
Sent: Monday, September 13, 2010 5:46 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. I was born and raised in and around the Seattle area. I love how beautiful Washington is and as a park lover and advocate for our national parks, North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of

Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Jennie Tanzi
409 SW 12th Ave Apt 403
Portland, OR 97205-2336

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Yovonne Autrey-Schell [sulien_1@hotmail.com]
Sent: Monday, September 13, 2010 2:46 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak, to say the very least. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter

tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Yovonne Autrey-Schell
360 Duck Lake Dr NE
Ocean Shores, WA 98569-9452

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Daniel Shoe [danielshoe@yahoo.com]
Sent: Tuesday, September 28, 2010 9:38 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 28, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Lets Keep the Air Clear!

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter

tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. Daniel Shoe
14911NE 76 th ct
Redmond, WA 98052
(425) 558-3505

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Laura Baroff [laura.baroff.1987@alum.bu.edu]
Sent: Monday, September 13, 2010 2:15 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a resident of the Pacific Northwest, national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter

tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Laura Baroff
1531 SE Pershing St
Portland, OR 97202-2840

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Rhett Lawrence [rhettlawrence@yahoo.com]
Sent: Tuesday, September 14, 2010 10:47 AM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 14, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

I am an Oregon resident and I thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. Rhett Lawrence
6445 N Commercial Ave
Portland, OR 97217-2024

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Janette Cunningham [jcgam_wa@yahoo.com]
Sent: Sunday, September 19, 2010 1:14 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 19, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

I appreciate the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. I am an outdoors person and vaule our national parks. That means the air quality of North Cascades, Mount Rainier, and Olympic National Parks is very important and I recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

You are aware that the SIP as proposed is weak and does not provide adequate protections. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter

tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Janette Cunningham
14315 103rd Ave NE
Bothell, WA 98011-5209

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Alex Woolery [minus.a@gmail.com]
Sent: Monday, September 13, 2010 3:16 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and traveler, and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks. I recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan, so that state and regional air quality are better protected. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of

Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. Alex Woolery
2356 NW Overton St Apt 6
Portland, OR 97210-2968

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Charles Williams [stormmoon@aol.com]
Sent: Monday, September 13, 2010 1:15 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

I write regarding Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks - and a trip to Mt. Rainier National Park this past July -, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. Charles Williams
2285 Oakway Ter
Eugene, OR 97401-6457

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Marilyn Closterman [trackrabbit2003 @yahoo.com]
Sent: Tuesday, September 28, 2010 9:08 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 28, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

40 years ago when I moved to Seattle, I remember the air pollution irritated my eyes, just as it had it New York City. Over time thanks to the Clean Air Act air pollution was reduced in the Puget Sound region so that my eyes no longer burn, but the pollution is still enough to recreate a noticible haze during certain times of the week and year. More must be done to reduce haze in the Cascade region. Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Marilyn Closterman
1080 SW Mt Pilchuck Pl
Issaquah, WA 98027-3503
(425) 996-7158

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Jeanne Ferguson [magic@hemp.net]
Sent: Monday, September 13, 2010 1:45 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington.
As a national park lover, visitor, and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of

Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Jeanne Ferguson
2445 NW57th St #712
Seattle, WA 98107

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Larry Lawton [llmystic7@yahoo.com]
Sent: Tuesday, September 14, 2010 2:47 AM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 14, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state should revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington should consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan should eliminate haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, who bring in money and jobs to our economy, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. Larry Lawton
18 Aberdeen Gardens Rd
Aberdeen, WA 98520-9639

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Susan Marett [marett@cablespeed.com]
Sent: Tuesday, September 14, 2010 1:18 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 14, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington.

As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter

tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Susan Marett
92 N Rhododendron Dr
Port Townsend, WA 98368-9485
(360) 385-0390

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Michael Mauch [mmauch@tgmpmp.com]
Sent: Monday, September 13, 2010 1:16 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park volunteer and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. Michael Mauch
8405 113th St E
Puyallup, WA 98373-4725

Blain, Lindsay (ECY)

From:	Site Administrator [npca@npca.org] on behalf of Robert+Julia Kenny+Glover [synergy@whidbey.com]
Sent:	Monday, September 13, 2010 2:45 PM
To:	ECY RE AQComments
Subject:	Comments on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As national park lovers and advocates for our national parks, we treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. We believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of

Washington and the beloved parks in the region.

Thank you for considering our comments.

Please note: Our comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. Robert+Julia Kenny+Glover
7292 Maxwelton Rd
Clinton, WA 98236-8814

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Eldon Ball [eldonball@juno.com]
Sent: Wednesday, September 22, 2010 3:21 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 22, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.
Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:
--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!
The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.
Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. Eldon Ball
3200 NE 140th St Apt 11
Seattle, WA 98125-3670
(206) 366-8405

Blain, Lindsay (ECY)

From:	Site Administrator [npca@npca.org] on behalf of Joseph and Diane Williams [dwilliams3880@aol.com]
Sent:	Sunday, September 19, 2010 11:44 AM
To:	ECY RE AQComments
Subject:	Comments on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Sep 19, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

It would appear, however, that the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality.We believe the following should be considered:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of

Washington and the beloved parks in the region.

Thank you for considering our comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. Joseph and Diane Williams
3880 Stikes Dr SE
Lacey, WA 98503-8207

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Kathy Guilbert [kguilb@comcast.net]
Sent: Thursday, September 16, 2010 2:22 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 16, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington.

As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter

tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Kathy Guilbert
14919 91st Pl NE
Bothell, WA 98011-4543

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Helen Meeker [helenmeeker@centurytel.net]
Sent: Thursday, September 16, 2010 10:52 AM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 16, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a State of Washington citizen, national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Helen Meeker
11325 SW 220th St
Vashon, WA 98070-6421

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Susan Joshua [sophiajoshua@hotmail.com]
Sent: Monday, September 27, 2010 10:04 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 28, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Dr. Susan Joshua
40 Van Ness Ave
Ashland, OR 97520-1840

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Sandra L. Herndon [herndon@ithaca.edu]
Sent: Monday, September 13, 2010 1:45 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington.

Please NOTE that particulate emissions from biomass burning have been documented as higher than from coal. PLEASE ensure that all pollution controls include emissions from all sizes of biomass incinerators.

The several proposed biomass incinerators in the South Sound area will add considerably to the health hazards as well as to the haze over our beautiful Olympic Peninsula.

As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Sandra L. Herndon
449 E Pointes Dr E
Shelton, WA 98584-8850

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of David Gladstone [bluecamaslily@aol.com]
Sent: Monday, September 13, 2010 1:45 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, my wife and I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. We believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists like us from visiting Washington's beloved parks.

Thank you for considering our comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. David Gladstone
PO Box 803
Snohomish, WA 98291-0803
(360) 387-1495

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of A.E. White [aw95@comcast.net]
Sent: Monday, September 13, 2010 11:16 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 14, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

To get right to the Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington I want to say as a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Miss A.E. White
2330 43rd Ave E
Seattle, WA 98112-2792

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Edward Loosli [ed-l@sbcglobal.net]
Sent: Monday, September 13, 2010 12:45 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. Unfortunately, the SIP as proposed is unacceptably weak.

As an advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter

tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. Edward Loosli
303 E 10th St
The Dalles, OR 97058-2359

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Danny Dyche [tolarian@juno.com]
Sent: Tuesday, September 28, 2010 6:36 AM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 28, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

I thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As an advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.
Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality.
I believe the SIP should be improved in the following respects:
--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years.
The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.
I thank you for considering my comments. My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA

Regional Haze Program Manager.

Sincerely,

Mr. Danny Dyche
902 SE Marinette Ave
Hillsboro, OR 97123-5192

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Boni Biery [birdsbeesfishtrees@gmail.com]
Sent: Monday, September 13, 2010 11:16 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 14, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution, including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, in order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should stop the degradation of air quality in North Cascades National Park and Glacier Peak Wilderness now, not permit it to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the
TOTAL impact a pollution source like TransAlta would have on all twelve protected public lands which it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter

tourists, such as me and my family, from visiting the beloved parks in our region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Boni Biery
903 N 188th St
Shoreline, WA 98133-3906

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Steve Foster [siberman88@aol.com]
Sent: Sunday, September 19, 2010 10:44 AM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 19, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

I'm writing to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you.
Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. Steve Foster
2209 NE 93rd Ct
Vancouver, WA 98664-2402

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Richard Bergner [captainfidalgo@yahoo.com]
Sent: Tuesday, September 14, 2010 9:47 AM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 14, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington.

I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter

tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. Richard Bergner
15515 Yokeko Dr
Anacortes, WA 98221-8754

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Judith Prowell [prowell1914@comcast.net]
Sent: Friday, September 24, 2010 8:57 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 24, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a resident of Washington and a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mrs. Judith Prowell
1914 165th Pl NE
Bellevue, WA 98008-2617

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of James Boone [jameslboone@yahoo.com]
Sent: Tuesday, September 14, 2010 4:18 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 14, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

I was a resident of Washington State from 1993 till 2009 when I moved to Portland Oregon to be near my son and his family. I lived west of Centralia most of that time and several years in Olympia. Pollution from the coal-fired TransAlta's power plant in Centralia was always a concern on mine.

I want to thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP). As a national park lover and advocate for our national parks, I treasure the beauty and great air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is too weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to

reduce TransAlta's nitrogen oxide.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. James Boone
15633 NW Saint Andrews Dr
Portland, OR 97229-7820
(360) 493-1633

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Caroll Vrba [caroll.vrba@yahoo.com]
Sent: Monday, September 13, 2010 2:45 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington.

As a resident of Washington state and a national park lover and advocate, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks. A strong SIP is a step in the right direction for protection of these and other treasured public spaces.

I believe that the SIP as proposed is unacceptably weak. Please support revision of the plan to better protect state and regional air quality. The following improvements are suggested:

--ensure pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
-- consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--address the fact that air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--look at the time line in Washington's plan, as currently written the plan will allow hazy air for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views and increase the potential health hazards and forest damage associated with toxins in our air. Not only will this impact our national parks and wilderness areas for decades to come but may also attract other power plants that make use of the lower requirements in our state. This will deter not only residents like me and my family, but visitors from around the world who come for Washington states' legendary clean air and water.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Caroll Vrba
3705 Highway 25 S
Gifford, WA 99131-9707

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Dan Blair [danjanbee@eoni.com]
Sent: Monday, September 13, 2010 1:16 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

My wife Jan and I, both members of the National Parks Conservation Association, appreciate the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP). We stayed in Centralia last May on our way to Seattle; until then we were unaware of the coal-fired power plant owned by TransAlta that is located there.

As national park lovers and advocates for our national parks, we treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and -- one of our favorites -- Olympic National Parks, and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is just too weak. In order to preserve these parks for present and future generations, Washington must revise its plan to better protect state and regional air quality. Here are ways in which we believe the SIP could be improved:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs, and require emission reductions to protect all of them.
--The state says it is making progress towards eliminating haze-pollution. This conclusion, however, is inconsistent with actual projections, which show that air pollution in Washington will increase by the year 2018.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years! Since we are senior citizens, even 2064 is beyond our lifespan, but it is imperative that Washington address this for those who follow us (among them, our five grandchildren).

The Clean Air Act requires power plants to reduce haze-causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for giving our comments your most serious and thoughtful consideration. Please note: These comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. Dan Blair
PO Box 330
Joseph, OR 97846-0330

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Connie Ellsbury [cellsbu@q.com]
Sent: Monday, September 13, 2010 2:15 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

I am very concerned about the haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mrs. Connie Ellsbury
66 157th Ave SE
Bellevue, WA 98008-4614

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Leonard Jaffee [ljaffee@comcast.net]
Sent: Monday, September 13, 2010 1:45 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP), which concerns haze pollution, including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the proposed SIP is too weak. To preserve these parks for present and future generations, the state must revise its plan to protect state and regional air quality better. So, the SIP must be improved in the following respects:

--Washington's plan must not allow worsening of the air quality of North Cascades National Park and Glacier Peak Wilderness.

--Washington must impose pollution controls for TransAlta's nitrogen oxide emissions -- controls that would reduce pollution by 90% or more over its current proposal.

--Washington must consider the total effect a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.

--Air pollution in Washington may increase by 2018, but the state asserts it is making progress towards eliminating haze-pollution. The state's assertion is inconsistent with actual projections.

--Washington's plan must rid haze pollution from Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At minimum, Washington must require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue unnecessarily to obscure views in our national parks and wilderness areas for decades to come and deter tourists from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Dr. Leonard Jaffee
11710 SE Fuller Rd
Portland, OR 97222-1132

Blain, Lindsay (ECY)

From:	Site Administrator [npca@npca.org] on behalf of Don Franks [don.franks@proquill.com]
Sent:	Monday, September 13, 2010 1:16 PM
To:	ECY RE AQComments
Subject:	Comments on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

My wife and I frequently hike Mount Rainier National Park and we'd thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP). We treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. Don Franks
16623 3rd Ave S
Burien, WA 98148-1414

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Mlou Christ [mnortie@yahoo.com]
Sent: Wednesday, September 22, 2010 7:55 AM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 22, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

It's pretty difficult for the US to affect the pollution and haze from China's coal plants, but you certainly can do away with what comes from the TransAlta coal-fired plant. And you should!

With a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.Un-fortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith

Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Mlou Christ
900 SE 13th Ave
Portland, OR 97214-2516

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Thomas Sullivan [tmpsull@hotmail.com]
Sent: Wednesday, September 15, 2010 11:19 AM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 15, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith

Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. Thomas Sullivan
4115 Dayton Ave N
Seattle, WA 98103-7722

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Rose Lagerberg [russlag1@live.com]
Sent: Monday, September 13, 2010 8:46 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington.

I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should and could be improved.

Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.

Washington's plan as currently written will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mrs. Rose Lagerberg
13715 Wallingford Ave N

Seattle, WA 98133-7245

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Keith Houser [vermin1070@hotmail.com]
Sent: Monday, September 13, 2010 1:45 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Please revise Washington's Regional Haze State Implementation Plan (SIP) to improve air quality.

For starters, don't air quality in North Cascades National Park and Glacier Peak Wilderness to get worse. Also, Washington should reduce nitrogen oxide emissions from TransAlta by at least 90% over its current proposal. Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them. Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Sincerely,

Mr. Keith Houser
4223 163rd Ave SE
Bellevue, WA 98006-1868

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Andrew Peterson [adpete@xprt.net]
Sent: Monday, September 13, 2010 8:46 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington.

We are working hard to _shut_down_ the PGE coal fired plant at Boardman, which uses 20 trainloads of coal per day, on average. I understand that the TransAlta plant in Centralia uses a similar amount ... all coal coming from the Powder River Basin, which is being ripped apart by _our_ greed for their resources. There are better alternatives, and any money used to run coal plants could be better spent on the infrastructure improvements to move clean power around the Northwest.

The plant in Centralia is not just a Washington problem, it effects the entire "trough" that includes Puget Sound, Portland, and the Willamette Valley. I remember my father telling me that years ago there was a heavy haze that settled over Grants Pass, Oregon, and the source for it was a forest fire on the Olympic Peninsula. If the wind is blowing the "wrong" way, Portland gets the haze from Centralia.

Washington needs strong measures in place to minimize the pollution from Centralia until alternative sources are in place to allow shutting it down completely.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. Andrew Peterson
3146 SE 54th Ave
Portland, OR 97206-2145

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of D. Deloff [darfd@aol.com]
Sent: Tuesday, September 14, 2010 7:47 AM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 14, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak.

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.

--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.

--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides. Without these controls, the emissions will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as myself, from visiting the state of Washington and the parks in the region.

Thank you for considering my comments.

Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. D. Deloff
4430 SW 202nd Ave
Beaverton, OR 97007-2254

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Pati An [anpati@comcast.net]
Sent: Wednesday, September 15, 2010 10:19 AM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 15, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

RE: WA's Regional Haze State Implementation Plan (SIP):

Our economic future is inextricably linked to our environment.

The SIP as proposed is unacceptably weak.
To preserve parks, WA must revise its plan to better protect air quality.

The SIP should be improved in the following respects:

--WA 's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.

--WA must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.

--WA must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions.

--WA plan must get rid of haze pollution in Olympic National Park by no later than 2064.

At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily impede air health.

Thank you for considering.

Comments are copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Pati An
16044 NE 180th St
Woodinville, WA 98072-9637

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Karen Falk [kfalk@bbllaw.com]
Sent: Monday, September 13, 2010 1:16 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.
For many years I have taken visiting friends and relatives to enjoy the breathtaking views. Now I fear these very same views will be "breath-taking" in all the wrong ways. Having criss crossed our beautiful country many times, I have always mourned the many areas spoiled by pollution. Don't let Washington become " oh this must have been nice once..."

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mrs. Karen Falk
12612 2nd Ave S
Seattle, WA 98168-2607
(206) 622-5511

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Dan Scribner [grouchyolgeeze@live.com]
Sent: Monday, September 13, 2010 10:16 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 14, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

As a 25 year volunteer fire lookout for the Forest Service I am speaking here from bitter personal experience regarding air quality. As each week went by during fire season, my ability to spot fires diminished due to continually degrading air quality until finally I was actually guessing if I was seeing a smoke or not. The fire season began in late June or early July at my lookout, Suntop, just North of Mt. Rainier, and the skies were clear, clean, sweet and blue. As the season progressed we would first see the colors of the sunsets begin to change from red to a bronze/gold color, very pretty but an indication of chemicals in the air. Then we would see a wall of brown air to the west. Daily it would edge closer and closer until finally there was no more blue sky to the west, but, east of the Cascade Mountains the air was still clear and blue, as the muck was held back by the Cascades. Then a few days later streaks of muck began flowing Eastward across the Cascades, then quickly there were no more blue skies. Just slowly roiling muck rendering visibility very difficult, and breathing nasty tasting. This needs to be stopped!

Sincerely,

Mr. Dan Scribner
PO Box 495
Enumclaw, WA 98022-0495
(360) 588-6981

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Marie-Claire Dole [mcdcorp@fidalgo.net]
Sent: Monday, September 13, 2010 3:15 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington.

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.

--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades.

Clean air is no luxury it is a must.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mrs. Marie-Claire Dole
1515 Walter St
Mount Vernon, WA 98273-4854
(360) 336-3776

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of M. A. Stacey [midge_po@msn.com]
Sent: Monday, September 13, 2010 1:16 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution.

As an Oregonian, I treasure the beauty and pristine air quality of the Northwest and recognize that with a strong SIP, the state of Washington has an opportunity to protect what is now left of these once-pure attributes from corporate greed and lack of foresight.

In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality.

Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.

--Washington must consider the total impact a pollution source like TransAlta's nitrogen oxide or the coal plant would have on all protected public lands it impairs and should require emission reductions to protect all of them.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. M. A. Stacey
6125 SE Division St
Portland, OR 97206-1300

Blain, Lindsay (ECY)

From:	Site Administrator [npca@npca.org] on behalf of Sharon Wilson [sharon.l.wilson@boeing.com]
Sent:	Monday, September 13, 2010 2:46 PM
To:	ECY RE AQComments
Subject:	Comments on Washington's Proposed Regional Haze State Implementation Plan
Categories:	General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

I'm writing to you about Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution, including that emitted by TransAlta's coal-fired power plant in Centralia, Washington.

The SIP is too weak.Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.

The Clean Air Act requires power plants to reduce haze-causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come.

I love our national parks and I love mountain views. Please protect them both.

Thanks for listening.

Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Sharon Wilson
19151 110th Pl SE
Renton, WA 98055-8112
(253) 850-1779

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Daniel Kerlee [waldlee@aol.com]
Sent: Wednesday, September 15, 2010 7:50 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 15, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

I would like to comment on the Washington State Regional Haze State Implementation Plan. I have been visiting Mt. Rainier National Park for over fifty years, and I am frustrated that the pollution from the TransAlta power plant in Centralia is not being adequately addressed. This plant should be immediately fitted with pollution controls to eliminate nitrogen oxide emissions to the greatest degree possible. I am particularly concerned about the TransAlta plant because it affects views in all parks in our area.

Also the air quality in North Cascades National Park and in the Glacier Peak Wilderness must not be allowed to deteriorate any further.

Plans to reduce haze in Olympic National Park must be implemented on a timetable that will allow my children to appreciate them - significant reduction in the next fifty years at least.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. Daniel Kerlee
1708 Magnolia Blvd W
Seattle, WA 98199-3953
(206) 216-0627

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Jackie Easley [easleyr@hotmail.com]
Sent: Thursday, September 16, 2010 9:22 AM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 16, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

With a strong Regional Haze State Implementation Plan (SIP), we can protect the quality of Mt. Rainier National Park.

The SIP as proposed is weak. In order to preserve the park, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved. The legislature must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants. At a minimum, we should require pollution controls to reduce TransAlta's nitrogen oxide.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mrs. Jackie Easley
11429 SE 322nd Pl
Auburn, WA 98092-4835

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Elise Shearer [elisesarge2@usa.net]
Sent: Monday, September 20, 2010 8:47 AM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 20, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on the haze issues over Washington State's national parks. As a prior resident of Washington State, I treasure the scenery and beauty of our beloved forests and mountains.

Please put scrubbers in the coal plant stacks to clean the exhaust. This haze will continue to contribute to pollution and eventually start causing effects such as acid rain over the NW forests. We have already felt the effect of this over the eastern forests, please don't let it happen to our beautiful NW forests.

Let's not forget the long-term effects on human health and those who suffer from bronchial and asthmatic issues. This haze has to blow somewhere, and into the cities it goes!

Sincerely,

Mrs. Elise Shearer
9980 SW Johnson St
Tigard, OR 97223-5223
(503) 620-3140

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Pavel Dolezel [pavel.dolezel@artigma.com]
Sent: Friday, September 17, 2010 9:03 AM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 17, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for listening to Washington State residents.

Please protect our most valuable asset - our beautiful Northwest mountains and forests. We cannot do so without protecting the clear air.

Therefore we need to strengthen the Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. Pavel Dolezel
911 167th Ave NE
Bellevue, WA 98008-3740

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Ineke Deruyter [ideruyter@hotmail.com]
Sent: Monday, September 13, 2010 10:16 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 14, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Dear Decision makers,
In these troubled times of economic and environmental uncertainty places like Mt Rainier are necessary for sustaining our souls and for regrouping our sanity.
Please make sure that all our scenic areas stay healthy for our out-door activities and enjoyment of nature, by improvement of pollution control at TransAlta and a better protection of our National Parks.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Ineke Deruyter
9322 N Oswego Ave
Portland, OR 97203-2339

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Arthur Mink [mink3@readysetsurf.com]
Sent: Monday, September 13, 2010 2:46 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington.

Unfortunately, the SIP as proposed is unacceptably weak. As currently written the plan will allow hazy air at Olympic for 323 more years!

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. Arthur Mink
3731 SW Donovan St
Seattle, WA 98126-3627

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of Rebecca Stillwell [stillhall@aol.com]
Sent: Monday, September 13, 2010 6:46 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

My husband and I were just up on Hurricane Ridge the other day, along with people from all over the country and world. If pollution from the coal plant obscures the view there, no one will come. What a shame, since the Olympic Peninsula is ever so worth protecting!

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to

reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mrs. Rebecca Stillwell
1875 NW Gibson Way
Albany, OR 97321-1214

Blain, Lindsay (ECY)

From: Site Administrator [npca@npca.org] on behalf of John Witte [jwitte@reed.edu]
Sent: Monday, September 13, 2010 2:15 PM
To: ECY RE AQComments
Subject: Comments on Washington's Proposed Regional Haze State Implementation Plan

Categories: General Comment

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

It is way past time to get rid of coal as a source of energy The stuff is the dirtiest of the dirty. If this were to occur, the haze and pollution problems throughout the US would be GREATLY reduced or eliminated! So, EPA, it's up to you to help bring this about!

Sincerely,

Dr. John Witte
4855 SE Tenino Ct
Portland, OR 97206-0848

From: Stephen Kuchera
To: ECY RE AQComments;
Subject: Comments on Washington"s Proposed Regional Haze State Implementation Plan
Date: Monday, September 13, 2010 2:45:56 PM

Sep 13, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

In the beautiful Pacific Northwest, we have places where nowhere else in America, let alone few places in the world, can boast to claim in it's backyard. I believe we need better pollution controls so these monuments of nature aren't hidden in our filth as many of their counterparts in southern CA. I've been down in southern CA on a picture perfect day and remember thinking 'this is it? I would've thought perched atop a mountain I could see miles and miles.' I would not expect to have this same experience in the Pacific NW. If we don't act now, I do believe that we are neglecting what is arguably the most beautiful place in America and letting it fall into a cycle that will be very hard to overturn in the future.

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like

TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Mr. Stephen Kuchera
570 Throne Dr Apt 369
Eugene, OR 97402-7695

From: Mary Karr
To: ECY RE AQComments;
Subject: Comments on Washington"s Proposed Regional Haze State Implementation Plan
Date: Monday, September 13, 2010 10:46:16 PM

Sep 14, 2010

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

I wanted to add, before the form letter stating all that I agreee with, that the Pika is very much in danger in our mountains. We enjoy going to Mt Rainier especially looking for this little guy. We love to hear his call that is so much bigger than its little body. And have you taken the time to watch it busily gathering greens from the surrounding plants that it depends on to survive? Well, without the sun, which now has to fight the haze to shine on our mountains, the plants will start to fade away. That means the food supply for these wonderous creatures will disappear meaning the Pikas will disappear. And this is only one species I can think of off the top of my head. So many more will perish without our help to stop the pollution causing the haze. Won't you please help our Grandchildren to come to hear the echo of these little creatures and not just read about them in the history books as an extinct species?

Thank you for the opportunity to comment on Washington's Regional Haze State Implementation Plan (SIP) to address haze pollution including that emitted by TransAlta's coal-fired power plant in Centralia, Washington. As a national park lover and advocate for our national parks, I treasure the beauty and pristine air quality of North Cascades, Mount Rainier, and Olympic National Parks and recognize that with a strong SIP, the state of Washington has a unique opportunity to protect these and other treasured public spaces.

Unfortunately, the SIP as proposed is unacceptably weak. In order to preserve these parks for present and future generations, the state must revise its plan to better protect state and regional air quality. I believe the SIP should be improved in the following respects:

--Washington's plan should not allow the air quality in North Cascades National Park and Glacier Peak Wilderness to get worse.
--Washington must consider pollution controls for TransAlta's nitrogen

oxide emissions that would reduce pollution by 90% or more over its current proposal.
--Washington must consider the total impact a pollution source like TransAlta would have on all twelve protected public lands it impairs and require emission reductions to protect all of them.
--Air pollution in Washington is projected to increase by 2018, but the state says it is making progress towards eliminating haze-pollution. This conclusion is inconsistent with actual projections.
--Washington's plan must get rid of haze pollution in Olympic National Park by no later than 2064, but as currently written the plan will allow hazy air at Olympic for 323 more years!

The Clean Air Act requires power plants to reduce haze causing pollutants, including nitrogen oxides, which can be easily reduced through technologies that have been used by other power plants for decades. At a minimum, Washington should require pollution controls to reduce TransAlta's nitrogen oxide. Without these controls, the coal plant in Centralia will continue to unnecessarily obscure views in our national parks and wilderness areas for decades to come and deter tourists, such as me and my family, from visiting the state of Washington and the beloved parks in the region.

Thank you for considering my comments. Please note: My comments will be copied to Dennis J. McLerran, EPA Region 10 Administrator, and Keith Rose, EPA Regional Haze Program Manager.

Sincerely,

Ms. Mary Karr
17225 195th Pl NE
Woodinville, WA 98077-9414

United States Department of Agriculture | Forest Service | Pacific Northwest Region | 333 SW First Avenue (97204)
PO Box 3623
Portland, OR 97208-3623
503-808-2468

File Code: 2580
Date: October 5, 2010

Mr. Ted Sturdevant
Director
Washington Department of Ecology
PO Box 47600
Olympia, WA 98504-7600

Dear Mr. Sturdevant:

The USDA Forest Service has evaluated the Public Review Draft of Washington's Regional Haze State Implementation Plan. While Ecology has improved this draft considerably, as compared to the previous draft (for Federal Land Manager's review), we still have significant concerns with key parts of this plan. Our remaining concerns are as follows:

- The rate of progress in improving visibility in the Class I areas analyzed in your draft Regional Haze SIP is much slower than the Uniform Rate of Progress, yet Ecology is proposing no actions other than Best Available Retrofit Technology (BART) to remedy this. The rate of progress achieved through BART alone is inadequate to meet the requirements of the Regional Haze Rule and the expectations of citizens for excellent visibility conditions in the Class I areas of this state.

- The BART analysis and selection of control requirements for TransAlta Centralia is not adequate. Post-combustion NOx controls are appropriate as BART for TransAlta Centralia coal-fired power plant. Selective Catalytic Reduction (SCR) was never adequately evaluated for BART. Once properly evaluated, if Flex Fuels plus SCR is not economically reasonable, Flex Fuels plus Selective Non-Catalytic Reduction (SNCR) should be selected as BART.

- Ecology has inappropriately exempted Alcoa Wenatchee Aluminum Works from BART based upon a technically flawed modeling analysis. A BART analysis for this facility is needed, or the facility must take federally enforceable limits to reduce its contribution to haze in the Alpine Lakes Wilderness.

We look forward to resolving these issues with Ecology.

Sincerely,

/s/ Philip J. Mattson (for):

MARY WAGNER
Regional Forester

Enclosure:

Technical Comments on the Public Review Draft of the Washington State Regional Haze State Implementation Plan

Reasonable Progress Goals

Although Ecology has improved its documentation of a four-factor analysis, it has not yet taken measures to reduce emissions of haze-causing pollutants beyond BART. Because Ecology's Reasonable Progress Goals are substantially slower than the uniform rate of progress, the Regional Haze Rule requires states to further reduce its emissions or demonstrate why additional emission reductions are not reasonable at this time. Ecology has identified several source categories for which NOx and SO_2 emission reductions may be reasonable including process heaters, FCCU/CO Boiler units at petroleum refineries, dry process cement kilns, industrial boilers, and Kraft pulping mills. Ecology states that it is not reasonable to require additional controls on these sources at this time because of there is not sufficient time to go through the rule making process, as would be required under Washington State Law. However, we note that Oregon was able to identify go through the rule making process to obtain controls under Reasonable Progress for the PGE Boardman Facility.

Additionally, it is unclear why Ecology is setting the Reasonable Progress Goals for the 20% Least Impaired Days as no degradation (i.e., the same deciview value as baseline) when the WRAP modeling shows lower values are projected for all Class I areas in Washington.
This is in contradiction to § 51.308 (d) (1) (vi)

> "(vi) The State may not adopt a reasonable progress goal that represents less visibility improvement than is expected to result from implementation of other requirements of the CAA during the applicable planning period."

In Ecology's "Federal Land Managers Comments and Ecology's Response to Comments" document (Appendix B, p. B12), Ecology addresses the Forest Service concern that visibility conditions at the NOCA1 IMPROVE site are projected to deteriorate by 2018. The Forest Service acknowledges that the roughly 9,500 tpy of SO2 reductions apparently not included in the WRAP modeling are significant and would most likely influence the projected visibility conditions favorably. Indeed worst 20% day sulfate concentrations have been declining at most Washington Class I areas, including NOCA1, from 2000 to 2008. In the same time period, however, monitoring data shows that clearest 20% day sulfate values at NOCA1 are increasing. In discussing the FS comment on modeled increase in sulfate impacts at NOCA1, Ecology makes the following statement:
"Ecology's investigation of the projected increases in visibility impairment at NOCA1 concluded that the projected increase in visibility impairment is the result of the comparatively long residence time of air parcels near the monitor combined with the presence of large point sources of SO_2."

In light of the worsening clear day sulfate concentrations, the confusion surrounding the WRAP modeling results, and Ecology's own statement that increasing impairment at NOCA1 can be expected due to large nearby SO2 point sources, it would seem that these large point sources should be identified, and would be candidates for reasonable progress controls as soon as practicable.

TransAlta BART Determination

Flex Fuels plus Selective Catalytic Reduction

The BART rule (FR Vol. 70. No. 128/July 6, 2005), specifies the five-step process used in determining BART. These steps are as follows:

1. Identifying all available retrofit technologies;
2. Eliminate technically infeasible options;
3. Evaluate control effectiveness of remaining control technologies;
4. Evaluate impacts and document the results; and
5. Evaluate visibility impacts.

The process is very linear. Ecology appropriately identified both selective catalytic reduction (SCR) and selective non-catalytic reduction (SNCR) as available retrofit technologies for controlling NOx. However, it is unclear whether or not Ecology is stating that SCR is technically infeasible or not due to complications associated with the tight spacing at TransAlta's Centralia facility. Ecology's cites the following issues for not selecting SCR as BART (Appendix L of Public Review Draft of the WA RH SIP):

- The tight construction site,
- Potential difficulty in finding a location for ammonia storage that is safe, does not impede access to other components, or interfere with underground or above ground utilities and ducting,
- Elevated construction location, and
- Difficulty in ducting exhaust gas from the boiler through the SCR units to the ESPs while achieving even flue gas distribution across the SCR catalyst beds and within the ESP.

The final BART rule states (page 39165 of the July 6, 2006 FR/Vol. 70. No. 128) "*where you conclude that a control option identified in Step 1 is technically infeasible, you should demonstrate that … specific circumstances preclude its application to a particular emission unit. A demonstration of technical infeasibility may involve irresolvable technical difficulties with applying the control to the source (e.g., size of the unit, location of the proposed site, operation* *problems related to specific circumstances of the source, space constraints, reliability, and adverse side effects on the rest of the facility). Where the resolution of technical difficulties is merely a matter of increased cost, you should consider the technology to be technically feasible. The cost of a control alternative is considered later in the process."*

However, in Ecology's BART Determination Support Documentation for TransAlta Centralia Generation, LLC Power Plant (Revised April 2010) Ecology states that *"The primary difficulties are lack of space for easy installation of the catalyst beds and ducts, leading to very high construction costs that far surpass ranges of acceptable cost effectiveness".* This implies that Ecology believes SCR is technically feasible, but was not selected as BART due to excessive costs. This is further supported by the statement that *"Ecology concurs with TransAlta that the construction costs to overcome the technical difficulties of retrofitting an SCR system on its boilers, given its current configuration and installed emission controls, render this technology economically infeasible for implementation at this time."*

TransAlta evaluated the cost of retrofitting SCR in a "hot, dirty" location, above the first ESPs, as a cost of \$413/kW, based upon scaling the \$200/kW using "engineering judgment". Ecology compares this with the PGE Boardman's SCR retrofit cost of \$382/kW, prepared by PGE's consultant. However, we note that the PGE cost estimate revised by Oregon DEQ, after hiring an independent third party engineering firm to analyze the costs (Eastern Research Group). ERG estimated the cost of an SCR retrofit at the PGE Boardman facility at approximately \$250/kW, which is 35% less than the estimate prepared by PGE's consultant.

Today, we note a similar situation exists for the TransAlta Centralia power plant in which TransAlta has prepared a cost estimate, which varies greatly from estimates provided by the National Park Service and estimates in the ERG report to Oregon DEQ. Referring to the National Park Service references of costs for recent SCR retrofits, we note that "*the overall range for these industry studies is \$50/kW to \$300/kW. The upper end of this range is for highly complex retrofits with severe space constraints, such as Belews Creek, reported to cost \$265/kW, or Cinergy's Gibson Units 2-4. Gibson, a highly complex, space-constrained retrofit in which the SCR was built 230 feet above the power station using the largest crane in the world only cost \$251/kW in 2007".* Thus TransAlta's cost estimate of \$413/kW is suspect because it far surpasses not only the revised costs for installing SCR at the PGE Boardman facility, but at other highly complex sites as well. Ecology did not perform and document its own independent cost estimate.

Using the \$413/kW estimate, Ecology states that annualized costs for installing SCR on both units would have a cost effectiveness of \$9091/ton NOx removed. Other states have found that \$7300/ton is cost effective for NOx removal as BART. If TransAlta's cost estimates are over-inflated, by 35 - 65% greater than the upper range of costs for other complex SCR installations, it appears that SCR installation at TransAlta would be reasonable. Ecology does not provide its own cost analysis which supports its rationale for dismissing SCR as infeasible due to excessive costs

Ecology's BART determination is also lacking an evaluation of the visibility improvement which could be accomplished by Flex Fuels plus SCR. Thus the benefits associated with incurring the costs of adding SCR on both units is not quantified, thus the BART analysis is incomplete.

Flex Fuels Plus Selective Non-Catalytic Reduction (SNCR)

The rationale Ecology provides for not selecting Flex Fuels plus SNCR as BART for NOx is unconvincing. Ecology cites the combination of the following factors, when considered together; provide sufficient rationale for Ecology to dismiss this option as BART. These factors are:

- Incremental cost effectiveness
- energy and non-air quality environmental impacts
- existing air pollution controls,
- remaining useful life of the facility, and
- Compliance with State climate change rules.

Each of these reasons is examined below.

Ecology states that the incremental cost effectiveness of Flex Fuels plus SNCR is $2145/ton. Yet, it does not provide any additional analysis, such as creating a least-cost envelope of dominant alternatives which would help one determine whether Flex Fuels plus SNCR is unreasonable. Ecology recognizes that the combination of Flex Fuels and SNCR would increase the level of visibility improvement at the 12 affected Class I areas, in some cases up to nearly 2.0 deciviews of improvement. Ecology merely states that "While this additional project does result in some visibility benefit, we must also weigh other factors of the BART analysis to determine feasibility.

Additionally, Ecology identifies the energy and non-air quality environmental impacts as another factor in not selecting this option as BART. Ecology states that this alternative would result in a parasitic load of 1.4 MW. The EPA BART rule states *"…because energy penalties or benefits can usually be quantified in terms of additional costs or income to the source, the energy impacts analysis can, in most cases, simply be factored into the cost impact analysis*.". It appears that Ecology is double counting energy penalties (i.e., parasitic load) in making its BART determination.

Ecology also states that there is a potential for ammonia slip with SNCR, which would in turn contribute to visibility impacts. Ecology then states that this is a manageable impact. Ammonia slip may cause visibility impacts in an ammonia limited environment. However Ecology has not demonstrated that the atmosphere between Centralia and the affected Class I areas is ammonia limited, nor has it quantified the potential impact through the modeling evaluation. In fact, this is an air quality impact, not a non-air quality impact, under which it is claimed. Additionally, SNCR has been selected as BART for a number of coal-fired power plants, all of which face this same potential for ammonia slip (e.g., PGE Boardman, Oregon, Trigen Craig, CO, Golden Valley Electric Healy, AK, Basin Electric, Leland Olds Power Plant, ND, etc.). Apparently, other states believe this is a manageable issue.

Ecology also considered the existing controls at the facility in making its BART determination. The BART rule allows for consideration of existing controls in the BART determination process. Existing controls are to be included as part of Step 1 (identify all available retrofit control techniques), and Step 2 (include control options that involve improvements to existing controls in addition to add on or complete replacement of existing controls.) If the existing controls were put in place after the baseline period, they could be evaluated as any other control alternative. The presence of existing controls by itself is not sufficient basis to dismiss other control technologies. Ecology already considers the comparative cost of existing controls and Flex Fuels plus SNCR in the incremental cost analysis. Ecology is double counting this factor as a rationale for not selecting Flex Fuels plus SNCR as BART.

Ecology also states that they believe the likely remaining useful life of the TransAlta Centralia facility is 15 years or less. Should this become an enforceable permit condition, then it can be included in the determination of annualized cost effectiveness, and not be considered as a separate factor. We refer Ecology to the most recent proposal by Oregon DEQ for early shutdown options for the PGE Boardman power plant as an example of the proper way to consider a shortened remaining useful life in determining BART.

Finally, Ecology identifies a proposed 3-step process requiring TransAlta to comply with Executive Order 09-05 pertaining to State climate change regulations. Ecology states that this factor affects the remaining life of the facility. As such, Ecology needs to account for this in the annualize costs of potential BART alternatives, and not cite it as an independent factor.

When only considering factors which are not double counted, Flex Fuels plus SNCR is not selected as BART solely because of the incremental cost effectiveness of $2145/ton. This value is within reasonable costs as identified by other states. Ecology should revise its BART determination.

BART Exemption Modeling for Alcoa Wenatchee Aluminum Works

The US Forest Service has reviewed Ecology's response to our previous comments on the acceptability of the use of fine-resolution CALMET wind fields in the Alcoa Wenatchee Works BART exemption modeling and information provided in Appendix I of the Public Review Draft of the Regional Haze SIP. Ecology's response has not resolved our concerns about both procedural and technical issues with this analysis.

General Issues:

Ecology argued that no lower limit exists to the application of CALMET examined applications of CALMET. Ecology stated: *"After finding numerous references to analyses with CALPUFF using similar grid spacing in equally complex terrain between 1999 and 2007 and finding no mention of any lower limit to the acceptable meteorological grid spacing,"* First, we would like to highlight the oversight in Ecology's argument that, in each of the cases cited by Ecology, no corresponding performance evaluation was conducted that *objectively* documented that greater performance was achieved with the application of CALMET at a higher resolution. Rather, Ecology should have focused its review upon published cases that documented the improved performance of CALMET. Earth Tech (2001), RWDI (2002), and Scire et al. (2009) all documented evaluations of CALMET at high resolutions. In each case, poor performance was achieved when relying solely upon the ability of CALMET to induce specific features into the 3-D windfield. Chandresekar (2003) provides the best summary of CALMET's capabilities: *"…regions of complex terrain can introduce additional difficulties like inadequate density of observations, limitations of a diagnostic model to reproduce the observed features over complex terrain, and difficulties in fully resolving terrain features by using a coarse prognostic model over a complex terrain. The effectiveness of this approach may therefore be different for a region of complex terrain*."

Finally, it is important to note that EPA shifted its policy in 2009 regarding the resolution of CALMET wind fields as a direct response to the growing trend of applications of CALMET at higher resolutions with little or no scientific justification.

Procedural Issues:

Ecology acknowledges that the Washington-Oregon-Idaho BART Modeling Protocol was developed to provide consistency between the BART modeling performed in the three states. But Ecology also states that "*the authors of the protocol agreed that the document was to be a guideline, and that States have the ability to deviate from the guideline under certain circumstances"*. There is no documented mechanism which allows for unilateral approval of deviations from the modeling protocol.

Further, section 6 of the EPA Guidelines on Air quality Modeling (GAQM) published in Appendix W of Part 51 includes recommendations regarding the application of CALPUFF for visibility assessments for long range transport in general. The GAQM indicates that such applications will require significant consultation with the appropriate reviewing authority and the affected FLM (Federal Land Manager). As indicated in our previous comments, the reviewing authority (US EPA Region 10) and the US Forest Service have both indicated the unacceptable nature of Ecology's deviation from the modeling protocol. As such, Ecology has not followed established protocol or EPA guidance on this issue.

Technical issues:

Ecology's justification for use of the 0.5 km grid resolution is not consistent with EPA's guidance on this issue. The May 15, 2009 EPA Regulatory Air Quality Modeling Clearinghouse Memo states the following in addressing the use of finer resolution CALMET wind field.

An argument for the use of finer resolution CALMET wind fields should address two components.

1. *The prognostic meteorological data sets from numerical weather prediction (NWP) models lack sufficient resolution to capture the meteorological features of interest which would be responsible for transport of airborne contaminants from the source to the Class I area(s) of interest.*
2. *Diagnostic wind model (DWM) such as CALMET can enhance the NWP data used as the first-guess wind field (CALMET switch setting IPROG=14) sufficiently to adequately replicate the key meteorological features of interest.*

In addressing the first issue, it is necessary to identify the meteorological features of interest which are responsible for transport of airborne contaminants from Alcoa Wenatchee Aluminum Works to the Alpine Lakes Wilderness. In addressing this, (1) the meteorological conditions associated with transport of air pollutants from Alcoa Wenatchee Aluminum works to the Alpine Lakes Wilderness need to be identified, and (2) the scale of motion needs to be identified for these conditions.

A general rule of thumb is that a prognostic meteorological model cannot physically resolve a meteorological feature that is less than five times the grid resolution (horizontally and vertically) (ref: NOAA COMET learning module on numerical weather prediction). Thus, if the horizontal grid resolution of the prognostic meteorological model is 4-km, it is reasonable to assume that it cannot resolve a meteorological feature less than 20-km in length or width.

For example, if a cold air mass descends along the east side of the Cascades causing easterly flows during the winter time, which transports pollutants from the Alcoa Wenatchee Aluminum Works to the Alpine Lakes Wilderness, then the scale of this synoptic system may be on the order of hundreds of kilometers, a phenomenon easily resolved by a 4-km MM5 run. However, in the case of up-valley flows driven by difference in the local surface energy budgets, this phenomenon may be on the scale of the length of the valley of interest, something which may not be resolved by a 4-km MM5 model

Thus, if the locally-forced flows (such as mountain-valley winds) are the meteorological feature of interest and the only meteorological features which drive the transport winds from the Alcoa Wenatchee Aluminum Works towards the Alpine Lakes Wilderness, and these flows are less than 20-km, indeed, the 4 km NWP data cannot resolve this phenomenon. However, there may be other meteorological phenomenon of 20-km or larger scale which can drive flows from the Alcoa Wenatchee Aluminum Works towards the Alpine Lakes Wilderness. These should also be addressed and a discussion of which meteorological feature is associated with worst-case haze impacts in the wilderness ought to be identified as well.

The second component of EPA's recommendation is to demonstrate that CALMET can enhance NWP data used as the first-guess wind field sufficiently to adequately replicate key meteorological features of interest.

One of the key contentions made by Ecology is that use of the 4-km CALMET generated wind field creates "errors" in the surface wind field, which are resolved by use of the 0.5-km wind field. This is demonstrated in Figure I-2 and I-3 in which both the 4-km and 0.5-km surface winds are shown with the 0.5-km resolved terrain as background. Ecology states *"...the finer resolution modeling provides a much more detailed spatial pattern in the winds which conforms more accurately to the terrain when compared with the wind fields from the lower resolution model runs. It is clear from these plots that the lower resolution runs will miss much of the terrain channeling within the modeling domain. More important, the failure of the 4-km grid to accurately represent peaks will allow air to flow unimpeded through regions that would otherwise deflect it."* In examining the validity of this statement, we note the following.

Ecology's approach is based upon the flawed assumption that increased structural detail of the higher resolution wind field is an indication of improved performance of the wind model. In the IWAQM guidance reassessment (EPA, 2009), EPA warned of the temptation to apply this form of reasoning. EPA stated: "*…the higher resolution CALMET simulations may increase the structural detail of the final wind fields; however, the majority of CALMET evaluations to date have been subjective in nature and have relied upon the perceived increase in structural detail (i.e. "realism"). This evaluation relies upon the perceived increase in structural detail without any form of a statistical performance evaluation to verify the objective accuracy of high resolution wind fields. In short, a subjective assessment that a wind field is "realistic" is not sufficient to support the assumption that the wind field accurately reflects reality.*" Ecology uses the exact same reasoning and arbitrarily concludes that the increased structural detail must in fact be the correct wind field realization without any means to support such. In essence, the argument is condensed into "we will apply CALMET at a higher resolution to justify a higher resolution of CALMET."

Evaluation of the 4-km and the 0.5-km wind field is performed by comparing it with the 0.5-km resolved terrain, not both the 4-km and 0.5-km terrain. Following this logic, it is reasonable to conclude that the 0.5-km winds should be evaluated by comparing them with terrain resolved at a higher resolution, perhaps 10 meters. Under this evaluation scenario, if any locations occur where the 0.5-km winds appear to move towards the 10 meter resolved terrain, rather than tangential to the terrain, then the 0.5-km wind should be deemed inappropriate. Similarly, if 12-km winds were plotted against a 4-km resolved terrain, and locations were found in which the 12-km winds were found to flow towards the terrain, then they should be found to be inappropriate. Following this logic, it appears that plotting the winds created with the same resolution as the terrain will always be selected, especially if the performance is evaluated based upon terrain following flows. Is there a point of diminishing returns when the use of higher grid resolution no longer affects the results? If so, this has not been demonstrated.

Ecology inherently assumes that any deviation from tangential airflow is unexpected and therefore in error. In fact, numerous forces operating at different scales of motion, determine the wind direction, making it one of the most difficult meteorological parameters to accurately predict because of small scale influences near the surface.

Air can flow up and over terrain if it has sufficient amount of kinetic energy to overcome resistant forces. The behavior of the air flow is determined by the ratio of the amount of kinetic energy of the air flow to the resisting forces of gravity, buoyancy, (i.e., static stability) and terrain height (referred to as the local Froude number). Thus if the sufficient kinetic energy exists, the wind would be expected to travel up and over terrain, rather than around it. Even if sufficient kinetic energy did not exist, the wind direction may not necessarily be channeled directly through the terrain, as frictional forces, and small scale differences in surface albedo, and Bowen ratios would act to induce turbulence, resulting in unexpected wind directions.

CALMET must rely on the limited surface and upper air observations in the computational domain to calculate the local Froude number. Recall, that CALMET must obtain the needed information from observation stations which may not be representative of the location of interest (in this case, the terrain between Wenatchee and Alpine Lakes Wilderness). Thus, the CALMET calculated wind behavior is not necessarily representative of reality.

Additionally, the terrain height used may not be representative of actual terrain features of interest as it's is based upon the terrain radius of influence (TERRAD) specified by the user. Additionally, the static stability used in the calculation of the local Froude Number is based upon the potential temperature lapse rate, determined from the domain representative upper-air station specified by the user. If the upper air station is far away from the local terrain of interest, it will not be representative of the local temperature structure of the complex terrain between Wenatchee and Alpine Lakes Wilderness.

CALMET also lacks the necessary physics to balance the forces when air flows near terrain, as such it forces air to flow tangentially to the terrain. The tendency of CALMET to generate terrain following flows is a known limitation in the model. This has been documented by EPA in its discussion of the ability of diagnostic wind model (DWM) to enhance numeric weather prediction (NWP) data to adequately replicate meteorological fields of interest (Section 2.2 of the Reassessment of IWAQM Phase 2 Summary report, draft May 27, 2009). In that discussion, EPA states that CALMET only contains algorithms for certain aspects of the valley wind system (drainage flows). Other portions of the wind system (cross-valley, up/down valley circulations) are neglected in the algorithm (Scire et al. 2000a).

CALMET also does not adjust the velocity to represent the decrease in kinetic energy of an air parcel as it works to ascend the barrier. This creates another concern regarding the directionality of the wind determined by the Froude number adjustment. CALMET assumes that the resultant wind vector will flow tangentially to the terrain obstacle. This assumption is only valid for isolated terrain features.

Given the limitations of diagnostic models to ensure dynamically consistent wind fields (Seaman, 2000), there is legitimate concern that the increased structural detail in the horizontal wind fields resulting from application of CALMET at higher grid resolutions may lead to spurious effects on plume dispersion which may not be obvious, even from a detailed review of horizontal wind fields. As such, the decrease in model-predicted results as a function of increasing horizontal grid resolution in CALMET may be caused by inappropriate changes in the vertical velocity fields which in turn may enhance vertical turbulence and plume dispersion.

CALMET is a mass-consistent diagnostic wind field model (DWM) and uses divergence to calculate vertical motions in the atmosphere (given in equation 2-2 of the CALMET User's Guide (Scire et al. 2000)). In order to maintain the constraint of mass-consistency, the vertical component of the wind must change in relation to changes in the horizontal resolution. Reviwing the CALMET source code shows that the change from 4-km resolution to 0.5-km will result in an order of magnitude change in the rate of change of the horizontal wind components (represented by du/dx and dv/dy in the divergence calculations). In order to maintain mass consistency, the vertical velocity must increase due to the increase in the horizontal resolution of the model.

Ecology assumes that the slight decrease in model-predicted concentrations is a result of a longer plume trajectory resulting from the finer grid resolution. It does not consider the implications of enhanced vertical turbulence and plume dispersion which may occur as a result of increasing grid resolution within CALMET. Without performing a more detailed analysis which evaluates these phenomenons, the justification is purely theoretical and does not justify the use of the higher resolution grid spacing in CALMET as compared to the grid spacing of the NWP.

Additionally, there are several other important meteorological variables which affect visibility. These parameters include vertical velocity and turbulence parameters which affect plume dilution, vertical temperature gradients, which affect which whether or not plumes will move over or follow terrain, and relative humidity which affects hygroscopic particle growth rates such as ammonium sulfate and ammonium nitrate. The Forest Service is particularly interested in knowing whether or not the change in grid resolution from 4.0km to 0.5km resulted in a change in vertical wind velocity or turbulence which may have artificially altered the plume dilution.

Finally, in assessing any model performance, one must use an appropriate standard for evaluation. In most cases, this is the actual observation of the parameter of interest (e.g., wind direction and speed, or a tracer study for air quality modeling). Due to an absence of valid meteorological data in the area of interest, Ecology was not able to conduct a quantitative model performance evaluation. Only a subjective analysis was performed, on a very limited number of hours out of the entire 3-year period, thus creating a low degree of confidence in the interpretation of the results.

An objective analysis is needed to assess model performance. EPA has identified several methods for assessing model performance, all of which include a comparison with observation data. Statistical measures should be identified and compared with statistical benchmarks. Additionally, graphical evaluation tools such as time series plots of predicted wind speed, wind speed bias, root mean square error and Index of Agreement (IOA) are some examples of these recommended model performance metrics. Given the lack of a complete statistical model performance analysis, the subjective evaluation provided by Ecology does not provide a high degree of confidence in their interpretation of results.

In summary, Ecology has inappropriately exempted Alcoa Wenatchee Aluminum Works from BART based upon a technically flawed modeling analysis. As such, a BART analysis for this facility needs to be performed or the facility must take federally enforceable limits to reduce its contribution to haze in the Alpine Lakes Wilderness following the established BART modeling protocol.

North Central Washington Prescribed Fire Council
P.O. Box C
Loomis, WA 98827

For the record:

The North Central Washington Prescribed Fire Council recognizes the complex nature of managing a multitude of natural resources values including viewshed values to multiple users. ~~We further recognize the need~~ Healthy forests provide clean air, clean water, and quality of life for the residents of Washington, ~~to share these resources with others~~ and to that end we are dedicated. However the categorical inclusion of prescribed burning emissions with automobile and industrial emissions is ~~a huge flaw in~~problematic to the proposed Regional Haze Reduction Policy. To enact ~~S~~such a policy, in fire dependent ecosystems is environmentally, ecologically and economically ~~unsound~~ unattainable and unsustainable.

F~~In f~~ire dependent ecosystems, such as ~~it is a seminal fact that: “No fire. Is not an option”. Therefore the only choices are wildfire or prescribed fire. The health of~~ Eastern Washington’s dry forests characterized by ponderosa pine, are dependent upon frequent, low intensity surface fires. The past~~after~~ 100 years of ~~of~~ unmitigated fire exclusion ~~are in~~have resulted in the serious decline of forest health in these fire adapted systems. These forests, historically sustained by frequent fires, are now being ravaged by insect and disease outbreaks resulting in increased susceptibility to extreme wildfire. Climate change modeling predicts an increase in both the~~ed~~ number~~s~~ and size of wildfires in the future. To continue to ~~the~~ adhere to a failed policy of unmitigated fire suppression/exclusion without actively reducing and restructuring fuels ~~including prescribed burning~~ is recklessness verging on irresponsibility. By default this policy is choosing wildfire over prescribed fire. With prescribed fire 99% of ~~everything is~~ the factors are KNOWN about the event – when, where, how long, how much, and how much it will cost (Planned events, i.e., prescribed burns can be budgeted). Whereas with wildfire 99% of everything is UNKNOWN about the event – when, where, how long, how much and how much it will cost (Unplanned events cannot be budgeted – recent wildfires have cost billions of dollars and ~~more often than not~~frequently cause irrepairable damage to resources ~~is extreme from the fire and from firefighting efforts~~we work to protect.)

Additionally fire and its by-products are essential to the health of fire dependent ecosystems - (See appendix A)

Based on the foregoing in reference to the Regional Haze Reduction Implementation Plan we respectfully submit that prescribed burning be segregated from other “anthropogenic” pollution sources and as such that prescribed burning, and emissions there from, be managed as an ecosystem service that sustains fire dependent ecosystems, reduces negative environmental, ecological~~ and~~ , economic, and social impacts.

Further we request that prescribed burning emissions be considered “natural” emissions. Despite the ignition source, pyrolysis or fire in its natural environment, i.e., fire dependent ecosystems, is a natural process.

North Central Washington Prescribed Fire Council
P.O. Box C
Loomis, WA 98827

Respectfully,

Dale Swedberg, Chair

Appendix A

Benefits of Fire

For the last 100 years there has been much effort of demonization and proclaiming the negative aspects of wildland fire, while there has been little acknowledgement about the numerous benefits and positive aspects of wildland fires, in particular fire dependent ecosystems. Some of these benefits include:

1. **Reduced fuels on the landscape** resulting in:
   a) less severe fire behavior and more easily controlled fires;
   b) reduced ground litter allowing more understory vegetation to grow.

2. **Production of smoke** resulting in:
   a) increased germination of many species of plants that occur in fire dependent or fire-prone ecosystems
   b) can inhibited growth of certain seedlings, e.g., certain weeds

3. **Production of charcoal** that:
   a) enhances and increases the water retention ability of soil
   b) contributes to soil building
   c) can inhibit the germination and/or growth of certain seeds and seedlings, e.g., certain weeds

4. **Releases nutrients tied up in dead vegetation** thus making nutrients available to living and growing vegetation.

5. **Reduces abundance and density of vegetation that uses lots of water** (this vegetation generally increases in the absence of frequent fire) thus contributing to increase surface water flow and recharging of aquifers.

6. **Thins small ponderosa pines** resulting in fewer pines leading to healthier pines that are more resistant to insects, diseases and wildfire.

7. **Maintains a mosaic of plants and plant communities on the landscape in varying stages of succession** thus meeting the needs of a wide diversity of species.

8. **Changes the soil pH to favor fire dependent species** thus perpetuating species that are adapted to a fire environment.

9. **Heat induces germination of seeds of some species** such as *Ceanothus velutinus* also called buckbrush, shiny-leafed Ceanothus or mountain balm, which is a very important winter food for deer. In a food study it was found that *Ceanothus velutinus* comprised over 50% of the diet between October and March. *Ceanothus*

Appendix A

Benefits of Fire

velutinus seed will lay dormant in the soil waiting to be heated up by fire before germinating.

10. **Exposure of mineral soil provides conditions needed by seeds of certain species to germinate such as Western Larch.**

11. **Reduces density and distribution of plant and animal parasites and diseases on the landscape.**

12. **Maintains a healthy functioning ecosystem.**

13. **Rhizomes and roots of some species of plants will lay dormant for up to 100 years waiting for fire to create the conditions for them to send up shoots some of these plants include fire weed and quaking aspen.**

14. **Mountain goats and bighorn sheep prefer open areas to brushy treed areas. These open areas are maintained by frequent fires.**

15. **Regrowth from shrubs and forbs after a fire are highly preferred by big game animals like deer and elk.**

16. **In a fire dependent ecosystem – fire is the force, "the heart beat", that keeps the system functioning.**

17. **Fires provide the "edge effect" that many wildlife species prefer.**

Fore more information about Fire Effects visit:
http://www.fs.fed.us/database/feis/

http://www.tncfire.org/training_usfln_NWfln.htm

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October 4, 2010

Doug Schneider
Washington Department of Ecology
Air Quality Program
P.O. Box 47600
300 Desmond Drive
Lacey, WA 98504-7600

Re: TransAlta Centralia Generation LLC's Comments on Proposed Regional Haze State Implementation Plan

Dear Mr. Schneider:

TransAlta Centralia Generation LLC ("TransAlta") appreciates the opportunity to provide its attached comments on the Department of Ecology's proposed Regional Haze State Implementation Plan ("RH SIP"). The RH SIP reflects a tremendous effort by Ecology personnel over the last few years to develop a State plan to reduce emissions and improve visibility in the national parks and other federal lands of the Northwest. In TransAlta's opinion, the RH SIP that applies to the Centralia Plant complies fully with Federal Clean Air Act requirements.

Our attached comments consist mainly of recommendations to clarify certain aspects of the Centralia Plant BART Order and the RH SIP for the Environmental Protection Agency's review. The most important request we have is that the RH SIP emphasize that the TransAlta BART Order provides "greater reasonable progress" towards the Clean Air Act's goal of natural visibility than would alternative BART determinations. Although the purpose of the Order is to set BART limits for nitrogen oxide emissions, the Order significantly exceeds already established BART limits for SO_2 by incorporating a coal sulfur content limit.

TransAlta

Please contact me or Brian Brazil if you have any questions regarding these comments.

Sincerely,

Lou Florence
President
TransAlta Centralia Generation LLC

cc: Richard DeBolt, Communications and Community Relations Director
Robert Elliott, Director, Southwest Clean Air Agency

TRANSALTA'S COMMENTS ON WASHINGTON DEPARTMENT OF ECOLOGY'S PROPOSED REGIONAL HAZE STATE IMPLEMENTATION PLAN
Submitted 10-4-2010

The Centralia Plant BART Order's Coal Sulfur Content Limit Achieves "Greater Reasonable Progress" than Alternative NOx Controls (SNCR)

The Centralia Plant BART Order sets NOx emission limits based on low NOx Burners (LNB) with Over-Fire Air (OFA), the Flex Fuels Project, and coal content limits for nitrogen and sulfur based on Powder River Basin coal. Based on comments received by the Department of Ecology ("Ecology") during the adoption of the Centralia Plant BART Order, we anticipate that comments will be made on the proposed Regional Haze State Implementation Plan ("RH SIP") that BART for the Centralia Plant requires additional NOx control (SNCR) beyond LNB, OFA and the Flex Fuels Project. In response, it is important to emphasize that the Centralia Plant BART Order's coal sulfur content limit actually achieves "greater reasonable progress" than would the Flex Fuels Project plus SNCR. EPA's regulations authorize BART alternatives that achieve "greater reasonable progress" than BART. Therefore, even assuming that the Centralia Plant's BART limits should be based on the Flex Fuels Project plus SNCR, the Centralia Plant BART Order complies with EPA's regulations as a BART alternative.

Specifically, EPA's regulations allow states to adopt "alternative measures" to BART if they achieve "greater reasonable progress than would be achieved through the installation and operation of BART." *See* 40 CFR 51.308(e)(2). Assuming for the sake of argument that Flex Fuel plus SNCR constitutes BART, the BART Order achieves "greater reasonable progress" than BART, in effect, by setting more stringent conditions on sulfur dioxide emissions than approved as BART in 2003. The resulting sulfur dioxide emission reductions result in greater visibility improvement than the nitrogen oxide reductions that would be achieved by adding SNCR to the BART Order. Therefore, whether the Flex Fuels Project by itself or the Flex Fuels Project plus SNCR is BART, the Centralia Plant's BART Order complies with EPA's Regional Haze Regulations ("RHR") as an "alternative measure."

The federal courts have confirmed EPA's position that the Clean Air Act authorizes BART alternatives that achieve "greater reasonable progress":

> Under the unique circumstances of this case, however, EPA chose not to adopt the emission control limits indicated by BART analysis, but instead to adopt an emission limitations standard that would produce greater visibility improvement at a lower cost. Congress's use of the term "including" in § 7491(b)(2) prior to its listing BART as a method of attaining "reasonable progress" supports EPA's position that it has the discretion to adopt implementation plan provisions other than those

provided by BART analyses in situations where the agency reasonably concludes that more "reasonable progress" will thereby be attained.

Central Arizona Water Conservation Dist. v. U.S. E.P.A., 990 F.2d 1531, 1543 (9th Cir. 1993).

In 1997 the Southwest Clean Air Agency issued the RACT Order to the Centralia Plant setting sulfur dioxide and nitrogen oxide emission limits. In 2003 EPA approved the RACT Order's sulfur dioxide limits as meeting BART requirements. 68 Fed. Reg. 34821 (June 11, 2003). Ecology concurred with EPA's position that the 2003 BART approval means that the current BART determination applies only to NOx. *See* Ecology's BART Determination Support Document for TransAlta Centralia Generation, LLC Power Plant, p. 1 (rev. Apr. 2010) ("Support Document"). This position is consistent with EPA and state regulations that prohibit setting a more stringent BART emission limit for the same pollutant for which BART has been previously set. *See* 40 C.F.R. 51.302(c) (4(v); WAC 173-400-151(4).

In spite of the Agencies' conclusion that the Centralia Plant has met its BART obligations for sulfur dioxide emissions, the Centralia Plant BART Order requires the use of Powder River Basin (PRB) coal and sets PRB-based coal sulfur content limits that Ecology estimates result in a 60 percent reduction of sulfur dioxide emissions from the baseline period. *See* Centralia Plant BART Order, Secs. 1.3, 3, 6; BART Order Support Document, p. 22, 27. The sulfur dioxide reductions resulting from the BART Order exceed the BART limit set in 2003. The BART Order's reductions meet the RHR's requirement for a "demonstration that the emission reductions resulting from the . . . alternative measure will be surplus to those reductions resulting from measures adopted to meet requirements of the CAA [Clean Air Act] as of the baseline date of the SIP." 40 CFR 51.308(e)(2)(iv). Therefore, the coal sulfur content limit may be considered in determining whether the BART Order adopts a BART alternative that achieves "greater reasonable progress" than BART.

To evaluate whether the BART Order qualifies as a BART alternative, the initial question is whether sulfur dioxide emission reductions may be traded for nitrogen oxide reductions. In response to the question whether the RHR allows such interpollutant trading, EPA guidance states that although the RHR does not expressly address interpollutant trading, such trading is allowed as a BART "alternative measure" if it results in "greater reasonable progress": "The regulations , . . do allow States to adopt alternative measures in lieu of BART, so long as the alternative measures provide for greater reasonable progress than would BART." *See* EPA, "Additional Regional Haze Questions" (Aug. 24, 2006) (page 9, question 5, pertinent pages included as Attachment 1).

A BART alternative achieves "greater reasonable progress" through "greater emission reductions" when "the distribution of emissions is not substantially different than under BART. . . ." 40 CFR 51.301(e)(3). For reasons described below, the 2668 lb/hr. reduction in sulfur dioxide emissions from baseline levels[1] is "greater" than the 984 lb/hr. reduction in nitrogen oxides from adding SNCR to the Flex Fuels Project (see Environ, Visibility Modeling for Centralia Power Plant, March 2010, Table 3, included as Attachment 2). In this case, the sulfur dioxide emissions are from the same location as the NOx reductions would be, which meets the requirement that the "distribution" be "not substantially different."

One basis for evaluating whether the sulfur dioxide reductions result in "greater emission reductions" than would nitrogen oxide reductions from SNCR are calculations from the Oregon Department of Environmental Quality's (ODEQ) modeling of visibility improvements at the Mt. Hood Wilderness Area from emission reductions considered for PGE's Boardman Plant. The ODEQ's modeling analysis found that there would be a 0.09 dV improvement per 1000 ton of reductions of sulfur dioxide and a 0.21 dV improvement per 1000 ton of reduction of nitrogen oxides (see letter from National Park Service to ODEQ, January 30, 2009, included as Attachment 3). Based on this 43 percent ratio (SO_2 to NO_x), the 2668 lb/hr reduction of sulfur dioxide would be equivalent to a reduction of 1147 lb/hr of nitrogen oxides. By this measure, the coal sulfur content limit significantly exceeds the "reasonable progress" that would be achieved by a 984 lb/hr reduction from SNCR.

The source apportionment data in Chapters 5 and 8 of the draft RH SIP further support the conclusion that the coal sulfur content requirement achieves greater reasonable progress. Sulfur dioxide contributes significantly more than nitrogen oxide emissions to visibility impairment at Washington Class I areas. For example, IMPROVE monitoring data shows that sulfates make up 46% of the light extinction on the Most Impaired Days at Mt. Rainier National Park compared with only 10% for nitrates (Chap. 8, p. 8-24).

As a conclusive demonstration of "greater reasonable progress," the table below shows that limiting coal sulfur content in conjunction with the Flex Fuels Project improves visibility to virtually the same degree as would the presumptive NOx limit (0.15 lb/mmbtu). The CALPUFF visibility modeling performed by Environ in October 2008 for the Flex Fuels Project assumed baseline coal sulfur content (4522 lbs/hr). The October 2008 modeling included no coal sulfur content condition in any of the control scenarios because it was proposed after the 2008 modeling was completed. The March 2010 modeling incorporated the sulfur content requirement and used an emission factor of 1854 lbs/hr. based on a 59% reduction. (Environ Modeling March 2010, Attachment 2).

[1] Per EPA's and Ecology's BART Guidelines, the baseline for modeling visibility improvement of alternative control technologies is the maximum actual 24-hour emissions rate during 2003 - 2005.

COMPARISON OF VISIBILITY IMPROVEMENT OF BART ORDER WITH PRESUMPTIVE BART LIMIT

	Baseline (max. 24 hr rate from 2003 – 2005)	Flex Fuel w/ baseline coal (2008)	BART Order - Flex Fuel w/ coal sulfur content limit (2010)[2]	Presumptive NOx limit (0.15 lb/mmbtu) w/ baseline coal (2008)
No. of days with change greater than 0.5 dV (MRNP)	505	488	462	455
Yearly predicted change to the 98th% Daily Haze Index	5.489	4.85	4.225	3.958

Based on comments raised during the BART proceeding, another issue may be whether the coal sulfur content limit qualifies as an "alternative" to BART because the primary purpose of converting to 100 percent PRB coal was not to improve visibility. EPA's policy, however, is that whether an emission reduction qualifies as a BART alternative depends on whether "visibility is actually improved more than it would be under BART," not "whether the emission reductions were developed explicitly for visibility. . . ." *See* EPA, "Summary of Comments and Responses on the 2004 and 2001 Proposed Guidelines for Best Available Retrofit Technology (BART) Determinations," Docket No. OAR-2002-0076, p. 260 ("EPA Response to Comments").

In sum, the BART Order Support Document currently references the sulfur content limit as providing visibility benefits beyond those of the NOx limit but does not characterize the sulfur dioxide emission reductions as a BART alternative. However, because the sulfur content limit exceeds BART requirements and has been incorporated in the BART Order, the BART Order qualifies as an "alternative measure." The emission reductions from the sulfur content limit achieve "greater reasonable progress" than would adding SNCR to the Flex Fuels Project (without the content limit) and conclusively counters the argument that BART for the Centralia Plant should include SNCR.

[2] The scenario of Flex Fuels Project plus SNCR with baseline coal has not been modeled. Presumably, the results of such modeling would lie between the Flex Fuel Project with baseline coal and this scenario.

For these reasons, TransAlta requests that Ecology revise the proposed RH SIP and request EPA's approval of the Centralia Plant BART Order on two alternative grounds: First, the BART Order's NOx limits comply with the BART requirement. Second, for the reasons explained above, the BART Order's coal sulfur content limit exceeds the BART requirement for sulfur dioxide and achieves "greater reasonable progress" compared to the nitrogen oxide control scenario of Flex Fuels Project plus SNCR. The BART Order also qualifies for approval as an alternative BART measure.

Remaining Useful Life Assumptions for Centralia Plant Overestimate Cost-Effectiveness of Add-On Controls

The cost-effectiveness of SNCR and SCR in the Centralia Plant BART Order Support Document are based on the assumption of a 15-year remaining useful life for the Centralia Plant (assuming commencement of operation in 2015). The Support Document recognizes that Executive Order 09-05 seeks to cut the Centralia Plant's carbon dioxide emissions by one-half by 2025. TransAlta is actively engaged with the State in developing a transition plan to accomplish this goal and is optimistic that an agreement will be reached. Assuming that an agreement is reached, the remaining useful life will be nine years or less if EPA approves the RH SIP in 2011 and new controls would not be installed and operational until 2016.

Based on the assumption of a nine-year rather than a 15-year useful life, SNCR and SCR become significantly less cost-effective than assumed for the purposes of the current BART determination. This conclusion is implied but not expressly stated in the Support Document. TransAlta requests that the following statement be added to the Support Document: "When an enforceable agreement to implement Executive Order 09-05 is completed, Ecology will update the BART cost-effectiveness analysis. Under an agreement consistent with the Executive Order, SNCR and SCR will be significantly less cost-effective than under the current useful life assumption."

Study of Grand Canyon After Mohave Plant Shutdown Shows No Perceptible Visibility Improvement

Under the BART Guidelines, the CALPUFF model is the primary tool for evaluating visibility improvement from alternative emission reductions. In EPA's review of the BART Order, it should consider the degree of uncertainty inherent in CALPUFF visibility modeling results.

The Mohave Plant had been considered to be one of the most significant contributors to visibility impairment at the Grand Canyon National Park (GCNP). A recent study of visibility improvement at the GCNP resulting from the shutdown of the 1580-MW coal-fired Mohave Generating Station concludes that CALPUFF may overstate the source to receptor impacts of emission reductions from power plants. *See* Terhorst and Berkman, 44 Atmospheric Environment 2534-2531, "Effect of Coal-fired Power Generation on Visibility in a Nearby National Park" (July 2010). Although IMPROVE data showed that sulfate levels dropped following the Plant closure, no statistically significant improvement in visibility resulted. The Study's authors concluded:

> We are thus unable to conclude that the closure improved visibility in the Grand Canyon. Our findings are consistent with, and indeed were predicted by, the results of tracer/receptor analyses performed over the past two decades, which consistently noted low correlation between MPP [Mohave] emissions and GCNP visibility. They stand in contrast to the various atmospheric transport models employed by Project MOHAVE, which predicted that visibility would have improved by 5% or more after the closure.

The Mohave Study supports the view that "real world" data should be considered, as well as CALPUFF modeling results, when determining the significance of the Centralia Plant's contribution to visibility impairment at the Northwest's national parks. As noted above, the source apportionment and other data in Chapters 5 and 8 of the draft RH SIP indicate that even 100 percent reduction of the Centralia Plant's NOx emissions are unlikely to be perceptible.

TransAlta recommends that the Mohave Study be referenced in the RH SIP with the following comment: "The Mohave Study is the only study of the actual visibility impacts of reducing emissions from a major power plant by 100 percent. The Study supports the conclusion that CALPUFF may overstate visibility benefits from emission reductions by the Centralia Plant. The Mohave Study should be a consideration when evaluating the modeled visibility benefits of emission reductions."

Federal Clean Air Act Allows the State to Exercise its Discretion in Making BART Determinations

In a recent letter to the U.S. Environmental Protection Agency (EPA) dated May 20, 2010, the National Parks Conservation Association (NPCA) recommended that EPA "ensure a strong degree of national consistency in determining BART for eligible sources . . . ." It should be recognized that the NPCA's recommendation for national consistency stems from its policy position on BART and the Regional Haze Program and not from Clean Air Act language or legal precedent.

The Federal Clean Air Act provides that BART is "determined by the State." 42 U.S.C. 9659(b)(2)(A). In its response to public comments on the Regional Haze Regulation (RHR), EPA agreed that "flexibility and State discretion are important" in BART determinations. EPA Response to Comments, p. 166.

In a 2002 case, the District of Columbia Circuit Court of Appeals' confirmed that "Congress intended the states to decide which sources impair visibility and what BART controls should apply to those sources." *See American Corn Growers Ass'n v. EPA*, 291 F.3d 1, 8 (D.C. Cir. 2002). The Court further explained that the Clean Air Act gives the states, not the EPA, "broad authority over BART determinations." *Id.* The NPCA's recommendation for EPA to impose "national consistency" is contrary to the Clean Air Act's grant of authority to states to exercise discretion through a balancing of the five statutory considerations for each individual BART source.

TransAlta encourages the Department of Ecology ("Ecology") to respond to the NPCA's letter and state in the RH SIP or a separate letter that the Clean Air Act authorizes the states to exercise their discretion in tailoring BART determinations for individual sources and that "national consistency" should not be a significant factor in EPA's review and approval of the RH SIP.

Attachment 1

Additional Regional Haze Questions
August 24, 2006

Note: The following are questions EPA has received from various States and Regional Planning Organizations (RPOs) related to the submission of regional haze SIPs under the program described by 40 CFR 51.308. This document provides guidance to the State air pollution control agencies and the general public on meeting the regional haze SIP requirements. These requirements can be found in sections 169A and 169B of the Clean Air Act and 40 CFR 51.300-51.309. This document does not substitute for those provisions, nor is it a regulation itself. Thus, it does not impose binding, enforceable requirements on any party, nor does it assure that EPA may approve all instances of its application, and thus the guidance may not apply to a particular situation based upon the circumstances. The EPA and State decision makers retain the discretion to adopt approaches on a case-by-case basis that differ from this guidance where appropriate. Any decisions by EPA regarding a particular SIP demonstration will only be made based on the statute and applicable regulations, and will only be made following notice and opportunity for public review and comment. Therefore, interested parties are free to raise questions and objections about the appropriateness of the application of this guidance to a particular situation; EPA will, and States should, consider whether or not the recommendations in this guidance are appropriate in that situation. This guidance is a living document and may be revised periodically without public notice. The EPA welcomes public comments on this document at any time and will consider those comments in any future revisions of this guidance document.

BART

1. Should a State promulgate a BART rule? Should a State's BART rule declare that VOC (and possibly ammonia) is/are not visibility impairing pollutant(s), or can this declaration be part of the SIP narrative?

   The regional haze rule (RHR) does not require that States promulgate BART rules. States are, however, required under 40 CFR 51.230 to show they have the legal authority to carry out the SIP. To the extent a BART rule can aid in this requirement, then it should be considered. A State's regional haze (RH) SIP submittal must include source-specific BART emission limits and compliance schedules for each source subject to BART. See 40 CFR 51.308(e). All regulatory requirements must be approved into the SIP.

   A State's BART rule should not declare that VOCs or ammonia are not visibility-impairing pollutants unless the State has evidence that VOCs (or ammonia) from its BART-eligible sources are not significant contributors to particle formation. Such a declaration must be substantiated in the SIP documentation. This declaration may be placed in the SIP narrative, which will be approved into the non-regulatory portion of the SIP following an opportunity for public review and comment on the State's conclusion. Furthermore, we recommend that prior to SIP submittal that collaboration between and among States and RPOs and Federal Land Managers (FLMs) occur such that the emissions, use of actual emissions (even double actual emissions) does not necessarily represent this.

18. If a State participates fully in CAIR, and satisfies its BART obligation for EGUs for NOx and SO2, must the PM BART eligibility analysis consider whether all visibility impairing pollutants, summed across a facility, exceed 250 tpy, or must only the PM emissions be considered?

    If at the final step of identifying the emission units that constitute a BART-eligible source, the State finds that a potential BART-eligible source has the potential to emit 250 tpy of *any* visibility-impairing pollutant, then the source is considered BART-eligible. For example, if a potential BART-eligible source has emissions of more than 250 tpy of SO2 and meets the other applicable requirements, then it may be subject to BART review for its emissions of PM. However, if the source's emissions of PM_{10} are less than 15 typ (assuming the State has established a *de minimis* level of 15 tpy), then the source's PM_{10} emissions need not be addressed in a BART determination.

19. An EGU has three boilers: a) coal boiler (5500 mmbtu/hr); and b) two auxilliary boilers (181.6 mmBtu/hr each). The State has determined the coal boiler to meet the first test for BART-eligibility. Since the two auxilliary boilers do not appear to fall under any of the 26 BART categories, would they pass the first test for BART-eligibility because they contribute to the "steam electric plant"?

    As a general matter, all the emission units, including any auxiliary boilers, at a fossil-fuel fired steam electric plant of more than 250 million BTU/hour heat input would be considered part of the same stationary source. Under the RH regulations, BART applies to certain existing stationary sources; stationary sources, in turn, are defined to include "all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control)." 50 CFR 51.301. The regulations further provide that "[p]ollutant-emitting activities must be considered part of the same industrial grouping if they belong to the same Major Group (i.e. which have the same two-digit [SIC] code)." For most plants on the BART list, there will be only one 2-digit SIC code that applies to the entire plant. As you have described the source in your question, the auxilliary boilers would fall within the same 2-digit SIC code as the coal boiler; these units accordingly are part of the same stationary source as the coal boiler.

    Note, however, that if the auxiliary boilers are only used during startup, then since we do not model startup conditions, those boilers would not contribute any emissions to the modeled visibility impact from the source; therefore those particular boilers may be exempted.

Reasonable Progress

1. Is there a metric for determining if controls required for PM2.5, O3, CAIR, or BART are "reasonable" without defining benefit of controls?

Unlike the technical demonstration for CAIR or BART, the reasonable progress demonstration involves a test of a strategy. The strategy includes a suite of controls that has been identified through the identification of pollutants and source categories of pollutants for visibility impairment - the possible controls for these pollutants (and their precursors) and source categories - the application of four statutory factors and how much progress is made with a potential strategy with respect to the glide path. Modeling occurs with a strategy and is not a source-specific demonstration like the BART assessment.

2. How can States demonstrate benefits of controls from a single source for RH without doing single source impact modeling, e.g. CALPUFF?

   Reasonable progress is not required to be demonstrated on a source-by-source basis. It is demonstrated based on a control strategy developed from a suite of controls that has been assessed with the four statutory factors and the uniform rate of progress.

3. What if a State is on the glidepath, but can still install cost effective controls? Is it obligated to install those controls?

   From the preamble to the Regional Haze Rule (64 FR 35732), EPA explained:

   > "If the State determines that the amount of progress identified through the analysis is reasonable based upon the statutory factors, the State should identify this amount of progress as its reasonable progress goal for the first long-term strategy, unless it determines that additional progress beyond this amount is also reasonable. If the State determines that additional progress is reasonable based on the statutory factors, the State should adopt that amount of progress as its goal for the first long-term strategy.

   The statutory factors must be applied before determining whether given emission reduction measures are reasonable. For example, even if emissions reductions from one source category are projected to be enough to achieve the uniform rate of progress towards natural background in 60 years, States should not forego an analysis of what degradation is being caused by pollutants from other source categories, or what improvements could be made by controlling them.

4. A. What type of demonstration is acceptable to justify a reasonable progress goal (RPG) that is less than the glidepath? B. What if controls needed for other programs (e.g., PM2.5, ozone, CAIR) are installed?

   A. If after applying the four statutory reasonable progress factors, the rate of visibility improvement is still less than the uniform glide path, States may adopt the calculated RPGs, provided that they explain in the SIP how achieving the uniform glide path is not reasonable based on the application of the factors. States must demonstrate why the slower rate is reasonable, and state the projected date for achieving natural background under this alternative rate of progress.

B. Existing controls that are installed as a result of other existing CAA programs can contribute to a State's ability to satisfy its RPG. However, the statutory factors must be applied before determining whether given emission reduction measures are reasonable. In particular, the State should adopt a rate of progress greater than the glidepath if this is found to be reasonable according to the statutory factors. See in particular the directive in the preamble to the RHR at 64 FR 35732.

5. Can a source commit to extra control of one visibility-impairing pollutant in exchange for doing less to control a less significant pollutant (inter-pollutant trading)?

The regulations require the States to adopt measures that will make reasonable progress toward the national goal. States have the flexibility in developing these measures to focus on those pollutants that have the most significant impact on visibility. A State could conclude that after application of the four statutory reasonable progress factors, it is "reasonable" to control one pollutant to a higher level than another pollutant.

In the context of BART, the RHR does not provide for inter-pollutant trading where the source is installing controls based on the State's BART determination. The regulations, however, do allow States to adopt alternative measures in lieu of BART, so long as the alternative measures provides for greater reasonable progress than would BART. Inter-pollutant trading is not allowed in a trading program alternative to BART, -- see 64 FR at 35743.

In addition, States may allow sources to "average" emissions across any set of BART-eligible emission units within a fenceline, so long as the emission reductions from each pollutant being controlled for BART would be equal to those reductions that would be obtained by simply controlling each of the BART-eligible units that constitute BART-eligible source (70 FR 39172).

Coordination with RPOs, States, and FLMs

1. What are EPA's expectations and the basis for consultation requirements regarding formal consultative procedures? What constitutes effective FLM communication? Can it be assumed that if the FLM attends the RPO meetings and calls and doesn't raise any concerns it has no problems with a State's SIP?

40 CFR 51.308(i) requires that States consult with FLMs before adopting and submitting their RH SIPs. These requirements are summarized as follows:

States must provide the FLM an opportunity for consultation, in person and at least 60 days prior to holding any public hearing on the SIP. The State must also provide the opportunity for the FLMs to discuss their: (i) assessment of impairment of visibility in any Class I area; and, (ii) recommendations on the

Attachment 2

ENVIRON

VISIBILITY MODELING FOR CENTRALIA POWER PLANT

COMPARISON OF FLEX FUEL AND FLEX FUEL WITH SNCR

March 2010

TABLE 1

BASELINE (2003-2005) 24-HOUR MAXIMUM EMISSION RATES

Year	NOx (lb/hr)		SO_2 (lb/hr)		PM_{10} (lb/hr)	
	Unit 1	Unit 2	Unit 1	Unit 2	Unit 1	Unit 2
2003	2,474	2,293	1,898	1,783	91	57
2004	2,440	2,510	2,062	2,460	91	90
2005	2,415	2,496	740	1,135	98	144
Max Rate Used	2,474	2,510	2,062	2,460	98	144
Date of Max	02/28/03	06/17/04	10/13/04	10/13/04	12/16/05	7/12/05
MMBtu/hr on Max day	8,201	8,198	7,516	7,295	8,175	8,461
lb/MMBtu on Max Day	0.302	0.306	0.274	0.337	0.012	0.017

TABLE 2

BART NOX EMISSION RATES

Case	Emission Factor (lb/MMBtu)	Heat Demand (MMBtu/hr)	Unit 1 NOx (lb/hr)	Unit 2 NOx (lb/hr)
Flex Fuels	0.240	8,200	1,968	1,968
Flex Fuels w SNCR [1]	0.180	8,200	1,476	1,476

1. NOx emission rate for "Flex Fuels w SNCR" case is based on 75% of Flex Fuels case.

TABLE 3

BART EMISSION RATES BY CASE, TOTAL FOR BOTH UNITS

Case	NOx (lb/hr)	SO_2 (lb/hr)	PM_{10} (lb/hr)
Baseline [1]	4,984	4,522	242
Flex Fuels [2]	3,936	1,854	242
Flex Fuels w SNCR [2]	2,952	1,854	242

1. Maximum actual 24-hour emissions during 2003-2005.
2. Flex Fuel SO_2 emissions based on the ratio of sulfur in Jacobs Ranch coal to Centralia Mine coal (41%) times the 2003-2005 maximum 24-hour rate of 4,522 lb/hr. NOx emissions reduced by 25% for SNCR.

TABLE 4
STACK PARAMETERS

Case	Stack Location xlcc (km) [1]	Stack Location ylcc (km) [1]	Base Elevation (m) [2]	Stack Height (m)	Diameter (m)	Velocity (m/s)	Temperature (K)
All	-136.702	-239.551	108.6	143.3	12.82 [3]	15.0 [4]	332.3 [4]

1 Lambert Conic Conformal (LCC) coordinates with reference Latitude 49 North and reference Longitude 121 West.

2 Source elevation based on bilinear interpolation of the 4-km mesh size terrain used by CALMET

3 The units were simulated as a release from a single stack. The two stacks are next to one another and the flows were combined using an equivalent diameter calculated from the combined area of the two stacks

4 Velocity and temperature are based on the average measured data from 2003-2005

TABLE 5
PM10 SPECIATION

Case	$(NH_4)_2SO_4$	NH_4NO_3	OC	PMC	PMF	EC
Baseline [1]	22.68%	0.00%	5.67%	39.81%	30.67%	1.18%
Flex Fuels [1]	22.68%	0.00%	5.67%	39.81%	30.67%	1.18%
Flex Fuels w SNCR [1]	22.68%	0.00%	5.67%	39.81%	30.67%	1.18%

1. NPS PM_{10} profile for Dry Bottom Boiler burning pulverized coal with FGD and ESP assuming a sulfur content of 0.92%, an ash content of 14.9%, and a heat content of 7,961 Btu/lb

TABLE 6

CALPUFF EMISSION RATES, TOTAL FOR BOTH UNITS

	Maximum 24-hour Emission Rates (lb/hr)								
Case	SO_2	SO_4	NOx	HNO_3	NO_3	OC [1]	PMC	PMF	EC
Baseline	4,522.0	40.0	4,984.0	0.0	0.0	13.7	96.4	74.3	2.9
Flex Fuels	1,854.0	40.0	3,936.0	0.0	0.0	13.7	96.4	74.3	2.9
Flex Fuels w SNCR	1,854.0	40.0	2,952.0	0.0	0.0	13.7	96.4	74.3	2.9

1. OC emissions were actually labeled secondary organic aerosols (SOA) in the CALPUFF input files to facilitate post-processing with CALPOST. This assumes all OC emitted forms SOA with the same molecular weight.

TABLE 7

NUMBER OF DAYS WITH PREDICTED CHANGE TO THE HAZE INDEX GREATER THAN 0.5 DECIVIEWS

		Number of Days in 2003-2005 with Delta HI > 0.5 dv		
Area of Interest	**Period**	**Baseline**	**Flex Fuels**	**Flex Fuels w SNCR**
Alpine Lakes Wilderness	2003-2005	432	361	323
Glacier Peak Wilderness	2003-2005	275	202	168
Goat Rocks Wilderness	2003-2005	414	354	318
Mt. Adams Wilderness	2003-2005	329	271	241
Mt. Hood Wilderness	2003-2005	224	176	147
Mt. Jefferson Wilderness	2003-2005	130	89	77
Mt. Rainier National Park	2003-2005	505	462	428
Mt. Washington Wilderness	2003-2005	101	63	45
N. Cascades National Park	2003-2005	206	137	103
Olympic National Park	2003-2005	254	216	199
Pasayten Wilderness	2003-2005	141	82	55
Three Sisters Wilderness	2003-2005	105	68	51
CRGNSA	2003-2005	245	173	140
Overall	Min	101	63	45
	Mean	259	204	177
	Max	505	462	428

TABLE 8

PREDICTED CHANGE TO THE 98TH PERCENTILE DAILY HAZE INDEX FOR 2003-2005

		98th Percentile Daily Delta HI (dv) [1]		
Area of Interest	**Period**	**Baseline**	**Flex Fuels**	**Flex Fuels w SNCR**
Alpine Lakes Wilderness	2003-2005	4.346	2.994	2.598
Glacier Peak Wilderness	2003-2005	2.622	1.905	1.532
Goat Rocks Wilderness	2003-2005	4.286	3.180	2.637
Mt. Adams Wilderness	2003-2005	3.628	2.591	2.147
Mt. Hood Wilderness	2003-2005	2.830	1.997	1.665
Mt. Jefferson Wilderness	2003-2005	1.888	1.267	1.053
Mt. Rainier National Park	2003-2005	5.489	4.225	3.501
Mt. Washington Wilderness	2003-2005	1.414	0.872	0.737
N. Cascades National Park	2003-2005	2.212	1.486	1.228
Olympic National Park	2003-2005	4.024	2.991	2.486
Pasayten Wilderness	2003-2005	1.482	0.999	0.822
Three Sisters Wilderness	2003-2005	1.538	0.993	0.819
CRGNSA	2003-2005	2.353	1.657	1.378
Overall	Min	1.414	0.872	0.737
	Mean	2.932	2.089	1.739
	Max	5.489	4.225	3.501

1. Based on the 22nd highest on a Class I area basis

TABLE 9

YEARLY PREDICTED CHANGE TO THE 98TH PERCENTILE DAILY HAZE INDEX

		98th Percentile Delta HI (dv) [1]		
Area of Interest	**Year**	**Baseline**	**Flex Fuels**	**Flex Fuels w SNCR**
Alpine Lakes Wilderness	2003	3.599	2.490	2.092
	2004	4.871	3.564	2.949
	2005	3.856	2.841	2.306
Glacier Peak Wilderness	2003	2.070	1.399	1.153
	2004	3.615	2.403	2.049
	2005	2.554	1.857	1.525
Goat Rocks Wilderness	2003	4.207	3.002	2.440
	2004	4.993	3.676	3.069
	2005	3.826	2.815	2.308
Mt. Adams Wilderness	2003	3.667	2.646	2.194
	2004	3.628	2.591	2.128
	2005	3.379	2.543	2.096
Mt. Hood Wilderness	2003	2.773	1.939	1.586
	2004	3.471	2.346	1.978
	2005	2.159	1.470	1.225
Mt. Jefferson Wilderness	2003	1.570	1.059	0.867
	2004	2.079	1.399	1.150
	2005	1.182	0.813	0.656
Mt. Rainier National Park	2003	5.552	4.318	3.606
	2004	5.447	4.252	3.573
	2005	5.373	4.092	3.401

1. Based on the 8th highest on a Class I area basis

TABLE 9 (Continued)

YEARLY PREDICTED CHANGE TO THE 98TH PERCENTILE DAILY HAZE INDEX

		98th Percentile Delta HI (dv) [1]		
Area of Interest	**Year**	**Baseline**	**Flex Fuels**	**Flex Fuels w SNCR**
Mt. Washington Wilderness	2003	1.374	0.925	0.755
	2004	2.027	1.323	1.106
	2005	0.945	0.594	0.485
N. Cascades National Park	2003	1.557	1.172	0.935
	2004	2.821	1.852	1.570
	2005	1.811	1.373	1.084
Olympic National Park	2003	3.848	2.824	2.432
	2004	4.645	3.192	2.695
	2005	3.629	2.734	2.214
Pasayten Wilderness	2003	1.131	0.767	0.618
	2004	1.954	1.287	1.075
	2005	1.172	0.771	0.622
Three Sisters Wilderness	2003	1.538	0.993	0.807
	2004	2.172	1.333	1.139
	2005	1.071	0.651	0.553
CRGNSA	2003	2.431	1.699	1.411
	2004	2.545	1.748	1.446
	2005	1.714	1.259	1.013
Overall	Min	0.945	0.594	0.485
	Mean	2.878	2.052	1.700
	Max	5.552	4.318	3.606

1. Based on the 8th highest on a Class I area basis

Attachment 3

United States Department of the Interior
NATIONAL PARK SERVICE
Air Resources Division
P.O. Box 25287
Denver, CO 80225

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:

January 30, 2009

N3615 (2350)

David Collier
Air Quality Planning Manager
Oregon Department of Environmental Quality
811 SW Sixth Avenue
Portland, Oregon 97204-1390

Dear Mr. Collier:

We are concerned that the Oregon Department of Environmental Quality (ODEQ) is considering revising its proposal to reduce fine particulate matter (PM_{10}), sulfur dioxide (SO_2), and nitrogen oxides (NO_x) emitted by Portland General Electric's (PGE) Boardman Plant (Boardman). The plant is located within 300 km of 14 Class I areas, including Mount Rainier and North Cascades National Parks (which are Class I areas administered by the National Park Service--NPS). Modeling analyses have shown that the plant causes visibility impairment in all 14 Class I areas within 300 km of the plant; this represents the greatest magnitude and extent of visibility impairment we have seen to date from any single source subject to Best Available Retrofit Technology (BART). Our continued review of the ODEQ proposal now leads us to believe that, if any changes should be made, they should lower the proposed limits on SO_2, NO_X, and PM_{10} and expedite their application.

In the enclosed Technical Support Document, we address the following issues in greater detail, but provide these summaries for your initial review.

Cost-Effectiveness Metrics

ODEQ has relied primarily upon PGE's cost estimates (instead of those lower estimates produced by ODEQ's consultant) in deriving the cost-per-ton ($/ton) of pollutant removed and the incremental cost for the control strategies it evaluated. While this $/ton approach is recommended by the EPA BART Guidelines, it is important that the costs be substantiated, the emission reductions be reasonably estimated, and the results placed into the proper perspective.

Cost analyses should follow the EPA BART Guidelines and make greater use of EPA's Office of Air Quality Planning & Standards (OAQPS) Control Cost Manual (Cost Manual) and vendor quotes and estimates. Instead, PGE has used a mix of various costing methods, as well as unsupported estimates. While we agree with PGE that inflation must be a factor, we have been advised by EPA OAQPS that this factor should be based upon the Chemical

Engineering cost indices, which we have incorporated into our analyses. We also agree that the costs of major capital projects had been increasing rapidly (although that may have changed with the recent global recession), but inflation is an issue faced by all major industries and should not become an excuse for inaction.

We also believe that the cost-per-deciview of visibility improvement ($/dv) metric can be an appropriate tool to evaluate the costs and benefits of reducing emissions from a source that is relatively close to one or more Class I areas. And, we emphasize that BART is not necessarily the most cost-effective solution. Instead, it represents a broad consideration of technical, economic, energy, and environmental (including visibility improvement) factors.

Visibility Improvement Metrics

BART is unique in that it incorporates an environmental benefit component, visibility improvement, into the analysis. While we commend ODEQ for presenting data on the cumulative impacts and benefits of the control strategies it evaluated, ODEQ has not described how it used that information. BART is much more than a simple $/ton technological exercise, and greater emphasis should be placed upon addressing visibility improvement.

We suggest that ODEQ review its dispersion modeling results to asses the relative effectiveness of reducing SO_2 versus NO_x at the Boardman site. Our analysis of the ODEQ modeling results leads us to conclude that it is much more effective to reduce NO_x there than SO_2. (Of course, we support reductions in all pollutants.) As we will show, **ODEQ has proposed SO_2 scrubbing as BART, but rejected Selective Catalytic Reduction (SCR), even though addition of SCR would yield greater visibility improvements at a lower annual cost and a lower cost per deciview of improvement.**

SO_2 BART

ODEQ has proposed that SO_2 BART at Boardman is a 30-day rolling average limit of 0.12 lb/mmBtu based upon application of Semi-Dry Flue Gas Desulfurization (SDFGD). **ODEQ has estimated that its SO_2 BART proposal would cost $36.6 million per year,** and reduce SO_2 emissions by 11,988 tons per year (tpy). **ODEQ placed great weight on the calculated $3,055/ton of this strategy.** ODEQ further estimates that this reduction in SO_2 emissions would result in a 1.04 dv improvement in visibility at Mt. Hood, and a cumulative improvement of 10.59 dv summed across all 14 Class I areas. (ODEQ's modeling analysis showed that, for every 1,000 tons of SO_2 reduced, visibility at Mt. Hood would improve by 0.09 dv, and by 0.88 dv across all of the Class I areas.) **The cost/dv of improvement was $35 million at Mt. Hood and $3.5 million across all 14 class I areas.**

NO_x BART

ODEQ has proposed that NO_x BART at Boardman is a 30-day rolling average limit of 0.28 lb/mmBtu based upon a combination of Low-NO_x Burners (LNB) and Modified Over-Fire Air (MOFA). ODEQ has estimated that its NO_x BART proposal would cost $3.7 million per year, and reduce NO_x emissions by 4,756 tpy. ODEQ placed great weight on the calculated $782/ton of this strategy. ODEQ further estimates that this reduction in NO_x emissions would result in a 0.58 deciview dv improvement in visibility at Mt. Hood, and a cumulative improvement of 4.62 dv summed across all 14 Class I areas. The cost/dv of improvement was $6 million at Mt. Hood and $0.8 million across all 14 class I areas.

ODEQ has rejected addition of SCR to the combination of LNB and MOFA on the basis of cost. **ODEQ has estimated that this NO_x BART strategy would cost $26.8 million per year,** and reduce NO_x emissions by 8,647 tpy. **ODEQ placed great weight on the calculated $3,096/ton of this strategy.** ODEQ further estimates that this reduction in NO_x emissions would result in a 1.84 deciview dv improvement in visibility at Mt. Hood, and a cumulative improvement of 12.31 dv summed across all 14 Class I areas. (ODEQ's modeling analysis showed that, for every 1,000 tons of NO_x reduced, visibility at Mt. Hood would improve by 0.21 dv, and by 1.42 dv across all of the Class I areas.) **The cost/dv of improvement was $15 million at Mt. Hood and $2.2 million across all 14 class I areas.**

Although the cost of adding SCR to the combined NO_x control system results in greater costs than the LNB+MOFA strategy proposed by ODEQ as BART, **the resulting NO_x BART strategy would yield greater visibility improvement at a lower annual cost and a lower cost per deciview of improvement than proposed by ODEQ for its SO_2 BART strategy. Based upon ODEQ's own data (as shown its Table 24), a combination of LNB+MOFA+SCR is more cost-effective and produces greater visibility improvement than the strategy ODEQ has proposed for SO_2, and should therefore be accepted as BART for NO_x.**

We look forward to working with the OR DEQ as this process advances, and we commend the department for its proposal. We believe that good communication and sharing of information will help expedite this process, and suggest that you contact Don Shepherd (don_shepherd@nps.gov, 303-969-2075) or Elizabeth Waddell (elizabeth_waddell@nps.gov, 206-220-4287) if you have any questions or comments.

Sincerely,

John Bunyak

John Bunyak
Chief, Policy, Planning and Permit Review Branch

Enclosures

cc:
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U.S. EPA, Region 10
1200 Sixth Avenue Suite 900
Seattle, Washington 98101

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September 27, 2010

Mr. Doug Schneider
Washington Dept. of Ecology
Air Quality Program
P.O. Box 47600
Olympia, WA 98504-7600

Re: Regional Haze SIP

Dear Mr. Schneider:

I am writing on behalf of Port Townsend Paper Corporation (PTPC) to comment on Washington's proposed Regional Haze SIP. The SIP includes Best Available Retrofit Technology (BART) orders for several industrial sources, including PTPC. Our company has no objection to the limits imposed on our BART-eligible process units by Order No. 7839. We appreciate Ecology's careful review of PTPC's BART engineering report.

Ecology's proposal to submit Order No. 7839 for incorporation into the SIP presents an operating flexibility concern for PTPC. As you know, the amendment of any element of a SIP requires multiple layers of state and federal administrative review, a process typically measured in years. To stay in business, however, PTPC must continually invest in process improvements to our mill. Those improvements include more efficient control technologies, reduced emissions and improved monitoring methods. Improved monitoring methods typically will supplant those specified in an existing air order. Monitoring also may change because EPA adopted an NSPS update, or because EPA disapproved a monitoring method developed by Ecology to satisfy an EPA requirement. In its current form, however, Order No. 7839 would require continued use of obsolete monitoring methods incorporated by reference in the order, even where new equipment, new requirements or new monitoring methods provide more accurate information about the compliance status of an emissions unit.

Let me offer a tangible example of the problem described above. Conditions 1 through 3 of Order No. 7389 incorporate by reference emission limits and monitoring methods contained in the August 2006 version of Order No. 2892-05AQ. In April 2010 Ecology revised this order in ways that change the monitoring requirements for several BART-eligible process units. Among other changes, Ecology repealed a fuel sulfur monitoring condition for Power Boiler # 10 to which EPA objected. The 2010 order states: "With issuance of this First Modification of Order No. 2892-05AQ, the conditions of . . . the original Order No. 2892-04AQ are no longer applicable." Unfortunately, that statement would not be true if Ecology incorporates the 2006 version of the Order into the SIP. PTPC would be directed to monitor NSPS Subpart D SO_2 emission limits from PB#10 using fuel receipts, even though EPA objected to that method and Ecology eliminated it from the 2010 version of the Order.

Example #2 -- Conditions A.1b and A.6 of Table 1 of the 2006 Order direct PTPC to monitor compliance with the PB #10 grain loading limit by monitoring process parameters from the wet scrubber serving that unit. Since that time, PTPC has proposed to retrofit PB #10 as a cogeneration facility, to install an ESP to further reduce particulate emissions, and to install a continuous emission monitor on the new ESP. *See* Proposed NOC Order No. 7850. The BART Order would force PTPC to continue monitoring process parameters from the wet scrubber, even though those parameters will no longer indicate the PM emission rate from PB#10 and the cogen project approval order imposes a more accurate monitoring scheme.

PTPC asks Ecology to revise Order No. 7839 to build some monitoring flexibility into the order, so that the deletion of obsolete monitoring methods does not require a SIP amendment. We do not propose that Ecology should give itself authority to weaken the monitoring requirements for BART-eligible process units. We seek only to give Ecology the flexibility to approve changes that maintain or enhance the stringency of the monitoring, without amending the SIP.

We are filing with this letter a proposed redline of Order No. 7389 that makes two changes. First, we propose to cross-reference the current 2010 version of Order No. 2892-05AQ, rather than the 2006 version. Second, we propose to add a condition that would authorize Ecology, by regulatory order, to revise monitoring, reporting and recordkeeping methods specified in Order No. 7389, "provided that the revised monitoring, reporting or recordkeeping method provides equal or better information on the compliance status of the source or emission unit subject to the monitoring."

The new paragraph would give Ecology the ability to update monitoring methods without a SIP amendment, while providing assurance that this authority could not be used to increase emissions. This kind of flexibility is essential to accommodate the investments and process upgrades that must occur if PTPC is to remain a competitive business in the global economy.

Please call if I can provide any additional background on the revisions proposed in this letter.

Sincerely-

E. Muehlethaler

Eveleen Muehlethaler
Port Townsend Paper Corporation
100 Mill Road
Port Townsend, WA 98368
(360) 379-2112
eveleenm@ptpc.com

Enclosures

Cc: Alan Newman (Ecology)
Marc Heffner (Ecology)
Roger Loney (PTPC)
Annika Wallendahl (PTPC)
Matt Cohen (Stoel Rives)

DRAFT ORDER WITH PTPC SUGGESTED CHANGES
STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

IN THE MATTER OF AN ADMINISTRATIVE ORDER AGAINST:	]	ORDER NO. 7839
Port Townsend Paper Corporation	]	

TO: Roger Loney
Port Townsend Paper Corporation
P.O. Box 3170
100 Paper Mill Hill Road
Port Townsend, WA 98368

This is an Administrative Order requiring your company to comply with WAC 173-400-151 by taking the actions that are described below. Chapter 70.94 RCW authorizes the Washington State Department of Ecology's Air Quality Program (Ecology) to issue Administrative Orders to require compliance with the requirements of Chapter 70.94 RCW and regulations issued to implement it.

Ecology has determined that portions of your facility are subject to the provisions of the federal and state visibility protection program (WAC 173-400-151 and 40 CFR Part 51, Subpart P). The rules require that the State determine what technologies and level of emission control constitutes Best Available Retrofit Technology (BART) for the eligible emission units at your facility.

FINDINGS

A. The Port Townsend Paper Corporation (PTPC) is a Kraft pulp and paper mill subject to BART.

B. The BART-eligible emission units at PTPC are the Recovery Furnace, the Smelt Dissolving Tank, the No. 10 Power Boiler, and the Lime Kiln.

C. Emissions from BART units are controlled by:

   a. Use of an electrostatic precipitator (ESP) to control PM/PM_{10} emissions from the non-direct contact evaporator (NDCE) Recovery Furnace.

   b. Use of a wet scrubber to control PM/PM_{10} and SO_2 emissions from the Smelt Dissolving Tank.

c. Use of a multiclone and wet scrubber for control of PM/PM_{10} emissions from the No. 10 Power Boiler.

d. Use of a wet venturi scrubber to control PM/PM_{10} and SO_2 emissions from the Lime Kiln.

D. Ecology has determined that the emission controls currently installed at PTPC meet the requirements of BART.

E. Ecology has determined that PTPC has met the requirements of Administrative Order No. #5072, First Amendment, which required submittal of a BART Technical Analysis for the PTPC facility.

Additional information and analysis is available in the BART Determination Support Document for Port Townsend Paper Corporation, Port Townsend, Washington, by the Washington State Department of Ecology, October 2008, and the Best Available Retrofit Technology Applicability Analysis and Determination Report for Port Townsend Paper Corporation, Port Townsend, WA, prepared by Trinity Consultants on behalf of Port Townsend Paper Corporation, December 2007.

YOU ARE ORDERED: To operate existing emission control equipment for the Recovery Furnace, Smelt Dissolver Tank, Lime Kiln, and No. 10 Power Boiler in accordance with the following conditions:

1. BART Emission Limitations

1.1. Meet the emission limitations for particulate matter, nitrogen oxides, and sulfur dioxide found in Order DE 05AQIS-2892, issued to the Port Townsend Paper Corporation on April 20, 2010 by the Washington State Department of Ecology's Industrial Section.

Deleted: August 10, 2006

1.2. Meet the SO_2 and NO_X limitations in PSD-I issued June 1, 1984.

1.3. Compliance will be determined as specified in Order DE 05AQIS-2892.

2. Schedule for Compliance

2.1. Compliance with the emission limitations for particulate matter, nitrogen oxides, and
sulfur dioxide is required upon the effective date of this Order.

3. Monitoring and Recordkeeping Requirements

3.1. Monitoring and recordkeeping requirements for particulate matter, nitrogen oxides, and sulfur dioxide are contained in Order No. DE 05AQIS-2892.

4. Reporting Requirements

   4.1. Reporting requirements for particulate matter, nitrogen oxides, and sulfur dioxide are contained in Order No. DE 05AQIS-2892.

5. Ecology may, by regulatory order, revise the monitoring, reporting and recordkeeping requirements specified in this order, provided that the revised monitoring, reporting or recordkeeping methods provide equal or better information on the compliance status of the source or emission unit subject to the monitoring.

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Failure to comply with this Order may result in the issuance of civil penalties or other actions, whether administrative or judicial, to enforce the terms of this Order.

You have a right to appeal this Order. To appeal you must:

- File your appeal with the Pollution Control Hearing Board within 30 days of the "date of receipt" of this document. Filing means actual receipt by the Board during regular office hours.
- Serve your appeal on the Department of Ecology within 30 days of the "date of receipt" of this document. Service may be accomplished by any of the procedures identified in WAC 371-08-305(10). "Date of receipt" is defined at RCW 43.21B.001(2).

If you appeal you must:

- Include a copy of this document with your Notice of Appeal.
- Serve and file your appeal in paper form; electronic copies are not accepted.

To file your appeal with the Pollution Control Hearing Board:

Mail appeal to:		Deliver your appeal in person to:
The Pollution Control Hearings Board P.O. Box 40903 Olympia, WA 98504-0903	OR	The Pollution Control Hearings Board 4224–6th Avenue SE Rowe Six, Bldg 2 Lacey, WA 98503

To serve your appeal on the Department of Ecology:

Mail appeal to:		Deliver your appeal in person to:
The Department of Ecology Appeals Coordinator P.O. Box 47608 Olympia, WA 98504-7608	OR	The Department of Ecology Appeals Coordinator 300 Desmond Drive SE Lacey, WA 98503

And send a copy of your appeal packet to:

Alan Newman
Department of Ecology
Air Quality Program
P. O. Box 47600
Olympia, WA 98504-7600

For additional information, go to the Environmental Hearings Office website at http://www.eho.wa.gov.

To find laws and agency rules, go to the Washington State Legislator website at http://www1.leg.wa.gov/CodeReviser.

Your appeal alone will not stay the effectiveness of this Order. Stay requests must be submitted in accordance with RCW 43.21B.320. These procedures are consistent with Chapter 43.21B RCW.

DATED this ___ day of ______, 200__ at Olympia, Washington.

____
Jeff Johnston, Ph.D.
Manager, Science and Engineering Section
Department of Ecology
Air Quality Program

70185041.3 0052782-00001

September 1, 2010

Washington Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Doug Schneider:

This should be a simple fix:

1) Slash burning is CARCINOGENIC!
2) Washington State is a "smoke-free" state.

Having said that, Washington State just came through a progressive and uncontrolled building of homes. To do that, every developer pushed the envelope on clearing the land to build the homes. In upper Kittitas County, in 2007, we suffered from an abundance of smoke admitting brush fires. I have enclosed a CD with pictures taken during this explosion of housing.

First the fires burned during winter, spring and fall, day and night, seven days a week. One of the burns was directly across from our home and in the direct flow of smoke from windy conditions. For the first time in my life, I suffered with continual sneezing, coughing and wheezing. Luckily working with my doctor, we could manage to get some control of the problem and I could resume my life.

I did some research and found out that to burn slash, a person could get a fire permit from three different departments, two of where were the Forest Service and Dept. of Ecology. These permits were not coordinated or followed up on. So I began to complain to the Dept of Ecology in Yakima. I watched one slash burn pile grow to the size of a three-story apartment house. First I was told that he could not burn on the weekend, and must finish burning by 3:00 p.m. My comment to that was, he will start on Saturday and then he can burn all weekend, day and night because no one will check during the weekend.

I complained long enough, loud enough and with enough pictures of actuals that he had to bring in major equipment, picked up the entire pile and moved it down wind of me (and in someone else's wind) and burned that gigantic pile, finishing before 3:00 p.m. on Friday. The special effort and extra cost to him was substantial I am sure. Luckily, all of the expansion has stopped because of the down turn in the economy and loss of home building including the planned homes across from me.

My degree is in Construction and I spent 30 years working on various sites, including Terminal 18 Redevelopment. I also know that one of the best ways to help with haze-reduction is to have controls on slash burning. This includes the burns allowed by the Forest Service in the national parks. The carcinogenic smoke settles in Cle Elum's and

Roslyn's valley and will not dissipate before the "forest fires" begin in August and September. We have our air polluted for the whole spring, summer and fall. Our children, elderly and everyone are suffering with breathing difficulties.

My elderly father lived in McCleary and McCleary had smoke. It is not "haze", it is smoke. I grew up in Grays Harbor County that had "haze" when one of the lumber companies burned slash. We all hated the slash burning because we had health issues and missed our few days of sun that would be covered by smoke.

My husband and I have a chipper. We chip our slash after the winter winds. We have watched one of the developer's parade his gigantic chipper in our 4th of July parade. The developers could have chipped all the slash and return it to the forest floor. Builders, developers, Forest Service, and Parks Services should be required to chip slash not burn it off.

And before you begin to say "no more wood stoves", I will tell you that I use one during the winter and I grew up with wood stoves burning. I never suffered from it's effects because we use seasoned wood. It is the burning of slash that pollutes the air and causes health issues. We need to become a true SMOKE FREE STATE!

Sincerely,

Sharon J. Robertson

Sharon J. Robertson
P.O. Box 24
410 Canyon Heights Drive
Cle Elum, WA 98922

206-714-6091

Pictures:

March 1, 2007 – Pictures taken from inside our home during the night.
May 8, 2007 - Piles of slash being piled up, directly across from our home.
May 12, 2007 - Smoke accumulation from developer's slash burn.
October 13, 2007 - View of smoke traveling up our road and circling above our home.

Comparisons of pictures taken in 04, 05, and 06 of a Kiwanis children's fishing derby with the same camera. It includes other pictures that show the sky as it was when we moved to this home and as it is today. .

Sharon Robertson
PO Box 24
Cle Elum, WA 98922

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Doug Schneider
Washington Dept. of Ecology
PO Box 47600
Olympia, WA 98504-7600

Cheryl McEvoy

To:	AQComments@ecy.wa.gov
Cc:	rose.keith@epa.gov; Janette Brimmer; Kevin Regan
Subject:	Washington Proposed Regional Haze State Implementation Plan Comments by National Parks Conservation Association, Sierra Club, and Northwest Environmental Defense Center
Attachments:	Comment Letter on Proposed Haze State Implementation Plan 10-5-10.pdf; Index to Exhibits on WA Regional Haze Plan.pdf

Dear Mr. Schneider:

Attached please find Earthjustice comments on behalf of National Parks Conservation Association, Sierra Club, and Northwest Environmental Defense Center regarding the proposed Regional Haze State Implementation Plan. I have also attached our index of exhibits to the comment letter, and am sending you those exhibits on CD by overnight mail.

Please do not hesitate to contact Janette Brimmer should you have any questions.

Thank you.

Cheryl McEvoy, Assistant to
Janette K. Brimmer
Earthjustice
jbrimmer@earthjustice.org
Counsel for Conservation Organizations
National Parks Conservation Association, Sierra Club, and
Northwest Enviornmental Defense Center

Comment Letter on Proposed Haz...   Index to Exhibits on WA Region...

Cheryl McEvoy
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F: 206-343-1526
www.earthjustice.org

Because the earth needs a good lawyer

10/5/10

To: Doug Schneider ~ DOE
RE: Regional Haze Reduction Plan
Public Testimony

USA's Air & Water are cleanest they have been in 60 years.

USA has many rules and regulations to maintain this status. Instead of more regulations we need to relax the ones we have.

USA is competing economically against China, India and the 3rd World all are bigger polluters than USA. One more regulation will further hobble and handicap us.

The Air on the Olympic Peninsula comes from overseas as our global wind is Northeastern predominantly westward. Regulating the Haze in the ONP, the Olympic National Park by punitive measures on the Peninsula citizens is contrary to the State Constitution.

Wood and Biomass are abundant on the Olympic Peninsula. To restrict the use of these resources in the face of rising energy costs is contrary to the best interest of our citizens, unconstitutional.

Rising

more to follow...

Karl Spees

Karl E. Spees M. D.
763 Strait View Dr.
Port Angeles, WA 98362


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USA 37
3c USA
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Tiffany Lamp
USA 1c
Doug Schneider
DOE - WA
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Olympia, WA
98504

Lynn D. Westfall
Senior Vice President,
External Affairs and Chief Economist

October 1, 2010

TESORO

Tesoro Companies, Inc.
19100 Ridgewood Parkway
San Antonio, TX 78259
210 626 4697
210 626 4018 Fax

Mr. Doug Schneider
Department of Ecology
Air Quality Program
P.O. Box 47600
Lacey, WA 98504-7600

Sent via Email: AQcomments@ecy.wa.gov

Re: Tesoro Refining and Marketing Company Comments on the Proposed Washington State Regional Haze State Implementation Plan (SIP)

Dear Mr. Schneider:

Tesoro Refining and Marketing Company (Tesoro) has reviewed the Proposed Regional Haze State Implementation Plan (Regional Haze SIP) information posted on the Washington State Department of Ecology's (Ecology's) website.[1] Based upon this review, Tesoro is providing the following comments and requested corrections.

Chapter 9, Section 9.2.2, Table 9-2 & Page 9-13, 2nd Paragraph – The table and paragraph notes that Tesoro has installed a "Wet Gas Scrubber (WGS)" and a "Flue Gas Scrubber (FGS)" on the Catalytic Cracking Unit (CCU), in addition to a Sulfur Recovery Unit (SRU). Tesoro installed a WGS in 2005; however, there was not an additional FGS installed on the CCU as noted in these sections. In addition, while Tesoro made changes to the refinery in 2007 to allow for additional H_2S treatment and handling, an SRU was not installed as noted in these sections.

Chapter 11, Section 11.4.2, Table 11-4 – For the Tesoro row within this table, the *"# of Units Subject to BART"* column should reflect fourteen (14) emission units.

In addition, Tesoro questions the need for the data presented in the *"Maximum dv impact on any one day in a 3 year period"* column of this table. The appropriate modeling result for comparison to the visibility impact contribution threshold is the 98th percentile value in the 3 year modeling period. The 98th percentile result is used because of the recognition that modeling results often produce higher "spikes," that are often data anomalies. Therefore, providing maximum visibility impact value in this table most likely represents and overestimation of the visibility impact and is the result of a modeling data anomaly.

Chapter 11, Section 11.5.2, 2nd Paragraph – The first sentence of this paragraph states the following:

[1] Located at: http://www.ecy.wa.gov/programs/air/globalwarm_RegHaze/RH_SIP/RH_SIP_Document_Table.pdf

Page 2

> *"Due to time needed for the design approval process and the major maintenance cycle at the refinery, Tesoro does not plan to replace the other two heaters until 2018."*

During the Best Available Retrofit Technology (BART) process, it was determined that NO_x reductions will be required for one process heater (F-103) at the Tesoro refinery. The installation of NO_x controls on certain other emissions units was determined to not constitute BART because the reductions could not be achieved within the required BART timeline. It is assumed that this sentence is referencing this BART conclusion; however, Tesoro requests the language of this paragraph to be changed to the following:

> *"Due to **the** time needed for the design approval process and the major maintenance cycle at the refinery, **the installation of NO_x controls on other emission units was determined to not be required as BART. This determination** is detailed in the Technical Support Document for the TESORO BART Determination in Appendix L."*

Chapter 11, Section 11.5.2, 5th Paragraph, 2nd & 3rd Sentences – Tesoro requests that these sentences be replaced with the following language in order to reflect the appropriate averaging periods of the refinery fuel gas sulfur limits:

> *"A new refinery gas hydrogen sulfide (H_2S) content limitation reduced the allowable H_2S content to 1,000 ppm (365-day rolling average) from the previous 10,000 ppm (hourly average) level, and required installation of a continuous refinery gas hydrogen sulfide continuous emission monitoring system. The refinery gas system modifications reduced the typical actual daily average H_2S content of the refinery gas to 70 – 100 ppm from over 2,000 ppm previously."*

Chapter 11, Section 11.5.2, Table 11-13 – This table does not accurately demonstrate the reductions Tesoro has (or will) achieve through the BART process. It appears this table was derived from data presented in Tesoro's BART visibility modeling report. The modeling analysis was developed at the beginning of the BART review process and does not reflect the final BART determination. In addition, the annual emission estimates in this table appear to be based upon the maximum short-term emissions for each pollutant and assuming that maximum amount is emitted every day for a year. It was appropriate to use a maximum short-term emission rate for the purpose of performing visibility modeling because the impact thresholds were based upon a 24-hour average. However, using this maximum short-term data to reflect annual emissions from the refinery is not appropriate and greatly overestimates emissions.

Tesoro suggests that Ecology delete Table 11-13. However if Ecology elects to maintain a tabulated comparison of emissions, Tesoro requests to work together with Ecology prior to the Regional Haze SIP being finalized to discuss the best method to represent a comparison. After this discussion and if needed, Tesoro can provide an updated Table 11-13 that more accurately reflects the expected refinery emission reductions due to the BART process.

Chapter 11, Section 11.6, Tables 11-16 & 11-17 – The columns in these tables that represent data from Tesoro's BART visibility modeling analysis contains a footnote that states the following:

> *"Includes effect of proposed reasonable progress limits"*

Tesoro has not agreed to any limits beyond what it reflected in the final BART Regulatory Order. In addition, there are no other limits proposed to be placed on Tesoro in the Regional Haze SIP. Therefore, to accurately represent the current status, this footnote reference must be removed from the table.

Appendix F, Page 2, Table 1 – Chapter 9 of the proposed Regional Haze SIP document (see Page 9-10 and Table 9-2) notes that the Western Regional Air Partnership's (WRAP's) 2018 projected SO_2 emission inventories do not reflect a significant amount of additional point source SO_2 emission reductions identified by Ecology. For example, WRAP projected a 360 ton/year decrease in SO_2 emissions in 2018, and Ecology's analysis shows a 9,826 ton/year decrease in SO_2 emissions. It is unclear if the Table 1 data reflects this discrepancy. Tesoro requests that this table either be updated to account for this difference or a footnote be added to note that the data presented is based upon higher than expected future SO_2 emission estimates.

Appendix F, Page 13, Table 6 – Ecology has indicated several times in the Regional Haze SIP document that Appendix F is setting the stage for future Reasonably Available Control Technology (RACT) determinations. Therefore, Tesoro is concerned that the information presented in this table will be used for future RACT determinations, but contains pollution control cost information that is not accurate. For SO_2 reductions from refinery process heaters, Table 6 reflects a cost/ton reduced range of $1,300 - $1,700. It appears that this range was taken from a WRAP technology study. The ability or reasonableness to install additional refinery gas sulfur reduction or possibly SO_2 controls is refinery specific, and costs vary significantly. For example, Tesoro has previously determined through the BART review process that any significant and reliable additional reductions in H_2S content of the refinery fuel gas would require the installation of an SRU, at an estimated cost of approximately $14,000 - $16,000/ton reduced. This cost estimate was even considered conservatively low because it did not consider the annual operating costs of a new SRU.

As another example, Table 6 represents a cost/ton of Selective Non-Catalytic Reduction (SNCR) to be $890 - $5,200. Tesoro has determined through a detailed technical evaluation and the cost/ton to adding SNCR to a process heater can be at least $18,000/ton.

Because the data in this table is setting the stage for possible future RACT determinations, Tesoro requests that the cost/ton information be removed since the costs of control technology evaluations can vary significantly depending upon the site specific application.

Appendix F, Page 14, Last Paragraph, Last Sentence – Tesoro requests that this sentence be updated to reflect that Tesoro installed a Wet Gas Scrubber in 2005 as well. The sentence should be updated as follows:

> *The Shell **and Tesoro refineries** installed SO_2 reduction technology on **their** FCCU/CO **boilers** in 2005 to comply with the MACT requirements for FCCU catalyst regenerators.*

Appendix F, Page 15, Table 7 – As noted above, Ecology has indicated several times in the Regional Haze SIP document that Appendix F is setting the stage for future RACT determinations. Therefore, Tesoro is concerned that the information presented in this table will be used for future RACT determinations, but is reflecting pollution control cost information that may not be accurate. For NO_x reductions from FCCU/CO boiler systems using a LoTOx technology, Table 7 reflects a cost/ton reduced range of $1,700 - $2,000. Tesoro considers this range of estimates to vastly underestimate the cost of installing LoTOx. Tesoro has previously determined through the BART review process that installation of a LoTOx system on the refinery's FCCU would cost at least $15,000/ton NO_x reduced. Because the data in this table is setting the stage for possible future RACT determinations, Tesoro requests that the cost/ton information be removed since the costs of control technology evaluations can vary significantly depending upon the site specific application.

Tesoro appreciates the opportunity to review and comment on the Proposed Regional Haze State Implementation Plan. Please contact Rebecca Spurling at (360) 293-1664 with any questions or if you require additional information.

Sincerely,

Lynn D. Westfall

Lynn D. Westfall
Senior Vice President
External Affairs and Chief Economist

cc: Rebecca Spurling
Chris Drechsel
Rob Gronewold

TESORO

Tesoro Companies, Inc.
19100 Ridgewood Parkway
San Antonio, TX 78259

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Mr. Doug Schneider
Department of Ecology
Air Quality Program
P.O. Box 47600
Lacey, WA 98504-7600

19 HRCSN31 98504

August 30th
Final December 2010
2010

To: Doug Schneider
To: Jeff Johnson Dept of Ecology
Air Quality Program

Hello Mister Johnson, we spoke on the phone Mon August 30th. Thank you for returning my call.

I am just an American willing to help. I'am just shy of being a hillbilly. But not so shy to speak up, and be counted as a pioneer on the road to cleaner air.

To reach me in person and to help with my dream, and turn it into reality.

Your article counts 156 forest. Nice testing and proving grounds. As I live very near the Olympic Rain Forest up here in Port Ageles. WA.

My Address: 3045 Obrien Rd.
Port Angeles, WA. 98362
My Phone # 360-797-4230

I am 52 yrs old, disabled by Degenerative Bone Desiese. Making time of the essense!

This plan will require scientific technology's. Be ready for one of the biggest job's anyone can be part of! "Team Clean Air"

Sincerely Robert Peterson ROBERT PETERSON

August 30th 2010
Final December 2010

To

Dept. of Ecology Air Quality Program

"THE EARTH IS A CONFINED SPACE"
MEANING: ANY SPACE HAVING A
LIMITED MEANS OF EGRESS WHICH IS
SUBJECT TO THE ACCUMULATION OF
TOXIC OR FLAMMABLE CONTAMINENTS
OF AN OXYGEN DEFICIENT ATMOSPHERE.

SOMEBODY'S ARE MISSING THE POINT

Point Being: SURVIVAL OF THE HUMAN RACE!
AS VISIBILTY DON'T MEAN SQUAT IF.
There is no one around To notice
Beleive it OR not!
TECHNOLOGY Today is so Good This
PROJECT is Ready To Be STARTED
: MONEY :
ENVIROMENTAL money
Smog credits - POLLUTOR'S
and so called Air Pollution Control Groups.
They Alone could Pay For A
World Wide Effort To clean our Air
And PUT many many People To work.
IF Greed Can Be Put Aside This
Could Also Be Key To World Peace

I HAVE DRAWINGS AND A PLAN!
I WAS A MACHINIST FOR 10 yrs
2 yr Degree AAS Applied Science
A LABOROR FOR 10 yrs
AND A Need To help SAVE our (HUMAN) RACE
From AIRBORNE TOXENS, AND Low Visibility

ROBERT PETERSON
TEAM CLEAN AIR
3045 obrien Rd.
PORT ANGELES, WA.
98362

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Sent to Cle Elum Tribune

I would like to thank the Cle Elum Ranger District for informing us that in September, they will once again burn 800 acres and slash piles throughout the district, with smoke visible from HW 97, I-90 and the Kittitas Valley.

They will monitor fuel conditions, smoke analysis and risk assessment with a contingency plan in case conditions change unexpectedly. This requires "Fire Managers" and specialist to monitor the burns. I am sure the "Pay Grade" required is far above what would be needed to hire someone to put all the downed trees, limbs etc. in a chipper. The chips could then be returned to the forest floor to be devoured by the forest eco system. But then we tax payers have deep pockets.

In addition to spending my tax dollars on this worthy effort to protect my home, I can once again get my supply of doctor prescribed nose spray, over the counter anti-histamine, vitamins and herbs which come to about $20.00 a month. In addition I can crank up my infra-red sauna, air purifier and anything else that will stave off the "second-hand" smoke from this burn. Luckily, I am not asthmatic yet.

I really appreciate the effort being made to protect my home and property at the expense of my health. It seems that having the "no smoking" cigarette ban in effect, the controls on purchases of home wood burning stoves and mission control for our cars do not apply to the practice of slash burning. What's it going to take? More laws, fines, or policies that we all hate but are necessary to protect us from the affects of what we, tax payers allow done to our environment with our money.

P.S. Comments are sought on state haze-reduction plan by the State Department of Ecology, to reduce pollution that causes haze (smoke?) on federal lands and 156 national parks. This has reduced views from 140 miles to 35 miles which can damage plants, and degrade water quality in streams and lakes. Many of the same pollutants that impact visibility also harm people, contributing to heart and lung problems. The Doe is seeking comments at a public hearing at 6 p.m., Sept. 28 at DOE head quarters, 300 Desmond Drive S.E., Lacy or you can mail to Doug Schneider, Washington Department of Ecology, P.O. Box 47600, Olympia, 98504-7600; e-mail at Aqcomments@ecy.wa.gov.

Sharon Robertson
September 13, 2010

Fall burning may begin in Cle Elum Ranger District

CLE ELUM - Fall prescribed burn activities planned for the Cle Elum Ranger District could begin as early as mid September, weather permitting.

Fire managers plan to treat approximately 800 acres using low intensity fire to reduce down and dead fuels to help the forest better withstand future wildfires, to improve protection of adjacent lands located within the wildland urban interface area and to enhance forest health and forage conditions for wildlife.

The treatment area is located north of Ellensburg and east of Highway 97 in the vicinity of First Creek and Reecer Creek. Smoke will likely be visible from Highway 97, I-90 and the Kittitas Valley.

Fire managers also plan to burn piles in many areas of the district. "Piles are a result of previous fuels reduction projects" said Kimiko Nalle, fuels technician for the Cle Elum Ranger District. "We will be burning piles in the vicinity of Liberty, Hurley Creek, Drop Creek, Osborne Point, several areas in the Taneum and Roaring Creek," Nalle said.

"As with any prescribed fire, a number of criteria must be met before burning can occur. Expected fire behavior, weather data, ground fuel conditions, smoke analysis, and risk assessment must be considered. There is also a contingency plan with staffing in place should the conditions change unexpectedly and the fire needs immediate suppression."

The Forest Service will continue to work with our regulatory partners in order to monitor the weather and seasonal factors that affect smoke production from prescribed burning. Fire managers understand the concerns that accompany smoke emissions from prescribed burns and, seek to minimize the impacts of smoke, while balancing the need to accomplish burning to reduce the impact of future wildland fire.

Prescribed burns may impact travel on forest roads. Warning signs will be placed along roadways before entering burn areas to advise and alert the public of prescribed burn activity.

For more info, please call the Cle Elum Ranger Station 509-852-1100.

Ms. Sharon Robertson
PO Box 24
Cle Elum, WA 98922

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Doug Schneider
Washington Dept. of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Coal in Washington State

What are the consequences of burning coal?

- American coal-fired power plants release one and a half billion tons of carbon dioxide into the atmosphere each year. Coal is a leading source of global greenhouse gas emissions.
- The average coal plant creates 170 pounds of mercury. Just a small fraction of a teaspoon of mercury can contaminate a lake and make fish dangerous for human consumption. Mercury also causes neurological disorders and birth defects.
- A single coal operation can produce over 190,000 tons of toxic sludge. Three-quarters of all sludge is placed in unmonitored landfills.

What about coal in Washington?

- Washington's only coal plant, owned by the Canadian company TransAlta, is the single largest emitter of greenhouse gases in the state, producing as much carbon pollution as every car, truck and van on the road in King, Yakima, Garfield, Columbia, and Lincoln Counties combined.
- The TransAlta plant is the number one source of mercury pollution in Washington, and produces 2.3 million tons of toxic coal ash waste.
- Burning coal at the TransAlta plant causes $11.2 million in annual health care costs from sulfur dioxide, nitrogen and other particulates.
- The TransAlta coal plant violates state and federal Clean Air requirements by spewing haze-causing pollution that affects 12 national parks and wilderness areas (including Mt. Rainier) and ranks third-worst in the nation for visibility impairment.
- The Northwest Power and Conservation Council, which includes Washington State, stated in their recent 6th power plan that we can move beyond coal and meet most of our growing energy needs through energy efficiency and renewable resources.
- By conserving power and increasing investments in clean energy, Washington can move beyond coal while decreasing monthly electricity bills.

What can we do? We need to show public support for moving Washington beyond coal!

- Our elected officials need to know that there is public support for moving Washington beyond coal. **Call the Washington State Legislative Hotline (1-800-562-6000) and ask your legislators to end the tax loophole and other dirty deals for TransAlta**, the Canadian company that is the biggest contributor to climate and mercury pollution in our state. Hotline operators can tell you who your legislators are based on your mailing address.

- **Show a movie about coal, such as *Coal Country*** (*www.coalcountrythemovie.com*) or ***Fighting Goliath/Covenant*** (*www.fightinggoliathfilm.com*) at your congregation and host a discussion about stewardship of creation. You can check out these movies for free from Earth Ministry/Washington Interfaith Power & Light's resource library at The Episcopal Center, 1551 10th Ave E, Seattle, WA 98102. Call (206) 325-4200 x2043 for more information.

Our resource collection holds over 200 books, videos and curricula addressing faith and ecology. Books and videos can be mailed on loan to anyone in the United States. *http://earthministry.org/resources/suggested-publications/resource-collection.*

Join Earth Ministry/Washington Interfaith Power & Light in moving Washington Beyond Coal!

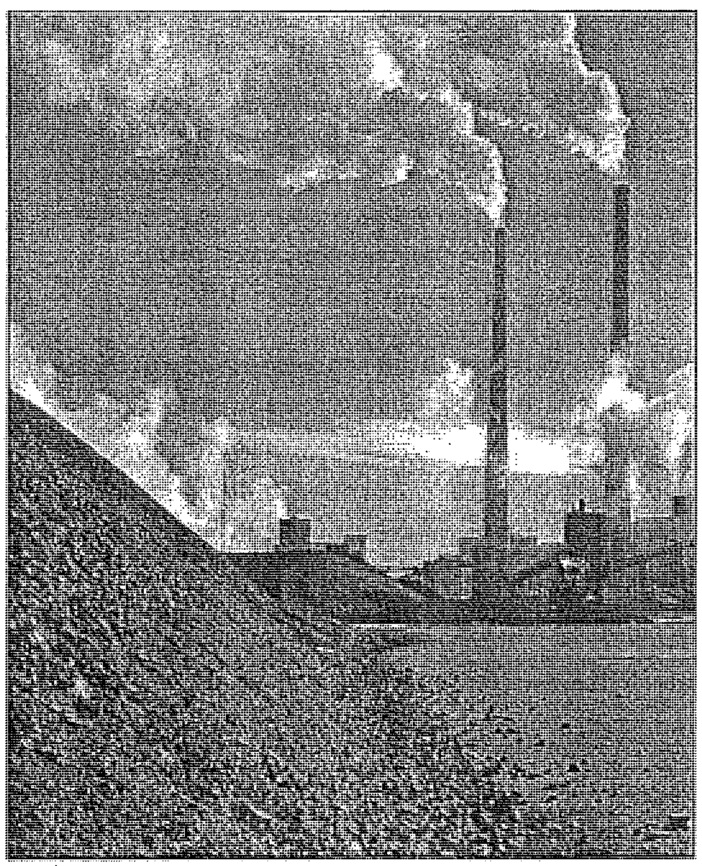
Final December 2010

Why Faith Communities are moving Beyond Coal

God gave us a beautiful creation, a gift of love beyond our human ability to understand and fully appreciate. The responsibility of humans to care and protect this great gift is central to all the many faith traditions of our land. Some religions call it stewardship, the obligation to till and keep the Earth. Others consider the obligation to care for creation as part of humanity's covenant with the Creator.

All faiths teach that we have a responsibility to care for the poor and most vulnerable, the least of these among our human and natural communities. All of God's children deserve enough to eat, clean water to drink, and safe air to breathe. We are called to take this responsibility seriously and work for justice while caring for the common good.

Coal-fired power production runs counter to these deeply held religious values.



Coal destroys creation. Coal is a dirty and damaging source of energy. Mountaintop removal mining has already contaminated 2,000 miles of rivers and destroyed more than 700,000 acres of forest. Coal burning darkens skies around the world. It pollutes water, contaminates fish, and rains sulfuric acid on our forests – all while leaving a legacy of toxic waste. Coal ash, one of the byproducts of coal burning, is a toxic substance that is often stored in retaining ponds where it can contaminate ground water.

Coal is damaging to human life. Every step of the coal-fired process is dangerous to human health, from mining and processing to burning and storage of waste ash. Those most often impacted by these dangerous processes are the most vulnerable members of our communities: the poor, the elderly, and children. The connection between coal plant pollution and asthma is clear and convincing.

More silent but more terrible are the effects of mercury from coal plants – these toxins are known to cause neurological damage in babies and children. Coal burning is linked to the leading causes of death in the United States: heart disease, cancer, stroke, and chronic lower respiratory diseases.

Coal burning is poor stewardship. Cleaner alternatives to coal-fired power plants already exist. Energy conservation alone would eliminate the need for a coal plant in Washington state, and renewable energy from wind and solar power, new ways to store power, and smarter electricity grids all make coal obsolete. When faced with these sustainable and affordable alternatives, continuing to burn coal is poor stewardship.

Coal is an enemy of the common good. The worst effects of coal-fired pollution are yet to be seen. The impacts of climate change are just being felt and will intensify over time. We are called to work for generational justice and to leave a better legacy for our children. The first step will be moving beyond coal.

Earth Ministry/Washington Interfaith Power & Light • 6512 23rd Ave NW, Suite 317 • Seattle, WA 98117
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FRIDAY, APRIL 10, 2009

Final December 2010

The Seattle Times

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Move Washington beyond coal

BY DAN RITZMAN AND LEEANNE BERES
Special to The Times

IN the fight against global warming, all eyes are currently on Gov. Chris Gregoire and the proposed deal with TransAlta, the multinational corporation that operates the Centralia coal-fired power plant. We applaud Gov. Gregoire's leadership on curbing climate change, pushing for a strong renewable energy standard and putting a cap on carbon emissions. Now it's time to address one of our state's dirtiest polluters, the coal plant in our backyard.

Washington state can continue to be a leader in clean energy and conservation. But scientists recommend that we need to take aggressive action quickly, within the next decade, to cut pollution and that includes the state's coal pollution. Religious communities are united in their call to protect human health and air quality in our state. Together, we call on Gregoire to stand up for cleaner energy options like wind and solar power and energy efficiency.

We support the governor's call to action, as she stated in her recent Seattle Times opinion piece ["Positioning Washington for climate leadership," April 7]: "By acting now, we will declare our energy independence and create job growth that the world will envy. When this recession ends, Washington must be ready to take new, bold steps to address climate change. We can't let fear drive us into inaction that we and future generations will regret."

In that spirit, we call for meaningful carbon reductions now, and that starts with ending our reliance on coal, a dirty and outdated power source. Burning coal creates more global-warming pollution than any other fixed energy source, releasing toxins into our air, water and communities, especially Mount Rainier National Park. Coal-fired power plants, our dirtiest energy source, make up 17 percent of our state's energy mix.

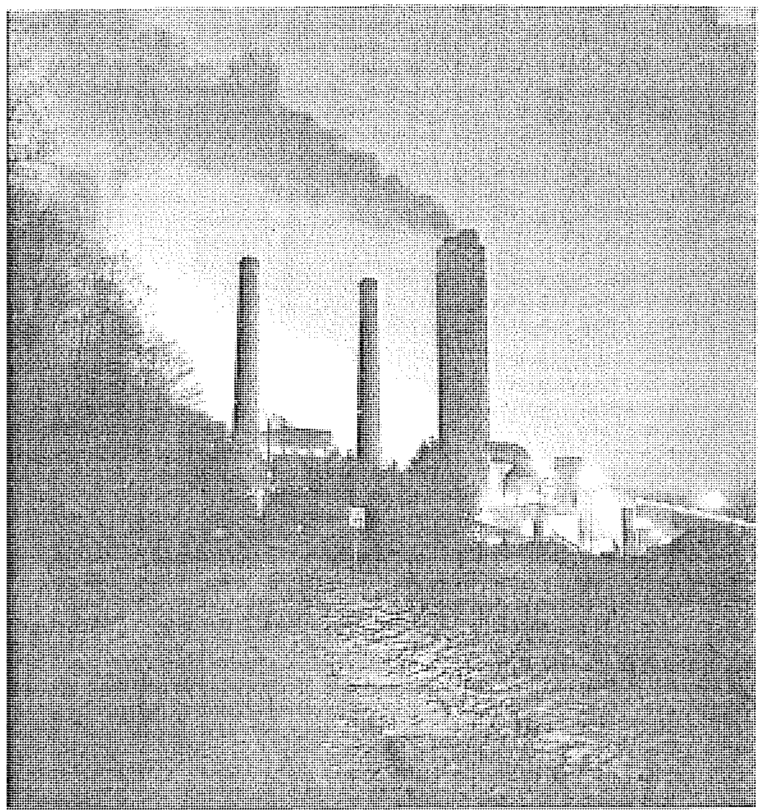
There is a growing consensus among religious leaders that climate change is the most important moral issue of this generation. Every major religion has a statement on climate change calling for immediate action to reverse its ill effects. People of faith have an obligation to our children and future generations to solve global warming, and the first step is reducing our dependence on fossil fuels and coal.

If we allow human-caused environmental disasters like climate change to destroy ecosystems and cause our human brothers and sisters to lose their homes or means to feed themselves, we have truly failed to love our neighbors as ourselves. There is a saying in the faith community: "If you love the Creator, love Creation."

TransAlta's plant spews 1.4 million tons of toxic waste a year and is the state's largest single-point emitter of global-warming pollution. Now, this multinational corporation wants a deal that would allow it to keep spewing toxins into our air and water without even dealing with the global-warming pollution. It would weaken standards for nitrogen oxide, which creates haze, destroying the pristine beauty of Mount Rainier National Park.

The deal would also fail to establish any enforceable standards for mercury, a toxic substance that pollutes our air and water, causing heart disease in adults and brain damage and mental retardation in unborn children and infants.

We call on the governor to provide for an open, public forum to discuss the TransAlta plant's role in meeting our climate-change goals before signing any agreements. She should continue to protect public health and the environment by toughening clean-air standards and creating a plan to move Washington beyond coal by 2018.



STEVE RINGMAN / THE SEATTLE TIMI

TransAlta has reached a tentative agreement with the state to continue operating the Centralia coal-fired power plant.

We can all work together to invest in new clean-energy sources within the state to meet our rising demand for electricity and to stimulate the economy by creating quality jobs for thousands across the state and especially for affected workers in Centralia. Gov. Gregoire, help lead us to this ambitious vision by creating a road map to move Washington beyond coal by 2018.

Dan Ritzman, left, is Western director of the Beyond Coal Campaign for the Sierra Club. LeeAnne Beres is executive director of Earth Ministry/Washington Interfaith Power & Light which engages the religious community in environmental stewardship.

MONDAY, SEPTEMBER 28, 2009

The Seattle Times

Final December 2010

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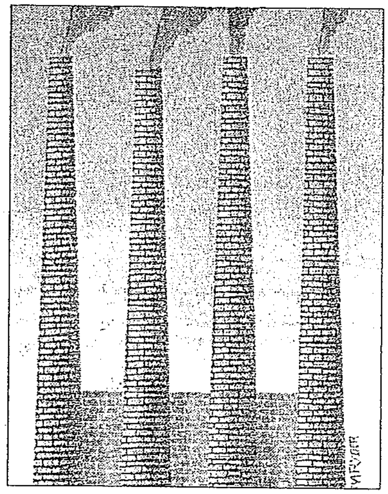
It's time to shut down Northwest coal plants

BY LEEANNE BERES
AND SARA PATTON
Special to The Times

A DRAFT 20-year power and conservation plan from the Northwest's official power-planning agency contains several groundbreaking provisions, including a call to meet virtually all new electric demand with clean energy. But the plan would not reduce the region's greenhouse-gas emissions at all, and fails to address closure of the coal plants that produce almost all of the power system's climate pollution.

The Northwest Power and Conservation Council's Sixth Plan, once final, will tell the Bonneville Power Administration, and thus the public utilities it directly serves, which resources it should use to satisfy electric demand. Investor-owned utilities will see it as a benchmark for their decisions.

In many ways, the draft plan offers exactly what clean-energy proponents have sought for decades: a call for utilities to use new energy efficiency and renewable energy to meet rising electricity needs. The draft prescribes 5,800 average megawatts of conservation and 1,800 average MW of new renewables by 2030. (For comparison, Seattle City Light customers use around 1,100 on average each year.) The plan would not increase the electric system's carbon-dioxide emissions. Tom Karier, one of Washington's representatives on the Council, deserves special credit for pushing the council so far.



M. RYDER / OP ART

Times, however, have changed. Today we face the reality of a global warming that threatens the very foundations of society and steadily worsens as greenhouse gases continue to spew from power plants stacks and vehicle tailpipes. From a moral and ethical perspective, it is simply unacceptable to allow this change in our climate to continue unchecked.

Simply stabilizing CO_2 emissions ignores the moral imperative to start cutting current emissions now. Washington, Oregon and Montana already have committed to 15-percent reductions by 2020, but the draft plan will not help the region achieve these emission-reduction goals.

Coal is the critical issue. We often forget that despite all our hydropower, the Northwest gets nearly a quarter of its electricity from dirty coal plants. Those plants now account for nearly 90 percent of the power system's global-warming emissions. We cannot possibly meet our climate responsibilities without ending our dependence on coal, a dirty and outdated power source. It is time to step up to the plate and shut down Northwest coal plants.

Although the council can't order the closure of coal plants, it can and should explicitly accept the necessity of phasing out coal. It can tell utilities to start planning for and working toward that goal. And it can do what its governing federal statute says it must do: fully factor environmental costs into its resource recommendations.

Council members should incorporate the supporting analyses done by their own staff into the final plan. These analyses include a finding that shedding coal power would have relatively minor rate impacts.

We have more than enough bill-cutting energy efficiency and affordable new renewable energy resources in our region to meet growing needs, save endangered salmon from looming extinction, phase out coal, and start electrifying transportation — all the while creating good, local, family-wage jobs and accelerating economic recovery.

The new draft Northwest and Conservation Plan is good, as far as it goes. But we must go farther, faster, and commit to phasing out dirty coal plants. Council members need to hear that message at the public hearings now being held throughout the region. Seattle's is Wednesday.

Public involvement is critical if the final plan is to satisfy Northwest needs and values.


LeeAnne Beres, left, is executive director of Earth Ministry.
Sara Patton is executive director of the NW Energy Coalition.

Earth Ministry

Faith-Based Environmental Stewardship

Earth Ministry is a vital organization with a positive vision, competent and energetic leadership, and the experience to lead all of us to care for creation, wherever we may live.

-Rev. Dave Brauer-Rieke, Lutheran Bishop
Oregon Synod, ELCA

Final December 2010

About Earth Ministry

Earth Ministry engages the Christian community in environmental stewardship. We work in partnership with individuals and congregations to respond to this great moral challenge through education, modeling sustainable lifestyle choices, and organizing for social change through environmental advocacy.

Founded in 1992, Earth Ministry has a history of leading the way in caring for the environment from a religious perspective. We support a growing network of congregations and have a national membership. While Earth Ministry is rooted in the Christian tradition, we actively engage all religious communities on climate and energy issues through Washington Interfaith Power & Light. Our programs and resources are available to all.

www.earthministry.org

Earth Ministry
6512 23rd Ave NW, Suite 317
Seattle, WA 98117
(206) 632-2426
emoffice@earthministry.org

Special thanks to the Edwards Mother Earth Foundation for financial support of this brochure.

Individuals and Families

Inspiration & Transformation

The Christian tradition calls us to be good stewards of the garden. Earth Ministry transforms hearts and minds and provides practical resources for living more sustainably.

We do this by:

- Maintaining a **resource library** full of creation care books, curricula, videos and games for adults, children and youth
- Offering **concrete ideas** for how to make homes and lives more eco-friendly
- Helping people to connect with God in nature by providing **outdoor experiences** such as field trips, reflective hikes, and habitat restoration projects
- Hosting **inspirational events** such as our annual Celebration of St. Francis, noted speakers, film screenings, worship services, and more

Congregations

Education & Action

Congregations flourish when members work together on a shared mission. Earth Ministry assists congregations with integrating creation care into all aspects of church life.

We do this by:

- **Speaking, teaching, and preaching** in member congregations around Washington State
- Creating **worship aids** to integrate creation care into religious services and educational curricula
- Providing **advice and guidance** for congregational green teams implementing sustainable practices
- Sharing **success stories** of faithful environmental stewardship in congregations around the country
- Honoring churchwide creation care commitments through our **Greening Congregations Program**

© Tim McGuire

Clergy and Lay Leaders

Empowerment & Engagement

Clergy and lay leaders are at the heart of creation care efforts. Earth Ministry informs religious leaders of the latest teachings and opportunities to put faith into action.

We do this by:

• Offering **religious perspectives on important environmental issues** such as climate & energy, water, food & farming, toxics & environmental health, transportation, and sustainable living

• Leading **adult education workshops** in churches

• Providing ideas and resources for **creation care litanies, hymns, prayers, scripture, and sermons**

• Preparing clergy and lay leaders to **speak knowledgeably on environmental issues** in their congregations, in public meetings, and in the press

All Christians

Faithful Advocacy

Christians have a responsibility to speak up on important state and national public policy decisions. Earth Ministry trains faithful citizens to become effective advocates for the Earth.

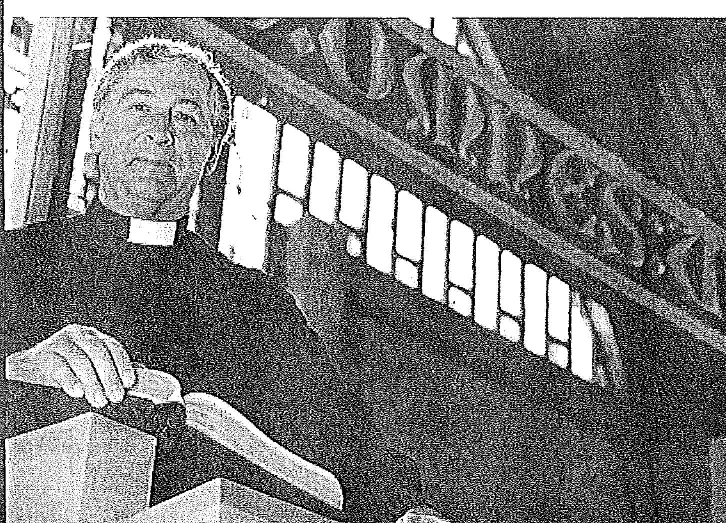
We do this by:

• Educating Christians about the **religious basis behind the call to advocacy**: speaking up for all of creation and the "least of these" among us

• Teaching religious leaders **basic advocacy skills** and training them to be effective advocates

• Bringing hundreds of faithful advocates to **Environmental Lobby Days and Faith Advocacy Days** in the state capitol and Congress

• **Providing opportunities for Christians to make their voices heard** at public hearings, in meetings with elected officials, and by writing letters to the editor on environmental issues



Washington Interfaith Power & Light

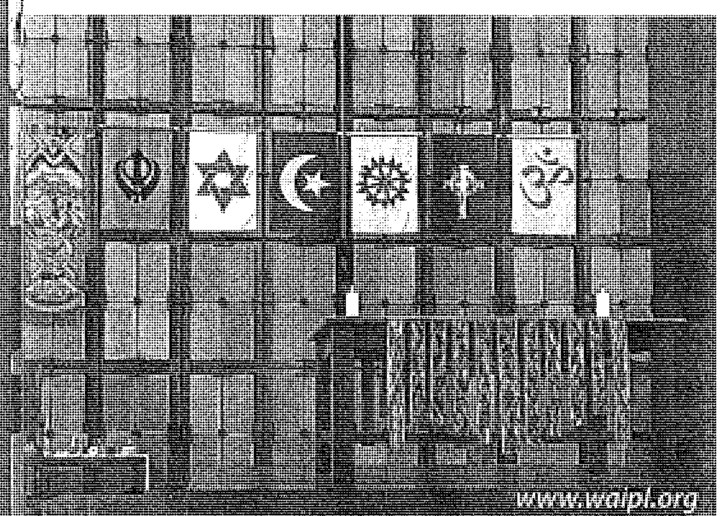
Interfaith Partnerships

Earth Ministry's Washington Interfaith Power & Light (WAIPL) project organizes a religious response to global warming. WAIPL is part of a national Interfaith Power & Light network that is 30+ states strong and growing. It is led by Jews, Christians, Muslims, Buddhists and the faithful from other traditions across Washington State.

Washington Interfaith Power & Light

WAIPL works to protect creation and safeguard society's most vulnerable from the impacts of climate change. We do this by:

- Offering **workshops, trainings, and advocacy opportunities** for people of all faiths to weigh in on important climate and energy policies
- Advising on ways to **improve energy efficiency** in homes and houses of worship and providing **member discounts on energy-saving products**
- Hosting **interfaith climate and energy events**
- Ensuring **religious voices on climate change** are heard by elected officials and in the media



Please check all that apply:

___ **I want to join Earth Ministry!**

___ **I want to join Washington Interfaith Power & Light (WAIPL)!**

___ **Enclosed is my tax-deductible contribution of:** (no extra cost to join both Earth Ministry & WAIPL)

___$35	___$60	___$100	___$250	___$500	___$1,000	___$5,000	Other $_____
Individual	Family	Advocate	Steward	Sustainer	Sacred Circle	Tree of Life	

For membership in either Earth Ministry or WAIPL, please make check out to Earth Ministry or fill in credit card information below.

___ **Sign me up for a monthly donation!**

My credit card will be charged the following amount each month:

___$5 ___$10 ___$15 ___$20 ___$25 ___$ Other

Visa/Mastercard # ______________________________ Exp. Date ______ / ______

Signature ______________________________

___ Send me *Earth Letter* electronically as a pdf file to save money and paper (Earth Ministry members only).

Contact Earth Ministry/Washington Interfaith Power & Light for information about congregational membership.
6512 23rd Ave NW, Suite 317, Seattle, WA 98117 (206) 632-2426

Final December 2010

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Membership

Individual Membership

Join Earth Ministry and add your voice to the growing movement of people of faith caring for God's great gift of creation. Your support will make a real difference!

Join online at *www.earthministry.org* or call today. You can also sign up for easy automatic monthly donations by credit card.

Membership levels:

$35 Individual	$500 Sustainer
$60 Family	$1,000 Sacred Circle
$100 Advocate	$5,000 Tree of Life
$250 Steward	

All members receive regular updates on our work, invitations to Earth Ministry events, and a one-year subscription to our award-winning quarterly journal, *Earth Letter*.

Members at the Steward level and higher also receive personal invitations to Earth Ministry events and an invitation to our annual "Hors d'oeuvres with Earth Ministry" event. Members of the Sacred Circle and higher receive all of the above and an invitation to lunch with our executive director.

Congregational Membership

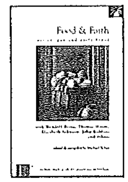
Earth Ministry has several levels of congregational membership and can work with you to engage your church in creation care efforts. Please visit *www.earthministry.org* or contact the office for more information and member benefits.

Earth Ministry is a charitable 501(c)3 non-profit organization.
All donations are tax-deductible to the full extent allowed by law.

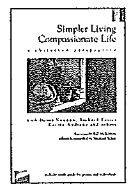
Earth Ministry Publications

Earth Ministry publishes resources to help individuals, congregations, clergy, and denominations connect faith with caring for the environment in practical ways. These publications are for sale in our secure online store at *www.earthministry.org* or by calling (206) 632-2426.

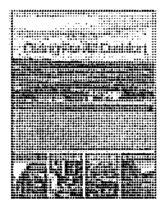
Money & Faith: The Search for Enough
Discuss issues of equity, ecology, scarcity and abundance.



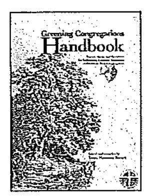
Food & Faith: Justice, Joy, and Daily Bread
Learn how to bring about a healthier and more just world through food choices.



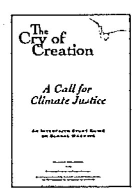
Simpler Living, Compassionate Life
Consider alternatives to the high-price, high-stress "Good Life": the riches of simplicity and compassion.



Caring for All Creation
Resources for worship services on environmental issues: *On the Road*, *At the Table*, *In the Home*, and *By the Waters*.



Greening Congregations Handbook
A comprehensive tool-kit for churches to integrate creation care into all aspects of congregational life.



The Cry of Creation
An interfaith study guide on climate change featuring science, theology, and steps for taking faithful action.

Statement of the National Park Service Before The Washington Department of Ecology Regarding Washington State Implementation Plan for Regional Haze

September 28, 2010

Good evening. I am Dave Uberuaga, Superintendent of Mount Rainier National Park. I appreciate this opportunity to present the comments of the National Park Service on Washington Department of Ecology's proposed State Implementation Plan for Regional Haze. We provided formal comments on the State's draft proposal for Best Available Retrofit Technology (BART) for TransAlta's Centralia power plant in October and November 2009 and on the draft state implementation plan in June 2010. We appreciate that the state has addressed some of our previous comments, however, we are still concerned that Washington's proposal does not protect visibility in our national parks and wilderness areas.

Our major concern is that Washington needs to require better controls of nitrogen oxide emissions from the TransAlta-Centralia power plant. The Centralia facility is located in proximity to majestic national parks and wilderness areas whose resources are significantly affected by its emissions. Mount Rainer National Park – established by the citizens of Washington in 1899 as the Nation's fifth national park—is about 50 miles away. Emissions from the Centralia facility also impact Olympic and North Cascades National Parks, and I am also speaking this evening of behalf of Superintendent Karen Gustin of Olympic National Park, and Superintendent Chip Jenkins of North Cascades National Park.

By law, our Nation strives to "conserve unimpaired" national parks and wilderness areas, "in their natural state," protected from the adverse impacts of air pollution.

In 1995, we testified regarding the need for strong limits on emissions of sulfur dioxide at the Centralia facility to address the visibility impairment and other environmental concerns at the park and in the region caused by those emissions. We note with appreciation that since those strong emissions limits were put in place and the facility came into compliance, there has been a dramatic reduction in measured sulfate at Mount Rainier and a corresponding, statistically significant improvement in visibility.

Today we are asking Washington to now require TransAlta to install the best technology to reduce emissions of nitrogen oxides, also a key component of visibility impairment at the parks. Our analyses conclude that post combustion controls, specifically selective catalytic reduction technology, is both technically feasible and the most cost-effective option when considering the visibility improvement that would occur at Mount Rainier, Olympic, and North Cascades National Parks, and nine other Class I wilderness areas administered by the U.S. Forest Service.

On June 24, 2009, the Department of the Interior was petitioned by the National Parks Conservation Association, Washington Wildlife Federation, Sierra Club, and Northwest Environmental Defense Center, to certify that emissions of nitrogen oxides from the Centralia facility are reasonably anticipated to cause or contribute to visibility impairment at Mount Rainier and Olympic National Parks. Such a certification would require the State to evaluate best available control technology to remedy any reasonably attributable visibility impairment under existing provisions of the State Implementation Plan. We are hopeful that the State's control determination for regional haze will also satisfy the concern for reasonably attributable impacts. To date, Washington's proposed determination of best technology does not adequately address these impacts.

We encourage the Department of Ecology to take a strong leadership role similar to its sulfur dioxide actions in 1995, and require selective catalytic reduction technology for Centralia as part of the regional haze State Implementation Plan. This would limit Centralia's emissions of nitrogen oxides to approximately 3,000 tons per year, or approximately 12,000 tons per year less than currently proposed. The Department of the Interior will make a final decision regarding the petition for reasonably attributable visibility impacts pending the outcome of the Department of Ecology's control determination for regional haze.

Like the reduction in sulfur oxides, such a reduction of nitrogen oxides would lead to a direct improvement in visibility at Mount Rainier National Park, as well as contribute to improved visibility and decreased health effects from fine particulate matter region-wide. While the focus of our concern is the nitrogen oxide emissions, we are also concerned with mercury deposition at Mount Rainer and throughout the region. Recent studies show elevated concentrations of mercury in snow, sediments, vegetation and fish collected in all three of our national parks in Washington. We note that addition of selective catalytic reduction technology, if appropriately designed, would achieve additional emissions reductions of mercury.

The National Park Service will be submitting additional written comments during the public comment period that address our concerns with the low degree of visibility improvement due to controls proposed in the State of Washington. We encourage the Department of Ecology to be proactive in protecting visibility and to revise its proposed state implementation plan accordingly.

In closing, I would like you to think about the importance of Mount Rainier, Olympic and North Cascades National Parks to this region and the world, for today's public and for future generations. There are many reasons that the law mandates our highest levels of environmental protection for these special areas. National parks and wilderness areas are our natural and cultural heritage. Sociology studies confirm their importance, as do our individual experiences of recreation and renewal. In 2009 Mount Rainier recorded over 1.7 million visitors and visitation as of the end of August 2010 is already above 1.3 million.

Regarding the economic benefits of the park, for example, in 2001 when our last visitor survey was conducted for Mount Rainier, we learned that recreation visitors to the park spent $29.8 million within a 30 mile radius of the park. The total economic impact of visitor spending was $24 million in direct sales, $9 million in personal income, $13 million in direct value added and 649 jobs. With multiplier effects, created by the re-circulation of the money spent by tourists, visitor spending generated about $35 million in local sales, and an associated $13 million in personal income, $20 million in value added and 812 jobs. [1]

These figures do not include park admission fees or the impacts of the NPS payroll and operations in the area.

National parks and wilderness areas not only guard the natural and cultural assets of our Nation, but they are also our most sensitive gauges of environmental stewardship. Harm to these resources that our nation strives hardest to protect must signal an alarm for other

[1] 3.3 million recreational visitors to Olympic NP spent $90 million within the Olympic Peninsula in 2000. Thetotal economic impact of visitor spending was $71 million in direct sales, $29 million in personal income, $45 million in direct value added and 1,881 jobs. With multiplier effects, created by the recirculation of the money spent by tourists, visitor spending generated about $100 million in local sales, and an associated $39 million in personal income, $62 million in value added and 2,290 jobs.

resources and for us. The National Park Services' desired outcome in this process is a solution and a decision that protects air quality and other important resources by using proven, cost effective technologies to significantly reduce emissions from the Centralia facility. To be clear, an outcome the National Park Service does not seek is the closure of the Centralia Power Plant. Experience from other states, and the success of the 1995 collaborative effort in reducing sulfur dioxide emissions from the plant, tells us that these two outcomes – achieving a significant reduction in emissions and keeping an important facility operating - are wholly compatible. We stand ready to work with all interested parties toward these outcomes.

This concludes my testimony. The National Park Service will be submitting detailed technical comments on the consent decree before the close of the public comment period.

Thank you.

National Park Service
U.S. Department of the Interior

David V. Uberuaga
Superintendent

Mount Rainier National Park
55210 238th Avenue E.
Ashford WA 98304-9751

360 569-2211 ext 2300 phone
dave_uberuaga@nps.gov

Submitted Dave Grundvig
9/28/10

Regional Haze Reduction

Power Generation, Clean Air & Living Wage Jobs for Working Families

Strategies for reduction of industrial particulates from power generation facilities

This brief summary is from the highly skilled craftsmen and woman that actually build, repair and retrofit coal fired boilers, nuclear power plants, natural gas co-gens, carbon neutral biomass boilers, components of hydro-electric dams, and much more: **The Boilermakers.**

Coal – Power Plants – Clean Air – an Emotional Issue

We are also environmentalists and conservationists and have some strong ideas for cleaning up the air! Unfortunately, a few well-funded extremists have apparently decided to "demonize" coal at any expense, including local jobs, regardless of the facts.

Boilermakers want clean air, and we know how to get it. There are exciting new state-of-the-art technologies in particulate control, emissions reduction, gasification technologies, CO2 capture technologies (such as the Mountaineer Power Plant in New Haven, W. VA.), and even more emerging.

On an immediate and local level, **haze reduction** can be achieved by a retrofit with full-scale air quality control systems. Many systems can be used, depending on the design and type of the plant, such as state-of-the-art scrubber/absorber systems, electrostatic precipitators, and absorber modules.

Clean Coal Technology – The Next Step!

Washington State can be a world leader in this new technology. CCT is a term used to describe a number of different state-of-the-art processes being developed; oxy-fuel, pre-combustion, chemical looping combustion, post-combustion, etc. They all have the same goal – to reduce climate pollution on a world-wide scale.

Coal has played a huge role in building our nation. CCT with carbon capture/sequester can produce clean reliable energy that will be a model for the rest of the world to follow.

Alternative Energy?

While some of the alternative energy systems being built can be useful, they simply are not the panacea that some believe. Windmills for example require vast amounts of land for both the unit itself and the new transmission lines they need to connect to the grid. The mere presence of windmills can have a devastating effect on birds such as the endangered Sage Grouse.

Whirring blades kill thousands of birds every year including kestrels, owls, and hawks, some of which are listed as threatened in Washington. Reliability is always an issue. If the wind is not blowing, no power is being produced. The majority of components (turbines, blades, etc.) used in windmills are built by foreign manufacturers in foreign countries.

We Can Do Better

Our highly skilled work force is ready to help take America to energy independence, to greatly reduce haze, pollutants and carbon footprint. Along with our union brothers in all of the other building trades we represent thousands of hard working voters.

We will be glad to meet with any group or state agency to work on reducing regional haze and air pollution in Washington.

Sincerely,

The members of Boilermakers Local 502

Family Of Companies
PORT TOWNSEND PAPER — CROWN PACKAGING — BOXmaster
CROWN • CREATIVE • GROUP

September 27, 2010

Mr. Doug Schneider
Washington Dept. of Ecology
Air Quality Program
P.O. Box 47600
Olympia, WA 98504-7600

Re: Regional Haze SIP

Dear Mr. Schneider:

I am writing on behalf of Port Townsend Paper Corporation (PTPC) to comment on Washington's proposed Regional Haze SIP. The SIP includes Best Available Retrofit Technology (BART) orders for several industrial sources, including PTPC. Our company has no objection to the limits imposed on our BART-eligible process units by Order No. 7839. We appreciate Ecology's careful review of PTPC's BART engineering report.

Ecology's proposal to submit Order No. 7839 for incorporation into the SIP presents an operating flexibility concern for PTPC. As you know, the amendment of any element of a SIP requires multiple layers of state and federal administrative review, a process typically measured in years. To stay in business, however, PTPC must continually invest in process improvements to our mill. Those improvements include more efficient control technologies, reduced emissions and improved monitoring methods. Improved monitoring methods typically will supplant those specified in an existing air order. Monitoring also may change because EPA adopted an NSPS update, or because EPA disapproved a monitoring method developed by Ecology to satisfy an EPA requirement. In its current form, however, Order No. 7839 would require continued use of obsolete monitoring methods incorporated by reference in the order, even where new equipment, new requirements or new monitoring methods provide more accurate information about the compliance status of an emissions unit.

Let me offer a tangible example of the problem described above. Conditions 1 through 3 of Order No. 7389 incorporate by reference emission limits and monitoring methods contained in the August 2006 version of Order No. 2892-05AQ. In April 2010 Ecology revised this order in ways that change the monitoring requirements for several BART-eligible process units. Among other changes, Ecology repealed a fuel sulfur monitoring condition for Power Boiler # 10 to which EPA objected. The 2010 order states: "With issuance of this First Modification of Order No. 2892-05AQ, the conditions of . . . the original Order No. 2892-04AQ are no longer applicable." Unfortunately, that statement would not be true if Ecology incorporates the 2006 version of the Order into the SIP. PTPC would be directed to monitor NSPS Subpart D SO_2 emission limits from PB#10 using fuel receipts, even though EPA objected to that method and Ecology eliminated it from the 2010 version of the Order.

Example #2 -- Conditions A.1b and A.6 of Table 1 of the 2006 Order direct PTPC to monitor compliance with the PB #10 grain loading limit by monitoring process parameters from the wet scrubber serving that unit. Since that time, PTPC has proposed to retrofit PB #10 as a cogeneration facility, to install an ESP to further reduce particulate emissions, and to install a continuous emission monitor on the new ESP. *See* Proposed NOC Order No. 7850. The BART Order would force PTPC to continue monitoring process parameters from the wet scrubber, even though those parameters will no longer indicate the PM emission rate from PB#10 and the cogen project approval order imposes a more accurate monitoring scheme.

PTPC asks Ecology to revise Order No. 7839 to build some monitoring flexibility into the order, so that the deletion of obsolete monitoring methods does not require a SIP amendment. We do not propose that Ecology should give itself authority to weaken the monitoring requirements for BART-eligible process units. We seek only to give Ecology the flexibility to approve changes that maintain or enhance the stringency of the monitoring, without amending the SIP.

We are filing with this letter a proposed redline of Order No. 7389 that makes two changes. First, we propose to cross-reference the current 2010 version of Order No. 2892-05AQ, rather than the 2006 version. Second, we propose to add a condition that would authorize Ecology, by regulatory order, to revise monitoring, reporting and recordkeeping methods specified in Order No. 7389, "provided that the revised monitoring, reporting or recordkeeping method provides equal or better information on the compliance status of the source or emission unit subject to the monitoring."

The new paragraph would give Ecology the ability to update monitoring methods without a SIP amendment, while providing assurance that this authority could not be used to increase emissions. This kind of flexibility is essential to accommodate the investments and process upgrades that must occur if PTPC is to remain a competitive business in the global economy.

Please call if I can provide any additional background on the revisions proposed in this letter.

Sincerely-

E.I. Muehlethaler

Eveleen Muehlethaler
Port Townsend Paper Corporation
100 Mill Road
Port Townsend, WA 98368
(360) 379-2112
eveleenm@ptpc.com

Enclosures

Cc: Alan Newman (Ecology)
Marc Heffner (Ecology)
Roger Loney (PTPC)
Annika Wallendahl (PTPC)
Matt Cohen (Stoel Rives)

DRAFT ORDER WITH PTPC SUGGESTED CHANGES
STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

IN THE MATTER OF AN]
ADMINISTRATIVE ORDER AGAINST:]
] ORDER NO. 7839
Port Townsend Paper Corporation]
____________________________________]

TO: Roger Loney
Port Townsend Paper Corporation
P.O. Box 3170
100 Paper Mill Hill Road
Port Townsend, WA 98368

This is an Administrative Order requiring your company to comply with WAC 173-400-151 by taking the actions that are described below. Chapter 70.94 RCW authorizes the Washington State Department of Ecology's Air Quality Program (Ecology) to issue Administrative Orders to require compliance with the requirements of Chapter 70.94 RCW and regulations issued to implement it.

Ecology has determined that portions of your facility are subject to the provisions of the federal and state visibility protection program (WAC 173-400-151 and 40 CFR Part 51, Subpart P). The rules require that the State determine what technologies and level of emission control constitutes Best Available Retrofit Technology (BART) for the eligible emission units at your facility.

FINDINGS

A. The Port Townsend Paper Corporation (PTPC) is a Kraft pulp and paper mill subject to BART.

B. The BART-eligible emission units at PTPC are the Recovery Furnace, the Smelt Dissolving Tank, the No. 10 Power Boiler, and the Lime Kiln.

C. Emissions from BART units are controlled by:

   a. Use of an electrostatic precipitator (ESP) to control PM/PM_{10} emissions from the non-direct contact evaporator (NDCE) Recovery Furnace.

   b. Use of a wet scrubber to control PM/PM_{10} and SO_2 emissions from the Smelt Dissolving Tank.

c. Use of a multiclone and wet scrubber for control of PM/PM_{10} emissions from the No. 10 Power Boiler.

d. Use of a wet venturi scrubber to control PM/PM_{10} and SO_2 emissions from the Lime Kiln.

D. Ecology has determined that the emission controls currently installed at PTPC meet the requirements of BART.

E. Ecology has determined that PTPC has met the requirements of Administrative Order No. #5072, First Amendment, which required submittal of a BART Technical Analysis for the PTPC facility.

Additional information and analysis is available in the BART Determination Support Document for Port Townsend Paper Corporation, Port Townsend, Washington, by the Washington State Department of Ecology, October 2008, and the Best Available Retrofit Technology Applicability Analysis and Determination Report for Port Townsend Paper Corporation, Port Townsend, WA, prepared by Trinity Consultants on behalf of Port Townsend Paper Corporation, December 2007.

YOU ARE ORDERED: To operate existing emission control equipment for the Recovery Furnace, Smelt Dissolver Tank, Lime Kiln, and No. 10 Power Boiler in accordance with the following conditions:

1. BART Emission Limitations

1.1. Meet the emission limitations for particulate matter, nitrogen oxides, and sulfur dioxide found in Order DE 05AQIS-2892, issued to the Port Townsend Paper Corporation on April 20, 2010 by the Washington State Department of Ecology's Industrial Section.

Deleted: August 10, 2006

1.2. Meet the SO_2 and NO_X limitations in PSD-I issued June 1, 1984.

1.3. Compliance will be determined as specified in Order DE 05AQIS-2892.

2. Schedule for Compliance

2.1. Compliance with the emission limitations for particulate matter, nitrogen oxides, and
sulfur dioxide is required upon the effective date of this Order.

3. Monitoring and Recordkeeping Requirements

3.1. Monitoring and recordkeeping requirements for particulate matter, nitrogen oxides, and sulfur dioxide are contained in Order No. DE 05AQIS-2892.

4. Reporting Requirements

 4.1. Reporting requirements for particulate matter, nitrogen oxides, and sulfur dioxide are contained in Order No. DE 05AQIS-2892.

5. Ecology may, by regulatory order, revise the monitoring, reporting and recordkeeping requirements specified in this order, provided that the revised monitoring, reporting or recordkeeping methods provide equal or better information on the compliance status of the source or emission unit subject to the monitoring.

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Failure to comply with this Order may result in the issuance of civil penalties or other actions, whether administrative or judicial, to enforce the terms of this Order.

You have a right to appeal this Order. To appeal you must:

- File your appeal with the Pollution Control Hearing Board within 30 days of the "date of receipt" of this document. Filing means actual receipt by the Board during regular office hours.
- Serve your appeal on the Department of Ecology within 30 days of the "date of receipt" of this document. Service may be accomplished by any of the procedures identified in WAC 371-08-305(10). "Date of receipt" is defined at RCW 43.21B.001(2).

If you appeal you must:

- Include a copy of this document with your Notice of Appeal.
- Serve and file your appeal in paper form; electronic copies are not accepted.

To file your appeal with the Pollution Control Hearing Board:

Mail appeal to:		Deliver your appeal in person to:
The Pollution Control Hearings Board P.O. Box 40903 Olympia, WA 98504-0903	OR	The Pollution Control Hearings Board 4224–6th Avenue SE Rowe Six, Bldg 2 Lacey, WA 98503

To serve your appeal on the Department of Ecology:

Mail appeal to:		Deliver your appeal in person to:
The Department of Ecology Appeals Coordinator P.O. Box 47608 Olympia, WA 98504-7608	OR	The Department of Ecology Appeals Coordinator 300 Desmond Drive SE Lacey, WA 98503

And send a copy of your appeal packet to:

Alan Newman
Department of Ecology
Air Quality Program
P. O. Box 47600
Olympia, WA 98504-7600

For additional information, go to the Environmental Hearings Office website at http://www.eho.wa.gov.

To find laws and agency rules, go to the Washington State Legislator website at http://www1.leg.wa.gov/CodeReviser.

Your appeal alone will not stay the effectiveness of this Order. Stay requests must be submitted in accordance with RCW 43.21B.320. These procedures are consistent with Chapter 43.21B RCW.

DATED this ___ day of ______, 200__ at Olympia, Washington.

____

Jeff Johnston, Ph.D.
Manager, Science and Engineering Section
Department of Ecology
Air Quality Program

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Confederated Tribes and Bands
Of the Yakama Nation

Established by the
Treaty of June 9, 1855

RECEIVED

OCT 06 2010

DEPARTMENT OF ECOLOGY
OFFICE OF DIRECTOR

September 28, 2010

Mr. Ted Sturdevant, Director
Washington State Dept. of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Re: Regional haze reduction—state implementation plan development

Dear Mr. Sturdevant:

The Yakama Nation is a federally recognized tribe with reserved treaty rights based on the Treaty of 1855. All vested rights and interests are throughout the Yakama Reservation, ceded lands, and "usual and accustomed areas" where we promote the protection and preservation of culture, archaeological and natural resources. Our nation strives to preserve our indigenous past as well as our present way of life, in protecting historical, cultural, and the natural aspects of our remaining environment. We are maintaining and preserving our traditional food, and medicine gathering areas throughout our reservation and ceded lands of approximately 11 million acres within the state of Washington as well as the "usual and accustomed areas" throughout the Columbia Basin.

As native people to the Columbia Basin, we appreciate and encourage the efforts of the Department of Ecology (DOE) in developing the Regional Haze Plan in Class one areas as part of the federal guidelines for returning Class One Areas to "natural conditions" by 2064: The results of a plan such as this speak to the very heart of our ties to the natural environment. Protecting the water, the land, and the air is the mandate from the Creator. Our forefathers engaged in resource management that ensured the protection and preservation of resources for future generations. Now, at this critical point in history, with such severe threats to the *How-Laak Hush Wit* (the Sacred Breath), the Yakama Nation is involved in important research that will influence policy development in the northwest and throughout the United States.

DOE's first phase of reducing haze-producing pollutants is a complex and critical part of reaching the long-term goals of the Regional Haze Plan. We have worked extensively with the Department of Environmental Quality in Oregon to provide input on strategy development for the Columbia River Gorge and on the Regional Haze Plan in Oregon. We would like the precedence of this staff-to-staff working relationship, that was developed in Oregon, and proved helpful to all parties concerned, to help us develop a plan to work with the Department of Ecology. For it is through a transparent and productive working relationship, that the Yakama Nation can best ensure that our concerns and priorities are best represented in the development of air quality policy.

To further discuss the development of this process, please contact me or Phil Rigdon, Deputy Director of Department of Natural Resources at 509-865-5121, ext. 4655.

Sincerely,

Harry Smith

Harry Smiskin
Tribal Council Chairman

Post Office Box 151, Fort Road, Toppenish, WA 98948 (509) 865-5121

From: cfp@cheneyfreepress.com
To: ECY RE AQComments;
Subject: Haze reduction
Date: Monday, August 23, 2010 10:21:41 AM

You are going to regulate Haze now!

How are you going to avoid forest fires cut down all the trees and pave over the mountains?

I bet 90 percent of the haze is caused by the fires set buy lightening how are
you going to fine God or mother nature.

I don't want to pay any more taxes and I don't want to pay for any more studies.... buy more buses for
on the coast or build better mass transit over there so you cut that side of the states demand for bio fuels.

Also while your at it let electricity created by dams be considered renewable. And quit worrying about the
fish now they have ladders and don't need your help any more.

Draining rivers so you can study the flow hurts the fish more than just leaving the water regulations
up to the damm managers and not the government watch dogs.

Haze control.... next you will fine me if it rains to much on my property.

Oh wait you tried but I don't live in a flood plain.

Thank you I guess I needed to vent and you where the first government agency to ask me for
my opinion in a long time... sorry I don't think your idea is a good one.

Carol
Cheney, Washington

From: Higgins, Alfred MD
To: ECY RE AQComments;
Subject: Air Quality Initiative
Date: Friday, August 27, 2010 12:42:21 PM

To Whom it may concern,

I am a licensed physician residing in Wenatchee, WA. While I am completely in favor of improving air quality for the restoration of visibility, and for reducing global warming, I would also like to remind you of the adverse health effects of air pollution. These affect all of us, not just those suffering from lung disease. The impact of open burning in the Wenatchee valley is evident whenever the air is stagnant and visibility is reduced to a few miles. Less tangible but possible to calculate would be the increased hospital admissions and the added premium of health care expenses during these events. It is also very likely that the agricultural burning contributes to the dispersion of exotic pollutants which are carcinogens as well. Needless to say, there is no regulation of agricultural burning so long as there is no enforcement. It is my opinion that WA State efforts to improve air quality should be accelerated as rapidly as possible.

Thank you, Alfred C. Higgins, M.D.

From: john@johnmarshallphoto.com
To: ECY RE AQComments;
cc: Swedberg, Dale (DFW);
Subject: Prescribed Burning
Date: Sunday, August 29, 2010 8:13:29 AM

To: D.O.E,
I learned about the plan to clean up Washington's air, from reading the Wenatchee World newspaper. Though a laudible goal, I have concerns about any plan that would further restrict prescribed burning in forest and range lands.

Eastern Washington forests are in bad shape, as a result of fire suppression. Trees that would have been naturally thinned out, by wild fire survive. The results is thickets of small diamater unhealthy trees. When a fire occurs under dry windy conditions, all of the trees over large areas get wiped out- and a huge amount of smoke pours into the air. In prescribed fire, managers pick their time for a fire to occur. The intent is to reduce the fuel under ideal conditions. There is also a benefit in that many shrubs that provide forage for wildlife are rejuvenated by fire.

Any intent to curtail prescribed fire due to smoke concerns, ignores the fact that every acre of eastern Washington forest is going to burn sooner or later. The choice is between little fires and big fires. There will be smoke no matter what policy is in place.

The Wenatchee World article says that the goal is to return visibility to "natural conditions" Natural conditions included a lot of fire in the woods. Fires ignited naturally from lightning strikes. Native americans, deliberately lit a lot of fires to keep the woods open and promote conditions for game. One could argue that they were part of nature. A question might be, just what period of time is one looking at as the standard for natural conditions? Fire suppression got underway in 1910, and greatly reduced the number of acres of forests that burned every year. That would have cleaned up the air, but with regard to eastern Washington forests, it only resulted in accumulating fuel on the ground resulting in more severe fires we have today.

Please leave prescribed fire off the list of activities you intend to regulate.

John Marshall
Wenatchee, WA

From: earnest spees
To: Karl E Spees;
cc: ECY RE AQComments;
Subject: Comment on DOE Haze Initiative
Date: Thursday, September 02, 2010 8:52:49 AM

Comment on DOE Haze Initiative

When there is a dust storm on the Mongolian Desert we often have evidence of it here in our beautiful red sunsets. The US has some of the cleanest industries in the world pollution-wise. Certainly our needs to produce goods and services (jobs) needs to be balanced against the small insignificant amounts of pollutants we put into our atmosphere. If there is a problem (the false premise) it probably is coming from around the world nations who are competing with us. No doubt DOE's solution will involve crippling our industry and restricting our use of our property.
Our governments stealth practice of closing down forest roads will no doubt cause a tremendous amount of air pollution when we have the inevitable wildfires in our wild places.
Under the guise of saving the planet, the DOE has launched initiative on multiple fronts to take power from the citizens and transfer it to the government in a non-representative fashion.

Article 1. Section 1. Of the Washington State Constitution

Political Power: All political power is inherent in the people, and governments derive their just powers from the consent of the governed, and are established to protect and maintain individual rights.

Which one of our rights are you protecting?

If their are problems with man-made pollutants they are being generated by the people who are competing with us (USA) in the world (primarily China and India) of industry. I suggest you get them to clean up their acts. The DOE can stop destroying forest roads. When we have the inevitable wild fires in our wild places, DOE's radical insane policies will be one of the factors resulting in a very large amount of air pollutants.

Most of you insane policies are based on the UN Sustainable Development Agenda 21. The policies are then implemented on shabby faulty 'science' and fraud. First world Countries are the most environmentally friendly. The unintended consequences of your insane policies is moving us toward a 2nd or 3rd world country status where pollution and environmental destruction are significant. Wise up. In the mean time your behavior needs to be curtailed. The number of citizens who are on-to-your destructive parasitic behavior is growing.

Karl Spees - Concerned Citizen and Conservationist and Student of Natural History

From: Debra Jon SH
To: ECY RE AQComments;
Subject: haze in Olympic national Park
Date: Monday, September 27, 2010 1:12:48 PM

I would like to share one comment regarding "haze." I have camped in 3 campgrounds recently. The problem I see is smoke from camfires in the campgrounds. It gets so bad I cannot keep our windows open in our small RV or walk in the area during the evening or when major fires are burning. People bring in or buy huge amounts of wood, build very large fires and burn all day (often leaving them going and going inside their RVs to cook and eat meals). They burn fires and get groups together drinking and making noise until late. Then go to bed and let fires smolder. I propose 1. limiting hours of burning to 2 hours for moring meals and 2 at night 5-7 pm to cook meals (and enforcing the time). 2. discouraging campfires by teaching people better and not featuring fires in all the literature about camping such as the newspapers. 3. Teaching people to stop burning garbage in fires. 4. Raise to prices on campfire wood sold or stopping the sale of wood. 4. Having "no burn" sections in campground to phase out campfires. I know this is something that people associate with camping, but we can change attitudes and behaviors, it has been done with many things before such as cutting wood in the campgrounds or feeding wildlife. The second comment I have is that we need to discourage dirving by getting some shuttles in place, especially natural gas or electric buses. I love parks that have these in place. Some parks allow no driving in some areas and it works for them, parts of Olympic National Park could do this also including Hurricane Ridge area.

Thank you for letting me have my say
Debra Sharp

From: Larry Lang
To: ECY RE AQComments;
Subject: haze reduction
Date: Tuesday, September 28, 2010 3:59:19 PM

To whom it may concern:

I am writing in response to an article in the Peninsula Daily News (Clallam County) of Monday September 27, 2010, page A-4 "Olympic National Park on list for Ecology's haze reduction efforts".

The article states that "the idea is to control what we can control", ralated to haze abatement. Concerning this issue, there is one cause of haze that is quite obvious to those of us who spend time at Ediz Hook in Port Angeles: large commercial ships.

Port Angeles is the pick up/drop off point for Puget Sound Pilots. Port Angeles harbor is also a stop-over point for ships. There are often as many as four large ships anchored in the harbor, and a fifth ship tied up the pier. Particularly while at anchor ships continue to discharge visible exhaust. In calm weather especially, the exhaust of one ship can cause a visible layer of haze covering much of the harbor and adjacent foothills.

Based on my frequent observations of shipping in Port Angeles harbor and passing the entrance of the harbor, the level of emissions and related haze must be tremendous. Taken cumulatively over the area of the Strait and Puget Sound, this influence is potentially affecting several of the National Parks and wilderness areas in this project.

I have no way of quantifying the amount or degree of this problem other than my personal, visual observations. I don't know if stopping or mitigating emissions from ships is possible in the short term, especially while those that are in motion. But ships at anchor, and especially those at dock, should be required to shut down if they are to remain for a certain period.

On a more positive note, we have recently arranged for the installation of a ductless heatpump. The incentives offered by our local utility, the State of Washington, and federal tax credits makes this purchase affordable for us where we otherwise would not consider it. The installation of a ductless heat pump will to a substantial degree offset our use of wood for heating, and consequently reduce emissions (at least locally).

I hope these comments will be helpful in development of the plan.

Lawrence A. Lang
808 Golf Course Road
Port Angeles, WA 98362
(360) 452-4348

From: aaron von awe
To: ECY RE AQComments;
Subject: Haze and Proposed Biomass Incinerator/ Power Generators
Date: Tuesday, September 28, 2010 7:41:15 PM

We the people, through our elected and appointed officials should be doing everything possible to ensure that the proposed Biomass Plants don't happen or are prevented from Hazing our Parks, which they will, my opinion. This is a dirty technology that will further pollute the air and make us all less healthy, and the Polluters are looking to get paid by the Taxpayers of America through Stimulus Money Grants. This is shameful.

From: aaron von awe
To: ECY RE AQComments;
Subject: Haze and Proposed Biomass Incinerator/ Power Generators
Date: Tuesday, September 28, 2010 7:41:15 PM

We the people, through our elected and appointed officials should be doing everything possible to ensure that the proposed Biomass Plants don't happen or are prevented from Hazing our Parks, which they will, my opinion. This is a dirty technology that will further pollute the air and make us all less healthy, and the Polluters are looking to get paid by the Taxpayers of America through Stimulus Money Grants. This is shameful.

From: Ryan Ferris
To: ECY RE AQComments;
cc: info@nwcleanair.org; Schneider, Doug; DOH CFH CCC Program; info@oppco.org; alaw@alaw.org;
Subject: comment for The WA Department of Ecology "regional haze" (air quality) hearing on September 28th...
Date: Thursday, September 30, 2010 12:19:45 AM

This is submitted as public comment for the "regional haze" (air quality) hearing hosted by the WA Department of Ecology on September 28th, 2010. I have cc'ed a number of other agencies (NW Air Authority, WA Sate DOH Cancer, Bellingham Opportunity Council, American Lung Association of WA) who I thought might be interested in my recommendation below to further popularize and subsidize heat pump installation as a method/policy for decreasing regional haze, improving air quality and public health, and increasing energy efficiency in Whatcom County, The North Cascades and other colder areas in Washington State.

Whatcom County has some number of anthropogenic sources of air pollution and haze. Here are a few:

- Thousands of diesel trucks streaming from B.C Canada to the U.S. south each day
- Two oil refineries
- I-5 traffic (cross-border or not)
- The practice of burning for heat in the winter

The trade between British Columbia and California is reputed to be one of the highest dollar volume cross border 'province to state' trade relationships in world history. It would seem unlikely that WA state Department of Ecology can slow the thousands of diesel trucks that stream across the border each day here. Given the criticality of the energy industry to the U. S. military bases hosted in WA state, it will be unlikely that the Department of Ecology will be able to substantially alter the effluent leaving the Cherry Point and Ferndale oil refineries. However, it may be possible for the Department of Ecology (and others) to find some mechanism, funding, argument or partnership to both stimulate the local economy and reduce carbon, benzene, and haze resulting from winter burning for heat in Bellingham and Whatcom County through the subsidization and installation of heat pumps for residential use. Let me explain:

Temperatures in Whatcom County are fundamentally colder than other I-5 cities and towns south of us. At nearly the 49th parallel and cloudy, we have a darker winter than the rest of state We are often subjected to a "northern flow" (called a nor'easter by locals) in winter that brings sub-arctic air mass across the "Sumas plain". Other weather systems of note here include powerful GOA ("Gulf of Alaska") storms that bring driving rain racing from the Pacific down from Queen Charlotte Sound. Unfortunately, Bellingham has a higher poverty and near poverty rate than many other Puget Sound counties. Many residents here, hoping to save on their utility bills, **chop and burn for heat.** They do so in the core neighborhoods of Bellingham, where **still air on a cold night can become quite polluted and noxious to breathe**. I know this for a fact, because I have installed a heat pump system complete with a number of layers of air filtration. During wintertime, the top most layer and other layers of my filtration system are often filled with a **sooty, black carbon residue** that is not as noticeable during the late spring and summer months.

According to the Washington State Comprehensive Cancer Control Plan, w**ood smoke is a dangerous hazard** often misunderstood by consumers:

"Wood smoke is a mixture of gases and fine particles and contains many toxic substances, some of which are known or probably human carcinogens. The fine particles that released carry other toxic substances deep into the lungs when a person breathes in the wood smoke.

The Department of Ecology has ranked residential wood burning as its second highest priority toxic air pollutant based on its cancer and cardiopulmonary risks in their recent air toxics ranking study. (49) Indoor emissions of wood smoke come from wood burning devices such as wood stoves and fireplaces. There are approximately 300,000 uncertified wood stoves and 700,000 fireplaces in Washington.(60) Uncertified stoves and fireplaces emit substantially more pollutants than a gas, propane, pellet, or certified wood stove....The potential for exposure can be high.

. ..Fifty-six percent of Washington's fine particle pollution during the winter

months comes from emissions from wood stoves and fireplaces."

The Washington State Comprehensive Cancer Control Plan continues to describe grants made to the Washington legislature to remove and/or replace wood stoves with cleaner burning models. I would recommend that the Department of Ecology and other state organizations consider applying for federal grants that would further subsidize the installation of hybrid heat pump systems in core residential areas. Heat pump systems, although potentially more expensive than some certified wood stoves, "extract heat from cold and cold from heat" to provide extraordinarily reasonably priced cooling and heating. In addition, a HVAC "stack" of air cleaners, high efficiency gas furnace/blower, heat pump coils provides for clean, dehumidified air and increased health. Because heat pumps use the differential between the coolant ("Puron") and the air temperature to generate heat or cold as needed, no emissions are generated from the heat pump itself, resulting in economical, efficient, and environmentally sound method of delivering residential heating and cooling.

I know this, because we had a hybrid heat pump system installed in Bellingham four years ago and we consider it some of the best money we have ever spent. Our utility bills are lower, my lung health is higher, and our family lives in a well-conditioned, clean, environmentally safe older home with minimum gas bills even during January. Popularizing and subsidizing hybrid heat pump installations could save hundreds of lives in Washington State. It could also reduce health costs, decrease utility bills and provide for "green shoots" and greater **HVAC** industry employment. Furthermore, energy from heat pump systems creates a more stable price mechanism for residential customers since only a minimum amount electricity is used by the heat pump and fan itself. Natural gas futures, for example, have seen increasing price volatility in recent years. I believe this price volatility has spooked low-income natural gas consumers in Whatcom County, directly resulting in increased wood burning.

I have two older articles I have published on our heat-pump installation (1,2). However, they both need to be updated with the good news that our hybrid heat pump system continues to bring us happiness and economy year after year. **I highly recommend reducing "regional haze" in Bellingham and Whatcom County through hybrid heat pump installations perhaps funded by federal stimulus "green shoots" dollars.** In the recent Rolling Stone interview, President Barack Obama comments:

"We instituted the first increase in fuel-efficiency standards in this country in 30 years...But we're going to have to do a lot more than that. When I talk to [Energy Secretary] Steven Chiu..and I ask him how we are going to solve this problem... what he'll tell you is that we can get

about a third of this done through efficiencies and existing technologies..."

Clearly, there will be federal funding for carbon neutral technology in the coming federal budgets. The potential for a cross agency partnerships between **DOH, ECY, and NWAIR** and the federal government and **HVAC** installers/Building Industry Groups in WA seems real for heat pump technology.

For many cross purposes - reducing '**regional haze**', reducing lung and other cancers, reducing asthma, reducing downstream environmental pollution - the installation of residential heat pumps will be so much more important than the installation of photovoltaics. I would note that because Washington is a "net metering" state, photovoltaic/heat pump combinations offer the possibility of storing "summer photovoltaic energy credits" for "winter heat pump usage". This would provides a path to decrease "*downstream*" carbon emissions from the production of electricity from natural gas plants, thus decreasing "**regional haze**" from the electricity to be used cooling and heating residential homes. Indeed, since electricity derived from hydro sources in WA state is more plentiful during the winter months, "*downstream*" carbon effluent from winter heat pump usage could potentially **be minimal, especially in a wet year**. Such energy dynamics may help decrease "**regional haze**" even further, perhaps *obviating the need to build additional* natural gas power plants in the Sumas Plain like the proposed Sumas 2. The installation of plants like Sumas 2 would almost certainly increase "**regional haze**" in Whatcom County and The North Cascades.

Thank you for your time,

Sincerely,

1401 E. Victor
Ryan M. Ferris
Bellingham, WA

360.676.2734 home
360.815.6856 cell

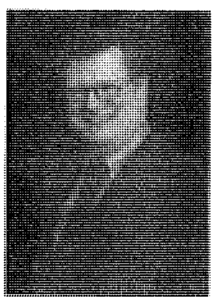
From: Dick Pilling
To: ECY RE AQComments;
Subject: Haze Control
Date: Thursday, September 30, 2010 4:14:14 PM

Sir

We do not need another rule that further reduces our personal freedoms enacted by far away bureaucrats who will be completely unaffected with the restrictions created by said rule.

Any proposed rules regulating home heating, wood stoves, and fireplaces merely hurts people in this area without any affect air quality because most of the pollution comes on the winds from far-off places.

Please concern yourself with real pollution.... Say that pollution that comes from cars in the Seattle area. Once you have your house cleaned up, you have my permission to consider mine...



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Carroll Realty... Small enough to be personal...
Big enough to do the job...

From: Ellen Reynoldson
To: ECY RE AQComments;
cc: DNR RE CPL; superintendent@k12.wa.us;
Date: Wednesday, October 06, 2010 9:55:30 PM

October 6, 2010

Doug Schneider
Department of Ecology
Air Quality Program
P.O. Box 47600
Olympia, WA 98504-7600
AQcomments@ecy.wa.gov

Dear Mr. Schneider,

I am looking at a smoke column from a prescribed fire. I feel good knowing that hazardous fuels that could threaten my home and family are being reduced, that ecosystem disturbance is being reintroduced, that fire is playing its natural role in the forest and that area burned will still have green trees next spring along with flowers and mushrooms. Several mornings the past few weeks, I have walked outside first thing in the morning and enjoyed the delicate scent of burnt sagebrush and conifers.

These experiences are far better than our typical annual summer experiences with large catastrophic wildfires burning the Entiat Valley. I'd like to relate my family's experiences just one year (1994), the wildfire smoke column was ugly and tall enough to be measured by NOAA's Doppler in Seattle. When the smoke was so thick that it seemed the entire county was stricken with sinus infections or pneumonia. When the DOE air quality station could not measure the particulates because the filter would be clogged before a reading could be taken. Student athletes were not able to practice outside because of poor air quality.

I am also glad that the forest resources protected by the prescribed fire will probably be able to be utilized to provide funding for Entiat's schools and roads. A smoking, burned to a crisp forest has few resources to utilize for school funding. Entiat community socio-economic vitality also suffers after each summer's wildfires as opportunities for employment or enjoyment of the forest have gone up in smoke.

Our family are life-long community volunteers and include 4th and 5th generation Entiat Valley residents.

Entiat community have a long history of partnership and a close working relationship with government agencies to develop plans which foster vital, thriving communities---people and natural resources. Our community lives in our watershed and has a proven vested interest in excellent resource stewardship.

We fully agree with the importance of quality air for health and visibility. Dept of Health has recommended people curtail their outdoor activities in the Entiat area almost annually due to health concerns from wildfire smoke. These wildfires impact all humans and resources in our community. People have had to evacuate their Entiat homes because of wildfires. In 1994, every single community in Chelan County was under evacuation orders. Also, wildfires are one of the threats to recovery of Upper Columbia Salmon, Steelhead and Bulltrout.

Our community thru our Entiat Watershed Planning Unit and Chelan County Rural Fire District #8 has developed plans to reduce threats to people and resources while proposing options to maintain, recover and restore ecosystems across all jurisdictions in the Entiat valley. Our community demands that plans have a strong foundation in science while using local data, history and knowledge. These plans meet that criteria and have been approved/adopted/accepted by non-governmental organizations, local, state and federal agencies and the Yakama nation. Implementation of both of these plans are included as short-term recovery actions in the *Upper Columbia River Salmon, Steelhead and Bulltrout Recovery Plan.* These plans can be found on the Cascadia Conservation District's web site:

Entiat Valley Wildfire Protection Plan

http://www.cascadiacd.org/index.php?page_id=298

Entiat (WRIA 46) Watershed Plan

http://www.cascadiacd.org/index.php?page_id=255

Entiat community suffers from the harmful effects of wildfire-created poor air quality almost every summer. Entiat community prefers smoke from prescribed fire which is restoring or maintaining ecosystems rather than wildfire smoke. We ask that DOE recognize their responsibility as the ESB 2514 lead agency and the ongoing partnership with the Entiat Watershed Planning Unit by classifying prescribed fire in the Entiat Watershed that is covered by one of the above plans as 'natural'.

We think this natural classification can be justified based on historical information which indicates that the Entiat Valley had 'natural' smoke in the valley most of the year in the late-1800's (see Emma Mead's diary and other historical information) from wildfires ignited by lightning. Also, the prescribed burning is restoring the natural disturbance regime to the ecosystems and recovering Endangered Species Act listed species. We understand that states in the southeast use that as rationale for classifying prescribed fire as natural.

We think that this can be further justified by the key role given to Community Wildfire Protection Plans by the federal Healthy Forest Restoration Act. We think a natural classification for prescribed fire as natural can be further found in the Washington State Wilderness Bill PUBLIC LAW 98-339-JULY 3, 1984 98 STAT. 299

> SEC. 9. Congress does not intend that designation of wilderness areas in the State of Washington lead to the creation of protective perimeters or buffer zones around each wilderness area. The fact that nonwilderness activities or uses can be seen or heard from areas within the wilderness shall not, of itself, preclude such activities or uses up to the boundary of the wilderness area.

We think the onerous bureaucratic permitting requirements of anthropogenic prescribed fires may doom the success of our plans which are being enthusiastically implemented. Entiat community has counted on and prided itself on its collaboration with DOE water resources. We truly understand that cost that effective collaboration takes. Entiat landowners have donated/volunteered thousands of hours working on these plans and securing community acceptance of them. I would not be happy if DOE air resources decisions sabotaged our grass-roots plans.

The community involvement required for these two plans has been phenomenal. Particularly if you were to understand that only 30% of Entiat homes have the internet. Communication was done one-on-one with community members to get support for both plans.

Thank you for considering our comments. Please contact us if you have any questions.

Sincerely,

Ellen
Reynoldson
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Transcripts from public hearings

Jerry Thielen: Again, good evening. My name is Jerry Thielen. I'm the Hearings Officer here for tonight's public hearing. The topic of tonight's hearing is on the Washington Regional Haze State Implementation Plan. Let the record show that it is now 6:43 p.m. on Tuesday, September 28, 2010 and this public hearing is being held at the Department of Ecology's Headquarters Offices at 300 Desmond Drive in Lacy, Washington. Notice of this public hearing was made in the following ways: published in the Federal Register on August 25. Also on August 25 it was published in the Vancouver Columbian Daily Journal of Commerce, *Peninsula Daily News, The Skagit Valley Herald*, and the *Wenatchee World.*

A notice to the public hearing was also posted on the Ecology Public Involvement Calendar on the Department of Ecology's website. Again, I'm gonna ask you to come up. I will call you up in the order in which you signed in. Your testimony will be limited to five minutes as we agreed at the top of the hour and I will apologize now for any mispronunciations of the names as we go through.

So with that we'll ask Mary Moore to come forward with your testimony. And again, if you would state your name and ay affiliation for the record and, again, yes, thank you. Speak right into the microphone so we can pick it up on the web interview.

Mary Moore: Good evening, my name is Mary Moore. I'm speaking tonight on behalf of the League of Women Voters of Washington State. My statement will be brief tonight since the league intends to send in a longer statement of position prior to the deadline of October 6.

The League has been concerned with air quality since 1970, working to make sure that the EPA maintained the highest of quality standards consistent with the Clean Air Act. It has lobbied extensively against any efforts to weaken the act. In 2008 the League called on Congress to enact legislation to significantly cut the greenhouse gas emissions which cause global warming. Specifically, the League supports the regulation and production of ambient toxic air pollutants as well as measures to reduce trans-boundary air pollutants.

And finally the league maintains that restricting greenhouse gas emissions from coal fire power plants is one of the most important steps that we can take to counter global climate change. Coal is the largest source of global warming pollution in the United States. Thank you.

Jerry Thielen: Thank you, very much. Next up we have Doug Howell.

Doug Howell: My name is Doug Howell. I am the Senior Campaign Representative for the Sierra Club and the Coal Free Washington Campaign. I have three points to make tonight and my comments will be focused on TransAlta, the coal plant.

The first is that we can't look at this issue in isolation and isolate it just around the haze issue. The second point is about the general lack of public process around reviewing the pollution problems with the coal plant, TransAlta's coal plant, and finally to talk about some of the solutions, the alternative to phasing out of coal. Specifically we know tonight is focused on nitrogen oxide and haze but the problem with isolating this problem with just haze is if we are recommending under the current standards you've put forward that unless we see significant improvements that we would ask EPA to reject the State's plan on haze and in particular for TransAlta.

If that happens and there are other technology requirements being required for the plant we can expect costs to go up, and so if you look at the costs then of this plant as just one piece of the puzzle you'd be missing a much larger and much more important point.

For example if we look at the costs of the nitrogen oxide technologies under BART that we could impose so that we could improve the problems related to NOX, we should also think about the problems related to Mercury. We recently had a voluntary agreement on 50 percent when the U.S. Government Accountability Office put out a study that said a 90 percent reduction is achievable, we see 10 other states requiring 90 percent reductions. If we did Mercury we could have additional costs there.

We know that there may be hazardous air pollutants promulgated, new rules from the U.S. EPA. We know eventually we're gonna get to find particulates. There'll be costs there. We know that eventually we're gonna get stronger controls for sulfur oxide. We know now that there's problems with coal ash. We just don't know how great those problems are but we're trying to find out. There will be costs there.

We know there will be costs if we can really improve the way we're managing industrial waste water. That's why we've had to file another lawsuit related to violations of the Clean Water Act. Then we finally would get to carbon dioxide and the costs associated with that. When this Department of Ecology did a study about the cost of climate change in Washington State it was $3.8 billion a year in 2020.

Well TransAlta is 10 percent of all climate emissions in state. Now you can't do cost of climate change that way but it's a good reference point, so 10 percent of that $3.8 billion, if it's 10 percent of emissions, is $380 million a year of costs related to carbon dioxide alone. So if you're looking just at the nitrogen oxide equation you're missing the big picture because what you really realize when you roll up all of these costs the cheapest thing is to expeditiously transition off coal as fast as possible. That's point one.

The second point is this process with looking at all the problems with the coal plant is really lacked public process. That is why today the Sierra Club hosted a number of events where we had hundreds of people coming out across the state from Vancouver to Spokane, to Kent, to Seattle, to Olympia, as well as other smaller events and smaller locations across the state because there has been such a lack of public process.

We can't honestly assess and engage the public and assess the problems unless we do many more of these forums and because we have lacked so many forums over the past year and a half we've had to go out and create our own forums to bring the public into this part of the equation.

The last point is about the solutions. We know we can transition off coal and we know we can do it quickly. Some energy analysis that has already been done looking at the alternatives out there, we have 12 natural gas plants up and down the I-5 corridor that are running at about 30 percent power right now. If we were to ramp up the amount of natural gas from these relatively idle natural gas plants we could close – we could shut down one boiler at TransAlta overnight.

If we ramped that up to 90 percent it could fulfill most of the energy needs. There are solutions there. There's another piece of the solution equation which is really important. We are subsidizing TransAlta, a multibillion corporation. We are subsidizing this plant. One of the subsidies that we know best is the tax exemption on coal. When that was created it was created with the deal that the plant – that the mine be kept open.

That mine closed in 2006. 600 workers lost their job and that multi-national corporation kept those tax subsidies anyway. Why don't we make them pay their taxes like everybody else and redirect that money into new economic development in Lewis County in Centralia. That is a solution where everybody an win and we can get rid of and transition off coal for the single worst polluter in Washington State. Thank you.

Jerry Thielen: Next we have Kathleen – Kathleen R-I-D-I-L-A- --

Kathleen Ridihalgh: Ridihalgh.

Jerry Thielen: Ridihalgh, there we go. That's right. Thank you.

Kathleen Ridihalgh: I'm Kathleen Ridihalgh. I represent the Sierra Club and also I'm representing information from the national parks and conservation association this evening and I'm speaking mostly, primarily to the TransAlta plant that's part of this plan, but first too I also want to speak to the process.

Last year as we all remember being here for the hearing was a chance for the public to comment on the initial step of this process, we submitted letters, a united message from environmental groups, faith groups, health groups saying that the draft that was put forth was completely inadequate.

We generated and talked with folks across the state representing those constituencies and more than 1,200 comments were entered into the record along those lines. According to analysis and the review that we've seen there has been no substantial improvement to the plan based on all that public input. So we're looking at this process, this one evening hearing here and hoping that this testimony will weigh in a lot more and maybe have some more influence than perhaps all that previous comment had.

With regards to the plan according to National Parks and Conservation Association analysis it will cause the air pollution to increase, not decrease over the next decade. The goal for Washington is to completely eliminate haze in Olympia National Park by 2064. This plan actually allows hazy air in the Olympics for 323 more years.

One of the reasons that we heard that the State couldn't put forward a plan that would adequately deal with the pollution is that it would end up being too expensive for the company but we see this as putting corporate profits against – ahead of protecting our cherished national parks.

We also hear a lot of talk about communities and strong economy and jobs. According to the NPCA, the National Park sites and Class 1 Air Sheds like Mount Rainier National Park on the Olympic Peninsula in Washington support 3,800 local jobs and saw more than 4.2 million recreation visits. In the same year park visitors and staff contributed more than $160 million to local economies. Those are jobs and that's an economy structure that can't be out-sourced.

Across the state travel and tourism spending in 2008 supported more than 150,000 local jobs, contributed $15.4 billion to the Washington economy and generated $1.1 billion in state and local taxes. I think that has to be taken into consideration when the economics are considered.

The final thing I want to address is that we hear a lot about all the different sources of haze. It kind of would have been nice to see a chart of maybe your plan that showed what the haze sources are and what you plan to do to deal with them, so just suggestion for next time. But one thing that I did find on-line is to look at the Lewis County pollution, the local pollution. The leading cause of nitrogen oxide in Lewis County is electricity generation from the TransAlta plant. It's 18,000 tons per square mile.

The second leading cause is transportation but it's only 3,000 tons per mile. You could eliminate pollution from cars and still have 15,000 tons per square mile in Lewis County. Particulate matter is the wood combustion issue. It's 2,400 tons per square mile from the plant. The second leading cause is wood combustion of those stoves, 480 tons per square mile. It's – Julie you mentioned bang for the buck. This is the biggest leading contributor of pollution locally and in the state. Thank you very much.

Jerry Thielen: Next we have Dave Grundvig.

Dave Grundvig: Once again my name is Dave Grundvig. I'm a boilermaker out of Local 502 and our jurisdiction covers pretty much Western Washington. A lot of the issues with regard to TransAlta and a lot of the other power houses that we have around seem small to me by comparison to the things that are being done in the BART system to abate a lot of these issues.

You have a lot of ways to combat the carbon. We have carbon capture which is new on the horizon. It's working in West Virginia. You have bio – what is it – it's algae basically where they're using that in Israel and they're actually growing algae and producing biomass diesel out of that and recycling the C02. And cows, my God, cows put out huge amounts of methane.

Methane is 20 times as bad for the environment as C02 by volume. There are many ways to abate, reduce these issues at a lot of the larger fire plants including coal. Sure, coal has got a lot of problems with it, it puts out a lot of side products, but anything you burn does. No matter what you burn, whether it be coal, gas, wood, which is biomass, you know, you like burning trees? Well sure, that's a mutual carbon cycle that that creates but it still puts a lot of of particulates in the air. So no matter what you do if you're gonna have electricity the wind doesn't always blow, the sun doesn't always shine and the grids that it takes to hook up a lot of these other systems would overwhelm the one we have.

The grid we have now is inadequate and it needs to completely be rebuilt along with a lot of other of our public works projects. I have to agree with the BART system. It seems like the most cost-effective means to me to come to an end with this thing or to gain ground on it. If you bring in a lot of gas pipelines – I'll point out the one down in California, the explosion we just had down there, where was that, San Bruno? Gas is dangerous. It's more dangerous than shipping car coal across the country.

When they closed down that coal mine in Centralia they brought in that Wyoming coal. It's much cleaner, much better for the environment, and so there are a lot of simple things that can be done before you ever start working on the real expensive stuff to get these reductions down or to reduce these emissions, I should say.

With regard to the emissions that are put out by fireplaces and those kinds of issues the extent to which those function isn't anywhere close, so it's already in effect with a lot of the precipitator units and the bag houses. They don't even come close. I live next to a wood stove that has some of those reducing issues and you still can't breathe it. You walk out onto my back porch and you can't take a breath of air.

There are a lot of issues that need to be addressed and dealt with, I think, before we start worrying about tearing down or completely re-vamping an existing system. So that's pretty much where my head is around this thing. The boilermarkers, we're elbow-deep in this stuff all day, every day.

Now we know about a lot of these problems and they're being worked on. They are. Granted it's slow and there are a lot of engineering developments that need to take place as well as research around the world. Israel has got a lot of them. We have a lot of them here. We have a gentleman right here in the back that's a boilermaker. He's also a graduate for -- biological graduate at any rate and he's working with some people on some of this stuff but he knows quite a bit about it as well and I'm sure he'll speak eventually. Thank you.

Jerry Thielen: All right, thank you very much. Next, we have Dave from the Mt. Rainier National Park Service. His last name, I can't pronounce. I could try but then I'd be really embarrassed.

Dave Uberuaga: Uberuaga. Good evening, I'm Dave Uberuaga, Superintendent of Mt. Rainier National Park and I appreciate this opportunity to present the comments of the National Park Service on Washington's Department of Ecology's proposed state implementation plan for regional haze. We provided formal comments on the State's draft proposal for best available retrofit technology for TransAlta's Centralia Power Plant in October and November 2009 and on the draft state implementation plan in June of 2010.

We appreciate that the State has addressed some of those previous comments, however, we are still concerned that Washington's proposal does not protect the visibility in our National Parks and wilderness areas. Our major concern is that Washington needs to require better controls for nitrogen oxide emissions from the TransAlta Centralia Power Plant.

The Centralia facility is located in proximity to majestic national parks and wilderness areas whose resources are significantly affected by its emissions. Mt. Rainier National Park was established by the citizens of Washington in 1899, the fifth oldest national park and is only about 50 miles away.

Emissions from Centralia facility also impact Olympic and North Cascades National Parks and I'm also speaking to, this evening, on behalf of Superintendent Karen Gustin of Olympic National Park and Superintendent Chip Jenkins of North Cascades National Park. By law our nation strives to conserve unimpaired national parks and wilderness areas in their natural state, protected from the adverse impacts of air pollution.

Back in 1995 we testified regarding the need for stronger emissions limits on sulfur dioxide at the Centralia facility to address the visibility impairment and other environmental concerns at the park and in the region caused by those emissions. We note with appreciation that since those strong emission limits were put in the place facility came into compliance there has been a dramatic reduction in measured sulfate at Mt. Rainier and correspondingly statistically significant improvement in visibility.

Today we are asking Washington to now require TransAlta to install the best technology to reduce the emissions of nitrogen oxides, also a key component of visibility impairment at the parks.

Our analysis conclude that post-combustion controls, specifically selective catalytic reduction technology, is both technically feasible and the most cost-effective option when considering the visibility improvement that would occur at Mt. Rainier, Olympic and North Cascades National Parks and nine other Class One wilderness areas administered by the U.S. Forest Service.

On June 24, 2009 the Department of Interior was petitioned by the National Parks Conservation Association, Washington Wildlife Federation, the Sierra Club and Northwest Environmental Defense Center to certify that emissions of nitrogen oxides from Centralia facility are reasonably anticipated to cause or contribute to visibility impairment at Mt. Rainier and Olympic National Parks.

Such a certification would require the State to evaluate best available technology to remedy any reasonable attributable visibility impairment under existing provisions of the State Implementation plan. We are hopeful that the State's controlled determination for regional haze will also satisfy the concern for reasonable attributable impacts.

To date Washington's proposed determination of best technology does not adequately address these impacts. We encourage the Department of Ecology's strong leadership role, similar to those, its sulfur dioxide actions in 1995, and require selective catalytic reduction technology for Centralia as part of the regional haze state implementation plan. This would limit Centralia's emissions of nitrogen oxides to approximately 3,000 tons per year or approximately 12,000 tons per year less than is currently being proposed.

The Department of Interior will make a final decision regarding the petition for reasonable attributable visibility impact pending the outcome of the Department of Ecology's control determination for regional haze. Like the reduction in sulfur oxides, such a reduction of nitrogen oxides would lead to a direct improvement in the visibility of Mt. Rainier National Park as well as contribute to the improved visibility and decreased health effects from fine particulate matter region-wide.

While the focus of our concern is the nitrogen oxide emissions we are also concerned with mercury deposition at Mt. Rainier and throughout the region. Recent studies show elevated concentrations of mercury in snow, sediments, vegetation and fish collected in all three of our national parks. We note that the addition of selective catalytic reduction technology is, if appropriately designed, would achieve additional emissions of mercury.

The National Park Service will be submitting additional written comments during the public comment period that address our concerns with the low degree of visibility improvement due to controls proposed in the State of Washington. We encourage the Department of Ecology to be proactive in protecting visibility and to revise his proposed state implementation plan.

In closing I would like you to think about the importance of Mt. Rainier, Olympic and North Cascades National Parks to this region and to the world for todays' public and for future generations. There are many reasons that the law mandates our highest levels of environmental protection for these special areas.

National parks and wilderness areas are our natural and cultural heritage. Sociology studies confirm their importance as do our individual experiences of recreation and renewal. In 2009 Mt. Rainier recorded over 1.7 million visitors and visitation as of the end of August 2010 is already above 1.3 million visitors.

Regarding the economic benefits of the park, for example, in 2001 when we did our last visitor survey at Mt. Rainier we learned that recreation visits to the park spent $29.8 million within a 30-mile radius of the park. The total economic impact of visitor spending was $24 million in direct sales and $9 million in personal income, and $13 million in direct value added, and 649 jobs.

Jerry Thielen: I'll ask you to wrap-up if you could.

Dave Uberuaga: Okay. I've got one more minute here. With multiplier effects created by the recirculation of money spent by tourists visitor spending generated about $35 million in local sales and associated $13 million in personal income in 812 jobs. These figures do not include park admission fees and/or impacts of the National Park Service payroll and operations in the area.

The national parks and wilderness areas will not only guard the natural and cultural assets of our nation but they are all most sensitive gauges of environmental stewardship. Harm to these resources that our nation strives hardest to protect must signal an alarm for other resources and for us. The National Park Service desired outcome in this process is a solution and a decision that protects air quality and other important resources by proven cost-effective technologies to significantly-reduced emissions for Centralia facility.

To be clear an outcome the National Park Service does not seek is the closure of the Centralia Power Plant. Experience from other states and the success of the 1995 collaborative effort on sulfur dioxide emissions from the plant tells us that these two outcomes, achieving a significant reduction in emissions and keeping important facility operating are wholly compatible.

We stand ready to work with all interested parties towards these outcomes. This concludes my testimony and the National Park Service will be submitting detailed technical comments on the consent decree before the close of public comment. Thank you very much.

Jerry Thielen: Thank you very much. Next we have Cara Dolan.

Cara Dolan: Good evening, my name is Cara Dolan. I want to thank you for the chance to testify. I'm here representing a growing coalition of health organizations including the Washington State Nurses Association, the Washington Physicians for Social Responsibility, the Washington State Association of Occupational Health Nurses, amongst other groups who have all signed on in support of transitioning Washington State off coal by 2015 for the reasons of the health impacts of coal pollution.

And I wanted to bring this up today because, as you mentioned earlier, the same pollutants that cause haze are also damaging our human health here in Washington. As the largest source of nitrogen oxide pollution in our state the Centralia generation facility owned by TransAlta is contributing to the known health impacts of nitrogen oxide which include impaired lung development, which often leads to asthma and COPD, and asthma exacerbation, and unfortunately as I think was mentioned here, the people most vulnerable to these impacts are children and the elderly and the already sick.

So I think for the sake of public health and the parks we need a strong plan that's gonna reduce knocks, and as was stated by the National Parks Conservation Association – I think I got that right earlier – this plan ultimately fails to reduce the haze causing pollutants. So on behalf of those health groups and a Washington citizen with asthma myself, I would like to testify in support of a strong plan to reduce these haze-causing pollutants and also just bringing a quick fact that the Center for Disease Control rates Washington as having one of the highest rates of asthma in the nation and predicts that – well, and shows an increasing proportion of the population with asthma in our state.

So nitrogen oxide pollution is not just about the haze. It's about the public health impacts as well. Thank you.

Jerry Thielen: Thank you. Next, we have Jessie Dye.

Jessie Dye: Thank you so much for your patience in listening to all of our testimony today. You're great. Thank you to the boilermakers and the people of faith, the environmentalists, all the people who are here to speak. My name is Jessie Dye. I'm program and outreach director for Earth Ministry which is a Washington State and National Organization which connects people of faith with environmental stewardship.

We have members and leaders who are Catholics, Evangelicals, Methodists, Presbyterians, Quakers, UCC. Whatever your faith tradition, I bet I know one of your pastors. Every major faith denomination in the U.S. has a statement on protecting creation and, in particular, on climate protection.

In our state our biggest concern is the coal plant in Centralia. I'm sorry to say that the plan in front of you, the NOx Plan for the State of Washington is not one that we find makes an improvement in the situation. For us the issue is human health, the toxics that affect newborns, the toxics that affect old people, the pollution that is harmful not only to our glaciers but also to the poorest who can't get healthcare for the illnesses that they face.

So we ask not just for protection from haze but also protection from the mercury, from the coal ash and from the carbon pollution that this plant creates. We're in great sympathy with the workers who struggle with the issues but we want to acknowledge that TransAlta has already broken one treaty when they close the coal plant for which we give them a $5 million tax break each year.

So from our perspective we can do so much better than the plan in front of you and we ask EPA to make a stronger plan for reducing NOX. Thank you so much.

Jerry Thielen: Thank you. Next we have Jay – is it Kramis?

Joe Kramis: I'm Joe Kramis, a retired Catholic priest and certainly sympathetic for boilermakers. I was a union member for many years as a younger lad and have a great love for union people and what they do and the service they give all of us. So their jobs are on the line, I know, with all of this, and that's an important consideration in how we address this issue.

I noticed from their brochure that they are working very strongly on efforts to reduce their emissions that would clean up their coal. I don't know how far that technology has come along yet. I've got a cousin that works in the coal industry back East and I've got a call in to him to find out what they're doing at that level but, so far as I know, there hasn't been much in the area of reduction that needs to be addressed and taken care of.

My hope is that with things like today they will be encouraged to do something more to make that happen. In the mean time as a – as a faith community person I know that most of our people in faith community are very strongly for taking care of our environment and I know that that's true probably of the boilermakers as well that many of them I'm sure down there are hunters and go into the woods and know appreciation for animals and for our woods, and all of the environment that's so necessary for us as human beings.

We may be top of the chain as human beings but, my golly, we're all inter-connected and that's very much a part of the teachings of our church, and I know of many of the faith traditions that we're all one with the universe and with all of creation. So how we treat one another and treat our environment is vital for our survival.

Jerry Thielen: Thank you. Next we have Joe McHugh.

Joe McHugh: I had some question as to whether I could add anything to the discussion meaningfully. I'm not even sure I can but since I signed up earlier, my mother died of tobacco illness. My two aunts died; one form emphysema, one from cancer, lung cancer.

I did a curriculum for the State of California on tobacco prevention using radio drama as a way to get young people engaged in sort of understanding what the issues were. It was a radio drama like the old cliffhangers. There were 10 episodes. Each one was about seven minutes long and a guy goes back in a time machine to find Sir Walter Raleigh and bring him to the present, show him all the trouble tobacco has caused and take him back, but of course the tobacco industry gets involved and they try to prevent this. And you know you have the chapter, episode 8 which ends with a screeching car, "Watch out for that car, Sir Walter!" "Will Sir Walter return to his century?"

It was really an eye opener to me in terms of how public perceptions are so impacted by modern media and how much of the game is really being defined by that so that science, the best science struggles mightily to even be heard within the mechanisms of leadership, and so I have great sympathy for the situation you're in.

I mention tobacco because I smoke myself, you know, and probably from utero I was getting nicotine hits from my mother. Right. So I started smoking when I was 12 and I quit when I was 27 and it darn near killed me to do it. I mean I was just miserable but I had tried so many times to get off it a little bit at a time. I had to do it cold turkey. I had to do it all at once.

I think that's – I'm just gonna finish. I just wrote a novel about the energy industry, electrical energy industry called kilowatt. I spent three years researching the novel, working with really top people in the field all over the country and I came to the conclusion which I really had not reached yet. I know I'm rambling. I just wanted to say one other thing. I founded a children's museum in West Virginia for a number of years so I really have lived and have great affection for coal people and this was in Beckley, down in the coal fields.

So I do know that culture. I know the history of coal. A lot of our exhibits are about the early days of coal mining. We have reached a place in human history where we have got to stop burning coal. It's not even an option. And the rest of this is just politics and moving things around, and we are gonna pay a tremendous price, and certainly our children. We have to stop.

Once we decide to stop all the other alternatives become real. If we play this game we're just hedging. We're, "Oh yeah, there's gonna be a solution down the road, it's coming, just you wait and see." We have to stop. So many – it's absurd to even start to list the reasons when you start to look at them all from asthma to carbon to mercury.

We can't eat fish. We go fishing every year. In Wisconsin we can't eat any of the fish anymore. You get your license they say, "You can't eat any fish by the way." We have to, as a species stop, no matter what the pain, for everyone. Thank you.

Jerry Thielen: Thank you. Dennis Lingle?

Dennis Lingle: Hi, I'm Dennis Lingle. I'm a boilermaker. I guess one of my questions was what we had done in the past here, I guess I've been around here for about 40 years and seen all the changes that have been made with the Centralia Steam Plant and others, okay, a lot has been changed. Okay. I don't – we're not a lot different. The environment is very, very important to us. We're no different than anybody else here. It happens to be one of my jobs. However the environmental issues that we've had over the years have changed a lot of things.

There's been a lot of coal technology that's changed a lot in the environment. Degasification of coal was thought about 30 years ago. A lot of the things that have taken place has been a result of people who – well different than where we are here when something changed or something cleaned up or whatever the case may be.

This plant that we're talking about here, I know we're talking about visibility and what-not but this plant has changed so much in the 39 years that I've been in this trade, it's amazing. It is amazing. You know they used to run these coal-fired coal plants full-boar, night-time pollution everywhere just to produce more megawatts. This is a tremendous amount of megawatts. It's 1,500 megawatts out there at that plant. They've got a coal fire, they've got a piquing unit right across the street, got the same footprint as far basically, okay, but only produces 244 megawatts.

So that's where we're at and that 1,500 megawatts is a lot. They've done a lot to clean it up and it's not just been TransAlta. They did a lot at PG&E and whatever, however, you know that this is what's changed our technology and a lot is happening and we've got a tremendous amount of coal in this country, a tremendous amount of coal. And the technology is coming that we can burn more. We just can't, in my mind, just shut everything down. We've got wind power, we understand that, but there's not grid going to those things. They're producing a minimal amount of megawatt and electricity. Our cost is tremendous here on the west side compared to a dam on the east side.

But I guess we're – a lot of this has come about by changing everybody's mindset and that's where the technology has come from. We've cleaned it up tremendously. That's the reason I would – I asked earlier about what have we done in the last 30 or 40 years, and what's been cleaned up and how it's majorly impacted, we're talking 25 percent of the pollution in Washington State, compared to outside sources.

A lot of those outside sources are not gonna clean up. We understand that, you know, but none of us are against the environment. None of the boilermakers are against the environment. We are out there hunting and we're out there and it's our children. Okay. So, thank you.

Jerry Thielen: All right, thank you. Mark Quinn?

Mark Quinn: Thank you. I'm Mark Quinn. I'm here representing the Washington Wildlife Federation and I'm happy to represent hunters and anglers, and other wildlife supporters who think we must do everything we can to protect our natural resources, especially our air and water. Hunters and fishers tend to be a pretty conservative bunch and we like to stay behind the scenes

I thought about seeing my cammo tonight so you wouldn't see me but –

Jerry Thielen: *[Chuckling.]*

Mark Quinn: Conservative is good when it comes to our natural resources. If the status quo means clean air and healthy wildlife we like it. If it means destroying and threatening wildlife habitat and polluting our air and water, we don't. We think nitrogen oxide represents more than just haze. We think it also represents a serious pollution that affects us and wildlife, and it's a matter of record that TransAlta continues to be the number one individual polluter in Washington for carbon dioxide, mercury and nitrogen oxides.

Coal is the dirtiest of our fossil fuels. Our literature, popular and scientific, is full of information documenting the health hazards and the environmental hazards of coal. It's the dirtiest way to generate electricity. It's an ugly landscape destroying process when we mine it. It's a terrible health hazard when we burn it and the coal ash that's left after it's through burning is also toxic.

It produces carbon dioxide, sulfur dioxide, which causes acid rain, nitrogen oxide which causes smog and haze, ash, other particulates and mercury, a substance we all know is a health hazard for wildlife and humans. We want to see every effort taken to control emission like nitrogen oxide, sulfur dioxide, and mercury, and eventually carbon dioxide at TransAlta, but we think a better approach in Washington, a state that according to Governor Gregoire aspires to be a global leader in reducing greenhouse gas emissions and leading the way on renewable energy would be a plan to phase out the burning of coal as a fuel source altogether and do it over a time frame that is meaningful and represents the urgency that the science tells us is necessary.

No, it's not gonna be easy but meaningful change rarely is. We know it's going to take time. That's why we want to start now. It's ironic that while we're scratching our heads trying to figure out how to stimulate a floundering economy we can't see the perfect opportunity that's right in front of us, the opportunity to invest in the future at TransAlta by transitioning away from coal to cleaner fuels that would create new jobs, reduce pollution, and all this time what are we doing? We're trying to figure out a way to maintain the status quo.

I appreciate the comments from the boilermakers. Like me they have a lot of respect for the environment and I have a lot of respect for what they do in their jobs but I think there's a – hate to use a cliché – a win-win situation here. It's just gonna take more leadership from the State, both the Department of Ecology and other regulators and our governor. We should expect more accountability for protecting our air and water from a company like TransAlta in the Evergreen State, and we should expect our state regulators and the governor to do everything in their power to incentivize a transition to cleaner fuels at TransAlta and not business as usual.

This time the status quo will not protect our air and water. We need to step up and outside the box. Thank you.

Jerry Thielen: Thank you. Is it

Rebecca Hawk: Good evening, everyone. My name is Rebecca Hawk. I am the Regional and National Air Quality Coordinator of the Yakama Nation. I bring you greetings from four hours away during rush hour in Yakama. Actually from Topanish is where the reservation is.

I also bring you a letter from our tribal council chairman, Mr. Harry Smiskin, and it is addressed to Mr. Ted Sturdavent, the Director of the Department of Ecology. The Yakama Nation is a Federally recognized tribe with reserved treaty rights.

All vested rights and interests are throughout the Yakama reservation, seated lands, and usual and accustomed areas where we promote the protection and preservation of culture, archeological and natural resources.

Our nation strives to preserve our indigenous past as well as our present way of life in protecting historical, cultural and the natural aspects of our remaining environment. We are maintaining and preserving our traditional food and medicine gathering areas throughout our reservation and seated lands of approximately 11 million acres within the State of Washington as well as the usual and accustomed areas throughout the Columbia basin.

As native people to the Columbia Basin we appreciate and encourage the efforts of the Department of Ecology in developing the regional haze plan in class 1 areas as part of the Federal guidelines for returning class 1 areas to natural conditions. I2064.

The results of a plan such as this speak to the very heart of our ties to the natural environment. Protecting the water, the land and the air is the mandate from the creator. Our forefathers engaged in resource management that ensured the protection and preservation of resources for the health and well-being of future generations.

Now at this critical point in history with such severe threats to the How-Laak Hush Wit or the sacred breath as we call it the Yakama nation is involved in important research that will provide important information to influence policy development in the Northwest and throughout the United States.

DOE's first phase of reducing haze producing pollutants is a complex and critical part of reaching the long-term goals of the regional haze plan. We have worked extensively with the Department of Environmental Quality in Oregon to provide input on strategy development for the Columbia River gorge and on the regional haze plan in Oregon.

We would like the precedence of this staff to staff working relationship that was developed in Oregon and proved helpful to all parties concerned to help us develop a plan to work with the Department of Ecology for it is through a transparent and productive working relationship that the Yakama nation can best assure that our concerns and priorities are best represented in the development of Air Quality Policy that will ensure health and well-being to the environment and the humans.

To further discuss the development of this process, et cetera, I would like to submit – we will be submitting this in formal written form and also some more technical comments at a later time. Thank you.

Jerry Thielen: All right, thank you very much. The last person that – who has signed up to testify is Mervin Swanson.

Mervin Swanson: Yeah, I'm Mervin Swanson. I'll give you a little history about myself. 35 years as a boilermaker retired, I'm a Fisheries Biologist by education, Environmental Studies Water and Atmosphere, University of Washington. I graduated in '78.

I have a little history involved in this environmental movement in this state. One of my good friends when he was in the legislature, Dan Grim, wrote a law for me which you guys enforce every day. It's the Wood Stove Bill. I asked him to write that for me and pass that for me and he did that.

So I am not opposed to environmental controls, let me get that straight, just because I'm a boilermaker and because of where I am, but I do feel strongly that we are taking a wrong approach. In a lot of this stuff so far everything

I'm hearing is the same thing I've heard in the political arena for the last two years, "Just say no."

I think it's time we step back and take a hard look at what we can do and start saying a little bit, "Yes, we can." I worked with Dr. Hsu Lin Chin trying to get funding for him over at Washington State University. Hsu Lin does a marvelous job in the – in sewage treatment facilities he's designing and taking – taking sewage, converting it into by-product and he takes the final stream of that by-product and he's turning it into an algae which then gives him biodiesel, and from the biodiesel he's able to make jet fuel which Boeing has been involved in investing in his school over there, and so has BioVentis.

And I helped him get some money from several of our Senators, a couple of our Senators. We can look at what he's doing and take a serious approach. Every community in this state was at one time obligated to come under a tertiary treatment near sewage but we walked away from that. Secondary is as far as it got.

With today's technology and with the flow of C02 that comes out of this plant, algae are consumers of carbon dioxide like nothing you ever seen. Those little buggers suck that stuff up like a vacuum cleaner. If you put that, a stream that could feed every community, a stream of C02 and they were to come out and build reactors, bioreactors in there, we would get clean water with biodiesel. We'd get rid of this damn foreign oil we've been bringing in all the time and we start running our stuff.

Not just that. We'd reduce nitrous oxide which is coming out of the tailpipe of your big semis and our ships that call at our ports out here. I hear a lot of talk about NO2X or NOX. With an atmosphere of 80 percent nitrogen and in a good electrical storm we're doing a lot of nitrogen fixing and we're creating a lot of nitrogen oxides.

So it's not all this plant, although I will say it does put out a lot like everything else but every waste stream has a product that can be recovered and recycled. We need to start saying, "Yes, we're gonna look at how we can recover and recycle that and turn it into a marketable product." We don't have to just say, "No, we're not gonna have it." We did that with nuke plants. How many billions did we lose? We had one sitting down the road here. It was 87 percent complete and what did we do? We stripped it out and sent it to China. Meanwhile its sister plant is running beautifully over in tri-cities and we're all living off the power from that thing.

So we have a history of making some stupid mistakes and maybe it's time we start saying, yes, let's take an honest look. Thank you.

Jerry Thielen: Thank you. Okay. That exhausts the lists of people who had indicated that they wanted to testify when they signed in and, as I promised some or most of you, I will give an opportunity to you if you have not yet spoken but have now changed your mind and would like to come forward and adhere to the time limits. We'll certainly allow you to do that.

Eric Rimmen: My name is Eric Rimmen. I don't have a written speech. I wish I did but I'm just gonna wing it. The thing is here we all have the same goal. A few of the people may – are a little off-task but we have the same goal. Myself, I'm a life-long environmentalist. My dad was a CCC member up in the Olympic National Park. We were talking about the haze up there. He worked his youth before he went in World War II up there. I've been up there many a time just like all the other parks. That's my big thing what I do.

Seated here today you have some of the best craftsmen in the world. That comes from the heart. These guys know what they're doing. Sometimes you confuse, and we were talking about TransAlt on coal, these guys want to build the best plants with the most features that protect the environment possible and I'm sure, I know I would like to invite anyone here discuss this further.

The only thing that really, you know I enjoyed the testimony, that disturbs me is demonizing coal. If you don't have one of our handouts, I'd like you to take one and, for example, look up the Mountaineer Power Plant, New Haven, West Virginia. That's just the start of what we're starting to do. Okay. That's even capturing carbon and all that.

Okay. We have all kinds of technology so instead of just stomping and let's get together on this thing and make coal work. Coal is American and despite what is said, there's room for alternative energy absolutely, but a lot of us from off-shore we need American power, American power independence, we have the best craftsmen and we can do this.

So, again, I invite everyone here or anyone here to talk to me after tonight or Gumby or Mr. Lingle and maybe we can get together on this. We have the same goal. Okay. Thank you.

Jerry Thielen: Great, thank you. Anyone else? Yes, sir.

Chris Bjornson: My name is Chris Bjornson. I'm a boilermaker. I'm a lifelong Washington resident and I'm a consumer and first comment is it seems like we got a little bit off track. I mean this is regional health reduction and what we can do to meet the goals and –

Jerry Thielen: And sir, could I get you to speak right into that microphone for me, please?

Chris Bjornson: Do which?

Jerry Thielen: Speak a little closer into that microphone?

Chris Bjornson: All right.

Jerry Thielen: You can take it out of there if you want.

Chris Bjornson: Got a little bit away from what we have to do to – or what we can do to implement the regional haze reduction and meet the goals and long term over the next few years, and I think we can do this without shutting down Centralia and one of – just like it's been said, just implement some of the technologies that are available to us to meet the reduced haze reduction, and in so doing, reducing the release of elements that are – and by-products that are harmful to all of us.

And as a consumer in Seattle over 30 percent of our electrical needs are met by coal production through electrical generation due to coal and I don't know that we can – solar and the wind, they only represent about one percent and I don't think they can fill the void or the gap that would be presented by just shutting down the coal.

Technologies are available to keep producing electricity with coal and if we rely totally on gas as a consumer I doubt that our electric rates would pay down and Washington used to have the cheapest electricity in the country and we've reduced our dams. Instead of building a better fish ladder we've reduced, we've let the dam – let open the floodgates and not utilized the water that we're capable of generating electricity with.

And as a lifelong Washington resident I don't think I'd still live here if I didn't like looking at Puget Sound or looking at the Olympics and looking at Mt. Rainier. And we just – we do have a common ground and we all want the same thing and I think we can do it without eliminating coal.

Jerry Thielen: Great, thank you. Anyone else? Seeing that there is no one else who has indicated that they'd like to testify I'd remind you that comments regarding this proposal need to be received by October 6 of this year and again to the addresses – well that were up on that screen and are included in the focus sheet, and again, we have additional focus sheets up front if you didn't want one because they have the addresses, snail mail and the e-mail for providing these comments.

Let the record show that it is now 7:44 p.m. and this hearing is now closed. Thank you very much. You all have a safe drive home.

[End of Audio]

Public Involvement Notices of Comment Period and Hearing

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600 • Olympia, WA 98504-7600 • 360-407-6000
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

NOTICE OF OPPORTUNITY FOR PUBLIC COMMENT

Regional Haze State Implementation Plan (SIP)

EPA adopted the Regional Haze Rule on July 1, 1999. It established a program to improve visibility in 156 of the nation's national parks and wilderness areas, where visibility is especially important. Congress called these "mandatory Class I areas." See Washington's eight Class I areas at http://www.ecy.wa.gov/programs/air/PDFS/wilderness.pdf.

Washington must submit a plan to the United States Environmental Protection Agency to reduce air pollutants that affect visibility in its Class 1 Areas. The Regional Haze SIP:

- Documents current conditions at Washington's mandatory Class 1 areas.
- Establishes the base for controls in future SIPs.
- Begins the process of making Reasonable Progress toward the 2064 goal of natural visibility conditions.

Public hearing schedule:

Date: Tuesday, September 28, 2010
Time: 6:00 p.m.

Location: Department of Ecology
Headquarters Building, Auditorium
300 Desmond Drive SE
Lacey, WA 98503

Ecology will provide a link to participate in the hearing via the Internet. Information about how to participate via the Internet will be available on the Regional Haze SIP webpage by September 21. View the Regional Haze SIP webpage at http://www.ecy.wa.gov/programs/air/globalwarm_RegHaze/regional_haze.html.

How to review and comment:

Ecology will accept comments on the draft Regional Haze SIP and appendices. The draft Regional Haze SIP and appendices will be available for review:

On-line at: http://www.ecy.wa.gov/programs/air/airhome.html

And at the following locations:

Bellingham Public Library
210 Central Avenue
CS-9710
Bellingham, WA 98227-9710
360-778-7323

Seattle Public Library – Central Library
1000 Fourth Avenue
Seattle, WA 98104
206-386-4636

Longview Public Library
1600 Louisiana Street
Longview, WA 98632
360-442-5300

Twisp Library
201 N. Methow Valley Highway
Twisp, WA 98856-0237
509-997-4681

Mount Vernon City Library
315 Snoqualmie Street
Mt. Vernon, WA 98273
360-336-6209

Port Townsend Public Library
1220 Lawrence Street
Port Townsend, WA 98368
360-385-3181

Wenatchee Library
310 Douglas Street
Wenatchee, WA 98801-2864
509-662-5021

Ecology will accept comments from August 25 to October 6. Send comments to:

Doug Schneider
Department of Ecology
Air Quality Program
P.O. Box 47600
Olympia, WA 98504-7600
AQcomments@ecy.wa.gov

Ecology's response to your comments:

All of the comments we receive will become part of the official record. Ecology will compile a summary of oral and written comments received during the comment period and Ecology's response to those comments.

For more information, contact:

Jeff Johnston
Department of Ecology
Air Quality Program
360-407-6115
jeff.johnston@ecy.wa.gov

Or go to: http://www.ecy.wa.gov/programs/air/globalwarm_RegHaze/regional_haze.html

Ecology's Regional Haze Focus Sheet: http://www.ecy.wa.gov/pubs/0902016.pdf

Documents related to the seven sources subject to BART requirements:
http://www.ecy.wa.gov/programs/air/globalwarm_RegHaze/bart/BARTInformation.html

If you need special accommodations, call the Air Quality Program at 360-407-6800. Persons with hearing loss, call 711 for Washington Relay Service. Persons with a speech disability, call 877-833-6344.

STATE OF WASHINGTON – KING COUNTY

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259292

DEPT OF ECOLOGY

No. PUBLIC COMMENT

Affidavit of Publication

The undersigned, on oath states that he is an authorized representative of The Daily Journal of Commerce, a daily newspaper, which newspaper is a legal newspaper of general circulation and it is now and has been for more than six months prior to the date of publication hereinafter referred to, published in the English language continuously as a daily newspaper in Seattle, King County, Washington, and it is now and during all of said time was printed in an office maintained at the aforesaid place of publication of this newspaper. The Daily Journal of Commerce was on the 12th day of June, 1941, approved as a legal newspaper by the Superior Court of King County.

The notice in the exact form annexed, was published in regular issues of The Daily Journal of Commerce, which was regularly distributed to its subscribers during the below stated period. The annexed notice, a

PN:REGIONAL HAZE SIP

was published on

08/25/10

Subscribed and sworn to before me on

11/09/2010

Notary public for the State of Washington,
residing in Seattle

JENNIFER A. PATZER
COMMISSION EXPIRES
NOTARY
PUBLIC
OCT. 24, 2011
STATE OF WASHINGTON

Affidavit of Publication

State of Washington, King County

State of Washington

DEPARTMENT OF ECOLOGY AIR QUALITY PROGRAM NOTICE OF OPPORTUNITY FOR PUBLIC COMMENT

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And at the following locations: Bellingham Public Library 210 Central Avenue CS-9710 Bellingham, WA 98227-9710 360-778-7323; Mount Vernon City Library 315 Snoqualmie Street Mt. Vernon, WA 98273 360-336-6209; Seattle Public Library – Central Library 1000 Fourth Avenue Seattle, WA 98104; Port Townsend Public Library 1220 Lawrence Street Port Townsend, WA 98368 360-385-3181; Longview Public Library 1600 Louisiana Street Longview, WA 98632 360-442-5300; Wenatchee Library 310 Douglas Street Wenatchee, WA 98801-2864 509-662-5021; Twisp Library 201 N. Methow Valley Highway Twisp, WA 98856-0237 509-997-4681

Ecology will accept comments from August 25 to October 6. Send comments to: Doug Schneider Department of Ecology Air Quality Program P.O. Box 47600 Olympia, WA 98504-7600 AQcomments@ecy.wa.gov

Ecology's response to your comments:

All of the comments we receive will become part of the official record. Ecology will compile a summary of oral and written comments received during the comment period and Ecology's response to those comments.

For more information, contact: Jeff Johnston Department of Ecology Air Quality Program 360-407-6115 jeff.johnston@ecy.wa.gov

Or go to: http://www.ecy.wa.gov/programs/air/globalwarm_RegHaze/regional_haze.html

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If you need special accommodations, call the Air Quality Program at 360-407-6800. Persons with hearing loss, call 711 for Washington Relay Service. Persons with a speech disability, call 877-833-6344.

Date of publication in the Seattle Daily Journal of Commerce, August 25, 2010.

8/25(259292)

rit of Publication
OF WASHINGTON)
) ss:
ounty of Clark)
Columbian

TAMI DAHLGREN
WA ST DEPT ECOLOGY/AIR QUAL-L
PO BOX 47600
OLYMPIA WA 98504-7600

REFERENCE: 72315 NN OPP REG. HAZE
3081598 DEPARTMENT OF ECOLOG

I, the undersigned say,

That I am over the age of eighteen and not interested in the above entitled matter; that I am now, and at all time embraced in the publication herein mentioned, was, the principal clerk of the printer of The Columbian, a daily newspaper printed, published and circulated in the said county and adjudged a newspaper of general circulation by the Superior Court of the County of Clark, State of Washington, under Proceeding No. 802006715; that the advertisement, of which the annexed is a true printed copy, was published in the above-named newspaper on the following dates, to wit:

PUBLISHED ON: 08/25

TOTAL COST: 286.88
FILED ON: 08/25/10

I Certify (or declare) under penalty of perjury that the foregoing is true and correct.

Signature Judy Moody

DEPARTMENT OF ECOLOGY
AIR QUALITY PROGRAM
NOTICE OF OPPORTUNITY FOR PUBLIC COMMENT
Regional Haze State Implementation Plan (SIP)

EPA adopted the Regional Haze Rule on July 1, 1999. It established a program to improve visibility in 156 of the nation's national parks and wilderness areas, where visibility is especially important. Congress called these "mandatory Class I areas." See Washington's eight Class I areas at http://www.ecy.wa.gov/programs/air/PDFS/wilderness.pdf.

Washington must submit a plan to the United States Environmental Protection Agency to reduce air pollutants that affect visibility in its Class 1 Areas. The Regional Haze SIP:

* Documents current conditions at Washington's mandatory Class 1 areas.
* Establishes the base for controls in future SIPs.
* Begins the process of making Reasonable Progress toward the 2064 goal of natural visibility conditions.

Public hearing schedule:
Date: Tuesday, September 28, 2010
Location: Department of Ecology
Headquarters Building, Auditorium
300 Desmond Drive SE
Lacey, WA 98503
Time: 6:00 p.m.

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310 Douglas Street
Wenatchee, WA 98801-2864
509-662-5021
Twisp Library
201 N. Methow Valley Highway
Twisp,WA 98856-0237
509-997-4681
Ecologywillacceptcommentsfrom August25 to October 6. Send comments to:

August 11, 2010.
DATE OF FILING COPY OF NOTICE TO CREDITORS with Clerk of Court: 8/6/10.
PERSONAL REPRESENTATIVE:
Bruce Vandebrake
16301 NE 187th Avenue
Brush Prairie, WA 98606
ATTORNEY FOR PETITIONER:
Michael E. Keller WSBA#6005
P.O. Box 130
Stanwood, WA 98292
360-629-7701
Aug. 11,18,25 375352

NOTICE OF TRUSTEE'S SALE
PURSUANT TO THE REVISED CODE OF WASHINGTON CHAPTER 61.24 ET. SEQ. APN 097382-026 TS NO: WA-09-286448-SH I. NOTICE IS HEREBY GIVEN that Quality Loan Se

THE WENATCHEE WORLD, WENATCHEE, WASHINGTON
AFFIDAVIT OF PUBLICATION
STATE OF WASHINGTON
COUNTY OF CHELAN

AIR QUALITY CONTROL-SW REGIONAL OFFICE
WASHINGTON STATE DEPT. OF ECOLOGY
P.O. BOX 47775
OLYMPIA, WA 98504-7775

REFERENCE INFORMATION:
Account # 129202
Ticket # 67535
Tag Line: DEPARTMENT OF ECOLOGY AIR QUALITY PR

The Wenatchee World is a legal newspaper published in Chelan County, Washington, and approved as such by the Superior Court of said County and State. Serving the counties of Chelan, Douglas, Grant & Okanogan.

PUBLISHED ON: Wenatchee World 08/25/10

TOTAL COST: $344.58

Subscribed and sworn to before me on 09/22/10

Jacobi A. Schall

Notary Public in and for the State of Washington, residing in Wenatchee

JACOBI A SCHALL
NOTARY PUBLIC
STATE OF WASHINGTON
COMMISSION EXPIRES
4-06-14

DEPARTMENT OF ECOLOGY
AIR QUALITY PROGRAM
NOTICE OF OPPORTUNITY FOR PUBLIC COMMENT

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THE WENATCHEE WORLD
www.wenatcheeworld.com • (509) 663-5161
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SKAGIT PUBLISHING

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L. Stedem Wood, Publisher

Affidavit of Publication in the matter of SVH-8345

In the Superior Court of the State of Washington In and For Skagit County

STATE OF WASHINGTON *ss*
County of Skagit

The undersigned, being first duly sworn on oath deposes that he/she is principal clerk of the Skagit Valley Herald, a daily newspaper. That said newspaper has been approved as a legal newspaper by the Superior Court of Skagit County and is now and has been for more than six months prior to the publication hereinafter referred to, published in the English language continually as a daily newspaper in Skagit County, Washington, and it is now and during all of said time was printed at an office maintained at the aforesaid place of publication of said newspaper.

That the annexed is a true copy of an advertisement, with publication dates, as it was published in regular issues (and not in supplemental form) of said newspaper commencing with the issue of August 25, 2010 and ending with the issue of August 25, 2010.

That such newspaper was regularly distributed to its subscribers during all of said period and the full amount of the fee charged for the foregoing is the sum of $375.00.

Michelle Boulman
clerk

Date: August 26, 2010

Subscribed and sworn to before me this
26th Day of August, 2010
Notary Public and for the State of Washington
Clerk's filing stamp

STACIE A. FILLER
Notary Public
State of Washington
My Commission Expires
November 21, 2012

DEPARTMENT OF ECOLOGY
AIR QUALITY PROGRAM

NOTICE OF OPPORTUNITY FOR PUBLIC COMMENT

Regional Haze State Implementation Plan (SIP)

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Public hearing schedule:
Date: Tuesday, September 28, 2010 Location: Department of Ecology
Time: 6:00 p.m.

Headquarters Building, Auditorium

300 Desmond Drive SE

Lacey, WA 98503

Ecology will provide a link to participate in the hearing via the Internet. Information about how to participate via the Internet will be available on the Regional Haze SIP webpage by September 21. View the Regional Haze SIP webpage at http://www.ecy.wa.gov/programs/air/globalwarm_RegHaze/regional_haze.html.

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Ecology's Regional Haze Focus Sheet: http://www.ecy.wa.gov/pubs/0902016.pdf

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Published August 25, 2010 SVH-8345

Affidavit of Publication

Final December 2010

In the Superior Court of the State of Washington for Clallam/Jefferson County

Peninsula Daily News

WA ST DEPT OF ECOLOGY
ATTN: ANGIE FRITZ
PO BOX 47600
OLYMPIA, WA 98504-7600

Reference: 4900695
5093968 Air Quality/Melanie Fors

The undersigned being first duly sworn on oath, deposes and says.

That she/he is authorized to and does make this affidavit for and on behalf of Peninsula Daily News, a corporation, and that the following statements of fact are within her/his personal and actual knowledge.

That said corporation is the owner and publisher of the Peninsula Daily News published in Clallam/Jefferson Counties, and had been approved as a legal newspaper by order of the Superior Court of said Clallam/Jefferson County of the State Of Washington.

That the annexed is a true copy of a legal insertion as it was published in regular issues (and not in the supplement form) of said newspaper was regularly distributed to its subscribers during all of said period. The publishing date cited is the last day of publication.

1 Insertion in Pub PDN on 08/25/10

SHARON R SCOTT
NOTARY
08/05/2011
PUBLIC
STATE OF WASHINGTON

S

Notary Public in and for the State of Washington residing in Port Angele

Peninsula Daily News P.O. Box 1330 Port Angeles, WA 98362

K-710

DEPARTMENT OF ECOLOGY
AIR QUALITY PROGRAM

NOTICE OF OPPORTUNITY FOR PUBLIC COMMENT

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STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600 • Olympia, WA 98504-7600 • 360-407-6000
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And at the following locations:

OFFICE OF THE CODE REVISER
STATE OF WASHINGTON
FILED

DATE: August 04, 2010
TIME: 9:52 AM

WSR 10-16-152

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DEPARTMENT OF ECOLOGY State of Washington http://www.ecy.wa.gov

Department of Ecology News Release - August 23, 2010

10-210

Comments welcome on state plan to reduce haze-producing pollution

OLYMPIA – The Washington Department of Ecology (Ecology) invites comments on the state's proposed plan to reduce pollution that causes haze in national parks and on other federal lands.

Regional haze reduces scenic views in national parks and wilderness areas. In the western United States, haze has reduced views from an average of 140 miles to 35 to 90 miles. Many of the same pollutants that impact visibility also can harm people, including contributing to heart and lung problems. They also can damage plants and degrade water quality in streams and lakes.

Federal law requires states to submit plans to reduce air pollutants that affect visibility in 156 national parks and wilderness areas. Washington has eight of these mandatory Class 1 areas:

- North Cascades, Olympic and Mount Rainier national parks.
- Pasayten, Glacier Peak, Alpine Lakes, Goat Rocks, and Mount Adams wilderness areas.

Federal law set a national goal to return visibility to "natural conditions" in Class 1 areas by 2064. To work toward that goal, states must develop Regional Haze State Implementation Plans for specific time periods between now and 2064.

Washington's first plan covers the initial (or foundational) planning period that extends from 2005 to 2018. The plan must show how the state will work to reduce emissions of haze-producing pollutants like nitrogen oxides (NOx) and sulfur dioxide (SO2) from smoke, vehicles, certain industrial plants. and other sources.

Ecology is seeking public comments on the draft plan. Comments on the long-term strategy for returning visibility to natural conditions can be especially helpful as the state starts to implement the plan. They also can help guide how the strategy is revised in future planning periods.

You can submit comments from Wednesday, Aug. 25, through Wednesday, Oct. 6, 2010, by:

- E-mail to AQcomments@ecy.wa.gov.
- Mail to Doug Schneider, Washington Department of Ecology, P.O. Box 47600, Olympia, WA 98504-7600.

You're also invited to comment on the plan during a public hearing at 6 p.m. Sept. 28, 2010, at Ecology headquarters, 300 Desmond Drive SE, Lacey.

Ecology will provide a link to participate in the public hearing via the Internet. That information will be available by Sept. 21 on Ecology's Regional Haze Information page.

You can review the proposed plan and related documents at these locations:

- Bellingham Public Library, 210 Central Ave.
- Longview Public Library, 1600 Louisiana St.
- Mount Vernon Public Library, 315 Snoqualmie St.
- Port Townsend Public Library, 1220 Lawrence St.
- Seattle Public Library (Central Library), 1000 Fourth Ave.
- Twisp Library, 2100 N. Methow Valley Highway
- Wenatchee Library, 310 Douglas St.
- Online when the comment period begins at http://www.ecy.wa.gov/programs/air/globalwarm_RegHaze/regional_haze.html

###

Media Contact: Seth Preston, Ecology communications manager, 360-407-6848; 360-584-5744 cell; seth.preston@ecy.wa.gov

Check out ECOconnect, Ecology's blog: http://ecologywa.blogspot.com/

Follow Ecology on Twitter: http://twitter.com/ecologywa

Department of Ecology News Release - September 23, 2010

10-248

Public hearing focuses on plan to reduce haze-producing pollution

OLYMPIA – The public can comment during a hearing next week on the state's proposed plan to reduce pollution that causes haze in national parks and on other federal lands.

Regional haze reduces scenic views in national parks and wilderness areas. In the western United States, haze has reduced views from an average of 140 miles to 35 to 90 miles. Many of the same pollutants that impact visibility also can harm people, including contributing to heart and lung problems. They also can damage plants and degrade water quality in streams and lakes.

The Washington Department of Ecology (Ecology) will hold the public hearing at 6 p.m. Tuesday, Sept. 28, 2010. The hearing will be at Ecology headquarters, 300 Desmond Drive SE, Lacey.

Ecology also will provide an online "listen-only" option via the Internet. But space is limited – register in advance.

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You can review the proposed plan and related documents at these locations: :

- Bellingham Public Library, 210 Central Ave.
- Longview Public Library, 1600 Louisiana St.
- Mount Vernon Public Library, 315 Snoqualmie St.
- Port Townsend Public Library, 1220 Lawrence St.
- Seattle Public Library (Central Library), 1000 Fourth Ave.
- Twisp Library, 2100 N. Methow Valley Highway
- Wenatchee Library, 310 Douglas St.
- Ecology's Air Quality Program website: *Regional Haze Information*

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Media Contact: Seth Preston, Ecology communications manager, 360-407-6848; 360-584-5744 cell; seth.preston@ecy.wa.gov

For more information:

- Review proposed plan and related documents: www.ecy.wa.gov/programs/air/globalwarm_RegHaze/regional_haze.html
- Register for public hearing "listen-only" internet option: www2.gotomeeting.com/register/898726243
- Check out ECOconnect, Ecology's blog: http://ecologywa.blogspot.com/
- Follow Ecology on Twitter: http://twitter.com/ecologywa

From: Thielen, Jerry (ECY)
To: Clark, Stuart (ECY);
cc: Dahlgren, Tami (ECY); Oliver, Julie (ECY); Schneider, Doug;
Subject: Regional SIP Hearing Summary
Date: Thursday, October 14, 2010 9:42:04 AM

On September 28, 2010, the Air Quality Program held a public hearing on the Regional Haze SIP. The following is a brief re-cap of that hearing.

46 people attended, plus about 14 Ecology staff

16 people testified

The audience was evenly split between people who came to condemn the use of coal for energy and Boilermakers union members. The anti-coal folks (about a dozen wore T-shirts from the Sierra Club's "Coal-Free Washington" campaign) called for tighter controls on TransAlta's NOx emissions and for the plant to stop using coal by 2015. Doug Howell, the campaign leader, generally criticized TransAlta and also criticized Ecology for what he claimed was a lack of public process around issues dealing with TransAlta.

The superintendent of Mount Rainier National Park also spoke and said he represented his colleagues at Olympic and North Cascades National Parks. He encouraged Ecology to require TransAlta to install more stringent controls for NOx, similar to those the company has in place for SO2. He praised the performance of the SO2 controls and their impact on reducing emissions in the park. (Interestingly, he went out of his way to say he did not favor shutting down TransAlta. He thinks the tighter controls will take care of the concerns about NOx.)

The Boilermakers talked about a variety of topics, including the progress that has been made in controlling pollution from the plant, the region's need for reliable electricity, the need for the kinds of jobs that the plant offers, etc.

Washington State Regional Haze State Implementation Plan

Appendix L

Best Available Retrofit Technology Technical Support Documents and Compliance Orders

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Contents

Overview of Appendix L

Appendix L has four major sections: (1) this overview, (2) Best Available Retrofit Technology (BART) determinations, (3) materials related to the public comment period and hearing on the BART determinations, and (4) supplemental materials related the TransAlta Centralia Generation, LLC facility.

One of the major requirements of the Regional Haze (RH) Rule is the determination and implementation of BART. Sources are eligible for BART controls if they meet a specific set of criteria. BART-eligible sources that cause or contribute to visibility impairment in a mandatory Class I Area are subject to BART. More background on BART may be found in Chapter 11.

Seven of the 15 BART-eligible sources in Washington had modeled visibility impairment above the 0.5 deciview thresholds for contributing to visibility impairment. Each of the 7 sources was subject to a full engineering analysis to determine the controls on visibility-impairing pollutants that would constitute BART for the source. Ecology developed a draft technical support document for the BART determination and a draft Compliance Order to implement BART for each source.

Each of the draft BART technical support documents and draft Compliance Orders were subject to a public comment period and hearing in October 2009. One public hearing addressed 6 of the 7 sources. A second public hearing was held for the TransAlta Centralia Generation, LLC BART source.

The second section of this appendix contains the final technical support document and the final compliance order for each of the 7 sources subject to BART. Ecology revised the draft BART technical support documents for INTALCO Aluminum Corporation–Ferndale, Tesoro Refining and Marketing Company, Port Townsend Paper Company, and TransAlta Centralia Generation, LLC in response to comments received during the public comment periods and hearings on the BART technical support documents and draft Compliance Orders. The draft compliance order for Tesoro Refining and Marketing Company was revised to address comments received from the company during the comment period on the Order.

The Final Compliance Orders for INTALCO Aluminum Corporation–Ferndale, Port Townsend Paper Company, and Lafarge North America were later revised to improve coordination between the requirements in the Compliance Order and either Air Operating Permit requirements or federal Consent Order. Table L-1 shows the dates the final Compliance Orders contained in this appendix were issued to these companies.

Table L-1 Issued Compliance Orders

BART Facility	Compliance Order #	Date Issued
BP Cherry Point Refinery	7836	July 7, 2010
INTALCO Aluminum Corporation–Ferndale	7837, Revision 1	November 15, 2010[1]
Tesoro Refining and Marketing Company	7838	July 7, 2010
Port Townsend Paper Company	7839, Revision 1	October 20, 2010[2]
Lafarge North America	7841, Revision 1	July 28, 2010[3]
TransAlta Centralia Generation, LLC	6426	June 18, 2010
Weyerhaeuser Company–Longview	7840	July 7, 2010

The final documents are organized into subsections as follows:

- L-1 BP Cherry Point Refinery
- L-2 INTALCO Aluminum Corporation–Ferndale
- L-3 Tesoro Refining and Marketing Company
- L-4 Port Townsend Paper Company
- L-5 Lafarge North America
- L-6 TransAlta Centralia Generation, LLC
- L-7 Weyerhaeuser Company–Longview

Additional materials related to the seven BART sources are available on Ecology's web site at http://www.ecy.wa.gov/programs/air/globalwarm_RegHaze/bart/BARTInformation.html. These include technical documents and correspondence related to the initial draft BART technical support documents and initial draft Compliance Orders that were taken to public hearing in October 2009.

The third section of this appendix contains materials related to the two public comment periods and hearings held in October 2009 on the draft BART draft Compliance Orders. These include:

- Public notice for the October 27, 2009 hearing on 6 of the 7 sources subject to BART
- Ecology's response to comments on the 6 draft BART technical support documents and Compliance Orders
- Public notice for the October 13, 2009 hearing on BART for TransAlta Centralia Generation, LLC
- Ecology's response to comments on the TransAlta Centralia Generation, LLC draft BART technical support document and Compliance Order

The fourth section of this appendix contains supplemental materials related to TransAlta Centralia Generation, LLC. These materials include:

[1] Original Compliance Order # 7839 issued July 7, 2010. Purpose of revision was to coordinate compliance requirements and emission limits with Air Operating Permit requirements.
[2] Original Compliance Order # 7839 issued July 7, 2010. Purpose of revision was to allow substitution of the monitoring recordkeeping and reporting to with methods that would provide equal or better information on emissions and compliance status.
[3] Original Compliance Order # 7841 issued July 7, 2010. Purpose of revision was to conform the Order with terms of the federal Consent Decree allowing the company to comply with limits on kiln restart.

- Signed Settlement Agreement between Washington State Department of Ecology and Trans Alta Centralia Generation, LLC
- Supplemental Information received from TransAlta Centralia Generation, LLC in Spring 2010
- Additional information on costs associated with Ecology's BART determination

In October 2007, Ecology and TransAlta Centralia Generation, LLC entered into formal mediation too address certain legal and regulatory issues. During the mediation, Ecology made a preliminary BART determination (supported by a draft Technical Support Document) for the Centralia facility. In May 2010, the parties signed a mediated Settlement Agreement. The Settlement Agreement incorporates the requirements of the preliminary BART determination. The Settlement Agreement also addresses reductions in mercury emissions.

Ecology drafted a federally enforceable Compliance Order to TransAlta Centralia Generation, LLC incorporating the requirements from the preliminary BART determination. The compliance order includes enforceable Nitrogen Dioxide (NO_2) emission limits.

After the public comment period and hearing on the draft BART technical support document and draft Compliance Order for the Centralia facility, Ecology requested additional information from the company. TransAlta Centralia Generation, LLC provided this information to Ecology in Spring 2010. Ecology reviewed the additional information as well as the oral and written comments related to the Centralia facility. After this review, Ecology did not see a basis for altering its original BART determination for this facility.

To respond to comments received on the Public Review Draft of the RH State Implementation Plan, Ecology has included supplemental information on the Selective Catalytic Reduction (SCR) costs that were used in making the BART determination. The information documents the differences between the Environmental Protection Agency (EPA) Control Cost Manual and estimated costs received from TransAlta Centralia Generation, LLC.

BART DETERMINATION SUPPORT DOCUMENT FOR BP CHERRY POINT REFINERY BLAINE, WASHINGTON

Prepared by

Washington State Department of Ecology
Air Quality Program

September 2009

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The Best Available Retrofit Technology (BART) program is part of the larger effort under the federal Clean Air Act Amendments of 1977 to eliminate human-caused visibility impairment in all mandatory federal Class I areas. Sources that are required to comply with the BART requirements are those sources that:

1. Fall within 26 specified industrial source categories.
2. Commenced operation or completed permitting between August 7, 1962 and August 7, 1977.
3. Have the potential to emit more than 250 tons per year (tpy) of one or more visibility impairing compounds.
4. Cause or contribute to visibility impairment within at least one mandatory federal Class I area.

BP West Coast Products, LLC (BP) owns and operates the BP Cherry Point Refinery (refinery). The refinery is located on Cherry Point near Blaine, Washington. The petroleum refining process results in the emissions of particulate matter (PM), sulfur dioxide (SO_2), volatile organic compounds (VOCs), nitrogen oxides (NO_X), and other pollutants. The pollutants considered to be visibility impairing are PM, SO_2, and NO_X.

Petroleum oil refineries are one of the 26 listed BART source categories. The BP Cherry Point Refinery started operations in 1971, and has had many modifications since then. As a component of a national Consent Decree between BP and the United States Environmental Protection Agency (EPA), most of the refinery's heaters and boilers have been evaluated for upgrading to lower emitting units within the last 10 years. As part of this Consent Decree program, many heaters have had been retrofitted with low-NO_X burners (LNBs) or ultra-low-NO_X burners (ULNBs).

Twenty-two of the refinery's emission units were determined to be BART eligible. BART-eligible emissions units as a group have the potential to emit more than 250 tons per year (tpy) of NO_X, SO_2, or PM_{10}. The units are as follows:

- Boiler #1
- Boiler #3
- Crude Charge Heater
- South Vacuum Heater
- #1 Reformer Heaters
- Naphtha Hydrodesulfuriztion (HDS) Charge Heater
- Naphtha HDS Stripper Reboiler
- 1st Stage Hydrocracker (HC) Fractionator Reboiler
- 2nd Stage HC Fractionator Reboiler
- R-1 HC Reactor Heater
- R-4 HC Reactor Heater

- Coker Charge Heater (#1 North)
- Coker Charge Heater (#2 South)
- #1 Diesel HDS Charge Heater
- Diesel HDS Stabilizer Reboiler
- Steam Reforming Furnace #1
- Steam Reforming Furnace #2
- Two Sulfur Recovery Units (SRUs) and one of the associated Tail Gas Unit (TGU)
- High Pressure Flare
- Low Pressure Flare
- Green Coke Load Out equipment

Modeling of visibility impairment from all BART-eligible units except Boilers #1 and #3 was done following the Oregon/Idaho/Washington/EPA-Region 10 BART modeling protocol.[1] Modeled visibility impacts of baseline emissions show impacts on the 22nd highest value in the 2003-2005 modeling period (the 98th percentile value) of greater than 0.5 deciviews (dv) at only one Class 1 area, Olympic National Park where the impact was 0.84 dv. NO_X and SO_2 emissions were responsible for 78.4 percent and 20.5 percent of the impacts, respectively. All NO_X and most SO_2 were emitted from combustion sources.

BP prepared a BART technical analysis for the 20 modeled units subject to BART using Washington State's BART Guidance.[2] The other two BART-eligible units (Boilers #1 and #3) are being replaced with new units as permitted under Prevention of Significant Deterioration (PSD) permit 07-01. The replacement boilers (Boilers #6 and #7) are under construction. Installation will be completed in 2009 and the older boilers decommissioned. Selective Catalytic Reduction (SCR) on the replacement boilers will provide significantly lower NO_X emissions.

The Washington State Department of Ecology (Ecology) has determined BART for all eligible emission units at the BP Cherry Point Refinery. Except for the two power boilers that are being replaced, the existing emission controls are determined to meet BART. The replacement boilers are determined to be BART for the original boilers.

[1] Modeling protocol available at http://www.deq.state.or.us/aq/haze/docs/bartprotocol.pdf.
[2] "Best Available Retrofit Technology Determinations Under the Federal Regional Haze Rule," Washington State Department of Ecology, June 12, 2007.

Table ES-1. ECOLOGY'S DETERMINATION OF EMISSION CONTROLS THAT CONSTITUTE BART

Emission Unit	BART Control Technology	Emission Limitations Contained in the Listed Permits, Orders, or Regulations
Crude Charge Heater	Current burners and operations	OAC 159, RO 28 (40 CFR 60 Subpart J), OAC 689a
South Vacuum Heater	Existing UNLB	RO 28 (40 CFR 60 Subpart J), OAC 902a
Naphtha HDS Charge Heater	Current burners and operations	RO 28 (40 CFR 60 Subpart J)
Naphtha HDS Stripper Reboiler	Current burners and operations	RO 28 (40 CFR 60 Subpart J)
#1 Reformer Heaters	Current burners and operations	RO 28 (40 CFR 60 Subpart J)
Coker Charge Heater (#1 North)	Current burners and operations	OAC 689a, RO 28 (40 CFR 60 Subpart J)
Coker Charge Heater (#2 South)	Current burners and operations	OAC 689a, RO 28 (40 CFR 60 Subpart J)
#1 Diesel HDS Charge Heater	Existing ULNB and operations	RO 28 (40 CFR 60 Subpart J), OAC 949a
Diesel HDS Stabilizer Reboiler	Existing ULNB and operations	RO 28 (40 CFR 60 Subpart J), OAC 949a
Steam Reforming Furnace #1 (North H2 Plant)	Current burners and operations	RO 28 (40 CFR 60 Subpart J)
Steam Reforming Furnace #2 (South H2 Plant)	Current burners and operations	RO 28 (40 CFR 60 Subpart J)
R-1 HC Reactor Heater	Existing ULNB and operations	RO 28 (40 CFR 60 Subpart J), OAC 966a
R-4 HC Reactor Heater	Current burners and operations	RO 28 (40 CFR 60 Subpart J)
1st Stage HC Fractionator Reboiler	Current burners and operations	OAC 149, OAC 351d, RO 28 (40 CFR 60 Subpart J)
2nd Stage HC Fractionator Reboiler	Existing UNLB and operations	OAC 149, RO 28 (40 CFR 60 Subpart J), OAC 847a
Refinery Fuel Gas (hydrogen sulfide)	Currently installed fuel gas treatment system.	RO 28 (40 CFR 60 Subpart J)
SRU & TGU (Sulfur Incinerator)	Current burners and operations	OAC 890b, 40 CFR 60 Subpart J (250 ppm SO_2 incinerator stack and 162 H_2S refinery fuel gas as supplemental fuel for incinerator), 40 CFR 63 Subpart UUU.
High and Low Pressure Flares		
NO_X	Good operation and maintenance including use of the flare gas recovery system and limiting pilot light fuel to pipeline grade natural gas.	40 CFR 63 Subpart A, NWCAA 462, 40 CFR 63 Subpart CC
SO_2	Good operating practices, use of natural gas for pilot.	40 CFR 63 Subpart A, NWCAA 462, 40 CFR 63 Subpart CC
PM	Good operating practices, use of an steam-assisted smokeless flare design, use of flare gas recovery system.	40 CFR 63 Subpart A, NWCAA 462, 40 CFR 63 Subpart CC
Green Coke Load out	Maintain as unused equipment for possible future use.	Emergency use only per criteria in the BART order and operation per applicable NWCAA regulatory order and regulations.
Power Boilers 1 and 3	Replacement with new Power Boilers 6 and 7	PSD 07-01 and NWCAA Order OAC #1001a

September 4, 2009

1. INTRODUCTION

This document is to support Ecology's determination of the Best Available Retrofit Technology (BART) for the BP Cherry Point Refinery on Cherry Point near Blaine, Washington.

1.1 The BART Program and BART Analysis Process

The federal Clean Air Act Amendments of 1977 (CAA) established a national goal of eliminating man-made visibility impairment in all mandatory federal Class I areas. The CAA requires certain sources to utilize BART to reduce visibility impairment as part of the overall plan to achieve that goal.

Requirements for the BART program and analysis process are given in 40 CFR 51, Subpart P, and Appendix Y to Part 51.[3] Sources are required to comply with the BART requirements if they:

1. Fall within 26 specified industrial source categories.
2. Commenced operation or completed permitting between August 7, 1962 and August 7, 1977.
3. Have the potential to emit more than 250 tons per year of one or more visibility impairing compounds including sulfur dioxide (SO_2), nitrogen oxides (NO_X), particulate matter (PM), and volatile organic compounds (VOCs).

Emission units that meet the source category, age, and potential to emit criteria must also make the facility "cause or contribute" to visibility impairment within at least one mandatory federal Class I area for the facility to remain BART applicable. Ecology has adopted the "cause and contribute" criteria that the EPA suggested in its guideline. BART-eligible units at a source cause visibility impairment if their modeled visibility impairment is at least 1.0 deciview (dv). Similarly, the criterion for contributing to impairment means that the source has a modeled visibility impact of 0.5 dv or more.

The BART analysis protocol in Appendix Y Sections III–V uses a 5-step analysis to determine BART for SO_2, NO_X, and PM. The five steps are:

1. Identify all available retrofit control technologies.
2. Eliminate technically infeasible control technologies.
3. Evaluate the control effectiveness of remaining control technologies.
4. Evaluate impacts and document the results.
5. Evaluate visibility impacts.

Ecology requires an applicable facility to prepare a BART technical analysis report and submit it to Ecology. Ecology then evaluates the report and makes a final BART determination decision.

[3] Appendix Y to 40 CFR 51 – Guidelines for BART Determinations Under the Regional Haze Rule.

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This decision is issued to the source owner as an enforceable Order, and included in the State's Regional Haze State Implementation Plan (SIP).

As allowed by the EPA BART guidance, Ecology has chosen to consider all five factors in its BART determinations. To be selected as BART, a control has to be available, technically feasible, cost effective, provide a visibility benefit, and have a minimal potential for adverse non-air quality impacts. Normally, the potential visibility improvement from a particular control technology is only one of the factors weighed for determining whether a control constitutes BART. However, if two available and feasible controls are essentially equivalent in cost effectiveness and non-air quality impacts, visibility improvement becomes the deciding factor for the determination of BART.

1.2 The BP Cherry Point Refinery

The BP Cherry Point Refinery (refinery) is located on Cherry Point near Blaine, Washington. It began operation in 1971 as the Atlantic Richfield Company (ARCO) refinery. Starting in 2000 and completed by Jan. 1, 2002, the refinery was acquired by BP and is operated by BP West Coast Products, LLC. The plant location is in northwest Washington in Whatcom County, about eight miles south of the U.S.-Canada Border. The land surrounding the refinery is primarily rural and agricultural, with some low density residential development. Three other major industrial operations exist within a six mile radius of the plant.

The crude oil processing capacity of the refinery is 230,000 barrels per day. Crude oil is principally delivered by tanker ship, though a pipeline to bring crude from Canada is available. The crude is processed into a wide variety of products including gasoline, diesel, low-sulfur diesel, jet fuel, calcined coke, green coke, sulfur, liquefied petroleum gas (LPG), butane, pentane, as well as intermediates such as reformate. A diagram of the refinery is included as Appendix C at the end of this report.

Products are sent to market in several ways. Ship and barges carry gasoline, jet fuel, diesels, and intermediate refined products. Pipelines are used to carry gasoline, diesels, and jet fuels. Rail cars are used to ship LPG, butanes, sulfur, green coke, and calcined coke. Finally, trucks are used to carry LPG, gasoline, diesels, jet fuel, calcined coke, and sulfur. The mode of transport is determined by location of the purchaser.

When originally constructed, the refinery did not include coke calciners. All coke produced was "green" or uncalcined coke. Since 1978, all coke produced is calcined coke. Calcining removes any remaining volatile hydrocarbons and some of the sulfur compounds in the coke. The primary usage of calcined coke is to make anodes for aluminum smelting. When the refinery produced and shipped green coke, a specific rail and car loading facility was built and used to ship green coke. The calcined coke system uses different rail car and truck loading facilities. The coke calciners were permitted in December 1977 after the end of the BART period. As a result, these units are not BART eligible.

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Table 1-1 below lists all the emitting equipment operating at the refinery. The BART eligibility of each unit is indicated in the table.

Table 1-1. BP CHERRY POINT REFINERY'S EMISSION UNITS AND BART ELIGIBILITY

Operational Area	Process Unit Number	Description of Major Emission Units	BART Eligible? Yes/No
Flares	28	Flare Gas Recovery	N/A
	29-111	Low Pressure Flare	Yes
	29-110	High Pressure Flare	Yes
Boilers and Cooling Towers	30-1601	Utility Boiler #1	Yes
	30-1603	Utility Boiler #3	Yes
	30.104	Utility Boiler # 4	No
	30.105	Utility Boiler #5	No
	30	Cooling Tower #1	Yes
	24	Cooling Tower #2	No
Crude/Vacuum	10-1401	Crude Charge Heater	Yes
	10.11	North Vacuum Heater	No
	10-1451	South Vacuum Heater	Yes
	11-1401	Naphtha HDS Charge Heater	Yes
	11-1402	Naphtha HDS Stripper Reboiler	Yes
	11-1403-1406	#1 Reformer Heaters	Yes
	21-1421-1424	#2 Reformer Heaters	No
Delayed Coker	12-1401-01	North Coker Charge Heater #1	Yes
	12-1401-02	South Coker Charge Heater #2	Yes
Diesel Hydrodesulfurization (HDS)	13-1401	#1 Diesel HDS Charge Heater	Yes
	13-1402	Diesel HDS Stabilizer Reboiler	Yes
	26-1401	#2 Diesel HDS Charge Heater	No
Hydrogen Plant	14-1401	North Reforming Furnace #1	Yes
	14-1402	South Reforming Furnace #2	Yes
Hydrocracker	15-1401	R-1 Hydrocracker Reactor Heater	Yes
	15-1402	R-4 Hydrocracker Reactor Heater	Yes
	15-1451	1st Stage Fractionator Reboiler	Yes
	15-1452	2nd Stage Fractionator Reboiler	Yes
Sulfur Complex	17, 19	#1 TGU Stack and #2 TGU Stack	Yes
LEU/LPG	22	Light End Unit (LEU) and Liquefied Petroleum Gas	No
Isomerization		IHT Heater	No
Calciner/Coke Handling	20-70	Calciner Stack #1 (Hearths #1 & #2)	No
	20-71	Calciner Stack #2 (Hearth #3)	No
	20-72	Coke Silos and Loading – Baghouses and Vents	Yes/No[4]
Wastewater	32	API Separators	No
		Slop Oil, equalization and recovered oil tanks	No

[4] Green coke loading is BART-eligible, calcined coke loading is not.

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Operational Area	Process Unit Number	Description of Major Emission Units	BART Eligible? Yes/No
Storage and Handling		Tank Farm Butane/Pentane Spheres	No No
Shipping, Pumping and Receiving	35	Marine Dock Dock Thermal Oxidizer	No[5] No[5]
	33	Truck Rack Truck Rack Thermal Oxidizer	No No
	37	Rail Car Loading LPG Loading Racks	No No

Many tanks are also BART-eligible based on age, however, the potential to emit (PTE) for VOC from these tanks as currently configured to meet requirements of various NSPS and NESHAP MACT requirements does not meet the BART eligibility criteria for emissions rate.

In the late 1990s, the EPA conducted a nation-wide enforcement initiative of the petroleum refining industry, targeting alleged violations of the Clean Air Act (CAA), Resource Conservation and Recovery Act (RCRA) and the Toxic Substances Control Act (TSCA). Following this in-depth investigation, the refinery's parent company, British Petroleum Exploration & Oil Company, entered into Consent Decree agreements with the EPA and intervening parties that will result in a reduction of air pollution emissions at their nine petroleum refineries.

As one of the nine affected refineries listed in the BP Consent Decree, the BP Cherry Point Refinery has been implementing control strategies to reduce emissions of VOCs, NO_X, and SO_2 from refinery process units. The BART-eligible units that have been recently retrofitted with low-NO_X or ultra-low-NO_X burners have been retrofitted to comply with the Consent Decree. In addition, the refinery has adopted an enhanced fugitive emission control program for VOC emissions from all plant operations.

Another result of the Consent Decree is that all refinery fuel gas must be processed to meet the sulfur content requirements of 40 CFR 60 Subpart J.

The refinery is a Title V source operating under Air Operating Permit #015 issued by the Northwest Clean Air Agency (NWCAA). Petroleum refineries are one of the 26 BART-eligible source categories. The Washington State Department of Ecology (Ecology) received a BART Analysis and Determination Report from BP on March 28, 2008, and additional information on June 25, 2008.

[5] Only the VOC emissions from the South Dock are BART eligible. The VOC emissions are now controlled by the thermal oxidizer permitted in 2001 to control the VOC emissions from the new North Dock. Under requirements of 40 CFR Part 63, Subpart CC, piping to collect and route VOC from the South Dock was permitted for installation and operation in 2001. The Thermal Oxidizer is not BART eligible. The North Dock is not BART eligible.

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1.3 BART-Eligible Units at the BP Refinery

Twenty-two of the plant's individual emission units were found to be BART eligible. Two BART-eligible units (Boilers No. 1 and 3) were not reviewed for BART because new units (Boilers No. 6 and 7) will replace the BART-eligible units. The replacement units have gone through PSD permitting, are currently under construction, and are scheduled to begin operation in 2009.

The other 20 BART-eligible units were modeled to determine visibility impacts on Class I Areas. Table 1-2 identifies the modeled BART-eligible units and the emission rates used for BART modeling.

Table 1-2. BASELINE MODELING EMISSION RATES FOR BART-ELIGIBLE UNITS

Emission Unit		Baseline Modeling Emission Rates (lb/hr)		
BART-Eligible Unit	**Baseline Firing Rate (MMBtu/hr)**	**NO_X**	**SO_2**	**PM_{10}**
Crude Charge Heater	593	109. 7	20.0	5.5
South Vacuum Heater	186	7.3	7.7	1.7
Naphtha HDS Charge Heater	106	10.4	3.9	1.0
Naphtha HDS Stripper Reboiler	64	6.3	2.3	0.6
#1 Reformer Heater	709	106.4	25.9	6.6
Coker Charge Heater (#1 North)	143	8.9	7.8	1.3
Coker Charge Heater (#2 South)	145	9.0	7.9	1.3
#1 Diesel HDS Charge Heater	34	3.3	1.2	0.3
#1 Diesel HDS Stabilizer Reboiler	56	5.5	2.0	0.5
Steam Reforming Furnace #1 (North Hydrogen (H2) Plant)	308	30.2	11.2	2.9
Steam Reforming Furnace #2 (South H2 Plant)	302	29.6	11.0	2.8
R-1 HC Reactor Heater	89	8.7	3.3	0.8
R-4 HC Reactor Heater	42	4.1	1.5	0.4
1st Stage HC Fractionator Reboiler	173	25.9	6.3	1.6
2nd Stage HC Fractionator Reboiler	145	8.2	5.3	1.3
SRU & TGU	---	1.4	8.5	0.2
High Pressure Flare	---	2.6	2.7	0.3
Low Pressure Flare	---	3.8	4.6	0.4
Green Coke Load Out	---	0.0	0.0	0.0
Note: The bolded units are those that have had controls (ULNBs) installed since 2005.				

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1.4 Visibility Impact of the BP Refinery's BART-Eligible Units

Class I Area visibility impairment modeling was performed by BP using the BART modeling protocol developed by Oregon, Idaho, Washington, and EPA Region 10.[6] This protocol uses three years of metrological information to evaluate visibility impacts. As specified in the protocol, BP used the highest 24-hour emission rates that occurred in the 3-year period to model impacts on Class I Areas.

A source causes visibility impairment if its modeled visibility impact is above one deciview and contributes to visibility impairment if its modeled visibility impact is above 0.5 deciview. The modeling indicates that the emissions from this plant contributes to visibility impairment on the 8^{th} highest day in any one year and the 22nd highest day over the three years (the 98th percentile days, respectively) at only the Olympic National Park. The modeling indicates the plant does not cause or contribute to visibility impairment at any other mandatory federal Class 1 area. NO_X and SO_2 emissions were responsible for 78.4 percent and 20.5 percent of the impacts, respectively. Primary particulate emissions are responsible for the remaining one percent of the refinery's visibility impact. For further information on visibility impacts of this facility, see Section 3.

2. OVERVIEW OF BP'S BART TECHNOLOGY ANALYSIS

Section 2 is a review of the BART technical analysis provided by BP to Ecology. The company used the five step process defined in BART guidance and listed in Section 1.1 of this report.

The BART units were divided into five groups:

1. Major combustion units (heaters and boilers) (Section 2.1)
2. Flares (Section 2.2)
3. Sulfur recovery units (Section 2.3)
4. Tail gas units (Section 2.3)
5. Green coke load out operation (Section 2.4)

BP looked at Cooling Tower #1 and its large diameter particulates and concluded these particulates would not leave the plant site. As a result, the emissions from this unit were not looked at further.

2.1 Controls Affecting All Combustion Units – Heaters and Boilers

The refinery maintains 15 heaters and two boilers that are subject to BART. All BART heaters and boilers are permitted to combust refinery fuel gas and natural gas. The maximum day heat input rates of all subject to BART combustion units are shown in Table 1-2. Actual operation is somewhat less than the maximum day heat input rates.

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[6] A copy of the modeling protocol is available at http://www.deq.state.or.us/aq/haze/docs/bartprotocol.pdf.

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The two BART-eligible boilers (Boilers No. 1 and No. 3) were not evaluated for BART impacts or controls by BP. BP considered them to not be subject to BART since they were scheduled to be replaced by two new boilers in 2009. See Section 4 of this document for more discussion of these units.

The following sections discuss the BART determination analysis performed for NO_X, SO_2, and $PM_{10}/PM_{2.5}$ for the refinery heaters.

2.1.1 NO_X Control Options for Refinery Heaters

A Summary of BP's review of NO_X control technologies that were determined to be commercially available for a retrofit on existing refinery heaters is given in Table 2-1. A more complete description and discussion of each technology follows.

Table 2-1. POTENTIAL NO_X CONTROL TECHNOLOGIES FOR REFINERY HEATERS

Options/Methods	Description	Potentially Applicable To	Overall Technical Feasibility
Selective Catalytic Reduction (SCR)	Injection of ammonia into a catalyst bed within the flue gas path.	All	Yes
Low-NO_X Burners (LNBs/ULNBs)	Reducing NO_X emissions through burner design.	All	Yes
Selective Non-Catalytic Reduction (SNCR)	Injection of ammonia directly into the flue gas path at a specific temperature.	All	No – Small operating range
External Flue Gas Recirculation (FGR)	Flue gas is recirculated via fan and external ducting and is mixed with combustion air stream.	More applicable to boilers. Safety concern with process heaters.	No – Potential safety issues
Low Excess Air Operation – CO Control	Reduce excess air level by maintaining CO at minimum threshold using in-situ CO analyzer in the flue gas stream.	All	No – Potential safety issues and small operating range.
Steam Injection	Steam is injected into the root of the flame or directly via the fuel stream which lowers the flame temperature.	All	Not feasible except 1st Stage HC Fractionator Reboiler.
Lower Combustion Air Preheat	Reduce combustion air temperature on systems with air preheat.	Units with air preheat	No
CETEK - Descale & Coat Tubes	Reduces the fire box temperature by improving heat transfer in applications where the tubes are externally scaled.	Units with externally scaled tubes.	No
Modify Existing Burners to Improve NO_X	Burner tip modification.	All	Yes

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Selective Catalytic Reduction (SCR) is a post-combustion control device in which ammonia is injected as the flue gas passes through a catalyst bed. NO_X reacts with the ammonia aided by the catalyst to form nitrogen and water. SCR is technically feasible for all refinery heaters and boilers. According to corporate experience, BP has found SCR capable of meeting the higher of a 98 percent emission reduction or five ppm NO_X.

Selective Non-Catalytic Reduction (SNCR) consists of injecting ammonia or urea into combustion unit flue gases in a specific temperature zone of between approximately 1600ºF and 2000ºF. The process relies on good mixing at high temperature to reduce NO_X to nitrogen (N_2) as the flue gas moves through the ductwork. For efficient NO_X removal using SNCR, the exhaust gas must remain within this temperature range for the appropriate length of time. The ammonia injector must be carefully located to ensure that the exhaust gas temperature is within the acceptable range. Due to the variability in the hydrogen content and heat content (collectively known as “specific gravity swings” or “gravity swings”) of refinery fuel gas, the exhaust temperature can vary significantly due to normal changes in refinery operation, even when the burner/heater operation remains constant. These variations make SNCR a poor candidate to control NO_X on the refinery heaters and boilers. As a result, BP considered SNCR to be technically infeasible for the refinery process heaters.

Low-NO_X Burners/Ultra-Low-NO_X Burners: Conventional burners can be retrofitted to reduce their NO_X emissions with either low-NO_X burners (LNBs) or ultra-low-NO_X burners (ULNBs). As the name implies, ultra-low-NO_X burners have lower emissions of the two types of burners. However, each has specific retrofit requirements and is not necessarily suited for all applications. Key feasibility criteria include the burner’s performance with fuel gas specific gravity change (a.k.a. “gravity swings”) for units with high turndown ratios and whether the boiler or heater can accommodate the longer flame pattern that is characteristic of LNBs. BP acquired an evaluation of whether low or ultra-low-NO_X burners were available for each BART-eligible heater from two burner vendors. BP’s BART analysis used based the type of burner recommended by the vendors as most appropriate for the unit’s design. Discussions of low-NO_X burners later in this support document generally refer to a burner replacement as LNB replacement regardless of the specific type of burner recommended by the vendors.

In **External Flue Gas Recirculation (FGR)**, flue gas is recirculated using a fan and external ducting and is mixed with the combustion air stream thereby reducing the flame temperature and decreasing NO_X formation. Generally, when a unit is retrofitted with external FGR, it will require an additional or larger forced draft (FD) fan. Application of external FGR is normally limited to boilers because there is a risk of recirculating hydrocarbons leaked from the heat transfer tubing into the process heater fire box potentially causing an unsafe situation. Therefore, external FGR was considered technically infeasible overall for use on refinery process heaters.

Low Excess Air Operation minimizes the amount of excess air (i.e., oxygen) during the initial stages of combustion and decreases the amount of NO_X formed. However, reducing the amount of oxygen can cause incomplete combustion, which increases carbon monoxide (CO) emissions. The combustion unit can be operated using the flue gas CO concentration to control the amount

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of excess air and, therefore, controlling the amount of NO_X generated. This CO level would be monitored by an in-situ CO analyzer in the flue gas stream. This technique requires a moderate amount of instrumentation and automation required for burner control (e.g., actuators for draft and air control). All of the process heaters at the refinery already utilize optimized combustion conditions that minimize excess air while maximizing fuel combustion efficiency and minimizing emissions.

Low oxygen operation results in longer flames that could cause flame impingement (flames directly striking the tubing) upon the heat transfer tubing or the fire bricks behind them. Historical operation has shown it is difficult to maintain safe operating conditions at low oxygen levels. Due to the limited viable operating range and potential safety issues, BP considers this technique technically infeasible for use on refinery heaters.

Steam Injection (a.k.a. flame tempering) decreases NO_X formation by injecting steam with the combustion air or fuel to reduce the peak flame temperature. Steam injection can impact combustion unit operation by changing the flame shape, reducing unit thermal efficiency, and affecting unit operating stability. The modest NO_X reductions at the heater may be offset by NO_X emissions resulting from increased steam generation elsewhere. Minimal NO_X reductions are gained in units already fitted with low-NO_X burners. Due to the technical issues and incompatibilities with some installed burners, BP considers steam injection to be technically infeasible for all but one of the BART-eligible refinery heaters, the 1st Stage HC Fractionator Reboiler.

Lower Combustion Air Preheat is another technique that can decrease NO_X formation by reducing flame temperature. This technique is only applicable to units equipped with air preheaters. For units that are not equipped with air preheat, combustion air is already entering at ambient air temperature. If cooler air is introduced into the heater as combustion air, the heater has to utilize additional fuel to heat the air for the combustion process which ends up negating any NO_X reductions generated. These issues make reducing the combustion air temperature technically infeasible for the BART refinery heaters.

CETEK is a commercial treatment that involves removing existing external tube scale and coating the cleaned tubes with a coating that reduces the rate of scale formation. Removing the scale and applying a coating to the heat transfer surfaces can allow less fuel to be burnt in the heater, yet supply the same heat to the petroleum product being heated. Reducing the fuel usage and possibly the peak flame temperature will lead to a decrease in NO_X emissions. This technique is only applicable to units where the heat transfer tubes are externally scaled.

This method of NO_X reduction is applicable to only the #1 Reformer Heater. This is the only BART unit that has scaling. The flames from the burners in the #1 Reformer Heaters currently impinge somewhat on the tubes and the scale protects the tubes from being damaged by the flames. As such, this emission control method cannot be implemented until the flame impingement issue is addressed in the #1 Reformer Heaters. Therefore, descaling and coating the tubes was eliminated from consideration in the BART analysis.

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As an alternative to installation of LNB or ULN burners, the existing **burners could be modified** to reduce NO_X**.** Although it is possible to modify burner tips to change fuel distribution among different burner zones, each burner in each heater at the refinery has been engineered for optimum performance, reliability, and safety. It is important to understand all the ramifications prior to attempting to redesign existing burners to achieve lower NO_X. For example, modifying the burners to achieve a longer flame that might result in cooler combustion temperatures and reduced NO_X formation can result in flame impingement on heat transfer surfaces or refractory materials which may damage the heater. BP found that modifying existing burners was technically feasible for only the 1st Stage HC Fractionator Reboiler.

BP's Unit Specific Evaluation of NO_X Control Effectiveness

Based on their review of the available NO_X controls, BP considers only the following controls to be the only NO_X control technologies applicable to the BART-eligible refinery heaters:

1. LNB plus SCR (vendor guarantee burner emission rate plus the less effective of 95 percent or five ppm).
2. SCR (95 percent or five ppm, whichever results in higher emissions).
3. LNB (vendor guarantee burner emission rate).

Five aspects of these control technologies were analyzed. They are costs of compliance, energy impacts, non-air quality environmental impacts, collateral emissions impacts, and remaining useful life. The remaining useful life of all refinery heaters was assumed to be 20 years. A discussion of these aspects as applied to each refinery heater follows.

Crude Charge Heater

The Crude Charge Heater is rated at 720 MMBtu/hr heat input and currently operates at 593 MMBtu/hr. This heater currently uses conventional design burners dating from the time of original installation.

<u>LNBs</u>: Installing LNBs on the Crude Charge Heater is not technically feasible due to the high heat density in the fire box. Flame impingement is likely and use of these burners would require reducing rated heater capacity (derating) and unit throughput.

<u>SCR</u>: Involves construction of a new SCR unit and possibly a new exhaust stack for this heater. The BART cost effectiveness analysis to install a SCR on the Crude Charge Heater was determined to be $14,658/ton. If lost refinery production due extended turnaround time required to install the new control is considered, the cost effectiveness is increased to $32,001/ton. BP proposed that this control option is not BART due to the high costs.

<u>LNBs plus SCR</u>: Because a LNB installation is technically infeasible, the combination of LNB and SCR is also technically infeasible.

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BP proposed continued use of the existing conventional burners as BART for NO_X for the Crude Charge Heater.

South Vacuum Heater

In response to the requirements of the Consent Decree, the South Vacuum Heater has had ultra-low-NO_X Burners installed and permitted by the Northwest Clean Air Agency (NWCAA) Order of Approval to Construct (OAC) #902, February 7, 2005, revised November 1, 2005. The heater is rated at 222 MMBtu/hr and currently operates at186 MMBtu/hr.

LNBs: ULNBs were installed on the South Vacuum Heater in 2005. Further NO_X reduction is not possible using burner upgrades due to high air preheat.

SCR: The BART cost effectiveness analysis to install a SCR on the South Vacuum Heater with existing ULNB was calculated to be $54,551/ton. If lost refinery production due extended turnaround time required to install the new control is considered, the cost effectiveness is increased to $82,643/ton. This control option was eliminated as BART.

BP's BART Proposal: The existing ULNBs are BART for NO_X for the South Vacuum Heater.

Naphtha HDS Charge Heater & Naphtha HDS Stripper Reboiler

The Naphtha HDS Charge Heater (design heat input of 110 MMBtu/hr, operating rate of 106 MMBtu/hr) and the Naphtha HDS Stripper Reboiler (design heat input of 86 MMBtu/hr), operating rate of 64 MMBtu/hr are currently fitted with conventional burners.

LNBs: The fire boxes of these two heaters are relatively small. Installing LNBs on these two units would result in flame impingement and require a significant derating of each unit to avoid tubing burn through. As a result, BP does not consider LNBs to be technically feasible for these two heaters.

SCR: Due to stack location, it is not possible to duct these two heaters to a single SCR unit. As a result, a separate SCR would be required for each unit. The BART cost effectiveness analysis to install SCRs on the Naphtha HDS Charge Heater or the Naphtha HDS Stripper Reboiler is estimated to be $26,667/ton for the Naphtha HDS Charge Heater and $31,467/ton for the Naphtha HDS Stripper Reboiler. If lost refinery production due extended turnaround time required to install the new control is considered, the cost effectiveness is increased to $32,175/ton and $40,711/ton, respectively. BP considers SCR to be financially infeasible for these two heaters.

LNBs plus Selective Catalytic Reduction: Because a ULNB installation is technically infeasible, the combination of ULNB and SCR is also technically infeasible.

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BP's BART Proposal: BP proposed that BART for NO_X for both the Naphtha HDS Charge Heater and the Naphtha HDS Stripper Reboiler is the current conventional burners.

#1 Reformer Heater

The #1 Reformer Heater (design heat input of 1,075 MMBtu/hr, operating rate of 709 MMBtu/hr) has a complex design with four independent fire boxes and two stacks. It is currently fitted with conventional burners.

LNBs: Installing LNBs on the #1 Reformer Heaters is not technically feasible. The existing burners produce the shortest, most compact flame available yet flame impingement on the tubes is a serious problem. The LNBs currently available produce a longer flame which would be expected to result in even greater levels of flame impingement. BP considers LNBs to be technically infeasible for this heater and eliminated from consideration as BART.

SCR: The SCR cost effectiveness analysis was predicted to be $15,253/ton. If lost refinery production due extended turnaround time required to install the new control is considered, the cost effectiveness is increased to $17,299/ton. This control option is eliminated as BART.

LNBs plus SCR: Because a LNB installation is technically infeasible, the combination of LNB and SCR is also technically infeasible.

BP's BART Proposal: BP proposed that BART for NO_X for the #1 Reformer Heater is the current conventional burners.

Coker Charge Heater (#1 North) and Coker Charge Heater (#2 South)

The Coker Charge Heater (#1 North (design heat input of 190 MMBtu/hr, operating rate of 143 MMBtu/hr)) and Coker Charge Heater (#2 South (design heat input of 190 MMBtu/hr, operating rate of 145 MMBtu/hr)) are currently fitted with early design LNBs which incorporate staged air combustion and flue gas recirculation. The installation of these burners was permitted in 1999. The operation of coker heaters is unique due to the cyclic nature of the unit which limits the effectiveness of NO_X control technologies.

LNBs: BP has estimated the cost effectiveness to install replacement LNBs was estimated to be of $31,301/ton for the north heater and $30,762/ton for the south heater. BP has considered installation of LNBs to be financially infeasible for BART for both of these heaters.

SCR: BP estimated the cost effectiveness to add SCR to the existing LNB installation was estimated to be $35,202/ton for the north heater and $34,597/ton for the south heater. The incremental cost to go from LNB to SCR as the next most stringent control device is $38,832/ton for the north heater and $38,164/ton for the south heater. Considering the cost effectiveness values, BP has considered SCR to be economically infeasible for use on these units.

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LNBs plus SCR: BP's evaluation of cost effectiveness assumes that the LNB installation and cost will not change. The SCR costs were adjusted downward to account for the lower post-LNB NO_X concentration. Lower NO_X concentrations result in a need for less catalyst and ammonia consumption. BP's corporate experience has found SCR controls NO_X emissions to either 95 percent or five ppm, whichever results in higher emissions. With a cost effectiveness of $43,460/ton for the north heater and $42,738/ton for the south heater, this combined control option was determined by BP to be not cost effective for these heaters.

BP's BART Proposal: BP proposed the existing LNBs with staged air combustion coupled as BART for NO_X for both Coker Charge Heater (#1 North) and Coker Charge Heater (#2 South).

#1 Diesel HDS Charge Heater and Diesel HDS Stabilizer Reboiler

The #1 Diesel HDS Charge Heater (design heat input of 71 MMBtu/hr, operating rate of 34 MMBtu/hr) and Diesel HDS Stabilizer Reboiler (reported design heat input of 53 MMBtu/hr, operating rate of 56 MMBtu/hr) have been fitted with ultra-low-NO_X burners (NWCAA OAC #949, March 31, 2006) to comply with terms of the Consent Decree.

LNBs: ULNBs are currently installed on the #1 Diesel HDS Charge Heater and Diesel HDS Stabilizer Reboiler.

SCR: The BART cost effectiveness analysis to add SCRs on the #1 Diesel HDS Charge Heater and Diesel HDS Stabilizer Reboiler was calculated to be $192,586/ton for the #1 Diesel HDS Charge Heater and $145,094/ton for the Diesel HDS Stabilizer Reboiler. If lost refinery production due extended turnaround time required to install the new control is considered, the cost effectiveness is increased to $282,388/ton and $206,592/ton, respectively. BP considers SCR to be economically infeasible as BART for both of these heaters.

BP's BART Proposal: BP proposed that the existing ULNBs are BART for NO_X for both #1 Diesel HDS Charge Heater and Diesel HDS Stabilizer Reboiler.

Steam Reforming Furnace #1 (North H2 Plant) and Steam Reforming Furnace #2 (South H2 Plant)

The Steam Reforming Furnace #1 (North H2 Plant (design heat input of 325 MMBtu/hr, operating rate of 308 MMBtu/hr)) and the Steam Reforming Furnace #2 (South H2 Plant (design heat input of 325 MMBtu/hr, operating rate of 302 MMBtu/hr)) are fitted with conventional burners.

CETEK: The Steam Reforming Furnace #1 is subject to scaling of the heat transfer tubes inside of the heater. As discussed above, the CETEK process involves descaling the tubes and coating them with a material that resists the formation of scale. Since the scaling in the Steam Reforming Furnace #1 also protects the tubing from damage from the flame impingement that also occurs, BP eliminated this technique from further consideration.

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LNBs: The BART cost effectiveness analysis to install ULNB on the Steam Reforming Furnace #1 (North H2 Plant) and Steam Reforming Furnace #2 (South H2 Plant) was estimated to be $21,234/ton for the north furnace and $21,682/ton for the south furnace. If lost refinery production due extended turnaround time required to install the new control is considered, the cost effectiveness is increased to $31,430/ton and $32,045/ton, respectively. BP considers the installation of LNBs to not be cost effective for use on these heaters.

SCR: The BART cost effectiveness analysis to install SCR on the Steam Reforming Furnaces was estimated to be $28,378/ton for the north furnace and $28,900/ton for the south furnace. If lost refinery production due extended turnaround time required to install the new control is considered, the cost effectiveness is increased to $46,449/ton and $47,320/ton, respectively. The incremental cost to go from LNB to SCR as the next most stringent control device was estimated at $59,622/ton for the north furnace and $60,719/ton for the south furnace. BP considers the use of SCR to not be cost effective for use on these heaters.

LNBs plus SCR: The cost effectiveness calculation assumes that the LNB installation and cost will not change as a result of the SCR installation. The SCR costs were adjusted downward to account for the lower SCR inlet NO_X concentration. Lower NO_X concentrations result in a need for less catalyst and ammonia consumption. BP's corporate experience has found SCR controls NO_X emissions to either 95 percent or five ppm, whichever results in higher emissions. With a cost effectiveness of $29,555/ton for the north furnace and $30,104/ton for the south furnace ($55,197/ton and $56,242/ton, respectively, if lost refinery production is considered), BP considered LNBs and SCR to not be economically feasible as BART for these furnaces.

BP's BART Proposal: BP proposed the current burners and operation are BART for NO_X for both Steam Reforming Furnace #1 (North H2 Plant) and Steam Reforming Furnace #2 (South H2 Plant).

R-1 HC Reactor Heater

The R-1 HC Reactor Heater (design and operating heat input of 89 MMBtu/hr) has been fitted with ULNBs (NWCAA OAC #966, August 9, 2006) to comply with the requirements of the Consent Decree.

LNBs: ULNBs have already been installed on the R-1 HC Reactor Heater.

Selective Catalytic Reduction: The BART cost effectiveness analysis to install SCRs on the R-1 HC Reactor Heater was estimated to be $214,726/ton. BP has determined that this control option is not economically feasible as BART for this heater.

BP's BART Proposal: BP proposed the existing ULNBs are BART for NO_X for the R-1 HC Reactor Heater.

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R-4 HC Reactor Heater

The R-4 HC Reactor Heater (design heat input of 79 MMBtu/hr, operating rate of 42 MMBtu/hr) is fitted with conventional burners.

LNBs: Installing ULNBs on the R-4 HC Reactor Heater is not technically feasible. A serious risk exists due to the high heat density, flame impingement, flame shape, and an exceedance of the API guidelines for burner spacing.

SCR: The BART cost effectiveness analysis to install SCR on the R-4 HC Reactor Heater was estimated to be $36,620/ton. This control option was eliminated as BART for this heater.

LNBs plus SCR: Because a LNB installation is technically infeasible, the combination of LNB and SCR is also technically infeasible.

BP's BART Proposal: BP proposed the current burners and operations are BART for NO_X for the R-4 HC Reactor Heater.

1st Stage HC Fractionator Reboiler

The 1st Stage HC Fractionator Reboiler (reported design heat input of 150 MMBtu/hr, operating rate of 173 MMBtu/hr) is fitted with conventional burners.

Steam Injection: BP evaluated the installation of this technique to reduce NO_X on this burner. However, BP did not perform a detailed evaluation and instead focused on the more effective technique of installation of LNBs.

Burner Modification: BP evaluated the installation of this technique to reduce NO_X on this burner. However, BP did not perform a detailed evaluation and instead focused on the more effective technique of installation of LNBs.

LNBs: The BART cost effectiveness analysis to install ULNBs on the 1st Stage HC Fractionator Reboiler was estimated by BP to be $12,044/ton. This control option is not cost effective as BART for this heater. Nonetheless, BP proposes to install ULNB on this unit to achieve 0.05 lb NO_X/MMBtu.[7]

SCR: The BART cost effectiveness analysis to install SCR on the 1st Stage HC Fractionator Reboiler was estimated to be $19,470/ton; the incremental cost to go from LNB to SCR as the next most stringent control device was estimated to be $36,945/ton. BP considers these cost effectiveness values to be too high and eliminated SCR as BART for this heater.

[7] Although burner vendors indicated they could achieve 0.04 lb NO_X/MMBtu, BP's operating experience with these burners indicated this was an extremely aggressive limit. Because BP lacks confidence that 0.04 lb/MMBtu can be achieved on a continuous basis, BP proposed 0.05 lb/MMBtu.

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LNBs plus SCR: The cost effectiveness calculation assumes that the LNB installation and cost will not change as a result of the SCR installation. The SCR costs were adjusted downward to account for the lower inlet NO_X concentration. The lower NO_X concentration results in needing less catalyst and less ammonia consumption. The cost effectiveness value is $23,518/ton; the incremental cost to go from LNB to SCR is $402,903/ton. BP considers these cost effectiveness values to be too high and eliminated SCR as BART for this heater.

BP's BART Proposal: BP proposed installation of ULNBs as BART for NO_X on the 1st Stage HC Fractionator Reboiler. BP recognized that the cost effectiveness to install LNBs on this heater is high. See Ecology's BART decision in Section 4 for this unit.

2nd Stage HC Fractionator Reboiler

The 2nd Stage HC Fractionator Reboiler (design heat input of 183 MMBtu/hr, operating rate of 145 MMBtu/hr) has been fitted with LNBs (NWCAA OAC #847, November 13, 2003) installed to comply with terms of the Consent Decree.

LNBs: The BART cost effectiveness analysis to replace the existing LNBs with ULNBs on the 2nd Stage HC Fractionator Reboiler was estimated to be $36,395/ton. This control option was eliminated as BART for this heater.

SCR: The BART cost effectiveness analysis to install SCRs on the 2nd Stage HC Fractionator Reboiler was estimated to be $37,810/ton. BP considers this cost to not be economically feasible and eliminated SCR as BART for this heater.

LNBs plus SCR: The cost effectiveness calculation assumes that the LNB installation and cost will not change as a result of the SCR installation. The SCR costs were adjusted downward to account for the lower inlet NO_X concentration. The lower NO_X concentration results in needing less catalyst and less ammonia consumption. With a cost effectiveness of $40,768/ton, this combined control option was eliminated by BP as BART for this heater as not economically feasible.

BP's BART Proposal: BP proposed the existing low-NO_X burners are BART for NO_X for the 2nd Stage HC Fractionator Reboiler.

2.1.2 SO_2 Control Options for Refinery Heaters and Other Combustion Devices

SO_2 emissions from combustion are the result of oxidation of sulfur compounds in the fuel. There are generally two methods of reducing SO_2 emissions from fired sources – reducing the sulfur in the fuel or use of add-on flue gas desulfurization technologies.

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Overview of Available Retrofit SO_2 Emission Control Techniques

A review of the current SO_2 control technologies was conducted and those technologies that were determined to be commercially available for a retrofit on existing refinery heaters include:

- Emerachem EMX
- Dry Scrubbing
- Fuel Gas Conditioning (sulfur content reduction)
- Spray Tower Scrubbing

Emerachem EMX (previously known as SCONOX) is an add-on technology that utilizes a catalyst to absorb the SO_2 in the flue gas. The catalyst is periodically regenerated using hydrogen. The regeneration stream is treated in a sulfur recovery unit or adsorbed on carbon. This technology has not been proven to run longer than one year without major maintenance. It has only been used on a small number of natural gas combustion turbines for NO_X control, not on oil refinery heaters. As was mentioned previously, BP requires the refinery heaters to be able to operate five years between turnarounds. As such, BP did not consider Emerachem EMX to be technically feasible for use on the refinery heaters.

Dry scrubbing is an add-on technology where the SO_2 in the flue gas reacts with injected bicarbonate; the products of the reaction are removed in a baghouse. Each process heater would be required to have its own dry scrubbing system. This technology requires a turnaround approximately every two years due to equipment plugging and wear. Therefore, BP does not consider this technology to be technically feasible for its refinery heaters.

Two remaining options, fuel gas conditioning and spray tower scrubbing, are considered technically feasible.

BP evaluated expanded **fuel gas conditioning** to reduce the concentration of sulfur in refinery fuel gas to 50 ppmv. Currently, all refinery fuel gas is required to meet the NSPS limit of 162 ppm H_2S. Based on an engineering assessment performed by Jacobs Engineering for BP, improvements to the current refinery fuel gas treatment system to continuously meet a 50 ppmv concentration would reduce the average total sulfur concentration in fuel gas combusted by BART-eligible heaters by 89 percent. Fuel gas conditioning would be applied to all of the refinery's fuel gas, so would affect all refinery gas combustion sources, both BART and non-BART.

This technique reduces SO_2 emissions from all refinery fuel gas combustion units. The additional sulfur removal would increase the sulfur quantity sent to the current sulfur recovery system by one ton per day, within the current capacity of the system. Upgrading the current refinery fuel gas treatment system to reliably meet a 50 ppmv level has a cost effectiveness of $22,282/ ton when the capital and operating costs are applied to only the SO_2 reduction from the combustion units that are subject to BART. Using the plant wide SO_2 emissions reduction to

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calculate the cost effectiveness (estimated to be a reduction of 715 tons per year), results in a cost effectiveness of $14,428 /ton reduced.

For **spray tower scrubbing (wet flue gas desulfurization)**, the most stringent control effectiveness was considered to be 95 percent control. In its work for BP, Jacobs Engineering has found that vendors are reluctant to guarantee a higher removal rate for fuel sulfur contents like BP currently has due to measurement inaccuracies.

Due to the locations of the various process heaters, each unit would have its own wet FGD system. In rare situations like the #1and #2 Reformer Furnaces, more than one stack may be able to be combined into a single FGD system. BP evaluated the possibility of installing wet FGD systems on the process heaters. As a result of the already low fuel sulfur concentration,[8] the cost effectiveness to install wet FGD systems on the process heaters and modify the wastewater treatment system to handle the wet FGD system effluent would result in cost effectiveness values of $29,982 to $102,068 (not including the cost of lost production to install the systems). BP considers the installation of wet FGD systems to reduce sulfur emissions to not be cost effective.

Fuel gas conditioning and spray tower scrubbing can be used together. BP evaluated the cost of this combination and found cost effectiveness values of $49,743 to $179,151/ton SO_2 removed. BP determined that the cost effectiveness of implementing both a refinery fuel gas sulfur reduction system and adding wet FGD systems to the process heaters was not cost effective.

BP's BART Proposal: Based on cost effectiveness, BP proposed continued operation of the existing refinery fuel gas treatment system as BART for SO_2 emissions from the BART-eligible refinery heaters and other combustion units.

2.1.3 PM Control Options for Refinery Heaters

PM emissions from gaseous fuel combustion are inherently low. The particles are also very small with most below $PM_{2.5}$, and the majority of these below one micron in size. PM is comprised of filterable and condensable fractions. The filterable portion exists in either the solid or the liquid state. Condensable particulate matter exists as a gas in the stack but condenses in the cooler ambient air to form $PM_{10}/PM_{2.5}$.

Overview of Available Retrofit PM Emission Control Techniques

BP reviewed information in EPA's RACT/BACT/LAER Clearinghouse (RBLC) database and control technology literature to find available technologies to control particulate emissions from refinery heaters. Control methods listed in the RBLC generally fell into three categories:

1. Use of low sulfur gaseous fuel.
2. Good combustion practices.

[8] 162 ppmv is approximately 0.1 grain/dscf.

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3. Proper design and operation.

No add-on control technologies were listed.
BP reviewed the current $PM_{10}/PM_{2.5}$ control technologies that were determined to be commercially available for a retrofit on existing refinery heaters. The complete listing is in Table 3-11 of the Best Available Retrofit Technology Determination, BP Cherry Point Refinery, submitted by BP to Ecology. Table 2-2 also lists a brief description of each technology and the two options are found to be technically feasible: fuel gas conditioning and wet electrostatic precipitators (WESPs).

Table 2-2. POTENTIAL $PM_{10}/PM_{2.5}$ CONTROL TECHNOLOGIES FOR REFINERY HEATERS

Options/Methods	Description	Potentially Applicable To	Overall Technical Feasibility
Fuel Gas Conditioning	The removal of sulfur compounds from fuel gas before burned in heaters.	Universally applied	Yes
Wet Electrostatic Precipitator (WESP)	A spray contactor circulates a neutralizing agent to react with sulfur compounds in the flue gas. The flue gas is then fed to a electric grid that enhances coalescing of sub-micron particles.	All	Yes

Fuel gas conditioning at the refinery is performed to remove sulfur from the fuel prior to combustion. Reducing sulfur in the refinery fuel gas reduces SO_2 emissions from all refinery combustion sources. SO_2 emissions can result in sulfate particulates that are usually collected in the back half of the particulate sampling train (i.e., measured as condensable particulates) and form in the atmosphere. A reduction in fuel gas sulfur content results in a reduction in condensable particulate emissions. Meeting the 50 ppm refinery fuel gas sulfur concentration evaluated for SO_2 emission reduction, BP estimated that fuel gas conditioning would result in a 25 percent reduction in the already low particulate emissions from the refinery heaters.

The capital costs to upgrade the refinery fuel gas sulfur removal system are the same as for SO_2 control. However, since the number of tons of particulate that could be controlled is significantly lower, the cost effectiveness is much higher. As a result, BP does not consider refinery fuel gas treatment to be cost effective for particulate control.

For the **WESP** option, the most stringent control effectiveness was considered to be 90 percent control. Utilizing both fuel gas conditioning and a wet ESP is assumed to be additive: the fuel gas conditioning brings the particulate emissions down by 25 percent and then the wet ESP removes 90 percent of the remaining $PM_{10}/PM_{2.5}$.

Each process heater will require its own WESP. BP did not perform a cost effectiveness evaluation for each heater. The company assumed that a WESP could be installed on all BART-

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eligible process heaters and performed an overall cost effectiveness evaluation for the use of a WESP on heaters. With a cost effectiveness of $24,280 /ton reduced, BP does not consider the installation of WESPs to be cost effective.
BP proposed that BART for particulate control was the current refinery fuel gas treatment system and operation of the currently installed burners.

2.1.4 BP's BART Proposal for the Combustion Unit Heaters

BP Proposal for Heater NO_X Control

BP proposed that BART for all eligible process heaters except the 1st Stage HC Fractionator Reboiler, is the level of control afforded by the currently installed burners. Table 2-3 summarizes BP's BART proposal for NO_X emissions from BART-eligible heaters at the refinery. The only new control technology equipment proposed is a new ULNB for the 1st Stage HC Fractionator Reboiler.

To comply with terms of the Consent Decree, BP installed ULNBs on the #1 HDS Charge Heater, the Diesel HDS Stabilizer Reboiler, and the R-1 HC Reactor Heater after the BART Baseline period. BP considers the NO_X emissions reduction from these three heaters plus the proposed new UNLB on the R-4 HC Reactor Heater as their proposed BART controls.

Table 2-3. SUMMARY OF BP PROPOSED NO_X BART FOR HEATERS THAT ARE SUBJECT TO BART

Process Unit Number	BART Source Point Description	BP Proposed BART Technology for NO_X	Baseline Firing Rate (MMBtu/hr)	NO_X Emission Factor (lb/MMBtu)	Proposed BART NO_X Emission Rate (lb/hr)
10-1401	Crude Charge Heater	Existing burners	593	0.185	109.7
10-1451	South Vacuum Heater	Existing UNLB	186	0.039	7.3
11-1401	Naphtha HDS Charge Heater	Existing burners	106	0.098	10.4
11-1402	Naphtha HDS Stripper Reboiler	Existing burners	64	0.098	6.3
11-1403-1406	#1 Reformer Heaters (4)	Existing burners	709	0.150	106.4
12-1401-01	Coker Charge Heater (#1 North)	Existing burners	143	0.062	8.9
12-1401-02	Coker Charge Heater (#2 South)	Existing burners	145	0.062	9.0
13-1401	#1 Diesel HDS Charge Heater	Existing ULNB	34	0.031	1.0
13-1402	Diesel HDS Stabilizer Reboiler	Existing ULNB	56	0.028	1.6
14-1401	Steam Reforming Furnace #1 (North H2 Plant)	Existing burners	308	0.098	30.2
14-1402	Steam Reforming Furnace #2 - (South H2 Plant)	Existing burners	302	0.098	29.6
15-1401	R-1 HC Reactor Heater	Existing ULNB	89	0.020	1.8
15-1402	R-4 HC Reactor Heater	Existing burners	42	0.098	4.1

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15-1451	**1st Stage HC Fractionator Reboiler**	**New ULNB**	**173**	**0.050**	**8.6**
15-1452	2nd Stage HC Fractionator Reboiler	Existing UNLB	144.5	0.057	8.2

BP Proposal for Heater SO_2 Control

BP proposed continued use of the current refinery gas sulfur removal system as BART for SO_2 emissions from BART-eligible refinery heaters.

BP Proposal for Heater PM_{10} Control

BP proposed good operating practices and continued use of the refinery fuel gas sulfur removal system as BART for PM_{10}/$PM_{2.5}$ emissions from BART-eligible refinery heaters.

2.2 Flares Control Options

The refinery maintains two flares that are subject to BART: a high pressure flare and a low pressure flare. The flare system thermally destroys gases of various flow rates and compositions. It also destroys gases released during upsets, malfunctions, and routine operations. Their primary purpose is to safely burn the volatile organic compounds (VOC) and other vented materials from the refinery processes. As a result, the flares emit NO_X, SO_2, and PM_{10}/$PM_{2.5}$, among other pollutants. Because BART is concerned only with normal operation, only emissions controllable during normal operation were considered in the BART analysis.

The high pressure flare serves high pressure process units such as the hydrocracker. The low pressure flare serves low pressure units such as the LPG unit. Both flares meet the applicable portions of 40 CFR 60.18 and are subject to the NSPS requirements for flares. Both flares are of the smokeless design and are steam assisted.

A flare gas recovery system was installed in 1984 that significantly decreased the total volume of gases routinely sent to the flare. In addition, a coker blowdown vapor recovery system was installed in 2007 that further reduced both the volume and sulfur content of the routinely flared gas.

2.2.1 NO_X Control Options

For reliable safe operation, the design of the flares requires the use of a pilot flame (pilot light). The combustion of the support fuel in the pilot light and the combustion refinery gases, flares emit NO_X.

BP searched the RBLC database and emission control literature to find available technologies to control flare emissions. In the RBLC, 37 entries were found regarding NO_X emissions from refinery flares. Several control methods were listed:

- Limit fuel to pipeline grade natural gas.

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- Proper operation and maintenance.
- Operate in accordance with 40 CFR 60.18, general control device requirements.
- Proper equipment design and operation, good combustion practices, and use of gaseous fuels.
- Conversion from steam assisted to air assisted.

No add-on control technologies were found or are known to be in commercial use. Three of the listed control methods focus on proper design and operation of the flare. The 4th option addresses the "cleanliness" of the fuel used for the pilot light. This increases the destruction efficiency and reduces the amount of NO_X emitted.

All of the listed control methods found in the RBLC search are technically feasible for the Cherry Point flares. No add-on controls were considered for BART.

BP already uses properly designed flares and the natural gas used for pilot light fuel contains minimal nitrogen and sulfur compounds. BP proposed BART for flare NO_X emissions to be the current system of pilot fuel, gas compressors, and flare design.

2.2.2 SO_2 Control Options

SO_2 emissions from flares primarily result from the combustion of sulfur-containing gases vented from the refinery processes. A minor contributor to SO_2 emissions from the flares is the natural gas combustion of the pilot flame.

A search of the RBLC database and emission control literature was performed to find available technologies to control SO_2 from flare emissions. Ninety-six entries were found regarding control of SO_2 from flares. Several categories of controls were listed:

- Maintain flared gas parameters (e.g., heat content, composition, velocity) to allow for good combustion.
- Good practices.
- Meet 40 CFR 60.18.
- Proper design including knock-out pot and seal drum; monitor for continuous presence of flame.
- Limit on sulfur content of feedstock and fuels (i.e., pollution prevention).

No add-on control technologies were found or are known to be in commercial use.

Three of the listed control methods focus on proper design and operation of the flare. The other two options also address the "cleanliness" of the fuel used for the pilot light. Natural gas is already used as fuel for the pilot light.

BP has performed several projects in the past to reduce the volume of gas sent to the flares and associated with that reduction in volume, the sulfur content in the flare feed gas. BP did not identify any additional opportunities to reduce the volume of gas routinely sent to the flares. As a result, BP proposed BART as continued operation of the flares as currently operated.

2.2.3 $PM_{10}/PM_{2.5}$ Control Options

Due to the combustion of natural gas in the pilot light and the combustion of refinery vent gases, flares emit small quantities of particulate matter ($PM_{10}/PM_{2.5}$).

A search of the RBLC database and emission control literature was performed to find available technologies to control flare emissions. In the RBLC, 15 entries were found regarding control of particulate matter for refinery flares. Two categories of control methods were listed:

- Proper equipment design and operation with good combustion practices.
- Use of an assisted smokeless flare design.

No add-on control technologies for flares were found or are known to be in commercial use. The listed control categories are to promote the proper operation of the flare, thereby increasing the destruction efficiency and reducing the amount of $PM_{10}/PM_{2.5}$ emitted.

The two listed control methods are already in use for the Cherry Point flares.

2.2.4 BP's BART Proposal for Flares

For NO_X, SO_2 and PM_{10} control, BP proposes continued operation and maintenance of the existing high and low pressure flares, including the continued use of the flare gas recovery system, limiting pilot light fuel to pipeline grade natural gas, operating in accordance with 40 CFR 60.18, and conversion from steam assisted to air assisted[9] flares as BART.

2.3 Sulfur Recovery System Control Options

The BP Cherry Point Refinery sulfur recovery system currently consists of two sulfur recovery units (SRUs) and two tail gas units (TGUs). The two SRUs were constructed in 1970 and one TGU was added in 1977. These three units are all BART eligible. In 2005 a second TGU was added in an action unrelated to the requirements of the Consent Decree. Together the combination of SRUs and TGUs are referred to as the SRUs, though all four units have combustion devices installed in them.

The SRUs convert hydrogen sulfide (H_2S) to SO_2 and elemental sulfur through use of the Claus reaction and process. The tail gas units oxidize any of the H_2S not treated in the SRUs before venting to the atmosphere through the "incinerator stack." The primary purpose of the tail gas units is to recover sulfide compounds that escape the SRUs and return a concentrated stream of

[9] The BP BART analysis did not include an explanation of changing from steam assisted to air assisted flares. Ecology does acknowledge that the change would slightly reduce the load on the existing steam boilers and could tend to reduce emissions of NO_X, SO_2, and particulate from the boilers. The change should not change emissions from the flares.

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sulfides to the SRUs. Any sulfur compounds not recovered by the TGUs are incinerated prior to being emitted. The two SRUs are operated in parallel with their exhaust gas streams combined and distributed to the two TGUs. One TGU utilizes the SCOT technology and the other utilizes the CANSOLV technology to assist in further collection of sulfur compounds and reducing the quantity of SO_2 discharged via the "incinerator stack."

The primary pollutant from sulfur recovery area is SO_2. Minor amounts of NO_X and $PM_{10}/PM_{2.5}$ are emitted as by-products of fuel combustion during gas treatment. Minor amounts of elemental sulfur can also be emitted from material handling operations.

The SRUs are subject to the requirements of 40 CFR 63 Subpart UUU, which specifies 40 CFR 60 Subpart J compliance as a control option. The SRUs are currently controlled to this MACT standard. The SRUs are not subject to additional controls.

2.3.1 NO_X Control Options

The TGU emits NO_X resulting from combustion of refinery fuel gas in the SRUs and combustion in the TGU.

BP reviewed the RBLC database and control technology literature to find available technologies to control NO_X emissions from the SRUs and the TGU. In the RBLC, 24 entries were found regarding NO_X control for SRUs and TGUs at refineries. Two categories of control methods for NO_X were listed:

- Good Operating Practices (e.g., "proper equipment design and operation, good combustion practices, and use of gaseous fuels", "optimized air-fuel ratio", "good operating practices").
- LNBs. LNBs can be installed either within the SRU itself (usually only as part of the initial design) or in the TGU.

No other add-on control technologies were found or are known to be in commercial use for control of NO_X from SRUs or TGUs.

<u>LNBs in the SRUs</u>: The SRU converts H_2S to SO_2 and elemental sulfur using heat to drive the Claus reaction. The heat needed for operation of an SRU is provided by the main reaction furnace burner operating on refinery fuel gas. This burner could potentially be replaced with a LNB to reduce NO_X emissions. The existing main reaction furnace burners in the SRUs at the refinery are side-entering.[10] Changing out the existing burner with a LNB would increase the flame length causing flame impingement and possible damage to the SRU. Because of flame impingement issues, BP considered using a LNB within the SRU technically infeasible.

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[10] The burners are located on the long wall of the rectangular furnace, reducing the distance between burner and heat transfer surfaces and the refractory walls of the furnace.

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LNBs in the TGU: After processing, to concentrate the sulfides in the exhaust from the SRUs, the TGU oxidizes the H_2S remaining before venting to the atmosphere. Utilizing a LNB in a TGU can be BACT for a new installation. The original TGU at the refinery was installed in 1977 and utilizes natural draft burners which are not suitable for the direct installation of a LNB. The natural draft design will require addition of fans to supply air to the LNBs. BP looked at the cost to install LNBs on the 1977 TGU and concluded that it would not be cost effective to install LNBs.

2.3.2 SO_2 Control Options

The purpose of the SRUs is to remove hydrogen sulfide from process gas and convert it to elemental sulfur. Hydrogen sulfide not removed by the SRUs and the TGUs are combusted in the TGUs and released as SO_2. Minor contributors to SO_2 emissions are the combustion of refinery fuel gas in the SRU furnaces to drive the Claus reactions and combustion of fuel in the TGU.

BP reviewed the RBLC database and control technology literature to find available technologies to control SO_2 emissions from the SRUs and TGU. Thirty-two entries were found regarding control of SO_2 from SRUs and TGUs. The following two categories of controls were listed:

- Restrictions on fuel sulfur content (e.g., “fuel sulfur content limits as follows: diesel fuel, 0.35% sulfur; natural gas, 0.01% sulfur; liquefied petroleum gas, 0.01% sulfur; refinery gas, 168 ppmv H_2S”).
- Specified additional processing device (e.g., Shell Claus Off-Gas Treating Process (SCOT) unit, tail gas incinerator/thermal oxidizer, selective amine absorbers).

No add-on control technologies specific to SO_2 (e.g., scrubber) were found or are known to be in commercial use.

One entry was found in the California Air Resources Board BACT Clearinghouse for a sulfur recovery plant at a refinery in the Bay Area Air Quality Management District. This determination lists a SCOT unit with a tail gas thermal oxidizer as the additional processing device. A SCOT unit is a patented technology TGU. The old TGU at BP utilizes the SCOT design.

Another entry in the Clearinghouse was for the new TGU utilizing the CANSOLV technology that was installed at the Cherry Point Refinery.

Both restrictions on fuel sulfur content and an additional processing device are technically feasible at the BP Cherry Point Refinery.

Restrictions on Fuel Sulfur Content: The TGU uses uninterruptible natural gas as the support fuel to drive the reaction to completion. Natural gas is the lowest sulfur content fuel available.

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Additional Processing Device: As noted above, the original TGU has a SCOT unit. The "new" #2 TGU is based on the newer CANSOLV technology and was installed to provide redundant capacity when the #1 TGU is out of service. BP does not consider replacement of the existing SCOT unit with a new CANSOLV unit as cost effective.

2.3.3 $PM_{2.5}$/PM_{10} Control Options

The TGU emits a small amount of PM_{10}/$PM_{2.5}$ from the combustion of refinery fuel gas in the SRUs and natural gas in the TGUs. Additionally, small amounts of particulate can be emitted from the storage and handling of elemental sulfur.

BP reviewed the RBLC database and control technology literature to find available technologies to control SRU and TGU PM_{10}/$PM_{2.5}$ emissions. The RBLC contained 16 entries on control of PM for SRUs and the tail gas combustion control. Only a few of the listings included a control method for particulate matter. Control methods included:

- Good combustion practices (e.g., "proper equipment design and operation, good combustion practices, and use of gaseous fuels", "optimized air-fuel ratio", "good maintenance and operation").
- Thermal oxidizer on the SRU such as the TGUs at the refinery.

No add-on control technologies specific to particulate matter, such as scrubbers or baghouses, were found or are known to be in commercial use.

Both listed control methods, good combustion practices and use of a thermal oxidizer, are technically feasible and in use at the refinery.

No information on dust control from sulfur handling was found.

2.3.4 BP's BART Proposal for the SRU and TGU

For NO_X, SO_2, PM_{10}/$PM_{2.5}$ control, BP proposes that continued operation of the existing SRUs and TGUs as BART.

2.4 Green Coke Load Out Control Options

The Green Coke Load Out system was permitted and constructed as part of the original refinery. The equipment was functionally replaced in 1978 by installation of the #1 & #2 calciners and their coke load out system. However, the equipment still physically exists at the refinery. The company desires to retain the ability of the green coke load out system in the event that the calciners are off-line for an extended period. The refinery does not have long-term storage capability for green coke and would use this equipment to export the green coke. Because the green coke load out would only be used during an upset condition, BP proposes that its operation is outside the purview of BART. From a practical perspective, this emission unit has virtually no

effect on Class I visibility because it's only emissions are relatively large particle size fugitive dust.
During the baseline period no green coke was loaded; consequently, there are no baseline emissions.

BP did not propose BART for this equipment. BP desires to retain the ability to operate this unit for possible future use.

2.5 BP's Proposed BART

Sections 2.1 to 2.5 of this report have summarized BP's BART evaluation for the BART-eligible units at the refinery. In summary, BP proposes that ULNB are BART for NO_X emissions from four refinery BART heaters. Two BART-eligible boilers are being replaced with new units, so BP did not consider the new boilers as BART units for BART evaluation purposes.

- #1 Diesel HDS Charge Heater (ULNB installed in 2006).
- Diesel HDS Stabilizer Reboiler (ULNB installed in 2006).
- R-1 HC Reactor Heater (ULNB installed in 2006).
- 1st Stage HC Fractionator Reboiler (proposed ULNB).
- For Boilers No. 1 and 3, replacement with new units (operational in 2009).

For all other units, BP proposes BART to be the existing burners and emission controls

3. VISIBILITY IMPACTS AND DEGREE OF IMPROVEMENT

A Class I area visibility impact analysis was performed on the BART-eligible emission units at BP using the CALPUFF model as recommended by Washington's BART modeling protocol with one exception. A database of actual ozone observations within Washington, Oregon, and Idaho prepared by Oregon DEQ was used to characterize background ozone concentrations instead of the constant 60 ppb ozone value recommended by the protocol. The addition of British Columbia ozone observations to this ozone database was approved by Ecology.[11]

Modeled baseline emission rates for the BART-eligible emission units were given in Table 1-2. Proposed BART emission rates shown in Table 2-3 changes only the NO_X emissions from four units. Table 3-1 shows the baseline modeling and proposed BART emissions for those four units. The first three units listed in Table 3-1 had ULNB burners added since the BART baseline period, so their NO_X emissions reductions were treated as a BART reductions for modeling purposes. The final unit shown in Table 3-1, the 1st stage HC Fractionator Reboiler, was proposed by BP to receive a new ULNB as BART.

[11] E-mail from Clint Bowman, Ecology to Ken Richmond, Geomatrix, Subject: Addition of BC Ozone Observations to Ozone, December 20, 2007.

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Table 3-1. PROPOSED BART CHANGES TO BASELINE EMISSIONS RATES

BART Source	Process Unit Number	Baseline NO_X BART Emission Rate (lb/hr)	Proposed NO_X BART Emission Rate (lb/hr)
#1 Diesel HDS Charge Heater	13-1401	3.3	1.0
HDS Stabilizer Reboiler	13-1402	5.5	1.6
R-1 HC Reactor Heater	15-1401	8.7	1.8
1st Stage HC Fractionator Reboiler	15-1451	25.9	8.65

Visibility impacts at each Class I area attributable to the refinery are shown in Table 3-2 for both baseline and proposed BART emission levels. Impacts include the number of days in the 3-year baseline period with impacts greater than 0.5 dv, the maximum 8th highest yearly impact in the 2003-2005 modeling period, and the maximum 22nd highest impact for that 3-year period.

Table 3-2. BASELINE AND BART VISIBILITY IMPACT MODELING RESULTS

Class I Area	Visibility Criterion	Baseline Emissions	BP's Proposed BART
Alpine Lakes Wilderness	# Days Haze Index > 0.5 dv in 2003-2005	7	5
	Max 98% value (8th high)	0.294	0.277
	3-yrs Combined 98% value (22nd high)	0.260	0.244
Glacier Peak Wilderness	# Days Haze Index > 0.5 dv in 2003-2005	0	0
	Max 98% value (Max annual 8th high)	0.290	0.280
	3-yrs Combined 98% value (22nd high)	0.248	0.233
Goat Rocks Wilderness	# Days Haze Index > 0.5 dv in 2003-2005	1	1
	Max 98% value (Max annual 8th high)	0.122	0.117
	3-yrs Combined 98% value (22nd high)	0.110	0.103
Mt. Adams Wilderness	# Days Haze Index > 0.5 dv in 2003-2005	0	0
	Max 98% value (Max annual 8th high)	0.083	0.078
	3-yrs Combined 98% value (22nd high)	0.082	0.078
Mt. Rainier National Park	# Days Haze Index > 0.5 dv in 2003-2005	3	3
	Max 98% value (Max annual 8th high)	0.279	0.266
	3-yrs Combined 98% value (22nd high)	0.222	0.212
North Cascades National Park	# Days Haze Index > 0.5 dv in 2003-2005	5	1
	Max 98% value (Max annual 8th high)	0.370	0.354
	3-yrs Combined 98% value (22nd high)	0.365	0.343
Olympic National Park	# Days Haze Index > 0.5 dv in 2003-2005	57	53
	Max 98% value (Max annual 8th high)	**0.901**	**0.832**
	3-yrs Combined 98% value (22nd high)	**0.842**	**0.786**
Pasayten Wilderness	# Days Haze Index > 0.5 dv in 2003-2005	0	0
	Max 98% value (Max annual 8th high)	0.215	0.202
	3-yrs Combined 98% value (22nd high)	0.196	0.185

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The results presented in Table 3-2 indicate that the visibility impact calculated on either an annual or three year 98th percentile basis does not exceed the 0.5 dv contribution threshold for seven of the eight areas modeled. The 98th percentile visibility impact at Olympic National Park does exceed the 0.5 dv contribution threshold.

During the modeling process, the relative contribution of each visibility impairing pollutant to visibility impact was determined. For the baseline period, modeling estimated that NO_X emissions caused an average of 78.4 percent of the refinery's total visibility impact on the Olympic National Park. SO_2 emissions caused 20.5 percent, and particulates only about one percent.

The visibility improvement from replacement of the BART eligible boilers with their replacement boilers was not performed. The new boilers were subject to the PSD permitting program and their visibility impacts were evaluated as part of that process.

Net Visibility Improvement

BP quantified the net visibility improvement from NO_X reduction due to the three new ULNBs installed after the 2003-2005 baseline period, and the proposed new ULNB. Table 3-3 shows the visibility improvement resulting from BP's proposed BART controls.

Table 3-3. NET VISIBILITY IMPROVEMENT OF BP'S PROPOSED BART CONTROLS AT OLYMPIC NATIONAL PARK

	Years			
	2003	**2004**	**2005**	**2003-05**
Modeled Visibility Improvement (dv)	0.062	0.056	0.069	0.056

4. ECOLOGY'S BART DETERMINATION

Ecology has reviewed the information submitted by BP. We agree with BP's proposal for BART with three exceptions.

The controls and emission limitations which Ecology has determined to be BART are summarized in Table 4-1 below. Ecology has made four revisions to BP's proposal for BART.

The first is BP's proposed BART for the 1st Stage HC Fractionator Reboiler. While BP offered to install new ULNB burners on this unit, BP recognized in their presentation that installation of ULNBs on this unit was not cost effective. Because this low NO_X burner installation was the least expensive of all the burner installations evaluated, they offered to install the burners as BART anyway. Ecology agrees that, at $12,044/ton NO_X reduced, installation of ULNBs on this heater is not cost effective. Ecology has decided that the current burners installed in this unit are BART for the 1st Stage HC Fractionator Reboiler.

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While Ecology has determined that the installation of ULNBs on the 1st Stage HC Fractionator Reboiler is not BART, we will credit BP in the future for their installation of these burners. Once the burners are installed, Ecology will recognize the installation as a reasonable progress emission reduction in a future regional haze SIP action.

Two other exceptions are Power Boilers No. 1 and No. 3. BP did not evaluate BART for these two boilers since their replacement units (Boilers No. 6 and No. 7) had recently completed the permitting process and were already under construction when their BART application was submitted. BP considered them to not be subject to BART since their replacements were scheduled to start operation in 2009. The boilers were started up in March, 2009.

In addition to not being evaluated for BART, the emissions of Power Boilers No. 1 and No. 3 are not included as BART unit emissions for modeling purposes. The two new boilers (Power Boilers 6 and 7) were permitted in November 2007 by both Ecology[12] and the Northwest Clean Air Agency.[13] As part of the permitting process, the visibility impact of the new boilers was evaluated against the criteria incorporated in the FLAG criteria manual.[14] BACT emission control requirements are incorporated in the permits issued for the installation of the new boilers. The new boilers incorporate SCR for NO_X control and are more fuel efficient; producing 67 percent more steam with only a 10 percent increase in fuel use. Power Boilers No. 1 and No. 3 are required to be decommissioned by March 27, 2010.

Ecology has determined that the new boilers satisfy the requirements of BART for Power Boilers No. 1 and No. 3.

Finally, BP did not evaluate BART for Cooling Tower #1. Cooling towers produce particulate from water droplet drift away from the towers. We have evaluated droplet and particulate drift from cooling towers in the past and found that they produce relatively large particulate that doesn’t drift far from the tower. Ecology has made a qualitative review of BART for the control of particulate from this cooling tower and determined that the existing drift controls satisfy BART for this unit.

The current refinery fuel gas treatment system provides both SO_2 and particulate matter control from all combustion equipment using this fuel. As a result, Ecology agrees that for the combustion equipment using refinery fuel gas, the reduced sulfur concentration limitation met by the refinery fuel gas treatment system provides a BART level of control for SO_2 and particulate matter.

Ecology agrees with BP that the current sulfur recovery system incorporates a BART level of emission control for SO_2 and particulate matter.

[12] PSD 07-01 is available at http://www.ecy.wa.gov/programs/air/psd/PSD_PDFS/PSD07_01Final.pdf.
[13] OAC #1001a is available from NWCAA or Ecology upon request.
[14] BP Cherry Point Refinery Boiler Replacement Project, Notice of Construction (NOC)/Prevention of Significant Deterioration (PSD) Permit Application, by Geomatrix Consultants, Inc., May 2007.

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Ecology recognizes that the Green Coke Load Out system provides a backup handling system to ship green coke off-site if the coker system is off-line for an extended period of time. While the facility has not had any recent use, the ability of the plant to use the system in an emergency situation is important. Ecology's BART determination allows its limited emergency usage. Criteria to allow its usage are contained in the BART order and operation would also have to comply with Ecology and NWCAA visible emissions and other criteria.

Table 4-1. ECOLOGY'S DETERMINATION OF EMISSION CONTROLS THAT CONSTITUTE BART

Emission Unit	BART Control Technology	Emission Limitations Contained in the Listed Permits, Orders, or Regulations
Crude Charge Heater	Current burners and operations	OAC 159, RO 28 (40 CFR 60 Subpart J), OAC 689a
South Vacuum Heater	Existing UNLB	RO 28 (40 CFR 60 Subpart J), OAC 902a
Naphtha HDS Charge Heater	Current burners and operations	RO 28 (40 CFR 60 Subpart J)
Naphtha HDS Stripper Reboiler	Current burners and operations	RO 28 (40 CFR 60 Subpart J)
#1 Reformer Heaters	Current burners and operations	RO 28 (40 CFR 60 Subpart J)
Coker Charge Heater (#1 North)	Current burners and operations	OAC 689a, RO 28 (40 CFR 60 Subpart J)
Coker Charge Heater (#2 South)	Current burners and operations	OAC 689a, RO 28 (40 CFR 60 Subpart J)
#1 Diesel HDS Charge Heater	Existing ULNB and operations	RO 28 (40 CFR 60 Subpart J), OAC 949a
Diesel HDS Stabilizer Reboiler	Existing ULNB and operations	RO 28 (40 CFR 60 Subpart J), OAC 949a
Steam Reforming Furnace #1 (North H2 Plant)	Current burners and operations	RO 28 (40 CFR 60 Subpart J)
Steam Reforming Furnace #2 (South H2 Plant)	Current burners and operations	RO 28 (40 CFR 60 Subpart J)
R-1 HC Reactor Heater	Existing ULNB and operations	RO 28 (40 CFR 60 Subpart J), OAC 966a
R-4 HC Reactor Heater	Current burners and operations	RO 28 (40 CFR 60 Subpart J)
1st Stage HC Fractionator Reboiler	Current burners and operations	OAC 149, OAC 351d, RO 28 (40 CFR 60 Subpart J)
2nd Stage HC Fractionator Reboiler	Existing UNLB and operations	OAC 149, RO 28 (40 CFR 60 Subpart J), OAC 847a
Refinery Fuel Gas (hydrogen sulfide)	Currently installed fuel gas treatment system.	RO 28 (40 CFR 60 Subpart J)
SRU & TGU (Sulfur Incinerator)	Current burners and operations	OAC 890b, 40 CFR 60 Subpart J (250 ppm SO_2 incinerator stack and 162 H_2S refinery fuel gas as supplemental fuel for incinerator), 40 CFR 63 Subpart UUU.
High and Low Pressure Flares		
NO_X	Good operation and maintenance including use of the flare gas recovery system and limiting pilot light fuel to pipeline grade natural gas.	40 CFR 63 Subpart A, NWCAA 462, 40 CFR 63 Subpart CC
SO_2	Good operating practices, use of natural gas for pilot.	40 CFR 63 Subpart A, NWCAA 462, 40 CFR 63 Subpart CC

September 4, 2009

Emission Unit	BART Control Technology	Emission Limitations Contained in the Listed Permits, Orders, or Regulations
PM	Good operating practices, use of an steam-assisted smokeless flare design, use of flare gas recovery system.	40 CFR 63 Subpart A, NWCAA 462, 40 CFR 63 Subpart CC
Green Coke Load out	Maintain as unused equipment for possible future use.	Emergency use only per criteria in the BART order and operation per applicable NWCAA regulatory order and regulations.
Power Boilers 1 and 3	Replacement with new Power Boilers 6 and 7	PSD 07-01 and NWCAA Order OAC #1001a

September 4, 2009

APPENDIX A. PRINCIPLE REFERENCES USED

Geomatrix, BP Cherry Point Refinery, et al., "Best Available Retrofit Technology Determination, BP Cherry Point Refinery, Blaine, Washington," March 2008. Amended by letter of June 25, 2008.

E-mail communications (various) between Valerie Lagen of BP and Bob Burmark of Ecology, regarding BP's BART proposal.

E-mail communications (various) between Dan Mahar of NWCAA and Bob Burmark of Ecology, regarding BP's BART proposal.

E-mail communications (various) between Eric Hansen of Geomatrix (now Environ) and Bob Burmark of Ecology.

E-mail communications between Nick Confuorto of Belco and Alan Newman of Ecology, regarding LoTO$_X$™ NO$_X$ control system, March 3-4, 2008.

Emission Standards Division, U.S. Environmental Protection Agency, "Alternative Control Techniques Document–NO$_X$ Emissions from Process Heaters (revised)," September 1993.

N. Confuorto and J. Sexton, "Wet Scrubbing Based NO$_X$ Control Using LoTO$_X$™ Technology–First Commercial FCC Start-Up Experience," presented at NPRA Environmental Conference, September 24-25, 2007.

S. Eaglson, N. Confuorto, S. Singhania, and N. Singahnia, "Controlling Fired Process Heater Emissions to Reduce Fuel Costs and Improve Air Quality," presented at Petrotech 2007, 7th International Oil & Gas Conference and Exhibition, January 24, 2007.

NWCAA, "Air Operating Permit Statement of Basis, AOP # 015," permit issued, September 6, 2006, and a January 2009 draft SOB for the renewal of this permit.

NWCAA, "Air Operating Permit, BP West Coast Products LLC, BP Cherry Point Refinery, Blaine Washington, AOP # 015," permit issued September 6, 2006, and a January 2009 draft renewal of this permit.

Edward Sabo, "Status Report: Candidate Stationary Source Control Measures," presented at MRPO Regional Air Quality Workshop, November 16, 2005. Presentation summarizes control techniques applied to oil refineries under federal consent orders.

Mid-Atlantic Regional Air Management Association (MARAMA), "Assessment of Control Technology Options for Petroleum Refineries in the Mid-Atlantic Region, Final Technical Support Document," January 31, 2007.

September 4, 2009

Air and Waste Management Association, Editors, Anthony Buonicore and Wayne Davis, “Air Pollution Engineering Manual,” Von Nostrand Reinhold, 1992.

EPA Air Pollution Control Cost Manual, Sixth Edition, EPA/452/B-02-001, January 2002.

APPENDIX B. ACRONYMS/ABBREVIATIONS

BACT	Best Available Control Technology
BART	Best Available Retrofit Technology
BP	BP West Coast Products, LLC
dv	Deciview(s)
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
FGR	Flue Gas Recirculation
LAER	Lowest Achievable Emission Rate
LNBs	Low-NO_X Burners
$LoTO_X^{TM}$	Patented Low Temperature Oxidation Process for Reducing NO_X in Gas Waste Streams
MMBtu	Million British Thermal Units
NO_X	Nitrogen Oxides
NWCAA	Northwest Clean Air Agency
PM	Particulate Matter
ppm	Parts per Million
ppmdv	Parts per Million Dry Volume
ppmv	Parts per Million by Volume
RACT	Reasonably Available Control Technology
Refinery	BP Cherry Point Refinery
SCR	Selective Catalytic Reduction
SNCR	Selective Non-Catalytic Reduction
SO_2	Sulfur Dioxide
SRU	Sulfur Recovery Unit
TGU	Tail Gas Unit
tpy	Tons per Year
ULNBs	Ultra-low-NO_X Burners
VOC(s)	Volatile Organic Compound(s)

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600 ◦ Olympia, WA 98504-7600 ◦ 360-407-6000
711 for Washington Relay Service ◦ Persons with a speech disability can call 877-833-6341

July 7, 2010

Mr. Jeff Pitzer
Business Unit Leader
BP Cherry Point Refinery
4519 Grandview Road
Blaine, WA 98230

Dear Mr. Pitzer:

Regional Haze Best Available Retrofit Technology (BART) Determination

Best Available Retrofit Technology (BART) is required to reduce the regional haze impacts of emissions of your facility. The enclosed Order #7836 contains our BART determination for your facility including a schedule for compliance.

If you have questions or requests relating to this order, please contact Alan Newman at (360) 407-6810 or alan.newman@ecy.wa.gov.

Sincerely,

Jeff Johnston, Ph.D.
Manager, Science and Engineering Section
Air Quality Program

jj/te

Enclosure

By certified mail

cc: Mark Buford, NWCAA
Valerie Lagen, BP Cherry Point Refinery
Alan Newman, Ecology

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

IN THE MATTER OF AN ADMINISTRATIVE ORDER AGAINST: BP Cherry Point Refinery	]]]]]	ORDER NO. 7836

TO: Mr. Jeff Pitzer
BP Cherry Point Refinery
4519 Grandview Road
Blaine, WA 98230

This is an Administrative Order requiring your company to comply with WAC 173-400-151 by taking the actions which are described below. Chapter 70.94 RCW authorizes the Washington State Department of Ecology's Air Quality Program (Ecology) to issue Administrative Orders to require compliance with the requirements of Chapter 70.94 RCW and regulations issued to implement it.

Ecology has determined that portions of your facility are subject to the provisions of the federal and state visibility protection program (WAC 173-400-151 and 40 CFR Part 51, Subpart P). The rules require that the State determine what technologies and level of emission control constitutes Best Available Retrofit Technology (BART) for the eligible emission units at your facility. The rules also require the installation and use of those emission controls on the BART-eligible emission units. The emission controls are to be installed as expeditiously as possible, but in no event can the State allow them to start operation later than five years after the State's Regional Haze SIP amendment is approved by the United States Environmental Protection Agency (EPA).

FINDINGS

The BP Cherry Point Refinery operates an oil refinery near Blaine, Washington, that contains emission units that are subject to BART.

A. The BART-eligible emission units at the BP Cherry Point Refinery are:

a. Process heaters and boilers:

1. 30-1601, Boiler #1
2. 30-1603, Boiler #3
3. 10-1401, Crude Charge Heater
4. 10-1451, South Vacuum Heater
5. 11-1401, Naphtha HDS Charge Heater

6. 11-1402, Naphtha HDS Stripper Reboiler
7. 11-1403-1406, #1 Reformer Heaters
8. 12-1401-01, Coker Charge Heater (#1 North)
9. 12-1401-02, Coker Charge Heater (#2 South)
10. 13-1401, #1 Diesel HDS Charge Heater
11. 13-1402, #1 Diesel HDS Stabilizer Reboiler
12. 14-1401, Steam Reforming Furnace #1 – (North Hydrogen (H2) Plant)
13. 14-1402, Steam Reforming Furnace #2 – (South (H2) Plant)
14. 15-1401, R-1 HC Reactor Heater
15. 15-1402, R-4 HC Reactor Heater
16. 15-1451, 1st Stage HC Fractionator Reboiler
17. 15-1452, 2nd Stage HC Fractionator Reboiler

b. Other units:

1. 17, 19, SRU & TGU
2. 29.110, High Pressure Flare
3. 29-111, Low Pressure Flare
4. Green Coke Load Out

B. BART emission limitations for the BART-eligible emission units is a combination of:

a. Use of existing burners on process heaters and reboilers.

b. Continued use of the current refinery fuel gas sulfur scrubbing system for control of sulfur dioxide (SO_2) emissions.

c. Replacement of Boilers #1 and #3 with Boilers #6 and #7 as permitted in Prevention of Significant Deterioration (PSD) 07-01 and Order of Approval to Construct (OAC) #1001a.

C. Treatment of Specific Units

a. Boilers #1 and #3 will be decommissioned by no later than March 27, 2010.

Additional information and analysis is available in the BART Determination Support Document for the BP Cherry Point Refinery, Blaine, Washington, prepared by the Washington State Department of Ecology, March 2009, and the Best Available Retrofit Technology Determination, BP Cherry Point Refinery, prepared by Geomatrix Consultants, March 2008.

YOU ARE ORDERED: To install and operate emission control equipment in accordance with the following conditions:

BART EMISSION LIMITATIONS

1. Particulate Matter Emissions

1.1. PM_{10} emissions from Boilers #6 or #7 (each) shall not exceed 3.4 lb/hr on a calendar day average.

1.2. For all other BART-eligible units, meet the emission limitations for particulate matter found in NWCAA's Regulation 455.1 given below.

1.2.1. Emissions shall not exceed 0.10 grain/dscf (corrected to seven percent oxygen), except from all gaseous and distillate fuel burning equipment (the definition of fuel burning equipment does not include internal combustion engines), emissions shall not exceed 0.05 grain/dscf (0.11 g/m^3) corrected to seven percent oxygen.

1.3. Compliance with the particulate emission limits above will be determined as follows:

1.3.1. For Boilers #6 and #7, continuous compliance shall be demonstrated by an annual emissions test on each exhaust stack using 40 CFR 60 Appendix A Method 5 front half, and 40 CFR 51 Appendix M Method 202 for the back half, or an equivalent test method if approved in advance by Ecology. After three consecutive years of annual tests on each boiler stack have demonstrated compliance, testing of each boiler stack may be reduced to once every five years. If a test demonstrates noncompliance, a retest along with resumption of annual testing is required for the unit until three consecutive years demonstrate compliance.

1.3.2. Burn only gaseous fuels.

1.3.3. For all BART-eligible units, perform particulate emissions testing to determine compliance when requested in writing by NWCAA or Ecology. Particulate testing is performed using EPA Test Method 5 in 40 CFR Part 60 Appendix A and Method 202 in 40 CFR 51 Appendix M.

2. Nitrogen Dioxide (NO_X) Emissions

2.1. Boilers #6 and #7

2.1.1. NO_X emissions shall not exceed the following emission limits:

2.1.1.1. During periods of normal operation, as defined as firing the boiler above 91 MMBtu HHV/hr (25 percent capacity), 9.0 ppm NO_X by volume, dry basis, corrected to three percent oxygen, based on a 1-hour average.

2.1.1.2. During periods of hot standby, as defined as firing the boiler below 18 MMBtu HHV/hr (five percent capacity), 40.0 ppm NO_X by volume, dry basis, corrected to three percent oxygen, based on a 1-hour average.

2.1.1.3. Operation of each boiler in transition mode, defined as a firing rate at or above 18 MMBtu HHV/hr (five percent capacity) to at or below 91 MMBtu HHV/hr (25 percent capacity), shall not exceed 100 hours per 12-month rolling period. Compliance shall be demonstrated by recording the number of hours operated in this firing range for each calendar month, and submitting the most recent 12-month cumulative total transition mode hours on monthly emission reports submitted to the NWCAA.

2.1.2. NO_X limits will apply and SCR will be operated at inlet temperatures above 500.0 degrees F.

2.1.3. Compliance with Condition 2.1.1 shall be determined by installing NO_X and oxygen continuous emission monitors (CEM) in each boiler stack. The CEM shall be calibrated, maintained, and operated in accordance with NWCAA Appendix A: Ambient Monitoring, Emission Testing, and Continuous Emission and Opacity Monitoring and 40 CFR Part 60 Appendices B and F.

2.2. South Vacuum Heater, Unit 10-1451

2.2.1. NO_X emissions shall not exceed 10.5 lb/hr based on a calendar day average.

2.2.2. Compliance with this condition shall be determined by a CEM installed, calibrated, maintained, and operated to measure NO_X and oxygen in the stack.

2.2.3. Each monitor shall meet the appropriate sections of NWCAA Section 366 and NWCAA Appendix A.

2.2.4. Hourly emission rates for NO_X shall be recorded. On-site documentation shall be kept showing the method of calculating the mass emission rate.

2.2.5. Report data in monthly monitoring report.

2.3. Coker Charge Heater (#1 North), 12-1401-01

2.3.1. NO_X emissions shall not exceed 15.2 lb/hr and 66 tons per year.

2.3.2. Compliance shall be determined by biennial performance tests on one of two identical heaters (#2 North or #2 South) using 40 CFR 60 Appendix A Method 7A or 7E.

2.4. Coker Charge Heater (#2 South), 12-1401-02

2.4.1. NO_X emissions shall not exceed 15.2 lb/hr and 66 tons per year.

2.4.2. Compliance shall be determined by biennial performance tests on one of two identical heaters using 40 CFR 60 Appendix A Method 7A or 7E.

2.5. Number 1 Diesel HDS Charge Heater, 13-1401 and Diesel HDS Stabilizer Reboiler, 13-1402

2.5.1. NO_X emissions from the #1 Diesel Hydrotreater Charge Heater shall not exceed 0.040 lb/MMBtu (higher heating value), or if this emission limit is exceeded, 1.9 lb/hr.

2.5.2. NO_X emissions from the Stabilizer Reboiler Heater shall not exceed 26 ppmv (dry basis corrected to seven percent O_2) based on a 24-hour rolling average. If this concentration is exceeded, a secondary limit to demonstrate compliance is 2.2 lb/hr based on a 24-hour rolling average.

2.5.2.1. Ongoing compliance with this condition shall be determined by a continuous emission monitor (CEM) installed, calibrated, maintained, and operated to measure NO_X and O_2 in the stack by no later than December 1, 2008. Each monitor shall meet the appropriate specifications of 40 CFR 60 Appendices B and F, NWCAA Section 367, and NWCAA Appendix A.

2.6. R-1 HC Reactor Heater, 15-1401

2.6.1. Nitrogen oxides (NO_X) from the Hydrocracker R-1 Heater shall not exceed the following emission limits:

2.6.1.1. 26 ppm by volume, dry basis, corrected to seven percent oxygen, based on a 24-hour rolling average. Or, if this concentration based limit is exceeded, the following mass emission rate limit shall be used to demonstrate compliance.

2.6.1.2. 3.6 lb/hr based on a 24-hour rolling average.

2.6.2. Biennial source testing shall be completed within two months of the anniversary date of the initial test. The test shall be performed under representative operating conditions and at a heater firing rate that corresponds to the operating condition of the Hydrocracker Unit on the scheduled test day. The test shall be conducted in accordance with USEPA Reference Method 7E, NWCAA Regulation Section 367, and NWCAA Appendix A.

2.6.3. NO_X emissions shall be continuously monitored by a certified continuous emission monitoring system (CEMS) for nitrogen oxides and oxygen. The CEMS shall be installed, calibrated, maintained, and operated in accordance with appropriate specifications of 40 CFR 60 Appendices B and F, NWCAA Section 367, and NWCAA Appendix A.

2.6.4. An operating and maintenance manual that contains O&M information on the ultra-low NO_X burners shall be maintained on site.

2.7. 1st Stage HC Fractionator Reboiler, 15-1451

2.7.1. NO_X emissions from the boiler stack shall not exceed 0.07 lb/MMBtu monthly average, or 56.2 tons per calendar year.

2.7.2. A continuous emission monitor or equivalent method approved by the NWCAA shall be used to measure nitrogen oxide emissions.

2.7.3. An operating and maintenance manual that contains O&M information on the low NO_X burners shall be maintained on site.

2.8. 2nd Stage HC Fractionator Reboiler, 15-1452

2.8.1. Emission of NO_X from the heater stack shall not exceed 0.07 lb/MMBtu based on a 24-hour average and shall not exceed 56.2 tpy on a calendar year rolling average.

2.8.2. Report NO_X emissions based on firing rates on a calendar month basis within 30 days after the end of the previous month.

2.8.3. Conduct periodic source testing once every five years within three months of the anniversary of the initial test. Follow 40 CFR 60 Appendix A Method 20.

2.8.4. An operating and maintenance manual that contains O&M information on the low NO_X burners shall be maintained on site.

2.9. No nitrogen dioxide emission limitations are applicable to the following units:

2.9.1. Crude Charge Heater Unit 10-1401, the Naphtha HDS Charge Heater Unit 11-1401.

2.9.2. Naphtha HDS Stripper Reboiler Unit 11-1402.

2.9.3. Number 1 Reformer Heaters 11-1403-1406.

2.9.4. Steam Reforming Furnace #1 (North Hydrogen (H_2)) Plant Unit 14-1401.

2.9.5. Steam Reforming Furnace #2 (South H_2 Plant) Unit 14-1402.

2.9.6. R-4 HC Reactor Heater, Unit 15-1402.

3. Sulfur Dioxide Emissions

3.1. For Boilers #6 and #7

3.1.1. SO_2 emissions from Boilers #6 or #7 (each) shall not exceed 39.3 lb/hr based on a 1-hour average.

3.1.2. SO_2 emissions from Boilers #6 or #7 (each) shall not exceed 59.6 tons per year.

3.1.3. Compliance with Condition 3.1 shall be demonstrated by:

3.1.3.1. Test once per calendar month for total sulfur in the boiler fuel using ASTM Test Method D-5504 or another method approved by Ecology. A minimum of three samples, taken at least an hour apart, shall be run per quarterly test.

3.1.3.2. Monitor fuel H_2S content using a CEMS that continuously monitors and records the concentration (dry basis) of H_2S in the fuel gas.

3.1.3.3. As an alternative to Conditions 3.1.3.1 and 3.1.3.2, BP may monitor using a CEMS that measure and records SO_2 emissions from the Boilers #6 and #7 exhaust stacks and meets the requirements contained in 40 CFR, Part 60, Appendix B, Performance Specification 2 and 40 CFR Part 60, Appendix F, Quality Assurance Procedures.

3.2. Coker Charge Heaters #1 North and #1 South

3.2.1. SO_2 emissions shall not exceed 14.9 lb/hr and 66 tons per year per heater.

3.2.2. Compliance shall be determined by biennial performance tests on one of two identical heaters using 40 CFR 60 Method 6 or 6C or Fuel Gas Analysis using Method 11 or 15.

3.3. Plant-wide refinery fuel gas requirements

3.3.1. All units shall meet the emissions limitations for fuel gas contained in the NWCAA's RO #28 dated May 15, 2002.

3.3.1.1. Fuel gas is limited to a composition of H_2S<230 mg/dscm (0.10 gr/dscf). Equivalent to 162 ppm H_2S, 3-hour rolling average.

3.3.2. Operate CEM for H_2S concentration at the fuel feed line in accordance with NWCAA 367 and Appendix A – "Ambient Monitoring, Emission Testing, and Continuous Emission and Opacity Monitoring," 40 CFR 60 Subpart J and 40 CFR 60 Appendices B and F.

3.3.3. Periods of excess emissions that shall be determined and reported are defined as follows. All rolling 3-hour periods during which the average concentration of H_2S as measured by the H_2S continuous monitoring system under §60.105(a)(4) exceeds 162 ppmv.

3.3.4. Report average H_2S content (3-hour rolling average) in monthly report.

4. All Other BART Units

4.1. SRU and TGU

4.1.1. Sulfur dioxide emissions from TGU stacks 1 and 2 shall not exceed any of the following emission limits:

4.1.1.1. 250 (2.50×10^2) ppm by volume, dry basis, corrected to zero percent oxygen, based on a 12-hour rolling average. The 12-hour rolling average shall be calculated based on corrected hourly averages for the 12 most recent, consecutive clock hours.

4.1.1.2. 1500 (1.50×10^3) ppm by volume, dry basis, corrected to zero percent oxygen, based on a 1-hour average.

4.1.1.3. Compliance with this condition shall be determined by a continuous emission monitor (CEM) installed, calibrated, maintained, and operated to measure sulfur dioxide and oxygen in each TGU stack. Each monitor shall meet the appropriate specifications of 40 CFR 60 Appendices B and F, NWCAA Regulation Section 367, and NWCAA Appendix A.

4.1.1.4. Total tons of sulfur dioxide emitted from the sulfur recovery unit shall not exceed 135 tons based on each consecutive 12-month rolling period. The most recent 12-month rolling total shall be reported to the NWCAA on each monthly emissions report.

SCHEDULE FOR COMPLIANCE

5. For all requirements in Conditions 1, 2, 3 and 4, compliance is required upon the effective date of this Order.

MONITORING AND RECORDKEEPING REQUIREMENTS

6. Sulfur Dioxide Emissions

6.1. The monthly total sulfur test results required by Condition 3.1.3.1 shall be submitted to NWCAA and Ecology upon request.

6.2. SO_2 performance tests required by Conditions 3.2.2 shall be submitted to NWCAA and Ecology upon request.

6.3. Operate CEMS measuring H_2S concentration in accordance with NWCAA 367 and NWCAA Appendix A, 40 CFR 60 Subpart J, and 40 CFR 60 Appendices B and F.

6.4. CEMS data including daily average H_2S concentrations of the refinery fuel gas shall be recorded and retained at the facility available for review by NWCAA or Ecology inspectors.

OTHER REQUIREMENTS

7. Boilers #1 and #3 shall be decommissioned by no later than March 27, 2010. The Northwest Clean Air Agency (NWCAA) shall be notified in writing of the decommissioning date of each boiler. Notifications shall be postmarked no later than 15 days after each decommissioning event.

8. BP may request this compliance Order be rescinded after all of the following occur:

   8.1. All BART units at the plant have continuously complied with the emissions limitations in Conditions 1 through 4 for a period of three years.

   8.2. The emission limitations in this Order have been incorporated into one or more enforceable orders or permits issued under the criteria of RCW 70.94.152 or 70.94.153 and NWCAA regulations implementing these provisions.

   8.3. The emission limitations in the enforceable orders or permits have been incorporated into the Air Operating Permit issued by NWCAA to BP.

9. Issuance of this order indicates requirements of Order 5069 have been complied with.

Within 20 days of receipt of this Order, you may request a delay in the submittal date. Any such request must be accompanied by a written justification for the delay.

Failure to comply with this Order may result in the issuance of civil penalties or other actions, whether administrative or judicial, to enforce the terms of this Order.

You have a right to appeal this Order. To appeal you must:

- File your appeal with the Pollution Control Hearing Board within 30 days of the "date of receipt" of this document. Filing means actual receipt by the Board during regular office hours.

- Serve your appeal on the Department of Ecology within 30 days of the "date of receipt" of this document. Service may be accomplished by any of the procedures identified in WAC 371-08-305(10). "Date of receipt" is defined at RCW 43.21B.001(2).

If you appeal, you must:

- Include a copy of this document with your Notice of Appeal.
- Serve and file your appeal in paper form; electronic copies are not accepted.

To file your appeal with the Pollution Control Hearing Board:

Mail appeal to:		Deliver your appeal in person to:
The Pollution Control Hearings Board P.O. Box 40903 Olympia, WA 98504-0903	OR	The Pollution Control Hearings Board 4224–6th Avenue SE Rowe Six, Bldg 2 Lacey, WA 98503

To serve your appeal on the Department of Ecology:

Mail appeal to:		Deliver your appeal in person to:
Department of Ecology Appeals Coordinator P.O. Box 47608 Olympia, WA 98504-7608	OR	Department of Ecology Appeals Coordinator 300 Desmond Drive SE Lacey, WA 98503

And send a copy of your appeal packet to:

Alan Newman
Department of Ecology
Air Quality Program
P.O. Box 47600
Olympia, WA 98504-7600

For additional information, go to the Environmental Hearings Office website at http://www.eho.wa.gov.

To find laws and agency rules, go to the Washington State Legislature website at http://www1.leg.wa.gov/CodeReviser.

Your appeal alone will not stay the effectiveness of this Order. Stay requests must be submitted in accordance with RCW 43.21B.320. These procedures are consistent with Chapter 43.21B RCW.

DATED this 7 day of July, 2010 at Olympia, Washington.

Jeff Johnston, Ph.D.
Manager, Science and Engineering Section
Department of Ecology
Air Quality Program

BART DETERMINATION SUPPORT DOCUMENT FOR ALCOA INTALCO WORKS FERNDALE, WASHINGTON

Prepared by

Washington State Department of Ecology
Air Quality Program

August 2009
Revised February 4, 2010

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The Best Available Retrofit Technology (BART) program is part of the larger effort under the federal Clean Air Act Amendments of 1977 to eliminate human-caused visibility impairment in all mandatory federal Class I areas. Sources that are required to comply with the BART requirements are those sources that:

1. Fall within 26 specified industrial source categories.
2. Commenced operation or completed permitting between August 7, 1962 and August 7, 1977.
3. Have the potential to emit more than 250 tons/year of one or more visibility impairing compounds.
4. Cause or contribute to visibility impairment within at least one mandatory federal Class I area.

The Alcoa Intalco Works (Intalco) is a primary aluminum smelter facility utilizing the prebake process. The smelter is located on Cherry Point near Ferndale, Washington. The aluminum smelting process produces emissions of particulate matter (PM), fluorides, sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen oxides (NO_X), and hydrocarbons. The pollutants considered to be visibility impairing are PM, SO_2, and NO_X.

Aluminum smelters such as the Intalco facility are one of the 26 listed BART source categories. The Intalco plant was constructed in 1965 and has the potential to emit more than 250 tons/year of PM and SO_2. Most of the plant's emission units are BART-eligible. Intalco's major sources of visibility impairing pollutants are three potlines and an anode bake furnace.

Modeling of visibility impairment was done following the Oregon/Idaho/Washington/EPA-Region 10 BART modeling protocol.[1] Modeled visibility impacts of baseline emissions show impacts on the 8th highest day in any year (the 98th percentile value) to be greater than 0.5 deciviews (dv) at seven Class 1 areas. The highest impact was 2.36 dv on Olympic National Park. Modeling showed that SO_2 emissions from the existing dry alumina/baghouse potline emission control system created 94 percent of the facility's total visibility impact.

Intalco prepared a BART technical analysis using Washington State's BART Guidance.[2]

The Washington State Department of Ecology (Ecology) determined that the current level of emissions control is BART for the applicable units at the Alcoa Intalco Works primary aluminum smelter facility. The potlines and anode bake furnace are currently well controlled for particulate emissions. A wet scrubber on each source would be required to control SO_2 emissions. Modeling indicated that addition of a wet scrubber system on the potlines could reduce the visibility impact on Olympic National Park by over a deciview. However, the potline scrubber system's estimated $7,500 cost per ton of SO_2 removed was determined to be excessive.

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[1] Modeling protocol available at http://www.deq.state.or.us/aq/haze/docs/bartprotocol.pdf.
[2] "Best Available Retrofit Technology Determinations Under the Federal Regional Haze Rule," Washington State Department of Ecology, June 12, 2007.

Ecology also determined that the wet scrubber would have an excessive capital cost of $234.5 million and unacceptable impacts on solid waste generation, electrical power use, and water consumption. Ecology determined that a scrubber on the anode bake furnace would have an excessive $36,400 cost per ton of SO_2 removed.

March 3, 2009, Revised February 4, 2010

1. INTRODUCTION

1.1 The BART Program and Analysis Process

The federal Clean Air Act Amendments of 1977 (CAA) established a national goal of eliminating man-made visibility impairment in all mandatory federal Class I areas. The Act requires certain sources to utilize Best Available Retrofit Technology (BART) to reduce visibility impairment as part of the overall plan to achieve that goal.

Requirements for the BART program and analysis process are given in 40 CFR 51, Subpart P and Appendix Y to Part 51.[3] Sources are "BART-eligible" if they:

1. Fall within 26 specified industrial source categories.
2. Commenced operation or completed permitting between August 7, 1962 and August 7, 1977.
3. Have the potential to emit more than 250 tons/year of one or more visibility impairing compounds including sulfur dioxide (SO_2), nitrogen oxides (NO_X), particulate matter (PM), and volatile organic compounds (VOCs).

Emission units that meet the source category, age, and potential to emit criteria must also make the facility "cause or contribute" to visibility impairment within at least one mandatory federal Class I area for a "BART-eligible facility" to be "subject to BART." Ecology has adopted the "cause and contribute" criteria that the United States Environmental Protection Agency (EPA) suggested in its guideline. BART-eligible units at a source cause visibility impairment if their modeled visibility impairment is at least 1.0 deciview (dv). Similarly the criterion for contributing to impairment means that the source causes a modeled visibility change of 0.5 dv or more.

The BART analysis protocol in Appendix Y to Part 51, Sections III–V uses a 5-step analysis to determine BART for SO_2, NO_X, and PM. The five steps are:

Step 1 – Identify all available retrofit control technologies.
Step 2 – Eliminate technically infeasible control technologies.
Step 3 – Evaluate the control effectiveness of remaining control technologies.
Step 4 – Evaluate impacts and document the results.
Step 5 – Evaluate visibility impacts.

Ecology requires a facility that is "subject to BART" to prepare a BART technical analysis report and submit it to Ecology. Ecology then evaluates the report and makes a BART determination decision. This decision is then issued to the source owner as an enforceable Order, and included in the state's Regional Haze State Implementation Plan (SIP).

[3] Appendix Y to 40 CFR 51–Guidelines for BART Determinations Under the Regional Haze Rule.

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As allowed by the EPA BART guidance, Ecology has chosen to consider all five factors in its BART determinations. To be selected as BART, a control has to be available, technically feasible, cost effective, provide a visibility benefit, and have a minimal potential for adverse non-air quality impacts. Normally, the potential visibility improvement from a particular control technology is only one of the factors weighed for determining whether a control constitutes BART. However, if two available and feasible controls are essentially equivalent in cost effectiveness and non-air quality impacts, visibility improvement becomes the deciding factor for the determination of BART.

1.2 The Alcoa Intalco Plant

Alcoa Intalco Works (Intalco) is a primary aluminum smelter facility located in Ferndale, Washington, near Cherry Point along the Strait of Georgia. The facility produces primary aluminum metal by the Hall-Heroult reduction process. It was originally constructed in 1965, and began operation in 1966. Intalco is a Title V source operating under Air Operating Permit No. 000295-0. Primary aluminum ore reduction plants are one of the 26 BART-eligible source categories. Intalco submitted a BART Determination Report to the Washington State Department of Ecology (Ecology) on December 4, 2007 as required by Order #5070.

1.3 BART-Eligible Units at Intalco

A review of the Intalco emission sources found that:

1. All of the plant's individual emission units except for one remelt furnace are BART-eligible by construction date.
2. The individual emission units in total have a potential to emit greater than or equal to 250 tons/year of both sulfur dioxide (SO_2) and particulate matter (PM).
3. A baseline Class I area visibility impact analysis of 2003-2005 emissions using the CALPUFF model indicated impacts for the entire facility exceeded the 0.5 deciview (dv) contribution threshold in at least one Class I area. This confirmed that Intalco was subject to BART, and was required to prepare a BART Determination.

Intalco's primary aluminum reduction operations include three potlines, an electrode manufacturing operation consisting of a paste production operation and a green anode baking furnace, and miscellaneous material handling operations. These units were placed into six groups:

1. Potlines (3)
2. Anode bake furnace (1)
3. Aluminum holding furnaces (12)
4. Various material handling and transfer operations
5. Combustion sources (natural gas, diesel, propane)
6. Other small miscellaneous sources

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1.3.1 Existing Potline Emissions Control

The potline operation manufactures metallic aluminum by the electrolytic reduction of alumina in the side-worked prebake cells. Direct electrical current passes between the anodes and the carbon cathode that lines the cell walls. This current electrolytically reduces the alumina to metallic aluminum and oxygen. Molten aluminum is deposited and accumulates over time at the cathode beneath a layer of molten cryolite bath. Periodically the molten aluminum is siphoned from beneath the cryolite bath and processed to achieve specific metal properties or is retained as pure aluminum. The produced aluminum is solidified into intermediate or final products.
The major pollutants emitted from the cells are PM, hydrogen fluoride, SO_2, and carbon monoxide. PM includes particulate fluoride and alumina. SO_2 comes from the sulfur in the petroleum coke and pitch components used to make the anodes that are consumed by the process. NO_X emissions are minimal since there is no external fuel or combustion zone and there are no large sources of nitrogen in the raw materials.

The potlines at Intalco consist of six potroom groups of electrolytic reduction cells connected in series that produce molten aluminum. There are two potroom groups per potline. Each potroom is comprised of 120 reduction cells (or pots) with 18 anodes per cell. All pots at Intalco are hooded to control emissions. Emissions captured by the hoods are drawn through one of six primary control systems. Each primary control system consists of a dry alumina injection system followed by a baghouse for the control of PM and fluoride emissions. The six primary control systems are located in the courtyards between the potrooms. The system at Intalco is large, treating approximately 1,815,000 acfm of 180°F exhaust gases. This primary PM control system has an efficiency of about 97.7 percent.

A small fraction of the pot emissions escape capture by the hoods and are released inside the potrooms. These secondary emissions are drawn through a secondary control system which consists of a series of 159 wet roof scrubbers that control PM and fluoride emissions. PM control efficiency for this secondary system is approximately 82 percent.

1.3.2 Existing Anode Bake Furnace Emissions Control

Anodes are manufactured in an ancillary on-site anode plant. Purchased calcined petroleum coke and anode butt material is crushed and sized, mixed together with pitch, and formed into blocks called “green anodes.” The green anodes are then cooled prior to being baked in the anode bake furnace. Only after the anodes have been baked can they be used in the potlines.

The anode bake furnace structure is a series of interconnected refractory flues connected to side main exhaust manifolds. The furnace is fueled with natural gas. Exhaust gases are routed so that flue gases preheat the next section of the furnace to be fired. Flue gases from the anode bake furnace contain PM, hydrogen fluoride, SO_2, NO_X, carbon monoxide, and hydrocarbons.

The bake furnace emissions are controlled by an alumina dry scrubber which is similar to the ones used for the potline primary control system. The bake oven gas stream is cooled by a water spray to reduce the inlet temperature before it enters the scrubber. Fresh and recycled alumina are injected into the gas stream, gaseous fluoride and polycyclic organic matter (POM) are adsorbed onto the alumina surface, and fabric filters on top of the reactor compartments collect entrained particulate matter present in the gas stream. The control system for the anode bake furnace treats approximately 216,000 acfm of 205°F exhaust gases. The fabric filters reduce PM emissions by as much as 99 percent.

1.3.3 Existing Aluminum Holding Furnace Emissions Control

The 12 holding furnaces at Intalco vary in size. They are heated by natural gas burners. The largest of these furnaces has a natural gas rated burner rated at 22 MMBtu/hr. There are no emission controls associated with the aluminum furnaces at Intalco. Emissions come from combustion of natural gas in the burners and the activities associated with treating molten metal while being processed in the furnaces.

1.3.4 Existing Controls for Material Handling and Transfer Operations, Other Natural Gas Combustion, and Other Small Miscellaneous Sources

The remaining emission units are various material handling and transfer operations, natural gas, diesel, and propane combustion, and other small miscellaneous sources that support the potlines, anode bake furnace and holding furnace operations. Aside from the natural gas combustion products, emissions from most of the support operations consist of relatively small amounts of PM that are controlled by fabric filter-type control devices. Fabric filters effectively remove about 99 percent of particulate emissions.

Natural gas consumption is mostly in the previously discussed anode bake furnace and aluminum holding furnaces. The balance comes from burners in the paste plant. Propane is used in forklifts. There are five small auxiliary diesel generators.

2. BART TECHNOLOGY ANALYSIS

The Intalco BART technology analysis was based on the 5-step process defined in BART guidance and listed in Section 1.1 of this report. Intalco's analysis included a review of available and technically feasible retrofit technologies (Steps 1 and 2), determination of control effectiveness for feasible options (Step 3), evaluation of cost and secondary impacts for feasible alternatives (Step 4), and analysis of impacts and visibility improvements (Step 5). The analysis looked at controls for SO_2, PM, and NO_X from each category of emission units: the potlines, anode bake furnace, aluminum holding furnaces, handling and transfer operations, combustion sources, and other small sources.

2.1 Potline Control Options

2.1.1 SO_2 Control Options

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Alcoa evaluated eight different SO_2 add-on control options along with pollution prevention as having potential application for potline SO_2 emission control. Six of the control options use wet scrubbing and two use dry scrubbing technology. A description of each technology is found in Appendix A.

Wet Scrubbing Technologies

- Limestone slurry scrubbing with forced oxidation (LSFO)
- Limestone slurry scrubbing with natural oxidation (LSNO)
- Conventional lime wet scrubbing
- Seawater scrubbing
- Dual alkali sodium/lime scrubbing (dilute mode)
- Conventional sodium scrubbing

Dry Scrubbing Technologies

- Dry sorbent injection
- Semi-dry scrubbing (spray dryer)

Limestone Slurry Forced Oxidation (LSFO) was determined to be a technically feasible wet scrubbing retrofit control option for the potroom reactors even though it is not ideally suited for scrubbing SO_2 concentrations that are less than or equal to 105 ppm. LSFO was also selected to be the best choice of the wet scrubbing technologies.

Dry sorbent injection downstream of the potline reactor fabric filters is not technically feasible because of the low temperatures (less than or equal to 205°F) and low SO_2 concentrations (less than or equal to 105 ppm). Spray dry scrubbing downstream of the potline reactors fabric filters is not technically feasible because of the low temperatures (less than or equal to 205°F) and low SO_2 concentrations (less than or equal to 105 ppm).

Pollution Prevention

The guidelines for BART determinations under the Regional Haze Rule recommend consideration of pollution prevention options in addition to add-on controls. The primary opportunity for pollution prevention in the smelting process to minimize SO_2 emissions is through controlling the sulfur content in the incoming petroleum coke used to make the anodes.

Intalco's Title V operating permit currently has a number of operational limits that cap allowable emissions of SO_2 from the facility, including a net potline aluminum production limit of 307,000 tons/year; a daily potline SO_2 limit of 37,780 lb/day; limits on sulfur in coke and pitch at 3.0 percent and 0.6 percent, respectively; and a carbon consumption limit of 0.425 pounds of carbon per pound of aluminum produced.

The current levels of sulfur in petroleum coke used by other aluminum smelters was evaluated to determine whether a pollution prevention option using lower sulfur content coke would be a feasible BART option for Intalco. This analysis indicated that some smelters currently utilize coke with sulfur contents as low as two percent. An analysis was also done to determine whether coke with sulfur levels below three percent can be anticipated to be available into the future. The primary conclusions from this analysis indicate that:

- There will be a continuing increase in the sulfur content of available coke. Low sulfur crude oil supplies are becoming less available and more expensive for petroleum refineries. In the future, refineries with coking capacity are expected to minimize their raw material costs by using more of the higher sulfur crude oils and oil sands that are less costly.
- As oil fields age, the sulfur content of the crude oil is known to increase and the crude oil in the fields becomes more viscous and harder to extract. This effect is expected to increase the sulfur content of the petroleum materials available to produce anode grade coke.
- Coke is a relatively small, low revenue component of a refinery's product profile. It is a low value product made from the thick, tar-like refinery wastes left over after all of the more valuable components have been removed from the petroleum crude. The aluminum industry has little influence in controlling the quantity, quality, and price of the coke produced by refineries.
- Global primary aluminum production is expected to grow, resulting in a commensurate growth in demand for anode grade coke. Growth in aluminum production will continue to outpace the growth in coke production.
- Coke providers are blending imported, high cost, lower sulfur coke with domestically sourced coke in attempts to meet the current specification requirements for coke.
- Removal or reduction of the sulfur content of the coke once it has been received is not feasible.

Feasible SO_2 Control Options from RBLC Database

The data in the USEPA's RACT/BACT/LAER (RBLC) database supports the approach of limiting raw material sulfur content as a control option for the potlines and the anode bake furnace. Many facilities have limited sulfur content in coke to limit SO_2 emissions. Two facilities have limits of three percent sulfur content in coke and one has a 2.95 percent sulfur content limit. One facility is shown in the RBLC to have a wet scrubber to control SO_2 emissions;[4] however, an investigation revealed that the wet scrubber was not required as part of a best available control technology (BACT) determination and that the facility currently does not operate a wet scrubber to control SO_2 emissions. That facility's current Title V permit for "Potline 5" limits coke sulfur content to three percent, coal tar pitch sulfur to 0.8 percent, potline SO_2 emissions to 364.52 lb/hr from the primary emissions control unit, 7.44 lb/hr from the roof

[4] RBLC ID ky-0070 for NSA–A division of Southwire Company on Potline 5 now Century Aluminum of Kentucky, LLC, Kentucky Title V Permit #V-01-019.

scrubbers, and 49.356 lb/ton of aluminum produced. Alcoa Intalco has a current limit of 44.8 lb SO_2 emitted per ton of aluminum produced.

Cost and Other Impacts of Feasible SO_2 Potline Controls

Wet scrubber costs for Intalco were estimated based on cost quotes received by Alcoa from two flue gas desulphurization equipment vendors. The cost quotes were originally provided as part of the BART analysis for Alcoa's Tennessee Operations in Alcoa, TN. Both vendors provided cost proposals for wet scrubbing systems based on LSFO scrubbers. Lime or sodium based scrubbers could also be used for potlines, but lime and sodium are less desirable reagents considering that these reagents are much more expensive. An advantage of the limestone forced oxidation process is that the spent slurry is oxidized to gypsum, which dewaters more efficiently, resulting in less waste materials requiring disposal. An LFSO scrubber was determined to be the most appropriate control device for the cost analysis.

Neither of the two vendors provided a comprehensive installed cost estimate. Both preliminary designs were based on a central scrubbing center as the least cost approach, where exhaust from all dry scrubbing systems would be ducted to a centralized scrubbing system. Both design estimates were based on systems that would provide 100 percent availability of emissions control on each day of the year, given that potlines cannot be easily shutdown and restarted for control system outages. To achieve this 100 percent availability, the proposed designs includes two scrubber towers, one to be active, and one to be held in reserve.

The capital and total annualized costs for a potline wet scrubber system as proposed was $234.5 million and 46.8 million per year, respectively. The wet scrubber cost effectiveness was $7,500 per ton of SO_2 removed. A lower cost option based on a single absorber tower based on information supplied by Intalco was analyzed by Ecology. A discussion of this option is included in Section 4, Ecology's BART determination.

The LSFO scrubber process oxidizes the spent slurry to gypsum sludge. The sludge volume would be 27,130 tons annually from the potline wet scrubber. It was not known at the time of the BART report preparation whether the gypsum would have commercial value or whether there would be any demand for it. If not sold, the sludges must be land filled.

It is estimated that 182.5 million gallons of water will be required annually to operate the potline wet scrubber at a cost of approximately $97,000. This would increase Intalco's daily water demand by approximately nine percent.

A total of approximately 64.8 million kWh would be needed to operate the potline scrubber annually. This is equivalent to adding over 6,000 new households to the community.[5] Table B-2 in Appendix B summarizes the impacts analysis.

[5] Calculated based on 2001 average energy usage per household for the U.S. as reported by the Department of Energy. See http://www.eia.doe.gov/emeu/reps/enduse/er01_us_tab1.html.

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Cost of anode grade coke is predicted to continue to rise in the future, as discussed in the previous pollution prevention section. Both increasing demand by the aluminum industry and the need of refineries to move toward using higher sulfur containing crude oil stocks drive Intalco's prediction. US Gulf calcined anode grade coke increased from $118.50/mt to $244.75/mt between 1994 and 2006. The future rate of cost increase is anticipated to be greater due to the reasons discussed in the pollution prevention section.

2.1.2 PM Control Options

Fabric Filters

Fabric filters generally provide high collection efficiencies for both coarse and fine (submicron) particles. They are relatively insensitive to fluctuations in gas stream conditions. Efficiency is relatively unaffected by large changes in inlet dust loadings. Filter outlet air is very clean.[6] Collected material is dry, which usually simplifies processing or disposal. Fabric filters are currently applied for controlling PM emissions from the potrooms at Intalco.

Electrostatic Precipitators

Electrostatic Precipitators (ESPs) are capable of very high removal efficiencies for large and small particles.[7] They offer control efficiencies that are comparable to fabric filters. Because of their modular design, ESPs, like fabric filters, can be applied to a wide range of system sizes. The operating parameters that influence ESP performance include particulate mass loading, particle size distribution, particulate electrical resistivity, space velocity, and precipitator voltage and current.

Dusts with high resistivities are not well-suited for collection in dry ESPs because the particles are not easily charged. An ESP is technically feasible for control of PM from the potrooms at Intalco.

Fabric filtration with dry alumina scrubbing has been widely used in the primary aluminum industry. Most smelters constructed within the past 20 years have used dry alumina scrubbing (either alumina injection or fluidized bed) with fabric filters to control particulate and fluoride emissions from potlines. A few plants use control systems consisting of ESPs to collect PM followed by spray towers to scrub gaseous fluoride. Wet systems have many disadvantages, such as corrosion by hydrofluoric acid, scaling, and acidic wastewater. ESPs and wet systems are no longer installed on new smelters in the U.S.

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[6] EPA 2003, "Air Pollution Control Technology Fact Sheet–Fabric Filter," EPA-452/F-03-025, August 7.
[7] EPA 2003, "Air Pollution Control Technology Fact Sheet–Dry Electrostatic Precipitator," EPA-452/F-03-028, August 7.

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Cyclones, Inertial Separators, and Wet Scrubbers

Cyclones and inertial separators are used for collection of medium-sized and coarse particles. Wet scrubbers generally remove large particles and can remove small particles with the use of high-pressure drops. However, none of these devices are as effective at removing small and submicron particles as fabric filters and ESPs.[8]

Cost and Other Impacts of Feasible Particulate Potline Controls

Fabric filters are currently used on Intalco's potlines. Since fabric filters have high control effectiveness similar to ESPs, are widely used for potline particulate control in the aluminum industry, and have process advantages relative to ESPs, no benefit was seen to switch from fabric filters to ESPs for PM control. Because no benefit was seen, no cost analysis of switching to an ESP-based particulate control was done.

2.1.3 NO_X Control Options

Potentially applicable NO_X emission controls include combustion controls and post-combustion controls. The pots are heated solely through the action of the electric reduction process. There is no combustion of fuel. There are also no large sources of nitrogen in the raw materials. This makes use of traditional combustion controls like staged combustion or low NO_X burners not applicable to the potlines. The temperature of the potroom exhaust is approximately 180°F and the NO_X concentration is less than one parts per million (ppm).

Possible post combustion controls include Selective Non-Catalytic Reduction (SNCR) and Selective Catalytic Reduction (SCR). Both involve injecting ammonia or urea into the gas stream to react with NO_X to produce nitrogen and water. SNCR requires an operating temperature of 1,600°F to 2,100°F and inlet NO_X concentrations typically from 200 to 400 ppm to be about 30-50 percent effective. SCR uses a catalyst to reduce the operating temperature requirement to between 500°F to 800°F, and can achieve up to 90 percent reduction of inlet NO_X concentrations to as low as 20 ppm.

Since there is no external fuel or combustion zone in the smelting cells, there are no technically feasible pre-combustion NO_X controls. Low temperature and NO_X concentration make both SNCR and SCR post process NO_X controls technically infeasible.

2.1.4 Intalco's BART Proposal for the Potlines

For potline SO_2 emissions, Intalco proposed BART to be the current level of control, which includes a maximum of three percent sulfur in the coke used to manufacture anodes. Use of wet scrubbing technology to reduce potline SO_2 emissions was rejected as BART due to excessive costs: total cost effectiveness of $7,500 per ton of SO_2 removed and capital and total annualized

[8] AWMA 2000, "Air Pollution Engineering Manual," Second Edition.

costs of $234.5 million. A potline wet scrubber would also have substantial non air quality impacts, including increased energy usage, added water consumption, and solid waste generation.

For PM emissions, Intalco proposed BART to be the current level of control, which is the use of baghouses to control PM emissions from the alumina dry scrubbers, and wet roof scrubbers to control secondary PM emissions from the potroom roofs.

For NO_X emissions, Intalco proposed BART to be no controls.

2.2 Anode Bake Furnace Control Options

The anode bake furnace process is discussed in Section 1.3.2 of this report. Emissions due to anode coke and pitch are similar to those from the potlines, so the same BART control options considered for the potlines are applicable to the bake furnace emissions exhaust. It is smaller, with only about 12 percent of the airflow volume of the combined potlines emission scrubber. It is natural gas fired rather than electrically heated, so it has products of combustion including NO_X.

2.2.1 SO_2 Control Options

A wet scrubber was identified as a technically feasible add-on pollution control option for the anode bake furnace. The anode bake furnace is a smaller source than the potlines and has a lower exhaust gas flow rate. A separate vendor cost proposal was not obtained for the anode bake furnace, but an SO_2 removal efficiency of 95 percent is assumed to be feasible. Wet scrubber costs for the anode bake furnace were scaled from the LSFO potline wet scrubber vendor quotes.

The estimated installed capital cost to add a wet scrubber to remove 95 percent of the SO_2 from the anode bake furnace exhaust would be approximately $29.5 million with an annualized cost of $6.3 million per year. The wet scrubber cost effectiveness is $36,400 per ton of SO_2 removed. The wet scrubber also has an energy impact of 6,570,000 kW-hr/yr as well as solid waste impacts associated with disposal of gypsum sludge from the scrubber and water use impacts from scrubber operation. The impacts are summarized in Table B-2 of Appendix B.

The pollution prevention option of reducing the sulfur content of the anode coke is available for the anode bake oven as well as the potlines. See the potline pollution prevention discussion in Section 2.1.1.

2.2.2 PM Control Options

Dry alumina injection with fabric filtration is currently used for PM control on the anode bake furnace. An ESP is also a technically feasible control, with a similar fine particulate PM capture efficiency. As described in Section 2.1.2, cyclones, inertial separators, and wet scrubbers are not as effective at removing small and submicron particles as fabric filters and ESPs.

2.2.3 NO_X Control Options

Advanced firing system: NO_X emissions from anode baking depend on operating practices and burner controls. The traditional methods of preventing NO_X formation using staged combustion or low NO_X burners are not applicable because of the unique configuration of an anode baking ring furnace, with fuel injected at several points in narrow flues. However, advanced firing systems that measure and regulate fuel flow precisely using a computerized control system can reduce total fuel usage. This will also reduce NO_X emissions. Prevention of NO_X formation using a more efficient advanced firing control system is technically feasible for the anode bake furnace at Intalco. Total gas usage is projected to be reduced by 20 percent, which would result in a corresponding 20 percent reduction in NO_X emissions, or approximately 27 tons/year.

The LoTO$_X$™ system is the patented technology of BOC Gases. In this NO_X removal system, ozone is injected into the exhaust gas stream in order to oxidize insoluble NO_X to soluble nitrogen compounds, including N_2O_5. N_2O_5 is highly soluble and reacts with moisture in the gas stream to form nitric acid. A scrubber is required downstream of the LoTOx™ system to remove the nitric acid formed by the reaction of N_2O_5 and moisture in the gas stream. The ozone is typically generated on site and on demand. Since LoTOx™ is a low temperature system, it does not require heat input and the low operating temperature (150 to 250°F) allows for stable and consistent control even with variations in flow, load, and NO_X concentrations.[9]

Use of the LoTOx™ system has not been demonstrated at an aluminum plant. Research indicates that application of the LoTOx™ technology has been limited to a sulfuric acid regeneration plant, a lead smelting reverbatory furnace, a stainless steel plant, a coal-fired electric generation unit, and two fluidized-bed catalytic cracking units (FCCU) at refineries.[10] [11] Reported NO_X removal efficiencies for the LoTOx™ system are on the order of 90 to 95 percent.

The temperature of the anode baking emission exhaust (approximately 200°F) is within the temperature range where LoTOx™ could be used. Although this technology has not been demonstrated on an anode bake furnace, low-temperature oxidation technology may be technically feasible for reducing anode bake furnace NO_X emissions. At a control efficiency of 90 percent for NO_X emissions when combined with wet scrubbing, the resulting reduction in NO_X emissions would be 122 tons/year.

Intalco made the case that cost data for the LoTOx™ system was not readily available. To show some cost estimation, Intalco noted that the LoTOx™ system would also require a scrubber

[9] BOC Process Gas Solutions, 2001, Low Temperature Oxidation System Demonstration at RSR Quemetco, Inc., City of Industry, California, June 28. See www.arb.ca.gov/research/icat/projects/boc.pdf.
[10] EPA, February 2005, "Using Non-Thermal Plasma to Control Air Pollutants," EPA-456/R-05-001. See www.epa.gov/ttn/catc/dir1/fnonthrm.pdf.
[11] EPA RACT/BACT/LAER Clearinghouse (RBLC) database.

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similar to the one described earlier for SO_2 control. That would make the cost of the entire LoTOx^{TM} system installation more than the previously estimated SO_2 scrubber cost of $29.5 million. NO_X emissions are lower than SO_2 emissions for the anode bake furnace, so the cost per ton values for NO_X would be higher than the $36,400 estimated for SO_2. Since cost for the LoTOx^{TM} system itself was not available, it is not possible to calculate a cost per ton for the total system based on both NO_X and SO_2. To give a sense of the possible minimum cost, if the LoTOx^{TM} system were free, the cost would be greater than $18,000 per ton of total pollutants removed.

2.2.4 Intalco's BART Proposal for the Anode Bake Furnace

Intalco proposed that the existing potline SO_2 control pollution prevention limit of three percent sulfur in the coke to be BART for anode bake furnace SO_2 emissions. The cost effectiveness of wet scrubbing to reduce SO_2 emissions was determined to be excessive at $36,400 per ton of SO_2 removed. As discussed below in Section 3, addition of a wet scrubber to the anode bake furnace would reduce the visibility impact on Olympic National Park by only 0.024 dv.

The existing level of control (based on baghouses on the alumina dry scrubbers) was proposed to be BART for PM emissions.

BART for anode bake furnace NO_X emissions was proposed to be no additional controls. The use of an advanced firing system for reduced energy use was rejected as BART because the 20 percent reduction in NO_X emissions would result in a negligible 27 ton per year NO_X reduction and visibility improvement. Emissions of all pollutants (SO_2 and NO_X) from the anode bake furnace are responsible for only about one percent of the visibility impact on Olympic National Park; the most impacted Class I Area (see Section 3 below). The use of LoTOx^{TM} was rejected as BART because the technology is not available or demonstrated in practice for aluminum anode bake furnace exhausts.

2.3 Aluminum Holding Furnaces

2.3.1 Aluminum Holding Furnaces Control Options

The 12 holding furnaces at Intalco are heated by natural gas burners, and vary in size, with the largest of these furnaces having a natural gas rated burner capacity of 22 MMBtu/hr. Emissions come from combustion of natural gas in the burners. There is currently no emission controls associated with the aluminum furnaces at Intalco.

2.3.2 Intalco's BART Proposal for the Aluminum Holding Furnaces

Intalco proposed that BART for the aluminum holding furnaces was no controls. The proposal rejected additional controls as BART because the modeling analysis discussed in Section 3 below showed that any visibility improvement would be negligible because the existing burners have a negligible contribution to visibility impacts.

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2.4 Material Handling and Transfer Operations

2.4.1 Material Handling and Transfer Operations and Other Miscellaneous Operations Control Options

The remaining emission units are various material handling and transfer operations, natural gas, diesel, and propane combustion, and other small miscellaneous sources that support the potlines and anode bake furnace. Aside from emissions from natural gas combustion, emissions from most of the support operations consist of relatively small amounts of PM that are controlled by fabric filter control devices.

2.4.2 Intalco's BART Proposal for the Material Handling and Transfer Operations

Intalco showed that PM emissions from the BART-eligible material handling and transfer operations were all controlled using fabric filter technology. This existing level of emissions control was proposed to be BART for these material handling and transfer operations.

3. VISIBILITY IMPACTS AND DEGREE OF IMPROVEMENT

A baseline Class I area visibility impact analysis was performed on the BART-eligible emission units at Intalco using the CALPUFF model with four kilometer grid spacing as recommended by the Oregon/Idaho/Washington/EPA-Region 10 BART modeling protocol. The modeled or projected 98th percentile visibility impacts for the entire facility exceed the 0.5 deciview (dv) contribution threshold in seven Class I areas as shown in Table 3-1.

Table 3-1. BASELINE VISIBIITY MODELING RESULTS

Class I Area	2003		2004		2005	
	Modeled 98th Percentile (deciview)	Number of Days Exceeding 0.5 dv	Modeled 98th Percentile (deciview)	Number of Days Exceeding 0.5 dv	Modeled 98th Percentile (deciview)	Number of Days Exceeding 0.5 dv
Alpine Lakes Wilderness Area	1.244	36	0.965	37	0.881	23
Goat Rocks Wilderness Area	0.500	8	0.579	10	0.317	3
Glacier Peak Wilderness Area	1.161	37	1.156	38	0.736	23
Mount Adams Wilderness Area	0.456	7	0.472	6	0.357	2
Mount Rainier National Park	0.843	22	1.052	26	0.629	15
North Cascades National Park	1.376	65	1.395	56	1.138	32
Olympic National Park	2.363	59	1.858	53	2.136	45
Pasayten Wilderness Area	0.866	30	0.871	33	0.659	13

Intalco's modeling consultant evaluated the effects of the different emission sources at the Intalco facility to determine which operations resulted in the greatest visibility impacts. This

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analysis indicated that the potlines are responsible for 98 percent of the visibility impact on the most impacted Class I area, and 96 percent of that impact is from the SO_2 emissions. Of the remaining two percent of the visibility impact, the anode bake furnace is the next largest source at about one percent of the impact. The other sources in total are the sources of the remaining one percent of the impact.

An evaluation of the potential improvement in visibility that would result from application of feasible pollution prevention/add-on control options was done. CALPUFF modeling was performed for two control scenarios: one with wet SO_2 scrubbing applied to the potline and one with wet SO_2 scrubbing applied to the anode bake furnace. In general, this modeling was the same as the baseline modeling except stack data and emission data associated with the application of the feasible add-on controls were used as model inputs. Emission information for both baseline and control scenario modeling is found in Appendix B.

The addition of a potline wet scrubber reduced modeled visibility impacts in all Class I areas. For example, the baseline modeling results indicate that the highest 98th percentile visibility impact from Intalco's BART-eligible sources at Olympic National Park estimated that wet scrubbers installed on the potlines would provide up to 1.172 dv of visibility improvement. The modeled visibility improvements from adding a wet scrubber at the anode bake furnace only are much smaller. The post-control modeling results for the anode bake furnace indicate visibility might be improved by up to 0.024 dv at Olympic National Park.

4. ECOLOGY'S BART DETERMINATION

Ecology's BART determination for Intalco is given in Table 4-1. A more detailed description of each decision follows.

Table 4-1. BART DETERMINATION FOR INTALCO

Pollutant	BART Determination
	Potlines
SO_2	Use of the current level of control, which is a pollution prevention limit of 3% sulfur in the coke used to manufacture anodes.
PM	Use of the current level of control, which is the use of baghouses to control PM emissions from the alumina dry scrubbers, and wet roof scrubbers to control secondary PM emissions from the potroom roofs.
NO_X	No control
	Anode Bake Furnace
SO_2	Use of the current level of control, which is a pollution prevention limit of 3% sulfur in the coke used to manufacture anodes.
PM	Use of the current level of control, which is the use of a baghouse.
NO_X	No control
	Aluminum Holding Furnaces
SO_2	No control

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Pollutant	BART Determination
PM	No control
NO_X	No control
	Material Handling and Transfer Operations
SO_2	No control
PM	Use of the current level of control, which is use of fabric filters.
NO_X	No control

Aluminum Potlines

Ecology determined that for SO_2 emissions from the potlines, BART is the current level of control, which is a pollution prevention limit of three percent sulfur in the coke used to manufacture anodes.

Ecology agrees with Intalco that a pollution prevention limit based on coke sulfur content below three percent is infeasible as BART based on an evaluation of the future availability of petroleum coke with lower sulfur content.

Ecology rejected the use of wet scrubbing technology as BART to reduce potline SO_2 emissions because of its excessive costs. Ecology has evaluated the cost estimate provided by Alcoa for this plant including adjusting Alcoa's cost estimates for various items like operational and maintenance labor. For the proposed two absorption tower design, our revised annualized cost was $6,574 per ton of SO_2 removed. The capital and total annualized costs were estimated to be $208.5 million and $40.9 million per year, respectively.

A single absorption tower design option was included in one of the two original Tennessee plant scrubber system proposals (by Babcock), but not evaluated by Intalco's within its BART proposal for Intalco This design would cost less, principally by eliminating the second, backup scrubber tower. With the single absorber tower configuration, if the scrubber tower needed to be taken down for maintenance, the primary control system emissions would need to bypass the absorber tower while maintenance occurs, resulting in SO2 emissions identical to the current rates during the bypassing. Unlike an electrical power plant where routine and planned shutdowns occur during which maintenance can be carried out, an aluminum smelter does not normally stop operating once it has started. Babcock estimated that the single tower design reduced the Total Capital Investment Costs (TCIC) by 28.1 percent, or to 71.9 percent of their two scrubber system proposal. Ecology scaled this cost reduction to the Intalco cost estimate, and included additional cost reductions in annual operating labor and maintenance labor as much as practical. The resulting capital and total annualized costs were $185.1 million and $38.7 million respectively. This gave a cost effectiveness of $6,145 per ton of SO_2 removed assuming an identical SO_2 removal rate. Any direct venting of the emission gasses during maintenance of the absorber tower would lower the SO_2 tons removed and increase this dollars/ton cost effectiveness estimate. Ecology finds the single absorber option to not be cost effective.

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Any potline wet scrubber system would also have substantial energy and non air quality impacts, including electricity, water, and waste disposal. Specifically for the limestone control option, Intalco has estimated that there would be an increased energy usage of 64,824,000 kWh of electricity per year, added water consumption of 183 million gallons per year, a need to discharge wastewater from the scrubber system, and solid waste generation of 27,000 tons/year.

In response to comments by Ecology on the wet scrubber option, Intalco identified additional impediments to utilizing a wet scrubbing system. The most important for implementing a wet scrubbing system is that they currently purchase potable water for industrial purposes and have turned over water rights previously issued to Intalco to the water district. The result of this water transfer is the plant would have difficulty in acquiring water rights for this consumptive industrial purpose.

Based on the cost effectiveness and the non air quality impacts of a wet scrubbing system, Ecology determined BART for SO_2 is the current level of emissions control.

Ecology determined that for PM emissions from the potlines, BART is the current level of control, which is the use of baghouses to control PM emissions from the alumina dry scrubbers, and wet roof scrubbers to control secondary PM emissions from the potroom roofs.

Ecology determined that there are no feasible technologies for the control of NO_X from the potlines. BART for NO_X is determined to be no controls.

Anode Bake Furnace

Ecology determined that the petroleum coke sulfur limit accepted as BART for the potlines is also BART for anode bake furnace SO_2 emissions. The cost of wet scrubbing to reduce SO_2 emissions would be excessive at $36,400 per ton of SO_2 removed while providing minimal visibility improvement.

Ecology determined that the existing level of control (based on baghouses on the alumina dry scrubbers) is BART for PM emissions.

Ecology determined that BART for anode bake furnace NO_X emissions is no controls. The use of an advanced firing system for reduced energy use was rejected as BART because the technology would result in a negligible emission reduction and visibility improvement. Similarly, the use of LoTOx™ was rejected as BART because the cost of the technology would be excessive and it has not been demonstrated in practice on aluminum plant anode bake furnaces.

Aluminum Holding Furnaces

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Ecology determined that BART for the aluminum holding furnaces is no controls. The use of additional controls was rejected as BART because any visibility improvement would be negligible due to the low level of emissions from the natural gas-fired burners.

Material Handling and Transfer Operations

Ecology determined that since PM emissions from the BART-eligible material handling and transfer operations are all controlled using fabric filter technology, the existing level of emissions control is BART for these material handling and transfer operations.

Ecology determined that BART for NO_X and SO_2 emissions from material handling and transfer operations is no controls. Material handling and transfer operations are a negligible source of NO_X and SO_2 emissions. Additional control of these pollutants would provide negligible visibility improvement.

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APPENDIX A

DESCRIPTION OF AVAILABLE SO_2 POTLINE CONTROL OPTIONS

Technology	Description
Limestone Slurry Forced Oxidation (LSFO)	Limestone slurry forced oxidation (LSFO) is used extensively in the utility flue gas desulphurization (FGD) market. It has not been used on an aluminum smelter. The raw material is finely ground limestone. The most commonly used equipment is an open, multi-level, countercurrent spray tower scrubber equipped with spray nozzles to inject the limestone slurry droplets into the gas stream. Liquor is collected at the bottom of the tower and sparged with air to oxidize the calcium sulfite to calcium sulfate to enhance the settling properties of the calcium sulfate. Recirculation pumps circulate the scrubbing liquor to the spray nozzles. SO_2 removal efficiencies of 90% have been achieved. The bleed from the scrubber is sent to a dewatering system to remove excess moisture. For an aluminum smelter, the process will produce either solid gypsum waste or commercial-grade gypsum suitable for reuse as a cement additive if a cement production facility is available and willing to accept the material. Only a very small purge or blowdown stream is required.
Limestone Slurry Natural Oxidation (LSNO)	Limestone slurry natural oxidation (LSNO) is very similar to LSFO. The major difference is the absence of an oxidation stage. The gypsum/calcium sulfite product is essentially a waste product with limited possibilities of use for agricultural purposes.
Conventional Lime Wet Scrubbing	Conventional lime wet scrubbing is also similar to LSFO except that the raw material is hydrated lime or quick lime that is either slaked on-site or purchased in the slaked form. The system typically uses forced oxidation, although natural oxidation is possible. The process will produce either solid gypsum waste or commercial-grade gypsum suitable for reuse as a cement additive if a cement production facility is available and willing to accept the material.
Seawater Scrubbing	Seawater scrubbing is a method for controlling SO_2 emissions in which seawater is used to absorb SO_2 in exhaust gases. Seawater is slightly alkaline (with a pH of approximately 8). SO_2 has a high solubility in seawater. Absorbed SO_2 is subsequently oxidized to sulfates by the use of aeration and the pH is adjusted by the addition of additional seawater. There are three main steps in this process: absorption, oxidation, and neutralization. Seawater is passed countercurrent through the gaseous exhaust stream, typically using a spray column in the aluminum industry. SO_2 preferentially dissolves in the seawater. Removal efficiencies of 85 to 95% have been measured in practice. The clean

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Technology	Description
	exhaust gas is de-misted prior to release to the atmosphere. The acidified seawater is then passed to an oxidation basin in which air is blown through the effluent. The additional oxygen ensures that the dissolved SO_2 is converted to sulfates. Finally, additional fresh seawater is added to raise the pH to neutral (or slightly alkaline) and the seawater is discharged back into the ocean. The effluent from this process will typically have a temperature increase of about 1°C and will have a change in sulfate concentration of approximately 2 to 5% above background.[12] [13] Scrubbing of the potline emissions also adds fluoride and trace amounts of polycyclic aromatic hydrocarbons (PAHs) to the effluent seawater. The volume of seawater required varies with exhaust flow rate and SO_2 loading in the gaseous exhaust stream. At Intalco, the volumetric flow rate needed was estimated to be approximately 2.2 million gallons per hour. A global review of feasible control technologies identified seawater scrubbing as having been installed at seven aluminum smelters, none of which are in the U.S. Even though this technology has been identified as a control technology in operation at six primary aluminum ore reduction plants in Norway and one primary aluminum ore reduction plant in Sweden, there are two reasons why this technology is not feasible at Intalco: 1. Federal Clean Water Act Section 304(b) effluent limitations guidelines would not allow discharge of the scrubber solutions to the nearby salt water without extensive treatment to remove the sulfides, fluorides, and other pollutants. Removal of potline fluoride from the seawater scrubber effluent may be feasible, but would also require precipitation of many other naturally occurring salts in the seawater (chlorides, sulfates, other fluorides, etc.), resulting in the unnecessary generation of large amounts of sludge for land disposal. Seawater scrubbing is, therefore, not a viable alternative for smelters in the U.S., especially when compared with other scrubbing technologies that use fresh water and require treatment/disposal for only those salts present in the potline exhaust. 2. The portion of Puget Sound where seawater would be withdrawn and discharged has been included as part of the Cherry Point

[12] Information from the ALSTOM Seawater FGD–Environmental Impact website at www.environment.power.alstom.com/home/power/seawater_fgd/environmental_impact.htm.

[13] Kwawaji, Akili D., et al. 2005. "Seawater Scrubbing for the Removal of Sulfur Dioxide in a Steam Turbine Power Plant." Proceeding of the PWR2005 ASME Power Conference. April 5-7. Chicago, IL.

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Technology	Description
	Aquatic Reserve that was established in 2000. The construction of intake and/or discharge structures within the Cherry Point Aquatic Reserve would require an impact analysis, assessment, and DNR authorization of any environmental impacts associated with a seawater scrubbing system. Since more than seven years have passed since Cherry Point was designated as an aquatic reserve and the initial SEPA evaluation has yet to be completed, the time required to complete an analysis of the environmental impacts associated with a seawater scrubbing system and obtain the requisite authorizations for a system that withdraws seawater from and discharges scrubber liquor into the Cherry Point Aquatic Reserve would make this technology infeasible for BART compliance.
Dual Alkali Sodium/Lime Scrubbing (dilute mode)	Dual alkali sodium/lime scrubbing (dilute mode) uses a caustic sodium solution in the scrubber tower. A portion of the scrubbing liquid is discharged to a neutralization stage where lime slurry is used to regenerate the caustic, which is returned to the scrubber. The bleed from the scrubber is sent to a dewatering system to produce a gypsum byproduct. The process will produce either solid gypsum waste or commercial-grade gypsum suitable for reuse as a cement additive. Dual alkali sodium/lime scrubbing (dilute mode) is not currently marketed by major FGD vendors because the system is too complicated and expensive. Because of lack of availability and anticipated excessive cost, dual alkali sodium/lime scrubbing is determined to be not technically feasible.
Conventional Sodium Scrubbing	Conventional sodium scrubbing has been installed in at least 12 aluminum smelters around the world. An alkaline solution of either soda ash or sodium hydroxide is pumped into the scrubbing tower and recirculated through a network of spray nozzles. Atomized droplets contact the up-flowing gas containing SO_2. Where this technology has been deployed, the liquid effluent containing dissolved salts, including sodium and fluorides, has been discharged into a large receiving stream or an open body of water without treatment. As discussed earlier in conjunction with seawater scrubbing, untreated discharge is not feasible for Intalco. As a result of the inability to discharge effluent, treated or otherwise, into a receiving water, Alcoa determined conventional sodium scrubbing to not be technically feasible.
Dry Injection	In dry injection, a reactive alkaline powder is injected into a furnace, ductwork, or a dry reactor. Typical removal efficiencies with calcium adsorbents are 50 to 60% and up to 80% with sodium base adsorbents. However, as with wet scrubbing, disposal of waste using sodium

Technology	Description
	adsorbents must consider their high solubility in water compared to those from calcium adsorbents. The temperature range over which scrubbing has been used is 300 to 1,800°F; the minimum temperature is 300 to 350°F. Dry systems are rarely used and according to EPA, only 3% of FGD systems installed in the U.S. are dry systems.[14] The dry waste material is removed using particulate control devices such a fabric filter or an electrostatic precipitator (ESP).
Semi-Dry Scrubbing	Semi-dry scrubbing is more commonly referred to as spray drying. Calcium hydroxide slurry (lime mixed with water) is introduced into a spray dryer tower. Sodium compounds can be used, but as with the dry scrubber, the high solubility of the sodium-based waste products in water complicates disposal of the waste. The slurry is atomized and injected into a reactor with the exhaust gases, where droplets react with SO_2 as the liquid evaporates. This system is categorized as a semi-dry system because the end product of the SO_2 conversion reaction is a dry material. The dry waste product is collected in the bottom of the spray dryer reactor and a fabric filter or ESP downstream of the spray dryer removes the $CaSO_3$, $CaSO_4$, and unreacted lime. This air pollution control system uses water for evaporative cooling and for the SO_2 reaction. It operates in a temperature range of 300 to 350°F because the temperature of the gases must be high enough to evaporate the water portion of the slurry. Approximately 12% of the FGD systems installed in the U.S. are spray-dry systems[15] with typical SO_2 removal efficiencies in the range of 80 to 90 percent. Unlike a wet scrubbing system, there is no liquid blow-downstream from the dry system and the collected solids are typically land filled.

[14] EPA 2003, "Air Pollution Control Technology Fact Sheet–Flue Gas Desulfurization," EPA-452/F-03-034.
[15] Ibid.

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APPENDIX B. LSFO SCRUBBER CONTROL SCENARIOS–EMISSIONS AND IMPACTS

Table B-1. EMISSION RATES FOR SO_2 CONTROL SCENARIOS[1]

Control Scenario	SO_2 Control Technology Evaluated	SO_2		NO_2		$PM_{2.5}$		PM_{10}	
		Emissions (tons/yr)	% Reduction (increase)[2]	Emissions (tons/yr)	% Reduction (increase)[2]	Emissions (tons/yr)	% Reduction (increase)[2]	Emissions (tons/yr)	% Reduction (increase)[2]
Current Allowable Emissions	Operating Limit of 3% Sulfur in Coke	7,076		136		693		869	
Scenario 1	Plus LSFO Scrubber Only for Potlines	854	88	136	0	984	(42)	1,113	(28)
Scenario 2	Plus LSFO Scrubber Only for Anode Bake Furnace	6,904	2	136	0	747	(8)	921	(6)

1. Total emission rate for the potline primary control system, the potline secondary control system emissions, and the anode bake furnace.
2. Compared with current potential emissions. Intalco's BART technical analysis provides information on increases in emissions of particulates due to LSFO scrubbers. Because sulfate dominates visibility impacts on Class I areas, these small increases in particulates were not a factor in the BART determination.

Table B-2. SUMMARY OF THE IMPACTS ANALYSIS FOR SO_2 CONTROL SCENARIOS

Control Scenario	SO_2 Control Technology Evaluated	SO_2 Emission Rate[1] (tons/yr)	SO_2 Emission Reductions[2] (tons/yr)	Installed Capital Cost	Total Annualized Control Costs	Cost Effectiveness (per ton SO_2 removed)	Energy Impact (kW-hr/yr)	Non-Air Quality Environmental Impacts
Current Allowable Emissions	Operating Limit of 3% Sulfur in Coke	7,076						
Scenario 1	Plus LSFO Scrubber Only for Potlines	854	6,223	$234,531,049	$46,820,000	$7,500	64,824,000	27,130 tons/yr of solid waste disposal 182.5 million gallons/yr makeup water
Scenario 2	Plus LSFO Scrubber Only for Anode Bake Furnace	6,904	172	$29,482,194	$6,227,000	$36,400	6,570,000	639.5 tons/yr of solid waste disposal 12.8 million gallons/yr makeup water

1. Total emission rate for the potline primary control system, the potline secondary control system, and the anode bake furnace.
2. Compared with current potential emissions.

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APPENDIX C. ACRONYMS/ABBREVIATIONS

BACT	Best Available Control Technology
BART	Best Available Retrofit Technology
dv	Deciview(s)
CO	Carbon Monoxide
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
ESPs	Electrostatic Precipitators
Intalco	Alcoa Intalco Works
LSFO	Limestone Slurry Forced Oxidation
LSNO	Limestone Slurry Natural Oxidation
mt	Metric Ton
NO_X	Nitrogen Oxides
PM	Particulate Matter
PM_{10}	Particulate Matter (with a mean diameter less than 10 microns)
ppm	Parts per Million
PSCAA	Puget Sound Clean Air Agency
SIP	Regional Haze State Implementation Plan
SO_2	Sulfur Dioxide
VOC	Volatile Organic Compound

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600 ◦ Olympia, WA 98504-7600 ◦ 360-407-6000
711 for Washington Relay Service ◦ Persons with a speech disability can call 877-833-6341

November 9, 2010

Mr. Barry Hullett
Alcoa Intalco Works
4050 Mountain View Road
Ferndale, WA 98248-0937

Dear Mr. Hullett:

Regional Haze Best Available Retrofit Technology (BART) Determination

Best Available Retrofit Technology (BART) is required to reduce the regional haze impacts of emissions of your facility. The enclosed Order #7837, Revision 1, contains our BART determination for your facility including a schedule for compliance.

This revision is in response to a request by the company to repeat the emission limitation, monitoring, recordkeeping, and reporting requirements contained in Order No. DE02AQIS-3967 rather than incorporating them by reference.

If you have questions or requests relating to this order, please contact Alan Newman at (360) 407-6810 or alan.newman@ecy.wa.gov.

Sincerely,

Jeff Johnston, Ph.D.
Manager, Science and Engineering Section
Air Quality Program

JJ/lb

Enclosure

cc: Kathyrn Mitchell, Intalco Ferndale
Alan Newman, Ecology
Rick Graw, USFS Portland
James Jones, EHS Services North America
Judy Schwieters, Industrial Section
John Bunyak, National Park Service

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

IN THE MATTER OF AN ADMINISTRATIVE ORDER AGAINST:	]	
	]	ORDER NO. 7837, Revsion 1
Alcoa Intalco Works	]	

TO: Mr. Barry Hullett
Alcoa Intalco Works
4050 Mountain View Road
Ferndale, WA 98248-0937

This is an Administrative Order requiring your company to comply with WAC 173-400-151 by taking the actions that are described below. Chapter 70.94 RCW authorizes the Washington State Department of Ecology's Air Quality Program (Ecology) to issue Administrative Orders to require compliance with the requirements of Chapter 70.94 RCW and regulations issued to implement it.

Ecology has determined that portions of your facility are subject to the provisions of the federal and state visibility protection program (WAC 173-400-151 and 40 CFR Part 51, Subpart P). The rules require that the State determine what technologies and level of emission control constitutes Best Available Retrofit Technology (BART) for the eligible emission units at your facility.

FINDINGS

A. The Alcoa Intalco Works (Intalco) is a primary aluminum smelter facility subject to BART.

B. The BART-eligible emission units at Intalco are the three potlines, anode bake furnace, 13 aluminum holding furnaces, material handling and transfer operations, and a number of small miscellaneous units.

C. Emissions from existing BART units are controlled by:

a. Use of six existing primary control systems each consisting of a dry alumina injection system followed by a baghouse for the primary control of PM and fluoride emissions from the potline buildings.

b. Use of a series of 159 wet roof scrubbers to control secondary PM and fluoride emissions from the potline buildings.

c. Use of a dry alumina injection system followed by a baghouse for control of PM and fluoride emissions from the Anode Bake Furnace.

d. Use of sulfur content limitations to limit SO_2 emissions due to the manufacture and consumption of anodes.

e. Use of baghouses and fabric filters to control PM emissions from various Material Handling and Transfer Operations throughout the facility.

D. Ecology has determined that the emission controls currently installed at Intalco meet the requirements of BART.

E. Ecology has determined that Intalco has met the requirements of Administrative Order No. #5070 which required submittal of a BART Technical Analysis for the Intalco facility.

F. On July 29, 2010 Intalco requested the original BART order to be revised to:
a. Incorporate the specific emission limitations, monitoring and reporting requirements contained in Order DE02AQIS-3967 rather than incorporate that order and its requirements by reference as done in the original version of this order, and
b. To include specific NOx emission rates, especially a revised NOx emission rate for the potlines based on recent source test information.

Additional information and analysis is available in the BART Determination Support Document for Alcoa Intalco Works, Ferndale, Washington, prepared by the Washington State Department of Ecology, and the BART Determination for Alcoa Intalco Works Ferndale, Washington, prepared by ENVIRON Corporation on behalf of Alcoa Intalco Works, November 2007.

YOU ARE ORDERED: To operate existing emission control equipment in accordance with the following conditions:

1. BART Emission Limitations are contained in the tables contained in Attachment A to this Order.

2. Schedule for Compliance

   2.1. Compliance with the emission limitations for particulate matter, nitrogen oxides, and sulfur dioxide is required upon the effective date of this Order.

3. Monitoring and Recordkeeping, Requirements are contained in Attachment A to this Order

4. Recordkeeping Requirements

4.1. Intalco shall submit a monthly air monitoring report which contains the respective results of the monitoring required in the conditions of this order. The report shall be submitted within 30 days of the end of each calendar month. Intalco shall report the data in a format that will allow a comparison of all the data to the respective emission limits. The format shall include a table which summarizes the required source tests conducted during that month and the dates when they were completed. Intalco shall submit the results of source tests to Ecology in the air monitoring report for the month that the results are received by Intalco. This reporting requirement applies to all Conditions in Attachment A of this Order.

Failure to comply with this Order may result in the issuance of civil penalties or other actions, whether administrative or judicial, to enforce the terms of this Order.

You have a right to appeal this Order. To appeal you must:

- File your appeal with the Pollution Control Hearing Board within 30 days of the "date of receipt" of this document. Filing means actual receipt by the Board during regular office hours.

- Serve your appeal on the Department of Ecology within 30 days of the "date of receipt" of this document. Service may be accomplished by any of the procedures identified in WAC 371-08-305(10). "Date of receipt" is defined at RCW 43.21B.001(2).

If you appeal, you must:

- Include a copy of this document with your Notice of Appeal.
- Serve and file your appeal in paper form; electronic copies are not accepted.

To file your appeal with the Pollution Control Hearing Board:

Mail appeal to:		Deliver your appeal in person to:
The Pollution Control Hearings Board P.O. Box 40903 Olympia, WA 98504-0903	OR	The Pollution Control Hearings Board 4224–6th Avenue SE Rowe Six, Bldg 2 Lacey, WA 98503

To serve your appeal on the Department of Ecology:

Mail appeal to:

Department of Ecology
Appeals Coordinator
P.O. Box 47608
Olympia, WA 98504-7608

OR

Deliver your appeal in person to:

Department of Ecology
Appeals Coordinator
300 Desmond Drive SE
Lacey, WA 98503

And send a copy of your appeal packet to:

Alan Newman
Department of Ecology
Air Quality Program
P.O. Box 47600
Olympia, WA 98504-7600

For additional information, go to the Environmental Hearings Office website at http://www.eho.wa.gov.

To find laws and agency rules, go to the Washington State Legislator website at http://www1.leg.wa.gov/CodeReviser.

Your appeal alone will not stay the effectiveness of this Order. Stay requests must be submitted in accordance with RCW 43.21B.320. These procedures are consistent with Chapter 43.21B RCW.

DATED this 15 day of November, 2010 at Olympia, Washington.

Jeff Johnston
Jeff Johnston, Ph.D.
Manager, Science and Engineering Section
Department of Ecology
Air Quality Program

Attachment A
BART Emission limitations, Monitoring, Recordkeeping and Reporting Requirements

Approval Condition	Process Area	Pollutant	Emission limit	Monitoring and Recordkeeping requirements	Reporting requirements
Plant Wide Limitations					
A1	Plantwide Natural gas Usage (not including Bake furnace)	Nitrogen oxides (NOx	341 lb/day, calendar month average	Intalco shall demonstrate compliance by using the following equation: Natural gas NOx from sources excluding the Bake Ovens and the Remelt Furnace = Plant wide natural gas – bake oven natural gas – remelt natural gas Intalco shall maintain a record of natural gas usage at the plant. Records maintained shall be sufficiently complete to quantify natural gas used in the bake furnace and remelt furnace. Natural gas usage shall be converted to a calendar month average NOx emission rate through the use of an Ecology specified emission factor of 140 lb/1.0x10^6scf of natural gas.	30 days after the end of each calendar month
A2	Plantwide SO_2 Emissions	Sulfur dioxide (SO_2)	Comply with the emission limitation contained in WAC 173-415-030(5); Total emissions of SO2 from all emissions units shall not exceed thirty grams of sulfur dioxide per kilogram of aluminum produced on a monthly average (sixty pounds per ton of aluminum produced).	a. Intalco shall conduct source tests upon Ecology's request using EPA RM 6 per 40 CFR Part 60, Appendix A, or another EPA approved method. b. Intalco shall determine total facility-wide SO2 emissions by summing the SO2 generated from the potlines, the anode bake ovens and natural gas usage. Intalco shall calculate SO2 emissions from the potlines, anode bake ovens, and paste plant by using the following mass balance equations and information:	30 days after the end of each calendar month or, for source tests, 30 days after the end of the month the source test report is received by Intalco

Approval Condition	Process Area	Pollutant	Emission limit	Monitoring and Recordkeeping requirements	Reporting requirements
				Total SO_2 = Raw Material SO_2 (Coke and Pitch) + Natural Gas SO_2 Raw material SO_2 (coke and pitch) will be determined by using the following mass balance equation: Coke and Pitch SO_2 = (total Pet coke weight %S) + (total pitch weight %S) + (total packing coke weight %S) – (COS x 64/60) Carbon consumption ratio is pounds of carbon consumed per pounds of Aluminum produced. Intalco shall assume 95% of the sulfur in green anodes is converted to SO_2 and 5% is converted to COS (Carbonyl Sulfide). Intalco shall calculate the SO_2 generated by natural gas combustion using an Ecology approved emission factor.	
Miscellaneous Materials Handling systems					
A3	Unspecified emission units	PM	Meet the more restrictive applicable emission limitation contained in • WAC 173-400-060, or • WAC 173-415-	Intalco shall conduct source tests upon Ecology's request using EPA RM 5 per 40 CFR 60, Appendix A, The test method required to demonstrate compliance with an applicable particulate matter control requirement of 40 CFR Part 63 Subpart	30 days after the end of the month the source test report is received by Intalco.

Approval Condition	Process Area	Pollutant	Emission limit	Monitoring and Recordkeeping requirements	Reporting requirements
			030(2), or • 40 CFR Part 63, Subpart RRR	RRR, or another EPA approved method.	
A4	Autogenous Mill – Unit #209	PM	Emissions of PM shall not exceed 5.0 tons of PM per year AND Emissions of PM shall not exceed 0.01 grains per dscf.	Intalco shall conduct source tests once every 5 years and upon Ecology's request using EPA RM 5 per 40 CFR 60, Appendix A, or another EPA approved method.	30 days after the end of the month the source test report is received by Intalco.
Aluminum Production					
A5		Aluminum Production Limit	Net potline production of Aluminum shall be limited to $\leq$307,000 tons of aluminum per calendar year.	Intalco shall maintain a record of the daily net production of aluminum and report the average daily net aluminum production in the monthly air monitoring. Net production of aluminum is the total mass of molten metal produced from tapping all pots in all operating potlines, measured at the casthouse scales and the rod shop scales	30 days after the end of each calendar month
A6	Potline Primary and Secondary Control Systems	Operational limits	The following limits shall not be exceeded : Operating < 720 pots/day $\leq$ 3.0 % sulfur in coke $\leq$ 0.6 % sulfur in pitch $\leq$ 150,000 amps of current $\leq$ 0.4250 carbon consumption ratio (pounds of carbon consumed per pound of Aluminum produced)	Intalco shall maintain a record of the data collected for the parameters listed below, compute the monthly average, and report the monthly average (unless another average is noted below) for each parameter in the monthly air monitoring report submitted to Ecology: • Number of pots operated per day (potdays) • Percent sulfur in pitch (Intalco shall	30 days after the end of each calendar month

Approval Condition	Process Area	Pollutant	Emission limit	Monitoring and Recordkeeping requirements	Reporting requirements
				analyze each incoming load or batch of pitch for sulfur content using the procedures in ASTM D4239 or other ASTM sulfur methods) • Percent sulfur in coke (Intalco shall analyze each incoming load or batch of coke for sulfur content using the procedures in ASTM D4239 or other ASTM sulfur methods) • Carbon consumption ratio as a daily average computed monthly • Amperes of current	
A7		Particulate (PM)	Emissions of PM shall not exceed a combined total of 5050 pounds per day (calculated on a monthly average) from the potlines (primary and secondary control systems) and the bake ovens AND Emissions of PM shall not exceed a combined total of 6.0 pounds per ton of aluminum (calculated on a three month average) produced from the potlines (primary and secondary control systems) and the bake ovens	Unless a different testing schedule is contained in an Ecology approved Air Monitoring Plan, Intalco shall determine PM emissions by testing the primary and secondary control systems and the bake furnace using the following methodology: Primary control system: Intalco shall test 4 cells (1 run/cell) per month per potline (2 cells from each of the 2 baghouse centers) for a minimum of 5 hours using EPA RM 5 per 40 CFR Part 60 Appendix A, Alcoa method B-54, or another EPA approved method. Secondary control system: Intalco shall test three roof scrubbers simultaneously (1 run/test) three times per month per potline using EPA RM 5 per 40 CFR Part 60 Appendix A, Alcoa method B-54b, or	30 days after the end of each calendar month

Approval Condition	Process Area	Pollutant	Emission limit	Monitoring and Recordkeeping requirements	Reporting requirements
				another EPA approved method. Bake Ovens: Intalco shall conduct a source test (3 runs/source test) once per year and upon Ecology's request using EPA RM 5 per 40 CFR Part 60 Appendix A	
A8		Sulfur dioxide (SO_2)	Emissions of SO_2 shall not exceed 37, 780 pounds per day	Intalco shall determine the SO_2 emitted by using the following formula: SO_2 emissions in lbs. /day = (carbon consumption ratio) (2000 pounds Aluminum per ton) x (% sulfur in baked anodes/100) x (% S converted to SO2/100) x (2 lb sulfur dioxide per lb sulfur)x (Tons of Aluminum per month)/ days per month. Carbon consumption ratio is pounds of carbon consumed per pound of Aluminum. Percent sulfur in baked anode material (Intalco shall analyze baked anode material for sulfur content using the procedures in ASTM D4239 or other ASTM sulfur methods). %S converted to SO_2 is 95% Intalco shall report the monthly average of pounds of SO_2 per day. Intalco shall maintain records of	Intalco shall report the 3monthly average of pounds of SO_2 per day in each month 30 days after the end of each calendar month

Approval Condition	Process Area	Pollutant	Emission limit	Monitoring and Recordkeeping requirements	Reporting requirements
				production data used to develop carbon consumption ratio and tons of aluminum produced. Intalco shall provide the records to Ecology upon request	
A9		Sulfur dioxide (SO_2)	Emissions of SO_2 shall not exceed 44.8 pounds per ton of aluminum produced (calculated on a three month average).	Intalco shall determine the SO_2 emitted by using the following formula: SO_2 emissions in lbs. /month = (carbon consumption ratio) (2000 pounds Aluminum per ton) x (% sulfur in baked anodes/100) * (% S converted to SO_2/100) x (2 lb sulfur dioxide per lb sulfur)x(Tons of Aluminum per month) Carbon consumption ratio is pounds of carbon consumed per pound of Aluminum. Percent sulfur in baked anode material (Intalco shall analyze baked anode material for sulfur content using the procedures in ASTM D4239 or other ASTM sulfur methods).. %S converted to SO_2 is 95%	Intalco shall report the 3 month average of pounds of SO_2 per ton of aluminum produced 30 days after the end of each calendar month
A10		Nitrogen oxides (NOx)	Emissions of NOx shall not exceed 219 pounds per day (calculated on a one month average).	Intalco shall determine plant wide emissions of NOx by using the plant specific emission factor of0.26 lb NOx/ton of Aluminum produced.	30 days after the end of each calendar month

Approval Condition	Process Area	Pollutant	Emission limit	Monitoring and Recordkeeping requirements	Reporting requirements
Anode Production and Baking					
A11	Green Carbon Pitch Fume Treatment System	PM10	Emissions of PM10 shall not exceed 2.36 lb/hour	Intalco shall conduct a source test once every two years and upon Ecology's request using EPA RM 5 per 40 CFR Part 60, Appendix A, or another EPA approved method. Intalco can reduce monitoring frequencies if each of three consecutive source tests demonstrates that the emission rate is < 75% of the applicable limit. Intalco shall resume the original source testing frequency any time a source test demonstrates emissions have increased above 75% of the applicable limit. Intalco shall submit a letter notifying Ecology that the monitoring frequency will be reduced. The notification shall demonstrate the justification for the reduced monitoring frequency and schedule.	30 days after the end of the month the source test report is received by Intalco.
A12	Anode Baking	Nitrogen oxides (NOx)	933 lb/calendar day, 30 day average	Intalco shall determine NOx emissions from its anode baking furnace operation by multiplying the Ecology approved site-specific emission factor of 2.02 lbs of NOx per ton of baked anodes times the tons of baked anodes produced during the month divided by the number of operating days during the month. Intalco shall report the monthly average of pounds of Baking	30 days after the end of the month the source test report is received by Intalco.

Approval Condition	Process Area	Pollutant	Emission limit	Monitoring and Recordkeeping requirements	Reporting requirements
				Furnace NOx per day. ***Baking Furnace NOx Equation:*** $\frac{Pounds\ NOx}{day} = \frac{tons\ of\ Aluminum}{month} \times \frac{2.02\ lb_{NOx}}{ton_{Al}} \times \frac{month}{days\ per\ month}$	
Metal Products Area					
A13	Remelt Furnace	Nitrogen oxides (NOx)	NOx emissions shall not exceed: 5.72 tons for the most recent 12-month period or 0.48 tons for any single month or 32 lb/calendar day, 30 day average. Remelt furnace NOx is , also included in plantwide natural gas NOx emission limit	Intalco shall determine Remelt Furnace NOx emission by the following method: Natural gas usage shall be converted to a calendar month average NOx emission rate through the use of an Ecology specified emission factor of 0.048 tons NOx /$1.0x10^6$scf of natural gas. For each month Intalco shall report: • The volume of natural gas consumed during the month ($1.0x10^6$scf) • The volume of natural gas consumed ($1.0x10^6$scf) in the most recent 12-month period • The tons of NOx emitted	30 days after the end of each calendar month

Approval Condition	Process Area	Pollutant	Emission limit	Monitoring and Recordkeeping requirements	Reporting requirements
				during the month, The total tons of NOx emitted for the most recent 12-month period	
A14	Homogenization Furnace – Unit #314	NOx	Emissions of NOx shall not exceed 83 ppm corrected to 3% oxygen.	Intalco shall conduct an annual source test on the furnace during full operation using EPA RM 7E for NOx and RM 3A for Oxygen as per 40 CFR Part 60, Appendix A, or another EPA approved method. Intalco can reduce the frequency of source testing to once every 5 years if each of three consecutive source tests demonstrates that the emission rate is < 75% of the applicable limit. Intalco shall resume the original source testing frequency any time a source test demonstrates emissions have increased above 75% of the applicable limit. Intalco shall submit a letter notifying Ecology that the monitoring frequency will be reduced. The notification shall demonstrate the justification for the reduced monitoring frequency and schedule. Intalco shall submit the notification to Ecology within 60 days after the last source test used to make the demonstration.	30 days after the end of the month the source test report is received by Intalco.

BART DETERMINATION
SUPPORT DOCUMENT FOR
TESORO MARKETING AND REFINING COMPANY
ANACORTES REFINERY

Prepared by

Washington State Department of Ecology
Air Quality Program

August 2009

Revised Feb, 22, 2010

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EXECUTIVE SUMMARY

The Best Available Retrofit Technology (BART) program is part of the larger effort under the federal Clean Air Act Amendments of 1977 to eliminate human-caused visibility impairment in all mandatory federal Class I areas. Sources that are required to comply with the BART requirements are those sources that:

1. Fall within 26 specified industrial source categories.
2. Commenced operation or completed permitting between August 7, 1962 and August 7, 1977.
3. Have the potential to emit more than 250 tons per year (tpy) of one or more visibility impairing compounds.
4. Cause or contribute to visibility impairment within at least one mandatory federal Class I area.

Tesoro Refining and Marketing Company (Tesoro) operates a petroleum (a.k.a. oil) refinery on March Point near Anacortes, Washington. The petroleum refining process results in the emissions of particulate matter (PM), sulfur dioxide (SO_2), volatile organic compounds (VOCs), and nitrogen oxides (NO_X). All of these pollutants are visibility impairing.

Petroleum (oil) refineries are one of the 26 listed source categories. Construction on the Tesoro refinery began in 1955 with commercial operation starting a year later. Additional units started operation in 1963-1964 and during a major expansion in 1971. The BART-eligible emission units at the refinery have the potential to emit more than 250 tpy of SO_2, NO_X, and PM. Fourteen of the 26 combustion units at the plant are BART-eligible. A number of the crude oil and oil product storage tanks are BART-eligible as sources of VOC. VOC emissions were not evaluated for visibility impairment or BART control technology due to the inability of the visibility model to evaluate visibility impact of VOCs. The combustion units are the major sources of visibility impairing pollutants from the oil refinery.

Modeling of visibility impairment was done following the Oregon/Idaho/Washington/EPA Region 10 BART modeling protocol.[1] Modeled visibility impacts of baseline emissions show impacts on the 8th highest day in any year (the 98th percentile value) of greater than 0.5 deciviews (dv) at five Class 1 areas. The highest impact was 1.72 dv on Olympic National Park. Modeling showed that on the most impacted days at Olympic National Park, approximately 57 percent of the visibility impairment is due to NO_X emissions and 41 percent is due to SO_2 emissions.

Tesoro prepared a BART technical analysis following Washington State's BART Guidance.[2]

The Washington State Department of Ecology (Ecology) has determined BART at the Tesoro refinery for PM/PM_{10}, SO_2, and NO_X, as depicted in Table ES-1.

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[1] Modeling protocol available at http://www.deq.state.or.us/aq/haze/docs/bartprotocol.pdf.
[2] "Best Available Retrofit Technology Determinations Under the Federal Regional Haze Rule," Washington State Department of Ecology, June 12, 2007.

- BART for PM/PM_{10} (all particulates) is the use of refinery fuel gas or natural gas for fuel and the current combination of emission controls on Unit F-304.
- BART for SO_2 is the elimination of routine use of fuel oil in Unit F-103 and meeting current requirements on sulfur content of refinery fuel gas.
- BART for SO_2 for Unit F-304 is the continued use of current wet scrubber emission controls
- BART for NO_X is based on continued use of the existing burners and controls except for Unit F-103 which will install new ultra-low-NO_X burners.

The BART controls selected by Ecology will result in a visibility improvement at Olympic National Park of less than half of a deciview.

Table ES-1. ECOLOGY'S DETERMINATION OF THE EMISSION CONTROLS THAT CONSTITUTE BART

	BART Control Technology	Emission Limitation
F-103		
PM/PM_{10}	Ending routine use of fuel oil. Use of refinery fuel gas or natural gas as primary fuel.	Fuel oil allowed only under the following conditions: • Natural gas curtailment. • Periods with limited refinery fuel gas availability, such as start-up and shutdown of major refinery process units, while major refinery process units are not operating and producing refinery gas, and emergency conditions as necessary to maintain safe operations or equipment shutdown. Test firing on fuel oil is allowed for up to 24 hours per calendar year.
SO_2	Ending routine use of fuel oil. Use of refinery fuel gas or natural gas as primary fuel.	Same as for PM/PM_{10}.
NO_X	Ultra-low-NO_X burners	Not to exceed 59.1 tpy, rolling annual (365) total calculated daily.
All Other BART-Eligible Units		
F-104, F-304, F-654, F-6600, F-6601, F-6602, F-6650, F-6651, F-6652, F6653, F-6654, F-6655, Flare X-819, Cooling Towers 2 and 2a	Currently installed combustion and other controls.	Per applicable NWCAA regulatory orders and regulations.

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1. INTRODUCTION

This document is to support Ecology's determination of the Best Available Retrofit Technology (BART) for the Tesoro Refining and Marketing Company (Tesoro) petroleum (a.k.a. oil) refinery on March Point near Anacortes, Washington.

The Tesoro refinery processes crude oil to produce refined oil products, including ultra low sulfur diesel oil, jet fuel, #6 fuel oil, and gasoline. Fourteen of the 26 process heaters, flares, and boilers, plus two cooling towers at the plant are BART-eligible. The primary emission units of concern are the process heaters, boilers, and flares. The process heaters, boilers, and flares emit SO_2 and NO_X. Direct PM emissions from BART-eligible units are low because almost all of them combust either refinery fuel gas or natural gas. Only one BART unit is currently permitted to use fuel oil.

Eleven of the 74 storage tanks are also BART-eligible sources of VOCs. The CALPUFF model used to evaluate visibility impairment cannot model VOCs. Ecology directed that VOC emissions BART-eligible storage tanks and other units not be evaluated for visibility impact or BART control technology. The BART determination for the Tesoro refinery focuses only on PM, SO_2 and NO_X.

1.1 The BART Analysis Process

Tesoro and Ecology used the United States Environmental Protection Agency's (EPA's) BART guidelines contained in Appendix Y to 40 CFR Part 51, as annotated by Ecology, to determine BART. The BART analysis protocol reflects utilization of a 5-step analysis to determine BART for SO_2, NO_X, and PM_{10}. The five steps are:

1. Identify all available retrofit control technologies.
2. Eliminate technically infeasible control technologies.
3. Evaluate the control effectiveness of remaining control technologies.
4. Evaluate impacts and document the results.
5. Evaluate visibility impacts.

The BART guidance limits the types of control technologies that need to be evaluated in the BART process to available control technologies. Available control technologies are those which have been applied in practice in the industry. The State can consider additional control techniques beyond those that are 'available', but is not required to do so. This limitation to available control technologies contrasts to the Best Available Control Technology (BACT) process where innovative technologies and techniques that have been applied to similar flue gases must be considered.

As allowed by the EPA BART guidance, Ecology has chosen to consider all five factors in its BART determinations. To be selected as BART, a control has to be available, technically feasible, cost effective, provide a visibility benefit, and have a minimal potential for adverse non-air quality impacts. Normally, the potential visibility improvement from a particular control technology is only one of the factors weighed for determining whether a control constitutes BART. However, if two available and feasible controls are essentially equivalent in cost effectiveness and non-air quality impacts, visibility improvement becomes the deciding factor for the determination of BART.

1.2 Basic Description of the Tesoro Refinery

The Tesoro refinery purchases crude oil on the open market for processing into a variety of petroleum products, including gasoline and ultra low sulfur diesel. Current refinery throughput is approximately 115,000 barrels per day of crude oil. Crude oil is heated and sent to the crude distillation unit where the crude oil is separated into various fractions based on boiling point of the hydrocarbons. The various crude fractions are sent for further processing and refining in other units of the plant. De-asphalted heavy oil from the crude unit is hydrotreated prior to being sent to the Fluid Catalytic Cracking Unit (FCCU) to be split into lighter fractions for blending. The refinery also produces heavy fuel oil (a.k.a. #6 oil or bunker C) and paving asphalts. Figure 1-1[3] is a simplified process flow diagram of the overall refinery process.

Catalyst used in the FCCU is regenerated in a separate regenerator unit. In the regenerator unit, the carbon, sulfur and other impurities are burned off the catalyst. The exhaust gas from the regenerator is routed to the two carbon monoxide boilers (F-302, CO Boiler No. 1 and F-304, CO Boiler No. 2) to be combusted and the energy recovered. Exhaust gas from the two carbon monoxide boilers is routed to a single Flue Gas Scrubber for particulate and SO_2 control.

The principle air pollution control authority for this facility is the Northwest Clean Air Agency (NWCAA).

[3] Copied from Air Operating Permit Statement of Basis, Tesoro Refining and Marketing Company, for Air Operating Permit No. 013, issued November 25, 2002.

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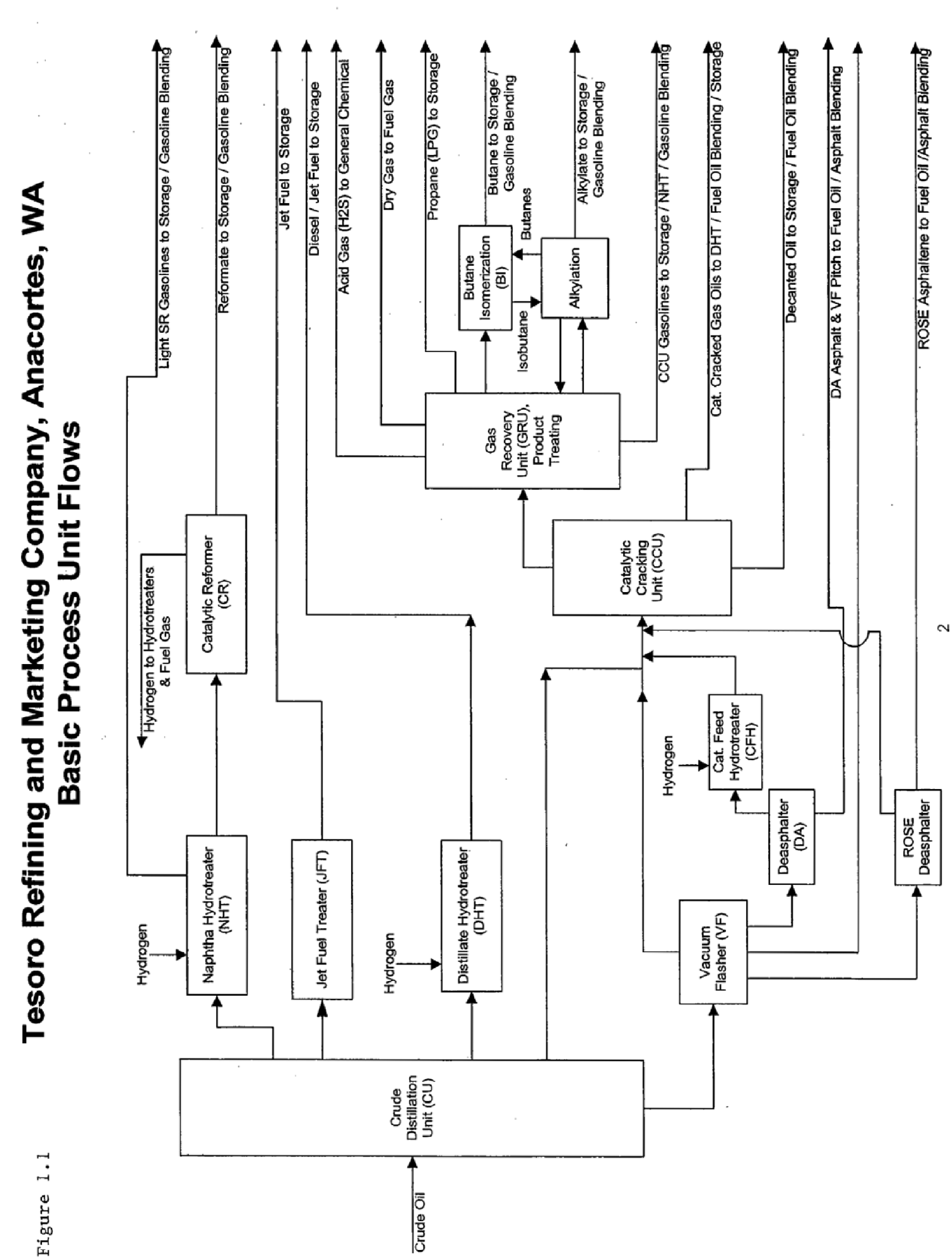

Figure 1.1

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1.3 BART-Eligible Units at the Tesoro Refinery

Fourteen of the 26 process heaters, flares, and boilers and the two cooling towers at the Tesoro refinery are BART-eligible. This means that these 14 emission units have the potential to emit more than 250 tpy of SO_2, NO_X, and PM/PM_{10} and commenced operation within the 15-year BART period.[4] The refinery was constructed during 1955-1956 and reported to have begun commercial operation in 1956.

Table 1-1 identifies the BART-eligible units and the emissions used in the BART modeling.

Table 1-1. BART MODELING EMISSION RATES FOR BART-ELIGIBLE UNITS

Emission Unit			BART Impact Modeling Emissions (lb/hr)		
Source Designation	**Service**	**Design Heat Input (MMBtu/hr)**	**NO_X**	**SO_2**	**PM_{10}**
F-103	Crude Oil Distillation	145	53.5	160.5	9.1
F-104	Gasoline Splitter/Reboiler	53	0.8	39.8	0.4
F-304	CO Boiler No. 2	322	242.7	24.9	14.1
F-654	Catalytic Feed Hydrotreater	16.5	1.3	11.7	0.1
F-6600	Naphtha Hydrotreater	71.5	13.1	56.0	0.9
F-6601	Naphtha Hydrotreater	75	8.0	77.5	0.6
F-6602	Naphtha Hydrotreater	75	8.3	25.6	0.6
F-6650/6651	Catalytic Reformer	286	101.3	332.0	2.8
F-6652/6653	Catalytic Reformer	105	19.2	86.1	1.5
F-6654	Catalytic Reformer	35	4.0	32.2	0.3
F-6655	Catalytic Reformer	30	2.9	15.1	0.2
X-819	Flare	244	2.0	10.0	0.4
CWT #2	Cooling Water Tower		0	0	0.1
CWT #2a	Cooling Water Tower		0	0	0.1

Tesoro and Ecology reviewed the currently installed and potential controls for all BART-eligible emission units listed above. Tesoro's review was focused on the combustion units because of the contribution of these units to visibility impairment and availability of emission controls.

[4] The 15-year period ending with August 7, 1977, the date of passage of the Clean Air Act amendments of 1977.

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Some of the combustion units listed above have been subject to BACT review as part of projects to upgrade or increase plant production capacity. Others have had emission controls added to comply with federal hazardous air pollutant control requirements or to reduce ambient air quality impacts of other projects at the refinery. The results of these actions are incorporated in the modeled emission rates shown in Table 1-1.

1.3 Visibility Impact of BART-Eligible Units at the Tesoro Refinery

Emission units that meet the source category, age, and potential to emit criteria are "BART-eligible." To be "subject to BART," the actual emissions from the "BART-eligible" units at the facility must "cause or contribute" to visibility impairment within at least one mandatory federal Class I area. Ecology has adopted the "cause and contribute" criteria that EPA suggested in its guideline. BART-eligible units at a source cause visibility impairment if their modeled visibility impairment is at least 1.0 deciview (dv). Similarly, the criterion for contributing to impairment means that the source causes a modeled visibility change of 0.5 dv or more.

Class I area visibility impairment and improvement modeling was performed by Tesoro using the BART modeling protocol developed by Oregon, Idaho, Washington, and EPA Region 10.[5] This protocol uses three years of metrological information to evaluate visibility impacts. As directed in the protocol, Tesoro used the highest 24-hour emission rates that occurred in the 3-year period to model its impacts on Class I areas.

Modeled visibility impacts of baseline emissions show impacts on the 8th highest day in any year (the 98th percentile value) of greater than 0.5 deciviews (dv) at five Class 1 areas. The highest impact was 1.72 dv at Olympic National Park. Modeling showed that on the most impacted days at Olympic National Park, approximately 57 percent of the visibility impairment is due to NO_X emissions and 41 percent is due to SO_2 emissions. For more information on visibility impacts of this facility, see Section 3 below.

[5] A copy of the modeling protocol is available at http://www.deq.state.or.us/aq/haze/docs/bartprotocol.pdf.

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2. BART TECHNOLOGY ANALYSIS

The Tesoro BART technology analysis was based on the 5-step process defined in BART guidance and listed in Section 1.1 of this report. The first subsection below deals with an overview of the controls evaluated for combustion units, the second with, evaluation of plant-wide SO_2 controls and specific controls on individual combustion units, and the third with controls on the cooling towers. The latter two sections provide an overview of the potentially feasible emission controls evaluated by Tesoro followed by Tesoro's BART proposal.

In Tesoro's evaluation of costs in the 2008 BART analysis, they assumed that all control installations would occur at a regularly scheduled maintenance turn-around. These are the costs presented in sections 2.2 and 2.3. Tesoro subsequently submitted additional cost analyses for implementation of the BART controls on 5 units at other than a regularly scheduled maintenance turn-around. This is discussed in Section 2.4.

2.1 Controls Evaluated for Combustion Units

The Tesoro refinery has 14 fuel combustion units subject to BART. The three subsections below provide an overview of the NO_X, SO_2, and PM/PM_{10} control techniques that were evaluated by Tesoro. While the units differ in firing rate, usage, and specific design features, most of the NO_X, SO_2, and PM/PM_{10} controls could be used on all units.

2.1.1 NO_X Controls Evaluated for All Combustion Units

There are a variety of controls that can be used for reducing the quantity of NO_X emitted to the atmosphere from the process heaters and CO Boiler which are subject to BART. Specifically, the company evaluated eight different technologies, including variations of several of them. NO_X emissions control from refinery fuel gas and flue gas combustion can be achieved with eight technologies or combinations of technologies.

- Flue gas recirculation (FGR)
- Low-NO_X burners (LNBs)
  - Staged-air LNBs
  - Staged-fuel LNBs
- Ultra-low-NO_X burners (ULNBs)
- Selective non-catalytic reduction (SNCR)
  - SNCR
  - LNBs + SNCR
  - ULNBs + SNCR
- Selective catalytic reduction (SCR)
  - SCR
  - LNBs + SCR
  - ULNBs + SCR

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- LoTO$_X$™ process (evaluated only for Unit F-304, CO Boiler No. 2)
- Sulfur Recovery Unit with Tail Gas Unit (SRU/TGU; evaluated for only Unit F-304, CO Boiler No. 2).

Additional control techniques were considered by Tesoro and are not listed here due to their lack of applicability to the Tesoro emission units. The following are more detailed descriptions of the NO_X control and reduction technologies evaluated by Tesoro for use at the refinery. Control techniques that are applicable to only one or two units are specifically noted.

Flue gas recirculation (FGR) generally involves mixing some of the flue gas from the heater or boiler with the air fed to the burner(s). FGR can be integrated into the construction of the unit or can be added to an existing unit. In the FGR process, approximately 15 to 30 percent of the air supplied to the burner's primary combustion zone is flue gas.[6] The flue gas reduces the peak flame temperature and the local oxygen concentrations resulting in less thermal NO_X formation. Thermal NO_X is the principal kind of NO_X produced in combustion of most gaseous and liquid fuels. FGR has been used on only a few oil refinery process heaters. These installations require extensive modification to the heater to accommodate the changed combustion characteristics and to avoid the introduction of hydrocarbon vapors that may leak from the heat transfer tubing to the flue gas.

Tesoro regards flue gas recirculation of flue gases at process heaters as an unacceptable safety risk due to the potential of formation of explosive gas mixtures in the event of a heater tube failure. Few applications have been made to refinery process heaters due to this risk. Therefore, this technology was not explored further.

Low- and ultra-low-NO_X burners come in two principle designs: staged-air and the staged-fuel burners. Both function by adjusting the mixture of fuel and air to reduce peak temperatures and minimize the production of NO_X. Some LNBs and ULNBs include flue gas recirculation in their design. Both designs generally have longer flame zones than the 'standard' burners that they replace in retrofit situations. The longer flame is not an issue in new heater installations due to the heaters being designed to accommodate the LNB or ULNB burners. Emission factors from EPA's RACT/BACT/LAER Clearinghouse range from 0.08 to 0.1 lb/MMBtu (NO_X) for LNBs and ULNBs.

LNB and ULNB retrofits are commonly installed as a result of BACT and LAER determinations or as a result of federal Consent Order requirements.

Staged-air, low-NO_X burners limit NO_X production by reducing flame oxygen concentrations in the primary combustion zone. The initial fuel combustion takes place in a fuel-rich, reducing atmosphere with a flame high temperature due to the low combustion air/fuel ratio. The low O_2 concentration limits NO_X formation.

[6] (CPPI, 1990), (Campbell, 1991), (Martin, 1993), (Shareef, 1988)

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For this burner design, retrofitting heaters with less than three feet between the burner and the opposite wall of the firebox may not be practical due to potential flame impingement on the firebox refractory materials or heat transfer tubes. Emission reductions achieved by staged-air LNBs range from 30 to 40 percent below emissions from conventional burners. Tesoro used a 40 percent NO_X reduction for its initial cost analysis review.

Staged-fuel, low-NO_X burners separate the combustion zone into two regions. The first is a lean primary region in which all the combustion air is injected with a small fraction of the fuel. This is followed by a second region where the remaining fuel is injected and combustion is completed.

Staged-fuel LNBs have several advantages over staged-air LNBs. First, the improved fuel/air mixing reduces the excess air necessary to ensure complete combustion. The lower excess air both reduces NO_X formation and improves heater efficiency. Second, for a given peak flame temperature, staged-fuel LNBs have a more compact (shorter) flame than staged-air LNBs. Up to 72 percent NO_X emissions reductions for staged-fuel LNBs have been reported over conventional burners based on vendor test data. Tesoro used a 60 percent average NO_X reduction for its initial cost analysis review. Ecology has only included information using this version of LNB in the unit-specific discussions below.

Ultra-low-NO_X burners (ULNBs) recirculate hot, oxygen-depleted flue gas from the flame or firebox back into the combustion zone. This reduces the average oxygen concentration within the flame maintaining the temperatures necessary for optimal combustion efficiency. ULNBs are physically larger than the conventional or LNB burners that might be used but compensate by having shorter flames than LNBs and are occasionally more efficient at combusting the fuel. They may require fans to provide combustion air rather than using a natural draft combustion air system. The conventional burner equipped heaters at Tesoro all use natural draft combustion air delivery systems. Burner mount modifications may be required because ULNBs usually do not fit into conventional burner mounts.

ULNBs now have the following features available:

- Compact sizes
- Shorter flame paths
- High turndown ratios

Tesoro used a 75 percent average NO_X reduction for its initial cost analysis based on EPA methods. After receiving vendor guaranteed average NO_X emission reductions ranging from 60 to 73.5 percent for specific units, Tesoro developed a vendor cost factor analysis for each unit based on the vendor guarantee and the unit-specific emission rate.

Selective Non-Catalytic Reduction (SNCR) is a post-combustion technology that involves directly injecting ammonia or urea into the hot flue gas. The reaction requires the flue temperatures required range from 1,600 to 1,750°F for ammonia and from 1,000 to 1,900°F for urea-based reagents. Other chemicals such as hydrogen, hydrogen peroxide, fuel gas, and methanol may be added to improve performance and lower the minimum threshold temperatures. The injection point must be at a location where temperature of the flue gas is within the required temperature range for enough time for the reaction to occur.

Not all of the ammonia or urea is used. Unreacted ammonia in the emissions (ammonia slip) is potentially higher in SNCR systems than in an SCR system due to higher reactant injection ratios (2:1). The degree of ammonia slip can be minimized through consistent operation of the heaters and good operational controls.

Vendors contacted by Tesoro have projected potential NO_X reductions at a maximum 25 ppm ammonia slip. SNCR systems may increase fuel gas consumption by approximately 0.3 percent in addition to the power required to vaporize aqueous ammonia. One result of the SNCR process is the formation of small amounts of nitrous oxide (N_2O), a greenhouse gas.

Ammonia used in the process is delivered and stored on site as either anhydrous ammonia or aqua-ammonia. If urea is used, it is delivered and stored as a dry material. Anhydrous and aqua-ammonia at concentrations above 19 percent ammonia require special reporting, handling, and worker safety requirements be followed. Urea is either dissolved in water and injected into the flue gas or converted to ammonia prior to injection.

SNCR may be used as the sole NO_X control technique or in combination with LNBs or ULNBs. At optimum temperatures, NO_X destruction efficiencies range from 30 to 50 percent. Tesoro used a 50 percent NO_X reduction for its initial cost analysis review.

Vendor NO_X reduction guarantees ranged from 35 to 40 percent based on Tesoro's fuel gas compositions and measured bridgewall temperatures. EPA's RACT/BACT/LAER Clearinghouse lists an emission limit of 127 ppmdv NO_X at seven percent oxygen for a SNCR used to control emissions from a Fluid Catalytic Cracking Regenerator unit followed by a CO Boiler.

NO_X tempering (steam or water injection) was proposed by Peerless Manufacturing Company as a technique that could be combined with SNCR on Units F-103 and F-304. Water or steam injection is a common NO_X control for large combustion turbines permitted prior to 2000. Peerless proposed a patented process in which water is injected into the burner flame to reduce the peak flame temperature. For each 190°F of flame temperature reduction, the NO_X is reduced by 50 percent.[7] Peerless estimated that NO_X tempering would reduce NO_X formation by 30 to 35 percent.

Flame temperature cooling is likely to reduce bridgewall (a.k.a. arch) temperatures and thus reduce the heat energy available to heat the crude oil. To overcome this reduction in heat energy, fuel use in the two units would need to increase, but this potentially reduces the

[7] EPA, 2003 and EPA, 1993.

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effectiveness of tempering. Other potentially adverse effects are anticipated to occur. Finally, to date, NO_X tempering has only been used on large utility boilers. Tesoro did not analyze this technique any further.

Selective Catalytic Reduction (SCR) is a post-combustion gas treatment technique to reduce NO_X in the exhaust stream through the use of a catalyst. As with SNCR, an ammonia or urea solution is injected in the flue gas upstream of a catalyst bed where it selectively reduces the nitrogen oxide compounds in the exhaust to produce elemental nitrogen and water. The catalyst's function is to reduce the reaction temperature from the range needed for SNCR.

Catalysts have been formulated to operate at three temperature ranges, a low temperature range based on platinum, and middle and high temperature catalysts based on a mixture of vanadium, titanium, and tungsten oxides. The operating temperature of the SCR system defines the catalyst type used. A conventional (middle range) SCR catalyst functions at temperatures of 600 to 750°F (the high temperature is often given as 850°F). Low temperature catalysts operate best in the range of 470 to 510°F. High temperature catalysts operate at temperatures of 900 to 1000°F.

Other than the catalyst bed reactor, major components of an SCR system are ammonia storage sources, vaporizer, and an ammonia injection grid. Catalyst deactivation and residual ammonia slip in the flue gas are the two key drawbacks in an SCR system. Catalyst activity decreases with operating time and with catalyst fouling. Disposal of the fouled catalyst presents another environmental concern due to the toxic metals contained in the catalyst. This concern is minimized as the result of the vendors recycling used catalysts.

Ammonia slip can be held to levels below five ppm in many situations, though the vendors contacted by Tesoro projected potential NO_X reductions using a maximum slip of 25 ppm ammonia.

SCR catalysts will oxidize a small portion of the SO_2 in the flue gas to SO_3 which can combine with water vapor to form sulfuric acid mist.

Typical SCR NO_X removal efficiencies range from 70 to 90^+ percent removal, depending on the unit being controlled. Tesoro used a 90 percent NO_X removal in its cost analyses.

The **LoTOx™** process is available from BELCO under license from BOC. It uses ozone to convert NO and NO_2 to N_2O_5 which is removed from the flue gas by water where it is converted to nitric acid or is removed with a caustic scrubber and converted to a nitrate. Specifically, ozone (O_3) is generated from industrial-grade oxygen using common industrial methods. O_3 is injected into the flue gas at a suitable, low temperature. O_3 oxidizes the NO_X to N_2O_5. In a wet scrubber, the N_2O_5 combines with water vapor in the flue gas to form nitric acid (HNO_3). Following the reaction zone, multiple spray levels scrub the flue gas to absorb nitric acid mist and unreacted O_3 in the final step. The reported LoTOx™ NO_X removal efficiency is 80 percent.[8]

NO_X concentration changes in the flue gas do not adversely affect the removal efficiency of the $LoTO_X$™ process. This means the Refinery Operations staff can optimize the combustion process to achieve the most cost-efficient burner conditions without considering NO_X generation. Continuous NO_X monitors within the system provide the O_3 flow rates necessary to achieve a set stack NO_X level.
LoTOx™ systems require a downstream caustic or water based scrubber. The use of the water based scrubber would require either a use for the dilute nitric acid produced or a separate acid neutralization tank or other denitrifying wastewater treatment process. The scrubber must be compatible with the LoTOx™ system.

Currently, EDV® Wet Scrubbing systems with the LoTOx™ process for NO_X control are installed on five Fluid Catalytic Cracking Units (FCCUs). One of these began operation in 2006 and the other units were commissioned during 2007. Tesoro considered adding LoTOx™ only to unit F-304, CO Boiler No. 2.

Use of a LoTOx™ unit with caustic scrubbing liquor will also produce a sodium or calcium nitrate-, sulfate-, and sulfite-rich wastewater which must be discharged to the plant's industrial waste water system. The increased nitrates to the treatment system could have a beneficial or detrimental effect. Beneficial effects would come from reduced need to add nitrogen to the industrial treatment system for nutrient balancing of the biological treatment process. Detrimental effects could come from the need for denitrification in the final clarifier prior to discharge. Denitrification in the clarifier would result in increased total suspended solids in the effluent and could lead to violations of the refinery's discharge permit. Tesoro did not perform a detailed evaluation of potential impacts.

A Sulfur Recovery Unit with Tail Gas Treatment (SRU/TGU) can be used to accept ammonia-rich vent gas from the Sour Water Stripper's (SWS) second stage instead of burning it in F-304, CO Boiler No. 2. In this control option, the SWS vent stream would be rerouted from F-304 to a Sulfur Recovery Unit (SRU) where the ammonia would be converted to nitrogen gas rather than nitrogen oxides.

The Tesoro refinery does not operate its own SRU, but routes its H_2S acid gas stream to the SRU and sulfuric acid plant at the neighboring General Chemical facility. Due to a recent upgrade to the sulfur removal system at Tesoro and resulting increase in sulfides sent to it, the General Chemical facility has no additional sulfur processing capacity. The General Chemical facility cannot handle the ammonia-rich SWS gases.

Tesoro's proposal to remove the ammonia-rich SWS vent gas stream from F-304 and treat it in an SRU requires construction of a new and independent SRU. The SRU would provide capacity

[8] (EPA, 2005) BELCO Product Literature.

for future reductions of sulfur in the refinery fuel gas and in the fuel oils produced by the refinery.

The various emission controls described above are summarized in Table 2-1.

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Table 2-1. SUMMARY OF NO_X RETROFIT TECHNOLOGIES EVALUATED

Technology	Manufacturer Contacted	Description	EPA Removal Rate	Vendor Removal Rate
FGR	N/A	Recycles 15-30% of inert flue gas to the primary combustion zone.	30%	--
LNB	John Zink (SFG/PSFG Retrofit Kit) & Todd Combustion	Burner upgrade kit includes tile, cone extension, primary riser, four fuel gas tips.	40% staged air 60% staged fuel	28-66%
ULNB	John Zink (Coolstar Burner)	Compact size, short flame, high turndown capabilities.	75%	73%
SNCR	Peerless Manufacturing Group	19% aqueous ammonia injection into radiant and convective regions of firebox (1,600-2,200°F).	50%	35-40%
SCR	CRI Catalyst	19% aqueous ammonia injection and catalyst (470-510°F and 600-750°F), low temperature pelletized extrudate catalyst.	90%	90%
$LoTO_X$	Available through BELCO under license from BOC	Uses ozone to convert NO_X to higher oxidation state which is subsequently hydrolyzed and removed with a caustic scrubber. Cons: High power consumption, creates pressure drops and incompatible when located upstream of existing WGS due to pressure sensitive venturi scrubber. Potential for nitric acid mist.	--	80%
SRU/TGU	Generally available technologies	NO_X emissions from F-304, CO Boiler No. 2 can be reduced by discontinuing the burning of ammonia-rich SWS vent gas. Routing the vent gas to an SRU, where ammonia is converted to nitrogen gas, is an identified option.	--	30%

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2.1.2 SO_2 Controls Evaluated for All Combustion Units

All BART-eligible combustion units are permitted to burn refinery fuel gas that has been treated to reduce the sulfur content or natural gas. While there are a number of add-on SO_2 control technologies available, at an oil refinery the most effective method is reduction of the fuel gas (refinery gas) sulfur content.

A review of the current information in the EPA RACT/BACT/LAER clearinghouse database indicates limited use of add-on SO_2 emission controls at oil refineries. The predominant control technology reported is “use of low sulfur fuel.” The exception to this is Catalyst Regenerator/CO Boiler stacks where add-on SO_2 controls are often included. The wet scrubber on Unit F-304, CO Boiler No. 2 is discussed in section 2.2.4 below. For its analysis, Tesoro focused on additional methods to reduce the sulfur content of the fuels used in the BART-eligible heaters and boilers.

Eliminating use of high sulfur fuel oil is a proven way to reduce SO_2 emissions from an oil refinery. This involves removal of the ability to fire fuel oil from the affected process heaters and boilers. The units may then be fired exclusively with natural gas, refinery fuel gas, or lower sulfur content distillate oil. At the Tesoro plant, only one of the BART-eligible units (Unit F-103) is still capable of firing a liquid fuel oil.

Tesoro evaluated **additional flare gas recovery** to reduce the amount of untreated gas burned in the flare system. Refinery fuel gas that is not used beneficially is sent to the plant flare system for combustion and disposal. Collection and routing of the recovered gas for use in the refinery fuel gas system reduces both the quantity of the gas flared and the sulfur content of the gas to match the level of the rest of the plant. Flare gas consists of purge gas, pilot burner gas (natural gas), various off gases associated with loading operations and process vents, and occasionally off gases from other process units during upsets, start-up, and shutdown conditions.

Converting equipment to run on exclusively natural gas is another method that can be used to reduce SO_2 emissions. The equipment is disconnected from the refinery fuel gas system and reconnected directly to a natural gas supply. This reduces SO_2 emissions because the total sulfur content of the natural gas is much lower than the refinery fuel gas. To implement this option requires installation of natural gas lines to all affected heaters and boilers or conversion of the entire plant to this option. Natural gas is a fuel that must be purchased and thus increases plant costs.

Natural gas can be added to the “fuel drum” where the **refinery fuel gas is mixed with the natural gas**. Many oil refineries use this practice to meet regulatory requirements, supplement limited refinery fuel gas, or reduce fluctuations in heat content and concentrations of hydrogen, ethane, propane, and butane in the fuel gas. Mixing pipeline or retail quality natural gas into the refinery fuel gas system involves routing a natural gas pipeline to the refinery gas fuel drum for mixing with the refinery gas. Tesoro already adds natural gas to its refinery fuel gas system.

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Refinery gas sulfur removal is the most common method of treating refinery fuel gas. In this process, a solvent such as mono- or di-ethylamine is used to remove hydrogen sulfide and other reduced sulfides from the fuel gas. The untreated refinery fuel gas is "washed" with the amine. The sulfides preferentially attach to the amine solvent and are removed from the refinery fuel gas. The used amine solvent is routed to a regenerator system where the sulfide is thermally removed from the amine. The sulfides are routed to a sulfur recovery unit or similar process. The cleaned amine is then returned to the stripping process.

Provision for additional refinery fuel gas sulfur removal has been done within the current fuel gas cleaning system. The sulfur removed by the system must be routed to a sulfur recovery unit or sulfuric acid plant. Currently Tesoro is contracted with General Chemical to provide this service for the refinery. However, the General Chemical facility is at capacity and cannot accept more sulfur. As a result, Tesoro would need to construct a new sulfur recovery unit.

A new **Sulfur Recovery Unit (SRU)** is required to remove additional sulfur. Tesoro has evaluated the costs to install a new, 50 ton/day SRU at their plant as part of a project proposed in 2006. The capital cost was estimated to be $58 million to meet the federal New Source Performance Standard limit for refinery gas H_2S of 152 ppmv. Annual operational costs were not evaluated.

2.1.3 PM/PM_{10} Controls for All Combustion Units

With the exception of emissions from Unit F-304, CO Boiler No. 2 discussed in section 2.2.4 below, PM/PM_{10} controls applicable to the process heaters at this facility are tied directly to the use of fuel. Using low sulfur refinery fuel gas reduces potential particulate emissions as much as possible. The refinery gas system includes process steps to remove particulates and some heavier hydrocarbons from the refinery gas prior to being sent to the various fuel burning units. While reduction of fuel oil use in Unit F-103 is primarily to reduce SO_2 emissions, reduced or even total elimination of fuel oil combustion in this unit will also reduce PM/PM_{10} emissions.

2.2 Evaluation of Controls for All Combustion Units

The subsections below evaluate plant-wide SO_2 reduction first and then the application of controls to each of the 14 combustion units subject to BART.

2.2.1 Plant-Wide SO_2 Control

The Tesoro refinery has 14 combustion units subject to BART that emit SO_2. SO_2 results from the combustion of sulfur containing fuels such as the refinery fuel gas, natural gas, and fuel oil. Tesoro evaluated reduction of SO_2 from Units F-103 and F-304 and Flare X-819 individually and in combination with all other combustion BART units. Applicability of unit specific SO_2 controls on Units F-103 and F-304 and Flare X-819 are discussed in individual subsections below.

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2.2.1.1 Evaluation of Plant-Wide Control

SO_2 controls at oil refineries has been studied by EPA who concluded that controlling refinery fuel gas sulfur content is the most efficient method to reduce SO_2 emissions from an oil refinery. The use of "low sulfur fuel" is the most common SO_2 control technique applied to oil refinery process units. "Low sulfur fuel" is usually defined as refinery fuel gas meeting the New Source Performance Standard (NSPS) requirements of 40 CFR Part 60, Subpart J.

In 2007 the Tesoro refinery upgraded the refinery gas sulfur removal system. The upgrade resulted in the refinery fuel gas with an average daily H_2S concentration of 70 ppm. However, short-term concentration "spikes" above 200 ppm can occur for several reasons, including rates of 1000 ppm when the sulfur recovery units or sulfuric acid plant is out of operation. This upgrade reduced the annual emissions of SO_2 from the refinery but not the short-term emissions. The refinery gas system upgrade was not subject to the New Source Review process but was included in OAC 952a issued by NWCAA as part of an order addressing installation of a larger amine system stripper gas pipeline to the sulfuric acid plant.

Sulfur removed from refinery products and the refinery fuel gas system is sent to the sulfur recovery and sulfuric acid production system operated by General Chemical. Tesoro owns the equipment for the system and contracts with General Chemical for operation and maintenance (O&M). General Chemical is responsible for all costs and environmental compliance. Currently the General Chemical plant is at capacity and unable to accept any additional sulfur from the Tesoro refinery. As a result any additional refinery fuel gas sulfur content reductions require the construction of a new sulfur recover unit.

Any additional reduction in refinery fuel gas sulfur content will require construction of a new SRU. In conjunction with a proposal to install a new coking system, Tesoro evaluated the construction of a new 50 ton/day SRU and refinery modifications to route sulfur streams to the new unit. The capital cost is estimated to be $58 million to continuously treat all refinery gas to the level of the NSPS standard (162 ppm of H_2S). Attributing all the cost to the SO_2 reductions to all combustion units (not just the BART eligible units) results in a plant wide reduction from the 2003 – 05 average emissions of 395 tons of SO_2 with a cost effectiveness of $16,100/ton of SO_2 (not including O&M costs). Tesoro also evaluated the cost effectiveness of continuously meeting a limit of 50 ppm of H_2S (a plant wide annual decrease of 451 tons per year), with the use of a new SRU. To meet a 50 ppm H_2S concentration would reduce the cost effectiveness to $14,100/ton, also not including O&M costs.

2.2.1.2 Proposed BART for SO_2

Tesoro proposed to continue use of the current refinery fuel gas system meeting the requirements of NWCAA's OAC 952a for control of plant-wide SO_2.

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2.2.2 Unit F-103, Crude Oil Distillation Heater

The Crude Oil Distillation Heater is used to heat crude oil for initial distillation steps. It has 24 burners split between two combustion cells. This 145 MMBtu/hr (average rate 103.5MMBtu/hr) heater was constructed in 1963 and utilizes natural gas, refinery fuel gas, or fuel oil. Currently fuel oil is used as backup fuel to natural gas and refinery fuel gas, though there are no permit restrictions limiting the use of fuel oil in this unit. The burners used are of original equipment design and emit relatively high levels of NO_X compared to current LNB or ULNB designs.

2.2.2.1 NO_X Control

This heater currently uses "default" original manufacturer design burners originally installed in 1963. The current emission rates for this heater are an annual 121 tons per year (tpy) at an average concentration of 193 ppmv. After an evaluation of the technical feasibility of the NO_X controls listed in Table 2-1, Tesoro evaluated the cost effectiveness of ULNB, SCR, SNCR, ULNB plus SCR, and ULNB plus SNCR. Table 2-2 lists pertinent criteria and cost effectiveness.

Table 2-2. UNIT F-103 NO_X CONTROLS EVALUATED IN DETAIL

Control Technology	Emission Reduction Anticipated – EPA Method	Annual NO_X Emission Rate (tpy)	Average Cost Effectiveness ($/ton) – EPA Method	Emission Reduction Anticipated – Vendor Cost Factor Analysis	Average Cost Effectiveness ($/ton) – Vendor Cost Factor Analysis
No controls	--	121	--	--	--
SNCR	50%	61	$6376	40%	$17760
ULNB	75%	30	$3398	66.2%	$4648
ULNB + SNCR	87.5%	15	$6556	80%	$10886
SCR	90%	12	$9444	90%	$6743
ULNB + SCR	97.5%	3	$11331	97%	$8107

All of these controls are capable of being installed on this heater. Tesoro's current understanding of the characteristics of potential ULNB burners suggests that flame impingement is not an issue and adequate space exists to install SCR. Installation of SNCR will reduce the gross heat available to heat crude oil. This reduction is due to the need to evaporate the water included in the aqua-ammonia used in the proposed SNCR system. Within the heat input capacity limits of the existing burners, this evaporation of water can be overcome by burning more fuel with an accompanying increase in emissions of other pollutants.

The most significant adverse impact resulting from SCR or SNCR is an increase in the amount of refinery fuel gas used to overcome heat losses. The increase in fuel use results in incrementally higher emissions of other pollutants from the combustion unit.

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2.2.2.2 SO_2 Control

Tesoro evaluated the elimination of routine use of fuel oil combustion in Unit F-103 heater. This option results in a very small cost at this time and would reduce SO_2 emissions from the unit by about eight tpy (current SO_2 emissions are 160.5 tpy). If the actual use of fuel oil in this heater were higher, even approaching the annual heat input requirements of the heater, the SO_2 reductions would be even larger. Tesoro is concerned that in the future as the costs of fuel oil and refinery fuel gas change, fuel oil use could again become cheaper than natural gas/refinery fuel gas costs.

2.2.2.3 PM/PM_{10} Control

Tesoro has evaluated ending the routine use of fuel oil in this heater as a BART technology. As noted above, the alternative has essentially no current cost to the plant and will reduce plant-wide PM emissions by about 26 percent or 7.7 tpy (the current emissions for this unit are 9.1 tpy).

2.2.2.4 Proposed BART

Tesoro has evaluated the technically feasible controls for cost effectiveness and energy consumption and other non-air quality impacts. Based on that evaluation, they propose the installation of ULNBs as BART for NO_X on this heater.

Tesoro has also proposed BART for SO_2 and PM/PM_{10} for this heater as ending the routine use of fuel oil. Tesoro wants to retain fuel oil use in this heater to cover periods of natural gas curtailment, start-up, and shutdown of major process units in the refinery, and emergency conditions that would limit the availability of refinery fuel gas.

2.2.3 Unit F-104, Gasoline Splitter Reboiler

The Gasoline Splitter Reboiler is a heater used to heat the gasoline fraction from the Crude Distillation Unit for further distillation steps. It has six floor-mounted ULNB burners. This 53 MMBtu/hr (average rate 15.5MMBtu/hr) heater was constructed in 1972 and utilizes only refinery fuel gas.

2.2.3.1 NO_X Control

This heater currently uses ULNBs installed in 2004. The current emission rates for this heater are 4.7 tpy, at an average concentration of 48 ppmv. After an evaluation of technical feasibility to retrofit the heater with the NO_X controls in Table 2-1, the only control evaluated for cost effectiveness for this heater was SCR. The average cost effectiveness of SCR was found to exceed $100,000/ton removed. No further analyses were performed.

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2.2.3.2 Proposed BART

Based on their cost evaluation, the relative newness of the existing ULNBs installed in this unit and the high cost of SCR, Tesoro proposes the currently installed ULNBs as BART for NO_X on this heater.

Tesoro's continued use of the refinery fuel gas system as plant-wide SO_2 BART applies to Unit F-104. The continued use of low sulfur refinery fuel gas minimizes potential particulate emissions as much as possible and is considered BART for PM/PM10.

2.2.4 Unit F-304, CO Boiler No. 2

The Unit F-304, CO Boiler makes use of the thermal energy in the carbon monoxide rich flue gas from the Fluid Catalytic Cracking Unit (FCCU) catalyst regenerator by combusting the gas and providing steam for many plant processes. This unit exhausts through a common stack with the other CO Boiler (F-302) which also receives off gas from the FCCU regenerator. Refinery fuel gas is used as a supplemental fuel when required. This unit is capable of operating as a conventional refinery fuel gas fired boiler when the catalyst regenerator is not operating. This 322 MMBtu/hr (average rate 184.5 MMBtu/hr) heater was constructed in 1964 and has four wall-mounted burners.

2.2.4.1 NO_X Control

This boiler currently uses "default" original manufacturers design burners as originally installed in 1964. The current emission rates for this heater are 836 tpy. After an evaluation of the technical feasibility of the NO_X controls in Table 2-1, Tesoro evaluated the cost effectiveness of ULNB, SCR, SNCR, ULNB plus SCR, and ULNB plus SNCR. Table 2-3 lists pertinent criteria and cost effectiveness.

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Table 2-3. UNIT F-304 NO_X CONTROLS EVALUATED IN DETAIL

Control Technology	Emission Reduction Anticipated – EPA Method	Average Cost Effectiveness ($/ton) – EPA Method	Emission Reduction Anticipated – Vendor Cost Factor Analysis	Annual NO_X Emission Rate (tpy) – Vendor Removal Rates	Average Cost Effectiveness ($/ton) – Vendor Cost Factor Analysis
No controls	--	--	--	836	--
LoTO$_X$™[9]	80%	--	80%	167	$14873
LNB + SNCR	--	--	39%	514	$4592
SNCR	50%	$2403	35%	543	$4534
LNB	--	--	5.5%	790	$6045

Initially, Tesoro evaluated only the use of SNCR with the EPA method screen. Consultation with vendors and receipt of information on performance and price estimates resulted in the evaluation of the additional controls. All of these controls are capable of being installed on this heater.

The installation of SNCR will slightly reduce the gross heat available to provide steam. This reduction is due to the need to evaporate the water included in the aqua ammonia used in the proposed SNCR system. During normal operating rates, the heat input capacity limits of the existing burners is able to overcome this loss by burning more fuel, with an accompanying increase in emissions of other pollutants.

As noted above, the LoTO$_X$™ system has been installed on very few other CO boiler/regenerator units. The installations provide both NO_X and particulate control. The existing particulate and SO_2 control is incompatible with the acidic environment produced in the LoTO$_X$™ process and cannot be retrofitted with the ozone injection step. The vendor has advised Tesoro that if replacement of the current Flue Gas Scrubber system were not possible, the LoTO$_X$™ system would have to be installed after the Flue Gas Scrubber.[10]

As an alternative to installation after the existing Flue Gas Scrubber, it could be replaced with a new LoTO$_X$™ system and BELCO Wet Gas Scrubber. While not analyzed, the cost of removal of the 3-year old Flue Gas Scrubber and replacement with a new LoTO$_X$™ system was considered to be very costly and was not evaluated.

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[9] Cost effectiveness shown is the lowest of the four analyses made. The differences in the four LoTO$_X$™ cost analyses are primarily due to the cost of oxygen to produce ozone. The range of oxygen prices is $75/ton to $180/ton.

[10] Response to questions regarding BART analysis, May 2, 2008, pp. 3-6.

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2.2.4.2 SO_2 Control

The FCCU Catalyst Regenerator burns carbon contamination off of the catalyst to reactivate it. Sulfur in the catalyst contaminants is also oxidized in the catalyst regenerator step. Gases from the FCCU Catalyst Regenerator are exhausted to Units F-302 and F-304, CO Boilers.

The Flue Gas Scrubber installed on the stack for Units F-302 and F-304 (CO Boilers No. 1 and 2, respectively), provides a large decrease in SO_2 and sulfuric acid emitted. The scrubber was installed to comply with federal hazardous air pollutant (MACT) requirements for the FCCU Catalyst Regenerators. Tesoro selected the Flue Gas Scrubber over a cyclone particulate collector to meet the federal requirement because the scrubber also provided a significant SO_2 emission reduction.

2.2.4.3 PM/PM_{10} Control

Unit F-304, CO Boiler No. 2 includes a Flue Gas Scrubber to remove particulate from the exhaust form the FCCU Catalyst Regenerator. This Flue Gas Scrubber was recently installed by the plant to comply with the MACT requirements to control emissions of particulate Hazardous Air Pollutants from the FCCU Catalyst Regenerator. At that time, Tesoro evaluated installation of an alternate particulate control device but chose to install the Flue Gas Scrubber instead. The choice was based on simplified maintenance, ability to comply with MACT standard, and the ability to reduce SO_2 and SO_3 emissions from the FCCU Catalyst Regenerator and CO Boilers No. 1 and 2. While only Unit F-304 (CO Boiler No. 2) is subject to BART, both boilers exhaust through a common stack.

2.2.4.4 Proposed BART

Tesoro has evaluated the technically feasible controls for cost effectiveness, energy consumption and other non-air quality impacts. There is no adverse energy, air quality, or non-air quality impacts resulting from any of these controls on this unit.

Based on the original evaluation, Tesoro proposed the installation of low-NOX burners and SNCR as BART for NOX on this unit. However, this initial evaluation did not reflect the cost incurred by Tesoro for being required to take the F-304 boiler offline outside the normal turnaround schedule. With these costs included in the analysis, the use of the existing burners has been determined to be BART for NOX. See Section 2.4 for more information. BART for SO2 and PM/PM10 is the existing Flue Gas scrubber

2.2.5 Unit F-6650, Catalytic Reformer Feed Heater

The Catalytic Reformer Feed Heater is used to heat the gasoline (naphtha) fraction for reforming into higher octane isomers. The heater has 10 floor-mounted burners and exhausts into two common stacks with Units F-6651, F-6652, and F-6653.[11] The heater is rated at 157 MMBtu/hr (average rate 124.7MMBtu/hr). The heater was constructed in 1971 and utilizes refinery fuel gas. The burners used are of original equipment design and emit relatively high levels of NO_X compared to current LNB or ULNB designs.

2.2.5.1 NO_X Control

This heater currently uses "default" original manufacturers design burners as originally installed in 1971. The current emission rates for this heater are 144.7 tpy, at an average concentration of 172 ppmv. After an evaluation of technical feasibility to retrofit the heater with the NO_X controls in Table 2-1, Tesoro evaluated the cost effectiveness of LNB, ULNB, SCR, LNB plus SCR, and ULNB plus SCR. Table 2-4 lists pertinent criteria and cost effectiveness.

Table 2-4. UNIT F-6650 NO_X CONTROLS EVALUATED IN DETAIL

Control Technology	Emission Reduction Anticipated – EPA Method	Annual NO_X Emission Rate (tpy)	Average Cost Effectiveness ($/ton) – EPA Method	Emission Reduction Anticipated – Vendor Cost Factor Analysis	Average Cost Effectiveness ($/ton) – Vender Cost Factor Analysis [12]
No Controls	--	144.7	--	--	--
LNB	60%	36.2	$4938	60%	$3349
ULNB	75%	36.2	$3973	60%	$3349
SCR	90%	14.5	$8473	90%	$10776
ULNB + SCR	97.5%	3.6	$10878	96%	$10772
LNB + SCR	96%	5.8	$11030	96%	$10772

All of these controls are capable of being installed on this heater. Flame impingement from LNB and ULNB burners is not an issue; however, there is inadequate space under the heater to retrofit ULNBs.

Adequate space exists to install SCR. Installation of an SCR system is evaluated for all four heaters because all four heaters exhaust to a common plenum leading to the two common stacks. The SCR addition can be done with or without a duct burner to raise the flue gas temperature. A duct burner would be fueled by refinery fuel gas. The costs for SCR presented in Table 2-4 are for the duct burner option. The non-duct burner option has a marginally different cost (see the Tesoro BART analysis report).

[11] Refer to the Tesoro BART analysis for a more detailed description of how these heaters work together.
[12] Averaged across Units F-6650, F-6651, F-6652, and F-6653.

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2.2.5.2 Proposed BART

Tesoro has evaluated the technically feasible controls for cost effectiveness, energy consumption and other non-air quality impacts. There is no adverse energy, air quality, or non-air quality impacts resulting from any of these controls on this unit.

In their original BART evaluation, Tesoro proposed the installation of LNBs as BART for NOX on this heater. However, this initial evaluation did not reflect the cost incurred by Tesoro for being required to take the F-6650 heater offline outside the normal turnaround schedule. With these costs included in the analysis, the use of the existing burners has been determined to be BART for NOX. See Section 2.4 for more information

The unit is fueled by refinery fuel gas. Tesoro proposed its current use of refinery fuel gas to control SO_2 emissions from Unit F-6650. The continued use of low sulfur refinery fuel gas minimizes potential particulate emissions as much as possible and is considered BART for PM/PM10.

2.2.6 Unit F-6651, Catalytic Reformer Inter-Reactor Heater

The Catalytic Reformer Inter-Reactor Heater is used to heat the gasoline fraction at an intermediate point in the process of reforming gasoline into higher octane isomers. The heater has 16 floor-mounted burners in two connected fireboxes and exhausts into two common stacks with Units F-6650, F-6652, and F-6653.[13] The heater is rated at 157 MMBtu/hr (average rate 90.4MMBtu/hr). The heater was constructed in 1971 and utilizes refinery fuel gas. The burners used are of original equipment design and emit relatively high levels of NO_X compared to current LNB or ULNB designs.

2.2.6.1 NO_X Control

This heater currently uses “default” original manufacturers design burners as originally installed in 1971. The current emission rates for this heater are 104.7 tpy, at an average concentration of 171 ppmv. After an evaluation of technical feasibility to retrofit the heater with the NO_X controls in Table 2-1, Tesoro evaluated the cost effectiveness of LNB, ULNB, SCR, LNB plus SCR, and ULNB plus SCR. Table 2-5 lists pertinent criteria and cost effectiveness.

[13] Refer to the Tesoro BART analysis for a more detailed description of how these heaters work together.

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Table 2-5. UNIT F-6651 NO_X CONTROLS EVALUATED IN DETAIL

Control Technology	Emission Reduction Anticipated – EPA Method	Annual NO_X Emission Rate (tpy)	Average Cost Effectiveness ($/ton) – EPA Method	Emission Reduction Anticipated – Vendor Cost Factor Analysis	Average Cost Effectiveness ($/ton) – Vendor Cost Factor Analysis[14]
No controls	--	104.7	--	--	--
LNB	60%	42	$4614	60%	$3349
ULNB	75%	26.2	$3722	60%	$3349
SCR	90%	10.5	$11260	90%	$10776
LNB + SCR	96%	4.2	$13440	96%	$10772
ULNB + SCR	97.5%	2.6	$13257	96%	$10772

All of these controls are capable of being installed on this heater. Flame impingement from LNB and ULNB burners is not an issue; however, there is inadequate space under the heater to retrofit ULNBs.

Adequate space exists to install SCR. Installation of an SCR system is evaluated for all four heaters because all four heaters exhaust to a common plenum leading to the two common stacks. The SCR addition can be done with or without a duct burner to raise the flue gas temperature. A duct burner would be fueled by refinery fuel gas. The costs for SCR presented in Table 2-5 are for the duct burner option. The non-duct burner option has a marginally different cost (see the Tesoro BART analysis report).

2.2.6.2 Proposed BART

Tesoro has evaluated the technically feasible controls for cost effectiveness, energy consumption and other non-air quality impacts. There is no adverse energy, air quality, or non-air quality impacts resulting from any of these controls on this unit.

In their original BART evaluation, Tesoro proposed the installation of LNBs as BART for NOX on this heater. However, this initial evaluation did not reflect the cost incurred by Tesoro for being required to take the F-6651 heater offline outside the normal turnaround schedule. With these costs included in the analysis, the use of the existing burners has been determined to be BART for NOX. See Section 2.4 for more information.

The unit is fueled by refinery fuel gas. Tesoro proposed its current use of refinery fuel gas to control SO_2 emissions from Unit F-6651. The continued use of low sulfur refinery fuel gas minimizes potential particulate emissions as much as possible and is considered BART for PM/PM10.

[14] Averaged across Units F-6650, F-6651, F-6652, and F-6653.

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2.2.7 Unit F-6652, Catalytic Reformer Inter-Reactor Heater

The Catalytic Reformer Inter-Reactor Heater is used to heat the gasoline fraction at an intermediate point in the process of reforming gasoline into higher octane isomers. The heater has seven floor-mounted burners which exhaust into two common stacks with Units F-6650, F-6651, and F-6653.[15] The heater is rated at 74 MMBtu/hr (average rate 41.7 MMBtu/hr). The heater was constructed in 1971 and utilizes refinery fuel gas. The burners used are of original equipment design and emit relatively high levels of NO_X compared to current LNB or ULNB designs.

2.2.7.1 NO_X Control

This heater currently uses "default" original manufacturers design burners as originally installed in 1971. The current emission rates for this heater are 17.1 tpy, at an average concentration of 61 ppmv. After an evaluation of technical feasibility to retrofit the heater with the NO_X controls in Table 2-1, Tesoro evaluated the cost effectiveness of LNB, ULNB, SCR, LNB plus SCR, and ULNB plus SCR. Table 2-6 lists pertinent criteria and cost effectiveness.

Table 2-6. UNIT F-6652 NO_X CONTROLS EVALUATED IN DETAIL

Control Technology	Emission Reduction Anticipated – EPA Method	Annual NO_X Emission Rate (tpy)	Average Cost Effectiveness ($/ton) – EPA Method	Emission Reduction Anticipated – Vendor Cost Factor Analysis	Average Cost Effectiveness ($/ton) – Vendor Cost Factor Analysis[16]
No controls	--	17.1	--	--	--
LNB	60%	6.8	$16818	60%	$3349
ULNB	75%	4.3	$13648	73.5%	$3349
SCR	90%	1.7	$41599	90%	$10776
LNB + SCR	96%	0.7	$49510	96%	$10772
ULNB + SCR	97.5%	0.4	$48895	96%	$10772

All of these controls are capable of being installed on this heater. Flame impingement from LNB and ULNB burners is not an issue. ULNBs were found to be a good technical fit due to adequate space under the heater. The ULNBs proposed by the manufacturer would have a NO_X emission rate of about 1/3 of their alternate LNB units at a 50 percent increase in cost.

Adequate space exists to install SCR. Installation of an SCR system is evaluated for all four heaters because all four heaters exhaust to a common plenum leading to the two common stacks. The SCR addition will require a duct burner to raise the flue gas temperature enough to

[15] Refer to the Tesoro BART analysis for a more detailed description of how these heaters work together.
[16] Averaged across Units F-6650, F-6651, F-6652, and F-6653.

consistently meet the temperature requirements of a SCR catalyst. The duct burner would be fueled by refinery fuel gas.

2.2.7.2 Proposed BART

Tesoro has evaluated the technically feasible controls for cost effectiveness, energy consumption and other non-air quality impacts. There is no adverse energy, air quality, or non-air quality impacts resulting from any of these controls on this unit.

In their original BART evaluation, Tesoro proposed the installation of ULNBs as BART for NOX on this heater. However, this initial evaluation did not reflect the cost incurred by Tesoro for being required to take the F-6652 heater offline outside the normal turnaround schedule. With these costs included in the analysis, the use of the existing burners has been determined to be BART for NOX. See Section 2.4 for more information.
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The unit is fueled by refinery fuel gas. Tesoro proposed its current use of refinery fuel gas to control SO_2 emissions from Unit F-6652. The continued use of low sulfur refinery fuel gas minimizes potential particulate emissions as much as possible and is considered BART for PM/PM10.

2.2.8 Unit F-6653, Catalytic Reformer Inter-Reactor Heater

The Catalytic Reformer Inter-Reactor Heater is used to heat the gasoline fraction at an intermediate point in the process of reforming gasoline into higher octane isomers. The heater has three floor -mounted burners which exhaust into two common stacks with Units F-6650, F-6651, and F-6652.[17] The heater is rated at 42 MMBtu/hr (average rate 31.4 MMBtu/hr). The heater was constructed in 1971 and utilizes refinery fuel gas. The burners used are of original equipment design, emitting relatively high levels of NO_X compared to current LNB or ULNB designs.

2.2.8.1 NO_X Control

This heater currently uses "default" original manufacturer design burners as originally installed in 1971. The current emission rates for this heater are 13 tpy, at an average concentration of 61 ppmv. After an evaluation of technical feasibility to retrofit the heater with the NO_X controls in Table 2-1, Tesoro evaluated the cost effectiveness of LNB, ULNB, SCR, LNB plus SCR, and ULNB plus SCR. Table 2-7 lists pertinent criteria and cost effectiveness.

[17] Refer to the Tesoro BART analysis for a more detailed description of how these heaters work together.

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Table 2-7. UNIT F-6653 NO_X CONTROLS EVALUATED IN DETAIL

Control Technology	Emission Reduction Anticipated – EPA Method	Annual NO_X Emission Rate (tpy)	Average Cost Effectiveness ($/ton) – EPA Method	Emission Reduction Anticipated – Vendor Cost Factor Analysis	Average Cost Effectiveness ($/ton) – Vendor Cost Factor Analysis [18]
No controls	--	13	--	--	--
LNB	60%	6.8	$19190	60%	$3349
ULNB	75%	3.3	$15604	73.5%	$3349
SCR	90%	1.3	$38829	90%	$10776
LNB + SCR	96%	0.7	$48396	96%	$10772
ULNB + SCR	97.5%	0.3	$47845	96%	$10772

All of these controls are capable of being installed on this heater. Flame impingement from LNB and ULNB burners is not an issue. ULNBs were found to be a good technical fit due to adequate space under the heater. The ULNBs proposed by the manufacturer would have a NO_X emission rate of about one-third of their alternate LNB units at a 50 percent increase in cost.

Adequate space exists to install SCR. Installation of an SCR system is evaluated for all four heaters because all four heaters exhaust to a common plenum leading to the two common stacks. The SCR addition will require a duct burner to raise the flue gas temperature enough to consistently meet the temperature requirements of a SCR catalyst. The duct burner would be fueled by refinery fuel gas.

2.2.8.2 Proposed BART

Tesoro has evaluated the technically feasible controls for cost effectiveness, energy consumption and other non-air quality impacts. There is no adverse energy, air quality, or non-air quality impacts resulting from any of these controls on this unit.

In their original BART evaluation, Tesoro proposed the installation of ULNBs as BART for NOX on this heater. However, this initial evaluation did not reflect the cost incurred by Tesoro for being required to take the F-6653 heater offline outside the normal turnaround schedule. With these costs included in the analysis, the use of the existing burners has been determined to be BART for NOX. See Section 2.4 for more information.

The unit is fueled by refinery fuel gas. Tesoro proposed its current use of refinery fuel gas to control SO_2 emissions from Unit F-6653. The continued use of low sulfur refinery fuel gas minimizes potential particulate emissions as much as possible and is considered BART for PM/PM10.

[18] Averaged across Units F-6650, F-6651, F-6652, and F-6653.

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2.2.9 Unit F-654, Catalyst Feed Hydrotreater Heater

The Catalyst Feed Hydrotreater Heater is used to heat the deasphalted heavy oil fraction from the crude unit prior to sulfur removal in the hydrotreater. The heater has three floor-mounted burners. The heater is rated at 16.5 MMBtu/hr (average rate 7.6 MMBtu/hr). The heater was constructed in 1964 and utilizes refinery fuel gas. The burners used are of original equipment design and emit relatively high levels of NO_X compared to current LNB or ULNB designs.

2.2.9.1 NO_X Control

This heater currently uses “default” original manufacturers design burners as originally installed in 1964. The current emission rates for this heater are 2.6 tpy, at an average concentration of 52 ppmv. After an evaluation of technical feasibility to retrofit the heater with the NO_X controls in Table 2-1, Tesoro evaluated the cost effectiveness of ULNB, SCR, and ULNB plus SCR. Table 2-8 lists pertinent criteria and cost effectiveness.

Table 2-8. UNIT F-654 NO_X CONTROLS EVALUATED IN DETAIL

Control Technology	Emission Reduction Anticipated – EPA Method	Annual NO_X Emission Rate (tpy)	Average Cost Effectiveness ($/ton) – EPA Method	Emission Reduction Anticipated – Vendor Cost Factor Analysis	Average Cost Effectiveness ($/ton) – Vendor Cost Factor Analysis
No controls	--	2.6	--	--	--
ULNB	75%	0.7	$36131	73.5%	$43093
SCR	90%	0.3	$104352	90%	--
ULNB + SCR	97.5%	0.1	$124119	96%	--

All of these controls are capable of being installed on this heater. Adequate space exists to install ULNBs and SCR. ULNBs were found to be a good technical fit due to adequate space under the heater. A vender provided the price quotation for ULNBs that could be installed in the heater.

A screening analysis using EPA cost estimating procedures was done for installation of an SCR system. As can be seen, the cost of SCR is extremely high, primarily due to the very low uncontrolled NO_X emissions.

There is no adverse energy, air quality, or non-air quality impacts resulting from any of these controls on this unit.

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2.2.9.2 Proposed BART

Tesoro has evaluated the technically feasible controls for cost effectiveness, energy consumption and other non-air quality impacts. Based on that evaluation, they propose the currently installed burners as BART for NO_X on this heater.

The unit is fueled by refinery fuel gas. Tesoro proposed its current use of refinery fuel gas to control SO_2 emissions from Unit F-654. The continued use of low sulfur refinery fuel gas minimizes potential particulate emissions as much as possible and is considered BART for PM/PM10.

2.2.10 Unit F-6600, Naphtha Hydrotreater Feed Preheater

The Naphtha Hydrotreater Feed Preheater is used to heat the naphtha fraction prior to sulfur removal in the naphtha hydrotreater. The heater has four floor-mounted burners. The heater is rated at 71.5 MMBtu/hr (average rate 46.3 MMBtu/hr). The heater was constructed in 1971 and utilizes refinery fuel gas. The burners used are of original equipment design and emit relatively high levels of NO_X compared to current LNB or ULNB designs.

2.2.10.1 NO_X Control

This heater currently uses “default” original manufacturers design burners as originally installed in 1971. The current emission rates for this heater are 18.9 tpy, at an average concentration of 61 ppmv. After an evaluation of technical feasibility to retrofit the heater with the NO_X controls in Table 2-1, Tesoro evaluated the cost effectiveness of LNB, ULNB, SNCR, and ULNB plus SNCR. Table 2-9 lists pertinent criteria and cost effectiveness.

Table 2-9. UNIT F-6600 NO_X CONTROLS EVALUATED IN DETAIL

Control Technology	Emission Reduction Anticipated – EPA Method	Annual NO_X Emission Rate (tpy)	Average Cost Effectiveness ($/ton) – EPA Method	Emission Reduction Anticipated – Vendor Cost Factor Analysis	Average Cost Effectiveness ($/ton) – Vendor Cost Factor Analysis
No controls	--	18.9	--	--	--
LNB	60%	8	$26647	--	--
ULNB	75%	5	$21491	73.5%	$17581
SNCR	50%	9	$23779	--	--
LNB + SNCR	80%	4	$34847	--	--
ULNB + SNCR	87.5%	2	$32009	--	--

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All of these controls are capable of being installed on this heater. Adequate space exists to install ULNBs and SNCR. ULNBs were found to be a good technical fit due to adequate space under the heater and lower emissions than LNBs.

A screening analysis using EPA's cost estimating procedures was done for installation of these of controls. As can be seen, the costs estimated using EPA's methods is extremely high, primarily due to the very low uncontrolled NO_X emissions. A vendor provided the price quotation for ULNBs that could be installed in the heater.

2.2.10.2 Proposed BART

Tesoro has evaluated the technically feasible controls for cost effectiveness, energy consumption and other non-air quality impacts. There is no adverse energy, air quality, or non-air quality impacts resulting from any of these controls on this unit. Based on that evaluation, they propose the currently installed burners as BART for NO_X on this heater.

The unit is fueled by refinery fuel gas. Tesoro proposed its current use of refinery fuel gas to control SO_2 emissions from Unit F-6600. The continued use of low sulfur refinery fuel gas minimizes potential particulate emissions as much as possible and is considered BART for PM/PM10.

2.2.11 Unit F-6601, Naphtha Hydrotreater Stabilizer Column Reboiler

The Naphtha Hydrotreater Stabilizer Column Reboiler is used to heat the naphtha fraction prior to sulfur removal in the naphtha hydrotreater. The heater has four floor-mounted burners. The heater is rated at 75 MMBtu/hr (average rate 48.3 MMBtu/hr). The heater was constructed in 1971 and utilizes refinery fuel gas. The burners used are of original equipment design and emit relatively high levels of NO_X compared to current LNB or ULNB designs.

2.2.11.1 NO_X Control

This heater currently uses "default" original manufacturers design burners as originally installed in 1971. The current emission rates for this heater are 19.8 tpy, at an average concentration of 61 ppmv. After an evaluation of technical feasibility to retrofit the heater with the NO_X controls in Table 2-1, Tesoro evaluated the cost effectiveness of LNB, ULNB, SNCR, and ULNB plus SNCR. Table 2-10 lists pertinent criteria and cost effectiveness.

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Table 2-10. UNIT F-6601 NO_X CONTROLS EVALUATED IN DETAIL

Control Technology	Emission Reduction Anticipated – EPA Method	Annual NO_X Emission Rate (tpy)	Average Cost Effectiveness ($/ton) – EPA Method	Emission Reduction Anticipated – Vendor Cost Factor Analysis	Average Cost Effectiveness ($/ton) – Vendor Cost Factor Analysis
No controls	--	19.8	--	--	--
LNB	60%	8	$28538	--	--
ULNB	75%	5	$22995	73.5%	$17150
SCR	50%	2	$36638	--	--
LNB + SCR	80%	1	$52184	--	--
ULNB + SCR	87.5%	0.5	$51509	--	--

All of these controls are capable of being installed on this heater. Adequate space exists to install ULNBs and SNCR. ULNBs were found to be a good technical fit due to adequate space under the heater and have lower emission rates than LNBs.

A screening analysis using EPA's cost estimating procedures was done for installation of these of controls. As can be seen, the costs estimated using EPA's methods is extremely high, primarily due to the very low uncontrolled NO_X emissions. A vendor provided the price quotation for ULNBs that could be installed in the heater.

2.2.11.2 Proposed BART

Tesoro has evaluated the technically feasible controls for cost effectiveness, energy consumption and other non-air quality impacts. There is no adverse energy, air quality, or non-air quality impacts resulting from any of these controls on this unit. Based on that evaluation, they propose the currently installed burners as BART for NO_X on this heater.

The unit is fueled by refinery fuel gas. Tesoro proposed its current use of refinery fuel gas to control SO_2 emissions from Unit F-6601. The continued use of low sulfur refinery fuel gas minimizes potential particulate emissions as much as possible and is considered BART for PM/PM10.

2.2.12 Unit F-6602, Naphtha Hydrotreater Feed Preheater

The Naphtha Hydrotreater Feed Preheater is used to heat the naphtha fraction prior to sulfur removal in the naphtha hydrotreater. The heater has four floor-mounted burners. The heater is rated at 75 MMBtu/hr (average rate 28 MMBtu/hr). The heater was constructed in 1971 and utilizes refinery fuel gas. The burners used are of original equipment design and emit relatively high levels of NO_X compared to current LNB or ULNB designs.

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2.2.12.1 NO_X Control

This heater currently uses "default" original manufacturers design burners as originally installed in 1971. The current emission rates for this heater are 1.3 tpy, at an average concentration of 61 ppmv. After an evaluation of technical feasibility to retrofit the heater with the NO_X controls in Table 2-1, Tesoro evaluated the cost effectiveness of LNB, ULNB, SNCR, and ULNB plus SNCR. Table 2-11 lists pertinent criteria and cost effectiveness.

Table 2-11. UNIT F-6602 NO_X CONTROLS EVALUATED IN DETAIL

Control Technology	Emission Reduction Anticipated – EPA Method	Annual NO_X Emission Rate (tpy)	Average Cost Effectiveness ($/ton) – EPA Method	Emission Reduction Anticipated – Vendor Cost Factor Analysis	Average Cost Effectiveness ($/ton) – Vendor Cost Factor Analysis
No controls	--	18.9	--	--	--
LNB	60%	8	$26647	--	--
ULNB	75%	5	$21491	73.5%	$17581
SNCR	50%	9	$23779	--	--
LNB + SNCR	80%	4	$34847	--	--
ULNB + SNCR	87.5%	2	$32009	--	--

All of these controls are capable of being installed on this heater. Adequate space exists to install ULNBs and SNCR. ULNBs were found to be a good technical fit due to adequate space under the heater.

A screening analysis using EPA's cost estimating procedures was done for installation of these of controls. As can be seen, the costs estimated using EPA's methods is extremely high, primarily to the very low uncontrolled NO_X emissions. A vendor provided the price quotation for ULNBs that could be installed in the heater.

2.2.12.2 Proposed BART

Tesoro has evaluated the technically feasible controls for cost effectiveness, energy consumption and other non-air quality impacts. There is no adverse energy, air quality, or non-air quality impacts resulting from any of these controls on this unit. Based on that evaluation, they propose the currently installed burners as BART for NO_X on this heater.

The unit is fueled by refinery fuel gas. Tesoro proposed its current use of refinery fuel gas to control SO_2 emissions from Unit F-6602. The continued use of low sulfur refinery fuel gas minimizes potential particulate emissions as much as possible and is considered BART for PM/PM10.

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2.2.13 Unit F-6654, Catalytic Reformer Stabilizer Column Reboiler

The Catalytic Reformer Stabilizer Column Reboiler is used to heat the gasoline fraction at an intermediate stage in the reforming process. The heater has three floor-mounted burners. The heater is rated at 35 MMBtu/hr (average rate 24.6 MMBtu/hr). The heater was constructed in 1971 and utilizes refinery fuel gas. The burners used are of original equipment design and emit relatively high levels of NO_X compared to current LNB or ULNB designs.

2.2.13.1 NO_X Control

This heater currently uses "default" original manufacturers design burners as originally installed in 1971. The current emission rates for this heater are 10.2 tpy, at an average concentration of 59 ppmv. After an evaluation of technical feasibility to retrofit the heater with the NO_X controls in Table 2-1, Tesoro evaluated the cost effectiveness of LNB, ULNB, SNCR, and ULNB plus SNCR. Table 2-12 lists pertinent criteria and cost effectiveness.

Table 2-12. UNIT F-6654 NO_X CONTROLS EVALUATED IN DETAIL

Control Technology	Emission Reduction Anticipated – EPA Method	Annual NO_X Emission Rate (tpy)	Average Cost Effectiveness ($/ton) – EPA Method	Emission Reduction Anticipated – Vendor Cost Factor Analysis	Average Cost Effectiveness ($/ton) – Vendor Cost Factor Analysis
No controls	--	10.2	--	--	--
LNB	60%	4.0	$18952	--	--
ULNB	75%	2.6	$15483	73.5%	$11069
SCR	50%	5.1	$44084	--	--
LNB + SCR	80%	2.0	$53174	--	--
ULNB + SCR	87.5%	1.3	$52603	--	--

All of these controls are capable of being installed on this heater. Adequate space exists to install ULNBs and SNCR. ULNBs were found to be a good technical fit due to adequate space under the heater and to have lower emissions than LNBs.

A screening analysis using EPA's cost estimating procedures was done for installation of these of controls. As can be seen, the costs estimated using EPA's methods is extremely high, primarily to the very low uncontrolled NO_X emissions. A vendor provided the price quotation for ULNBs that could be installed in the heater.

2.2.13.2 Proposed BART

Tesoro has evaluated the technically feasible controls for cost effectiveness, energy consumption and other non-air quality impacts. There is no adverse energy, air quality, or non-air quality impacts resulting from any of these controls on this unit. Based on that evaluation, they propose the currently installed burners as BART for NO_X on this heater.

The unit is fueled by refinery fuel gas. Tesoro proposed its current use of refinery fuel gas to control SO_2 emissions from Unit F-6654. The continued use of low sulfur refinery fuel gas minimizes potential particulate emissions as much as possible and is considered BART for PM/PM10.

2.2.14 Unit F-6655, Catalytic Reformer Stabilizer Regeneration Gas Heater

The Catalytic Reformer Stabilizer Regeneration Gas Heater is used to heat the gasoline fraction at an intermediate stage in the reforming process. The heater has three floor-mounted burners. The heater is rated at 30 MMBtu/hr (average rate 11.5 MMBtu/hr). The heater was constructed in 1971 and utilizes refinery fuel gas. The burners used are of original equipment design and emit relatively high levels of NO_X compared to current LNB or ULNB designs.

2.2.14.1 NO_X Control

This heater currently uses “default” original manufacturers design burners as originally installed in 1971. The current emission rates for this heater are 3.3 tpy, at an average concentration of 55 ppmv. After an evaluation of technical feasibility to retrofit the heater with the NO_X controls in Table 2-1, Tesoro evaluated the cost effectiveness of LNB and ULNB. Due to unit size, temperature profiles, and configuration, SCR and SNCR were not technically feasible. Table 2-13 lists pertinent criteria and cost effectiveness.

Table 2-13. F-6655 NO_X CONTROLS EVALUATED IN DETAIL

Control Technology	Emission Reduction Anticipated – EPA Method	Annual NO_X Emission Rate (tpy)	Average Cost Effectiveness ($/ton) – EPA Method	Emission Reduction Anticipated – Vendor Cost Factor Analysis	Average Cost Effectiveness ($/ton) – Vendor Cost Factor Analysis
No controls	--	3.3	--	--	--
LNB	40%	2.0	$73228	--	--
LNB	60%	1.3	$48818	28.6%	$86519
ULNB	75%	0.8	$40047	--	--

At the initial technical evaluations, all of these burner designs were viewed as being able to be installed on this heater. Upon receipt of more detailed information from the vendor, it was found that only a LNB could fit into the space in and under the heater. Flame impingement from the burners is not an issue.

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A screening analysis using EPA's cost estimating procedures was done for installation of all three varieties of burners. As can be seen, the costs estimated using EPA's methods is extremely high, primarily to the very low uncontrolled NO_X emissions.

A vendor provided a price quotation for LNBS that could be installed in this application. The vendor quoted removal efficiency is based on the expected and guaranteed emission rates of the burners proposed for installation. Their control efficiency is lower than the generally accepted removal rates of LNBs.

2.2.14.2 Proposed BART

Tesoro has evaluated the technically feasible controls for cost effectiveness, energy consumption and other non-air quality impacts. There is no adverse energy, air quality, or non-air quality impacts resulting from any of these controls on this unit. Based on that evaluation, they propose the currently installed burners as BART for NO_X on this heater.

The unit is fueled by refinery fuel gas. Tesoro proposed its current use of refinery fuel gas to control SO_2 emissions from Unit F-6655. The continued use of low sulfur refinery fuel gas minimizes potential particulate emissions as much as possible and is considered BART for PM/PM10.

2.2.15 Flare X-819

Flare X-819 is used to combust process vent gases and vapors from loading operations that are not routed to the refinery gas system and gases from emergency releases of tank and process vessels. The flare operates all the time, but its primary function is to allow for the safe emergency venting of various process units in the refinery. Operation of the flare during emergency venting situations prevents hazardous conditions from occurring at the Tesoro refinery as a result of the emergency release of hydrocarbon vapors near process heaters.

The flare is a 2-stage, steam assisted flare of the "smokeless" design, rated at 244 MMBtu/hr and 2.6 million standard cubic feet per day (million scfd) of flared gas (0.5 million scfd in first stage and 2.1 million scfd in second stage). The flare was constructed in 1971 and utilizes refinery fuel gas for the pilot light fuel. While the potential to emit is considerably higher, for modeling purposes if the flare operated continuously at the modeled flare gas flow rate, it would emit 43.8 tons of SO_2 and 8.8 tons of NOx per year. Information presented indicates the flare meets the design criteria of 40 CFR 60.18 for elevated flares.

2.2.15.1 NO_X, SO_2, and PM/PM_{10} Control

There are no emission controls directly attributable to operation of flares. Reduction of routine flaring operations is the most common way to reduce non-emergency flare emissions. Tesoro already utilizes a flare gas recovery compressor and other measures to recover combustible gases and route them to the refinery fuel gas system. Adding a second compressor would recover gas from additional emergency vents that are currently routed directly to the flare system.

Tesoro evaluated addition of a second flare gas recovery compressor to reduce emissions from the flare. They estimated that this would reduce SO_2 emissions by about 10 tpy, have a capital cost of $2 million and a cost effectiveness of $21,960/ton.

2.2.15.2 Proposed BART

Tesoro proposed that BART for operations of the flare system is continued operation of the current system.

2.3 Evaluation of Controls for Cooling Water Towers 2 and 2a

The cooling water towers are used to cool returned "process cooling water" to prepare it for reintroduction to the process cooling water equipment. Current emissions of PM/PM_{10} from the cooling tower are approximately 0.2 lb/hr (0.88 tpy). The cooling towers were constructed in 1971 and include reasonable droplet drift control techniques for the time.

2.3.1 PM/PM_{10} Control

Tesoro requested an estimate for replacement of the current cooling tower drift control with a state-of-the-art system to reduce $PM//PM_{10}$ emissions from the cooling tower. This estimate was "on the order of $150,000" and would provide an 80 to 90 percent reduction in cooling tower drift emissions. Assuming the only cost involved with new drift elimination system is the capital cost, the estimated cost effectiveness is $41,781. Tesoro noted that the particulate formed by cooling towers tends to be larger in size and deposit on the area immediately around the cooling towers.

2.3.2 Proposed BART

After consideration of the cost per ton reduced and the small quantity of PM/PM_{10} that would be controlled, Tesoro proposed continued operation of the current system as BART for the cooling tower.

2.4 Compliance Schedule Based Considerations

Subsequent to the information submitted by Tesoro in 2008, Ecology and Tesoro entered discussions on the BART compliance schedule to install the emission controls proposed by Tesoro as BART. EPA Region 10 was asked to provide specific information on some aspects of the proposed compliance schedules.

The requirements for BART in 40 CFR Part 51, Subpart P include the following requirement addressing when a source is to meet the BART emission limitations.

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> A requirement that each source subject to BART be required to install and operate BART as expeditiously as practicable, but in no event later than 5 years after approval of the implementation plan revision.[19]

Based on an anticipated implementation plan revision approval about December 2010, all BART controls would need to be in operation by December 2015.

The installation of the proposed controls on Unit F-103 would meet the two primary constraints on the project: it could be accomplished within the normal turn-around schedule and within five years of the anticipated approval date of the state SIP.

The work on the CO Boiler, F-304, and the 4 catalytic reformer heaters, units F-6650–6653, either had to be accomplished outside of the normal turn-around schedule or would not occur till more than five years after the Ecology anticipated date of SIP approval. For these 5 units, Tesoro initially proposed a schedule based on complying with the BART limitation 5 years after the Regional Haze implementation plan was approved by EPA, and that the implementation plan approval date would be no earlier that the end of 2012, unless that date was less than 3 years prior to the routine, scheduled turn-around. One result of this proposal is that for these units, the earliest compliance date would be 2017. The company also proposed a provision that would further extend the compliance date for these units into the future if the SIP were approved after 2014.

The extended BART compliance date request by Tesoro was presented to EPA Region 10. The region advised Ecology that the proposal did not meet the plain requirements of the regional Haze rules.

The basis for Tesoro's proposed compliance dates relates to their schedule for turn-around activities. As appears common in the petroleum refining and other industries, the various process units at the plant are taken out of service for major maintenance and upgrades on a routine cycle between 1 and 7 years for industries in Washington. The petroleum refining industry takes process units out of service for major maintenance and upgrades at five year intervals. The refinery as a whole is never taken fully out of service, though work on primary processing units like the Crude Unit and the Catalytic Reformer significantly affect the quantity of refined products produced during those times.

Corporate policy for Tesoro requires the maintenance needs, modifications, and any desired upgrades to the units involved in a particular turn-around are determined three years before the work is completed. The 3 year period allows for identification of non-routine work or upgrades, planning level cost analysis and approval from plant and corporate management, followed by financing, design, and new equipment purchases , all of which need to occur prior to contracting for the work. Permitting with the local air pollution control agency is not started until financing is approved by company management and design is far enough along to allow the permitting

[19] 40 CFR 51.308(e)(1)(iv)

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process to begin. Permitting usually starts 12 to 18 months before the actual start of construction, depending on complexity of permitting.

Ecology has confirmed the outlines of this 3 year planning/construction process through contacts with other refineries and the management of the local air pollution control agency that oversees the 4 largest oil refineries in the Washington. In general this process is the same as at the other refineries, as is the 5 year period between turn-arounds.

CO Boiler 2 (F-304) and the catalytic reformer heaters (F-6650–6653) have a normal turn-around scheduled for 2012, less than 3 years after the BART order is issued, let alone the approval of the Regional Haze implementation plan, which Ecology anticipates to be the end of 2010. The next scheduled turnaround is scheduled for 2017.

As a result of Ecology's requested and EPA's confirmation that a 2017/18 BART compliance date did not comply with the requirements of the federal visibility rules, Tesoro investigated the costs to install the BART controls at a time other than the normal scheduled turn-around schedule, including accelerated installation in 2012. As a result, the cost to install the controls increases, not just in direct costs for installation of the controls, but in "lost opportunity" costs due to taking these units off-line for at an unanticipated time. The "lost opportunity costs" are a direct consequence of taking the units off line outside of the normal schedule. These costs are built into the planning and total cost of the routine turn-around schedule and as such are not an extraordinary cost in that context.

The process to retrofit an existing heater with new low NOx or Ultra low NOx heaters is not a simple process of turning the heater off, letting it cool sufficiently, unbolting the old burners and installing the new burners, and turning it back on, though that is in essence all that is done. The new burners have different flame length characteristics that need to be accounted for in revisions to the refractory brick in the heaters. The heater must be cool enough for a man to get inside to work on the refractory brick. The overall time to turn off the heater, cool it sufficiently to do the burner work, conduct test firings of the burners to assure the flame pattern is what it is supposed to be, and finally return the unit to service will take several weeks.

While the unit is off line, the remainder of the refinery either has to operate at reduced rate, or on purchased intermediate products purchased from others. The plant has inadequate storage tank capacity to handle an outage of the F304 and F-6650 – 6653 units and remain near full operating rate. The 'lost opportunity cost" is an extraordinary expense associated with the off-cycle project. As such, this becomes a site specific consideration in the cost to implement the burner retrofits on the CO Boiler and heaters[20].

[20] "The cost analysis should also take into account any site-specific design or other conditions identified above that affect the cost of a particular BART technology option." 40 CFR Part 51, Appendix Y, Section IV.4.a

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For Unit F-304, installation of the BART controls off the normal schedule causes the cost effectiveness to install the originally proposed BART controls of low NO_X burners and SNCR system to rise to $10,802/ton NO_X reduced from the original $4,592/ton NO_X reduced.

Similarly the costs to install the low and ultra low NO_X burners proposed for the catalytic reformer heaters (F-6650–6653) also increases to $13,190/ton NO_X reduced from the original $3,349/ton NO_X reduced.

In this evaluation, Ecology also compared these costs for burner replacement to the costs reported by another Washington state petroleum refinery that is subject to BART. The costs reported by Tesoro are in line with the costs reported by that refinery before the "lost opportunity costs" are removed from that refinery's cost calculations. At the other refinery, the "lost opportunity costs" are primarily due to the additional time required to install low NOx burners compared to a normal turn-around on the same unit.

As a result of the increased costs to install these controls "off schedule" Tesoro proposed that BART for NO_X from these units is the existing burners.

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3. VISIBILITY IMPACTS AND DEGREE OF IMPROVEMENT

The results of the Tesoro's modeling are shown in Table 3-1 for all Class I areas within 300 km of the plant plus the Columbia River Gorge National Scenic Area. The table shows the maximum day impairment due to Tesoro, the highest of the annual, 98th percentile days for the three years modeled, and the 98th percentile day of the modeled 3-year period. Also shown is the modeled visibility impairment resulting from the BART controls proposed by Tesoro. The shaded areas indicate values above the 0.5 dv threshold used to determine if a source contributes to visibility impairment.

The modeled emission rates were derived from operating records of the units and reflect the highest 24-hour emission rates within the three years that were modeled except for Unit F-304. Subsequent to the three years of the modeling period, this unit had a Flue Gas Scrubber installed and permitted with significantly lower emission rates. The emissions for Unit F-304 were scaled downward to reflect the currently-permitted emission rate for SO_2. For the other units with proposed BART controls, the effectiveness of the BART control was applied to the baseline emission rate to estimate the effect of BART on visibility impacts. The modeled emission rates are shown in Table 3-2.
Ecology modelers have reviewed the modeling performed by Tesoro and have found that the modeling complies with the Modeling Protocol and produces a reasonable result.

The modeled emission reductions proposed in the 2008 BART analysis result in substantial reduction in the visibility impairment caused by Tesoro in the most heavily impacted Class I areas modeled. At the three most heavily impacted Class I areas, Olympic National Park, North Cascades National Park, and the Alpine Lakes Wilderness, Tesoro's proposed BART controls would provide 0.2 to 0.5 dv reduction in visibility impairment in each of these areas.

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Table 3-1. MODELED BASELINE AND TESORO'S PROPOSED BART CONTROL VISIBILITY IMPACTS

Class I Area	Visibility Criterion	Baseline Emissions	Proposed BART
Alpine Lakes Wilderness	Max delta deciview		
	Max 98% value (8th high)	0.917	0.733
	3 years combined 98% value (22nd high)	0.810	0.640
Glacier Peak Wilderness	Max delta deciview		
	Max 98% value (8th high)	0.908	0.679
	3 years combined 98% value (22nd high)	0.847	0.675
Goat Rocks Wilderness	Max delta deciview		
	Max 98% value (8th high)	0.293	0.239
	3 years combined 98% value (22nd high)	0.281	0.234
Mt. Adams Wilderness	Max delta deciview		
	Max 98% value (8th high)	0.255	0.197
	3 years combined 98% value (22nd high)	0.228	0.185
Mt. Rainier National Park	Max delta deciview	1	
	Max 98% value (8th high)	0.712	0.582
	3 years combined 98% value (22nd high)	0.643	0.542
North Cascades National Park	Max delta deciview		
	Max 98% value (8th high)	1.001	0.751
	3 years combined 98% value (22nd high)	0.915	0.742
Olympic National Park	Max delta deciview		
	Max 98% value (8th high)	1.722	1.248
	3 years combined 98% value (22nd high)	1.399	1.025
Pasayten Wilderness	Max delta deciview		
	Max 98% value (8th high)	0.497	0.388
	3 years combined 98% value (22nd high)	0.497	0.385
Class II area modeled per the Modeling Protocol			
Columbia River Gorge National Scenic Area	Max delta deciview		
	Max 98% value (8th high)	0.162	0.1331
	3 years combined 98% value (22nd high)	0.119	0.105

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Table 3-2. MODELED EMISSION RATES

Unit	2002-2005 Rates (lb/hr)			Tesoro's Proposed BART (lb/hr)		
	SO_2	NO_X	PM_{10}	SO_2	NO_X	PM_{10}
F-103	160.5	53.5	9.1	152.5[a]	18.2[b]	1.4
F-104	39.8	0.8	0.4	39.8	0.8	0.4
F-304	24.9	242.7	14.1	24.9	148.0[b]	14.1
F-654	11.7	1.3	0.1	11.7	1.3	0.1
F-6600	56.0	13.1	0.9	56.0	13.1	0.9
F-6601	77.5	8.0	0.6	77.5	8.0	0.6
F-6602	25.6	8.3	0.6	25.6	8.3	0.6
F-6650/6651	332.0	101.3	2.8	332.0	28.3[d]	2.8
F-6652/6653	86.1	19.2	1.5	86.1	5.2[b]	1.5
F-6654	32.2	4.0	0.3	32.2	4.0	0.3
F-6655	15.1	2.9	0.2	15.1	2.9	0.2
X-819	10.0	2.0	0.4	10.0	2.0	0.4
CWT #2	0	0	0.1	0	0	0.1
CWT #2a	0	0	0.1	0	0	0.1

[a] Reflects ending fuel oil usage.
[b] Reflects reduction due to ultra-low-NO_X burners.
[c] Reflects reduction due to SNCR.
[d] Reflects reduction due to low-NO_X burners.

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4. ECOLOGY'S BART DETERMINATION

Ecology has reviewed the information submitted by Tesoro. We agree with Tesoro's proposal for BART. Ecology's determination of BART for Tesoro is shown in Table 4-1. In making its determination of BART for these units, Ecology reviewed the types of controls and emission rates required under EPA national Consent Orders issued to oil refineries and BACT and BART determinations or guidance from other states.

Units F-302 and F-304 both exhaust to the same particulate/SO_2 control device, the Flue Gas Scrubber. Currently the emission limitations attributable to the individual units and on the FCCR catalyst regenerator that feeds these two units are added together and regulated at the scrubber stack. For this BART determination, Ecology proposes to continue this practice for particulate and SO_2.

Ecology believes the NO_X emission controls and resulting emission reductions originally proposed as BART by Tesoro are appropriate and cost effective to implement as part of a regularly scheduled turn-around project. These controls may ultimately be required to be installed in the future as further progress toward meeting the visibility goals. However, the increased costs to accomplish the burner and SNCR installations outside of the unit's normal maintenance cycle, we determine that BART for Unit F-304 is the current emission controls and emission limitations.

Similar to Unit F-304, Ecology believes the emission controls and resulting emission reductions originally proposed as BART by Tesoro for the Catalytic Reformer Heaters F-6650–6653 are appropriate and cost effective to implement as part of a regularly scheduled turn-around project. These controls may ultimately be required to be installed in the future as further progress toward meeting the visibility goals. However, the increased costs to accomplish the low and ultra low NO_X burner installations outside of the unit's normal maintenance cycle, we determine that BART for Unit F-304 is the current emission controls and emission limitations.

As a result of the reduced NO_X emission reductions proposed as BART by Ecology when compared to Tesoro's initial BART proposal, the visibility improvement will be considerably less than was modeled by Tesoro and depicted in Section 3. Ecology has not remodeled the visibility improvement or required Tesoro to do so. Using only the 3-year, 98th percentile day at Olympic National Park as an example, we estimate that the visibility improvement due to this proposed BART determination to be about 0.1 dv, compared to Tesoro's modeled improvement for their original proposed BART of 0.37 dv for the same day.

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able 4-1. ECOLOGY'S DETERMINATION OF THE EMISSION CONTROLS THAT CONSTITUTE BART

	BART Control Technology	Emission Limitation
F-103		
PM/PM_{10}	Ending routine use of fuel oil. Use of refinery fuel gas or natural gas as primary fuel.	Fuel oil allowed only under the following conditions: • Natural gas curtailment. • Periods with limited refinery fuel gas availability, such as start-up and shutdown of major refinery process units, while major refinery process units are not operating and producing refinery gas, and emergency conditions as necessary to maintain safe operations or equipment shutdown. Test firing on fuel oil is allowed for up to 24 hours per calendar year.
SO_2	Ending routine use of fuel oil. Use of refinery fuel gas or natural gas as primary fuel.	Same as for PM/PM_{10}.
NO_X	Ultra-low-NO_X burners	Not to exceed 59.1 tpy, rolling (365 day) annual total calculated daily.
All Other BART-Eligible Units		
F-104, F-654, F-6600, F-6601, F-6602, F-6650, F-6651, F-6652, F6653, F-6654, F-6655, Flare X-819, Cooling Towers 2 and 2a	Currently installed combustion and other controls.	Per applicable NWCAA regulatory orders and regulations.

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APPENDIX A. PRINCIPLE REFERENCES USED

Anvil Associates, Tesoro NW, et al., “Tesoro Best Available Retrofit Technologies (BART) Assessment Assistance, Final Engineering Analysis Report,” February 2008. Amended by letter of May 2, 2008.

Geomatrix Consultants, “BART Determination Modeling Analysis Tesoro Anacortes Refinery,” February 2008.

E-mail communications between John Giboney of Tesoro and Alan Newman of Ecology, regarding modeling input for refinery gas-based SO_2 emissions, January 1-7, 2008.

E-mail communications between Toby Allen of NWCAA and Alan Newman of Ecology, regarding new refinery fuel gas treatment system, January 7, 2008.

E-mail communications between Nick Confuorto of Belco and Alan Newman of Ecology, regarding $LoTO_X$™ NO_X control system, March 3-4, 2008.

Emission Standards Division, U. S. Environmental Protection Agency, “Alternative Control Techniques Document–NO_X Emissions from Process Heaters (Revised),” September 1993.

N. Confuorto and J. Sexton, “Wet Scrubbing Based NO_X Control Using $LoTO_X$™ Technology–First Commercial FCC Start-Up Experience,” presented at NPRA Environmental Conference, September 24-25, 2007.

Belco Technologies Corp., “Flue Gas Scrubbing of FCCU Catalyst Regenerator Flue Gas–Performance, Reliability, and Flexibility – A Case History,” company report, undated.

S. Eaglson, N. Confuorto, S. Singhania, and N. Singahnia, “Controlling Fired Process Heater Emissions to Reduce Fuel Costs and Improve Air Quality,” presented at Petrotech 2007, 7th International Oil & Gas Conference and Exhibition, January 24, 2007.

NWCAA, “Air Operating Permit Statement of Basis, Tesoro Refining and Marketing Company, AOP # 013,” permit issued, November 25, 2002.

NWCAA, “Air Operating Permit, Tesoro Refining and Marketing Company, AOP # 013,” permit issued, November 25, 2002.

Gerald Bouziden, K. Gentile, R.G. Kunz, “Selective Catalytic Reduction of NO_X from Fluid Catalytic Cracking Case Study: BP Whiting Refinery,” presented at National Environmental & Safety Conference, April 23-24, 2002.

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Edward Sabo, "Status Report: Candidate Stationary Source Control Measures," presented at MRPO Regional Air Quality Workshop, November 16, 2005. Presentation summarizes control techniques applied to oil refineries under federal consent orders.

Mid-Atlantic Regional Air Management Association (MARAMA), "Assessment of Control Technology Options for Petroleum Refineries in the Mid-Atlantic Region, Final Technical Support Document," January 31, 2007.

James H. Wilson, Maureen A. Mullen, "Including the Emission Effects of Refinery Cases and Settlements in Projections for the EPA's CAAA Section 812 Analysis," Review performed under EPA Contract No. EP-D-04-006

Air and Waste Management Association, Editors, Anthony Buonicore and Wayne Davis, "Air Pollution Engineering Manual," Von Nostrand Reinhold, 1992.

EPA Air Pollution Control Cost Manual, Sixth Edition, EPA/452/B-02-001, January 2002.

APPENDIX B. ACRONYMS/ABBREVIATIONS

BACT	Best Available Control Technology
BART	Best Available Retrofit Technology
dv	Deciview(s)
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
FCCU	Fluid Catalytic Cracking Unit
FGR	Flue Gas Recirculation
LAER	Lowest Achievable Emission Rate
LNBs	Low-NO_X burners
$LoTO_X$™	Patented low temperature oxidation process for reducing NO_X in gas waste streams
MMBtu	Million British thermal units
NO_X	Nitrogen oxides
NWCAA	Northwest Clean Air Agency
PM	Particulate matter
ppm	Parts per million
ppmdv	Parts per million dry volume
ppmv	Parts per million by volume
RACT	Reasonably Available Control Technology
SCR	Selective Catalytic Reduction
SNCR	Selective Non-Catalytic Reduction
SO_2	Sulfur dioxide
SRU	Sulfur Recovery Unit
SWS	Sour Water Stripper
Tesoro	Tesoro Refining and Marketing Company
TGU	Tail Gas Unit
tpy	Tons per year
ULNBs	Ultra-low-NO_X Burners
VOC(s)	Volatile organic compound(s)

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600 ∘ Olympia, WA 98504-7600 ∘ 360-407-6000
711 for Washington Relay Service ∘ Persons with a speech disability can call 877-833-6341

July 7, 2010

Mr. Don Sorensen, Refinery Manager
Tesoro Refining and Marketing Company
10200 West March Point Road
P. O. Box 700
Anacortes, WA 98221

Dear Mr. Sorensen:

Regional Haze Best Available Retrofit Technology (BART) Determination

Best Available Retrofit Technology (BART) is required to reduce the regional haze impacts of emissions of your facility. The enclosed Order #7838 contains our BART determination for your facility including a schedule for compliance.

If you have questions or requests relating to this order, please contact Alan Newman at (360) 407-6810 or alan.newman@ecy.wa.gov.

Sincerely,

Jeff C Johnston

Jeff Johnston, Ph.D.
Manager, Science and Engineering Section
Air Quality Program

jj/te

Enclosure

By certified mail

cc: Toby Allen, NWCAA
Alan Newman, Ecology
Rebecca Spurling, Tesoro Refining and Marketing

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

IN THE MATTER OF AN ADMINISTRATIVE ORDER AGAINST: Tesoro Refining and Marketing Co.	]]]]]	ORDER NO. 7838

TO: Mr. Don Sorensen, Refinery Manager
Tesoro Refining and Marketing Company
10200 West March Point Road
P. O. Box 700
Anacortes, WA 98221

This is an Administrative Order requiring your company to comply with WAC 173-400-151 by taking the actions which are described below. Chapter 70.94 RCW authorizes the Washington State Department of Ecology's Air Quality Program (Ecology) to issue Administrative Orders to require compliance with the requirements of Chapter 70.94 RCW and regulations issued to implement it.

Ecology has determined that portions of your facility are subject to the provisions of the federal and state visibility protection program (WAC 173-400-151 and 40 CFR Part 51, Subpart P). The rules require that the State determine what technologies and level of emission control constitutes Best Available Retrofit Technology (BART) for the eligible emission units at your facility. The rules also require the installation and use of those emission controls on the BART-eligible emission units. The emission controls are to be installed as expeditiously as possible, but in no event can the State allow them to start operation later than five years after the State's Regional Haze SIP amendment is approved by the United States Environmental Protection Agency (EPA).

FINDINGS

The Tesoro Refining and Marketing Company operate an oil refinery on March Point in Washington State that contains emission units that are subject to BART.

A. The BART-eligible emission units at the Tesoro refinery are:

   a. Process heaters and boilers

      1. F-103, Crude Oil Distillation
      2. F-104, Gasoline Splitter/Reboiler
      3. F-304, CO Boiler #2
      4. F-654, Catalytic Feed Hydrotreater
      5. F-6600, Naphtha Hydrotreater

6. F-6601, Naphtha Hydrotreater
7. F-6602, Naphtha Hydrotreater
8. F-6650, Catalytic Reformer
9. F-6651, Catalytic Reformer
10. F-6652, Catalytic Reformer
11. F-6653, Catalytic Reformer
12. F-6654, Catalytic Reformer
13. F-6655, Catalytic Reformer

b. Other units

1. X-819, Flare
2. CWT #2, Cooling Water Tower
3. CWT #2a, Cooling Water Tower

B. BART emission limitations for the BART-eligible emission units are based on usage of the following technologies or a combination of technologies:

a. Use of existing burners on Units F-104, F-654, F-6600, F-6601, F-6602, F-6650, F-6651, F-6652, F-6653, F6654, F-6655, and X-819.

b. Restricted use of fuel oil in Unit F-103 and use of ultra-low-NO_X burners.

c. Use of existing burners for control of nitrogen oxides on Unit F-304.

d. Use of the existing Flue Gas Scrubber (FGS) to control sulfur dioxide (SO_2) and particulate matter emissions from Unit F-304.

e. Continued use of the current, upgraded refinery fuel gas sulfur treatment system for control of sulfur dioxide emissions from all process heaters and boilers fueled with refinery fuel gas.

f. Continued operation of CWT #2 and #2a as currently permitted.

Unit F-304, CO Boiler #2, exhausts to the same particulate and SO_2 emission control device (the Flue Gas Scrubber) with Unit F-302, CO Boiler #1. Currently installed emissions monitoring devices monitor the emissions of the Flue Gas Scrubber. Tesoro proposed and Ecology has accepted continuation of monitoring the emissions from the Flue Gas Scrubber for compliance with the BART limitation for particulate and SO_2 from Unit F-304.

Additional information and analysis is available in the BART Determination Support Document for Tesoro Marketing and Refining Company, Anacortes Refinery, prepared by the Washington State Department of Ecology, October 2008, and the Tesoro Best Available Retrofit Technologies (BART) Assessment Assistance Final Engineering Analysis Report, prepared by Anvil Associates, Geomatrix Consultants, and Tesoro NW, dated February 2008, amended by letters of May 2, 2008, January 30, 2009, and May 5, 2009.

YOU ARE ORDERED: To install and operate emission control equipment in accordance with the following conditions:

BART EMISSION LIMITATIONS

1. Particulate Matter Emissions

   1.1. Unit F-304 shall meet the following emission limitation:

      1.1.1. Particulate matter less than 10 micron in diameter (PM_{10}) emitted from the Flue Gas Stack shall not exceed 0.11 grains/dscf, 1-hour average, corrected to seven percent oxygen, and

      1.1.2. 1.0 lb PM/1000 lb coke burnt off in the Catalyst Regenerator.

   1.2. For Units F-104, F-654, F-6600, F-6601, F-6602, F-6650, F-6651, F-6652, F-6653, F6654, F-6655, and X-819, (all other BART-eligible units), emissions shall not exceed 0.05 grain/dscf (0.11 g/m^3), 1-hour average, corrected to seven percent oxygen.

   1.3. For Unit F-103, particulate matter emissions shall not exceed 0.05 grain/dscf (0.11 g/m^3), 1-hour average, (corrected to seven percent oxygen), except when burning fuel oil as allowed by Condition 3.1. When burning fuel oil, particulate emissions shall not exceed 0.10 grain/dscf, 1-hour average, corrected to seven percent oxygen.

   1.4. For Units CWT #2 and #2a, particulate matter emissions shall not exceed 0.10 grain/dscf (0.23 g/m3), 1-hour average.

   1.5. Compliance with the particulate emission limits above will be determined as follows:

      1.5.1. For Unit F-304

         1.5.1.1. Compliance will be demonstrated through use and continuous operation of the Flue Gas Scrubber as described in the unit's Operation and

Maintenance Manual, including all unit start-up, shutdown, and malfunction procedures.

1.5.1.2. Compliance with Condition 1.1.1 will be determined upon request of NWCAA or Ecology for emissions testing using EPA methods in 40 CFR Part 60 Appendix A. Particulate testing will use EPA Methods 5 and 202.

1.5.1.3. Compliance with Condition 1.1.2 will be determined upon request of NWCAA or Ecology for emissions testing using EPA methods in 40 CFR Part 60 Appendix A. Particulate testing will use EPA Method 5B.

1.5.2. For Unit F-103, when burning oil, visually observe stacks on a daily basis to qualitatively assess whether emissions are visible. The frequency may be reduced to weekly if no visible emissions are observed for 30 consecutive days. Tesoro shall revert to daily observations of individual stacks if any visible emissions are noted during the observation.

1.5.3. For Unit F-103, when burning fuel gas and for Units F-104, F-654, F-6600, F-6601, F-6602, F-6650, F-6651, F-6652, F-6653, F6654, F-6655, X-819 when burning gaseous fuels, visually observe stacks monthly to qualitatively assess whether emissions are visible. The frequency may be reduced to quarterly if no visible emissions are observed for six consecutive months. Tesoro shall revert to monthly observations of individual stacks if any visible emissions are noted during the observation.

1.5.4. If visible emissions are observed from Units F-103, F-104, F-654, F-6600, F-6601, F-6602, F-6650, F-6651, F-6652, F-6653, F-6654, F-6655, or X-819, reduce emissions to zero as soon as possible. If emissions cannot be reduced to zero, the permittee may monitor by Ecology Method 9A no later than 24 hours after detection and daily thereafter until opacity is shown to be less than 20 percent or the permittee will conduct a Method 5 assessment within 30 days.

1.5.5. Keep records of all observations available for inspection.

1.5.6. For Units F-103, F-104, F-654, F-6600, F-6601, F-6602, F-6650, F-6651, F-6652, F-6653, F6654, and F-6655, and upon request of NWCAA or Ecology compliance with Condition 1. 2 and 1.3 will be determined using EPA methods in 40 CFR Part 60 Appendix A. Particulate testing will use EPA Methods 5.

2. Nitrogen Dioxide Emissions

   2.1. Unit F-103

      2.1.1. Starting no later than the date in Condition 5, emissions of nitrogen dioxide from Unit F-103 is limited to:

         2.1.1.1. 59.1 tons/yr, rolling annual (365 days) total calculated daily.

      2.1.2. Compliance will be determined by use of a continuous emission monitoring system meeting the criteria of Condition 9.3 or a source-specific emission factor developed and periodically revised per Conditions 9.4 and 9.5.

      2.1.3. Emissions testing utilizing EPA Reference Method 7E will be performed within 180 days of the start of operation of the NO_X control system.

   2.2. Units F-104, F-304, F-654, F-6600, F-6601, F-6602, F-6650, F-6651, F-6652, F-6653, F-6654, F-6655, X-819

      2.2.1. No nitrogen dioxide emission limitations are applicable to these units.

3. Sulfur Dioxide Emissions

   3.1. Unit F-103

      3.1.1. Starting no later than the date in Condition 5, Unit F-103 is to be fired by refinery fuel gas meeting the requirements of Condition 3.4 below, or natural gas. Fuel oil may be used when the conditions in Condition 3.1.2 are met.

      3.1.2. Fuel oil may be used only in the following circumstances:

         3.1.2.1. Curtailment of natural gas supply, or

         3.1.2.2. Periods with limited refinery fuel gas availability such as start-up and shutdown of major refinery process units, while major refinery process units are not operating and producing refinery gas, and emergency conditions as necessary to maintain safe operations or equipment shutdown, or

         3.1.2.3. Test firing on fuel oil is allowed for up to 24 hours per calendar year.

3.2. Unit F-304

3.2.1. Starting no later than the date in Condition 5, emissions of sulfur dioxide in the stack from the Flue Gas Scrubber treating the exhaust from Units F-304 and F-302 is to meet the following:

3.2.1.1. Not exceed, 25 ppmv (dry basis, 0% O_2, 365-day rolling average), or

3.2.1.2. 50 ppmv (dry basis, 0% O_2, 7-day rolling average).

3.2.1.3. Compliance to be demonstrated by a continuous emissions monitor meeting the criteria of Condition 8.1.

3.2.1.4. Bypassing of the Flue Gas Scrubber

3.2.1.4.1. Bypassing of the Flue Gas Scrubber is to be minimized.

3.2.1.4.2. Sulfur dioxide emission when the Flue Gas Scrubber is bypassed shall not exceed 1000 ppmdv, 1-hour average, corrected to seven percent oxygen. Compliance with the 1000 ppmdv limitation must be demonstrated by use of a continuous emissions monitor or mass balance calculation. The mass balance calculation must assume all sulfur entering Units F-302 and F-304 (CO Boilers #1 and #2) is oxidized to SO_2 and discharged to the atmosphere unless demonstrated otherwise by process data and/or analytical methods at representative operating conditions.

3.2.1.4.3. Records and data used to determine compliance with this provision shall be kept for at least five years and made available to NWCAA or Ecology on request.

3.2.1.4.4. Sulfur dioxide emissions during bypass of the Flue Gas Scrubber shall be minimized to the extent reasonably practicable by methods such as FCCU feed rate reduction, FCCU feed sulfur content reduction, catalyst utilization, and/or other actions. These procedures are to be incorporated into the FCCU operations and maintenance procedures.

3.2.1.4.5. Records must be taken during each Flue Gas Scrubber bypass event. The records shall contain the date and time of the beginning and end of the bypass event, all actions taken to reduce SO_2

emissions during the bypass, all actions required to restart the Flue Gas Scrubber and end bypassing. The record may take the form of a checklist. Records of each bypass event shall be retained at the facility for at least five years and be made available to NWCAA or Ecology upon request.

3.3. Units F-104, F-654, F-6600, F-6601, F-6602, F-6650, F-6651, F-6652, F-6653, F-6654, F-6655

3.3.1. Starting no later than the date in Condition 5, these units shall only fire refinery gas meeting the criteria in Condition 3.4 or natural gas.

3.4. Refinery fuel gas requirements

3.4.1. Refinery fuel gas from blend drum V-213 shall not contain greater than 0.10 percent by volume H_2S, 365-day rolling average, measured according to Condition 8.3 of this order.

3.4.2. Bypass of acid gas from the amine regenerator C-1120 system away from the normal processing flow to General Chemical shall be recorded and reported the NWCAA (i.e., any period that PC5265A is opened). A root-cause analysis shall be conducted and recorded for any bypass event.

SCHEDULE FOR COMPLIANCE

4. Particulate Matter Emissions

4.1. For all units, compliance with the emission limitations is required on the issuance date of this Order.

5. Schedule for Compliance with Sulfur Dioxide Emissions Limitation

5.1. For all units, compliance with the emission limitations is required on the issuance date of this Order.

6. Schedule for Compliance with Nitrogen Dioxide Emissions Limitations

6.1. Compliance with the nitrogen dioxide emission limitation for Unit F-103 is to be achieved as follows:

6.1.1. Submittal of Notice of Construction application to NWCAA for the installation of NO_X controls on Unit F-103 no later than June 30, 2014. The facility may submit a request for an extension to Ecology no later than 90 days prior to this date. Ecology will respond to the facility in writing whether it will accept or deny the extension request.

6.1.2. Start of construction for installation of ultra-low-NO_X burners in Unit F-103, no later than March 1, 2015. The facility may submit a request for an extension to Ecology no later than 90 days prior to this date. Ecology will respond to the facility in writing whether it will accept or deny the extension request.

6.1.3. Start operation of emission controls installed to meet the NO_X emission limitation no later than September 30, 2015. The facility may submit a request for an extension to Ecology no later than 90 days prior to this date. Ecology will respond to the facility in writing whether it will accept or deny the extension request.

6.1.4. Compliance with the 365-day rolling average emission limit begins on the 365th day after the date the emission controls start operation unless the criteria of Condition 14 are invoked.

MONITORING AND RECORDKEEPING REQUIREMENTS

7. Particulate Matter (PM_{10})

7.1. For Unit F-304, Flue Gas Scrubber Stack

7.1.1. Particulate emissions stack test results shall be submitted to NWCAA and Ecology upon request.

7.1.2. Emissions testing shall use EPA Methods 5 and 202 to demonstrate compliance with Condition 1.1.1.

7.1.3. Emissions testing shall use the procedures of 40 CFR 63.1564(c) and 63.1572 to demonstrate compliance with Condition 1.1.2.

7.1.4. Visual emissions monitoring data shall be recorded and retained at the facility available for review by NWCAA or Ecology inspectors.

7.1.5. Visible emissions observation records are to be retained at the facility for at least five years.

7.2. For all other BART-eligible emission units

7.2.1. Particulate emissions stack test results shall be submitted to NWCAA and Ecology upon request.

7.2.2. Emissions testing shall use EPA Method 5.

7.2.3. Visual emissions monitoring data shall be recorded and retained at the facility available for review by the NWCAA or Ecology inspectors.

7.2.4. Visible emissions observation records are to be retained at the facility for at least five years.

8. Sulfur Dioxide

8.1. Unit F-103

8.1.1. A record of all hours of operation using fuel oil shall be kept. The record shall record the day and time of the start of use of fuel oil, the day and time fuel oil use ends, and the reason fuel oil is used.

8.1.2. The records are to be retained at the facility for at least five years and be made available to NWCAA or Ecology upon request.

8.2. Unit F-304

8.2.1. A continuous emission monitor system (CEM) shall be installed, calibrated, maintained, and operated to measure oxygen and SO_2 concentrations in the Flue Gas Scrubber stack.

8.2.2. The monitors shall meet the more stringent of the specifications of 40 CFR Part 60 Appendices B and F, or the NWCAA Regulation 367 and Appendix A.

8.2.3. SO_2 emissions data from the CEM shall be maintained as calendar day average concentrations (ppmdv). The daily averages shall be used to calculate and record 7-day and 365-day rolling averages. The daily average SO_2 concentrations and calculations of the 7-day and 365-day averages shall be retained at the facility for at least five years and made available to NWCAA or Ecology on request.

8.3. Refinery fuel gas system

8.3.1. A continuous emissions monitoring system (CEMS) for hydrogen sulfide concentration shall be installed, calibrated, maintained, and operated measuring the outlet stream of the fuel gas blend drum subsequent to all unmonitored incoming sources of sulfur compounds to the system and prior to any fuel gas combustion device. The monitor shall be certified in accordance with 40 CFR Part 60 Appendix B and operated in accordance with 40 CFR Part 60 Appendix F and the NWCAA Regulation 367 and Appendix A.

8.3.2. Record the calendar day average H_2S concentration of the refinery fuel gas as measured by the CEM required in Condition 8.3.1. The daily averages shall be used to calculate the 365-day rolling average. Records of the daily average H_2S concentration and 365-day rolling averages are to be retained at the facility for at least five years and be made available to NWCAA or Ecology upon request.

9. Nitrogen Dioxide Emissions

9.1. Unit F-103

9.1.1. Nitrogen dioxide emissions are to be quantified by means of a continuous emission monitoring system, consisting of a continuous nitrogen oxides monitor and a continuous flow rate monitor meeting the requirements of Condition 9.3, or

9.1.2. Development of a unit-specific emissions factor. The method to develop and update the emission factor is described in Conditions 9.4 and 9.5 below.

9.2. All other BART-eligible units

9.2.1. No monitoring and recordkeeping requirements.

9.3. Nitrogen oxides and flow continuous monitor requirements

9.3.1. The monitor shall meet the more stringent of the specifications of 40 CFR Part 60 Appendices B and F, or the NWCAA Regulation 367 and Appendix A.

9.3.2. Each calendar day's average nitrogen oxides emissions will be calculated and recorded daily.

9.3.3. The rolling annual total nitrogen oxides emissions shall be recalculated and recorded daily.

9.4. If used, a unit-specific emissions factor, expressed as lb/MMBTU of fuel fired shall be based on the following:

9.4.1. Minimum of four discrete NO_X stack tests utilizing the emission test method given in 40 CFR Part 60, Appendix A, Method 7E.

9.4.2. Each of the four tests is to be no closer than three weeks apart or as specified in the source testing plant submitted to NWCAA and Ecology and approved by both agencies.

9.4.3. The first test is the initial compliance test specified in Condition 2.1.3.

9.4.4. Each source test must include information on production rate through the unit, fuel firing rate, specific gravity of the refinery fuel gas, and heat content of the refinery fuel gas. For Unit F-103, the information recorded will include whether fuel oil was used during the test and the nitrogen and sulfur content of the fuel oil.

9.4.5. Each stack test shall be conducted at normal operating rate.

9.4.6. The supporting information and the emission factor (or factors if multiple operating rates have been tested) developed shall be submitted to NWCAA and Ecology within 60 days of the last of the emission tests. Ecology and NWCAA must concur with the appropriateness of the factor proposed.

9.5. If the NO_X emissions from Unit F-103 are determined by a unit-specific emission factor, nitrogen oxide emissions shall be tested at least once each calendar year utilizing 40 CFR Part 60, Appendix A, Method 7E. The information specified in Condition 9.4.4 shall be collected as part of each emission test, and with all previous emissions and process information collected, is used to recalculate the unit-specific emission factor for use in the following calendar year.

REPORTING REQUIREMENTS

10. The test report for the initial NO_X emission control system performance testing required by Condition 2.1 shall be submitted to Ecology and to NWCAA within 45 days of completion.

11. Documentation of completion of each milestone in Condition 6 will be provided by Tesoro by certified mail to Ecology and to NWCAA within 30 days of completion.

12. Continuous emission monitoring data and/or emission factor based emissions shall be submitted to Ecology and to NWCAA on a semiannual basis, January through June and July through December. The semiannual report shall be provided within 45 days of completion of the reporting period. The submittal shall be electronically in a format acceptable to NWCAA. Reporting to Ecology will end when Tesoro has demonstrated compliance with the BART emission limits in this order applicable to a specific unit for a continuous 36-month period.

13. Continuous Emission Monitoring Quality Control Testing

    13.1. Data quality control testing shall be performed at least once per calendar quarter. This entails Cylinder Gas Audits and Relative Accuracy Audits.

    13.2. A Relative Accuracy Test Audit (RATA) test shall be performed at least once per year on every CEM system required by this Order.

    13.3. All RATA tests shall assess the ability of the entire system from stack probe to data acquisition system output.

    13.4. Tesoro shall notify Ecology and NWCAA when annual RATA testing is scheduled to occur, no later than 30 days prior to the testing date.

    13.5. Tesoro shall provide Ecology and NWCAA a copy of the RATA test results in an electronic format within 45 days of completion of the RATA test.

    13.6. Tesoro shall provide NWCAA the results of all quarterly cylinder gas audits performed with the next quarterly data assessment report submitted to NWCAA.

OTHER CONDITIONS

14. If after installation, operational adjustments, and testing, the BART control technology for NO_X specified for Unit F-103 is unable to meet the emission limitation for the unit, Tesoro may submit a written request to Ecology (with a copy sent to NWCAA) that the BART emission limitation for that unit be modified. The request must at a minimum provide the following:

    14.1. If the request is submitted before installation of the control technology:

14.1.1. Tesoro documents the technical difficulties and reasons why the limit cannot be achieved.

14.1.2. Tesoro provides documentation of all work with the equipment vendor and installer, if one is involved, to achieve the emission limitation.

14.1.3. Tesoro proposes an alternative control technology and emission limitation as BART for this unit, including an evaluation of the visibility improvement achievable through implementation of the proposed limitation compared to the effect of the limitation currently in this Order.

14.2. If the request is submitted after the unit has been in operation, but no sooner than 12 months after the start of operation, Tesoro's request must contain:

14.2.1. All information collected by Tesoro and its vendor or equipment installer to determine reasons for failure to meet the emission limitation, including but not limited to:

14.2.2. A listing of the actions to comply attempted, results, and reasons for failure.

14.2.3. Copies of all continuous emission monitor results or emissions tests performed.

14.2.4. Documentation of operating conditions during each test.

14.2.5. Fuels used and fuel ultimate analysis information to be provided for at least one emissions test.

14.2.6. Tesoro proposes as BART an emission limitation based on the capabilities of the control equipment as installed on the unit (including basis for it) for the revised emission limitation. The request shall include an evaluation of the visibility improvement achievable through implementation of the proposed limitation compared to the improvement provided by the limitation currently in this Order.

15. Tesoro may request this compliance Order be rescinded after all of the following occur:

15.1. All BART units at the plant have continuously complied with the emissions limitations in Conditions 1, 2, and 3 for a period of three years after the date in Condition 6.

15.2. The emission limitations in this Order have been incorporated into one or more enforceable orders or permits issued under the criteria of RCW 70.94.152 or 70.94.153 and NWCAA regulations implementing these provisions.

15.3. The emission limitations in the enforceable orders or permits have been incorporated into the Air Operating Permit issued by NWCAA to Tesoro.

16. By issuance of this order, the requirements of Order 5071 have been complied with and it is rescinded.

Within 20 days of receipt of this Order, you may request a delay in the submittal date. Any such request must be accompanied by a written justification for the delay.

Failure to comply with this Order may result in the issuance of civil penalties or other actions, whether administrative or judicial, to enforce the terms of this Order.

You have a right to appeal this Order. To appeal you must:

- File your appeal with the Pollution Control Hearing Board within 30 days of the "date of receipt" of this document. Filing means actual receipt by the Board during regular office hours.

- Serve your appeal on the Department of Ecology within 30 days of the "date of receipt" of this document. Service may be accomplished by any of the procedures identified in WAC 371-08-305(10). "Date of receipt" is defined at RCW 43.21B.001(2).

If you appeal, you must:

- Include a copy of this document with your Notice of Appeal.
- Serve and file your appeal in paper form; electronic copies are not accepted.

To file your appeal with the Pollution Control Hearing Board:

Mail appeal to:		Deliver your appeal in person to:
The Pollution Control Hearings Board P.O. Box 40903 Olympia, WA 98504-0903	OR	The Pollution Control Hearings Board 4224–6th Avenue SE Rowe Six, Bldg 2 Lacey, WA 98503

To serve your appeal on the Department of Ecology:

Mail appeal to:		Deliver your appeal in person to:
Department of Ecology Appeals Coordinator P.O. Box 47608 Olympia, WA 98504-7608	OR	Department of Ecology Appeals Coordinator 300 Desmond Drive SE Lacey, WA 98503

And send a copy of your appeal packet to:

Alan Newman
Department of Ecology
Air Quality Program
P.O. Box 47600
Olympia, WA 98504-7600

For additional information, go to the Environmental Hearings Office website at http://www.eho.wa.gov.

To find laws and agency rules, go to the Washington State Legislator website at http://www1.leg.wa.gov/CodeReviser.

Your appeal alone will not stay the effectiveness of this Order. Stay requests must be submitted in accordance with RCW 43.21B.320. These procedures are consistent with Chapter 43.21B RCW.

DATED this 7 day of July, 2010 at Olympia, Washington.

Jeff C Johnston

Jeff Johnston, Ph.D.
Manager, Science and Engineering Section
Department of Ecology
Air Quality Program

BART DETERMINATION
SUPPORT DOCUMENT FOR
PORT TOWNSEND PAPER CORPORATION
PORT TOWNSEND, WASHINGTON

Prepared by

Washington State Department of Ecology
Air Quality Program

August 24, 2009
Revised February 4, 2010

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The Best Available Retrofit Technology (BART) program is part of the larger effort under the federal Clean Air Act Amendments of 1977 (CAA) to eliminate human-caused visibility impairment in all mandatory federal Class I areas. Sources that are required to comply with the BART requirements are those sources that:

1. Fall within 26 specified industrial source categories.
2. Commenced operation or completed permitting between August 7, 1962 and August 7, 1977.
3. Have the potential to emit more than 250 tons per year of one or more visibility impairing compounds.
4. Cause or contribute to visibility impairment within at least one mandatory federal Class I area.

The Port Townsend Paper Corporation (PTPC) operates a kraft pulp and paper mill that manufacturers unbleached kraft pulp, kraft papers, and lightweight linerboard. The mill is located in Port Townsend, Washington. The mill produces emissions of particulate matter (PM), sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen oxides (NO_X), and hydrocarbons. The pollutants considered to be visibility impairing are PM, SO_2, and NO_X.

Kraft pulp mills such as the PTPC facility are one of the 26 listed BART source categories. The PTPC mill was first constructed in the late 1920s, but it has had many modifications since then. The mill's potential emissions exceed 250 tons per year (tpy) for at least one of NO_X, SO_2, or PM_{10}. Four units are BART-eligible by construction date. They are the Recovery Furnace, Smelt Dissolving Tank, No. 10 Power Boiler, and the Lime Kiln.

Modeling of visibility impairment was done following the Oregon/Idaho/Washington/EPA-Region 10 BART modeling protocol.[1] Modeled visibility impacts of baseline emissions show impacts on the 8th highest day in any year (the 98th percentile value) of greater than 0.5 deciviews (dv) at only one Class 1 area, the Olympic National Park. The visibility impairment of the highest 98th percentile day was 1.50 dv. NO_X and SO_2 emissions from the Recovery Furnace and No. 10 Power Boiler were responsible for most of the visibility impact.

PTPC prepared a BART technical analysis using Washington State's BART Guidance.[2]

The Washington State Department of Ecology (Ecology) determined that the current level of emissions control is BART for the four applicable units. A wide variety of additional controls were investigated for each unit, but all were determined to be either technically or economically infeasible.

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[1] Modeling protocol available at **http://www.deq.state.or.us/aq/haze/docs/bartprotocol.pdf**.
[2] "Best Available Retrofit Technology Determinations Under the Federal Regional Haze Rule," Washington State Department of Ecology, June 12, 2007.

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1. INTRODUCTION

1.1 The BART Program and Analysis Process

The federal Clean Air Act Amendments of 1977 (CAA) established a national goal of eliminating man-made visibility impairment in all mandatory federal Class I areas. The CAA requires certain sources to utilize Best Available Retrofit Technology (BART) to reduce visibility impairment as part of the overall plan to achieve that goal.

Requirements for the BART program and analysis process are given in 40 CFR 51, Subpart P and Appendix Y to Part 51.[3] Sources are required to comply with the BART requirements if they:

1. Fall within 26 specified industrial source categories.
2. Commenced operation or completed permitting between August 7, 1962 and August 7, 1977.
3. Have the potential to emit more than 250 tons per year of one or more visibility impairing compounds including sulfur dioxide (SO_2), nitrogen oxides (NO_X), particulate matter (PM), and volatile organic compounds (VOCs).

Emission units that meet the source category, age, and potential to emit criteria must also make the facility "cause or contribute" to visibility impairment within at least one mandatory federal Class I area for the facility to remain BART applicable. Ecology has adopted the "cause and contribute" criteria that EPA suggested in its guideline. BART-eligible units at a source cause visibility impairment if their modeled visibility impairment is at least 1.0 deciview (dv). Similarly, the criterion for contributing to impairment means that the source has a modeled visibility impact of 0.5 dv or more.

The BART analysis protocol in Appendix Y Sections III–V uses a 5-step analysis to determine BART for SO_2, NO_X, and PM. The five steps are:

Step 1 – Identify all available retrofit control technologies.
Step 2 – Eliminate technically infeasible control technologies.
Step 3 – Evaluate the control effectiveness of remaining control technologies.
Step 4 – Evaluate impacts and document the results.
Step 5 – Evaluate visibility impacts.

Ecology requires an applicable facility to prepare a BART technical analysis report and submit it to Ecology. Ecology then evaluates the report and makes a final BART determination decision. This decision is issued to the source owner as an enforceable Order, and included in the State's Regional Haze State Implementation Plan (SIP).

[3] Appendix Y to 40 CFR 51–Guidelines for BART Determinations Under the Regional Haze Rule.

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As allowed by the EPA BART guidance, Ecology has chosen to consider all 5 factors in its BART determinations. To be selected as BART, a control has to be available, technically feasible, cost effective, provide a visibility benefit, and have a minimal potential for adverse non-air quality impacts. Normally the potential visibility improvement from a particular control technology is only one of the factors weighed for determining whether a control constitutes BART. However, if two available and feasible controls are essentially equivalent in cost-effectiveness and non-air quality impacts, visibility improvement becomes the deciding factor for the determination of BART.

1.2 The Port Townsend Paper Corporation Mill

The Port Townsend Paper Corporation (PTPC) operates a kraft pulp and paper mill (PTPC Mill) in Port Townsend, Washington. It is located in the northeast corner of the Olympic peninsula where Puget Sound meets the Strait of Juan de Fuca. The facility produces a variety of unbleached pulp and paper products including market pulp, converting paper, and containerboard. It was originally constructed in 1927. The PTPC Mill is a Title V source operating under Air Operating Permit WA 000092-2. Kraft mills are one of the 26 BART-eligible source categories. The Washington State Department of Ecology (Ecology) received a BART Analysis and Determination Report from PTPC on December 20, 2007.

1.3 BART-Eligible Units at the PTPC Mill

A review of the PTPC Mill emission sources found that:

1. Four of the plant's individual emission units were BART-eligible by construction date. The four are the Recovery Furnace, the Smelt Dissolving Tank, the No. 10 Power Boiler, and the Lime Kiln.
2. The four individual emission units in total have a combined potential to emit at least 250 tpy of nitrogen oxides (NO_X), sulfur dioxide (SO_2), and particulate matter (PM).

A Class I area visibility impact analysis was performed using the maximum daily emissions during the 2003-2005 time period and the CALPUFF model. Model results indicate visibility impacts from the BART-eligible units exceeded the 0.5 deciview (dv) contribution threshold in at least one Class I area. This confirmed that PTPC was required to continue in the BART process and prepare a BART determination.

1.3.1 Existing Recovery Furnace Emissions Control

PTPC operates a non-direct contact evaporator (NDCE) Recovery Furnace with an electrostatic precipitator (ESP). The Recovery Furnace fires predominantly black liquor solids (BLS) and some recycled fuel oil (RFO).

A chemical recovery furnace is not simply a "boiler" designed to burn fuel and produce steam. It is a complex device which serves as a chemical reactor, a chemical recovery unit, an internal high efficiency SO_2 scrubber, and an energy recovery unit. The Recovery Furnace recovers sufficient energy to supply a major portion of the PTCP Mill's steam load and electrical power needs. The Recovery Furnace operates by spraying spent pulping chemical liquids (black liquor) from the digester into the furnace. The organic chemicals in the black liquor (mostly lignins) are combusted. Combustion provides the energy to recover the inorganic pulping chemicals (reduce sodium sulfate to sodium sulfide) for reuse.

The major pollutants emitted from the Recovery Furnace are SO_2, NO_X, and PM_{10}. SO_2 comes from the oxidation of organic sulfur compounds known as total reduced sulfur (TRS) present in the black liquor and losses of sulfur from the chemical recovery section of the furnace. Additional SO_2 emissions result from the oxidation of sulfur in fuel oil which may be used during the combustion process. The chemical recovery process scrubs out most of the SO_2 generated in the chemical recovery/combustion process in the furnace. The scrubbing action is through the reaction of sodium oxide with the SO_2. SO_2 emissions from the furnace represent a loss of process chemical and are not desirable, so the furnace operation is optimized to minimize sulfur loss.

NO_X may form as fuel NO_X and thermal NO_X. Technical literature suggests that NO_X formation from the chemical recovery process is primarily fuel NO_X since recovery furnace temperatures are not high enough for significant thermal NO_X formation.[4] NO_X emissions from recovery furnaces are typically low due to the low nitrogen (N) concentration in the black liquor solids (approximately 0.1 percent), the low overall conversion of liquor N to NO_X (10-25 percent), and the existence of sodium fumes that can participate in "in-furnace" NO_X reduction or removal.[5]

The majority of PM_{10} emissions from the Recovery Furnace are sodium salts with about 80 percent of the PM_{10} being sodium sulfate and smaller amounts of potassium sulfate, sodium carbonate, and sodium chloride.[6] These salts primarily result from the carryover of solids from the combustion process plus sublimation and condensation of inorganic chemicals.[7] Some PM_{10} emissions can also be attributed to the combustion of fossil fuel. Filterable PM_{10} emissions from recycled fuel oil combustion depend not only on the completeness of combustion but also on the sulfur and metals content of the oil.

The particulate collected by the ESP is sent to the Smelt Dissolving Tank for chemical recovery.

The most restrictive emission limits that the Recovery Furnace is currently subject to are in 40 CFR 63 Subpart MM and PSD 1. The applicable PM, NO_X, and SO_2 emission limits are shown in Table 1-1.

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[4] NCASI Special Report 99-01, *A Review of NO_X Emission Control Strategies for Industrial Boilers, Kraft Recovery Furnaces, and Lime Kilns,* April 1999.
[5] NCASI Special Report No. 03-06, *Effect of Kraft Recovery Furnace Operations on NOX Emissions: Literature Review and Summary of Industry Experience,* October 2003.
[6] NCASI Technical Bulletin No. 725, *Particulate Matter Emissions From Kraft Mill Recovery Furnaces, Lime Kilns, and Smelt Dissolving Tanks,* November 1996.
[7] AP-42, Section 10.2, Chemical Wood Pulping, dated September 1990.

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Table 1-1. RECOVERY FURNACE CURRENT EMISSION LIMITS

Pollutant	Emission Limit	Regulatory Basis
PM/PM_{10}[a]	0.044 gr/dscf @ 8% O_2	NESHAP Subpart MM, 40 CFR 63.862(a)(1)(i)(A)
NO_X[b]	N/A	N/A
SO_2[c]	200 ppm @ 8% O_2	Permit Limit PSD-I (Condition 2)

[a] PM limits of 0.08 gr/dscf and 0.10 gr/dscf both at 8% O_2 also apply to the Recovery Furnace per Order DE 05AQIS-2892 and WAC 173-405-040(1)(a), respectively. Since the MACT limit of 0.044 gr/dscf at 8% O_2 is also applicable, only the most stringent standard is presented in the table.
[b] There are no NO_X limits that apply to PTPC's Recovery Furnace.
[c] An SO_2 limit of 500 ppm at 8% O_2 also applies to the Recovery Furnace per WAC 173-405-040(11)(a). Since the 200 ppm at 8% O_2 from the PSD-I permit limit is on the same basis, the more stringent of the two limits is presented in the table.

The PTPC Mill's Recovery Furnace is equipped with three electrostatic precipitators (ESPs) to reduce PM/PM_{10}. Each ESP is a parallel single chamber, dry bottom ESP. Two of the ESP units, manufactured by Research Cottrell, were rebuilt in 1993. The third ESP, manufactured by Environmental Elements, was installed as part of a Prevention of Significant Deterioration (PSD) permitting effort in approximately 1986 to 1987. No other add-on control devices are used for the Recovery Furnace.

1.3.2 Existing Smelt Dissolving Tank Emissions Control

A smelt dissolving tank is a part of the kraft pulping chemical recovery process. Smelt, the molten chemicals collected in the bottom of a recovery furnace, is continuously withdrawn from the furnace into a smelt dissolving tank. The smelt is then dissolved with weak wash[8] in the Smelt Dissolving Tank to produce green liquor, which is processed in the causticizing area to produce white liquor for use in the chip digestion process.[9] PM emissions are primarily composed of inorganic components such as sodium sulfate and sodium carbonate. NO_X emissions are minimal since no combustion occurs in these units. SO_2 emissions are from the oxidation of Total Reduced Sulfur (TRS) in the smelt.

The most restrictive emission limitation for the Smelt Dissolving Tank is in 40 CFR 63 Subpart MM. The applicable PM, NO_X, and SO_2 emission limits are shown in Table 1-2.

[8] This process water, also known as weak white liquor, is composed of all liquors used to wash lime mud and green liquor precipitates.
[9] The names of the various liquors denote their actual color.

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Table 1-2. SMELT DISSOLVING TANK CURRENT EMISSION LIMITS

Pollutant	Emission Limit	Regulatory Basis
PM/PM_{10}[a]	0.20 lb/ton BLS	NESHAP Subpart MM, 40 CFR 63.862(a)(1)(i)(b)
NO_X[b]	N/A	N/A
SO_2[c]	N/A	N/A

[a] A PM limit of 0.3 lb/ton BLS also applies to the Smelt Dissolving Tank per WAC 173-405-040(2). Since the MACT limit of 0.20 lb/ton BLS is also applicable, only the most stringent standard is presented in the table.
[b] There are no NO_X limits that apply to PTPC's Smelt Dissolving Tank.
[c] There are no SO_2 limits that apply to PTPC's Smelt Dissolving Tank.

The Smelt Dissolving Tank is controlled with a Ducon UW4 Model 4 scrubber. The scrubber was originally installed during the 1970s and was modified by APTech in 2003. The modification in 2003 included the installation of new spray header and nozzles, spin breakers, and chevrons in order to further reduce particulate matter emissions and allow for compliance with MACT II requirements. No other control devices are used on the Smelt Dissolving Tank.

1.3.3 Existing No. 10 Power Boiler Emissions Control

The No. 10 Power Boiler operates by combusting wood waste, primary clarifier sludge, old corrugated container (OCC) rejects, and recycled fuel oil (RFO) to produce steam for use in the kraft pulping process. The boiler is a spreader stoker-type boiler with horizontally opposed overfire air ports and tangential oil burners downstream (above) the grate. While it primarily fires wood waste on the grates, the RFO fired at the tangential burners contributes approximately 30 percent of the heat input.

PM_{10} emissions from wood-fired boilers result from inorganic materials contained in the wood waste and unburned carbon resulting from incomplete combustion.[10] NO_X emissions from boilers are formed by two mechanisms, fuel NO_X and thermal NO_X. Fuel NO_X is the dominant mechanism for NO_X formation during wood waste combustion.[11] SO_2 emissions from combination wood residue and oil boilers are formed as the sulfur contained in the oil oxidizes during the combustion process. PTPC's RFO contains 0.45 to 0.75 percent sulfur, approximately 30 percent[12] of which oxidizes and exits the stack as SO_2. The remaining sulfur is captured by the alkaline wood ash and minimal amounts may exhaust as other sulfur compounds.[13]

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[10] NCASI Technical Bulletin No. 884, *Compilation of Criteria Air Pollutant Emissions Data for Sources at Pulp and Paper Mills Including Boilers*, August 2004.
[11] NCASI Corporate Correspondent Memorandum No. 06-0142006, *Information on Retrofit Control Measures for Kraft Pulp Mill Sources and Boilers for NOx, SO_2 and PM Emissions*, June 2006.
[12] Average percentage of the sulfur burned that is emitted as SO_2, calculated based on the correlation for sulfur capture in combination bark boilers developed by NCASI. NCASI Technical Bulletin No. 884, *Compilation of Criteria Air Pollutant Emissions Data for Sources at Pulp and Paper Mills Including Boilers,* August 2004, pp. 40 and 41.
[13] NCASI Technical Bulletin No. 884, *Compilation of Criteria Air Pollutant Emissions Data for Sources at Pulp and Paper Mills Including Boilers*, August 2004.

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The most restrictive emission limitations on emissions from the No. 10 Power Boiler are in 40 CFR 60 Subpart D NSPS. The applicable PM, NO_X, and SO_2 emission limits are shown in Table 1-3.

Table 1-3. NO. 10 POWER BOILER'S CURRENT EMISSION LIMITS

Pollutant	Emission Limit	Regulatory Basis
PM/PM_{10}	0.10 lb/MMBtu	NSPS Subpart D, 40 CFR 60.42(a)(1)
NO_X	0.30 lb/MMBtu	NSPS Subpart D, 40 CFR 60.44(2)
SO_2	0.80 lb/MMBtu	NSPS Subpart D, 40 CFR 60.43(a)(1)
Note: NESHAP Subpart DDDDD, Boiler MACT, limits may have applied to the No. 10 Power Boiler. However, the Boiler MACT rule was vacated by the United States Court of Appeals decision on June 8, 2007.		

The No. 10 Power Boiler employs multiclones followed by a Turbotak scrubber to control particulate matter emissions. The multiclones remove the coarse particulate using centrifugal action. The Turbotak was installed in 1988 as a replacement of an existing venturi scrubber. The Turbotak scrubber is a wet scrubber that exposes the exhaust gas stream to a series of atomized water sprays. The multiple water sprays allow for optimizing the ratio between the water droplet diameter and the particulate matter diameter. The Turbotak also employs removal equipment including a knockout chamber, a fan, and chevrons.

1.3.4 Existing Lime Kiln Emissions Control

In the PTPC Mill's Lime Kiln, calcium oxide (CaO) is regenerated from lime mud, which consists primarily of calcium carbonate ($CaCO_3$). The heat required to convert the calcium carbonate to calcium oxide is provided by the combustion of RFO. Lime kilns are generally long, rotating cylindrical units installed on a slope (one end of the lime kiln is at a higher elevation than the other). Lime mud enters the kiln at the "higher" end and makes its way down to the "lower" end of the kiln. The heat, provided by the fuel oil burner, is generated at the "lower" end of the kiln. This counter-current flow of lime mud and hot combustion gases provides an efficient environment for the conversion to CaO.

PM/PM_{10} emissions from lime kilns primarily result from combustion gases picking up dust from lime mud and other particulate matter from alkali vaporization. Sodium sulfate and sodium carbonate primarily comprise the smaller PM with aerodynamic diameter less than 10 μm. NO_X formation in PTPC Mill's Lime Kiln occurs as both "thermal NO_X" and "fuel NO_X." The kiln reaches temperatures high enough for the direct oxidation of atmospheric nitrogen to NO_X. Thermal NO_X formation increases with temperature, oxygen and nitrogen concentrations, and residence time. Additionally, the nitrogen in the fuel oil fired by the Lime Kiln can convert to NO, forming "fuel NO_X." SO_2 emissions from PTPC Mill's Lime Kiln results from the oxidation of sulfur in the fuel oil and, to a lesser extent, sulfur in the lime mud. While the potential for SO_2 emissions from some lime kilns may be high based on the sulfur content of the fuel, most lime kilns emit very low levels of SO_2 due to the regenerated quicklime in the kiln acting as an inherent scrubbing agent. PTPC's particulate control venturi scrubber following the

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kiln further augments this SO_2 removal process since the scrubbing solution becomes alkaline as it captures the lime dust.[14]

The most restrictive emission limitations on the Lime Kiln are in 40 CFR 63 Subpart MM and WAC 173-400-040(11)(a). The applicable PM, NO_X, and SO_2 emission limits are shown in Table 1-4.

Table 1-4. LIME KILN CURRENT EMISSION LIMITS

Pollutant	Emission Limit	Regulatory Basis
PM/PM_{10}[a]	0.064 gr/dscf @ 10% O_2	NESHAP Subpart MM, 40 CFR 63.862(a)(1)(i)(c)
NO_X[b]	N/A	N/A
SO_2[c]	500 ppm @ 10% O_2	WAC 173-405-040(11)(a)

[a] A PM limit of 0.13 gr/dscf at 10% O_2 also applies to the Lime Kiln per WAC 173-405-040(3)(a). Since the MACT limit of 0.064 gr/dscf @ 10% O_2 is also applicable, only the most stringent standard is presented in the table.
[b] There are no NO_X limits that apply to PTPC's Lime Kiln.
[c] A TRS limit of 8 ppm at 10% O_2 also applies to the Lime Kiln per 40 CFR 60.283 (a)(5).

The Lime Kiln employs a venturi scrubber to control particulate matter emissions. The showers of the Lime Kiln's venturi scrubber were modified in 2003 for MACT II compliance. No other control devices are used for the Lime Kiln.

1.4 Visibility Impact of the PTPC Mill's BART-Eligible Units

Class I area visibility impairment and improvement modeling was performed by PTPC using the BART modeling protocol developed by Oregon, Idaho, Washington, and EPA Region 10.[15] This protocol uses three years of metrological information to evaluate visibility impacts. As directed in the protocol, PTPC used the highest 24-hour emission rates that occurred in the 3-year period to model its impacts on Class I areas. The modeling indicates that the emissions from this plant caused visibility impairment to Olympic National Park on both the 8th highest impacted day in any one year and the 22nd highest day over the three years that were modeled.[16] For more information on visibility impacts of this facility, see Section 3.

[14] Ibid.
[15] A copy of the modeling protocol is available at **http://www.deq.state.or.us/aq/haze/docs/bartprotocol.pdf**.
[16] A source causes visibility impairment if its modeled visibility impact is above one deciview, and contributes to visibility impairment if its modeled visibility impact is above 0.5 deciview.

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2. BART TECHNOLOGY ANALYSIS

The PTPC BART technology analysis was based on the 5-step process defined in BART guidance and listed in Section 1.1 of this report.

The following three tables identify and summarize possible control options considered in the BART determination analysis for PM_{10}, NO_X, and SO_2 emissions from the PTPC Mill. Sections 2.1 through 2.4 discuss emissions from each BART emissions unit. A more complete description of each control option is provided in Appendix A. Longer discussions of why technologies were considered infeasible were placed in Appendices B through E to make the main body of this report shorter.

Table 2-1. PM_{10} CONTROL TECHNOLOGIES EVALUATED

Control Technology	Available for Emission Unit (Yes/No)[a,b]			
	NDCE Recovery Furnace	Smelt Dissolving Tank	No. 10 Power Boiler	Lime Kiln
Fabric Filters (baghouse)	N/A	N/A	YES	N/A
Cyclone Separator	N/A	N/A	YES	N/A
Wet Scrubber	N/A	Currently used	Currently used	N/A
ESP	Currently used	N/A	YES	N/A
Proper Operating Practices	N/A	N/A	YES	N/A

[a] Availability based on whether control technology can be considered for each.

[b] Availability of PM_{10} control on all units except the No. 10 Power Boiler is not applicable (N/A) because the remaining units comply with MACT standards for PM. Per Section IV of EPA's "Guidelines for BART Determinations under the Regional Haze Rules" [40 CFR Part 51, Appendix Y], "Unless there are new technologies subsequent to the MACT standards which would lead to cost-effective increases in the level of control, [state agencies] may rely on the MACT standards for purposes of BART."

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Table 2-2. NO_X CONTROL TECHNOLOGIES EVALUATED

Control Technology	Available for Emission Unit (Yes/No)[a]			
	NDCE Recovery Furnace	Smelt Dissolving Tank[b]	No. 10 Power Boiler	Lime Kiln
Low Excess Air (LEA)	Yes	N/A	Yes	No
Staged Combustion	Currently used	N/A	Currently used	Yes
Flue Gas Recirculation (FGR)	Yes	N/A	Yes	Yes
Low NO_X Burners (LNB)	Yes	N/A	Yes	Yes
Fuel Staging/Reburning	Yes	N/A	Yes	Yes
Water/Steam Injection	No	N/A	No	Yes
Mid-Kiln Firing	No	N/A	No	Yes
Mixing Air Fan	No	N/A	No	Yes
Good Operating Practices and Proper Design	Yes	N/A	Yes	Yes
Selective Non-Catalytic Reduction (SNCR)	Yes	N/A	Yes	Yes
Selective Catalytic Reduction (SCR)	Yes	N/A	Yes	Yes
Oxidation/Reduction Scrubbing	Yes	N/A	Yes	Yes

[a] Availability based on whether control technology can be considered for each emission unit, not on technical feasibility.
[b] NO_X control technologies are not evaluated for the Smelt Dissolving Tank since this unit is not a source of NO_X emissions.

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Table 2-3. SO_2 CONTROL TECHNOLOGIES EVALUATED

Control Technology	Available for Emission Unit (Yes/No)[a]			
	NDCE Recovery Furnace	Smelt Dissolving Tank	No. 10 Power Boiler	Lime Kiln
Flue Gas Desulfurization (FGD) with Wet Scrubber	Yes	Yes[b]	Yes	Yes
FGD – Semi-Dry Lime Hydrate Slurry Injection (semi-dry slurry injection) with ESP or Baghouse	Yes	Yes[b]	Yes	Yes
FGD – Semi-Dry Lime Hydrate Powder Injection (semi-dry powder injection) with ESP or Baghouse	Yes	Yes[b]	Yes	Yes
FGD – Spray Drying with ESP or Baghouse	Yes	Yes[b]	Yes	Yes
Inherent Dry Scrubbing	Currently used	No	No	Currently used
Low Sulfur Fuel Selection	Yes	No	Yes	Yes
Increased Oxygen Levels at the Burners	No	No	No	Yes
Good Operating Practices	Yes	Yes	Currently used	Yes

[a] Availability based on whether control technology can be considered for each emission unit, not on technical feasibility.
[b] Ecology recognizes that the Smelt Dissolving Tank vent system has very little flow, so emission control using these technologies is questionable. PTPC chose to evaluate them, so those evaluations are presented in this report.

2.1 NDCE Recovery Furnace Control Options

2.1.1 PM/PM_{10} Control Options

As noted in Section 1.3, the Recovery Furnace is subject to the NESHAP (MACT) standard for PM (as a surrogate for HAP metals) contained in 40 CFR Part 63 Subpart MM, *National Emission Standards for Hazardous Air Pollutants for Chemical Recovery Combustion Sources at Kraft, Soda, Sulfite, and Stand-Alone Semichemical Pulp Mills.*

Particulate emissions from the Recovery Furnace are controlled by an ESP. The ESP control on the Recovery Furnace reduces particulate emissions to less than the MACT limit of 0.044 gr/dscf at eight percent O_2. Actual emissions average about 50 percent of the MACT standard.

The date the PTCP Mill was required to comply with the particulate emission requirements of 40 CFR Part 63 Subpart MM by March 13, 2004. They met that standard without the need to add any new particulate controls. No new technologies for controlling PM have subsequently become available after this date. Therefore, PTPC proposed the current dry ESP and meeting the MACT limits for PM/PM_{10} for the Recovery Furnace as BART and did not analyze other options for PM emissions control from the Recovery Furnace.[17]

2.1.2 NO_X Control Options

Recovery furnaces inherently use staged combustion. The design of the kraft Recovery Furnace at the PTPC Mill uses multiple levels of air admission into the furnace to control the kraft recovery sodium sulfate reactions and to assure complete combustion of organic compounds. The process control system that regulates this staged combustion process helps minimize the formation of NO_X.

Recovery furnaces have special safety systems to preclude fuel/air explosions and steam explosions if steam pressure ratings are exceeded. Chemical recovery furnaces can experience other unique types of explosions such as pyrolysis gas (CO, methane, hydrogen, and others) explosions and smelt/water explosions. If a recovery furnace experiences a "black out" where the flame extinguishes and the hot char bed continues to produce pyrolysis gases, then a spark or flame can reignite the gases and produce a fuel/air explosion. If a boiler tube develops a leak and water comes into contact with the molten salt at the bottom of the furnace, a very forceful explosion may take place. These hazards pose a significant danger to employees and equipment. These special safety issues and the chemical reactions noted in Section 1.3.1 are what make a chemical recovery furnace unique and explain why some emission technologies that may work for ordinary boilers are technically infeasible and even dangerous for a chemical recovery furnace.

In a 2003 special report, the National Council for Air and Stream Improvement (NCASI) specifically addressed options for reducing NO_X emissions from recovery furnaces, indicating that no operating kraft recovery furnace currently utilizes post-combustion control (such as SCR or SNCR) and limited pollution prevention techniques for NO_X are available.[18] A subsequent NCASI Corporate Correspondence Memorandum states:[19]

> *Optimization of the staged combustion principle within large, existing kraft recovery furnaces to achieve lower NO_X emissions might be the only technologically feasible option at the present time for NO_X reduction . . . Ultimately, the liquor nitrogen content, which is dependent on the types of wood pulped, is the dominant factor affecting the level of NO_X emissions*

[17] Per Section IV of EPA's "*Guidelines for BART Determinations under the Regional Haze Rules*" [40 CFR Part 51, Appendix Y], "Unless there are new technologies subsequent to the MACT standards which would lead to cost-effective increases in the level of control, [state agencies] may rely on the MACT standards for purposes of BART."
[18] NCASI Special Report No. 03-06, *Effect of Kraft Recovery Furnace Operations on NOx Emissions: Literature Review and Summary of Industry Experience,* October 2003.
[19] NCASI Corporate Correspondent Memorandum No. 06-014, *Information on Retrofit Control Measures for Kraft Pulp Mill Sources and Boilers for NOx, SO_2 and PM Emissions*, June 2006.

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> *from black liquor combustion in a recovery furnace. Unfortunately, this factor is beyond the control of pulp mill operators.*

NO_X control technologies determined to be technically infeasible are discussed in Appendix B.

As described in the NCASI publication quoted above, and as found in a search of the EPA RBLC database, good combustion practices optimizing the staged combustion inherent in the design of a kraft recovery furnace is the only NO_X control that is both available technology and has been installed on recovery furnaces in the U.S.

2.1.3 SO_2 Control Options

The following table and the following text describe possible SO_2 control options and why PTPC proposed them to be either technically or economically infeasible for the Recovery Furnace.

Table 2-4. TECHNICALLY INFEASIBLE RECOVERY FURNACE SO_2 CONTROL OPTIONS

Technology	Description
FGD with Wet Scrubber	NCASI reports that the use of add-on control equipment specifically installed to reduce of SO_2 from recovery furnaces has not been demonstrated anywhere in the United States and is considered prohibitive from a cost perspective.[20] There are several reasons that a wet scrubber has not been applied for the control of SO_2 from a kraft recovery furnace. A well designed and properly operated recovery furnace emits little SO_2 during normal operation. The majority of SO_2 emissions occur during highly sporadic, unpredictable, and short duration "spikes" in SO_2 emissions. These spikes can be theoretically traced back to dozens of potential culprits, the best characterized and understood of which is variations in black liquor sulfidity and solids content. Thus, a scrubber would not actually remove much SO_2 on an annual basis. Based on the technical difficulties described and the lack of successful implementation, PTPC has also proposed that this technology be considered technically infeasible for control of SO_2 and was not considered further.
FGD – Semi-Dry Slurry or Powder Injection or Spray Drying with ESP or Baghouse	The spray dryer system operation is based on the injection of a sorbent such as lime or sodium bicarbonate into the flue gas. For a kraft recovery furnace, such injection is not reasonable. Dust captured by the ESP is returned to the kraft recovery process via the Smelt Dissolving Tank. Introduction of lime or sodium bicarbonate into the

[20] NCASI, *Corporate Correspondence Memo CC-06-14: Information on Retrofit Control Measures for Kraft Pulp Mill Sources and Boilers for NOx, SO2, and PM Emissions*, June 4, 2006.

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Technology	Description
	flue gas will disrupt the chemical balance of the kraft process. Also, as with wet FGD systems, there is a lack of existing installations for this process. The sulfur content of the gas stream is too low for effective operation of the control technology. For these reasons, PTPC proposed that this technology be considered technically infeasible and eliminated from BART consideration.
Low Sulfur Fuel Selection	The fuel of a recovery furnace is primarily the black liquor processed by the furnace, supplemented with fuel oil. The furnace is operated as a high efficiency SO_2 scrubber in order to recover process chemicals. The sulfur content of the black liquor solids cannot be controlled by the PTPC Mill, but is efficiently recovered by proper operation of the Recovery Furnace. SO_2 emissions primarily come from supplemental fuel. At the PTPC Mill, RFO is the fuel oil used plantwide. It has sulfur content typically between 0.45 and 0.75% sulfur, with a guaranteed maximum of 0.76%. As discussed in Section 2.3.3, switching to the next lower sulfur content of RFO would cost $15,702 per ton of SO_2 emissions avoided. PTPC proposed that this is not cost effective for BART. For these reasons, PTPC did not consider low-sulfur fuel selection any further for the Recovery Furnace.

2.1.4 PTPC's BART Proposal for the Recovery Furnace

For PM/PM_{10} control, PTPC proposed to continue to use the existing ESP as BART. Actual emissions from use of the current ESP average less than 50 percent of the NESHAP Subpart MM limit of 0.044 gr/dscf at eight percent O_2.

For NO_X control, PTPC proposed to continue to properly operate the existing staged combustion system as BART for control of NO_X emissions from the Recovery Furnace.

For SO_2 control, PTPC proposed that Good Operating Practices, as currently in place, should be determined to be BART for the Recovery Furnace. Good Operating Practices entail minimizing fuel oil firing and maintaining the char bed resulting from black liquor solids combustion.

2.2 Smelt Dissolving Tank Control Options

As discussed in Section 1.3.2, a wet scrubber is currently used to reduce PM/PM_{10} emissions. This wet scrubber also provides some reduction of sulfur emissions. The Smelt Dissolving Tank is not a combustion source and has very low emissions as shown in Table 3-3 in Section 3.

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2.2.1 PM/PM_{10} Control Options

As noted in Section 1.3, the Smelt Dissolving Tank is subject to the NESHAP (MACT) standard for PM (as a surrogate for HAP metals) contained in 40 CFR Part 63 Subpart MM, *National Emission Standards for Hazardous Air Pollutants for Chemical Recovery Combustion Sources at Kraft, Soda, Sulfite, and Stand-Alone Semichemical Pulp Mills.* The date the PTPC Mill was to be in compliance with the requirements of 40 CFR Part 63 Subpart MM was March 13, 2004. No new technologies for controlling smelt dissolving tank PM have subsequently become available after this date. As a result, no additional engineering analyses were conducted by PTPC.

2.2.2 NO_X Control Options

NO_X control technologies are not evaluated for the Smelt Dissolving Tank. It is not a combustion source and the materials processed are not a source of NO_X.

2.2.3 SO_2 Control Options

A possible alternative SO_2 control (to the currently used wet scrubber) might be FGD using either a semi-dry or dry process with addition of either an ESP or baghouse. Operation of either of these spray-dryer-type systems is based on the feasibility of injecting lime into the flue gas followed by a dry ESP or baghouse downstream of the dryer to capture the dry particles. The Smelt Dissolving Tank's exhaust stream has high moisture content (typically 25 to 40 percent) and almost no flowrate, making usage of a spray dryer with a dry ESP system technically infeasible.[21]

The addition of an alkaline solution to the existing wet scrubber could theoretically provide as much as 90 percent reduction of potential annual SO_2 emissions. The annual cost effectiveness for implementing this control technology on the low airflow and low emissions from the Smelt Dissolving Tank was estimated to be $16,247 per ton of SO_2 removed to remove 1.03 tons per year. PTPC proposed that the option of reducing SO_2 emissions by adding alkaline solution to the existing scrubber be considered economically infeasible.

2.2.4 PTPC's BART Proposal for the Smelt Dissolving Tank

For PM/PM_{10} control, PTPC proposes to continue to use the Smelt Dissolving Tank's existing scrubber in lieu of additional add-on control or replacement of the existing scrubber. PTPC will continue to operate the existing scrubber to comply with the existing NESHAP (MACT) Subpart MM limit of 0.20 lb PM_{10} per ton BLS.

For NO_X control, PTPC proposes no additional controls as BART. There is no combustion occurring in the Smelt Dissolving Tank, and the unit is not considered a source of NO_X emissions.

[21] Ibid.

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For SO_2 control, PTPC proposes to continue to properly operate the Smelt Dissolving Tank's existing wet scrubber as BART.

2.3 No. 10 Power Boiler Control Options

As discussed in Section 1.3.3, the No. 10 Power Boiler has an overfire air system. A multiclone followed by a wet scrubber are currently used to reduce PM/PM10 emissions.

2.3.1 PM/PM_{10} Control Options

Table 2-1 and Appendix A list five identified PM/PM_{10} control technologies along with proper operating practices. Since the power boiler currently uses a multiclone and wet scrubber, only the two alternative PM control technologies, discussed in the following table, were investigated further.

Table 2-5. NO. 10 POWER BOILER PM/PM_{10} CONTROL OPTIONS EVALUATED

Technology	Description
Fabric Filters (baghouse)	The use of fabric filters to control particulate matter emissions from wood-fired boilers results in a fire hazard due to the potential of burning cinders escaping the multiclone, temperature excursions, and/or operating upsets combined with fabric flammability causing the fabric filters to ignite or melt, depending on the fabric used. Because of this, fabric filters are rarely used on wood-fired boilers. Fabric filters have been successfully used on some wood-fired boilers that burn wood residue or bark stored in salt water because the salt reduces the fire hazard. PTPC's Title V Operating Permit specifically prohibits burning salty hog fuel in the No. 10 Power Boiler as part of the opacity limit. The use of fabric filters to control particulate matter emissions from the No. 10 Power Boiler is proposed to be technically infeasible due to fire hazard.
Wet ESP (addition)	Addition of a wet ESP following the existing scrubber and multiclone system was considered technically feasible. A cost control evaluation was done to evaluate economic feasibility. The control level for the addition of a wet ESP was based on a vendor guarantee of 0.01 gr/dscf. This guarantee represents a removal efficiency of approximately 69% based on the current limit of 0.10 lb/MMBtu at maximum capacity.[22] The cost per ton of PM_{10} removed for the installation of a wet ESP to further control the No. 10 Power Boiler was estimated to be \$11,294. PTPC proposed this value as not cost effective.

[22] Percent control rate determined by the current emissions rate using a boiler firing rate of 360 MMBtu/hr, producing 250,000 pounds steam per hour compared to the potential emissions at the 0.01 gr/dscf vendor guarantee and the design exhaust flow rate of 200,000 acfm.

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Technology	Description
Wet ESP (substitution)	A wet ESP could be completely substituted for the wet scrubber to get the improved particulate removal discussed in the previous paragraph, but a wet ESP would remove less SO_2 than the existing wet scrubber does. The economic analysis would be based on the same particulate emissions reduction as when the unit was being considered in series with the existing scrubber. Since SO_2 contributes to visibility impact, and the particulate reduction would be the same for either option, the complete substitution of the existing wet scrubber with a wet ESP option was not considered further.

2.3.2 NO_X Control Options

The No. 10 Power Boiler is a load-following spreader stoker combination fuel boiler with tangentially fired oil burners. It combusts wood waste, sludge, OCC rejects, and oil. The spreader stoker design inherently uses a form of staged combustion. In the PTPC Mill's No. 10 Power Boiler, the fuel-rich combustion of the wood waste on the grates results in incomplete combustion and lower flame temperatures. Downstream of the primary flame, the horizontally opposed overfire air ports supply excess air to complete the combustion. Further downstream, the tangential oil burners supply additional heat without increasing the primary flame temperature. This firing configuration results in low peak flame temperatures, and minimal thermal-NO_X formation. As a result, the majority of the NO_X from wood-fired boilers is fuel NO_X.[23] Table 2-2 lists the control technologies considered for the No. 10 Power Boiler. Appendix C contains a discussion of the reasons why each of these additional control options was proposed to be technically infeasible for NO_X control. The discussion was put into an appendix because of its length.

2.3.3 SO_2 Control Options

Implementation of **FGD technology using wet injection with a wet scrubber** on the No. 10 Power Boiler could reduce SO_2 emissions. This technology would involve adding additional alkaline chemicals such as lime or sodium hydroxide to the existing wet scrubber solution. This addition would further increase the pH of the scrubber effluent, which would in turn increase the pH of the ash clarifier into which the scrubber effluent empties. The ash clarifier's pH currently ranges from 11 to 12.2 as a result of the alkaline nature of the fly ash removed by the wet scrubber. The clarifier has a pH limit of 12.45 to ensure that the sludge and scrubbing liquor are not classified as a dangerous waste under Washington State Dangerous Waste regulations and a hazardous waste under federal Resource Conservation and Recovery Act (RCRA) regulations. Increasing the pH of the ash clarifier to a pH of 12.5 or greater would result in generation of a sludge characterized as a state dangerous or RCRA hazardous waste. Such characterization would increase the cost and complexity of ash disposal significantly.

[23] NCASI Special Report 03-04, *NO_X Control in Forest Products Industry Boilers: A Review of Technologies, Costs, and Industry Experience,* August 2003.

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Aside from making the sludge into a state dangerous waste and RCRA hazardous waste, the implementation of wet FGD is unlikely to provide significant additional control of SO_2. The alkaline fly ash currently absorbs the SO_2 in the flue gas in the same manner as a FGD alkaline reagent. The calcium and sodium oxides in the fly ash captured by the existing wet scrubber causes the scrubber water to become alkaline, allowing for absorption of SO_2 in the scrubber water. Addition of more alkaline solution to the existing scrubber would provide only an incremental increase in SO_2 absorption.

Because of the above described issues of small increase in performance and significant problems with sludge disposal, PTPC proposed that the implementation of wet FGD technology for control of SO_2 from the No. 10 Power Boiler be considered technically infeasible.

Reducing sulfur content of the fuel is a common approach to reduce SO_2 emissions. This option is considered technically feasible, so a cost estimate to implement it was done. The cost of switching from the recycled fuel oil (RFO) currently fired in the No. 10 Power Boiler (and all other PTPC Mill oil-fired units) to 'High Spec' RFO with guaranteed maximum sulfur content of 0.5 percent ($43.53/barrel) is approximately $15,702 per ton of SO_2 emissions avoided. Switching from RFO to 500 ppm or 15 ppm sulfur diesel ($92.67/barrel) would cost approximately $19,650 per ton of SO_2 emissions avoided. Both 500 ppm and 15 ppm sulfur diesel fuel have essentially the same price per barrel. This estimate calculates the current SO_2 emissions based on the guaranteed maximum sulfur content of 0.76 percent in the RFO. The estimate also assumes that all sulfur in the fuel oil is emitted as SO_2[24] and none is absorbed in the fly ash. It does not include costs of any changes in plant equipment required to store or burn the new fuel.

PTPC proposed that this cost is too high for BART.

2.3.4 PTPC's BART Proposal for the No. 10 Power Boiler

For PM/PM_{10} control, PTPC proposed continued use of the existing wet scrubber as BART.

For NO_X control, PTPC proposed to continue using good operation of the boiler's inherent staged combustion system as BART.

For SO_2 control, PTPC proposed continued operation of the existing wet scrubber and continued good operation of the boiler aimed at minimizing fuel oil firing as BART.

2.4 Lime Kiln Control Options

As discussed in Section 1.3.4 the Lime Kiln currently uses a wet venturi scrubber to reduce PM/PM_{10} emissions. The calcium oxide particulates create alkalinity that enhances SO_2 scrubbing.

[24] For the cost analysis, SO_2 emissions are based on AP-42 Table 1.3-1 emission factor (157*S% lb $SO_2/10^3$ gallons), which assumes 100% of the sulfur in the oil is emitted as SO_2.

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2.4.1 PM_{10} Control Options

The Lime Kiln's particulate emissions are currently regulated under 40 CFR 63 Subpart MM. The Lime Kiln meets these emissions requirements. The compliance date for Subpart MM was March 13, 2004. No new technologies for controlling PM have subsequently become available after this recent date. Therefore, PTPC considered the MACT limits for PM from the Lime Kiln as BART and did not analyze further options for PM emissions control.

2.4.2 NO_X Control Options

For purposes of product quality and process economics, PTPC operates its Lime Kiln using a minimum of excess air. This practice contributes to minimizing NO_X emissions.

A RACT/BACT/LAER Clearinghouse (RBLC) search results reveal that no add-on controls or combustion modifications have been required to meet RACT, BACT, or LAER. The database lists only requirements such as "good combustion" or "proper kiln design" as BACT for control of NO_X from a lime kiln.

Ten possible control options were investigated. PTPC proposed all were technically infeasible. A discussion of each of these technologies is found in Appendix D.

2.4.3 SO_2 Control Options

In addition to the SO_2 removal that occurs from the lime produced in the Lime Kiln, the current wet venturi scrubber captures lime dust making the scrubber solution more alkaline and promoting additional SO_2 reduction.

As listed in Table 2-3, several additional technologies were investigated for technical feasibility. After investigation, all were determined to be technically infeasible except for selection of a lower sulfur fuel oil and improved FGD within the existing wet scrubber. A discussion of each technically infeasible category is contained in Appendix E.

Lower sulfur fuel was rejected previously (see Section 2.3.3), because it was not economically justifiable. That analysis is valid throughout the plant, including the Lime Kiln, because it is based on the purchase price of the fuels alone and not installation or operation of equipment.

PTPC included the option of adding more alkali to the wet scrubber to attempt to provide an additional 90 percent control efficiency as the BART 102 modeling scenario described in Section 3. The visibility impact reduction as described in Section 3 was estimated to be 0.004 dv. This small change is understandable considering that existing SO_2 emissions from the Lime Kiln are only about one percent of the total SO_2 emissions of PTPC's BART units. The minimal emissions reduction and visibility impact reduction indicated this option is not BART.

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2.4.4 PTPC's BART Proposal for the Lime Kiln

For PM_{10} control, PTPC proposed continued use of the existing wet venturi scrubber as BART. PTPC will continue to operate the current scrubber to comply with the existing NESHAP Subpart MM limit of 0.064 gr/dscf at 10 percent O_2.

For NO_X control, PTPC proposes that proper kiln design and operation as BART for NO_X emissions.

For SO_2 control, PTPC proposes continued operation of the Lime Kiln wet venturi scrubber as BART.

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2.5 PTPC's Proposed BART

Table 2-6. SUMMARY OF PTPC'S PROPOSED BART

Pollutant	Emission Unit	Proposed BART Control Option	Control Option Emissions Level or Control Efficiency
PM_{10}	No.10 Power Boiler	Existing Wet Scrubber[a]	0.10 lb/MMBtu[b] (current NSPS Subpart D limit)
	Recovery Furnace	Existing ESP	0.044 gr/dscf[b] (current MACT Subpart MM limit)
	Smelt Dissolving Tank	Existing Wet Scrubber	0.200 lb/BLS[b] (current MACT Subpart MM limit)
	Lime Kiln	Existing Venturi Scrubber	0.064 gr/dscf[b] (current MACT Subpart MM limit)
NO_X	No. 10 Power Boiler	Existing Staged Combustion System	0.80 lb/MMBtu[b] (current NSPS Subpart D limit)
	Recovery Furnace	Existing Staged Combustion System	N/A[c]
	Smelt Dissolving Tank	N/A	N/A[c]
	Lime Kiln	Good Operating Practices	N/A[c]
SO_2[e]	No. 10 Power Boiler	Good Operating Practices	0.30 lb/MMBtu[b]
	Recovery Furnace	Good Operating Practices	200 ppm @ 8% O_2[b] (current PSD limit)
	Smelt Dissolving Tank	Good Operating Practices	N/A[b,c]
	Lime Kiln	Existing Venturi Scrubber[d]	Continued use of wet scrubber with inherently alkaline scrubber solution 500 ppm @ 10% O_2[b] (current WAC limit)

[a] The addition of a wet ESP to the existing wet scrubber on the No. 10 Power Boiler is determined to not be cost effective. However, the visibility impact of implementing this control technology is evaluated as BART 101 for informational purposes to further support the ineffectiveness of implementing this control technology.

[b] For the purposes of presenting this BART emissions limit summary, for the baseline case (where no controls are applied), the existing emissions limits proposed as BART are listed in this table. However, the baseline emission rates used for the BART determination visibility modeling analysis are the maximum actual daily emission rates as presented and modeled for the BART applicability analysis rather than these maximum emissions limits.

[c] There are no current limits that apply to the emission unit for the specified pollutant.

[d] The addition of alkaline solution to the scrubber was found to be cost ineffective. However, the visibility impact of implementing this control technology is evaluated as BART 102 for informational purposes to further support the ineffectiveness of implementing this control technology.

[e] Switching to a lower sulfur content recycled fuel oil (RFO) was determined to be economically infeasible as discussed in Section 2.3.3.

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3. VISIBILITY IMPACTS AND DEGREE OF IMPROVEMENT

A baseline Class I Area visibility impact analysis was performed on the BART-eligible emission units at the PTPC Mill using the CALPUFF model with four kilometer grid spacing as recommended by Oregon/Idaho/Washington/EPA Region 10 BART modeling protocol. The 98th percentile modeled 24-hour average visibility impacts modeled for the BART eligible units at the PTPC Mill at each Class I area within 300 km and in the Columbian River Gorge National Scenic Area are shown in Table 3-1.

Table 3-1. BART APPLICABILITY VISIBILITY MODELING RESULTS

Class I Area	22nd highest Δdv, 2003-5 (98th %ile)	8th High 2003 Δdv	8th High 2004 Δdv	8th High 2005 Δdv
Alpine Lakes Wilderness Area	0.284	0.264	0.281	0.313
Glacier Peak Wilderness Area	0.251	0.226	0.238	0.258
Goat Rocks Wilderness Area	0.137	0.137	0.128	0.134
Mount Adams Wilderness Area	0.124	0.128	0.124	0.105
Mount Rainier National Park	0.244	0.272	0.231	0.211
North Cascades National Park	0.236	0.196	0.248	0.236
Olympic National Park	**1.919**	**1.767**	**1.983**	**1.919**
Pasayten Wilderness Area	0.125	0.120	0.147	0.123
Columbia River Gorge National Scenic Area (not a Class I area)	0.060	0.064	0.069	0.043

The BART applicability modeling results presented in Table 3-1 indicates that the 98th percentile visibility impact exceeds the 0.5 dv contribution threshold at only one of the eight Class I areas, Olympic National Park.

After modeling visibility impacts of the BART eligible units at the plant, PTPC proposed three modifications to the initial scenario, to better model the impacts at Olympic National Park:

1) Refinements to the unit emissions used for modeling, applicable to both baseline and control technology modeling
2) Use a different background ammonia concentration (0.5 ppb) from the one specified in the modeling protocol (17 ppb)
3) Use of the new IMPROVE equation.

Ecology did not accept the latter two changes, as they deviated from the modeling protocol. Modeling files submitted by the company were used to extract the visibility impairment based on the old IMPROVE equation. PTPC was requested to rerun some of the post processing steps, so as to revert back to using the 17 ppb ammonia background.

Specific emission changes between the initial BART screening modeling and the final modeling presented in this BART analysis are discussed in Section 6.3 of the BEST AVAILABLE

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RETROFIT TECHNOLOGY APPLICABILITY ANALYSIS AND DETERMINATION REPORT, PORT TOWNSEND PAPER CORPORATION, December 2007. These changes, which affected all emissions from the No. 10 Power Boiler and the particulate emissions from the Smelt Dissolving Tank and the Lime Kiln, were accepted by Ecology.

The revised emission rates are summarized in Table 3-2. They result in a modeled 98th percentile visibility impact of 1.614 ΔDV at Olympic National Park. This final baseline modeling result is used as the basis for comparing changes in the remainder of the modeled impacts discussion.

Table 3-2. MAXIMUM 24-HOUR AVERAGE ACTUAL EMISSION RATES

Emission Unit	NO_X (lb/hr)	SO_2 (lb/hr)	H_2SO_4 (lb/hr)	Filterable PM_{10}[a] (lb/hr)	Total PM_{10}[b] (lb/hr)
Recovery Boiler	78.76	105.76	1.66	19.53	24.25
Smelt Dissolving Tank	1.05	0.26	0.11	9.55	9.94
No. 10 Power Boiler	82.61	71.39	8.09	31.59	56.62
Lime Kiln	9.98	1.61	0.78	6.35	7.69

[a] Filterable PM_{10} represents the sum of the modeled filterable PM speciation groups of PMC, PMF, and EC.
[b] Total PM_{10} (TPM_{10}) represents the sum of the modeled filterable and condensable PM, including sulfuric acid (H_2SO_4).

An evaluation of the modeling results show that on an annual basis, NO_X and SO_2 emissions from PTPC each contribute about 40 percent of PTPC's total visibility impact on Olympic National Park. The particulate emissions contribute about 20 percent to visibility impact on the park. Seasonally, the contribution of NO_X, SO_2, and particulate to the modeled visibility impairment varies.

Total visibility impacts are lower during the summer. In the summer, SO_2 from the PCTP Mill can contribute up to about a 50 percent of the visibility impairment caused by the plant, while in the winter NO_X can contribute up to about 50 percent of the visibility impairment caused by the PTPC Mill. The relative contribution of particulate emissions is fairly stable year round at about 18 percent. Figure 3-1 shows the monthly distribution of the days with high impacts (i.e. ΔDV > 0.5) and the breakdown by species.

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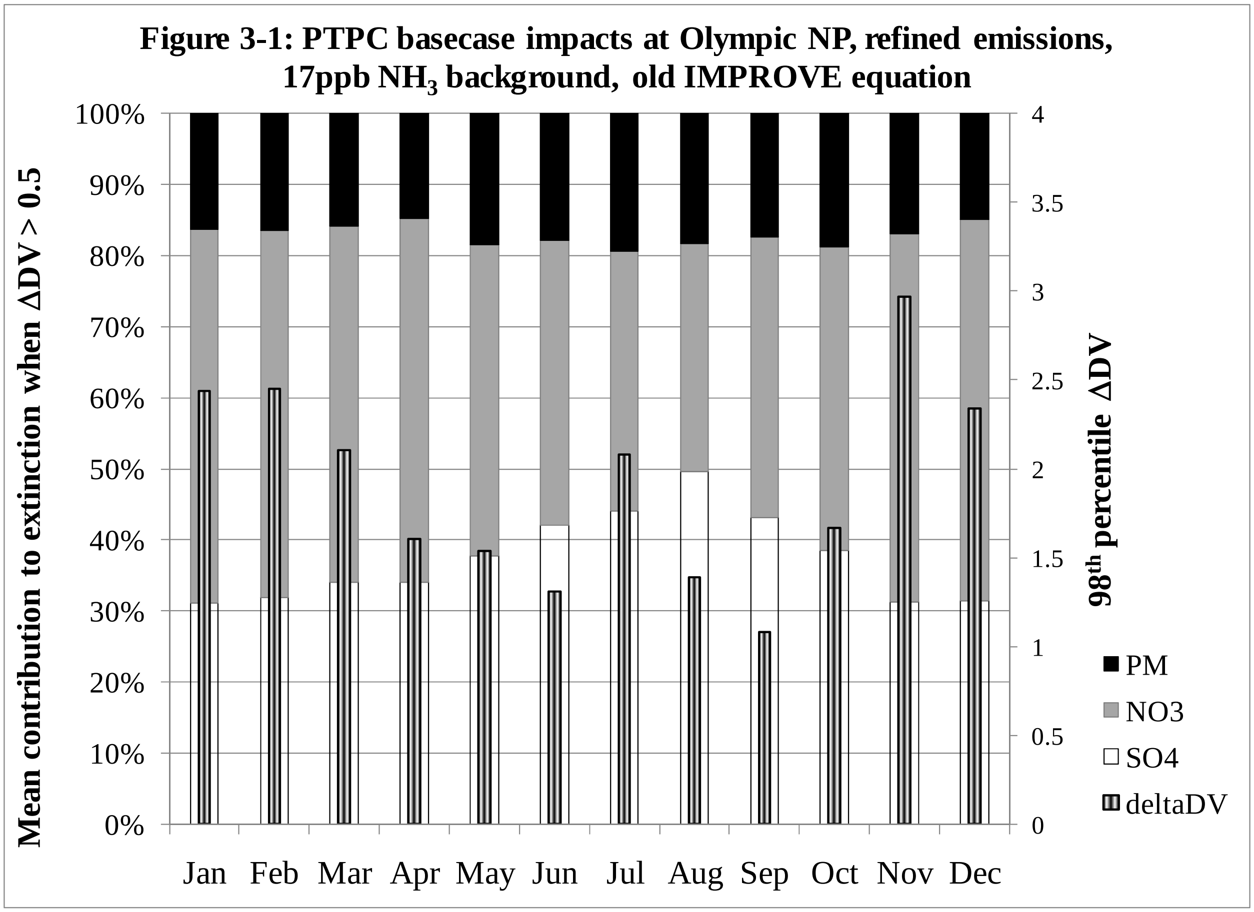

Net Visibility Improvement

PTPC evaluated the potential visibility improvement that could occur if two of the emissions reduction options were implemented individually. Table 3-4 outlines these modeling scenarios.

Table 3-4. NET VISIBILITY IMPROVEMENT ANALYSIS CONTROL SCENARIOS

Modeling Scenario	Scenario Description
BART100	**Baseline Scenario**
BART101	With Power Boiler No. 10 PM_{10} reductions from the addition of a wet ESP (reduction of PM_{10} emissions to 0.01 gr/dscf vendor guarantee)
BART102	With Lime Kiln SO_2 emissions control from addition of alkaline solution to the existing wet venturi scrubber (assumed 90% emissions reduction of SO_2)

Table 3-5 summarizes the visibility impacts and potential improvement at Olympic National Park for the baseline scenario and the two control option scenarios. The impacts are expressed in terms of the maximum 98th percentile (22nd highest day) 24-hour average visibility impact over the three years of meteorological data modeled.

Table 3-5. BART DETERMINATION VISIBILITY IMPACTS AT

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OLYMPIC NATIONAL PARK

Modeling Scenario	98th Percentile Δdv (22nd high in 3 years)	Net Visibility Improvement over Baseline
BART100 (baseline)	1.614	
BART101(PB#10)	1.355	-0.259
BART102 (Lime Kiln)	1.610	-0.004

The modeling results indicate a visibility improvement of 0.259 dv could result from the addition of a wet ESP to further reduce PM_{10} emissions from the No. 10 Power Boiler. The visibility improvement which could result from a 90 percent reduction of SO_2 from the Lime Kiln scrubber is 0.004 dv. PTPC proposed that both emission reduction options were economically infeasible.

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4. ECOLOGY'S BART DETERMINATION

Ecology has reviewed the information submitted by PTPC. Ecology agrees with the analyses performed by PTPC and has determined that the current levels of control are BART for the four BART-eligible process units. The controls and emission limitations are summarized in Table 4-1 below.

Table 4-1. ECOLOGY'S DETERMINATION OF EMISSION CONTROLS THAT CONSTITUTE BART

Emission Unit	Pollutant	BART Control Technology	Emission Limitation
NDCE Recovery Furnace	PM_{10}	Existing ESP	NESHAP Subpart MM limit of 0.044 gr/dscf at 8% O_2
	NO_X	Existing staged combustion system	No limit
	SO_2	Good Operating Practices	PSD permit limit of 200 ppm @ 8% O_2
Smelt Dissolving Tank	PM_{10}	Existing wet scrubber	NESHAP Subpart MM limit of 0.20 lb PM10 per ton BLS
	NO_X	No controls	No limit
	SO_2	Existing wet scrubber	No limit
No. 10 Power Boiler	PM_{10}	Existing multiclone and wet scrubber	NSPS Subpart D limit of 0.10 lb/MMBtu
	NO_X	Existing staged combustion system	NSPS Subpart D limit of 0.30 lb/MMBtu
	SO_2	Good Operating Practices	NSPS Subpart D limit of 0.80 lb/MMBtu
Lime Kiln	PM_{10}	Existing venturi wet scrubber	NESHAP Subpart MM limit of 0.064 gr/dscf @ 10% O_2
	NO_X	Good Operating Practices	No limit
	SO_2	Existing wet scrubber	500 ppm @ 10% O_2

4.1 Recovery Furnace BART Determination

For PM/PM_{10} emissions control, Ecology determined that BART is the current level of control provided by the existing ESP. Actual emissions from use of the current ESP average less than 50 percent of the NESHAP (MACT) Subpart MM limit of 0.044 gr/dscf at eight percent O_2. The compliance date for the MACT was March 13, 2004. No new technologies for controlling PM have become available since then, and the MACT limitation is the strictest limitation currently existing for PM/PM_{10} applicable to this Recovery Furnace.

Since the Recovery Furnace currently utilizes a dry ESP system to control particulate emissions, Ecology made a planning level estimate of the cost to reduce particulate emissions further using cost estimating tools available from EPA's OAQPS.[25] The estimate showed that improvements to the ESP to reduce the BART modeled 106 tpy of particulate emissions in half could cost about $5,100 dollars per ton of particulate removed. As shown in Table 3-2, a reduction of 50% of the recovery furnace particulate emissions would result in approximately a 12% reduction in total particulate emissions from the PTPC plant site. Scaling this from Figure 3-1, this would indicate a small visibility improvement of about 0.07 dv. Ecology considers this improvement to the ESP performance to not be cost effective.

For NO_X control, Ecology has determined that BART is the current level of control provided by the existing staged combustion system. Good combustion practices that optimize the staged combustion inherent in the design of the furnace are the only available technology for control of NO_X that has been demonstrated on recovery boilers. Ecology agrees that the available alternative NO_X control technologies are technically infeasible.[26]

Ecology evaluated the use of a wet scrubbing system to reduce SO_2 from the recovery furnace. Ecology is aware of three recovery furnaces in the Northwest using a wet scrubber to reduce SO_2 emissions, the oldest having been in operation since at least the mid 1980s. Two units are still operational (at Georgia Pacific Camas), but one was shut down in the early 2000s (Longview Fibre). These scrubbers were originally installed to recover waste heat for use in the plant by making hot water by directly contacting the water stream with the hot stack gases. In order to use the hot water produced in this process, the flue gas concentrations of particulate and SO_2 needs to be significantly reduced prior to making the hot water. As a result, this heat recovery process provides some ancillary control of sulfur and particulate emissions.

Ecology's review of recent EPA RBLC recovery furnace entries generally confirms that for most recovery furnaces, installing a scrubber was not considered Best Available Control Technology (BACT). However, one wet scrubber was listed.[27]

Examination of 1997-2007 stack tests on the PTPC recovery furnace showed that SO_2 emissions are typically very low, with most tests showing less than 20 ppm (which was the limit on the GP Camas plant scrubbers). Emissions from a few of the tests were higher than 20 ppm, with the highest near 160 ppm. This testing history indicates that the recovery furnace routinely operates at low SO_2 emission rates, but periodically experiences sporadic short term "spikes" in SO_2 emissions.

[25] EPA Control Cost manual methods were used to calculated costs which were inflated to 2007 dollars.
[26] See Appendix B of this report for further discussions of these technologies.
[27] Meadwestvaco Kentucky, Inc, RBLC entry KY-0085

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The EPA scrubber fact sheet indicates[28] that scrubbers with inlet concentrations of 250 to 10,000 ppm can have scrubbing efficiencies of 80 to 99 percent. A scrubber operating at 20 ppm would be expected to be less efficient.

At Ecology's request, PTPC provided a rough estimate of the cost of installing a scrubber to remove SO_2 from the recovery furnace emissions. PTPC assumed a cost of $34 per scfm airflow for this type of wet scrubber.[29] At 250,000 scfm (wet basis) with an assumed 90 percent scrubbing efficiency that removed 417 tpy SO_2, the cost would be $20,383 per ton of SO_2 removed. If the scrubber could not achieve 90 percent efficiency, the cost would be higher. This cost estimate did not consider any site specific retrofit costs.

PTPC concluded the installation of a scrubber to control SO_2 emissions from their recovery furnace to not be cost effective.

For SO_2 control, Ecology has determined that BART is the current level of control provided by the existing staged combustion system operated to minimize loss of sulfur chemicals from the furnace.

4.2 Smelt Dissolving Tank BART Determination

For PM/PM_{10} emissions control, Ecology has determined that BART is the current level of control provided by the existing scrubber and meeting the emission limitation in 40 CFR 63, Subpart MM of 0.20 lb PM_{10} per ton BLS.

For SO_2 control, Ecology has determined that BART is the current level of control provided by the Smelt Dissolving Tank's existing wet scrubber.

4.3 No. 10 Power Boiler BART Determination

For PM_{10} control, Ecology evaluated the controls proposed by PTPC and also looked at the potential to modify the existing wet scrubbing system to provide additional particulate removal.

As discussed in Section 1.3.3, the existing Turbotak wet scrubber was installed in 1988, replacing a venturi scrubber. It is continuously maintained. Routine testing has shown it has consistently operated at between 1/3 and 1/2 of its NSPS based limit of 0.1 gr/dscf since its installation. The emission rate for this unit used in the BART visibility impact modeling reflects this low actual emission rate. BART modeling (see Figure 3-1) indicates that particulate emissions contributed the smallest part of PTPC's visibility impacts. Ecology determined that the small visibility improvement potential from upgrading the scrubber did not justify a full engineering study of the scrubber to determine possible particulate scrubbing improvements.

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[28] US EPA CATC, *Air Pollution Control Technology Fact Sheet – Spray Tower Wet Scrubber,* EPA-451/F-03-016, July 2003. Available at **www.epa.gov/ttn/catc/dir1/fsprytwr.pdf**.
[29] Cost derived from data in US EPA CATC, *Air Pollution Control Technology Fact Sheet – Spray Tower Wet Scrubber,* EPA-451/F-03-016, July 2003. Available at **www.epa.gov/ttn/catc/dir1/fsprytwr.pdf**.

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As noted previously, the cost effectiveness of installing a wet ESP is $11,294 per ton of PM_{10} reduced for approximately 109 tpy of emissions reductions. Modeling indicates a definite visibility improvement could occur. However, Ecology determines that the cost of the improved particulate control is too high to justify as BART.

For PM_{10} control, Ecology has determined that BART is the current level of control provided by the existing wet scrubber.

For NO_X control, Ecology has determined that BART is the current level of control provided by proper operation of the boiler's staged combustion system as BART. Ecology could not find a technically feasible NO_X control technology available for retrofit on this boiler. The spreader-stoker design of the No. 10 Power Boiler inherently uses staged combustion, resulting in lower flame temperatures and minimal thermal NO_X formation.

Ecology reviewed BART and further progress evaluations proposed by other states where switching to lower sulfur content fuel oils was considered. Many of the States in the NESCAUM region are considering mandating low sulfur fuel oils for further progress requirements to reduce visibility impairment. NESCAUM evaluated the cost differential of lower sulfur fuels compared to the current fuel oils and determined a range of expected cost effectiveness. For the NE states the cost of this measure was expected to be $500 – 750/ton SO2 reduced. Well below the costs predicted for PTPC.

New Hampshire evaluated the costs for lower sulfur residual oils for the Newton Station and determined that BART for SO_2 is a change from 2% sulfur residual oil to 1% sulfur residual oil for a cost effectiveness of $1900 per ton SO_2 reduced, a value considerably less than the costs for PTPC.

For SO_2 control, Ecology has determined that BART is continued operation of the existing wet scrubber, continued use of the current low sulfur fuels, and implementing good combustion practices aimed at minimizing recycled fuel oil firing as BART.

4.4 Lime Kiln BART Determination

For PM_{10} control, Ecology has determined that BART is the current level of control provided by the existing wet venturi scrubber and compliance with the 40 CFR Part 63, Subpart MM limit of 0.064 gr/dscf at 10 percent O_2.

For NO_X control, Ecology has determined that BART is proper kiln design and Good Operating Practices. Operation using a minimum of excess air minimizes NO_X emissions as well as promoting product quality and process economics.

For SO_2 control, Ecology has determined that BART is the current level of control provided by the Lime Kiln wet venturi scrubber as BART.

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APPENDIX A. COMPILATION OF AVAILABLE PM, NO_X, AND SO_2 CONTROL OPTIONS FOR ALL UNITS

Available PM Control Technologies	
Technology	**Description**
Fabric Filter (baghouse)	A fabric filter (baghouse) consists of several fabric filters, typically configured in long, vertically suspended sock-like configurations. Dirty gas enters from one side, often from the outside of the bag, passing through the filter media and forming a particulate cake. The cake is removed by shaking or pulsing the fabric, which loosens the cake from the filter, allowing it to fall into a bin at the bottom of the baghouse. A variety of fabrics is available to cover fuel gas temperatures up to about 650°F. Baghouses are unsuitable for use on water saturated gas streams.
Cyclone Separators	Cyclone separators remove solids from the air stream by application of centrifugal force. In solid fuel combustion devices like hog fuel boilers, they are commonly used to remove large particles prior to the flue gas entering a baghouse or ESP.
Wet Scrubbers	Wet scrubbers intercept dust particles using droplets of liquid (usually water). The larger, particle-enclosing water droplets are separated from the remaining droplets by gravity. The solid particulates are then separated from the water.
Electrostatic Precipitator (ESP)	An electrostatic precipitator (ESP) removes particles from an air stream by electrically charging the particles, then passing them through a force field that causes them to migrate to an oppositely charged collector plate. The dust from the collector plates falls into a collection hopper at the bottom of the ESP. The collection efficiency of an ESP depends on particle diameter, electrical field strength, gas flowrate, and plate dimensions. ESPs can be designed for both dry and wet applications.
Electrified Gravel Bed Filters (EGFs)	Electrified gravel bed filters (EGFs) are a technique that is no longer implemented in Washington State. It used electricity to generate an electrostatic charge on a moving bed of gravel to collect particulate from a wood-fired boiler. The last unit operating in Washington was recently replaced with a baghouse.
Proper Operating Practices	A properly operated emission unit will minimize the formation of PM_{10} emissions. Proper design of combustion units (e.g., boiler and recovery furnaces) concerns features such as the fuel and combustion air delivery system and the shape and size of the combustion chamber. Good operating practices for combustion units typically consist of controlling parameters such as fuel feed rates and air/fuel ratios.

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Available NO_X Control Technologies	
Technology	**Description**
Low Excess Air (LEA)	Low excess air (LEA) is a technique where combustion is optimized by reducing the excess air introduced to the unit to the minimum necessary for stable, efficient combustion. Excess air is the air supplied in addition to the quantity required for stoichiometric combustion.
Staged Combustion Technologies	Staged combustion technologies such as overfire air (OFA) reduce NO_X emissions by creating a "fuel-rich" zone via air staging (diverting a portion of the total amount of air required through separate ports). For typical staged combustion, there is a slight excess of air in the initial burn zone. The highest temperatures are reached here, generating thermal NO_X. In the secondary burn zone, a secondary burner injects additional fuel into the marginally lean air, creating strongly rich air (i.e., more fuel is present than oxygen available to oxidize the fuel). In this reducing atmosphere, NO is reacted to N as the hydrocarbons and CO scavenge oxygen. For proper operation, the secondary burn zone must be between 1,800 and 2,200°F. Following this section is the final burn zone, where secondary air (from the cooler) provides sufficient oxygen to oxidize the remaining combustibles.
Flue Gas Recirculation (FGR)	Flue gas recirculation (FGR) reduces peak flame temperature by recirculating a portion of the flue gas back into the combustion zone as a replacement for combustion air. The recirculated gasses have a lower oxygen content that reduces the peak flame temperature in the combustion zone.[30]
Low NO_X Burners (LNB)	Low NO_X burners (LNB) are a technique with limited applicability to pile burning wood-fired boilers and recovery furnaces. Low NO_X burners modify the initial combustion conditions to reduce the peak flame temperature and are often used in conjunction with modifications to overfire air systems. They are most useful when using fuels like natural gas or distillate oil.
Fuel Stating (regurning)	Fuel stating (Regurning) is also known as "reburning" or "off-stoichiometric combustion." Fuel staging is a technique where ten to twenty percent of the total fuel input is diverted to a second combustion zone downstream of the primary zone. Again, this is a technique to reduce the peak flame temperature during combustion
Water/ Steam Injection	Water/steam injection into the main flame can reduce the flame temperature and the generation of NO_X. It is an older technique most often used on older burner designs in natural gas and oil-fired boilers and gas turbines. If the flame temperature is sufficiently quenched, the

[30] Prasad, Arbind, "Air Pollution Control Technologies for Nitrogen Oxides," *The National Environmental Journal*, May/June 1995.

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Available NO_X Control Technologies	
Technology	**Description**
	generation of CO can increase and the process efficiency will decrease.
Mid-Kiln Firing	Mid-kiln firing is a form of staged fuel combustion specifically applied to cement and lime kilns. A specially designed fuel injection system introduces a second fuel source at a midpoint in the kiln.[31]
Mixing Air Fan (mid-kiln air lances)	For lime kilns, this technology is a method of staging combustion air through the use of a fan that is mounted on the rotating kiln shell. This can reduce NO_X formation by decreasing peak flame temperatures.
Good Operating Practices and Proper Design	The formation of NO_X can be minimized by proper operation and design practices. Operators can control the combustion stoichiometry to minimize NO_X formation while achieving efficient fuel combustion. This is the most basic combustion modification technique available.
Selective Non-Catalytic Reduction (SNCR)	Selective non-catalytic reduction (SNCR) is an exhaust gas treatment process in which urea or ammonia is injected into the exhaust gas. High temperatures, normally between 1,600 and 1,900°F, promote the reaction between urea or ammonia (NH_3) and NO_X to form N_2 and water.[32] The effectiveness of SNCR systems depends upon six main factors: (1) inlet NO_X concentration, (2) temperature, (3) mixing, (4) residence time, (5) reagent-to-NO_X ratio, and (6) fuel sulfur content.[33]
Selective Catalytic Reduction (SCR)	Selective catalytic reduction (SCR) is an exhaust gas treatment process in which NH_3 or urea is injected into the exhaust gas upstream of a catalyst bed for exhaust temperatures between 450 and 750°F.[34] In the SCR process, the urea or NH_3 injected into the exhaust is stored in a liquid storage tank and vaporized before injection. The exhaust/ammonia mixture then passes over the catalyst. The function of the catalyst is to lower the activation energy of the NO decomposition reaction, therefore, lowering the temperature necessary to carry out the reaction. On the catalyst surface, NH_3 and nitric oxide (NO) or nitrogen dioxide (NO_2) reacts to form diatomic nitrogen (N_2) and water. When operated within the optimum temperature range, the reaction can result in removal efficiencies between 70 and 90 percent.[35] The rate of NO_X removal increases with temperature up to a maximum removal rate at a temperature between 700 and 750°F. As the temperature increases

[31] Battye et al., EC/R Incorporated, *"NOx Control Technology for the Cement Industry"* Final report prepared for EPA, September 19, 2000, Page 65.
[32] NCASI Special Report 03-04, *NOxNOX Control in Forest Products Industry Boilers: A Review of Technologies, Costs, and Industry Experience*, August 2003.
[33] Ibid.
[34] Ibid.
[35] 65Air Pollution Control Cost Manual, Section 4, Chapter 2, Selective Catalytic Reduction, NO_X Controls, EPA/452/B-02-001, pp. 2-9.

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Available NO_X Control Technologies	
Technology	**Description**
	above the optimum temperature, or decreases below the optimum range for a conventional vanadium pentoxide catalyst, the NO_X removal efficiency begins to decrease.[36] Depending on the temperatures involved, low temperature and higher temperature catalyst formulations are available. The effectiveness of an SCR system depends upon the same factors as the SNCR system and the condition of the catalyst. The catalyst can degrade over time due to poisoning, fouling, thermal stress, and erosion by particulates, reducing the NO_X removal efficiency of the SCR system.[37]
Oxidation/ Reduction (O/R) Scrubbing	Several proprietary oxidation/reduction (O/R) scrubbing NO_X removal processes are commercially available. The basic elements of a typical process include cooling of the combustion gas stream below its dew point to condense water, treat with ozone or sodium chlorite to oxidize NO_X and SO_2 to their highest oxidized forms, then absorb these oxides as acids in a scrubber. It has been reported that O/R scrubbing has a theoretical NO_X removal efficiency of 95 percent.[38]

SO_2 controls can be placed into three groups: (1) wet flue gas desulphurization systems, (2) dry or semi-dry flue gas desulphurization systems, and (3) low sulfur fuels.

Available SO_2 Control Technologies	
Technology	**Description**
Flue Gas Desulfurization (FGD) with a Wet Scrubber	In flue gas desulfurization (FGD) with a wet scrubber**,** a solution of sodium or calcium hydroxide absorbs SO_2 from the flue gas forming sodium or calcium sulfite. The collected sulfite can be further oxidized to sulfate or left as the sulfite. Typically, large quantities of liquid or solid wastes are generated requiring disposal.[39]
Semi-Dry Lime Hydrate Slurry Injection FGD	For lime hydrate slurry injection, calcium hydroxide in the form of lime slurry is injected into the gas stream. Calcium hydroxide and SO_2 will react to form calcium sulfite. A fabric filter or ESP will be needed to remove the dry solid reaction products from the gas stream.

[36] Air Pollution Control Cost Manual, Section 4, Chapter 2, Selective Catalytic Reduction, NOx Controls, EPA/452/B-02-001, pp. 2-10.
[37] NCASI Special Report 03-04, NO_X Control in Forest Products Industry Boilers: A Review of Technologies, Costs, and Industry Experience, August 2003.
[38]Ibid.
[39] Cooper, C. David and Alley, F.C. *Air Pollution Control – A Design Approach, 2nd Edition*. Waveland Press: Prospectus Height, Illinois, 1994.

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Available SO_2 Control Technologies	
Technology	**Description**
Dry Lime Powder Injection FGD	Dry lime powder injection FGD controls SO_2 using the same methods as lime hydrate slurry injection and depends on most of the same parameters. As with the lime slurry, a fabric filter or ESP is needed to remove the solid reaction products from the gas stream.[40]
Spray Dryer with an ESP FGD	Spray dryer with an ESP FGD requires installation of a spray dryer and an ESP. Dry lime is injected by a spray dryer into the flue gas in the form of fine droplets under well controlled conditions such that the droplets will absorb SO_2 from the flue gas and then become dry particles because of the evaporation of water. The dry particles are captured by the ESP downstream of the dryer. The captured particles are then removed from the system and disposed.[41]
Low Sulfur Fuel Selection	SO_2 emissions are influenced by the sulfur content of the fuel as well as the sulfur content of the process material. For the Recovery Furnace, the black liquor solids are both the fuel and the material being processed. In the case of the Smelt Dissolving Tank, there is no fuel burning, and in the case of the No. 10 Power Boiler, there is no process material. For the Lime Kiln, the fuel is the dominant source of sulfur rather than the lime feed.
Increased Oxygen Levels at the Burner	Increased oxygen levels at the burner have been shown to decrease SO_2 emissions from lime kilns. The increase in oxygen drives the SO_2 to SO_3 allowing the SO_3 to react with lime to produce $CaSO_4$.
Good Operating Practices	Good operating practices imply that the emission unit is operated within parameters that minimize emissions of air pollutants and maximize combustion efficiency.

[40] Chemical Lime Company Material Safety Data Sheet, Calcium Hydroxide.
[41] Cooper, C. David and Alley, F.C. *Air Pollution Control – A Design Approach, 2nd Edition*. Waveland Press: Prospectus Height, Illinois, 1994.

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APPENDIX B. TECHNICALLY INFEASIBLE NO_X CONTROL TECHNOLOGIES FOR THE RECOVERY FURNACE

Technique	Feasibility Issues/Problems/Limitations
Low Excess Air	Results in the production of smoke, increased CO emissions, and other problems associated with the furnace operation, such as increased corrosion and fouling.[42]
Flue Gas Recirculation	Does not significantly reduce NO_X emissions when firing black liquor solids in a recovery furnace since the majority of NO_X emissions arise from fuel nitrogen. The corrosive conditions inherent in the firing of black liquor solids prevents the use of FGR as the fly ash in the flue gas stream would accumulate in the ductwork required for FGR and absorb moisture, resulting in duct pluggage and severe corrosion. Additionally, the reduced oxygen concentration formed in the furnace by FGR would result in an unacceptable increase in CO emissions. The increased flue gas volume would increase gas velocity in the super heaters and furnace bank, which can cause additional pluggage and lost capacity.
Low NO_X Burners (LNB)	The fireside conditions in a kraft recovery furnace do not accommodate LNB; usage of LNB would prohibit use of multi-stage air feeds and multiple small fuel nozzles, compromising the burners' intended purpose of chemical recovery and impacting their ability to support liquor burning and hearth bed control. The use of low NO_X burners has not been successfully demonstrated for a kraft recovery furnace application.[43]
Fuel Staging	Usage of fuel staging is generally limited to natural gas or distillate oil combustion. Under normal operation, the furnace combusts mostly black liquor solids. The black liquor solids cannot be diverted to a second combustion zone without negatively impacting the delicate balance of the kraft recovery process.
Water/Steam Injection	When firing black liquor solids in a recovery furnace, the majority of NO_X emissions arise from fuel nitrogen. Water/steam injection controls primarily thermal NO_X.
Selective Non-Catalytic Reduction (SNCR)	SNCR for control of NO_X emissions from a kraft recovery furnace has never been demonstrated on a long-term basis and is not listed on the RBLC for any recovery furnace.[44] The Recovery Furnace's complex chemical reaction balance can be upset by the SNCR usage, potentially damaging the furnace and negatively impacting product quality. Optimum NH_3/NO_X molar ratio and correct reaction temperatures would be difficult to monitor and maintain due to fluctuations in furnace load and exhaust gas temperatures. This would cause loss of efficiency

[42] NCASI Special Report 03-04, *NO_X Control in Forest Products Industry Boilers: A Review of Technologies, Costs, and Industry Experience*, August 2003.
[43] NCASI Corporate Correspondent Memorandum No. 06-0142006, *Information on Retrofit Control Measures for Kraft Pulp Mill Sources and Boilers for NO_X, SO_2 and PM Emissions*, June 2006.
[44] NCASI Corporate Correspondent Memorandum No. 06-0142006, *Information on Retrofit Control Measures for Kraft Pulp Mill Sources and Boilers for NO_X, SO_2 and PM Emissions*, June 2006.

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Technique	Feasibility Issues/Problems/Limitations
	and result in the release of NH_3 into the atmosphere. It is likely that formation of NH_3 salts would occur which could result in an increase of process downtime. The Recovery Furnace may operate at temperatures above 2,000°F. At temperatures exceeding 2,000°F, the NH_3 injected with the SNCR begins to oxidize, creating additional NO_X. While SNCR has been demonstrated during a short trial on a recovery furnace (which was decommissioned shortly after the trial concluded), long-term use of an SNCR system on a recovery furnace has never been evaluated.
Selective Catalytic Reduction	SCR technology for control of NO_X emissions from a kraft recovery furnace has never been demonstrated even on a short-term basis and is not listed on the RBLC for any recovery furnace.[45] The Recovery Furnace heat input and black liquor solids characteristics vary continuously. This causes temperature swings that would make efficient SCR operation difficult. Efficient operation requires constant exhaust temperatures within a defined range, usually ± 50°F. A low temperature results in slow reaction rates which lead to low nitrogen oxides conversion and unreacted NH_3 passing through the reactor bed (ammonia slip). A high temperature results in shortened catalyst life and can lead to the oxidation of NH_3 and the formation of additional NO_X. Controlling the feed rate of the SCR NH_3 reagent would also present unique technical considerations. NH_3 injection rates must be closely track the varying NO_X rate from the furnace to maintain a given level of NO_X control while simultaneously avoiding excess ammonia slip.
Oxidation/Reduction Scrubbing (including LoTOx)	The ability of an O/R scrubbing system (like LoTOx) to perform efficiently on a recovery furnace has not been demonstrated on a recovery furnace. There are about 10 installations of LoTOx technology on oil refinery FCCUs and 4 other installations of the technology. The principle operating cost is consumption of pure oxygen to produce ozone. A telephone call with the technology supplier indicated that they were focusing on the refining applications at this time.[46] An O/R scrubbing system is designed to complement control systems that already include a caustic scrubber, which PTPC's Recovery Furnace does not have (it has an ESP). If a caustic scrubber were installed on the Recovery Furnace, other technical difficulties would arise. The high moisture content of black liquor solids results in a flue gas dew point temperature that is expected to exceed 300°F, the maximum temperature for effective oxidation/reduction scrubbing. If the flue gas temperature is lowered to below 300°F where these processes work best, condensation liquids with high corrosion potential and disposal issues result. Bleed air or a water spray cooling tower are the technologies typically used to cool the stack gas stream. Increased air flow requires an increase in the size of the induced draft (ID) fan and its power consumption.

[45] Ibid.
[46] By Al Newman in March 2008.

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APPENDIX C. TECHNICALLY INFEASIBLE NO_X CONTROL TECHNOLOGIES FOR THE NO. 10 POWER BOILER

Technique	Feasibility Issues/Problems/Limitations
Low Excess Air (LEA)	LEA is difficult to employ in spreader stoker boilers because high excess air levels are needed for proper fuel burning.[47] LEA is not anticipated to produce NO_X reductions beyond those already achieved by the staged combustion inherently practiced in the boiler. LEA can result in the production of smoke, increased CO emissions, and other problems associated with the boiler operation including increased corrosion and fouling.[48] Due to fluctuations in the fuel properties, a low level of overall excess air would likely cause incomplete combustion, resulting in increased CO emissions.
Flue Gas Recirculation (FGR)	FGR primarily reduces thermal NO_X. FGR would not significantly reduce NO_X emissions when firing a wood waste spreader stoker boiler since the majority of NO_X emissions arise from fuel nitrogen. The use of FGR would also result in soot fouling.
Low NO_X Burners (LNB)	LNB primarily reduce thermal NO_X. As with FGR, is not expected to significantly reduce NO_X emissions when firing a wood-waste spreader stoker boiler since the majority of NO_X emissions arise from fuel nitrogen. A combustion engineering (CE) representative stated that there is no commercially available low NO_X oil burner that can be retrofitted into a tangential type burner like those used in PTPC's No. 10 Power Boiler.
Fuel Staging (Reburning)	Traditional fuel staging (reburning) requires the use of natural gas or distillate oil in a secondary combustion zone downstream of the primary zone. The No. 10 Power Boiler does not use these fuels. Fuel staging often employs FGR, which is considered infeasible for hogfuel boilers due to its inability to minimize fuel NO_X, the primary component of NO_X from wood waste combustion.[49] PTPC's No. 10 Power Boiler inherently uses a process similar to fuel staging by design. The tangential oil burners, which typically supply approximately 30% of the heat to the boiler, are located downstream of the primary wood-fired flame.
Selective Non-Catalytic Reduction (SNCR)	SNCR technology has never been successfully demonstrated for wood-fired boilers with changing loads.[50] The No. 10 Power Boiler firing rate varies to meet the PTPC Mill's steam demand. It has been used on many wood-fired boilers where loads are steadier, like at sawmills.

[47] Washington State Department of Ecology Publication No. 03-02-009, *Hog Fuel Boiler RACT Determination*, April 2003, downloaded June 25, 2007, http://www.ecy.wa.gov/biblio/0302009.html.
[48] NCASI Special Report 03-04, *NOx Control in Forest Products Industry Boilers: A Review of Technologies, Costs, and Industry Experience*, August 2003.
[49] NCASI Special Report 03-04, *NOx Control in Forest Products Industry Boilers: A Review of Technologies, Costs, and Industry Experience*, August 2003.
[50] NCASI Corporate Correspondent Memorandum No. 06-0142006, *Information on Retrofit Control Measures for Kraft Pulp Mill Sources and Boilers for NO_X, SO_2 and PM Emissions*, June 2006.

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Technique	Feasibility Issues/Problems/Limitations
	There are several reasons why SNCR technology has not been successfully implemented on load-following wood-fired boilers. The injection of the reagent must be applied in a narrow temperature window in order for the reduction reaction to successfully complete. In a load-following boiler, the region of the boiler where this temperature is located varies depending on the firing rate, making it difficult to control the SNCR reaction temperature. Another factor preventing proper implementation of SNCR technology in wood-fired boilers is inadequate reagent dispersion in the injection region, which can lead to significant amounts of unreacted ammonia exhausted to the atmosphere (i.e., large ammonia slip). At least one pulp mill wood-fired boiler had to abandon their SNCR system due to problems caused by poor dispersion of the reagent within the boiler.[51]
Selective Catalytic Reduction (SCR)	SCR technology has never been successfully demonstrated for a spreader stoker boiler.[52] There are several reasons. Size constraints often make locating an SCR system near the boiler impossible in retrofit situations. Most hogfuel boiler temperature profiles are not appropriate for SCR, and the SCR system pressure drop requirements result in sizing concerns related to existing boiler fans. NCASI notes that the high PM concentrations upstream of the PM control equipment would impede catalyst effectiveness and could result in deactivation or poisoning of the catalyst, while installation of SCR downstream of the PM control equipment would render the gas stream too cold for effective reaction with the catalyst to reduce NO_X. The desired temperature range for SCR application is 450 to 750°F, while the outlet temperature of the No. 10 Power Boiler's wet scrubber is less than 150°F. Reheating the flue gas would result in significant energy penalties.
Oxidation/ Reduction (O/R) Scrubbing	O/R scrubbing is not listed as a successfully demonstrated option in any RBLC determination. This technology is not considered readily available or proven for industrial boiler retrofit operations.[53] Even if such technology were to be considered proven and technically feasible for retrofit operations, it is unlikely to be cost feasible.[54]

[51] Ibid.
[52] Ibid.
[53] This technology is not evaluated as a readily available BART option in the BART guidance documents for industrial boilers issued by the Midwest RPO (*Midwest RPO Candidate Control Measures for Industrial, Commercial, and Institutional Boilers,* March 2005) or MANE-VU (*Assessment of Control Technology Options for BART-Eligible Sources: Steam Electric Boilers, Industrial Boilers, Cement Plants, and Paper and Pulp Facilities,* March 2005).
[54] NCASI Special Report 03-04, *NOx Control in Forest Products Industry Boilers: A Review of Technologies, Costs, and Industry Experience,* August 2003.

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APPENDIX D. TECHNICALLY INFEASIBLE NO_X CONTROL TECHNOLOGIES FOR THE LIME KILN

Technique	Feasibility Issues/Problems/Limitations
Staged Combustion	Staged combustion, also known as staged air combustion or non-selective noncatalytic reduction (NSNCR), is comprised of an initial burn zone (oxidizing), a secondary burn zone (reducing), and a final burn zone (oxidizing). Although staged combustion can theoretically result in NO_X reductions of 20 to 50 percent, the technology is not listed as a control for NO_X in the RBLC database, and PTPC is aware of no lime kilns and only a few cement kilns using this technology. To date, PTPC is aware of only one full-scale industrial operation (a cement kiln in Brevik, Norway) using NSNCR that has reported on its experience. A recent paper reviews six years of operation of the Brevik plant. The Brevik plant included a low NO_X burner in addition to NSNCR. While positive results were initially reported, the averaged results over the six years show little improvement as compared to prior operation with a conventional burner and no NSNCR. In addition, long-term testing showed increases in CO and SO_2 concentrations.[55] Process differences between cement and lime production are the reason this technology has not been applied to the lime industry. A multi-stage pre-heater and cyclones, which a lime kiln does not have, are necessary for the staged combustion required for this control technology.
Mid-Kiln Firing	Although mid-kiln firing (MKF) can reduce NO_X emissions in cement kilns, the longer, lower temperature flame and the addition of fuel to the lime would negatively affect the quality of the lime produced. Introduction of fuel at mid-kiln will increase carryover of unburned carbon to the product. This unburned fuel will prevent the lime product from being used in many applications.[56] MKF is not listed for control of NO_X from a lime kiln in the RBLC.
Mixing Air Fan (mid-kiln air lances)	Mixing air fan (mid-kiln air lances) is a method of staging combustion air to reduce NO_X formation through the use of a fan that is mounted on the rotating kiln shell. However, a mixing air fan can create an oxidizing environment in the kiln in a location that may increase the sulfur content of the product to an unacceptable concentration. There has been no application of a mixing air fan on a lime kiln in the U.S.
Flue Gas Recirculation (FGR)	FGR involves routing a portion of the flue gas to the combustion area for the purpose of reducing the maximum flame temperature (and thus lowering thermal NO_X). Achieving high flame temperatures is critical in the lime production process. The flame temperature achieved using FGR would be below the temperature necessary for proper lime formation. In addition, a

[55] *NO_X Emission Control Technologies for Cement and Lime Kilns*, (Draft, 1995). Radian Canada, Inc.
[56] National Lime Association letter to Ms. Rosalina Rodriguez, North Carolina Department of Natural Resources, *Re: Comments on VISTA's Draft Regional Haze Modeling Protocol*, Ocotober 21, 2005.

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Technique	Feasibility Issues/Problems/Limitations
	long and lazy flame will be produced, which is not acceptable for ensuring lime quality. FGR would also require an excessive amount of ducting from the stack to the kiln inlet. FGR has never been demonstrated on a lime kiln and is not listed in the RBLC.
Low NO_X Burners (LNB)	The RBLC does not indicate that LNB has been considered for a lime kiln. There is no commercially available low NO_X burner on the market for implementation in a lime kiln. A 2006 NCASI Corporate Correspondent Memorandum states that "[t]he concept of 'low NO_X burner' is considered a misnomer in the rotary kiln industry. . . In rotary kilns, it is not possible to stage the mixing in the same way [as low NO_X burners in a boiler]."[57] A LNB by design lowers the flame temperature of the burner and changes the flame shape. This is negative for quality control and the calcining process needed to convert a high percentage of $CaCO_3$ mud to CaO reburn lime in the Lime Kiln.
Fuel Staging	The major requirements for fuel staging are to have the fuel feed rate to the main combustion zone be reduced and have an equivalent amount of fuel being fed to the reburn burners in the reburn zone, located downstream of the main combustion zone. Reburning would require major changes for a lime kiln, which could impact the quality of the lime being produced. A lime kiln does not have an area that could be used as a "reburn zone," and additional heat is not needed for a lime kiln pre-heater. Due to these difficulties, this technology has not been previously applied to lime kilns.
Water/Steam Injection	The effectiveness of water/steam injection on lime kiln NO_X emissions is unproven, and this technology is not listed in the RBLC for lime kilns. Water or steam injection into a burner flame will reduce the flame temperature and the generation of NO_X, and is an old, well documented technology for NO_X reduction in boilers and gas turbines. As discussed earlier in the FGR section, the Lime Kiln requires high temperature operation to properly calcine lime. Water/steam injection decreases process efficiency along with flame temperature, and can increase CO generation.
Selective Catalytic Reduction (SCR)	SCR is not listed in the RBLC database for control of NO_X from a lime kiln. To avoid fouling the catalyst bed with the PM in the exhaust stream, an SCR unit would need to be located downstream of the particulate matter control device (PMCD). However, due to the low exhaust gas temperature exiting the PTPC Lime Kiln's wet scrubber PMCD (approximately 156°F); a heat exchanger system would be required to reheat the exhaust stream to the desired reaction temperature range of 450 to 750°F. The source of heat for the heat exchanger would be the combustion of fuel oil, which would

[57] NCASI Corporate Correspondent Memorandum No. 06-0142006, Information on Retrofit Control Measures for Kraft Pulp Mill Sources and Boilers for NO_X, SO_2 and PM Emissions, June 2006.

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Technique	Feasibility Issues/Problems/Limitations
	generate additional NO_X and SO_2.
Selective Non-Catalytic Reduction (SNCR)	SNCR has never been demonstrated on a lime kiln and is not listed on the RBLC. Several difficulties preclude use of an SNCR for control of NO_X emissions from lime kilns. If burner temperatures exceed 2,000°F, the NH_3 injected with the SNCR will begin to oxidize, creating additional NO_X. It is also difficult to maintain the correct NH_3/NO_X ratio during load fluctuations. Excess NH_3 will be released into the atmosphere, creating NH_3 slip. NH_3 slip can form ammonium salts which form a visible plume.
Oxidation/ Reduction (O/R) Scrubbing	While O/R scrubbing has a high theoretical NO_X removal efficiency, the technology has never been installed for lime kilns or cement kilns.[58] Additionally, this technology is not listed in the RBLC database for lime kilns.

[58] Telephone conversation between Mr. Darryl Haley (Tri-Mer Corporation) and Mr. David Wilson (Trinity Consultants), October 18, 2001.

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APPENDIX E. TECHNICALLY INFEASIBLE SO_2 CONTROL TECHNOLOGIES FOR THE LIME KILN

Technique	Feasibility Issues/Problems/Limitations
Semi-Dry Lime Hydrate Slurry Injection FGD	For lime hydrate slurry injection, calcium hydroxide in the form of lime slurry is injected into the gas stream. A fabric filter or ESP would need to be installed on the kiln to remove the solid reaction products from the gas stream. After the calcium hydrate is injected into the gas stream, the slurry droplets will dry and the particulate matter will be removed from the stream by the fabric filter or ESP. The only possible location to inject the lime hydrate is in the feed chute, which is between the kiln and the pre-heater chamber. The gas residence time in the feed chute is approximately 0.9 seconds, the saturation temperature is approximately 350°F, the actual temperature in the chute is approximately 2000°F, and the SO_2 concentration is relatively low. The injection of lime hydrate slurry at this location will not be effective because the ΔTsat temperature is too large (1650°F), the residence time is too short, and the SO_2 concentration is low. Another possible location for injection would be after the kiln and pre-heater, but before the fabric filter or ESP. However, the kiln already has excess reactive lime available and providing additional lime will not have an appreciable contribution to reducing emissions. In addition, injection at this location is not effective due to the low temperature and low SO_2 concentration.
Dry Lime Hydrate Powder Injection	For lime hydrate powder injection, calcium hydroxide in the form of a lime powder is injected into the gas stream. As with the lime slurry, a fabric filter or ESP would need to be installed on the kiln to remove the solid reaction products from the gas stream. The dry lime hydrate can be also be injected in either the feed chute or prior to the fabric filter or ESP. Hydrated lime decomposes to CaO at a temperature of 1076°F.[59] Since the temperature in the feed chute is 1900 to 2000°F, the hydrated lime will decompose at this location. There is already an abundance of CaO dust at this point in the process, so any additional dry lime will not absorb additional SO_2. Prior to the fabric filter or ESP, the temperature is less than 500°F, which is too low for any substantial reaction between dry $Ca(OH)_2$ and SO_2 to occur.
Lime Spray Drying FGD	Lime spray drying FGD would spray lime in addition to that inherently present in the exhaust stream, so that the lime could absorb the SO_2 in the exhaust. There is already an abundance of lime product in the process. Additional dry lime will not absorb additional SO_2. Injecting additional lime in the transfer chute to control SO_2 is redundant with control already achieved through inherent dry scrubbing of SO_2 and the lime product.
Increased Oxygen Levels at the Burner	The required increase in O_2 levels for implementation of this technology results in additional sulfur being deposited in the lime product, which can potentially compromise product quality. Further, increased O_2 levels near the burner would lead to additional fuel and thermal NO_X formation.

[59] Chemical Lime Company Material Safety Data Sheet, Calcium Hydroxide

APPENDIX F. ACRONYMS/ABBREVIATIONS

BART	Best Available Retrofit Technology
CaO	Calcium Oxide
CO	Carbon Monoxide
dv	Deciview(s)
Ecology	Washington State Department of Ecology
EPA	Environmental Protection Agency
ESP	Electrostatic Precipitator
F	Fahrenheit
FGD	Flue Gas Desulfurization
MACT	Maximum Available Control Technology
NDCE	Non-Direct Contact Evaporator
NO_X	Nitrogen Oxides
O_2	Sulfur Dioxide
OCC	Old Corrugated Container
PM	Particulate Matter
ppm	Parts per million
PTPC	Port Townsend Paper Corporation
PTPC Mill	Port Townsend Paper Corporation Kraft Pulp and Paper Mill
PSD	Prevention of Significant Deterioration
RFO	Recycled Fuel Oil
SCR	Selective Catalytic Reduction
SNCR	Selective Non-Catalytic Reduction
SO_2	Sulfur Dioxide
tpy	Tons per year
TRS	Total Reduced Sulfur
VOCs	Volatile Organic Compounds

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600 • Olympia, WA 98504-7600 • 360-407-6000
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

October 20, 2010

Mr. Roger Loney
Port Townsend Paper Corporation
P.O. Box 3170
100 Mill Road
Port Townsend, WA 98368

Dear Mr. Loney:

Regional Haze Best Available Retrofit Technology (BART) Determination

Best Available Retrofit Technology (BART) is required to reduce the regional haze impacts of emissions of your facility. The enclosed Order #7839, Revision 1, contains our BART determination for your facility revised as requested in your September 27, 2010 comments on the Washington Regional Haze Plan.

The primary purpose of the revision is to allow substitution of the currently required emissions monitoring recordkeeping and reporting procedures with methods that Ecology determines would provide equal or better information on emissions and compliance status. The substituted requirements have to be contained in a regulatory order issued by Ecology.

The secondary purposes are to incorporate the revised monitoring and recordkeeping requirements contained in Order DE 05AQIS-2892, First Modification, and to substitute the new modified order for the now rescinded original order.

Ecology considers these changes to be administrative in nature.

If you have questions or requests relating to this order, please contact Alan Newman at (360) 407-6810 or alan.newman@ecy.wa.gov.

Sincerely,

Jeff Johnston, Ph.D.
Manager, Science and Engineering Section
Air Quality Program

AN:lb

Enclosure

cc: Marc Heffner, Industrial Section
Eveleen Muehlethaler, Port Townsend Paper
Alan Newman, Ecology
Commenters on the proposed BART Order

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

IN THE MATTER OF AN ADMINISTRATIVE ORDER AGAINST:	]	ORDER NO. 7839, Revision 1
Port Townsend Paper Corporation	]	

TO: Mr. Roger Loney
Port Townsend Paper Corporation
PO Box 3170
100 Mill Road
Port Townsend, WA 98368

This is an Administrative Order requiring your company to comply with WAC 173-400-151 by taking the actions that are described below. Chapter 70.94 RCW authorizes the Washington State Department of Ecology's Air Quality Program (Ecology) to issue Administrative Orders to require compliance with the requirements of Chapter 70.94 RCW and regulations issued to implement it.

Ecology has determined that portions of your facility are subject to the provisions of the federal and state visibility protection program (WAC 173-400-151 and 40 CFR Part 51, Subpart P). The rules require that the State determine what technologies and level of emission control constitutes Best Available Retrofit Technology (BART) for the eligible emission units at your facility.

FINDINGS

A. The Port Townsend Paper Corporation (PTPC) is a Kraft pulp and paper mill subject to BART.

B. The BART-eligible emission units at PTPC are the Recovery Furnace, the Smelt Dissolving Tank, the No. 10 Power Boiler, and the Lime Kiln.

C. Emissions from BART units are controlled by:

   a. Use of an electrostatic precipitator (ESP) to control PM/PM_{10} emissions from the non-direct contact evaporator (NDCE) Recovery Furnace.

   b. Use of a wet scrubber to control PM/PM_{10} and SO_2 emissions from the Smelt Dissolving Tank.

   c. Use of a multiclone and wet scrubber for control of PM/PM_{10} emissions from the No. 10 Power Boiler.

d. Use of a wet venturi scrubber to control PM/PM_{10} and SO_2 emissions from the Lime Kiln.

D. Ecology has determined that the emission controls currently installed at PTPC meet the requirements of BART.

E. Ecology has determined that PTPC has met the requirements of Administrative Order No. #5072, First Amendment, which required submittal of a BART Technical Analysis for the PTPC facility.

F. On September 27, 2010 Port Townsend Paper submitted comments on the Washington State Proposed Regional Haze State Implementation Plan. The comments requested a revision to this Order to reflect the April 20, 2010 revision to Consolidated Order DE 05AQIS-2892 and to clarify that the company could choose to implement alternatives, such as continuous emission monitoring, to the currently required EPA Reference Method stack testing. This revision incorporates the company request. Ecology has reviewed the request and concur that the changes are acceptable and nonsubstantive.

Additional information and analysis is available in the BART Determination Support Document for Port Townsend Paper Corporation, Port Townsend, Washington, prepared by the Washington State Department of Ecology, October 2008, and the Best Available Retrofit Technology Applicability Analysis and Determination Report for Port Townsend Paper Corporation, Port Townsend, Washington, prepared by Trinity Consultants on behalf of Port Townsend Paper Corporation, December 2007.

YOU ARE ORDERED: To operate existing emission control equipment for the Recovery Furnace, Smelt Dissolver Tank, Lime Kiln, and No. 10 Power Boiler in accordance with the following conditions:

1. BART Emission Limitations

   1.1. Meet the emission limitations for particulate matter, nitrogen oxides, and sulfur dioxide found in Order DE 05AQIS-2892, First Modification, issued to the Port Townsend Paper Corporation on April 20, 2010, by the Washington State Department of Ecology's Industrial Section.

   1.2. Meet the SO_2 and NO_X limitations in PSD-I issued June 1, 1984.

   1.3. Compliance will be determined as specified in Order DE 05AQIS-2892, First Modification.

2. Schedule for Compliance

2.1. Compliance with the emission limitations for particulate matter, nitrogen oxides, and sulfur dioxide is required upon the effective date of this Order.

3. Monitoring and Recordkeeping Requirements

3.1. Monitoring and recordkeeping requirements for particulate matter, nitrogen oxides, and sulfur dioxide are contained in Order No. DE 05AQIS-2892, First Modification.

4. Reporting Requirements

4.1. Reporting requirements for particulate matter, nitrogen oxides, and sulfur dioxide are contained in Order No. DE 05AQIS-2892, First Modification.

5. Ecology may, by regulatory order, revise the monitoring, reporting and recordkeeping requirements specified in this order. The revised monitoring, reporting or recordkeeping methods must provide equal or better information on the compliance status of the source or emission unit subject to the revised monitoring, reporting or recordkeeping methods.

Failure to comply with this Order may result in the issuance of civil penalties or other actions, whether administrative or judicial, to enforce the terms of this Order.

You have a right to appeal this Order. To appeal you must:

- File your appeal with the Pollution Control Hearing Board within 30 days of the "date of receipt" of this document. Filing means actual receipt by the Board during regular office hours.

- Serve your appeal on the Department of Ecology within 30 days of the "date of receipt" of this document. Service may be accomplished by any of the procedures identified in WAC 371-08-305(10). "Date of receipt" is defined at RCW 43.21B.001(2).

If you appeal you must:

- Include a copy of this document with your Notice of Appeal.
- Serve and file your appeal in paper form; electronic copies are not accepted.

To file your appeal with the Pollution Control Hearing Board:

Mail appeal to:

The Pollution Control Hearings Board
P.O. Box 40903
Olympia, WA 98504-0903

OR

Deliver your appeal in person to:

The Pollution Control Hearings Board
4224–6th Avenue SE Rowe Six, Bldg 2
Lacey, WA 98503

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The Department of Ecology
Appeals Coordinator
P.O. Box 47608
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300 Desmond Drive SE
Lacey, WA 98503

And send a copy of your appeal packet to:

Alan Newman
Department of Ecology
Air Quality Program
P.O. Box 47600
Olympia, WA 98504-7600

For additional information, go to the Environmental Hearings Office website at http://www.eho.wa.gov.

To find laws and agency rules, go to the Washington State Legislator website at http://www1.leg.wa.gov/CodeReviser.

Your appeal alone will not stay the effectiveness of this Order. Stay requests must be submitted in accordance with RCW 43.21B.320. These procedures are consistent with Chapter 43.21B RCW.

DATED this 20 day of October, 2010 at Olympia, Washington.

Jeff Johnston, Ph.D.
Manager, Science and Engineering Section
Department of Ecology
Air Quality Program

BART DETERMINATION SUPPORT DOCUMENT FOR LAFARGE NORTH AMERICA SEATTLE PLANT

Prepared by

Washington State Department of Ecology
Air Quality Program

October 21, 2008

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EXECUTIVE SUMMARY

The Best Available Retrofit Technology (BART) program is part of the larger effort under the federal Clean Air Act Amendments of 1977 to eliminate human-caused visibility impairment in all mandatory federal Class I areas. Sources that are required to comply with the BART requirements are those sources that:

1. Fall within 26 specified industrial source categories.
2. Commenced operation or completed permitting between August 7, 1962 and August 7, 1977.
3. Have the potential to emit more than 250 tons per year of one or more visibility impairing compounds.
4. Cause or contribute to visibility impairment within at least one mandatory federal Class I area.

Lafarge North America (Lafarge) operates a Portland cement plant in Seattle, Washington. The cement production process results in the emissions of particulate matter (PM), sulfur dioxide (SO_2) and nitrogen oxides (NO_X). All of these pollutants are visibility impairing.

Cement plants such as the Lafarge facility are one of the 26 listed source categories. The Lafarge plant began commercial operation in March of 1967 and has the potential to emit more than 250 tons per year of SO_2, NO_X, and PM. Sixteen of the 18 processing areas at the plant are BART-eligible. Lafarge's major sources of visibility impairing pollutants are clinker cooling system and the wet process rotary cement kiln.

Modeling of visibility impairment was done following the Oregon/Idaho/Washington/EPA-Region 10 BART modeling protocol.[1] Modeled visibility impacts of baseline emissions show impacts on the eighth highest day in any year (the 98th percentile value) of greater than 0.5 deciviews (dv) at seven Class 1 areas. The highest impact was 3.16 dv on Olympic National Park. Modeling showed that NO_X and SO_2 emissions from the kiln are responsible for the facility's visibility impact.

Lafarge prepared a BART technical analysis following Washington State's BART Guidance.[2]

The Washington State Department of Ecology (Ecology) determined that BART for PM emissions is the current system of baghouses and electrostatic precipitators at the facility. BART for NO_X is selective non-catalytic reduction (SNCR). BART for SO_2 emissions from the kiln is the current level of control provided by the cement kiln process plus the addition of a dry sorbent injection system using lime. The BART controls selected by Ecology will result in a visibility improvement at Olympic National Park of approximately 1.1 dv with improvements of 0.2 to 0.8 dv at other affected Class I areas.

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[1] Modeling protocol available at http://www.deq.state.or.us/aq/haze/docs/bartprotocol.pdf.
[2] "Best Available Retrofit Technology Determinations Under the Federal Regional Haze Rule," Washington State Department of Ecology, June 12, 2007.

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1. INTRODUCTION

This document is to support Ecology's determination of the Best Available Retrofit Technology (BART) for the Lafarge cement plant located in Seattle, Washington.

The Lafarge plant produces Portland cement using the wet process. Sixteen of the 18 emission units at the plant are subject to BART. The primary emission units of concern are the rotary kiln and the clinker cooler. The rotary kiln is the source of the SO_2 and NO_X produced by the plant. The clinker cooler system is the largest particulate source. All other units are particulate sources controlled by baghouses with low individual emission rates resulting from low airflow rates and intermittent operations. These units collectively have the potential to emit less than 10 percent of the potential particulate emissions from the plant. Currently, an electrostatic precipitator controls particulate matter emissions from the kiln. Particulate matter emissions from the clinker cooler are controlled by a baghouse and a backup baghouse.

1.1 The BART Analysis Process

Lafarge and Ecology used the U.S. Environmental Protection Agency's (EPA's) BART guidelines contained in Appendix Y to 40 CFR Part 51, as annotated by Ecology, to determine BART for the kiln and clinker cooler. The BART analysis protocol reflects utilization of a 5-step analysis to determine BART for SO_2, NO_X, and PM_{10}. The five steps are:

1. Identify all available retrofit control technologies.
2. Eliminate technically infeasible control technologies.
3. Evaluate the control effectiveness of remaining control technologies.
4. Evaluate impacts and document the results.
5. Evaluate visibility impacts.

The BART guidance limits the types of control technologies that need to be evaluated in the BART process to available control technologies. Available control technologies are those that have been applied in practice in the industry. The state can consider additional control techniques beyond those that are 'available', but is not required to do so. This limitation to available control technologies contrasts to the Best Available Control Technology (BACT) process where innovative technologies and techniques that have been applied to similar flue gasses must be considered.

As allowed by the EPA BART guidance, Ecology has chosen to consider all 5 factors in its BART determinations. To be selected as BART, a control has to be available, technically feasible, cost effective, provide a visibility benefit, and have a minimal potential for adverse non-air quality impacts. Normally the potential visibility improvement from a particular control technology is only one of the factors weighed for determining whether a control constitutes BART. However, if two available and feasible controls are essentially equivalent in cost-effectiveness and non-air quality impacts, visibility improvement becomes the deciding factor for the determination of BART.

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1.2 Basic Description of the Lafarge Plant

The Lafarge plant produces 465,000 tons of Portland cement clinker per year using the wet process. In this process, the raw materials are fed into the rotary kiln as slurry. In the kiln, the slurry is heated to approximately 2700ºF so that the water in the slurry is evaporated and the ground material is converted to metal oxides, the active component of cement.

The primary minerals in Portland cement are calcium oxide, aluminum oxides, iron oxides, and silica. These minerals are derived from limestone, sand, clay, iron ore, iron bearing byproducts, aluminum silicates, natural soils, petroleum contaminated soils, natural gravel, fly ash, boiler slag, lime, gypsum, fluid catalytic cracking unit catalyst, and Vactor wastes (street grit removed from storm drains and pipes), blast furnace and foundry sands, and other material containing calcium, silica, iron, and alumna.

The heat input to the kiln is limited to 282 MMBtu/hr by regulatory order.[3] Fuels that are currently permitted to be used in the rotary kiln are petroleum coke, coal, natural gas, tire derived fuel (TDF), waste oil, and tank bottom oil (TBO).

The raw materials are crushed, mixed with water to form slurry, and pumped into the kiln. In the rotary kiln, heat from combustion is used to dry the slurry and calcine the clinker to remove the carbon dioxide and sulfur dioxide from the minerals to produce cement clinker. The clinker is quickly cooled prior to being pulverized into cement powder. Clinker cooling produces some particulates, which are vented to a baghouse. The final cement powder is mixed with a variety of other materials such as gypsum to produce cements with specific properties.

The principle air pollution control authority for this facility is the Puget Sound Clean Air Agency (PSCAA).

1.3 BART-Eligible Units at Lafarge

Sixteen of the 18 emission units at the Lafarge plant are BART eligible. This means that these 16 emission units have the collective potential to emit more than 250 tons per year of SO_2, NO_X, and PM/PM_{10} and they all commenced operation within the 15-year BART period.[4] Specifically, the plant was constructed during 1966 and is reported to have begun commercial operation in March of 1967.

Table 1-1 gives an overview of the potential emissions from the facility and identifies the primary BART-eligible units. The Potential to Emit is based on permitted emission rates for the

[3] PSCAA Order No. 6202.
[4] The 15-year period ending with August 7, 1977, the date of passage of the Clean Air Act amendments of 1977.

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BART-eligible units as listed in the Air Operating Permit issued to Lafarge and the supporting documents for the permit.

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Table 1-1. POTENTIAL TO EMIT BY EMISSION UNITS AND WHETHER A BART ANALYSIS WAS PERFORMED BY LAFARGE

Emission Unit	Potential to Emit Tons/year			BART Analysis Performed? (Yes or No)
	NO_X	SO_2	PM_{10}	
Rotary, wet process cement kiln	1720	1650	71	Yes
Clinker cooler primary and backup baghouses	N/A	N/A	2816[5]	Yes
Raw material, finished product storage bins, finish mill conveying system, bagging system, bulk loading/unloading system baghouses	N/A	N/A	480	No

Ecology reviewed the current controls for all emission units at the plant. Lafarge's review focused on the largest emitting units, the wet process kiln, and the primary and backup clinker cooler baghouses. The primary clinker cooler baghouses are designed to operate all the time, while the backup baghouses are intended to operate in the event of failure of one or more of the primary baghouses.

The rotary kiln is the stationary combustion source at the plant. Its emissions of NO_X and SO_2 have been periodically evaluated as part of permitting projects to add new fuels to the list of fuels approved for use in this rotary kiln.

The remaining BART-eligible emission units at the facility are sources of particulate. These units are devoted to handling raw materials, intermediate materials (such as crushed rock or partially crushed clinker), or finished cement. PSCAA has previously subjected these units to a Reasonably Available Control Technology (RACT) analysis as part of bringing the Duwamish Industrial area into attainment with the PM_{10} ambient standards. The RACT analysis for these particulate sources imposed a PM_{10} emission limit of 0.005 g/dscf on all the BART-eligible units. The clinker cooler primary baghouse is the exception to this PM_{10} emission limit.

1.4 Visibility Impact of BART-Eligible Units at Lafarge Plant

Class I area visibility impairment and improvement modeling was performed by Lafarge using the BART modeling protocol developed by Oregon, Idaho, Washington, and EPA Region 10.[6]

[5] Primary baghouse system. The backup baghouse system is smaller than the primary system, but could emit 1408 tons per year if it were to operate for a full year.
[6] A copy of the modeling protocol is available at http://www.deq.state.or.us/aq/haze/docs/bartprotocol.pdf.

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This protocol uses three years of metrological information to evaluate visibility impacts. As directed in the protocol, Lafarge used the highest 24-hour emission rates that occurred in the 3-year period to model its impacts on Class I areas. The modeling indicates that the emission from this plant causes visibility impairment on the eighth highest day in any one year and the 22nd highest day over the three years that were modeled.[7] For more information on visibility impacts of this facility, see Section 3 below.

2. BART TECHNOLOGY ANALYSIS

The Lafarge BART technology analysis was based on the 5-step process defined in BART guidance and listed in Section 1.1 of this report.

2.1 Clinker Cooler

Emissions from the clinker cooler are particulates formed during the cooling of the hot clinker and initial handling of the brittle clinkers in the clinker cooler. The existing clinker cooler baghouses and backup baghouses were upgraded in 1994. RACT emission limits were established for these units by PSCAA in order for the area around the plant to return to compliance with the PM_{10} ambient air quality standard. The RACT emission limit for the primary clinker cooler baghouses is 0.025 grain/dry standard cubic foot (g/dscf). For the backup clinker cooler baghouses and all other baghouses at the facility, the emission limitation is 0.005 g/dscf.[8]

2.1.1 PM/PM_{10}

There are many PM/PM_{10} emission controls available for use at this facility. Only those that are capable of meeting the existing emission limitation on the units were evaluated by Lafarge. Controls for particulate emissions from the clinker cooler that were evaluated are given in Table 2-1.

Table 2-1. PM /PM_{10} CONTROLS EVALUATED

Control	Removal Efficiency, % Removal	Typical Emission Limitation, Grains/Dry Standard Cubic Foot (g/dscf)
Baghouse	99.8–99.9	0.004–0.2
Electrostatic precipitator	99.7	0.004–0.2

[7] A source causes visibility impairment if its modeled visibility impact is above one deciview, and contributes to visibility impairment if its modeled visibility impact is above 0.5 deciview.
[8] PSCAA Order 5627.

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The existing baghouses provide for 99.8 percent control of particulate. This is equal or superior to an electrostatic precipitator. Other controls such as wet scrubbers and wet venture scrubbers are available but do not control PM emissions control as well as the currently installed baghouses.

2.1.2 Proposed BART

The currently installed baghouses are the highest level of particulate control available for the clinker cooler system. Lafarge has proposed that the existing baghouses are BART for particulate matter from this clinker cooling processing area.

2.2 Wet Process Rotary Kiln

This unit is a source of sulfur dioxide resulting from the combustion of sulfur containing fuels like coal and petroleum coke and from calcining sulfur minerals in the raw materials, forming SO_2. NO_X is formed in the combustion process through either oxidation of fuel bound nitrogen or oxidation of nitrogen gas in the high temperature flame zone of the kiln (prompt NOx). Particulates are formed in the dryer sections of the kiln through the rotary action of the kiln causing the brittle clinker to fall and fracture, forming smaller clinkers and dust.

2.2.1 SO_2 Control

Currently there is no specific SO_2 control installed on the Lafarge facility. The alkaline nature of the cement clinker formed in the kiln ensures that the process alone provides a considerable amount of sulfur dioxide control. EPA has evaluated this and reports that between 70 and 95 percent SO_2 control is provided by the cement clinker itself.[9] In spite of this much 'native' SO_2 removal in the cement process, Lafarge evaluated the efficacy of a number of add-on SO_2 control technologies that could be applied to their facility.

Table 2-2. SO_2 CONTROL TECHNOLOGIES EVALUATED

Control Technology	Control Efficiency
Dry sorbent injection with lime or sodium	25–35% with an ESP, up to 50% with baghouse
Spray dryer (semi-dry FGD)	Up to 90% with baghouse, up to 70% with ESP
Wet limestone forced oxidation	Up to 95%
Wet lime	Up to 95%
Ammonia forced oxidation	Up to 95%
Alternative fuels and raw materials	< 25%

[9] AP-42 5th Edition–Compilation of Air Pollutant Emission Factors; Chapter 11.6–Portland Cement Manufacturing, U. S. EPA, OAQPS.

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Dry sorbent injection involves injecting a dry powder such as sodium carbonate or bicarbonate, calcium oxide, magnesium hydroxide, or calcium hydroxide. The dry reagent reacts with the SO_2 and any SO_3 in the flue gas to convert the carbonates, oxides, or hydroxides to sulfites and sulfates. Injected sorbent (unreacted and reacted) is removed from the flue gas by the particulate control device. Due to the nature of the reaction between lime and the SO_2 in the flue gas, higher SO_2 removal rates and lower lime injection rates can be achieved with the use of a baghouse compared to the use of an electrostatic precipitator (ESP). The cost to replace the existing ESPs with a new baghouse was not evaluated by Lafarge. The addition of duct sorbent injection to cement kiln exhaust is a relatively new concept in the industry, but has been used at a number of kilns around the world.

Lafarge has determined that dry sorbent injection using lime to control SO_2 from the kiln is technically available and analyzed the cost and other environmental impacts of its use at their facility. Their analysis indicates that there is:

- An appropriate location for injection of the dry sorbent.
- Recovered reacted dry sorbent can be beneficially utilized in the cement product.
- This location provides adequate contact time between the flue gas and the dry sorbent to provide a level of emissions control.
- No new ductwork, reactor vessels, or replacement particulate control device is required.
- That this location in conjunction with the existing ESPs will provide a SO_2 removal rate 25 percent (based on a design 7.5 percent control effectiveness and a 90 percent availability of the control system) of the SO_2 leaving the kiln.

A **spray dryer** injects a slurry of recycled solids from the particulate control mixed with lime limestone, or sodium carbonate into the flue gases to react with SO_2 and SO_3 within the droplets containing the reagent chemical. The reaction rate slows as the droplets dry out. The reagent may be sprayed into a duct or a special reactor vessel. The dried reagent is commonly collected in a baghouse located downstream of the injection site, though there are boiler installations using an ESP. The presence of a baghouse increases the removal efficiency of the technique compared to use of an ESP.

Lafarge has proposed that installation of a spray dryer system is technically infeasible at this time. Use of this control would require the addition of the following:

- A new reactor tank since duct length provides insufficient detention time for the spray dryer process.
- Significant modifications to the existing ductwork at the exit of the kiln.
- Disposal costs for the sulfite waste product.
- Higher removal rates than the duct sorbent injection process would require replacement of the ESPs with a baghouse.

Wet Scrubbers for SO_2 control come in a variety of configurations differing most importantly in the chemistry used. Lafarge evaluated the use of a wet limestone forced oxidation and a wet lime scrubbing systems. Ecology requested an evaluation of the use of an ammonia forced oxidation scrubber that is discussed below.

In a **wet limestone forced oxidation** scrubber, limestone is pulverized and mixed into slurry, which is injected into a reactor vessel. The SO_2 reacts with the limestone slurry to form calcium sulfite. The calcium sulfite in solution is mixed with air to force the reaction of the calcium sulfite to the calcium sulfate (gypsum) form. The calcium sulfate is removed from the scrubbing liquor via a belt or filter press. Lafarge would use the resulting gypsum by mixing it with the cement clinker produced by the kiln.

The plant already uses limestone as one of its major raw materials. Due to this use, the wet limestone forced oxidation process would not require additional or new raw material storage or handling equipment. The gypsum produced would offset purchased gypsum currently used by the plant.

In industrial boiler and coal fired electric utility boiler applications, the wet limestone forced oxidation process has demonstrated removal efficiencies of over 95 percent. There is limited application of this process to cement kilns. At a Lafarge facility in Europe, the process has been able to routinely achieve 81 percent control.[10]

Lafarge has determined that installation of a wet limestone forced oxidation scrubbing system is a feasible control option for this facility. The wet scrubber system would be located between the existing ESPs and the stack. At this location, it would provide about 90 percent removal efficiency. Lafarge estimates that such a system would only be available for 90 percent of the operating time for an annual SO_2 removal efficiency of 81 percent. Experience with this technology on coal-fired power plants indicates that the availability of the control system will be much higher than 90 percent.

The **ammonia forced oxidation** process has been used on a few industrial and coal-fired boilers, but not on cement kilns. The process is similar to the wet limestone process with ammonia replacing the calcium carbonate of the limestone and the final product being ammonium sulfate. The ammonium sulfate can be sold as a fertilizer.

In Lafarge's evaluation of this technology, they focused on the additional space necessary for ammonia storage, the incompatibility of ammonia with the cement product, and the perceived difficulty of selling the resulting ammonium sulfate.

While this technology provides essentially identical emissions control as the wet limestone forced oxidation process, Lafarge has determined the technology is not technically feasible for their facility.

[10] RTP Environmental Associates, "Proposed Best Available Retrofit Technology (BART) for the Lafarge Plant in Seattle, Washington," December 2007, pp. 3-6.

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Wet lime scrubbing is similar to the wet limestone forced oxidation process with a few notable differences. First, instead of limestone (calcium carbonate) being used as the reagent, lime (calcium oxide) is used. Second, the wet lime process does not normally take the calcium sulfite formed and further oxidize it to calcium sulfate. Lime is considerably more expensive than limestone and without the inclusion of forced oxidation, the scrubber wastes (primarily calcium sulfite) must be landfilled. Lafarge did not propose to include the forced oxidation step.

Lafarge considers this process technically feasible to implement at their facility.

Cost analysis of the available SO_2 control options

Lafarge estimated the costs of the various control options that are considered technically feasible. The costs and emission reduction provided by each control option evaluated is in Table 2-3. Note that Lafarge did not provide a cost analysis for dry sorbent injection that included the costs of O&M or lime. The cost effectiveness value shown in the table is solely for the capital cost.

Table 2-3. COST AND COST EFFECTIVENESS ANALYSIS SUMMARY

Control Option	Capital Cost	Annualized Cost	Current Emissions, Tons/Year	Tons Per Year Reduced, Tons/Year	Cost Effectiveness, $/Ton Reduced
Dry sorbent injection	$6,090,000	$574,896[11]	570	142.5	$4,034[11]
Wet limestone forced oxidation	$77,064,944	$15,198,999[12]	570	462	$32,920
Wet lime scrubbing	Not calculated		570	399	

2.2.2 NO_X Control

Currently, the NO_X emissions on the rotary kiln are controlled via combustion controls only. This provides a minimal amount of control, and is included in the baseline emissions condition. A number of controls were evaluated in Table 2-4 below.

[11] Does not include annual O&M costs. Based on seven percent interest rate and 20-year equipment lifetime.
[12] Based on seven percent interest rate and 20-year equipment lifetime.

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Table 2-4. NO_X CONTROLS EVALUATED

Control Technology	Control Efficiency	Technically Feasible?
Low NO_X burners/indirect firing	15% reduction	Yes
Mid-kiln firing of whole tires	40% reduction	Yes
SCR	Up to 95% reduction	No
SNCR	30-40% reduction	Yes
Low NO_X burners/indirect firing/SNCR	45-85% reduction	Yes
Low NO_X burners/indirect firing/mid-kiln firing	55% reduction	Yes

Low NO_X burners are a common control technique applied to many different combustion sources. Low NO_X burners reduce the emissions of NO_X by reducing the peak temperature of the flame area of the burner. Low NO_X burners have been retrofitted on other wet process kilns in the U.S. According to Lafarge, the use of low NO_X burners would require the replacement of the existing direct firing burner system (the burner fires directly into the rotary kiln) with an indirect firing system (where the burner fires into a smaller primary combustion chamber prior to being ducted to the kiln). The indirect firing component allows better control of the combustion conditions that lead to the formation of NO_X. Lafarge determined that even though the conversion to an indirect firing system with low NO_X burners may be a challenging construction project, the conversion is a technically feasible emission control option. The only significant adverse impact that they identified to this process was that it could result in a limitation on the volatility of the coals used. The systems are apparently adversely impacted when high volatility coals are used. Sub-bituminous coals from the Wyoming/Montana Powder River Basin are considered high volatility coals.

Low NO_X burners are estimated to reduce NO_X emissions by about 15 percent. This technology is compatible with mid-kiln firing, SCR, and SNCR since it is implemented at the fuel feed end of the kiln. Lafarge has estimated that installation of Low NO_X burners and indirect firing would have a capital cost of $15,000,000, and a cost effectiveness of $19,246/ton NO_X reduced.[13]

Mid-kiln firing is a process where a small part of the fuel needs to the kiln is introduced at approximately the middle of the kiln's total length. The process is also known as 'reburning' when applied to fossil fuel fired boiler systems. Whole tires are an attractive, available, and relatively low cost fuel that has been proven in practice to reduce NO_X emissions from long wet

[13] The cost effectiveness is based on a 10 percent interest and a 15-year capital recovery period. Using the Ecology standard of seven percent interest rate and a 20-year period changes the cost effectiveness to $2,921/ton reduced.

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kilns such as this one. This technology is expected to reduce NO_X emissions by about 40 percent.[14]

While the literature indicates that any fuel can be added at this point, Lafarge indicates that a quick burning fuel such as wood chips or natural gas would not be effective at reducing NO_X. Preferably, the fuel used would have a relatively long burning time. Whole vehicle tires are the common fuel to meet this criteria, though dewatered wastewater sludge (biosolids) would meet this criterion. Lafarge considers this technology technically infeasible since they do not believe they can guarantee a long-term supply of whole tires. Lafarge currently has the capability to feed whole tires at the mid-kiln location, and did not estimate the cost of this control technique as part of this evaluation.

Selective Catalytic Reduction (**SCR**) is a NO_X control technology that is commonly applied to combustion sources in both new construction and retrofit installations. It involves the use of a base or precious metal catalyst and the injection of ammonia or urea into the flue gas stream. The ammonia reacts with the NO_X to form nitrogen gas and water. Some excess ammonia escapes the process and is emitted. Worldwide, there are only two reported uses of SCR on a cement kiln, and neither of these was on a wet process kiln. The Solnhofen cement plant is a preheater (dry process) type kiln and the SCR process is reported by the cement industry to have operated for a limited period of time before being shutdown. The other installation is on a dry kiln at Cementeria de Monselice in Italy and is still in operation at this time. Dry cement kilns and wet process kilns differ in how and where the fuel is combusted. This difference is significant enough to remove SCR from consideration as an available emission control technology for a wet process kiln.

Selective Noncatalytic Reduction (SNCR) is a NO_X control technology often used where lower rates of NO_X reduction are required or SCR is not feasible. In SNCR process, ammonia, an ammonia water solution, or a urea water solution is sprayed into the combustion zone at a location where the temperature is in the range of 1600–1800ºF. At the Lafarge plant, this temperature window occurs at the same location where mid-kiln firing might occur. According to the company, mid-kiln firing and SNCR are incompatible technologies due to the location of this temperature window.[15] To date, there are two wet kiln plants operating with SNCR, one is the Ash Grove Cement plant in Midlothian, Texas; the other facility is in Europe. When used on boilers, SNCR has exhibited a range of control efficiency from 30–70 percent. The higher levels of control effectiveness have not been demonstrated at the few wet process cement kilns using this control. Lafarge estimates that implementation of SNCR on their wet kiln would result in a reduction of NO_X of 40 percent. They consider the process technically feasible.

Low NO_X burners with indirect firing and SNCR can feasibly be combined at this facility. Lafarge has noted that implementation of low NO_X burners/indirect firing and SNCR would increase the NO_X control efficiency to 55 percent. Lafarge considers that the combination is

[14] Texas Cement Kiln Report (FINAL–7/14/2006), pp. 4-42.
[15] RTP Environmental Associates, "Proposed Best Available Retrofit Technology (BART) for the Lafarge Plant in Seattle, Washington," December 2007, pp. 12-14 of Section 3 and letter of March 11, 2008.

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technically feasible to implement, though they did not estimate the costs to implement this process.

Table 2-5 is a summary of the cost analysis and emissions reduction anticipated from use of the control technologies evaluated for NO_X control.

Table 2-5. COSTS AND COST EFFECTIVENESS ANALYSIS SUMMARY

Control Option	Annualized Cost	Uncontrolled Emissions, Tons/Year	Tons Per Year Reduced, Tons/Year	Cost Effectiveness, $/Ton Reduced
Low NO_X Burners/Indirect Firing	$2,738,547	2172.5	325.9	$19,246
SNCR	Not Calculated	2172.5	869	
Mid-kiln firing	Not Calculated	2172.5	869	

2.2.3 PM/PM_{10} Control

Currently particulate control on the rotary kiln is provided by parallel electrostatic precipitators. The plant design anticipated building a second rotary kiln and included as part of the initial construction one electrostatic precipitator for each kiln. Since only one kiln has been constructed, both precipitators are used on the one kiln. Each of the two ESPs was sized to control emissions from one rotary kiln. Each ESP has three stages designed to handle an exhaust flow rate of 400,000 actual cubic feet per minute (acfm) with a space velocity of five feet/second. The one existing kiln operates with an exhaust flow rate under 200,000 acfm. Lafarge has ducted their two ESPs to their one kiln. As a result, each existing ESP has a space velocity of about two feet/second. Because of the low velocities through the ESPs, actual removal efficiency is 99.95 percent or higher, which is equal to or exceeds the capability of a baghouse. The current emission limitation for the kiln/ESP stack is 0.05 g/dscf as required by PSCAA regulation.[16]

Lafarge proposes that the existing ESP system is BART for their cement kiln.

Lafarge's analysis of the visibility impact modeling indicates that the PM_{10} emissions do not contribute a significant amount to the plant's modeled visibility impact.

[16] Regulation I, Section 9.09.

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2.2.4 Proposed BART

Lafarge has proposed that the controls listed in Table 2-6 be determined to be BART for the rotary kiln.

Table 2-6. LAFARGE'S PROPOSED BART CONTROLS

Parameter	Control Technology	Proposed BART Control Efficiency, % Reduction	Baseline 30-Day Average Emissions	Proposed 30-Day Average Emission Limit
SO_2	Duct sorbent injection with lime	25	5.74 ton/day	4.31 ton/day
NO_X	SNCR	40	19.1 ton/day	11.5 ton/day
$PM/PM_{10}/PM_{2.5}$	Existing ESP system	0	0.05 g/dscf	0.05 g/dscf

3. VISIBILITY IMPACTS AND DEGREE OF IMPROVEMENT

Lafarge modeled their current visibility impairment and the potential improvement from the two control scenarios that they evaluated as potential BART controls for their facility. In modeling the emissions, they followed the BART modeling guidance prepared for use by sources in Washington, Oregon, and Idaho. In accordance with the EPA BART guidance, this modeling protocol utilizes the CALPUFF modeling system and the 'old' IMPROVE equation to convert modeled concentrations to visual impairment. This approach is consistent with most of the states included in the Western Regional Air Partnership for modeling individual source visibility impairment. The 'old' IMPROVE equation is used because it is included within the CALPUFF modeling system and is part of the EPA accepted version of the model per 40 CFR Part 51, Appendix W. A new equation is available, but is not included within the version of the CALPUFF modeling system specified in the modeling protocol.

The results of the Lafarge modeling are shown in Table 3-1 for all Class I areas within 300 km of the plant plus the Columbia River Gorge National Scenic Area. The table shows the maximum day impairment due to Lafarge, the highest of the three 98th percentile days of each year modeled, and the 98th percentile day of all three years modeled. Also shown is the modeled visibility impairment resulting from the two control scenarios modeled by Lafarge. The modeled emissions for the baseline condition and the two control scenarios are included in Table 3-1. The shaded areas indicate values above the 0.5 dv threshold used to determine if a source contributes to visibility impairment.

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The emission rates modeled were derived from operating records of the rotary kiln and reflect the highest 24-hour emission rate within the three years that were modeled. The emission reduction percentages (see table above) were applied to this maximum 24-hour emission rate and those rates were then used for modeling the visibility impairment/improvement that could be achieved using the proposed controls. The maximum day SO_2 emissions during the three years of modeling were not used as that day was reported to be in an abnormal, upset operating condition. In reviewing the emission information, it is also unusually high compared to all other monitored days in the 3-year period. The modeled emission rates are shown in Table 3-1.

Ecology modelers have reviewed the modeling performed by Lafarge and have found that the modeling complies with the Modeling Protocol and produces a reasonable result.

The modeled emission reductions result in substantial reduction in the visibility impairment caused by Lafarge in all Class I areas modeled and in the Columbia River Gorge NSA. At the three most heavily impacted Class I areas, Olympic National Park, Mt. Rainier National Park, and the Alpine Lakes Wilderness, Lafarge's proposed BART controls would provide 0.8 to 1 dv reduction in visibility impairment in each of these areas.

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Table 3-1. THREE YEAR DELTA DECIVIEW RANKING SUMMARY

Class I Area	Visibility Criterion	Baseline Emissions	Control Scenario 1: SNCR & DAA	Control Scenario 2: SNCR & Wet Scrubbing
Alpine Lakes Wilderness	Max delta deciview	4.93	3.342	2.779
	Max 98% value (8th high)	2.07	1.335	1.232
	3-yrs Combined 98% value (22nd high)	2.06	1.318	1.182
Glacier Peak Wilderness	Max delta deciview	3.34	2.234	1.754
	Max 98% value (8th high)	1.62	1.05	0.866
	3-yrs Combined 98% value (22nd high)	1.43	0.901	0.769
Goat Rocks Wilderness	Max delta deciview	1.56	0.979	0.859
	Max 98% value (8th high)	0.92	0.581	0.457
	3-yrs Combined 98% value (22nd high)	0.85	0.529	0.448
Mt. Adams Wilderness	Max delta deciview	1.49	0.934	0.812
	Max 98% value (8th high)	0.78	0.491	0.389
	3-yrs Combined 98% value (22nd high)	0.76	0.48	0.389
Mt. Hood Wilderness	Max delta deciview	1.72	1.097	0.874
	Max 98% value (8th high)	0.65	0.412	0.339
	3-yrs Combined 98% value (22nd high)	0.62	0.383	0.307
Mt. Rainier National Park	Max delta deciview	4.47	2.98	2.631
	Max 98% value (8th high)	2.04	1.261	1.092
	3-yrs Combined 98% value (22nd high)	1.78	1.131	0.959
North Cascades National Park	Max delta deciview	2.76	1.8	1.577
	Max 98% value (8th high)	1.48	0.947	0.754
	3-yrs Combined 98% value (22nd high)	1.27	0.798	0.693
Olympic National Park	Max delta deciview	6.99	4.893	4.25
	Max 98% value (8th high)	3.16	2.072	1.81
	3-yrs Combined 98% value (22nd high)	2.96	1.937	1.678
Pasayten Wilderness	Max delta deciview	1.37	0.876	0.736
	Max 98% value (8th high)	0.82	0.513	0.429
	3-yrs Combined 98% value (22nd high)	0.72	0.461	0.393
Class II area modeled per the Modeling Protocol				
Columbia River Gorge National Scenic Area	Max delta deciview	1.41	0.881	0.758
	Max 98% value (8th high)	0.59	0.371	0.336
	3-yrs Combined 98% value (22nd high)	0.51	0.316	0.265
Modeled Rates (lb/hr)				
	NO_X -->	1595	957	957
	SO_2 -->	479	359	48
Modeled Rates (ton/day)				
	NO_X -->	19.1	11.5	11.5
	SO_2 -->	5.7	4.3	0.6

The 8th day in any year or the 22nd day over the 2-year period is the 98th percentile days.

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4. ECOLOGY'S BART DETERMINATION

Ecology has reviewed the information submitted by Lafarge. In general, we agree with Lafarge's BART technology evaluation.

While the other particulate sources at the plant that are BART-eligible were not evaluated, we note that the particulate emission limit on these units is based on the use of baghouses meeting an emission limitation of 0.005 g/dscf.

Ecology does not agree with Lafarge's proposed BART emission limitations for NO_X and SO_2 emissions from the rotary kiln.

4.1 Clinker Cooler Baghouses

These units are already well controlled with baghouses. Only an ESP could provide an equivalent level of control, and this would require removal and replacement of the existing baghouses, increase the electrical needs of the facility, and not produce a reduction in emissions. The current emission limitations on the clinker cooler baghouses are reflective of current BACT levels of control imposed on dry material handling equipment.

BART for the clinker cooler baghouses is the existing primary and backup baghouses and the emission limitations for these units contained in Regulation 1, Section 9.09 (in effect on June 30, 2008), and Order of Approval Number 5627. The emission limitations reflecting BART is provided in Table 4-1 below.

4.2 Wet Process Rotary Kiln

4.2.1 SO2 Control

We performed additional cost and technology evaluations for SO_2 controls available for the facility. Those evaluations were specifically oriented to the use of a lime spray dryer or dry sorbent injection. Lafarge has proposed dry sorbent injection as BART for SO_2 control, but did not provide any cost information in their original analysis. At our request, they have supplemented that information and reported the capital cost of a dry sorbent injection system as $6,090,000. We have used this capital cost and estimated its annual operating costs to determine the cost effectiveness of this control. We estimate the annual costs of this control to be $1,116,571, for a cost effectiveness of $7,123/ton SO_2 removed. This is comparable to the applicant's estimated cost of $4,034/ton SO_2 removed, which does not include O&M and reagent costs.

The average cost effectiveness of this control is relatively high compared to other cost effective determinations by Ecology and other agencies. However, the visibility improvement resulting from the implementation of this control technology is substantial. Using the impacts on Olympic National Park, as an example, indicates that on the days where Lafarge has its highest adverse

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visibility impact, the SO_2 emissions account for approximately 20 percent of the total visibility impairment. On the worst 98th percentile day in 2004 of 2.072 dv, this indicates that approximately 0.8 dv is due entirely to the SO_2 emissions from the plant. We believe that this is a significant visibility improvement that comes at a reasonable cost of $1.4 million/dv.

Ecology has determined that BART for SO_2 at the Lafarge plant is the current level of SO_2 control afforded by the cement process plus addition of a duct sorbent injection system using lime with an additional removal effectiveness of 25 percent. Emission limitations resulting from use of this technology are shown in Table 4-1 below.

4.2.2 NO_X Control

In response to our review comments, Lafarge evaluated the inclusion of low NO_X burners at their facility. As noted by Lafarge, low NO_X burner technology is compatible with both SNCR and mid-kiln firing of whole tires, additional technologies that are technically feasible and provide approximately the same level of NO_X control in long wet kilns. The cost effectiveness of SNCR with a 40 percent removal rate is estimated by Ecology to be $1,409/ton reduced.[17] The cost effectiveness of SNCR plus low NO_X burners is estimated to be $6,274/ton[18] reduced. The incremental cost of adding low NO_X burners to the SNCR process is $14,900/ton reduced. We find the average and incremental cost effectiveness of the SNCR and low NO_X burners are not cost effective.

Ecology disagrees with Lafarge's conclusion that the mid-kiln firing with whole tires is not technically feasible due to a lack of a long-term tire supply. We see used tires being produced for many years into the future. According to the Department of Ecology's publication, Solid Waste in Washington, Fifteenth Annual Status Report,[19] there are approximately five million waste vehicle tires produced in Washington each year and about 26 percent of those tires are not reused in any way, but are disposed of in landfills. This Ecology report indicates that over 22 thousand tons of used tires are disposed of in landfills each year. According to the State of Texas,[20] tires have a heat content of 14,000 Btu/lb and a sulfur content equivalent to the coal commonly used in Texas kilns. The steel in the tires makes a beneficial contribution to the iron oxide component of the finished cement.

With 22,000 tons of tires per year being disposed of in landfills in Washington, we believe that there is an adequate supply of tires for the foreseeable future. We have determined that the use of mid-kiln firing with whole tires is technically feasible.

While the heat content of tires makes it an attractive fuel source, other industrial operations in Washington that have tried using tires as part of their fuel find significant handling and operational difficulties with their use. The steel component has proven to be a major ash

[17] Based on a seven percent interest rate and a 20-year lifetime for the emission control installed.
[18] Based on a seven percent interest rate and a 20-year lifetime for the emission control installed.
[19] Ecology Publication 06-07-024, December 2006.
[20] Texas Cement Kiln Report (FINAL–7/14/2006), pp. 4-39.

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handling issue for these facilities along with the increased particulate emissions due to the filler compounds (such as zinc oxide) in the tires. Neither the steel portion of tires nor the zinc oxide has been a problem for cement plants using whole tires for fuel. The steel is fully oxidized to iron oxides and with the zinc oxide is incorporated within the cement clinker.

Lafarge has already installed the equipment necessary to feed whole tires to their kiln. This installation was costly to the plant and full use of that capability has not yet been realized or permitted. We believe that since the cost of the modifications to allow mid-kiln firing of whole tires has already been completed, the use of this technique, instead of SNCR, would result in reduced annual costs. We would anticipate the annual cost would be reduced to the costs necessary to purchase, store and feed whole used and discarded tires to the existing mid-kiln firing apparatus. While not evaluated in detail, we are of the opinion that implementation of mid-kiln firing of whole tires should be even more cost effective than the use of SNCR since most of the physical equipment is already in place at the plant.

Ecology considers the use of SNCR or mid-kiln firing of whole tires to be equivalent NO_X control techniques for the Lafarge wet process cement kiln. Both techniques are anticipated to provide a 40 percent reduction in NO_X emissions. Which technology is actually implemented is Lafarge's decision and will reflect many other considerations than the amount of NO_X reduction provided.

Ecology has determined that BART for NO_X control at the Lafarge cement kiln is the use of SNCR or mid-kiln firing of whole tires. The emission limitation reflecting BART is provided in Table 4-1 below.

4.2.3 PM/PM$_{10}$ Control

Ecology agrees with Lafarge's analysis that the existing ESPs provide a BART level of particulate control. The BART emission limitations for these ESPs are contained in Regulation 1, Section 9.09 (in effect on June 30, 2008), and Order of Approval Number 5627 of the Puget Sound Clean Air Agency. The emission limitation reflecting BART is provided in Table 4-1 below.

4.3 All Other PM$_{10}$ Sources at the Plant

Ecology agrees with Lafarge's analysis that the existing ESPs provide a BART level of particulate control. The BART emission limitations for these ESPs is contained in Air Operating Permit Number 14046, issued to the Lafarge North America, Seattle Plant on May 15, 2004, and modified July 28, 2004 by the Puget Sound Clean Air Agency. The emission limitation reflecting BART is provided in Table 4-1 below.

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4.4 Averaging Period for NO_X and SO_2 Limitations

Ecology has evaluated the BART emission limitations for NO_X and SO_2 and determined that the limit is to be a single day, not to exceed value. Lafarge proposed that the emission limitations be 30-day rolling averages.
The rationale for the not-to-exceed form of the BART emission limitations is as follows:

Lafarge was found to be subject to BART based on visibility impairment modeled from the 24-hour maximum rates for NO_X and SO_2 over a specific 3-year period. The impact of controls on visibility impairment was determined by reducing these maximum 24-hour rates according to the control effectiveness of the selected controls.

Lafarge proposed the maximum day emission rates after control be used as a 30-day average limitation. If these rates were used as rolling 30-day average, then maximum emissions could exceed the observed 30-day maximum rates used in the analysis. Further, if the 30-day average value were met continuously year around, the resulting annual emissions would be higher than the plant's current annual emission rate Consequently, Ecology has determined that to limit the maximum daily impact on visibility and preserve the annual emission rate, the BART limitations should be the SO_2 and NO_X limitations proposed by Lafarge but in a daily not-to-exceed form. This determination is depicted in Table 4-1.

Table 4-1. ECOLOGY'S DETERMINATION OF THE EMISSION LIMITS AND CONTROLS THAT CONSTITUTE BART

	BART Control Technology	Emission Limitation
Clinker Cooling		
$PM/PM_{10}/PM_{2.5}$	Existing baghouses	0.025 g/dscf for the primary baghouse 0.005 g/dscf for backup baghouse
Rotary Kiln		
$PM/PM_{10}/PM_{2.5}$	Existing electrostatic precipitators	0.05 g/dscf
NO_X	SNCR or Mid-kiln firing of whole tires	Not to exceed 22960 lb/day
SO_2	Duct sorbent injection with lime plus currently permitted fuels and the cement kiln process	Not to exceed 8620 lb/day
All Other PM_{10} Sources at Plant		
	Existing baghouses	0.005 g/dscf

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APPENDIX A. PRINCIPLE REFERENCES USED

RTP Environmental Associates, “Proposed Best Available Retrofit Technology (BART) for the Lafarge Plant in Seattle, Washington,” December 2007. Amended by letters of March 11, 2008 and June 5, 2008.

Travis Weide to Alan Newman, e-mail message, April 8, 2008 and June 5, 2008.

ERG, Inc., “Assessment of NO_X Emissions Reduction Strategies for Cement Kilns – Ellis County Final Report,” July 14, 2006, ERG No. 0195.00.002, TECQ Contract No. 582-04-65589, Work Order No. 05-06.

Albert R. Axe, Jr. on behalf of the Portland Cement Association, Comments on report “NO_X Emission Reductions from Ellis County Cement Kilns,” letter, addressed to David Shanbacher, Chief Engineer, Texas Commission on Environmental Quality, June 9, 2006. Includes report “The Experience of SCR at Solnhofen and its Applicability to U.S. Cement Plants.”

Portland Cement Association, Comments on the final report “Assessment of NO_X Emissions Reduction Strategies for Cement Kilns – Ellis County,” November 20, 2006.

Raytheon Engineers and Constructors, Inc. and Easter Research Group, Inc., “Coal Utility Environmental Cost (CUECost) Workbook Users Manual and Excel spreadsheet, Version 1.0,” Provided by EPA, 1998.

CEMBUREAU, “Best Available Techniques for the Cement Industry,” 1999.

European Commission, Institute for Prospective Technological Studies, Integrated Pollution Prevention and Control, “Reference Document on the Best Available Techniques in the Cement and Lime Manufacturing Industries,” Draft September 2007.

Trinity Consultants, “Five Factor BART Analysis for Ash Grove Cement,” Montana City, MT, June 2007, plus EPA comment letter of January 9, 2008 to Joe Scheeler, Ash Grove Cement Company from Callie A. Videtich, Director, Air and Radiation Program.

Bison Engineering, Inc., “Best Available Retrofit Technology Analysis,” Holcim (US) Inc., Three Forks, MT, July 2007, plus EPA comment letter of January 9, 2008 to Ned Pettit, Environmental Manager, Holcim, Inc. from Callie A. Videtich, Director, Air and Radiation Program.

A. A. Linero, P.E., “What's Up With Cement Plant Permitting?” Florida Department of Environmental Protection, 2002.

Nicholas Confuorto, Belco Technologies Corp & Jeffrey Sexton, Marathon Petroleum Company LL, “Wet Scrubbing Based NO_X Control Using Lotox™ Technology – First Commercial FCC Start-up Experience,” Paper given at NPRA Environmental Conference, Austin, TX, September 24-25, 2007.

Air and Waste Management Association, Editors, Anthony Buonicore and Wayne Davis, “Air Pollution Engineering Manual,” Von Nostrand Reinhold, 1992.

Sargent & Lundy, “Dry Flue Gas Desulfurization Technology Evaluation,” Prepared for National Lime Association, Project Number 11311-000, September 2002.

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APPENDIX B. SUMMARY OF ECOLOGY'S COST ANALYSIS

Equipment Life	20 years
Capital Cost Recovery Period	7%
CR Factor	0.0944

	Uncontrolled tpy	% Reduction	Tons Reduced	Capital Cost (CUECost)	Annualized Capital Cost	Annual O&M Cost	Total Annual Cost	$/Ton	Source of Cost Information
Mid-Kiln Firing	2172.5	0.5	1086.25	$ -	$ -	$ -	$ -	$ -	
SNCR	2172.5	0.4	869	1,499,410	141,544	1,082,997	1,224,541	1,409	CUECost
SNCR+LNB/IDF	2172.5	0.55	1194.9	16,499,410	1,557,544	5,938,737	7,496,281	6,274	CUECost + applicant
LNB/IDF	2172.5	0.15	325.9	15,000,000	1,416,000	4,855,740	6,271,740	19,246	Applicant, from 2000 Cement ACT
LSFO	570	0.9	513	64,139,934	6,054,810	4,875,339	10,930,149	21,306	CUECost
LSD	570	0.7	399	42,313,879	3,994,430	3,135,824	7,130,254	17,870	CUECost
Dry Sorbent Injection	570	0.275	156.75	6,090,000	574,896	541,675	1,116,571	7,123	Applicant supplied capital costs information, April 2008. Annual costs derived by ARN utilizing CUECost analysis factors and accounting for already existing equipment and staff. Operating staff reduced from CUECost to 0.5 FTE/shift from 1 FTE/shift based on observation of operating control systems.

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APPENDIX C. ACRONYMS/ABBREVIATIONS

BACT	Best Available Control Technology
BART	Best Available Retrofit Technology
dv	deciview(s)
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
ESP	Electrostatic Precipitator
Lafarge	Lafarge North America
NO_X	Nitrogen Oxides
O&M	Operation & Maintenance
PM	Particulate Matter
PSCAA	Puget Sound Clean Air Agency
RACT	Reasonably Available Control Technology
SCR	Selective Catalytic Reduction
SNCR	Selective Non-Catalytic Reduction
SO_2	Sulfur Dioxide
TBO	Tank Bottom Oil
TDF	Tire Derived Fuel

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600 • Olympia, WA 98504-7600 • 360-407-6000
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

July 28, 2010

Mr. Richard Sebastianelli
Lafarge North America, Inc.
5400 West Marginal Way Southwest
Seattle, WA 98106-1517

Dear Mr. Sebastianelli :

Regional Haze Best Available Retrofit Technology (BART) Determination

Best Available Retrofit Technology (BART) is required to reduce the regional haze impacts of emissions of your facility. The enclosed Revised Order #7841 contains our BART determination for your facility including a schedule for compliance. This revision replaces Order No. 7841 dated July 7, 2010.

If you have questions or requests relating to this order, please contact Alan Newman at (360) 407-6810 or alan.newman@ecy.wa.gov.

Sincerely,

Jeff Johnston, Ph.D.
Manager, Science and Engineering Section
Air Quality Program

jj/te

Enclosure

By certified mail

cc: Alan Newman, Ecology
Steve Van Slyke, PSCAA

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

IN THE MATTER OF AN ADMINISTRATIVE ORDER AGAINST: Lafarge North America, Inc.	]]]]]	REVISED ORDER NO. 7841

TO: Mr. Richard Sebastianelli
Lafarge North America, Inc.
5400 West Marginal Way Southwest
Seattle, WA 98106-1517

This is an Administrative Order requiring your company to comply with WAC 173-400-151 by taking the actions that are described below. Chapter 70.94 RCW authorizes the Washington State Department of Ecology's Air Quality Program (Ecology) to issue Administrative Orders to require compliance with the requirements of Chapter 70.94 RCW and regulations issued to implement it.

Ecology has determined that portions of your facility are subject to the provisions of the federal and state visibility protection program (WAC 173-400-151 and 40 CFR Part 51, Subpart P). The rules require that the State determine what technologies and level of emission control constitutes Best Available Retrofit Technology (BART) for the eligible emission units at your facility. The rules also require the installation and use of those emission controls on the BART-eligible emission units. The emission controls are to be installed as expeditiously as possible, but in no event can the State allow them to start operation later than five years after the State's Regional Haze SIP amendment is approved by the United States Environmental Protection Agency (EPA).

FINDINGS

A. The Lafarge North America, Inc., Seattle Plant (Lafarge) is a wet process cement plant subject to BART.

B. BART emission limitations for the plant are based on:

   a. Use of existing baghouses and electrostatic precipitators for the control of particulate matter.

   b. Use of SNCR or mid-kiln firing of whole tires for control of nitrogen oxides.

   c. Use of the existing wet process rotary kiln process plus dry sorbent injection for control of sulfur dioxide (SO_2) emissions.

C. The Lafarge North America Seattle Cement plant is included in federal Consent Decree resolving Case 3:10-cv-00044-JPG-CJP, Filed 03/18/10 in United States District Court for the Southern District of Illinois. This Consent Decree establishes compliance schedules and emission limitations for a number of cement kilns owned and operated by Lafarge North America. In addition to emission limitations and dates to achieve compliance with those limitations, the Consent Decree contains provisions related to temporary cessation of operation of a kiln. These provisions require that a kiln comply with the emission limits applicable to it when the kiln is restarted (provided the restart is after the date established to comply with the new emission limitations) or if the kiln is not operated for more than two years, a restart of the kiln is to be treated as a new emissions source.

D. On July 27, 2010, Lafarge North America requested the BART Compliance Order be revised primarily to reflect specific criteria included in the federal Consent Decree, eliminate some initial stack testing performance requirements, and to eliminate compliance schedule dates that occurred prior to issuance of the Order. No emission limitation is being changed as part of this request, nor is the performance test using EPA reference methods being deleted. The request also included several administrative changes such as the name of the plant manager, which have been made.

Additional information and analysis is available in the BART Determination Support Document for Lafarge North America, Seattle Plant, prepared by the Washington State Department of Ecology, October 2008, and the Proposed Best Available Retrofit Technology (BART) for the Lafarge Plant in Seattle, Washington, prepared by RTP Environmental Associates on behalf of Lafarge North America, December 2007.

YOU ARE ORDERED: To install and operate emission control equipment in accordance with the following conditions:

BART EMISSION LIMITATIONS

1. Particulate Matter Emissions

   1.1. Meet the emission limitations for particulate matter found in Puget Sound Clean Air Agency's (PSCAA) Regulation 1, Section 9.09 (in effect on June 30, 2008), and Order of Approval Number 5627.

   1.2. Compliance will be determined as specified in Air Operating Permit Number 14046.

2. Nitrogen Dioxide Emissions

   2.1. Starting no later than the date in Condition 5, emissions of nitrogen dioxide from the wet process rotary cement kiln are limited to a maximum of:

      2.1.1. 22,960 lb/calendar day, except during periods of control system malfunction.

2.1.2. During documented periods of emission control system malfunction (as defined in 40 CFR 60.2), Lafarge shall utilize good operating practices to minimize nitrogen dioxide emissions.

2.2. Compliance will be determined by use of a continuous emission monitoring system.

2.3. An initial performance test utilizing EPA Reference Method 7E will be performed within 180 days of the start of operation of the NO_X control system.

3. Sulfur Dioxide Emissions

3.1. Starting no later than the date in Condition 5, emissions of sulfur dioxide from the wet process rotary cement kiln are limited to a maximum of:

3.1.1. 8,620 lb/calendar day, except during periods of emission control system malfunction.

3.1.2. 1000 ppmdv, 1-hour average.

3.1.3. During documented periods of emission control system malfunction (as defined in 40 CFR 60.2), Lafarge shall utilize good operating practices to minimize sulfur dioxide emissions.

3.2. Compliance will be determined by use of a continuous emission monitoring system.

3.3. An initial performance test utilizing EPA Reference Method 6C will be performed within 180 days of the start of operation of the SO_2 control system.

SCHEDULE FOR COMPLIANCE

4. Particulate Matter Emissions

4.1. Compliance with the emission limitations is required upon the effective date of this Order.

5. Schedule for Compliance with Sulfur Dioxide and Nitrogen Dioxide Emissions

5.1. Compliance with the sulfur dioxide and nitrogen dioxide emission limitations is required. Compliance will be assured by meeting the following milestones:

5.1.1. Installation and operation of SO_2 and NO_X controls no later than February 1, 2011, unless the kiln is in temporary cessation on that date per Section VII of the federal Consent Decree.

5.1.2. If the kiln is in temporary cessation on February 1, 2011, then installation and operation of SO_2 and NO_X controls no later than the date that the kiln is restarted after February 1, 2011.

5.2. Operate in compliance with the SO_2 emission limitations no later than April 30, 2011, or 90 days after the kiln is restarted if the kiln is in temporary cessation on February 1, 2011.

5.3. Operate in compliance with the NO_X emission limitation no later than the date Lafarge completes optimization of the NO_X control system per the criteria in paragraph 10 of the Appendix to the Consent Decree.

MONITORING AND RECORDKEEPING REQUIREMENTS

6. Particulate Matter

6.1. Monitoring and recordkeeping requirements are contained in Air Operating Permit Number 14046, issued to Lafarge North America, Seattle Plant on May 15, 2004, and modified July 28, 2004, by the PSCAA.

7. Sulfur Dioxide

7.1. Sulfur dioxide emissions are to be quantified by means of a continuous emission monitoring system, consisting of a continuous sulfur dioxide monitor, and a continuous flow rate monitor.

7.2. The sulfur dioxide monitor must meet the requirements of 40 CFR Part 60, Appendix B, Performance Specification 2.

7.3. The flow rate monitor must meet the requirements of 40 CFR Part 60, Appendix B, Performance Specification 6, except for location of the flow rate monitor. The flow rate monitor may be collocated with the nitrogen dioxide or sulfur dioxide monitor's probe, provided that location is demonstrated to meet the other requirements in Performance Specification 6 and the quality assurance requirements referenced in Condition 7.4.

7.4. As a minimum, the continuous emission monitors must meet the annual quality assurance requirement of 40 CFR Part 60, Appendix F.

7.5. Each calendar day's sulfur dioxide emissions will be calculated and recorded daily.

8. Nitrogen Dioxide Emissions

8.1. Nitrogen dioxide emissions are to be quantified by means of a continuous emission monitoring system, consisting of a continuous nitrogen oxides monitor, and a continuous flow rate monitor.

8.2. The nitrogen oxides monitor must meet the requirements of 40 CFR Part 60, Appendix B, Performance Specification 2.

8.3. The flow rate monitor must meet the requirements of 40 CFR Part 60, Appendix B, Performance Specification 6, except for location of the flow rate monitor. The flow rate monitor may be collocated with the nitrogen dioxide or the sulfur dioxide monitor's probe, provided that location is demonstrated to meet the other requirements in Performance Specification 6 and the quality assurance requirements referenced in Condition 8.4.

8.4. As a minimum, the continuous emission monitors must meet the annual quality assurance requirement of 40 CFR Part 60, Appendix F.

8.5. Each calendar day's nitrogen oxides emissions will be calculated and recorded daily.

REPORTING REQUIREMENTS

9. Initial performance testing of the NO_X emission control system required by Condition 2.3 and the SO_2 control system required by Condition 3.3 shall be submitted to Ecology and to PSCAA within 30 days of completion.

10. Documentation of each action or activity listed in Condition 5, including notification of the start and end of temporary cessation of kiln operation, will be provided by Lafarge by certified mail to Ecology and to PSCAA within 30 days of completion.

11. Malfunction of the emission control system must, at a minimum, be documented in writing and submitted to PSCAA and Ecology with the emissions monitoring data per Condition 12. Additional recordkeeping and notifications related to excess emissions may also be required by Ecology rule or PSCAA regulation.

12. Continuous emission monitoring data shall be submitted to Ecology and to PSCAA in accordance with PSCAA's Regulation 1, Section 12.03 (effective June 30, 2008). The submittal shall be sent electronically in a format acceptable to PSCAA. Reporting to Ecology will end when Lafarge has demonstrated compliance with the BART emission limits in this order for a continuous 36-month period.

13. Lafarge may request this compliance Order be rescinded after all of the following occur:

13.1. The plant has continuously complied with the emissions limitations in Conditions 1, 2, and 3 for a period of three years after the date in Condition 5.2.

13.2. The emission limitations in this Order have been incorporated into an enforceable order or permit issued under the criteria of RCW 70.94.152 or 70.94.153 and PSCAA regulations implementing these provisions.

13.3. The emission limitations in the enforceable order or permit have been incorporated into the Air Operating Permit issued by PSCAA to Lafarge.

This revision replaces Order No. 7841 dated July 7, 2010.

Failure to comply with this Order may result in the issuance of civil penalties or other actions, whether administrative or judicial, to enforce the terms of this Order.

You have a right to appeal this Order. To appeal you must:

- File your appeal with the Pollution Control Hearing Board within 30 days of the "date of receipt" of this document. Filing means actual receipt by the Board during regular office hours.

- Serve your appeal on the Department of Ecology within 30 days of the "date of receipt" of this document. Service may be accomplished by any of the procedures identified in WAC 371-08-305(10). "Date of receipt" is defined at RCW 43.21B.001(2).

If you appeal, you must:

- Include a copy of this document with your Notice of Appeal.
- Serve and file your appeal in paper form; electronic copies are not accepted.

To file your appeal with the Pollution Control Hearing Board:

Mail appeal to:		Deliver your appeal in person to:
The Pollution Control Hearings Board P.O. Box 40903 Olympia, WA 98504-0903	OR	The Pollution Control Hearings Board 4224–6th Avenue SE Rowe Six, Bldg 2 Lacey, WA 98503

To serve your appeal on the Department of Ecology:

Mail appeal to:		Deliver your appeal in person to:
Department of Ecology Appeals Coordinator P.O. Box 47608 Olympia, WA 98504-7608	OR	Department of Ecology Appeals Coordinator 300 Desmond Drive SE Lacey, WA 98503

And send a copy of your appeal packet to:

Alan Newman
Department of Ecology
Air Quality Program
P.O. Box 47600
Olympia, WA 98504-7600

For additional information, go to the Environmental Hearings Office website at http://www.eho.wa.gov.

To find laws and agency rules, go to the Washington State Legislature website at http://www1.leg.wa.gov/CodeReviser.

Your appeal alone will not stay the effectiveness of this Order. Stay requests must be submitted in accordance with RCW 43.21B.320. These procedures are consistent with Chapter 43.21B RCW.

DATED this 28 day of July, 2010 at Olympia, Washington.

Jeff Johnston, Ph.D.
Manager, Science and Engineering Section
Department of Ecology
Air Quality Program

BART DETERMINATION SUPPORT DOCUMENT FOR TRANSALTA CENTRALIA GENERATION, LLC POWER PLANT CENTRALIA, WASHINGTON

by
WASHINGTON STATE DEPARTMENT OF ECOLOGY
AIR QUALITY PROGRAM

August 2009
Revised April 2010

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Executive Summary

The Best Available Retrofit Technology (BART) program is part of the larger effort under the Clean Air Act Amendments of 1977 to eliminate human-caused visibility impairment in all mandatory Class I areas. Sources that are required to comply with the BART requirements are those sources that:

1. Fall within 26 specified industrial source categories;
2. Commenced operation or completed permitting between August 7, 1962 and August 7, 1977;
3. Have the potential to emit more than 250 tons per year of one or more visibility impairing compounds;
4. Cause or contribute to visibility impairment within at least one mandatory Class I area.

TransAlta Centralia Generation LLC Power Plant (TransAlta) operates a two unit, pulverized coal fired plant near Centralia Washington. Each unit of the plant is rated at 702.5 MW net output. Operation of a coal fired power plant results in the emissions of Particulate Matter (PM), Sulfur Dioxide (SO_2) and Nitrogen Oxides (NO_x). All of these pollutants are visibility impairing.

Pulverized coal plants such as the TransAlta facility are one of the 26 listed source categories. The units at the plant began commercial operation in 1971 and 1972. The units have the potential to emit more than 250 tons per year of SO_2, NO_x, and PM. As part of an approval of the Washington State Visibility State Implementation Plan (SIP) in 2002, Environmental Protection Agency (EPA) Region 10 determined that particulate and SO_2 controls installed as part of a 1997 Reasonably Available Control Technology (RACT) determination[1] issued by the Southwest Clean Air Agency (SWCAA)[2] met the requirements for BART and constituted BART for those pollutants. EPA specifically did not adopt the NO_x controls in the RACT order as BART.

Modeling of visibility impairment was done following the Oregon/Idaho/Washington/EPA-Region 10 BART modeling protocol.[3] Modeled visibility impacts of baseline emissions show impacts on the 8th highest day in any year (the 98th percentile value) of greater than 0.5 Deciviews (dv) at the twelve Class 1 areas within 300 km of the plant. The highest impact was 5.55 dv at Mt. Rainier National Park. Modeling showed that NO_x and SO_2 emissions from the power plant are responsible for the facility‟s visibility impact.

TransAlta prepared a BART technical analysis following Washington State‟s BART Guidance.[4]

The TransAlta facility is specifically addressed in Executive Order 09-05 issued by the Governor of Washington. Under that Executive Order, Ecology is to work with the company on the development

[1] SWAPCA Order No. 97- 2057R1 issued December 26, 1998
[2] Previously known as the Southwest Air Pollution Control Authority (SWAPCA)
[3] Modeling protocol available at http://www.deq.state.or.us/aq/haze/docs/bartprotocol.pdf
[4] "Best Available Retrofit Technology Determinations Under the Federal Regional Haze Rule," Washington State Department of Ecology, June 12, 2007

of an order which will result in the plant"s greenhouse gas emissions meeting the state"s greenhouse gas emission performance standard[5] by 2025.

The Washington State Department of Ecology (Ecology) determined that BART for NO_x emissions is the current combustion controls combined with the completion of the Flex Fuels project and the use of a sub-bituminous coal from the Powder River Basin (PRB) or other coal that will achieve similar emission rates. This change results in a 20% reduction of NO_x emissions from the baseline period emission rate. The use of low sulfur PRB coal also reduces SO_2 emission by about 60% from the same period. The NO_x reduction from the BART controls selected by Ecology will result in a visibility improvement from the baseline impacts at Mt. Rainier National Park of approximately 1.13 dv, with improvements of 0.67 to 1.45 dv at other affected Class I areas. The controls have been installed and have met the emission limitation since October 1, 2009.

[5] The standard is in Chapter 80.80, RCW. Currently the standard is 1100 lb/MWh and is required to be updated in 2012 and every 5 years thereafter. The current standard is less than half of the plant current emission rate of about 2300 lb/MWh.

1.0 INTRODUCTION

This document is to support Ecology"s determination of the BART for the TransAlta coal fired power plant located near Centralia, Washington.

The TransAlta plant is a coal fired power plant rated to produce a net of 702.5 MW per unit. The plant has 2 tangentially fired pulverized coal units currently using PRB sub-bituminous coals for fuel.

In a letter dated October 16, 1995, the National Park Service (NPS) notified Ecology certified that there was uniform visibility haze visibility impairment at Mt. Rainier National Park. The Park Service expressed their belief that some or all of the haze was attributable to emissions from the Centralia coal fired power plant.

In 1998, the SWCAA issued a RACT, Order No. 97-2057R1, for compliance with the requirements of Chapter 70.94.153 Revised Code of Washington. This order established emission reductions for SO_2 and NO_x emissions from the coal fired boilers at the plant. The emission limitations in the Order were the results of a negotiation process involving SWCAA, the plant"s ownership group, the NPS, US Forest Service, Ecology and EPA, Region 10.

On June 11, 2003, EPA Region 10 approved the Ecology Visibility SIP submitted on November 9, 1999[6]. Ecology included the RACT emission reductions for Centralia as evidence of further progress in meeting the national visibility goals, but not as BART since no determination of attribution had been made as was required by the visibility rules in place in 1997. The Federal Register notice approving this 1999 submittal notes that while the NPS had certified visibility impairment at Mt Rainier National Park "The State of Washington has not determined that this visibility impairment is reasonably attributable to the Centralia Power Plant (CPP)."

The EPA approval of Ecology"s 1999 visibility SIP submittal included a determination by EPA that the SO_2 and PM limits and controls required by the 1997 RACT order issued by SWCAA met the requirements of BART. EPA"s determination that SO_2 and PM emissions were BART level of control were based on an analysis performed by Region 10 staff and an example analysis in the Technical Support Document issued by SWCAA.

In the Federal Register notice, the EPA specifically did not include the NO_x emission limit in the RACT Order as BART stating "while the NO_x emission limitation may have represented BART when the emission limits in the RACT Order were negotiated, recent technology advancements have been made. EPA cannot say that the emission limitations in the SWAPCA[7] RACT Order for NO_x represent BART."

As a result of the June 11, 2003 approval of the Washington State Visibility SIP, the TransAlta plant is subject to BART under the Regional Haze (RH) program only for its NO_x emissions[8].

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[6] 68 *Federal Register* 34821, June 11, 2003.
[7] At the time, SWCAA was known as the Southwest Air Pollution Control Agency (SWAPCA).
[8] Letter from Mahbubul Islam, EPA Region 10, to Robert Elliott, SWCAA, and Phyllis Baas, Ecology, on Best Available Retrofit Technology Applicability for the TransAlta Centralia Power Plant (September 18, 2007).

1.1 The Best Available Retrofit Technology Analysis Process

TransAlta and Ecology used EPA"s BART guidance contained in Appendix Y to 40 CFR Part 51, as annotated by Ecology, to determine BART. The BART determination for coal fired power plants greater than 750 MW of total output must follow the process in BART guidance. The BART analysis protocol reflects utilization of a five-step analysis to determine BART. The 5 steps are:

1. Identify all available retrofit control technologies;
2. Eliminate technically infeasible control technologies;
3. Evaluate the control effectiveness of remaining control technologies;
4. Evaluate impacts and document the results;
5. Evaluate visibility impacts.

The BART guidance limits the types of control technologies that need to be evaluated in the BART process to available control technologies. Available control technologies are those which have been applied in practice in the industry. The state can consider additional control techniques beyond those that are "available," but is not required to do so. This limitation to available control technologies contrasts to the Best Available Control Technology (BACT) process where innovative technologies and techniques that have been applied to similar flue gasses must be considered.

In accordance with the EPA BART guidance, Ecology weighs all 5 factors in its BART determinations. To be selected as BART, a control has to be available, technically feasible, cost effective, provide a visibility benefit, and have minimal potential for adverse non-air quality impacts. Normally the potential visibility improvement from a particular control technology is only one of the factors weighed for determining whether a control constitutes BART. However, if two available and feasible controls are essentially equivalent in cost effectiveness and non-air quality impacts, visibility improvement becomes the deciding factor in the determination of BART.

1.2 Basic Description of the TransAlta Centralia Generation LLC Power Plant

The TransAlta plant is a 2 unit, pulverized coal boiler based power plant that currently uses PRB coal. The boilers were initially commissioned in 1971 and 1972. Each unit is currently rated at 702.5 MW (net) output capacity. The units are physically identical, tangentially fired, wet bottom units designed by Combustion Engineering.

TransAlta also operates 2 other generating resources that are part of the Centralia power plant complex. Operating under the name of Centralia Gas is a group of 4 combined cycle combustion turbines producing 248 MW. The combustion turbines were built in 2002 and were subject to Prevention of Significant Deterioration (PSD) permitting requirements. They are currently operated as peaking units. The combined cycle turbines are electrically and physically separate from the coal units. There is also a 1 MW hydropower facility located at TransAlta"s Skookumchuck River Dam and Reservoir.

In addition to the above electricity generating units, the plant includes numerous other units, including an oil fired auxiliary boiler used for cold starting of the coal fired boilers and steam turbines. The auxiliary boiler is a 170 MMBtu/hr, oil-fired unit permitted to operate on #2 distillate oil (with less than 0.5% sulfur by weight) for a maximum of 600,000 gallons per year. The SO_2 emissions from fuel oil combustion in this unit are included in the coal boiler SO_2 emission limitation. The potential to emit of NOx from this unit is 7.2 ton/year and SO_2 of 77 ton/year.

SO_2 control on the 2 coal fired boilers is provided by a wet limestone, forced oxidation wet scrubber system. This system removes over 95% of SO_2 in the flue gas from the boilers. The SO_2 controls were installed in the 1999 – 2002 time period.

Particulate control is provided by 2 electrostatic precipitators in series followed by the wet scrubber system. The first electrostatic precipitators were part of the original construction of the plant. The second precipitators date from the late 1970‟s.

Current NO_x control is provided by combustion modifications incorporating Alstom concentric firing, low NO_x burners with close-coupled and separated over-fire air[9]. These combustion modifications are collectively known as Low NO_x Combustion, Level 3 (LNC3)." The controls were installed in the 2000 – 2002 time period in response to the RACT Order. The combustion controls were designed and optimized to suit Centralia mine coal.

For a variety of reasons, TransAlta stopped active mining at the Centralia coal mine and now purchases all coal from PRB coal fields. To accommodate the change, the company has modified the rail car unloading system to handle up to 10 coal unit trains per week. Additional modifications are focused on the boilers. The boilers have been modified to reduce temperatures in the flue gas to accommodate the higher Btu coal now being combusted. Additional changes include the reinstallation of specific soot blowers and installation of new soot blowing equipment (steam lances) necessary to accommodate the different ash characteristics of the PRB coals. Improved fire suppression equipment has been installed to accommodate the increased potential of PRB coals to catch fire spontaneously.

TransAlta anticipates operating the plant until at least 2030. They acknowledge that to operate beyond 2025 will require significant plant upgrades to assure safe and reliable operation into the future.

On May 21, 2009, the Governor of Washington issued Executive Order 09-05, Washington‟s Leadership on Climate Change. One specific action in the Executive Order requires the Director of the Department of Ecology to:

> (1)(d) Work with the existing coal-fired plant within Washington that burns over one million tons of coal per year, TransAlta Centralia Generation, LLC, to establish an agreed order that will apply the Greenhouse gas emissions performance standards in RCW 80.80.040(1) to the facility by no later than December 31, 2025. The agreed order shall include a schedule of major decision making and resource investment milestones;

[9] This set of combustion controls are the basis of the presumptive BART limits of 0.15 lb NOx/MMBtu in Section 4.E of EPA‟s BART Guideline

The power plant is subject to the federal Clean Air Act's Title V permitting program. The plant operations are covered by air operating Permit No. SW98-8-R2-B, issued March 25, 2008 by SWCAA.

Ecology received a BART analysis from TransAlta in February, 2008, which was revised and resubmitted in July 2008 and supplemented in December 2008 and March 2010.

1.3 Best Available Retrofit Technology Eligible Units and Pollutant at TransAlta Centralia Power Plant

The TransAlta facility located near Centralia Washington includes a number of different operations and units. Emissions from the plant are primarily generated and emitted by the 2 coal fired boilers of the main power plant. The oil fired auxiliary boiler is operated infrequently and is permitted to use a limited number of gallons of diesel fuel oil each year. The auxiliary boiler is used during cold start-up of the coal boilers to heat the boiler water to prevent thermal shock and failure of cold boiler tubes and for preheating of the steam turbines. Emissions from the auxiliary boiler were not evaluated for BART.

As noted above, NO_x is the only pollutant addressed in this BART analysis. As required by the BART guidance and modeling protocol, the maximum day emission rate in the calendar 2003 to 2005 period was determined. The hourly NO_x emissions on the day with maximum emissions during the baseline period (2003-2005) were 2,474 lb/hr (0.302 lb/MMBtu) for Unit 1 and 2,510 lb/hr (0.306 lb/MMBtu) for Unit 2.

1.4 Visibility Impact of Best Available Retrofit Technology Eligible Units at TransAlta Centralia Power Plant

Class I area visibility impairment and improvement modeling was performed by TransAlta using the BART modeling protocol developed by Oregon, Idaho, Washington, and EPA Region 10[10]. This protocol uses 3 years of metrological information to evaluate visibility impacts. As directed in the protocol, TransAlta used the highest 24 hour emission rates for NO_x, SO_2, and PM/PM_{10} that occurred in the 3 year period to model its impacts on Class I areas. The modeled SO_2 and PM/ Coarse Particle Matter (PM_{10}) emission rates complied with their respective emission limits. The modeling indicates that the emissions from this plant cause visibility impairment on the 8th highest day in any one year and the 22nd highest day as all mandatory federal Class I areas within 300 km of the power plant[11]. For more information on visibility impacts of this facility, see Section 3 below.

1.5 Relationship of this Best Available Retrofit Technology Analysis to the 1997 Reasonable Available Control Technology Analysis and Determination

As noted previously, in 1997 the SWCAA finalized a determination of RACT for the Centralia Power Plant. As part of the technical analysis that led to the determination of RACT for NO_x emissions

[10] A copy of the modeling protocol is available at http://www.deq.state.or.us/aq/haze/docs/bartprotocol.pdf
[11] A source causes visibility impairment if its modeled visibility impact is above 1 dv, and contributes to visibility impairment if its modeled visibility impact is above 0.5 dv.

from this plant, 37 different emission control alternatives were evaluated (see Appendix B for the list). The analysis documents produced by the plant‟s owners reviewed many alternative techniques potentially applicable to the facility. The list of controls reviewed ranged from proven methods of combustion control to methods that had only been proven to work in the laboratory. The alternate technologies evaluated at that time included methods such as natural gas reburn, Selective Non-Catalytic Reduction, Selective Catalytic Reduction, and several options which could control NO_x and SO_2 with the same control system.

As discussed in the company‟s analysis and the SWCAA support document, these technologies were not selected as RACT for NO_x emissions in favor of the installation of the package of combustion modifications that are now recognized as LNC3.

Since the 1997 RACT Determination, Ecology has tracked development and installations of NO_x control technologies. Based on the large list of emission controls that had been reviewed to support the RACT determination, the relatively slow development of some techniques, and disappearance of some other techniques, Ecology allowed TransAlta to use the evaluation from the 1997 RACT determination to narrow the list of potential control technologies appropriate for this BART review.

The BART analysis by TransAlta focused on those controls that are available and have been implemented on coal fired boilers of the general size of the plant. For more details on the control options evaluated for the RACT analysis, please refer to the RACT report by PacifiCorp for the Centralia Power Plant and the SWCAA Technical Support Document supporting the RACT determination.

2.0 SUMMARY OF TRANSALTA CENTRALIA POWER PLANT'S BART TECHNOLOGY ANALYSIS

The TransAlta‟s BART technology analysis was based on the five step process defined in BART guidance and listed in Section 1.1 of this report. This section is an overview of TransAlta‟s BART analysis and supplemental material provided by the plant‟s owner.

2.1 Nitrogen Oxides Controls Evaluated

The plant already has installed combustion controls to reduce NO_x emissions from thermal NO_x. The controls currently installed are considered the base case from which the effects of other controls are evaluated.

Table 2-1 Nitrogen Oxides Controls Evaluated

Control technology	Control Efficiency	Technically feasible?
Low NOx burners with close coupled and separated overfire air (LNC3)	--	Yes, already installed under RACT
Flex Fuel Project – Existing LNC3 combustion controls plus change in fuel to PRB coal and boiler modifications to accommodate use of PRB type coals		Yes, LNC3 already installed, Unit 2 Flex Fuel modifications completed in 2008, Unit 1 were completed Summer 2009
SCR	Up to 95% reduction	Yes
SNCR	20 - 40% reduction	Yes
ROFA/RotaMix	Unknown	No
Neural net controls	Up to 15%	Yes

Low NO_x Combustion, Level 3

As noted above, the **combustion controls** known as LNC3 are currently installed on each of the coal fired boilers at the plant. These controls have demonstrated an ability to meet the current NO_x emission limit of 0.30 lb. NO_x/MMBtu using Centralia mine coal and PRB coals.

The Centralia Plant‟s implementation of the LNC3 technology was included in EPA‟s control effectiveness evaluations leading to its determination of the presumptive BART limits of 0.15 lb NO_x/MMBtu in Section 4.E of EPA‟s BART Guideline. In 2004 in connection with its adoption of the final BART Guidelines, EPA found that of the 17 boilers in the U.S. with the boiler design of the Centralia Plant‟s (tangential-fired) that burn sub-bituminous coal, two of the units with LNC3 installed prior to 1997 did not meet the presumptive BART limit. Seven of the units with pre-1997 design did meet the presumptive limit. Of the remaining eight units with LNC3 technology installed in 1997 or after, the two Centralia boilers were the only two that did not meet the presumptive limit. (EPA-HQ-OAQ-2002-076-0446(1) TSD).

Subsequent to the public comment period on the proposed BART determination, TransAlta was requested to supply additional information on the installation of LNC3 at this facility. This additional detail is contained in a March 31, 2010 report from CH2MHill to Mr. Richard Griffith (Appendix G).

The LNC3 system installed met its original design intent of a 1/3 reduction in NO_x from the boiler.

Subsequent to the initial burner installation, the company reports no additional analyses or boiler tuning operations beyond what is done in the normal course of operating the boilers.

Flex Fuel project

TransAlta has proposed its Flex Fuel project as an addition to the currently installed LNC3 combustion controls for consideration as BART emission control. The Flex Fuel project is a series of actions being undertaken by the company to accommodate the exclusive use of sub-bituminous coals with ash, nitrogen and sulfur contents similar to PRB sub-bituminous coals. Combustion modeling of the boilers performed by Black & Veatch using EPRI"s Vista model using a representative PRB coal has indicated that the proposed changes will result in a reduction of the hourly and annual emission rate for NO_x.

TransAlta decided to rely on PRB coal after suspending mining operations for Centralia sub-bituminous coal at the end of 2006. PRB coals have a number of characteristics that differ significantly from the Centralia coal the plant was designed to use. Important characteristics that affect the boilers" operation are the net heat content, the quantity of ash, and the abundance of sodium. Appendix A contains tables showing the important characteristics of typical PRB coals and the Centralia coal.

The most important differences between the coals is the heat content British Thermal Units Per Pound (Btu/lb), lower fuel nitrogen, lower sulfur content, the moisture content, and the concentration of sodium. Centralia coal is very low in sodium, higher in fuel nitrogen and sulfur content, and much higher in water content than the PRB coals. The difference in sodium content changes the ash that deposits on the boiler tubes from light and fluffy (Centralia) to glassy and sticky (PRB).

The boiler tube slagging and fouling characteristics of PRB coal increase the heat rates of the boilers compared with Centralia Mine coal. The Flex Fuel Project incorporates physical changes to the pressure parts in each boiler"s convective pass that improve heat transfer by reducing the boiler"s susceptibility to ash deposition. The major individual pressure part changes include: (a) reheater replacement to maximize soot blower cleaning effectiveness on the tube assembly surface areas, and (b) additional low temperature superheater and economizer heat transfer surface area to result in higher boiler efficiency and a lower flue gas exit temperature. Other significant changes associated with this project are reinstallation of some of the original soot blowers and installation of new „soot blowing" equipment specifically designed to remove the now sticky and glassy soot from the boiler tubes. These changes allow for more efficient heat transfer within the boiler. Additional discussion of this project"s effects and the combustion thermodynamic modeling performed to estimate the emissions decrease from the project can be found in the *BART Analysis Supplement* by TransAlta dated December 2008 and the *TransAlta Centralia Boiler Emissions Modeling Study* by Black & Veatch, dated Sept. 2007.

No changes to the fuel delivery equipment (other than adding fire suppression equipment), burners, combustion air system, or steam turbine are being made. The Flex Fuel Project allows the boilers to burn PRB coal more efficiently, but does not increase the boilers" potential steam generating capacity.

The lower nitrogen content of the PRB coals combined with the lower total quantity of fuel required to produce the same heat input rate to the boilers after the project has been completed on both units. The reduction in total fuel combusted will reduce the emissions of NO_x by approximately 20% from the rates during the 2003 – 2005 period. The emission rates during that baseline period averaged 0.304 lb NO_x/MMBtu and at the completion of the Flex Fuel project are expected to be below 0.24 lb/MMBtu.

Annual average NO_x emissions from December 1, 2003 through November 31, 2005 were 15,695 tons. Based on the proposed BART rate of 0.24 lb/MMBtu, the BART limit would reduce emissions by 3,139 tons/year to 12,556 tons/year.

The estimated capital to implement Flex Fuels on both units is $101,808,663, based on the actual costs to implement the Flex Fuels project on Unit 2 and the expected costs of installation on Unit 1. The annualized cost of the Flex Fuel Project is $11,184,197. Based on the estimated NO_x reductions of 3,139 tons/yr, the cost-effectiveness of the Flex Fuel Project is $3,563/ton of NO_x reduced. Since the Flex Fuel Project also reduces SO_2 emissions by an estimated 1,287 tons/year, TransAlta has calculated that the overall cost-effectiveness of the Flex Fuel Project as $2,526/ton of NO_x plus SO_2 reduced[12].

Neural net controls

Neural net controls for boilers are a relatively new technique. It is based on using a number of different boiler operational information and using that information to continuously optimize the combustion efficiency of the boiler. While numerous venders will provide this technology, TransAlta received detailed information from NeuCo, Inc. (NeuCo). NeuCo offers several neural net optimization products. Two of their products, CombustionOpt and SootOpt, provide the potential for NO_x reduction at some facilities. Both CombustionOpt and SootOpt are control-system-based products. CombustionOpt provides for optimized control of fuel and air to reduce NO_x and improve fuel efficiency. SootOpt improves boiler soot blowing by proportioning heat transfer and reducing “hot spots” resulting from ineffective cleaning. NeuCo stated that these products can be used on most boiler control systems and can be effective even in conjunction with other NO_x reduction technologies.

NeuCo predicts that generally CombustionOpt can reduce NO_x by 15 percent, and SootOpt can provide an additional 5 to 10 percent. Expected NO_x reductions are very unit-specific, and actual results may vary greatly. Previously received budgetary prices for CombustionOpt and SootOpt were

[12] Because the Flex Fuel Project is not being implemented for the primary purpose of emissions reduction, these cost effectiveness values are not directly comparable to those for installation of a control technology.

$150,000 and $175,000, respectively, with an additional $200,000 cost for a process link to the unit control system.

Because NeuCo does not guarantee NO_x reduction, the estimated emission reduction levels provided are not considered as reliable projections. In light of the uncertain and unquantifiable emission reductions, TransAlta considers a neural net system as a potential supplementary or polishing technology, but not as an applicable NO_x technology for this BART analysis. Because of the potential NO_x reductions and cost effectiveness, TransAlta is continuing to investigate use of this technique at this plant.

Selective Non-Catalytic Reduction

Selective Non-Catalytic Reduction **(**SNCR) is generally used to achieve modest NO_x reductions. It is often chosen to augment combustion controls on older coal fired boiler units which are generally smaller units (units with heat input less than 3,000 MMBtu/hr) and industrial boilers. With SNCR, an ammonia or urea solution is injected into a location in the furnace that provides a temperature range of 1,600 degrees Fahrenheit (°F) to 2,100°F and provides a minimum detention time for the reaction to occur. Within this temperature range the ammonia or urea reduces NO_x to nitrogen and water. NO_x reductions of up to 60 percent have been achieved, although 20 to 40 percent is more realistic for most applications.

Reagent utilization, which is a measure of the efficiency with which the reagent reduces NO_x, can range from 20 to 60 percent, depending on the amount of reduction to be achieved, unit size, operating conditions, and allowable ammonia slip. If the temperature in the boiler at the location of the ammonia injection is too high or too much ammonia is injected, the ammonia or urea is oxidized to NO_x. With low reagent utilization, low temperatures, or inadequate mixing, ammonia slip occurs, allowing unreacted ammonia to create problems downstream.

There are a number of potential adverse impacts due to ammonia slip. Unreacted ammonia can contaminate the fly ash collected in the ESPs that is sold for making concrete. If the ammonia concentration in the fly ash is high enough it will render the fly ash odorous and unsaleable[13]. If the fly ash is unsaleable to make concrete, it would require disposal in a landfill or could be sold to a cement plant as a raw material to make cement. If used to make cement, the heating of the fly ash in a cement kiln will release any mercury that may be contained in the fly ash.

Two additional issues with ammonia slip are that ammonia is listed as a toxic air pollutant by Ecology, and its discharge from the stack may result in additional impacts. The unreacted ammonia may also react with sulfur oxides to generate ammonium sulfate or bisulfate to foul economizer, air preheater, and other duct surfaces. At facilities where there is no wet scrubber system included, excess ammonia may also create a visible stack plume. Since the TransAlta plant has a wet scrubber, no additional plume visibility would be anticipated.

[13] Fly ash is reported to lose its desirability as a concrete admixture if the ammonia content is high enough that detectable levels of ammonia will be volatilized from the fly ash when it is mixed into the wet concrete. Ammonium on /in the fly ash is converted to ammonia when the pH of the mixture rises. At a pH of 12, essentially all the ammonium is converted to ammonia in solution. Based on Ecology"s review of the available literature, it is unlikely that a properly controlled SNCR system will cause any adverse impacts to fly ash sales due to ammonia slip.

The control effectiveness of SNCR is a function of many variables, including the uncontrolled emissions concentrations, physical conditions, and operational conditions. A study by Harmon[14] (1998) indicates that a large coal fired, tangentially fired unit equipped with a low NO_x SNCR has the potential to reduce NO_x emissions by only 20 to 25 percent with an ammonia slip of less than 10 ppm. The EPA Office of Air Quality Planning and Standards‟ *EPA Air Pollution Control Cost Manual* (EPA, 2002) states "SNCR systems applied to large combustion units (greater than 3,000 MMBtu/hr) typically have lower NO_x reduction efficiencies (less than 40 percent), due to mixing limitations." The Centralia Power Plant units have heat input rates of much greater than 3,000 MMBtu/hr (above 7,000 MMBtu/hr[15]). After considering the above factors and a reasonable compliance factor, TransAlta selected a control effectiveness of 25 percent for this evaluation.

TransAlta‟s cost analysis uses a urea-based SNCR system providing a nominal 25 percent reduction in NO_x levels with a 5 ppm ammonia slip. A 5 ppm ammonia slip is the maximum recommended taking into account the flue gas sulfur levels to avoid problems with ammonium sulfate and bisulfate fouling of the air heater. To achieve the proposed reduction, multiple nozzle lances are proposed to handle load changes from 50 to 100 percent.

Retrofit costs to incorporate SNCR at this facility are included in the cost estimate. These retrofit costs are higher than for other similarly sized facilities due to an extremely tight boiler outlet configuration, limited available space for new equipment, probable modifications to boiler tubes to accommodate the urea injection lances, construction access difficulties to install SNCR injection equipment, and location of urea storage and solution preparation equipment.

TransAlta has estimated that installation of SNCR on their units would consume about 700 kW-h of electricity per unit, or a total of 1.4 MW-h for both units.

The anticipated 25% reduction in emissions from the installation of SNCR would result in an emissions limitation of 0.225 lb/MMBtu and an emission reduction of 3,923 tons/year. TransAlta has estimated that the estimates of capital cost including the retrofit costs, adding SNCR to both units at the plant would cost $33.2 million with a cost effectiveness of $2,258/ton NO_x reduced.

Subsequent to the public comment period on the proposed BART determination, TransAlta was requested to supply additional information on the use and cost of SNCR at this facility. The company had its contractor supply additional information related to the basis of its SNCR cost estimates. This additional detail is contained in a March 31, 2010 report from CH2MHill to Mr. Richard Griffith (Appendix G). The additional detail indicates the cost estimating approach utilized by CH2MHill on this BART analysis.

The March 31, 2010 report indicates that the SNCR cost estimates in the June 2008 BART analysis were "budgetary estimates" supplemented by vendor quote of costs and NO_x removal efficiency from Fuel Tech.

[14] Harmon, A., et al. 1998. Evaluation of SNCR Performance on Large-Scale Coal-Fired Boilers. Institute of Clean Air Companies (ICAC) Forum on Cutting NO_x Emissions, Durham, NC, March 1998
[15] 2008 Acid Rain Program report lists heat input rate at 8500 MMBtu/hr/boiler

Selective Catalytic Reduction

Selective Catalytic Reduction (SCR) works on the same chemical principle as SNCR, but SCR uses a catalyst to promote the chemical reaction. Ammonia or urea is injected into the flue-gas stream, where it reduces NO_x to nitrogen and water. Unlike the high temperatures required for SNCR, the SCR reaction takes place on the surface of a vanadium/titanium-based catalyst at a temperature range between 580°F and 850°F. Due to the catalyst, the SCR process is more efficient than SNCR resulting in lower NO_x and ammonia emissions. Typically an SCR system can provide between 70 and 95% reduction in NO_x emissions.

On coal fired power plants, the most common type of SCR installation is known as the hot-side high-dust configuration, where the catalyst is located downstream from the boiler economizer and upstream of the air heater and particulate control equipment. In this location, the SCR is exposed to the full concentration of fly ash in the flue gas that is leaving the boiler. An alternate location for an SCR system is downstream of the air heater or the particulate control device. In many cases, this location is compatible with use of a low temperature SCR catalyst or is within the low end of the temperature range of a conventional catalyst. Because the temperature of the flue gas leaving the air heaters and the Electrostatic Precipitators (ESPs) is too cool for the low temperature versions of SCR catalyst to operate, the high-dust configuration is assumed for TransAlta.

In a new boiler installation or a retrofit installation where the existing boiler has minimal emission controls installed, the flue gases flow downward through the catalyst to aid in dust removal. In a retrofit situation, the SCR catalyst is often located in the existing gas duct, which may be expanded in the area of the catalyst to reduce flue gas flow velocity and increase flue gas residence time to maximize removal efficiency and minimize ammonia usage. As an alternate location, the catalyst bed in a retrofit situation may be installed in a "loop" of ducting. This loop may be horizontal or vertical in orientation, depending on how the flow in the duct that is intercepted is routed and available space to locate the catalyst bed.

A new installation type SCR costing was used as the basis for analysis at the Centralia Plant because of the limited space to install an SCR catalyst in the existing flue duct and the ability to design for a 90% + reduction catalyst bed. The short distance between the boiler air heater and the entrance to the first ESP does not provide the room required for a catalyst bed with reasonable temperatures or velocities to be inserted in the existing flue gas duct[16]. The ducts from each boiler to the ESP have a relatively high velocity, such that the amount of catalyst that could fit into the unmodified duct would have minimal effectiveness due to the short residence time through the catalyst bed.

As a result of electing to use a design capable of 90+% NO_x reduction, an adjustment was used for SCR cost estimates due to the Centralia Plant"s extremely tight boiler outlet ductwork configuration as shown in Figures 3-3, 3-4, and 3-5 of the June, 2008 Revised BART Analysis and March 2010 supplement. As can be seen in the figures, installation of a full-scale SCR system requires reconfiguration of the flue ducts from the boilers, structural modifications of the first ESPs (or

[16] See Figures ES-1, 3.2, 3-4, and 3.5 of the BART Analysis for Centralia Power Plant, Revised July 2008.and supplemented March 2010.

installation of all new structural support to hold the weight of the catalyst beds and ductwork) to accommodate the weight of the SCR catalyst and duct work, and realignment of the duct work from the economizers to the air preheaters. The restricted site layout, support structure needs, intricate duct routing, limited construction space, and complexity of erection increases the capital cost.

Each boiler at the Centralia Plant has two exhaust gas ducts to aid in splitting the flow to the ESPs. As a result each boiler would require two smaller, separate catalyst vessels instead of a single large catalyst vessel. The capital cost of installing dual catalyst vessels for each unit is slightly greater than a single catalyst vessel for units of similar size.

As in the case for SNCR, a potential adverse impact due to unreacted ammonia from the SCR system is that it may render fly ash unsaleable. At facilities where there is no wet scrubber system included, excess ammonia could also create a visible stack plume. Again, TransAlta has a wet scrubber, so a visible stack plume from ammonia is not likely.

As stated in TransAlta"s BART analysis, an SCR retrofit increases the electricity consumed by the existing flue gas fan system to overcome the additional pressure drop associated with the new catalyst, typically a 6- to 8-inch water gage increase[17]. The increase in pressure drop results in marginally higher operating costs. Since the BART analysis uses a planning level cost analysis, there has not been a more detailed engineering study of all components that may be affected by adding the SCR system.

TransAlta evaluated 2 options to use SCR at the plant. One option included SCR on only one unit to achieve the Presumptive BART emission limit of 0.15 lb NO_x/ MMBtu, both units averaged together. The other option included SCR on both units.

The emissions reduction for installation of SCR (at a 95% removal rate) on one unit would be 4,364 tons/year. The capital cost for including SCR on only one unit was estimated to be $290.1 million with a cost effectiveness of $8,205/ton NO_x reduced.

The emissions reduction for installation of SCR (at a 95% removal rate) on both units would be 7,855 tons/year. The capital cost for including SCR on both units would be double that for one unit with a cost effectiveness of $9,091/ton NO_x reduced.

Subsequent to the public comment period on the proposed BART determination, TransAlta was requested to supply additional information on the use and cost of SCR at this facility.

In addition to the more readily readable drawings (Appendix F), the company had its contractor supply additional information related to the basis of its SCR cost estimates. This additional detail is contained in a March 31, 2010 report from CH2MHill to Mr. Richard Griffith (Appendix G). The additional detail indicates the cost estimating approach utilized by CH2MHill on this BART analysis. The approach described involved a company re-evaluation of historical information updated with current equipment, material, and constructions costs, including cost estimates based on preliminary engineering sketches. The March 31 submittal indicates that a basic capital cost for an SCR system

[17] Associated with providing a gas velocity through the catalyst beds below 20 ft/sec.

of $200/kW was used as the basis for the cost estimate. This basic cost was then scaled by CH2MHill"s engineering judgment of the costs and complexity to install an SCR system on these boilers. As part of this additional analysis, the predicted TransAlta costs were compared to costs for other coal fired power plants in the western US (in Attachment 1 of the March 31, 2010 report). The cost analyses compared were performed by CH2MHill and 4 other consulting firms. Many have been determined to be BART by the various states. The cost for SCR at the Boardman OR plant is listed as $382/kW, versus $413/kW at Centralia. Both costs can be considered to be essentially equivalent since both are well within the +/- 30% cost estimating range of the EPA Control Cost Manual and CH2MHill"s +50%/-20% estimate range of each other"s cost analyses.

The March 31, 2010 report also contains an improved description of how CH2MHill envisioned the proposed SCR system to be installed and operated. Their proposal would have the SCR system installed in a "hot, dirty" location taking hot flue gas from the economizer and returning it to before the air preheater. The "hot dirty" location in the flow path assures the catalyst bed would be at proper operating temperatures. The catalyst beds would be located above the first ESPs to avoid structural supports in the current access way under the divergent ducting between the air preheater and the ESP inlets. Structural supports would block plant operations and maintenance staff access to equipment and the ESPs. Locating the catalyst above the ESP would also provide the duct length to provide for lower velocities through the catalyst bed. The structural needs to support the weight of the ductwork and the catalyst beds were evaluated qualitatively.

In response to Ecology"s questions resulting from public comment, TransAlta had CH2MHill evaluate 2 other locations where SCR catalyst could be installed (Appendix G).

One location evaluated an installation between the ESPs and the wet Flue Gas Desulfurization (FGD) system. The analysis indicates the anticipated difficulties due to changes in flue gas volume and velocity resulting from reheating the flue gas to 700°F and adding aqueous ammonia reagent. The potential adverse impacts of flue gas reheating (even through a regenerative system) on operation of the wet scrubbers were not evaluated.

The other location is in the ESP inlet ducting after the air preheater. The air preheater outlet is 300°F, well below the normal range for SCR catalysts. To increase the temperature of the gas exiting the air preheater would require changes to the plant thermodynamics (by reducing the temperature of combustion air) and would impact the overall plant heat rate and efficiency. In this location, CH2MHill has estimated that the catalyst bed could be no more than 17 feet deep without requiring significant modifications to the ductwork from the economizer to the air heater. CH2MHill presents information that in this location, one layer of catalyst would provide a 5% decrease in NOx with a 5 inch water gauge pressure drop. A 2-layer system would increase removal to 12% at a pressure drop of 15 inches water gauge. The effects of an increased back pressure on the boilers or the ability of the induced fans to accommodate this much increase in pressure drop was outside of the scope of CH2MHill"s contract.

Rrotating Overfire Air and Rotamix

Mobotec markets Rotating Overfire Air (ROFA) as an improved second-generation overfire air distribution system. In their system the combustion gases in the boiler are set in rotation with asymmetrically placed air nozzles. According to Mobotec installation information, the ROFA technology alone has not been installed on any tangentially-fired coal unit greater than 175 MW.

The Mobotec Rotamix technology is a modification of the SNCR process. The ammonia or urea solution is added using lances in conjunction with the ROFA air nozzles to improve both the chemical distribution and lengthen the residence time for the reactions to occur. According to the Mobotec installation list, the largest tangentially-fired coal unit using the Mobotec ROFA/Rotamix combination is 175 MW. The Rotamix SNCR system is anticipated to provide NO_x reductions similar to conventional SNCR systems[18].

Based upon the BART guidance, Mobotec ROFA and Rotamix technologies are „available" because they have been installed and operated successfully on tangentially fired pulverized coal boilers. TransAlta believes that while the ROFA and Rotamix technology are „available" control technologies as described in the BART guideline, the use of either ROFA as a replacement or addition to the current overfire air injection system or installation of the Rotamix process are not technically feasible technologies due to unknown difficulties with installation on their boilers. Due to perceived risks of scale-up to their unit size, TransAlta believes that these technologies are not applicable to their facility.

2.2 TransAlta's Proposed Best Available Retrofit Technology

The existing LNC3 combustion controls (low NO_x burners, close coupled and separated overfire air) currently installed at the plant and the Flex Fuels project meeting an emission limitation of 0.24 lb NO_x/MMBtu, 30 day average, is proposed as BART for their facility.

[18] The Mobotec combustion air injection techniques were not evaluated as part of the RACT process. Their development occurred after the RACT determination had been made.

3.0 Visibility Impacts and Degree of Improvement

TransAlta modeled the visibility impairment for the baseline years per the modeling protocol and the potential improvement from the control scenarios that they evaluated as potential BART controls for their facility. In modeling the emissions, they followed the BART modeling guidance prepared for use by sources in Washington, Oregon, and Idaho. In accordance with the EPA BART guidance, this modeling protocol utilizes the CALPUFF modeling system and the „old"Interagency Monitoring of Protected Visual Environments (IMPROVE) equation to convert modeled concentrations to visual impairment. This approach is consistent with most of the states included in the Western Regional Air Partnership for modeling individual source visibility impairment. The „old"IMPROVE equation is used because it is included within the CALPUFF modeling system and is part of the EPA accepted version of the model per 40 CFR Part 51, Appendix W. A new equation is available, but is not included within the version of the CALPUFF modeling system specified in the modeling protocol.

The results of the TransAlta modeling are shown in Table 3-1 for all Class I areas within 300 km of the plant plus the Columbia River Gorge National Scenic Area. Table 3-1 shows the maximum day impairment due to TransAlta, the highest of the 3, 98th percentile days of each year modeled, and the 98th percentile day of all 3 years modeled. Also shown is the modeled visibility impairment resulting from the control scenarios modeled by TransAlta. The modeled dv impacts for the baseline condition and the 3 control scenarios for the 98th percentile day (22nd day over the three year period) are included in Table 3-1[19].

The emission rates modeled were derived from operating records for each boiler and reflect the highest 24 hour emission rate within the 3 years that were modeled. The proposed emission rates were applied to this maximum 24 hour operating rate and those rates were then used for modeling the visibility impairment/improvement that could be achieved through the use of the proposed controls. The modeled emission rates are shown in Table 3-1.

The modeled visibility impairment indicates that the plant causes visibility impairment at all Class I areas within 300 km of the plant. The tables include modeled visibility levels for three alternative control scenarios, including the highest level of control considered by TransAlta to be available for the plant, SCR applied to both boilers.

Ecology modelers have reviewed the modeling performed by TransAlta and have found that the modeling complies with the Modeling Protocol and produces a reasonable result.

The modeled emission reductions from the control options modeled by the company result in substantial reduction in the visibility impairment caused by the Centralia Plant in all Class I areas modeled and in the Columbia River Gorge NSA. For example, Table 3-1[20] shows that at the 3 most heavily impacted Class I areas, Olympic National Park, Mt. Rainier National Park, and the Goat Rocks Wilderness, TransAlta"s proposed BART controls would provide 1.13 to 1.45 dv reduction in

[19] See the BART Determination Modeling Analysis, TransAlta Centralia Generation Power Plant by Geomatrix Consultants, Inc, June 2008, for additional information on the modeling results for the other control scenarios evaluated. This report is part of the July 2008 BART analysis report.

[20] Revised from the prior version of this document with the modeling results in the March 2010 modeling. This additional modeling was performed in response to public comments on the proposed BART determination.

visibility impairment in each of these areas. All Class I areas within 300 km of the plant are modeled to have visibility improvements of at least 0.2 dv from the NO_x emission reduction from use of SNCR or Flex Fuels. Combined with the effects of the reduction in SO_2 from implementation proposed BART controls, the minimum visibility improvement is 0.67 dv.

The initial modeling for the control scenarios in the table evaluated only the NO_x reduction impacts. Effects of SO_2 reductions which would occur as a result of implementing the Flex Fuels project were not initially evaluated by TransAlta.

The actual SO_2 emission rates from usage of PRB coals are anticipated to result in an additional reduction of about 1,287 tons/yr from the baseline emission rates. Subsequent to the public comment period, Ecology requested and TransAlta remodeled the Flex Fuels project emissions to include the effect of the SO_2 reduction from use of the PRB coals. The results of this remodeling are portrayed in Table 3-1. Control Scenario 3 was not included in the table as presented during the public comment period but was available in TransAlta"s July 2008 BART Analysis Revision.

In their review of the initial modeling results, TransAlta"s modeling consultant evaluated the modeling results to see if there were any patterns to the modeled impacts, such as season of the year, primary pollutant, or grouping of Class I area. Their review indicated that groups of Class I areas exhibited similar patterns. They found that the 12 Class I areas fell into 4 groups which coincide with both their physical locations and the modeled visibility effects. For their evaluation, see pages 8 and 9 of the June 2008 BART modeling report.

The important points to consider are that for the "East" group (Mt. Rainier N. P. and Goat Rocks and Mt. Adams Wildernesses) most impacts occurred in the summer due to SO_2 emissions. The expected high impacts due to NO_x do not occur because the weather patterns transport the plant"s plume to other areas in the winter seasons. The impacts on Olympic NP, (the sole member of the "Northwest" group) occur during wintertime stagnation episodes. While not mentioned in the report, this impact would be dominated by nitrates. For the "South" group (Mt. Hood, Mt. Jefferson, and Three Sisters Wildernesses) there are summertime impacts, but the highest potential visibility changes occur in the winter during wintertime stagnation episodes. Again, the wintertime events are dominated by nitrates. At the remaining 4 Class I areas (the "Northeast group"), there was no obvious seasonality or trends. The figures in Appendix D graphically depict this information for some of the Class I areas.

Overall, the visibility impacts from the plant"s emissions on Class I areas are dominated by nitrates. The tables in Appendix D[21] depict the chemical species contributions to visibility impairment for the baseline case, the Scenario 2 Flex Fuels case and the Scenario 1 SNCR case as predicted by CALPUFF. Again, consistent though not identical with the evaluation by TransAlta"s modeling consultant, at most nearby Class I areas, the visibility impairment on the 98th percentile worst days is primarily caused by the nitrate resulting from the plant"s emissions. These worst days primarily occur in the September through June time period. Conversely, at the more distant Class I areas the visibility impairment is more variable, but the 98th percentile days usually occur in the June through

[21] From Geomatrix BART Modeling Reports, June 2008 and January 2008.

September period and are dominated by sulfates. For more details, please refer to the Modeling Reports supplied by TransAlta.

As noted above, TransAlta was requested to remodel the emissions from the project as a result of public comment on the proposal. They remodeled 2 scenarios using the same modeling protocol as used in the initial modeling. The 2 scenarios were the Flex Fuels and the Flex Fuels plus SNCR control options. The emission rates are consistent between the scenarios, with only the NO_x rate changing to reflect the anticipated 25% reduction in NO_x from the application of SNCR to the emissions from the Flex Fuels Project. The modeling results are contained in a report attached to a March 26, 2010 e-mail from Ken Richmond of Environ to Alan Newman and Clint Bowman of Ecology (Appendix H).

The visibility impacts depicted in Table 3-1 have been updated to reflect the results of the revised modeling. The maximum 24 hour emission rate for SO_2 in the revised Control Scenario 2 and new Control Scenario 3 is based on the ratio of the average sulfur content of Jacobs Ranch PRB coal to the average of the Centralia Mine coal used in the 2003-5 time period. The maximum 24 hour NO_x emission rate used in the Flex Fuels only control scenario is as modeled previously. The NO_x rate for Flex Fuels plus SNCR is a 25% reduction from the Flex Fuels only rate.

Ecology did not request that TransAlta remodel their SCR control scenarios reflecting the use of low sulfur PRB type coals. The modeling results assume that TransAlta would return to using Centralia coal as a primary fuel for the boilers. Based on the modeling performed on Flex Fuels and Flex Fuels plus SNCR, there would be additional visibility improvements were PRB coal continued to be used by the facility and SCR added.

Table 3-1 3-Year Delta Deciview Ranking Summary

Class I Area	Visibility Criterion	Baseline Emissions	Control Scenario 1: SNCR	Control Scenario 2: Flex Fuel	Control Scenario 3: Flex Fuel plus SNCR	Control Scenario 4: SCR on both units
Alpine Lakes Wilderness	Max 98% value (8th high) in any year	4.871	4.393	3.564	2.949	3.057
	3-yrs Combined 98% value (22nd high)	4.346	3.844	2.994	2.598	2.531
Glacier Peak Wilderness	Max 98% value (8th high) in any year	3.615	3.209	2.403	2.049	2.036
	3-yrs Combined 98% value (22nd high)	2.622	2.294	1.905	1.532	1.562
Goat Rocks Wilderness	Max 98% value (8th high) in any year	4.993	4.398	3.676	3.069	3.137
	3-yrs Combined 98% value (22nd high)	4.286	3.708	3.108	2.637	2.385
Mt. Adams Wilderness	Max 98% value (8th high) in any year	3.628	3.118	2.646	2.194	1.984
	3-yrs Combined 98% value (22nd high)	3.628	3.152	2.591	2.147	1.934
Mt. Hood Wilderness	Max 98% value (8th high) in any year	3.471	3.051	2.346	1.978	2.082
	3-yrs Combined 98% value (22nd high)	2.830	2.388	1.997	1.665	1.543
Mt. Jefferson Wilderness	Max 98% value (8th high) in any year	2.079	1.784	1.399	1.150	1.159
	3-yrs Combined 98% value (22nd high)	1.888	1.596	1.267	1.053	1.061
Mt. Rainier National Park	Max 98% value (8th high) in any year	5.447	4.774	4.318	3.606	3.359
	3-yrs Combined 98% value (22nd high)	5.489	4.743	4.225	3.501	3.275
Mt. Washington Wilderness	Max 98% value (8th high) in any year	2.027	1.756	1.323	1.106	1.170
	3-yrs Combined 98% value (22nd high)	1.414	1.248	0.872	0.737	0.855
North Cascades National Park	Max 98% value (8th high) in any year	2.821	2.496	1.852	1.570	1.658
	3-yrs Combined 98% value (22nd high)	2.212	1.887	1.486	1.228	1.183
Olympic National Park	Max 98% value (8th high) in any year	4.645	4.040	3.192	2.695	2.506
	3-yrs Combined 98% value (22nd high)	4.024	3.456	2.991	2.486	2.339
Pasayten Wilderness	Max 98% value (8th high) in any year	1.954	1.701	1.287	1.075	1.160
	3-yrs Combined 98% value (22nd high)	1.482	1.318	0.999	0.822	0.864
Three Sisters Wilderness	Max 98% value (8th high) in any year	2.172	1.910	1.333	1.139	1.172
	3-yrs Combined 98% value (22nd high)	1.538	1.328	0.993	0.819	0.902
Class II area modeled per the Modeling Protocol						
Columbia River Gorge National Scenic Area	Max 98% value (8th high) in any year	2.545	2.193	1.748	1.446	1.347
	3-yrs Combined 98% value (22nd high)	2.353	1.942	1.657	1.378	1.182
Modeled Rates (lb/hr)	**Both units added together**					
	NOx -->	4,984	3,738	3,936	2,952	1148
	SO_2 -->	4,522	4,522	1,854	1,854	4,522

The 8th day in any year or the 22nd day over the 3 year period, are the 98th percentile days.

4.0 The Washington State Department of Ecology's Best Available Retrofit Technology Determination

Ecology has reviewed the information submitted by TransAlta. The following discussions present our rationale for our determination.

4.1 Nitrogen Oxides Control

The BART analysis reports and supplemental material provided by TransAlta indicate that the Flex Fuels project and SNCR are the only feasible controls for use at the Centralia power plant. We concur with their opinion on controls. This concurrence is based on our evaluations of their submittals plus Ecology research on potential controls.

4.1.1 Control options determined not to be feasible

Three available control technologies were evaluated and determined not to be feasible NO_x controls for use at the Centralia plant. In addition, one available control option, natural gas reburning, had been evaluated for the 1997 RACT determination but was not reevaluated by TransAlta in their BART analysis. Ecology has determined that none of these control technologies are feasible controls of NO_x at the Centralia plant.

Rotating Overfire Air /RotaMix

TransAlta did evaluate the installation of the Mobotec ROFA technology. Both Ecology and TransAlta found was that this air injection technique has been neither tested nor demonstrated in tangentially fired coal boilers of this size. Similarly, the Mobotec RotaMix technique for SNCR has not been tested or demonstrated on boilers of this size. For both Mobotec technologies, the largest tangentially fired unit reported to have the equipment is 565 MW[22,23]. This rating is below that of TransAlta"s units, which are rated at 700 MW each.

Emissions information on the recent installation is not published. The technology remains untested or demonstrated on units the size of the TransAlta facility. With the current lack of information on the control efficiency on the 565 MW plant, there are questions about the capabilities of scaling the technology up to Centralia size. Under BART, facilities are not expected to assume large risk or expense for installing a new technology or technique on an untried size or type of facility[24]. As a result, Ecology concurs with TransAlta that these techniques are not yet technically feasible for use on this facility.

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[22] As of 2009, The NALCO/Mobotec reports the largest tangentially fired pulverized coal unit using ROFA or Rotamix was 565MW, Minnesota Power"s Boswell Unit #4. The next two largest units listed by the company are a 424 MW wall-fired unit and a 577 MW opposed fired unit achieving a 55% reduction to 0.25 lb NOx/MMBtu on bituminous coal. Telephone call with Jay Crilley, Nalco, June 24, 2009

[23] In spite of the limited application of the Mobotec ROFA technology, EPA did evaluate in its analysis of control techniques when evaluating the presumptive BART limitations. Go to the EPA"s Regional Haze Rule Docket for EPA-HQ-OAR-2002-0076-0446(1) TSD.xls ,

[24] 40 CFR Part 51, Appendix Y, Section IV. D.

Selective Catalytic Reduction

For new coal fired power plants, SCR is the BACT control technology of choice to reduce NOx emissions. In some cases, the use of SCR is being considered to be the technology to be implemented for BART. There are a number of technical difficulties to implementing SCR at the Centralia plant presented by TransAlta in its reports. The primary difficulties are a lack of space for easy installation of the catalyst beds and ducts, leading to very high construction costs that far surpass ranges of acceptable cost effectiveness.

In response to public comment on the clarity of the plan and profile drawings supplied, Ecology acquired additional layout drawings from TransAlta with dimensions and elevations more readily discernable to reviewers (Appendix F). The drawings indicate that the location proposed for installation of an SCR system is on top of the first ESP bank. This is at an elevation of approximately 80 feet in the air, above the precipitator. This is also the elevation of the air preheaters. The horizontal distance between the outlet of the air preheater and the ESP is 55 feet. As indicated in the drawings, in this 55 ft distance the flue gas has to turn 90 degrees and spread it out across the full width of the ESP inlet.

The earlier BART analyses from TransAlta did not contain an explanation of the flow routing for the proposed SCR installation. As described in CH2MHill"s March 31, 2010 report (Appendix G), they envision a “hot, dirty” SCR installation. In other words, the flu gas would be intercepted on leaving the boiler economizer and routed through the SCR unit and returned to the inlet of the air preheater. A “hot, dirty” installation provides flue gas within the normal operating range of an SCR catalyst. A number of additional engineering analyses are identified in the March 2010 report that would be required to improve the construction cost estimate. These additional analyses include the a fluid dynamics evaluation for each possible location, an evaluation of new structures needed to support ductwork and catalyst beds, consideration of maintenance access to the ESPs and other equipment in that area of the plant, and a construction difficulty evaluation. All of these additional analyses were outside the scope of work for CH2MHill"s report.

Two other locations for installing an SCR system were evaluated in the March 2010 report. One location is in the diverging ducts between the air preheaters and the ESPs. CH2MHill acquired vendor information about the removal efficiency and head loss of a one and 2 layers of catalyst that could be installed within the duct. Due to velocity and the limited depth of catalyst bed possible in this location, SCR removal seems to be limited to 5% for a single layer system and 12% for a 2 layer system. As a result of the low removal rates that would be provided by a catalyst system in this location, CH2MHill did not evaluate the construction costs of this location. In Ecology"s view, there are significant questions if these ducts could support the added weight of the catalyst without additional structural support, or if the company could work around the loss of vehicle access for maintenance purposes to the equipment located on the ground under and around the air preheaters and ESPs.

The other location evaluated is in the ductwork between the ESPs and the wet FGD system. As indicated by the drawings in Appendix F, the ductwork is of different lengths and, what is not clearly obvious from the drawings, they have different cross-sectional dimensions. CH2MHill provided a qualitative analysis of what would be involved in installation of an SCR system between the ESPs and the wet FGD system (Appendix G). Ecology accepts their qualitative analysis as demonstrating the difficulties in retrofitting an SCR system in this location.

Ecology concurs with TransAlta that the construction costs to overcome the technical difficulties of retrofitting an SCR system on its boilers, given its current configuration and installed emission controls, render this technology economically infeasible for implementation at this time.

Neural Nets

This technique is an available control technology. However, Ecology agrees with TransAlta that the use of this technique at the Centralia plant is not guaranteed to reduce emissions. TransAlta is likely to continue to evaluate the appropriateness of installation and use of a neural net combustion optimization process at the facility and may at a future date choose to include it for polishing and fine-tuning operations beyond what can be achieved by their human operators.

Natural Gas Reburning

Natural gas reburning has the potential to reduce NO_x emissions. Natural gas reburning is a technique where natural gas is injected into the boiler above the last overfire air ports and additional overfire air ports are added above the natural gas injection level. The natural gas has the effect of reducing part of the nitrogen oxides to nitrogen gas, carbon dioxide and water. The technique has an estimated control effectiveness of 40 -50%.

Ecology has looked briefly at the use of natural gas reburning to reduce NO_x from these boilers. A review of the EPA RACT/BACT/LAER Clearinghouse database does not include any listings of this technique being used on any coal fired boiler of any size. The lack of any entries showing use of this technology for coal fired boilers of any size or type, lead us to question whether this control technique is truly available. A review of NO_x control literature from the late 1990"s indicates there was a lot of interest and evaluations of various methods to implement reburning, including the use of pulverized coal as the fuel. While there was much experimentation, it appears that low NO_x burner/combustion controls were the dominant technology being implemented at that time.

A 2005 review of NO_x control techniques available for coal fired boilers listed 26 plants that have installed or tested reburning[25]. Of these 26 plants, only 4 were indicated as still using reburning when the review was written. The report"s authors express the belief that the reason the control is not used on the plants where it is installed is simple economics; it is costly to operate the reburn process. The 4 largest units listed in the review article, bracket TransAlta in size, but none of them were operating their reburning equipment. The few NO_x emission limitations listed for reburning have higher emission rates than the control level achievable by Flex Fuels or SNCR. Based on the limited published information on installation of reburning on units the size of Centralia, we question the ability of the technology to achieve a level of control comparable to Flex Fuels or SNCR.

Natural gas reburning was not cost effective (compared to the installation of LNC3 combustion controls) in 1997. The cost of natural gas is the primary cost of using this technology. Natural gas

[25] See Reference 5 for details.

costs have increased significantly since 1997, while natural gas pipeline capacity in this part of Washington has not expanded significantly. SWCAA determined in 1997 that this control technique was not cost effective. Ecology is of the opinion that reburning is still not cost effective for implementation at the plant.

4.1.2 Evaluation of controls determined to be feasible

Low Nitrogen Oxides Combustion, Level 3/Flex Fuels

As described in Section 2, the Flex Fuels project is to allow the boilers at this plant to utilize PRB coals and accommodate its potential increased fire hazard. These modifications are relatively simple and well known in the coal combustion industry. Compared to the Centralia mine coal, PRB coal contains less nitrogen and has a higher energy content. These 2 factors work together to reduce the NO_x emissions from the boilers.

The estimated capital cost to TransAlta to implement the Flex Fuels project is \$101,808,663. The annualized cost of the Flex Fuel Project is \$11,184,197. Based on the estimated NO_x reduction of 3,139 tons/yr, the cost-effectiveness of the Flex Fuel Project is \$3,563/ton of NO_x reduced. Since the Flex Fuel Project also reduces SO_2 emissions by an estimated 1,287 tons/year, the cost-effectiveness of the Flex Fuel Project is \$2,526/ton of NO_x plus SO_2 reduced.

Selective Non-Catalytic Reduction

SNCR has been commonly selected for BACT determinations on new and modified coal fired power plants where SCR cannot be used, as a method to meet NO_x reductions required to comply with the Clean Air Interstate Rule (CAIR) program, and for seasonal NO_x control requirements. SNCR has been required to meet BART at a few facilities, although the most common BART determinations publically available from states to date is low NO_x burner technology similar to that already installed at the Centralia Plant with SNCR or SCR added later as further progress emission reductions. We evaluated a 25% reduction from the use of SNCR, a level supported in the emission control literature reviewed. When this reduction is applied to the baseline emission rate of 0.304 lb NO_x/MMBtu, the resulting emission limit becomes 0.23 lb NO_x/MMBtu. This is marginally better than the limit of 0.24 lb NO_x/MMBtu limit proposed for the Flex Fuels project.

As can be seen in June 2008 Modeling Report, visibility improvement resulting from the NO_x reductions from SNCR or Flex Fuels (Control Scenario SNCR, and Control Scenario Flex Fuels) provide essentially equal reduction in visibility impacts at all Class I areas within 300 km of the plant. In addition, the use of low sulfur sub-bituminous coals can also reduce SO_2 emissions from the plant by up to 1,300 ton/year[26]. The March 2010 modeling, which includes the effects of the reduced SO2 emissions from use of the Flex Fuels project, indicates that Flex Fuels provides significantly better visibility improvement than SNCR alone.

[26] The effects of the SO_2 reduction was modeled and included in the January 2008 BART report. However the NO_x and SO_2 rates modeled for that report are not identical to those used in the June 2008 report or the December update. The March 2010 remodeling includes the SO_2 reduction from Flex Fuels at the final anticipated reduction rather than the previous differing rates. Ecology is relying on the March 2010 analysis as the most accurate and consistent version for comparison purposes.

As can be seen by looking at Table 3-1, the visibility improvement modeled from the NO_x reduction aspects of the Flex Fuel project (Control Scenario 2) ranges from 1.13 to 1.45 dv at the 3 most heavily impacted Class I areas. This visibility improvement at the most heavily impacted Class I areas is significantly greater than that provided by the use of SNCR (Control Scenario 1). At the least impacted Class I areas the visibility improvement due to NO_x reductions by SNCR is about 0.2 dv while the Flex Fuels project provides about 0.67 dv of visibility improvement.

Ammonia slip from the use of an SNCR system is inevitable. TransAlta based its analyses assuming a 5 ppm slip. An SNCR system of the type contemplated for installation on these boilers normally results in an ammonia slip of 5 - 10 ppm[27]. As noted in Section 2‟s discussion of SNCR, there are a number of potential adverse impacts that can result from ammonia slip.

Due to the alkaline nature of the FGD system at the Centralia plant, only a small amount of the ammonia entering the FGD system may be removed[28]. Ammonia can be a visibility impairing air pollutant and is a precursor to the formation of secondary Fine Particles ($PM_{2.5}$). The presence of ammonia in the plant‟s exhaust will tend to increase the total quantity of ammonia available for the formation of ammonium nitrate and sulfate and ultimately in the concentration of $PM_{2.5}$ at downwind locations. This secondary $PM_{2.5}$ and ammonium aerosols increase can lead to lower visibility improvement than would be anticipated based solely on the reduction in NO_x emissions.

Flex Fuels plus Selective Non-Catalytic Reduction

Ecology has also evaluated the impacts of utilizing the Flex Fuels project and adding SNCR to further reduce NO_x emissions. Assuming a 25% reduction in NO_x to occur from adding SNCR to Flex Fuels, the resulting emission limit would be 0.18 lb NO_x/MMBtu. The capital costs to add SNCR to Flex Fuels would increase by about 1/3 above Flex Fuels project costs to an estimated $135 million. The annual costs would increase by $6.2 million to about $17.3 million/year. The cost effectiveness of Flex Fuels plus SNCR is $2,162/ton NO_x for a net reduction of 8,022 tons NO_x per year. The annual cost increase is mostly to cover the cost of ammonia or urea, and to remove ammonium sulfate and bisulfate from boiler tubes and duct work between the ammonia injection point and the first ESP.

Despite the apparent cost effectiveness, it is important to consider the incremental cost of installing SNCR. Given the Centralia Plant has already installed the LNC3 technology and the Flex Fuels project, the cost of adding SNCR now is also an incremental cost. The capital cost to add SNCR to Flex Fuels is the same as SNCR alone since the same equipment needs to be installed. The

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[27] For comparison, actual monthly average SO_2 emissions from this plant are currently under 20 ppm.
[28] Ammonia can be removed from air streams with an acidic solution. It can be removed from water solutions by making the solution alkaline. The wet FGD system is alkaline.
At intermediate pHs, the ammonia partitions between ammonium and ammonia in solution according to the following formula: Where: f = the decimal fraction of ammonia present in unionized form; pKa = ; T = water temperature in degrees Kelvin; and pH = the pH of the water solution. The unionized form is what can be emitted.

incremental cost of adding SNCR to both units at the facility is estimated to be $2,145/ton to remove an additional 2,890 tons[29] NO_x over Flex Fuels alone.

The combination of Flex Fuels and SNCR would increase the level of visibility improvement at the 3 most heavily impacted Class I areas due to NO_x reductions by an additional 1.9 dv on the 98th percentile day. At the most distant, least impacted Class I areas, the improvement is 0.8 to 1 dv. The incremental improvement in visibility from adding SNCR to Flex Fuels is at least 0.2 dv compared to Flex Fuels alone.

While this additional project does result in some visibility benefit, we must also weigh the other factors of the BART analysis to determine feasibility. These factors are the

- energy and non-air quality environmental impacts of compliance,
- any existing pollution control technology in use at the source, and the
- remaining useful life of the source.

There are several energy and non –air quality environmental impacts associated with SNCR. The small parasitic load associated with operating an SNCR system would reduce the power the Centralia plant has available for sale by about 1.4 MW. As previously discussed, there is also the potential for ammonia slip with SNCR, which would in turn contribute to visibility impacts. While we believe these impacts to will be manageable, they are additional operational complications resulting from the installation of SNCR.

The Centralia Plant has already installed substantial emissions control technology. SO_2 controls reducing emissions by 95% have been in operation for only 8 years. The LNC3 combination of combustion controls have been in operation for 8 years. This is the same technology used as the basis for EPA‟s presumptive BART control technology for NO_x. Throughout the western states, this package of combustion controls is being found to be BART or is a component of BART control determinations. As documented by TransAlta, their burner package vendor has confirmed in 2008 that the existing LNC3 package installed in their boilers is the current generation of the package. While the installed LNC3 controls at the Centralia Plant do not meet the presumptive BART limitation defined by EPA, the LNC3 controls installed meet the emission reduction anticipated and required in the 1997 RACT determination. The improvement expected was about a 33% improvement from a 1996/97 average of about 0.45 lb NO_x/MMBtu to the permitted 0.30 lb NO_x/MMBtu.

Further, the wet scrubber system installed on the plant in 2000 – 2002 provides in excess of 95% control of SO_2 emissions. Compared to many other plants of its vintage, the emissions of the Centralia plant are well controlled. This level of control weighs in favor of not requiring installation of significant control technology under BART given the significant NO_x reductions resulting from a project already installed.

There is an issue of the remaining useful life of the Centralia Plant. TransAlta‟s investor information about its facilities states that continued operation of the Plant beyond 2030 will require a substantial

[29] Based on 78% capacity factor, which is below the company target rate of over 84%

capital investment[30] with decisions to be made by 2025. However, that 20-year lifetime is longer than the BART guidance would consider as a limiting factor for making a BART technology decision on economic grounds.

There are other circumstances that affect the remaining lifetime of this plant in its current configuration. On May 21, 2009, the Governor of Washington issued Executive Order 09-05, Washington‟s Leadership on Climate Change. One specific action in the Executive Order requires the Director of the Department of Ecology to:

> (1)(d) Work with the existing coal-fired plant within Washington that burns over one million tons of coal per year, TransAlta Centralia Generation, LLC, to establish an agreed order that will apply the Greenhouse gas emissions performance standards in RCW 80.80.040(1) to the facility by no later than December 31, 2025. The agreed order shall include a schedule of major decision making and resource investment milestones;

The current greenhouse gas emission rate for the Plant is about 2,300 lb total greenhouse gases/MW-hour (MWh) of electricity produced for sale. The emission performance standard in the RCW 80.80.040(1) is currently 1,100 lb total greenhouse gases/MWh of electricity produced. Meeting that performance standard would require a greenhouse gas reduction in excess of 50%, on the order of 6-7 million tons of CO_2 per year. The law (Chapter 80.80, RCW) also requires an evaluation of technology every 5 years and a revision to this limitation be established by rule. The revised emission performance standard is based on the capability of new combined cycle natural gas combustion turbines offered for sale and purchase in the United States. Based on current offerings by the combined cycle combustion turbine industry, the first of the revised standards (due in 2012) is anticipated to be 850 – 920 lb/MWh.

TransAlta has a limited number of options to comply with the emission performance standard at the Centralia Plant. Those options include shutting the plant down[31], repowering it with a technology that complies with the performance standard, adding biomass to replace part of the coal supply[32], or addition of CO_2 separation and liquification equipment (along with development of a viable sequestration program). Regardless of the option chosen, each would bring significant further reductions to NO_x, SO_2 and PM emissions from the facility. To meet the requirements of the executive order, the likely economic lifetime of the current configuration of the Centralia Plant and any new emission control equipment would be 15 years or less.

The state has proposed to TransAlta a 3-step process for the plant to comply with the Executive Order. TransAlta is evaluating this proposal. Under the State proposal operation of the coal fired units would be ramped down over a 10-year period. The first action would be to operate the

[30] TransAlta Investor Day 2007, presentations published as PDF file on Nov. 17, 2007, Slide 38 of 101.
[31] Shutting down one unit would not comply with the standard.
[32] We estimate that to reduce emissions to just meet the 1100 lb/MWh standard, the plant would require biomass to replace at least 52% of the heat input to the plant. Assuming that this biomass is dry Douglas fir wood, we have estimated this to be approximately 500 dry tons/hour (over 12,000 tons/day) of biomass (probably wood or a wood derived fuel). Assumptions used in this calculation are, boiler heat input rate 8,554 MMBtu/hr/unit, dry Douglas fir wood at 8,900 Btu/dry lb, coal at 8,800 Btu/lb)

Centralia Gas facility and derate or otherwise limit the ability of one coal unit to produce electricity by the same amount as provided by the gas plant. This first step would start almost immediately after the agreed order was issued. The company would develop renewable energy resources adequate to shut down one coal unit completely about 2020. The second coal unit would be shut down by 2025 and be replaced by a combined cycle combustion turbine plant of about 700 MW size.

4.2 The Washington State Department of Ecology's Determination of Best Available Retrofit Technology

Ecology is proposing BART to be the Flex Fuels project plus use of a sub-bituminous Powder River Basin coal or other coal that will achieve similar emission rates.

Considerations in our decision include:

- When fully installed the Flex Fuel project will provide an emissions rate of 0.24 lbs NO_x/MMBTU, a 20 percent reduction from the current emissions rate. This is slightly higher than the emissions rate that would be achieved by SNCR.
- The Flex Fuels emission reductions are not exclusively NO_x, but include SO_2 reductions from ability to use PRB type coals.
- The NO_x emissions reduction from the use of Flex Fuels, SNCR, or SCR will result in reduced visibility impairment at all Class I areas within 300 km of the plant.
- The visibility improvement due to the use of Flex Fuels is greater than the use of SNCR alone as a result of the SO_2 reduction provided by the use of PRB type coals.
- The NO_x reduction will provide mostly a fall, winter, spring visibility improvement, during lower visitor usage days and periods with cool cloudy or stormy weather.
- The Flex Fuels emission reduction project was completed August 2009 with performance testing completed by the end of September 2009. The facility has met the proposed BART limits since October 2009.
- Additional NO_x reductions from adding SNCR may not occur until 3 to 5 years from when the BART Compliance Order is issued, further reducing the time period to amortize those costs, especially after considering the effects of the Executive Order.
- The Flex Fuels project does not impede any future requirement to impose SNCR (or even SCR) as part of a future reasonable progress determination.
- There will be federal requirements to reduce mercury emissions. The Flex Fuels project does not interfere with any potential mercury control technologies required by a future federal mercury control program.
- In order to meet the requirement of the Governor"s Executive Order on Climate Change, TransAlta will be making significant financial and plant viability analyses of how best to comply with the Executive Order directive and the resulting Agreed Order between the company and Ecology.
- Meeting the requirements of the Executive Order on Climate Change will significantly affect the NO_x emissions from the plant and based on the Ecology proposal, change the economic lifetimes of potential NO_x control technologies.

The emission limitation and coal quality limitation reflecting Ecology‟s determination of BART for NO_x from the Centralia Plant is provided in Table 4-1 below. A coal meeting the nitrogen and sulfur content of the Jacobs Ranch Upper Wyodak coal depicted in Appendix A, Table A-2 is considered to be a PRB coal or equivalent coal.

If the company finds it is unable to comply with the NO_x limitation in the BART order through the use of LNC3 combustion controls and Flex Fuels, it will be required to install SNCR or other NO_x reduction technique that will allow the plant to meet the BART emission limitation.

Table 4-1 Ecology's Determination of the Emission Controls That Constitute Best Available Retrofit Technology

BART Control Technology	Emission Limitation
Flex fuel project	0.24 lb NOx/MMBtu, 30 day rolling average, both units averaged together
Fuel Quality Requirements	Coal used shall be a sub-bituminous coal from the Powder River Basin or other coal that will achieve similar emission rates

Appendix A -- Coal Quality

Table A-1 Summary of Key Centralia mine and Powder River Basin Coal Characteristics

	TransAlta Centralia Mine Coal				Powder River Basin Coal		
	Low Sulfur (<1.2%)		High Sulfur (>1.2%)				
	Mean	Max	Mean	Max	Mean	Max	From
Btu/lb	7,681	8,113	7,930	8,121	8,414	8,800	Jacobs Ranch Upper Wyodak
Sulfur (%)	0.69	0.84	1.89	2.14	0.40	0.88	Jacobs Ranch Upper Wyodak
Ash (%)	15.44	16.44	14.43	16.46	6.21	13.04	Special K Fuel
Carbon (%)	44.95	47.37	45.63	46.45	49.11	51.26	Jacobs Ranch Upper Wyodak
Nitrogen (%)	0.76	0.80	0.71	0.75	0.67	0.8	Jacobs Ranch Upper Wyodak

Coal characteristics on an "as received" basis.

Table A-2 Powder River Basin Coal Characteristics, from *Best Available Retrofit Technology Analysis for the Centralia Power Plant, July 2008*

Coal Sources and Characteristics									
Coal Quality Data	**Units**	**Bucksk in**	**Caballo 8500**	**Cordero Rojo**	**Jacobs Ranch Upper Wyodak**	**Rawhid e**	**Special K Fuel**	**Belle Ayr**	**Eagle Butte**
Proximate Analysis (As-Received Basis)									
Higher Heating Value	Btu/lb	8400.00	8500.00	8456.00	8800.00	8300.00	7907.00	8500.00	8400.0 0
Moisture	%	29.95	29.90	29.61	26.45	30.50	25.74	30.50	30.50
Volatile Matter	%	30.25	31.40	30.71	32.50	30.40	28.76	30.40	31.92
Fixed Carbon	%	34.65	33.80	34.22	34.35	34.20	32.46	34.20	32.93
Ash	%	5.15	4.90	5.46	6.70	4.90	13.04	4.90	4.65
Fixed Carbon to Volatile Matter (Fuel) Ratio		1.15	1.08	1.11	1.06	1.13	1.13	1.12	1.03
Ultimate Analysis (As-Received Basis)									
Carbon	%	49.00	49.91	49.16	51.26	48.58	45.82	50.01	49.17
Hydrogen	%	3.24	3.56	3.43	3.89	3.34	3.07	3.43	3.42
Nitrogen	%	0.63	0.71	0.71	0.80	0.63	0.56	0.67	0.67
Sulfur	%	0.35	0.36	0.32	0.88	0.37	0.28	0.26	0.38
Ash	%	5.15	4.90	5.46	6.70	4.90	13.04	4.90	4.65
Moisture	%	29.95	29.90	29.61	26.45	30.50	25.74	30.50	30.50
Chlorine	%	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01
Oxygen	%	11.68	10.66	11.31	10.01	11.68	11.49	11.12	11.20

Note: Special K Fuel is blend of Spring Creek and Kaolin coals

Appendix B, -- Nitrogen Oxides Controls Evaluated in the 1997 Reasonable Available Control Technology Process

Table B-1 Nitrogen Oxides Controls Evaluated in the 1997 Reasonable Available Control Technology Process

Screening Criteria used in 1997 Review								
		Technically Feasible	Increase other Emissions	Safety?	Reduce Product Marketability	Cost Competitive compared to LNB?	Mets or Exceeds CDM Emission Level	Comments
	Boiler Modifications							
1	Boiler Tuning					Yes	No	
2	Low Excess Air					Yes	No	Already Optimized
3	Burners-out-of-Service (BOOS)	Constrained by mill capacity						
4	Fuel & Air Tip Replacement					Yes	Meets	New tip developments may provide capability to meet LNB levels of NOx
5	Close Coupled Overfire Air (CCOFA)				Increased UBC potential	Yes	Meets	
6	Separated Overfire Air (SOFA)				Increased UBC potential	Yes	Meets	
7	ABB Advanced TFS-2000 System (2 levels of SOFA)	Furnace height/spacing at Centralia reduces applicability			Increased UBC potential	Yes	Meets	Limited commercial demonstration of this technology, furnace specific
8	CCOFA plus SOFA	May necessitate pressure part modifications			Increased UBC potential	Yes	Exceeds	
9	Selective Noncatalytic Reduction (SNCR)	Not demonstrated on Centralia sized unit	Ammonia slip	Ammonia	Ammonia contamination of fly ash resulting in lost sales	No	Exceeds	High reagent cost/limited reduction capability
10	SNCR plus Air heater SCR (Hybrid)	Only one partial unit coal-fired utility demonstration; no demonstrations on Centralia sized unit	Ammonia slip	Ammonia	Ammonia contamination of fly ash resulting in lost sales	No	Exceeds	High reagent & O&M cost
11	Selective Catalytic Reduction (SCR)		Ammonia slip	Ammonia	Ammonia contamination of fly ash resulting in lost sales	No	Exceeds	Extremely high capital and O&M cost
12	Natural Gas co-firing				Reduced ash sales	No	Meets	# 14 is a better variation on this option
13	Natural Gas Conversion				No ash to sell	No	Meets	Very High Fuel cost
14	Natural gas	Not			Reduced ash	No	Meets	High variable cost

Screening Criteria used in 1997 Review								
		Technically Feasible	Increase other Emissions	Safety?	Reduce Product Marketability	Cost Competitive compared to LNB?	Mets or Exceeds CDM Emission Level	Comments
	Reburn (1st Generation)	demonstrated on Centralia sized unit			sales			of operation
15	Natural Gas Reburn (2nd Generation)	No Commercial Application			Reduced ash sales	No	Meets	Natural Gas Expensive
	Combined SO_2/NOx Controls							
16	UOP/PETC Fluidized Bed Copper Oxide	Pilot level or limited use				No	Exceeds	
17	Rockwell Moving-Bed Copper Oxide Process	Pilot level or limited use				No	Exceeds	
18	NOXSO Process	Pilot level or limited use				No	Exceeds	
19	Mitsui/BF Activated Process	Pilot level or limited use				No	Exceeds	
20	Sumitomo/EPDC Activated Char Process	Pilot level or limited use				No	Exceeds	
21	Sanitech Nelsorbent SOx-NOx Control Process	Pilot level or limited use				No	Exceeds	
22	NFT Slurry with NOXOUT Process	Pilot level or limited use				No	Exceeds	
23	Ebara E-Beam Process	Pilot level or limited use				No	Exceeds	
24	Karlsruhe Electron Streaming Treatment	Pilot level or limited use				No	Exceeds	
25	ENEL Pulse-Energization Process	Pilot level or limited use				No	Exceeds	
26	California (Berkeley) Ferrous Cysteine Process	Pilot level or limited use				No	Exceeds	
27	Haldor Topsoe WSA-SOX Process	Pilot level or limited use				No	Exceeds	
28	Degussa DESONOX Process	Pilot level or limited use				No	Exceeds	
29	B&W SOx/NOx/ROx/Box (SNRB) Process	Pilot level or limited use				No	Exceeds	
30	Parsons Flue Gas	Pilot level or				No	Exceeds	

Screening Criteria used in 1997 Review								
		Technically Feasible	Increase other Emissions	Safety?	Reduce Product Marketability	Cost Competitive compared to LNB?	Mets or Exceeds CDM Emission Level	Comments
	Cleanup Process	limited use						
31	Lehigh University Low-Temperature SCR Process	Pilot level or limited use				No	Exceeds	
32	IGR/Hellpump Solid-State Electrochemical Cell	Pilot level or limited use				No	Exceeds	
33	Argonne High-Temperature Spray Drying Studies	Pilot level or limited use				No	Exceeds	
34	PETC Mixed Alkali Spray Dryer Studies	Pilot level or limited use				No	Exceeds	
35	Battelle ZnO Spray Dryer Process	Pilot level or limited use				No	Exceeds	
36	Cooper Process	Pilot level or limited use				No	Exceeds	
37	ISCA Process	Pilot level or limited use				No	Exceeds	

Controls Evaluated in Detail as part of 1997 RACT Evaluation

Emission Reduction Technology	1997 Anticipated NO_x Emission Rate (lb/MMBtu)
Boiler Tuning	0.40 to 0.44
Fuel and Air Tip Replacement	0.40 to 0.44
LNB & Close Coupled Overfire Air (CCOFA)	0.38 to 0.42
LNB & Separated Overfire Air (SOFA)	0.30 to 0.34
Selective Noncatalytic Reduction (SNCR)	0.29 to 0.33
LNB with CCOFA plus SOFA	0.26 to 0.30
Hybrid (SNCR plus air heater SCR)	0.24 to 0.28
Gas Reburning	0.20 to 0.25
Selective Catalytic Reduction (SCR)	0.10 to 0.15

Appendix C -- References

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16. CH2MHill, **BART Analysis for Jim Bridger Unit 1** {also Units 2 – 4}, January 2007

17. Black & Veatch, **Portland General Electric Boardman Plant Best Available Retrofit Technology (BART) Analysis**, November, 2007

18. Northern States Power Co. d/b/a Xcel Energy – **Sherburne County Generating Plant Units 1 and 2 Best Available Retrofit Technology Analysis**, October, 2006

19. Pinnacle West, **Arizona Public Services, Four Corners Power Plant**, BART Analysis Conclusions, January, 2008

Appendix D Modeling Results

Modeling Result Information

Table D-1 is copied from the June 2008 BART Modeling Report, Table D-2 is from the Dec. 2008 Flex Fuels Addendum, and Table D-3 is from the January 2008 report.

Tabled D-1, D-2, and D-3 show the % contribution to visibility impairment on the days listed, the specific day and the modeled visibility on those days. The days shown are the 98th %tile for each year and the 3 years modeled. Since the same metrological information is used for each different emission scenario, the only thing that changes is the emission rate and percentage of total visibility attributable to each chemical species.

Table D-1 June 2008 report

BART Determination Analysis Results, Extinction Budgets for Design Days TransAlta Baseline Case									
		98th Percentile Paired By Class I Area		Contribution by Species (%)					
Area of Interest	Year	Delta HI (dv)	Date	SO4	NO3	OC	EC	PMC	PMF
Alpine Lakes Wilderness	2003	3.599	5/22/2003	31.8	67.1	0.3	0.2	0.2	0.4
	2004	4.871	7/18/2004	52.9	46.2	0.3	0.1	0.1	0.3
	2005	3.856	5/4/2005	29.1	70.2	0.2	0.1	0.1	0.3
	2003-2005	4.346	9/28/2005	30.3	68.8	0.3	0.1	0.2	0.4
Glacier Peak Wilderness	2003	2.070	8/15/2003	39.1	60.0	0.3	0.2	0.1	0.4
	2004	3.615	12/24/2004	48.0	51.4	0.2	0.1	0.1	0.3
	2005	2.554	5/4/2005	37.1	62.3	0.2	0.1	0.1	0.2
	2003-2005	2.622	6/10/2003	42.5	56.8	0.2	0.1	0.1	0.3
Goat Rocks Wilderness	2003	4.207	8/7/2003	44.4	55.0	0.2	0.1	0.1	0.2
	2004	4.993	6/11/2004	42.6	55.8	0.5	0.3	0.3	0.6
	2005	3.826	12/3/2005	34.9	64.5	0.2	0.1	0.1	0.3
	2003-2005	4.286	6/25/2005	34.4	64.6	0.3	0.2	0.2	0.4
Mt. Adams Wilderness	2003	3.667	7/5/2003	33.6	65.2	0.4	0.2	0.2	0.5
	2004	3.628	7/3/2004	42.0	57.0	0.3	0.2	0.2	0.4
	2005	3.379	9/2/2005	26.7	71.5	0.5	0.3	0.4	0.6
	2003-2005	3.628	7/3/2004	42.0	57.0	0.3	0.2	0.2	0.4
Mt. Hood Wilderness	2003	2.773	10/4/2003	37.6	61.8	0.2	0.1	0.1	0.3
	2004	3.471	9/25/2004	43.9	55.2	0.3	0.1	0.1	0.4
	2005	2.159	6/29/2005	40.3	58.7	0.3	0.2	0.1	0.4
	2003-2005	2.830	9/23/2004	26.2	72.9	0.3	0.1	0.2	0.4
Mt. Jefferson Wilderness	2003	1.570	10/14/2003	37.0	62.5	0.1	0.1	0.0	0.2
	2004	2.079	8/18/2004	30.6	68.4	0.3	0.2	0.1	0.4
	2005	1.182	4/25/2005	31.5	68.0	0.2	0.1	0.1	0.2
	2003-2005	1.888	7/5/2004	32.7	66.3	0.3	0.2	0.2	0.4
Mt. Rainier National Park	2003	5.552	2/26/2003	23.6	75.9	0.2	0.1	0.1	0.2
	2004	5.447	9/21/2004	17.9	80.5	0.5	0.2	0.3	0.6
	2005	5.373	4/28/2005	26.4	72.7	0.2	0.1	0.2	0.3
	2003-2005	5.489	7/4/2005	35.0	64.1	0.3	0.1	0.2	0.4
Mt. Washington Wilderness	2003	1.374	10/14/2003	36.6	63.0	0.1	0.1	0.0	0.2
	2004	2.027	6/22/2004	43.3	56.0	0.2	0.1	0.1	0.3
	2005	0.945	8/15/2005	57.2	42.0	0.3	0.1	0.1	0.4
	2003-2005	1.414	6/23/2004	51.9	47.5	0.2	0.1	0.1	0.2
N. Cascades National Park	2003	1.557	3/30/2003	22.2	76.6	0.4	0.2	0.2	0.5
	2004	2.821	12/24/2004	47.4	52.0	0.2	0.1	0.1	0.2
	2005	1.811	5/14/2005	45.5	53.6	0.3	0.1	0.1	0.4
	2003-2005	2.212	6/5/2004	40.3	59.1	0.2	0.1	0.1	0.3
Olympic National Park	2003	3.848	12/22/2003	24.4	73.3	0.6	0.3	0.6	0.8
	2004	4.645	10/4/2004	39.3	60.2	0.2	0.1	0.1	0.2
	2005	3.629	11/20/2005	22.4	77.1	0.2	0.1	0.1	0.2
	2003-2005	4.024	3/8/2004	44.0	55.3	0.2	0.1	0.2	0.3
Pasayten Wilderness	2003	1.131	5/24/2003	48.9	50.5	0.2	0.1	0.1	0.2
	2004	1.954	12/24/2004	43.6	55.9	0.1	0.1	0.1	0.2
	2005	1.172	7/5/2005	45.0	54.1	0.3	0.1	0.1	0.4
	2003-2005	1.482	6/25/2004	56.7	42.7	0.2	0.1	0.1	0.3
Three Sisters Wilderness	2003	1.538	5/12/2003	45.7	53.9	0.1	0.1	0.1	0.2
	2004	2.172	7/27/2004	55.3	44.0	0.2	0.1	0.1	0.3
	2005	1.071	9/28/2005	53.8	45.6	0.2	0.1	0.1	0.3
	2003-2005	1.538	5/12/2003	45.7	53.9	0.1	0.1	0.1	0.2
CRGNSA	2003	2.431	9/25/2003	29.8	68.8	0.4	0.2	0.2	0.6
	2004	2.545	5/15/2004	39.2	60.1	0.2	0.1	0.1	0.3
	2005	1.714	12/13/2005	17.4	81.8	0.2	0.1	0.2	0.3
	2003-2005	2.353	1/13/2005	29.8	69.5	0.2	0.1	0.2	0.3
Overall	Min	0.945		17.4	42.0	0.1	0.1	0.0	0.2
	Mean	2.892		38.1	61.1	0.2	0.1	0.1	0.3
	Max	5.552		57.2	81.8	0.6	0.3	0.6	0.8

Table D-2 December 2008 Flex Fuels Addendum

BART Determination Analysis Results, Extinction Budgets for Design Days TransAlta Flex Fuels									
		98th Percentile Paired By Class I Area		Contribution by Species (%)					
Area of Interest	Year	Delta HI (dv)	Date	SO4	NO3	OC	EC	PMC	PMF
Alpine Lakes Wilderness	2003	3.176	5/22/2003	36.8	61.9	0.4	0.2	0.3	0.5
	2004	4.469	7/18/2004	58.9	40.2	0.3	0.2	0.1	0.4
	2005	3.349	5/4/2005	34.4	64.8	0.2	0.1	0.1	0.3
	2003-2005	3.918	2/27/2004	56.7	42.9	0.1	0.1	0.1	0.1
Glacier Peak Wilderness	2003	1.823	11/1/2003	34.5	64.8	0.2	0.1	0.1	0.3
	2004	3.282	12/24/2004	53.8	45.5	0.2	0.1	0.1	0.3
	2005	2.233	5/4/2005	43.1	56.3	0.2	0.1	0.1	0.3
	2003-2005	2.348	7/18/2004	63.4	35.9	0.2	0.1	0.1	0.3
Goat Rocks Wilderness	2003	3.673	8/23/2003	29.4	69.1	0.4	0.2	0.3	0.6
	2004	4.538	9/21/2004	22.5	75.8	0.5	0.3	0.3	0.7
	2005	3.398	12/3/2005	40.1	59.1	0.2	0.1	0.2	0.3
	2003-2005	3.802	6/25/2005	39.7	59.0	0.4	0.2	0.2	0.5
Mt. Adams Wilderness	2003	3.236	7/5/2003	38.9	59.7	0.4	0.2	0.3	0.6
	2004	3.259	7/3/2004	47.6	51.2	0.3	0.2	0.2	0.4
	2005	2.988	5/30/2005	41.5	56.8	0.5	0.3	0.2	0.7
	2003-2005	3.236	7/5/2003	38.9	59.7	0.4	0.2	0.3	0.6
Mt. Hood Wilderness	2003	2.450	10/4/2003	43.3	56.0	0.2	0.1	0.1	0.3
	2004	3.119	9/25/2004	49.8	49.3	0.3	0.2	0.1	0.4
	2005	1.916	6/29/2005	45.9	52.9	0.4	0.2	0.1	0.5
	2003-2005	2.457	9/5/2004	37.6	61.5	0.3	0.2	0.1	0.4
Mt. Jefferson Wilderness	2003	1.376	10/14/2003	42.7	56.8	0.2	0.1	0.0	0.2
	2004	1.832	7/29/2004	45.6	53.4	0.3	0.2	0.1	0.4
	2005	1.014	9/27/2005	36.3	62.9	0.3	0.2	0.1	0.4
	2003-2005	1.643	7/5/2004	38.0	60.8	0.3	0.2	0.2	0.5
Mt. Rainier National Park	2003	4.865	4/17/2003	30.6	67.8	0.4	0.2	0.4	0.6
	2004	4.878	7/13/2004	48.9	50.1	0.3	0.2	0.1	0.4
	2005	4.757	6/3/2005	39.2	58.8	0.6	0.3	0.4	0.8
	2003-2005	4.854	2/28/2003	46.8	51.8	0.4	0.2	0.3	0.5
Mt. Washington Wilderness	2003	1.201	10/14/2003	42.3	57.2	0.2	0.1	0.0	0.2
	2004	1.799	6/22/2004	49.3	49.9	0.3	0.1	0.1	0.4
	2005	0.861	8/15/2005	63.0	36.0	0.3	0.2	0.1	0.4
	2003-2005	1.275	6/23/2004	58.1	41.4	0.2	0.1	0.1	0.3
N. Cascades National Park	2003	1.330	6/14/2003	45.9	53.4	0.2	0.1	0.1	0.3
	2004	2.548	12/24/2004	53.2	46.2	0.2	0.1	0.1	0.3
	2005	1.620	5/14/2005	51.4	47.6	0.3	0.2	0.2	0.4
	2003-2005	1.940	4/13/2004	41.7	57.7	0.2	0.1	0.1	0.2
Olympic National Park	2003	3.433	12/19/2003	24.5	72.2	0.9	0.5	0.8	1.2
	2004	4.130	7/30/2004	56.7	42.3	0.3	0.2	0.2	0.4
	2005	3.124	11/20/2005	26.7	72.6	0.2	0.1	0.1	0.2
	2003-2005	3.546	2/26/2005	39.9	59.2	0.3	0.2	0.1	0.4
Pasayten Wilderness	2003	0.981	6/12/2003	40.9	58.2	0.3	0.2	0.1	0.4
	2004	1.737	9/24/2004	55.0	44.4	0.2	0.1	0.1	0.2
	2005	1.038	7/5/2005	51.2	47.8	0.3	0.2	0.1	0.4
	2003-2005	1.353	10/9/2005	47.1	52.5	0.1	0.1	0.1	0.2
Three Sisters Wilderness	2003	1.361	5/12/2003	52.1	47.5	0.1	0.1	0.1	0.2
	2004	1.956	6/22/2004	50.2	49.0	0.2	0.1	0.1	0.3
	2005	0.921	7/25/2005	33.8	65.1	0.3	0.2	0.2	0.5
	2003-2005	1.361	5/12/2003	52.1	47.5	0.1	0.1	0.1	0.2
CRGNSA	2003	2.111	9/25/2003	34.9	63.4	0.5	0.3	0.3	0.7
	2004	2.250	5/15/2004	45.0	54.2	0.3	0.1	0.2	0.3
	2005	1.439	12/13/2005	21.0	78.0	0.3	0.1	0.2	0.4
	2003-2005	2.008	4/1/2004	22.4	75.9	0.5	0.3	0.4	0.6
Overall	Min	0.861		21.0	35.9	0.1	0.1	0.0	0.1
	Mean	2.562		43.1	55.8	0.3	0.2	0.2	0.4
	Max	4.878		63.4	78.0	0.9	0.5	0.8	1.2

Table D-3 January 2008 Report

BART Determination Analysis Results, Extinction Budgets for Design Days TransAlta SNCR Case									
		98th Percentile Paired By Class I Area		Contribution by Species (%)					
Area of Interest	Year	Delta HI (dv)	Date	SO4	NO3	OC	EC	PMC	PMF
Alpine Lakes Wilderness	2003	3.094	5/22/2003	38.0	60.7	0.4	0.2	0.3	0.5
	2004	4.393	7/18/2004	60.2	38.8	0.3	0.2	0.2	0.4
	2005	3.251	5/4/2005	35.6	63.6	0.3	0.1	0.1	0.3
	2003-2005	3.844	2/27/2004	58.0	41.6	0.1	0.1	0.1	0.1
Glacier Peak Wilderness	2003	1.773	8/15/2003	46.4	52.6	0.3	0.2	0.1	0.5
	2004	3.209	4/12/2004	41.5	57.7	0.2	0.1	0.1	0.3
	2005	2.172	5/4/2005	44.4	54.9	0.2	0.1	0.1	0.3
	2003-2005	2.294	7/9/2005	43.1	55.8	0.3	0.2	0.2	0.4
Goat Rocks Wilderness	2003	3.564	8/23/2003	30.5	68.0	0.4	0.2	0.4	0.6
	2004	4.398	9/21/2004	23.4	74.8	0.5	0.3	0.4	0.7
	2005	3.314	12/3/2005	41.3	57.9	0.2	0.1	0.2	0.3
	2003-2005	3.708	6/25/2005	41.0	57.8	0.4	0.2	0.2	0.5
Mt. Adams Wilderness	2003	3.152	7/5/2003	40.1	58.4	0.4	0.2	0.3	0.6
	2004	3.188	7/3/2004	48.9	49.9	0.3	0.2	0.2	0.4
	2005	2.914	7/1/2005	31.5	66.5	0.6	0.3	0.4	0.8
	2003-2005	3.152	7/5/2003	40.1	58.4	0.4	0.2	0.3	0.6
Mt. Hood Wilderness	2003	2.388	10/4/2003	44.5	54.7	0.2	0.1	0.1	0.3
	2004	3.051	9/25/2004	51.1	47.9	0.3	0.2	0.1	0.4
	2005	1.870	6/29/2005	47.3	51.6	0.4	0.2	0.1	0.5
	2003-2005	2.388	9/5/2004	38.8	60.2	0.3	0.2	0.1	0.4
Mt. Jefferson Wilderness	2003	1.338	10/14/2003	44.0	55.5	0.2	0.1	0.0	0.2
	2004	1.784	7/29/2004	46.9	52.1	0.3	0.2	0.1	0.4
	2005	0.982	9/27/2005	37.5	61.6	0.3	0.2	0.1	0.4
	2003-2005	1.596	7/5/2004	39.2	59.6	0.4	0.2	0.2	0.5
Mt. Rainier National Park	2003	4.754	2/28/2003	48.1	50.5	0.4	0.2	0.3	0.5
	2004	4.774	7/13/2004	50.3	48.7	0.3	0.2	0.1	0.4
	2005	4.613	12/12/2005	21.8	77.4	0.2	0.1	0.2	0.3
	2003-2005	4.743	8/16/2003	64.4	33.3	0.6	0.3	0.5	0.8
Mt. Washington Wilderness	2003	1.168	10/14/2003	43.6	55.9	0.2	0.1	0.1	0.2
	2004	1.756	6/22/2004	50.6	48.5	0.3	0.1	0.1	0.4
	2005	0.845	8/15/2005	64.3	34.8	0.3	0.2	0.1	0.4
	2003-2005	1.248	6/23/2004	59.4	40.0	0.2	0.1	0.1	0.3
N. Cascades National Park	2003	1.296	6/14/2003	47.2	52.1	0.2	0.1	0.1	0.3
	2004	2.496	12/24/2004	54.5	44.9	0.2	0.1	0.1	0.3
	2005	1.583	5/14/2005	52.7	46.3	0.3	0.2	0.2	0.4
	2003-2005	1.887	4/13/2004	43.0	56.4	0.2	0.1	0.1	0.2
Olympic National Park	2003	3.328	12/19/2003	25.4	71.1	0.9	0.5	0.9	1.2
	2004	4.040	10/4/2004	46.7	52.6	0.2	0.1	0.1	0.2
	2005	3.031	6/6/2005	46.8	52.2	0.3	0.1	0.2	0.4
	2003-2005	3.456	2/26/2005	41.1	57.9	0.3	0.2	0.1	0.4
Pasayten Wilderness	2003	0.953	6/12/2003	42.1	56.9	0.3	0.2	0.1	0.4
	2004	1.701	9/24/2004	56.3	43.1	0.2	0.1	0.1	0.2
	2005	1.012	7/5/2005	52.6	46.4	0.3	0.2	0.2	0.4
	2003-2005	1.318	10/9/2005	48.5	51.1	0.1	0.1	0.1	0.2
Three Sisters Wilderness	2003	1.328	5/12/2003	53.5	46.1	0.1	0.1	0.1	0.2
	2004	1.910	6/22/2004	51.6	47.7	0.2	0.1	0.1	0.3
	2005	0.891	7/25/2005	35.0	63.9	0.4	0.2	0.2	0.5
	2003-2005	1.328	5/12/2003	53.5	46.1	0.1	0.1	0.1	0.2
CRGNSA	2003	2.049	9/25/2003	36.1	62.2	0.5	0.3	0.3	0.7
	2004	2.193	5/15/2004	46.3	52.8	0.3	0.1	0.2	0.3
	2005	1.386	12/13/2005	21.9	77.1	0.3	0.1	0.2	0.4
	2003-2005	1.942	9/5/2004	40.1	58.9	0.3	0.2	0.2	0.4
Overall	Min	0.845		21.8	33.3	0.1	0.1	0.0	0.1
	Mean	2.497		44.4	54.5	0.3	0.2	0.2	0.4
	Max	4.774		64.4	77.4	0.9	0.5	0.9	1.2

Figures D-1 through D-5 graphically depict the seasonality of visibility impacts from the TransAlta facility. 5 different Class I areas are depicted in order to indicate how the seasonality of impacts changes somewhat based on season of the year.

Figure D-1

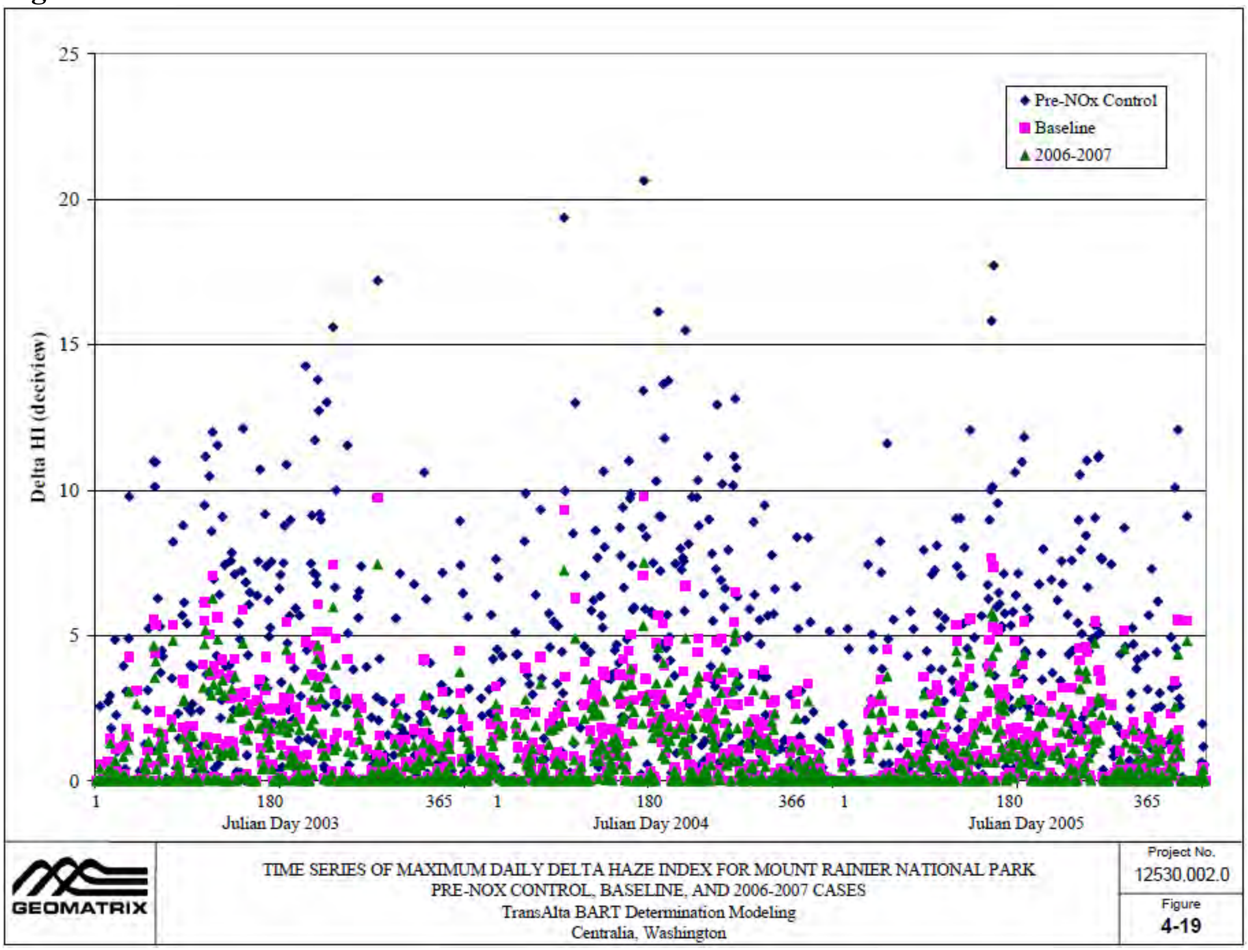
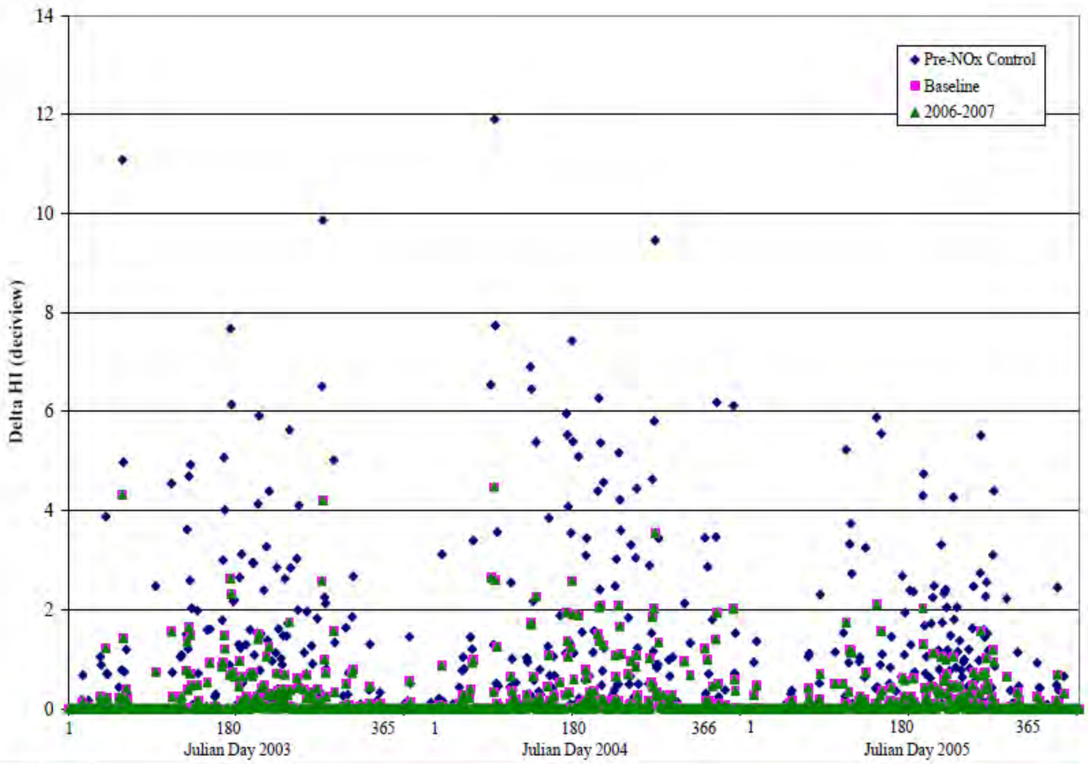


Figure D-2



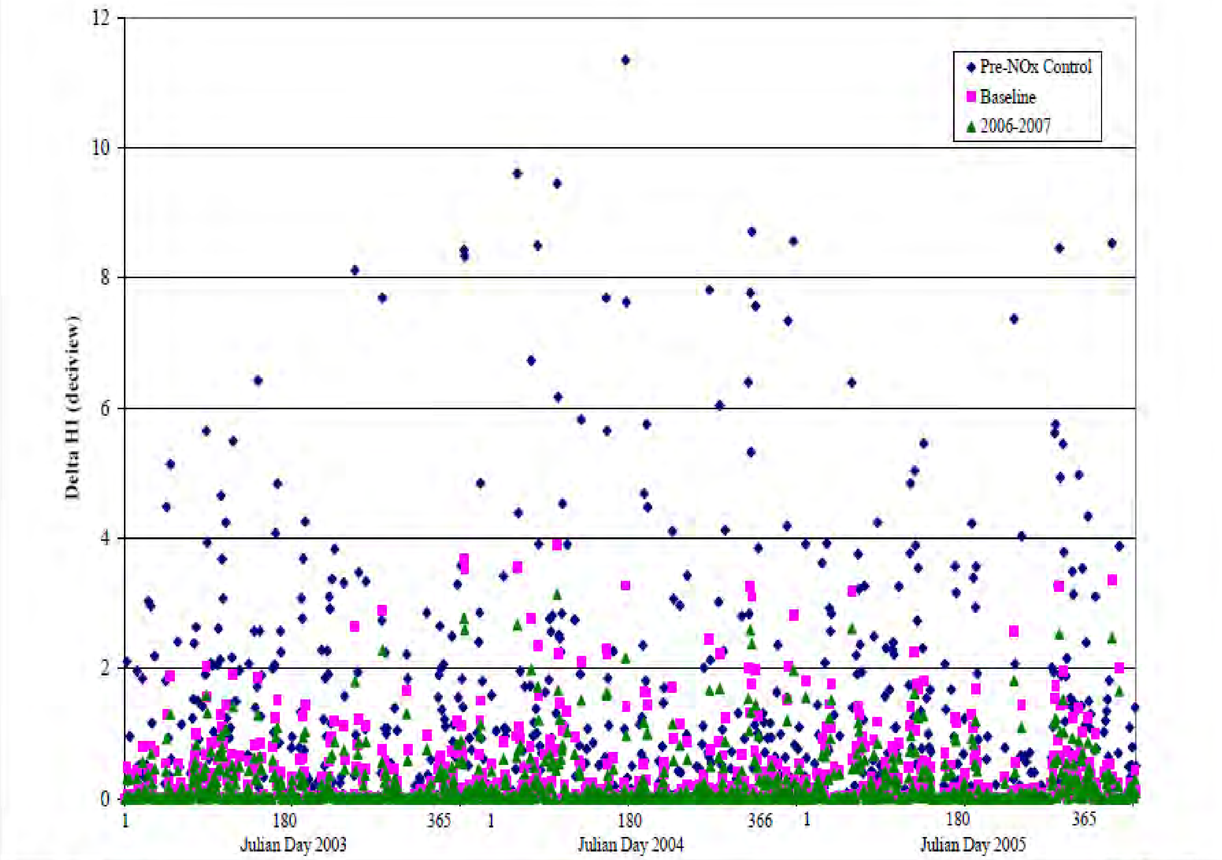
GEOMATRIX

TIME SERIES OF MAXIMUM DAILY DELTA HAZE INDEX FOR MOUNT JEFFERSON WILDERNESS
PRE-NOX CONTROL, BASELINE, AND 2006-2007 CASES
TransAlta BART Determination Modeling
Centralia, Washington

Project No. 12530.002.0

Figure 4-16

Figure D-4



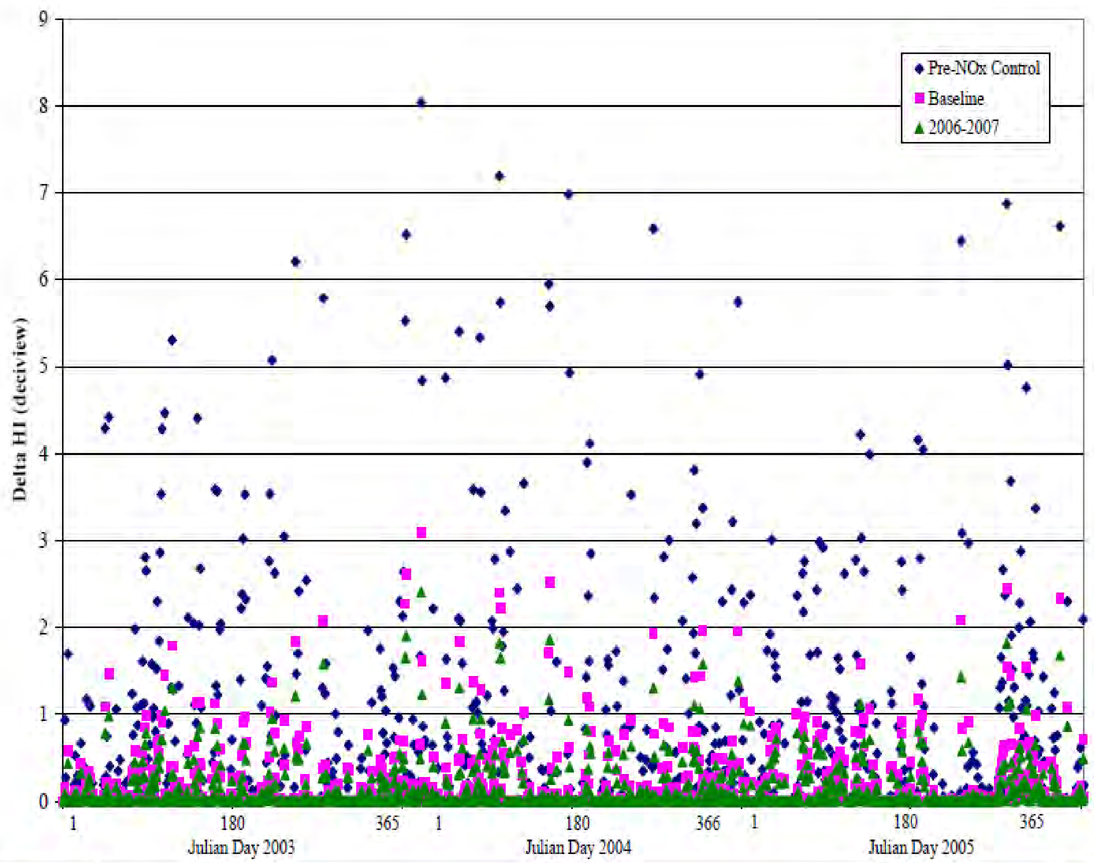
GEOMATRIX

TIME SERIES OF MAXIMUM DAILY DELTA HAZE INDEX FOR NORTH CASCADES NATIONAL PARK
PRE-NOX CONTROL, BASELINE, AND 2006-2007 CASES
TransAlta BART Determination Modeling
Centralia, Washington

Project No. 12530.002.0

Figure 4-25

Figure D-5



GEOMATRIX

TIME SERIES OF MAXIMUM DAILY DELTA HAZE INDEX FOR PASAYTEN WILDERNESS
PRE-NOX CONTROL, BASELINE, AND 2006-2007 CASES
TransAlta BART Determination Modeling
Centralia, Washington

Project No. 12530.002.0

Figure 4-31

Appendix E Coal Fired Electric Generating Unit BART Determinations in Western US

Table of Coal Fired Electric Generating Unit BART Determinations in Western US

All information presented is contained in Regional Haze State Implementation Plans available for public review or that have been submitted to EPA for approval, as of January 2010.

Table E-1

State	Unit	NOx Technology	lb/MMBtu, 30 day avg	Comments
EPA Region 8, Montana	Colstrip			No final Decisions publicly available
EPA Region 9, Navajo Reservation	Navajo			No final Decision publicly available
	Four Corners			No final Decision publicly available
Arkansas	Entergy Arkansas, Inc. White Bluff, Units 1 and 2		0.28 on bituminous coal 0.15 on sub-bituminous coal	Controls not given. Limits in State Regulation 19.1505
	SWEPCO Flint Creek Power Plant Unit 1		0.23	Controls not given. Limits in State Regulation 19.1506
California	No Coal fired Units subject to BART			
Colorado	Martin Drake Units 5 - 7	Install overfire air systems	0.39	Also limited to 0.35 lb/MMBtu, annual Average
	CENC (Trigen) Unit 4	Limited by rule to combustion controls, LNC3	115 lb/hr	
	CENC (Trigen) Unit 5	Limited by rule to combustion controls, LNC3	182 lb/hr	
	Craig Unit 1	Limited by rule to combustion controls, LNC3	0.39	Also limited to 0.30 lb/MMBtu, annual Average
	Craig Unit 2	Limited by rule to combustion controls, LNC3	0.39	Also limited to 0.30 lb/MMBtu, annual Average
	Public Service of Colorado, Comanche Units 1 and 2	Low NOx Burners	0.2	Also limited to 0.15 lb/MMBtu annual average both units combined
	Public Service of Colorado, Cherokee Unit 4	Modify existing Low NOx burner and over fire air or install new burners	0.28	

State	Unit	NOx Technology	lb/MMBtu, 30 day avg	Comments
	Public Service of Colorado, Hayden Unit 1	Modify existing Low NOx burner and over fire air or install new burners	0.39	
	Public Service of Colorado, Hayden Unit 2	Modify existing Low NOx burner and over fire air or install new burners	0.28	
	Public Service of Colorado, Pawnee Unit 1	Modify existing Low NOx burner and over fire air or install new burners	0.23	
	Public Service of Colorado, Valemont Unit 5	Modify existing Low NOx burner and over fire air or install new burners	0.28	
Idaho	No coal fired units			
Kansas	La Cynge Generating Station, Unit 1 and 2	SCR on Unit 1, Controls as needed on Unit 2	0.13, both units averaged together	
	Jeffrey Energy Center, Units 1 and 2	Low NOx Burners	0.15	
Minnesota	MN Power, Taconite Harbor Boiler No. 3	ROFA/Rotamix (Mobotec)	0.13	
	MN Power, Boswell Boiler No. 3	LNB + OFA, SCR	0.07	
	Rochester Public Utilities, Silver Lake, Unit #3 boiler	No additional controls	No Limit	
	Rochester Public Utilities, Silver Lake, Unit #4 boiler	ROFA/Rotamix (existing controls)	0.25	
	Xcel Energy, Sherco, Boiler 1	LNB +SOFA+Combustion Optimization	0.15	
	Xcel Energy, Sherco, Boiler 2	Combustion optimization	0.15	
	Xcel Energy, Allen S. King Boiler 1	SCR (existing controls)	0.1	
	Northshore Mining, Silver Bay, Boiler 1	LNB + OFA	0.41	
	Northshore Mining, Silver Bay, Boiler 2	LNB + OFA	0.4	
Iowa	Used CAIR for BART			
Louisiana	Used CAIR for BART			

State	Unit	NOx Technology	lb/MMBtu, 30 day avg	Comments
Nebraska	Gerald Gentleman, Units 1 and 2	Existing LNC3 on Unit 2 New LNC3 on Unit 1	0.23, both units averaged together	
	Nebraska City Station, Unit 1	LNC3	0.23	
Nevada	No Coal Fired BART units			
New Mexico	San Juan Generating Station	No final Decision publicly available		
North Dakota	Olds Unit 1	SNCR plus overfire air	0.19	
(All Lignite units)	Olds Unit 2	SNCR plus overfire air	0.35	
	Coal Creek Units 1and 2	Additional overfire air plus LNB	0.19	
	Stanton Unit 1	LNC3 plus SNCR for a 1/3 reduction	0.29	a 1/3 reduction
	Milton Young Station Unit 1	Advanced overfire air plus SNCR for a 58% reduction	0.36	
	Milton Young Station Unit 2	Advanced overfire air plus SNCR for a 58% reduction	0.35	
Oregon	Boardman	LNC3	0.28	Note SNCR to be installed by July 2014 @ 0.23 lb/MMBtu and SCR @ 0.07 lb/MMBtu required later. Neither is required as BART
Oklahoma	OG&E Muskogee Generating Station Units 4 and 5		0.15	
	OG&E Sooner Generating Station Units 1 and 2		0.15	
	AEP/PSO Northeastern Power Station Units 3 and 4		0.15	
Texas	No Coal Fired BART units Subject to BART			
Utah	Hunter Power Plant, Units 1 and 2	LNC3	0.26	Replacing LNC1 burners and add 2 levels of overfire air under minor NSR program.
	Huntington Power Plants, Units 1 and 2	LNC3	0.26	Replacing LNC1 burners and add 2 levels of overfire air under minor NSR program.

State	Unit	NOx Technology	lb/MMBtu, 30 day avg	Comments
Wyoming	Naughton Unit 1	LNC3	0.26	Wyoming Long term strategy for this unit requires SCR @ 0.07 lb/MMBtu by 2018.
	Naughton Unit 2	LNC3	0.26	
	Naughton Unit 3	LNC3 plus SCR	0.07	
	Jim Bridger Units 1 - 4	LNC3	0.26	
	Dave Johnston Unit 3	LNC3	0.26	
	Dave Johnston Unit 4	LNC3	0.15	
	Wyodak Unit 1	LNC3	0.23	
	Basin Electric Units 1 - 3	LNC3	0.23	

Appendix F TransAlta Centralia Power Plant Site Plan and Profile

These 4 drawings are large, and intended to be reproduces at 11 X 17 or larger scale for readability. The drawings are available from Ecology and are located on the Ecology website.

Drawing 1 is an overall site plan of the power plant including the plant office, wet scrubbers storm water lagoons, maintenance buildings, etc. It does not include the coal pile area.
Drawing 2 is a site plan of the boiler building, ESPs, and wet scrubber area of the plant.
Drawing 3 is an elevation drawing looking from the south at the overall steam turbine/boiler building, ESPs and old stacks.
Drawing 4 is an elevation drawing showing subset elevation indicated in Drawing 3 showing the plant boiler outlet area, and the ESPS.

Appendix G Centralia BART Control Technology Analysis, Response to Questions

RICHARD L. GRIFFITH, LLC
ATTORNEY

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March 12, 2010

VIA EMAIL AND FEDERAL EXPRESS

Alan R. Newman, PE
Washington Department of Ecology
PO Box 47600
Olympia, WA 98504-7600

Re: Partial Response to Department of Ecology's Request for Additional Information Related to Centralia Power Plant Emissions

Dear Mr. Newman:

On behalf of TransAlta Centralia Generation LLC ("TransAlta"), I have enclosed responses to Questions 1 and 3 of your letter to Mr. Richard DeBolt, dated January 5, 2010, related to the proposed BART determination. The responses were prepared by CH2M Hill, which prepared the Centralia Plant's BART Analysis (July 2008). As clarified in our recent phone conversation, the response to Question 1 consists of larger copies of the SCR drawings from the July 2008 BART Analysis showing dimensions and distances.

We will forward responses to the other questions as soon as they are completed. Please contact me if you have questions regarding this information.

Sincerely,

Richard L. Griffith

Richard L. Griffith

cc: Richard DeBolt, TransAlta

CH2MHILL

CH2M HILL
9193 South Jamaica Street
Englewood, CO 80112-5946
Tel 303.771.0900
Fax 720.286.9250

March 11, 2010

Mr. Richard L. Griffith, LLC
1580 Lincoln Street, Suite 700
Denver, CO 80203

Subject: Centralia BART Control Technology Analysis
Partial Response to Department of Ecology Questions

Dear Mr. Griffith:

Regarding the questions presented by the Washington Department of Ecology for the Centralia BART analysis, this letter provides responses to Questions 1 and 3. Also attached are five sets of the dimensioned general arrangement sketches requested in Question 1.

CH2M HILL continues to work on responses to remaining Ecology questions, and will forward responses when they are completed. Please contact us if you have any questions.

Sincerely,

CH2M HILL

Robert L Pearson

Robert Pearson, Ph.D.
Vice President

Attachments:

CENTRALIA BART
RESPONSES TO ECOLOGY QUESTIONS

Question 1:

To help answer questions about the 'lack of space' to install SCR, please provide scale drawings of the plant site and specific process areas, including plan and profile drawings of the boilers, the ductwork to and between the Koppers and Lodge-Cottrell ESPs, the duct work to the set scrubbers and the wet scrubbers and the new stack. The drawings need to indicate dimensions and distances, not the general arrangement of components. The drawings can cover multiple pages, must contain readable dimensions, and can be in a CAD interchange format file or equivalently detailed PDF format file instead of paper.

Response:

A. The following drawings are attached in response to the question from the Washington Department of Ecology:

> Plan and elevation general arrangement drawings from the Centralia BART report revised June 2008 depicting SCR equipment layouts, have been revised and presented to include dimensions. CH2M HILL developed sketches with proportional probable dimensions, and 11" by 17" sketches are included as an attachment.

B. As described within the BART report, the Centralia site conditions have the potential of significantly impacting the cost estimates for all emissions control options. In general, any site condition which restricts construction activities will likely increase overall project costs. These site conditions may include space restrictions inhibiting material and equipment installation, access limitations which limit the free movement and placement of construction equipment, interferences which may require pre-construction demolition or design change considerations, operational constraints which may impact construction approach and schedule, and construction staging issues such as laydown area and employee parking availability.

   Specifically for the Centralia plant, many of these site conditions are projected to significantly contribute to increased project costs for any construction activities. In large part due to previous environmental retrofit installations at Centralia, the available space for new equipment installation at the Centralia plant site is very limited. This limitation resulted in the consideration of locating a potential SCR installation over existing electrostatic precipitators, instead of being located closer to the boiler in order to minimize cost. Restricted site area may also impact costs for longer duct work runs and remotely located ancillary equipment.

Question 3:

Ecology has requested details of the SCR cost analysis produced by CH2M-Hill, specifically the analysis contained in the July, 2008 analysis. Specific issues with the cost analysis:

- *Explanation of all cost elements in the CH2M [sic] cost estimating spreadsheet, including discussion of differences on specific cost elements from the EPA Control Cost Manual defaults, especially the cost items not explicitly included in the EPA Control Cost Manual.*

  The summary table below compares the specific cost elements of the CH2M HILL SCR capital cost estimate with the default values from the EPA Air Pollution Control Cost Manual. Table A is intended as a response to the Ecology request.

  The cost estimating equations in Section 4.2, Chapter 2 "Selective Catalytic Reduction" of the EPA Air Pollution Control Cost Manual are based on equations developed by The Cadmus Group, Bechtel Power and SAIC in 1998 and follow the costing methodology of EPRI. CH2M HILL used alternative estimating methodologies which have extensively been utilized to develop budgetary cost estimates for utility power and air pollution control projects.

  The EPA Cost Manual methodology is generally applicable for new or existing sources, and allows inclusion of unique site-specific retrofit or lost generation costs. It should be noted that at a "study" level estimate of +/- 30% accuracy, the Manual states that "a retrofit factor of as much as 50 percent can be justified". Therefore, it is difficult to make a direct comparison of all of the cost elements, since the two methodologies breakdown costs differently.

  Because the EPA Cost Manual contains default values which are provided for a range of general applications, CH2M HILL considers the estimating methodology utilized for the Centralia BART analysis to be more accurate since specific site information and conditions were considered. In addition, current vendor cost information was utilized in developing the estimates.

TABLE A
Economic Analysis Summary for Both Units 1 and 2
CPP

Parameter	SCR		
NO_x Emission Control System	SCR		
SO_2 Emission Control System	Forced Oxidation Limestone Scrubber		
PM Emission Control System	Dual ESPs		
CAPITAL COST COMPONENT	**Cost**	**CH2M HILL Basis**	**EPA Control Cost Manual Basis**
Major Materials Design and Supply ($)	277,685,000	CH2M HILL factored estimate	EPA control cost manual
Eng, Startup, & Indirect ($)	57,500,000	CH2M HILL factored estimate	20% of total direct capital costs
Total Indirect Installation Costs (TIIC)	**335,185,000**		
Contingency ($)	50,277,750	15% of total indirect installation costs	15% of total indirect installation costs
Sales Tax ($)	26,814,800	8% of total indirect installation costs	Included in total direct capital costs
Plant Cost (PC)	**412,277,550**		
Margin ($)	41,227,755	10% of plant cost	No margin
Total Plant Cost (TPC)	**453,505,305**		**Includes 2% of total plant cost, AFUDC and cost to store 29 wt% aqueous ammonia for 14 days**
Owner's Costs ($)	45,350,531	10% of total plant cost	No owners costs
Allows for funds during construction (AFUDC) ($)	54,420,637	12% of total plant cost	No AFUCD
Lost Generation ($)	27,014,400	Calculated at $20/MW-hr and 42 days	
TOTAL INSTALLED CAPITAL COST ($)	**580,290,872**		
FIRST YEAR O&M COST ($)			
Operating Labor ($)	351,250	CH2M HILL estimate	Assumed none required for SCR
Maintenance Material ($)	702,500	CH2M HILL estimate	Combined with maintenance labor, 1.5 % of total capital cost
Maintenance Labor ($)	351,250	CH2M HILL estimate	
Administrative Labor ($)	0		
TOTAL FIXED O&M COST	**1,405,000**		
Reagent Cost	1,783,475	Anhydrous ammonia at $0.20/lb	Anhydrous ammonia at $0.058/lb
SCR Catalyst	2,107,500	Catalyst cost estimated at $3000/m^3	Catalyst cost at $85/ft^3
Electric Power Cost	2,403,603	Power cost estimated at $50/MW-hr	Power cost at $0.05/kW-hr, 1795 kW
TOTAL VARIABLE O&M COST	**6,294,577**		
TOTAL FIRST YEAR O&M COST	**7,699,577**		
FIRST YEAR DEBT SERVICE ($)	63,712,819	Calculated using 7% annual interest rate for 15 years	Calculated using 7% annual interest rate for 15 years
TOTAL FIRST YEAR COST ($)	**71,412,396**		
Power Consumption (MW)	7.03		
Annual Power Usage (kW-Hr/Yr)	48.1		
CONTROL COST ($/Ton Removed)			
NO_x Removal Rate (%)	72.0%		
NO_x Removed (Tons/Yr)	7,855		
First Year Average Control Cost ($/Ton NO_x Rem.)	9,091		

- *Basis of 16% multiplier in the calculations*

  We assume that Ecology is referring to the 15% Project Contingency in the SCR cost estimate. When developing a cost estimate, there is always an element of uncertainty since costs are based upon several assumptions and variables. Contingency provides an amount added to an estimate, which covers project uncertainties and added costs which experience dictates will likely occur. The magnitude of the contingency used in the CH2M HILL cost estimate is typical of contingency utilized in similar budgetary estimates, and matches the default 15% Project Contingency shown in Table 2.5 "Capital Cost Factors for an SCR Application" on page 2-44 of Section 4.2, Chapter 2 of the EPA Air Pollution Control Cost Manual, Sixth Edition.

- *Sources of 'vender quotes' referenced in the CH2M HILL documents*

  The cost estimates were developed as "budgetary estimates", therefore CH2M HILL did not use vendor quotes for the SCR cost estimate. A factored approach was utilized for the determining the SCR capital cost which utilized in-house cost information, and consists of compilation of vendor and previous project information.

- *Whether any structural analyses were done in support of SCR cost analysis and the results of the analyses*

  Detailed structural analyses were not performed for the SCR cost analysis. However, a cursory review of structural requirements was completed to locate the SCR reactor and ductwork. CH2M HILL assumed a separate structure for the SCR reactor and ductwork because the existing ESP structure was not designed for these additional loads.

Appendix H Additional Centralia Power Plant BART Modeling Simulations - Comparison of Flex Fuel and Flex Fuel plus SNCR

CH2MHILL

CH2M HILL
9193 South Jamaica Street
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Tel 303.771.0900
Fax 720.286.9250

March 31, 2010

Mr. Richard L. Griffith
1580 Lincoln Street, Suite 700
Denver, CO 80203

Subject: Centralia BART Control Technology Analysis
Second Response to Department of Ecology Questions

Dear Mr. Griffith:

This letter provides responses to Washington Department of Ecology's (Ecology) Questions 4 and 5, regarding the Centralia BART analysis. Also included is additional cost estimating background information for SCR and SNCR, in response to Ecology's request.

A response to Ecology Question 2, which was prepared by TransAlta, is also included in this response. Therefore, CH2M HILL does not have knowledge of, or accept responsibility for, the information presented within the Question 2 response.

In response to the last bullet of Question 2, we are submitting on behalf of TransAlta confidential, proprietary documents that are enclosed in a separate envelope marked "Confidential Business Information." Pursuant to RCW 43.21A.160, TransAlta certifies that the Alstom Power Instruction Manual, TransAlta Centralia Generation LLC, Centralia Plant Unit 2, cover page and p. 1-3 (Rev. 1, 06/21/01) relate to processes of production unique to TransAlta or may affect adversely the competitive position of TransAlta if released to the public or to a competitor. Accordingly, TransAlta requests that those records be made available only to the Director and appropriate personnel of the Department of Ecology.

We believe this transmittal completes CH2M Hill's responses to Ecology questions.

Please contact us if you have any questions.

Sincerely,

CH2M HILL

Robert L Pearson

Robert Pearson, Ph.D
Vice President

Cc: Mr. Alan Newman, State of Washington Department of Ecology
Mr. Richard DeBolt, TransAlta USA
Mr. Gary MacPherson, TransAlta USA

Attachments:

CENTRALIA BART
RESPONSES TO ECOLOGY QUESTIONS

Question 2 (Response prepared by TransAlta):

A copy of all reports on combustion analyses performed on the installed LNC3 combustion control system. Include a copy of the original LNC3 burner system specifications and vendor/contractual guarantee for the system currently installed. The information supplied needs to assist Ecology in answering specific comments on the proposed BART determination related to the NO_x reduction effectiveness of the installed combustion control system.

Response: TransAlta is not aware of any reports on combustion analyses performed on the LNC3 system.

Specific questions needing to be evaluated include:

- All analyses and test programs to improve the effectiveness of the installed system to reduce thermal NO_x emissions since the equipment installed in the boilers. Reports could have been produced by TransAlta or by PacifiCorp prior to the ownership change.

  Response: TransAlta is not aware of such analyses or reports.

- Any specific analysis that addresses the ability or inability of the system to meet the EPA presumptive BART emission limitation must be included (whether performed by or for TransAlta or PacifiCorp).

  Response: TransAlta is not aware of any such analysis.

- Design intent of the original LNC3 installation and whether the installation of LNC3 met its design intent.

Response: For original design specifications, see attached Alstom Power Instruction Manual, TransAlta Centralia Generation LLC, Centralia Plant Unit 2, cover page and p. 1-3 (Rev. 1, 06/21/01) (These pages are enclosed in a separate envelope marked "Confidential Business Information." Pursuant to RCW 43.21A.160, TransAlta is requesting that these documents not be released to the public.) The same design specifications apply to Unit 1. The Instruction Manual, p. 1-3, estimates emissions from the "low NO_x concentric firing system level III" installed at the Centralia Plant to range from: (a) 0.33 lb/mmBTU NO_x for eastern bituminous coal with a nitrogen content of about 1.48 lb/mmBTU and an oxygen to nitrogen content ratio of 5, and (b) about 0.35 lb/mmBTU for western subbituminous coal with a nitrogen content of about 0.82 lb/mmBTU and an oxygen to nitrogen content ratio of 20.

- What are the physical differences and similarities between these specific boilers and other similar boilers that have been able to achieve the presumptive BART limit of 0.15 Ib/MMBtu through the use of LNC3 control?

Response: A major engineering study by an engineering firm would be required to answer this. Ecology agreed not to require such a study.

- What can be done to the configuration of overfire air ports or by replacing the low NO_x burners to reduce thermal NO_x formation?

Response: TransAlta considered these types of controls and boiler reconstruction but did not identify any that would achieve the presumptive BART levels or that would be more cost-effective than Flex Fuel or SNCR.

Follow-up Information to Question 3:

While an initial response to Question #3 was previously prepared and submitted, Ecology requested additional detail regarding vendor information. As previously noted, CH2M HILL utilized a factored approach in the development of SCR costs for the Centralia BART analysis. In addition, previous CH2M HILL and other BART analysis SCR costs were considered when completing the cost estimates. In response to Ecology's request, a compilation of SCR BART analysis information was prepared and presented in Attachment 1. Previous project information was considered in applying a factored approach to developing SCR costs.

In addition, an updated SCR Economic Analysis Summary was prepared which clarifies responses regarding the EPA Cost Manual Basis for Total Fixed O&M Costs. The revised summary is presented as Attachment 2.

The following information provides additional explanation regarding the CH2M HILL cost estimating approach for the Centralia BART analysis:

Centralia Capital Cost Estimating Approach

For the Centralia BART analysis, CH2M HILL cost estimates were developed for the SCR and SNCR NO_x control technology alternatives. As explained within the BART analysis, the level of accuracy of the cost estimate can be broadly classified as "Order of Magnitude", which can be categorized as a -20/+50 percent estimate.

The approach utilized for Centralia is consistent with previous BART analyses completed by CH2M HILL; where the level of accuracy of cost estimating matches the preliminary nature of the level of BART engineering and design. In depth design information for each emissions control technology was not completed for Centralia, due to time and resource limitations. In addition, the accuracy of BART study estimates is only intended to allow economic comparison of alternatives. In order to increase the level of accuracy of the estimate, a preliminary engineering design would have been needed that would require significantly greater site information, more engineering effort, firm vendor quotations, a thorough constructability review, and a definitive estimating approach.

CH2M HILL visited the Centralia site to examine boiler outlet ductwork configuration, space availability for new equipment, and construction requirements and potential limitations. A restricted site impacted the SCR cost estimate primarily due to the limited space to install an SCR catalyst reactor vessel. Since each unit has separate flue gas exhaust trains, the resultant design has one SCR system for each outlet exhaust duct from the economizer that would be located on top of the existing electrostatic precipitators. The congested site with limited access would also significantly influence construction costs and schedule. Therefore, as an overall assessment, the Centralia site was considered to be a difficult retrofit for an SCR installation with a resulting higher cost compared to other power plant units of similar size.

Background estimating information was assembled through re-evaluation of historical information, updated with current project equipment, material, and construction costs. Construction costs were estimated for the Centralia area, and were developed from preliminary engineering sketches.

In addition to consideration of the site specific information, a factored approach was utilized in developing the Centralia SCR and SNCR cost estimates. With this approach, common historical cost basis from previous projects are used to develop an estimate for the project under consideration. For example, a common cost comparison factor for an SCR installation between different project sites may be based on size of unit ($/Kilowatt) or flue gas flow rate ($/Actual Cubic Feet Minute). This factor from a baseline unit is then utilized to calculate the approximate cost for another unit.

For the Centralia BART analysis, a $/KW factor was primarily utilized in calculating the total project cost estimate. In estimating the SCR equipment and installation costs, a factor of approximately $200/KW was used. This factor was based on other project cost information, with allowance for specific Centralia site information retrofit considerations. Centralia was considered to be a very difficult SCR retrofit installation, and this was reflected in the ultimate cost estimate.

Estimates from previous CH2M HILL and other BART analysis were also considered when reviewing and verifying reasonableness of the total cost estimate. A compilation of previous SCR and SNCR BART information was prepared and presented in Attachment 1—"SCR BART Cost Estimate Information", and Attachment 3---"SNCR BART Cost Estimate Information". While this previous project cost information was considered in applying a factored approach in developing the SCR cost estimate, no specific project information was utilized. Information from Attachments 1 and 3 were primarily used as a comparative check for reasonableness of estimate. Two other BART analyses, Boardman Station and Nebraska City 1, were completed by B&V and HDR respectively with SCR $/KW costs comparable to Centralia. While the Centralia SCR cost estimate of 413 $/KW is the largest value on the list, CH2M HILL considers this reasonable given the retrofit difficulty. BART analysis cost estimates from Attachment 3 demonstrate that the Centralia SNCR estimate is consistent with other units.

CH2M HILL's approach to preparing the SCR and SNCR order of magnitude cost estimate for the Centralia BART analysis may be summarized as follows:

1) Determine preliminary background information regarding each technology
2) Establish site specific information, including any limitations or restrictions
3) Review comparable project information, both internal and external, to establish factors used for estimating
4) Complete an estimating reasonableness review utilizing similar SCR and SNCR estimates

While several sources of information were used as background information in developing the SCR and SNCR cost estimates, no single piece of information was exclusively utilized as the basis for the cost estimates.

Question 4:

Ecology has requested details of the SNCR cost analysis produced by CH2M HILL, specifically the analysis contained in the July, 2008 analysis. Specific issues with the cost analysis:

- *Explanation of all cost elements in the CH2M [sic] cost estimating spreadsheet, including discussion of differences on specific cost elements from the EPA Control Cost Manual defaults, especially the cost items not explicitly included in the EPA Control Cost Manual.*

  The summary table below (Table B, Attachment 4) compares the specific cost elements of the CH2M HILL SNCR capital cost estimate with the default values from the EPA Air Pollution Control Cost Manual. Table B is intended as a response to the Ecology request.

  The cost estimating equations in Section 4.2, Chapter 2 "Selective Catalytic Reduction" of the EPA Air Pollution Control Cost Manual are based on equations developed by The Cadmus Group, Bechtel Power and SAIC in 1998 and follow the costing methodology of EPRI. CH2M HILL used alternative estimating methodologies which have extensively been utilized to develop budgetary cost estimates for utility power and air pollution control projects.

  The EPA Cost Manual methodology is generally applicable for new or existing sources, and allows inclusion of unique site-specific retrofit or lost generation costs. It should be noted that at a "study" level estimate of +/- 30% accuracy, the Manual states that "a retrofit factor of as much as 50 percent can be justified". Therefore, it is difficult to make a direct comparison of all of the cost elements, since the two methodologies break down costs differently.

  Because the EPA Cost Manual contains default values which are provided for a range of general applications, CH2M HILL considers the estimating methodology utilized for the Centralia BART analysis to be more accurate since specific site information and conditions were considered. In addition, current vendor cost information was utilized in developing the estimates.

- *Basis of 16% multiplier in the calculations*

  We assume that Ecology is referring to the 15% Project Contingency in the SNCR cost estimate. When developing a cost estimate, there is always an element of uncertainty since costs are based upon several assumptions and variables. Contingency provides an amount added to an estimate, which covers project uncertainties and added costs which experience dictates will likely occur. The magnitude of the contingency used in the CH2M HILL cost estimate is typical of contingency utilized in similar budgetary estimates, and matches the default 15% Project Contingency shown in Table 1.4 "Capital Cost Factors for an SNCR Application" on page 1-32 of Section 4.2, Chapter 1 of the EPA Air Pollution Control Cost Manual, Sixth Edition.

- *Sources of 'vender quotes' referenced in the CH2M HILL documents*

  SNCR cost estimates were developed as "budgetary estimates", and preliminary vendor equipment cost and estimated NO_x reduction efficiencies were provided by Fuel Tech. CH2M HILL completed the economic analysis through a combination of utilizing a factored approach from in-house cost information, previous project information, and vendor information. A summary of previous CH2M HILL and other BART analysis SNCR costs is provided as Attachment 3. Previous project information was considered in using factored estimates in developing SNCR costs.

  For additional explanation regarding the SNCR cost estimate, please see the response to Question 3 above.

- *Whether any structural analyses were done in support of SNCR cost analysis and the results of the analyses*

  Detailed structural analyses were not performed in completing the SNCR cost analysis.

Question 5:

A number of questions specific to the SCR system have been posed which the information TransAlta has already submitted does not answer. These are:

- *Specific information about the design of the SCR system evaluated by CH2M [sic]which may include a discussion or drawings for adding SCR to the plant, including flow paths, placement of catalyst (vertical or horizontal placement), catalyst cleaning method, ducting to the Boilers and ESPs.*

Response:

The preliminary design of the SCR presented with the Centralia BART analysis assumed that the full flue gas flow would be extracted from the boiler temperature region conducive to good SCR performance (580 degrees F to 750 degrees F). This temperature region on a coal fired boiler is typically located after the boiler economizer and before the air heater. The SCR design proposed for the Centralia units was a full scale system, where the flue gas is routed to a separate SCR reactor vessel which has cross-sectional area greater than the ductwork. An expanded reactor vessel allows lower flue gas velocity through the catalyst, as opposed to an in-duct SCR where the catalyst is placed in the existing ductwork with resulting higher velocity.

The flue gas would be extracted the boiler ductwork at the appropriate temperature region, pass through the SCR system, and then would be returned to the boiler discharge ductwork at a point just downstream of the extraction point. If space allows, an in-duct configuration may also include an expanded ductwork reaction chamber in order to reduce flue gas velocity and increase residence time.

For the Centralia BART analysis it was assumed that the full scale SCR catalyst would be installed in a horizontal configuration, with the flue entering the catalyst from the top of the catalyst and exiting from the bottom. Ammonia would be introduced ahead of the catalyst. For purposes of the conceptual layout and budgetary estimate for BART analysis, no detailed design was completed regarding catalyst cleaning methodology.

- *A discussion of alternate locations to install an SCR system such as in the duct from the ESPs to the wet scrubber. This location would include and need an evaluation of gas stream reheat requirements and costs. Include an evaluation of how much catalyst could be placed inside the duct at its current dimensions and the NO_x reduction which could be accomplished without expanding the existing ducts.*

Response:

The flue gas from the Centralia ESPs to the wet scrubber is approximately 300 degrees F, which is well below the desired temperature range of 580 to 750 degrees F. Operating an SCR system outside of the optimum temperature window will significantly decrease NO_x reduction efficiency. After the ESPs, the particulate loading in the flue gas has been reduced which would lessen the potential for SCR catalyst erosion. Consistent with typical utility design, the current ESP to scrubber full load ductwork flue gas velocity is assumed to be approximately 60 ft/sec. As requested, this analysis was based on utilizing the current ductwork dimensions, which maintains existing ductwork flue gas velocity.

In order to allow the in-duct SCR system to within the optimum temperature window, increasing the flue gas temperature ahead of the SCR would be required. This could be achieved through the installation of a flue gas heating system such as a regenerative heat exchanger or duct burner arrangement. While implementing a flue gas reheat system is a technically feasible alternative, utilizing this approach in the duct work from the ESPs to the scrubber creates significant operating concerns for an SCR system in this location.

If the flue gas is reheated to approximately 700 degrees F, the calculated velocity in the existing ductwork would be increased from 60 ft/sec to approximately 90 ft/sec.

Typical catalyst flue gas velocity design values are generally in the range of 15 to 20 ft/sec, which is approximately one-fifth of the reheated flue gas velocity. From discussions with an SCR catalyst supplier, a 90 ft/sec velocity level would render the SCR essentially ineffective. The primary ramifications from higher SCR velocities are greater potential for catalyst erosion, less time available for chemical reactions to occur, and increased pressure drop across the SCR system. From a catalyst vendor response, this configuration was considered infeasible.

- *For the SCR option, evaluate the quantity of catalyst that can be installed in the ducts from the boiler to the ESP, and how much NO_x reduction could be accomplished with that quantity of catalyst. Also, a cost estimate for this installation location. This analysis was requested previously.*

Response:

While meeting many design criteria is necessary for good SCR operation, the following issues may be especially essential to an in-duct configuration:

- Flue gas residence time through the catalyst
- Good mixing of ammonia prior to entering SCR catalyst
- Ammonia slip, or un-reacted ammonia passing through the catalyst
- Catalyst erosion
- Maintain reasonable pressure drop

The SCR system evaluated within the BART report was located in an area between the boiler outlet and ESP inlet, in the optimal flue gas temperature region between the economizer outlet and the air heater. This system was assumed to consist of ductwork to and from an expanded SCR reactor vessel, where the flue gas velocity through the catalysts would operate at approximately 20 ft/sec.

The above question requests an evaluation for the "ducts from the boiler to the ESP", which consists of flue gas entering the air heater at approximately 700 degrees F and flue gas temperature exiting the air heater is approximately 300 degrees F. For this analysis it was assumed that the current ductwork dimensions would be maintained, and no expansion of the ductwork size was considered. Since a review of an SCR system located in the 300 degree F temperature region has been addressed in the responses to the previous question, only an in-duct SCR system utilizing the existing ductwork dimensions between the economizer outlet and the air heater inlet will be considered. The flue gas in this area would be within the optimum SCR temperature region, therefore no flue gas reheat would be required for this configuration.

The design criteria for an in-duct SCR unit were developed from information provided by TransAlta. The boiler flue gas from the economizer sections on each unit passes through two separate sections of ductwork, one for each of the two air heaters for each unit. The ductwork to the air heater appears to be tapered and expands toward the air heater, and mid-duct dimensions were estimated from general arrangement drawings to be 43 feet by 14 feet. There appears to be approximately 17 feet of ductwork length available to install catalyst.

Utilizing the tested flow rate from each unit and the estimated cross-sectional area of the ductwork, the flue gas velocity in this ductwork from the economizer to the air heater inlet was calculated to be approximately 50 to 60 ft/sec. This is approximately three times the desired SCR design target velocity. While in-duct SCR catalysts have been installed, most have been designed to operate in a "polishing" mode with upstream NO_x reduction occurring through an SNCR system. The use of this configuration allows the SCR catalyst to utilize any ammonia slip from the SNCR system. In order to achieve an overall high level of NO_x reduction, dual systems are required due to the lower anticipated NO_x reduction efficiency from a stand-alone SNCR or in-duct SCR installation.

Preliminary SCR design information, and a budgetary cost estimate, was requested and received from a catalyst vendor for the in-duct configuration described above. The catalyst vendor response confirmed that the in-duct configuration resulted in duct velocities about three times higher than recommended, which would cause significant erosion concerns. However, with this alternative one layer of catalyst was estimated to reduce NO_x emissions by approximately 5% with an additional 5 inches water gage pressure drop. Two catalyst layers were estimated to achieve about 12% NO_x reduction at an additional 10 inches water gage pressure drop. Therefore, with the anticipated low NO_x reduction potential, significant additional pressure drop, and potential for erosion, this in-duct SCR configuration is not considered a practical alternative for Centralia.

Attachments

ATTACHMENT 1
SCR BART Cost Estimate Information

Unit Name	Unit size (kW)	Total Installed Capital Cost/unit	$/kW	Source
Dave Johnston Unit 3	250000	67,000,000	268	CH2M HILL
Colstrip	307000	25,300,000	82	TRC
Wyodak	365000	99,000,000	271	CH2M HILL
Dave Johnston Unit 4	360000	99,900,000	278	CH2M HILL
Jim Bridger Unit 3	530000	120,900,000	228	CH2M HILL
Laramie River 1	550000	99,000,000	180	B&V
Boardman	584000	223,000,000	382	B&V
Nebraska City 1	650000	244,400,000	376	HDR
Navajo 1	750000	210,000,000	280	ENSR
CPP Unit 1 & 2	1405000	580,300,000	413	CH2M HILL

ATTACHMENT 2
Table A – SCR Economic Analysis Summary

CPP

Parameter	SCR		
NO_x Emission Control System	SCR		
SO2 Emission Control System	Forced Oxidation Limestone Scrubber		
PM Emission Control System	Dual ESPs		
CAPITAL COST COMPONENT	**Cost**	**CH2M Hill Basis**	**EPA Control Cost Manual Basis**
Major Materials Design and Supply ($)	277,685,000	CH2M HILL factored estimate	EPA control cost manual
Eng, Startup, & Indirect ($)	57,500,000	CH2M HILL factored estimate	20% of total direct capital costs
Total Indirect Installation Costs (TIIC)	**335,185,000**		
Contingency ($)	50,277,750	15% of total indirect installation costs	15% of total indirect installation costs
Sales Tax ($)	26,814,800	8% of total indirect installation costs	Included in total direct capital costs
Plant Cost (PC)	**412,277,550**		
Margin ($)	41,227,755	10% of plant cost	No margin
Total Plant Cost (TPC)	**453,505,305**		Includes 2% of total plant cost, AFUDC and cost to store 29 wt% aqueous ammonia for 14 days
Owner's Costs ($)	45,350,531	10% of total plant cost	No owners costs
Allows for funds during construction (AFUDC) ($)	54,420,637	12% of total plant cost	No AFUCD
Lost Generation ($)	27,014,400	Calculated at $20/MW-hr and 42 days	
TOTAL INSTALLED CAPITAL COST ($)	**580,290,872**		
FIRST YEAR O&M COST ($)			
Operating Labor ($)	351,250	CH2M HILL estimate	Assumed none required for SCR
Maintenance Material ($)	702,500	CH2M HILL estimate	Combined with maintenance labor, 1.5 % of total capital cost
Maintenance Labor ($)	351,250	CH2M HILL estimate	
Administrative Labor ($)	0		
TOTAL FIXED O&M COST	**1,405,000**		
Reagent Cost	1,783,475	Anhydrous ammonia at $0.20/lb	Anhydrous ammonia at $0.058/lb[2]
SCR Catalyst	2,107,500	Catalyst cost estimated at $3000/m^3$	Catalyst cost at $85/ft^3$ [1]
Electric Power Cost	2,403,603	Power cost estimated at $0.05/kW-hr, 7025 kW	Power cost at $0.05/kW-hr, 1795 kW
TOTAL VARIABLE O&M COST	**6,294,577**		
TOTAL FIRST YEAR O&M COST	**7,699,577**		
FIRST YEAR DEBT SERVICE ($)	63,712,819	Calculated using 7% annual interest rate for 15 years	
TOTAL FIRST YEAR COST ($)	**71,412,396**		
Power Consumption (MW)	**7.03**		
Annual Power Usage (kW-Hr/Yr)	**48.1**		
CONTROL COST ($/Ton Removed)			
NO_x Removal Rate (%)	**72.0%**		
NO_x Removed (Tons/Yr)	**7,855**		
First Year Average Control Cost ($/Ton NO_x Rem.)	**9,091**		

Notes:

1 - Catalyst cost used for EPA Cost Manual calculations based on current cost estimate of $3000/m^3$. Cost manual recommends using the current cost estimate for catalyst cost.

2 – Calculated based on pure anhydrous ammonia, and not a 29% solution as listed in the EPA Cost Manual.

ATTACHMENT 3
SNCR BART Cost Estimate Information

Unit Name	Unit size (kW)	Total Installed Capital Cost/unit	$/kW	Source
Navajo 1	750,000	10,000,000	13	ENSR
Coal Strip	307,000	6,076,000	20	TRC
CPP - One Unit	702,000	16,600,000	24	CH2M HILL
RG1, 2, 3	100,000	2,497,500	25	CH2M HILL
Jim Bridger Unit 3	530,000	13,273,632	25	CH2M HILL
Jim Bridger 1, 2, 4	530,000	13,427,239	25	CH2M HILL
Dave Johnston Unit 4	360,000	10,105,779	28	CH2M HILL
Boardman	584,000	17,400,000	30	B&V
Wyodak	335,000	10,195,654	30	CH2M HILL
Laramie River 1	550,000	17,777,778	32	B&V
Tracy 3	113,000	3,661,875	32	CH2M HILL
Dave Johnston Unit 3	250,000	8,135,543	33	CH2M HILL
FC 1, 2, 3	113,000	3,760,313	33	CH2M HILL
Cholla 4	425,000	14,706,000	35	CH2M HILL
Cholla 2, 3	300,000	11,610,000	39	CH2M HILL
Apache 2, 3	195,000	7,781,130	40	CH2M HILL
Tracy 2	83,000	3,661,875	44	CH2M HILL
Naughton Unit 3	356,000	15,788,530	44	CH2M HILL
Apache 1	85,000	4,250,000	50	CH2M HILL
Naughton Unit 2	226,000	12,378,764	55	CH2M HILL
Naughton Unit 1	173,000	10,226,855	59	CH2M HILL
Tracy 1	55,000	3,661,875	67	CH2M HILL

ATTACHMENT 4
Table B – SNCR Economic Analysis Summary

CPP

Parameter	SNCR		
NO_x Emission Control System	SNCR		
SO2 Emission Control System	Forced Oxidation Limestone Scrubber		
PM Emission Control System	Dual ESPs		
CAPITAL COST COMPONENT		**CH2M Hill Basis**	**EPA Control Cost Manual Basis**
Major Materials Design and Supply ($)	14,711,977	Based on quote from Fuel Tech	EPA control cost manual
Eng, Startup, & Indirect ($)	5,400,000	Based on quote from Fuel Tech	20% of total direct capital costs
Total Indirect Installation Costs (TIIC)	**20,111,977**		
Contingency ($)	3,016,797	15% of total indirect installation costs	15% of total indirect installation costs
Sales Tax ($)	1,608,958	8% of total indirect installation costs	Included in total direct capital costs
Plant Cost (PC)	**24,737,732**		
Margin ($)	2,473,773	10% of plant cost	No margin
Total Plant Cost (TPC)	**27,211,505**		Includes 2% of total plant cost, AFUDC and cost to store urea for 14 days
Owner's Costs ($)	2,721,150	10% of total plant cost	No owners costs
Allows for funds during construction (AFUDC) ($)	3,265,381	12% of total plant cost	No AFUCD
Lost Generation ($)			
TOTAL INSTALLED CAPITAL COST ($)	**33,198,036**		
FIRST YEAR O&M COST ($)			
Operating Labor ($)	281,000	CH2M HILL estimate	Assumed none required for SNCR
Maintenance Material ($)	562,000	CH2M HILL estimate	Combined with maintenance labor, 1.5 % of total capital cost
Maintenance Labor ($)	281,000	CH2M HILL estimate	
Administrative Labor ($)			
TOTAL FIXED O&M COST	**1,124,000**		
Reagent Cost	909,012	Urea at $0.185/lb	Urea at $0.85/gal
SCR Catalyst			
Electric Power Cost	480,721	Power cost estimated at $0.05/kW-hr, 1405 kW	Power cost at $0.05/kW-hr, 158 kW
TOTAL VARIABLE O&M COST	**1,389,733**		
TOTAL FIRST YEAR O&M COST	**2,513,733**		
FIRST YEAR DEBT SERVICE ($)	3,644,966	Calculated using 7% annual interest rate for 15 years	
TOTAL FIRST YEAR COST ($)	**6,158,699**		
Power Consumption (MW)	**1.41**		
Annual Power Usage (kW-Hr/Yr)	**9.6**		
CONTROL COST ($/Ton Removed)			
NO_x Removal Rate (%)	**25.0%**		
NO_x Removed (Tons/Yr)	**2,727**		
First Year Average Control Cost ($/Ton NO_x Rem.)	**2,258**		

From: Ken Richmond [krichmond@Environcorp.com]
Sent: Friday, March 26, 2010 2:00 PM
To: Newman, Alan (ECY); Bowman, Clint (ECY)
Cc: RickLGrif@aol.com; Gary_MacPherson@TransAlta.com; Lori_Schmitt@transalta.com; richard_debolt@transalta.com
Subject: Additional Centralia Power Plant BART simulations
Attachments: flex-vs-flexwsncr.pdf

Al & Clint

I've attached the results from the additional BART simulations that you requested for the Centralia Power Plant. The results supplement the earlier BART simulations with 2 new cases.

Revised Flex Fuels: (PM10 242 lb/hr, NOx 3936 lb/hr & SO2 1854 lb/hr) The Flex Fuels SO2 emissions are based on the ratio of sulfur content of Jacobs Ranch (PRB) coal to Centralia Mine coal (41%) times the 2003-2005 maximum 24-hr baseline rate of 4522 lb/hr.

Flex Fuels with SNCR: (PM10 242 lb/hr, NOx 2952 lb/hr & SO2 1854 lb/hr) NOx emissions are reduced by 25% to 0.18 lb/MMBtu from the Flex Fuel factor of 0.24 lb/MMBtu.

In all respects the simulations were performed in the same manner as the original BART analysis. The results are summarized in the attached Tables that augment the tables from the original BART modeling analysis. How many copies of the modeling files do you want? As before the modeling files will contain spreadsheets with the extinction budgets for the top 8 days each year and top 22 days in three years for each Class I area of interest.

Regards,

Ken Richmond
Sr. Air Quality Scientist
ENVIRON International Corp.
19020 33rd Avenue W, Suite 310
Lynnwood, WA 98036
Phone: 425.412.1800
Direct: 425.412.1809
Fax: 425.672.1840

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VISIBILITY MODELING FOR CENTRALIA POWER PLANT

COMPARISON OF FLEX FUEL AND FLEX FUEL WITH SNCR

March 2010

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TABLE 1

BASELINE (2003-2005) 24-HOUR MAXIMUM EMISSION RATES

Year	NOx (lb/hr)		SO_2 (lb/hr)		PM_{10} (lb/hr)	
	Unit 1	Unit 2	Unit 1	Unit 2	Unit 1	Unit 2
2003	2,474	2,293	1,898	1,783	91	57
2004	2,440	2,510	2,062	2,460	91	90
2005	2,415	2,496	740	1,135	98	144
Max Rate Used	2,474	2,510	2,062	2,460	98	144
Date of Max	02/28/03	06/17/04	10/13/04	10/13/04	12/16/05	7/12/05
MMBtu/hr on Max day	8,201	8,198	7,516	7,295	8,175	8,461
lb/MMBtu on Max Day	0.302	0.306	0.274	0.337	0.012	0.017

TABLE 2

BART NOX EMISSION RATES

Case	Emission Factor (lb/MMBtu)	Heat Demand (MMBtu/hr)	Unit 1 NOx (lb/hr)	Unit 2 NOx (lb/hr)
Flex Fuels	0.240	8,200	1,968	1,968
Flex Fuels w SNCR [1]	0.180	8,200	1,476	1,476

1. NOx emission rate for "Flex Fuels w SNCR" case is based on 75% of Flex Fuels case.

TABLE 3

BART EMISSION RATES BY CASE, TOTAL FOR BOTH UNITS

Case	NOx (lb/hr)	SO_2 (lb/hr)	PM_{10} (lb/hr)
Base line [1]	4,984	4,522	242
Flex Fuels [2]	3,936	1,854	242
Flex Fuels w SNCR [2]	2,952	1,854	242

1. Maximum actual 24-hour emissions during 2003-2005.
2. Flex Fuel SO_2 emissions based on the ratio of sulfur in Jacobs Ranch coal to Centralia Mine coal (41%) times the 2003-2005 maximum 24-hour rate of 4,522 lb/hr. NOx emissions reduced by 25% for SNCR.

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TABLE 4
STACK PARAMETERS

Case	Stack Location xlcc (km) [1]	Stack Location ylcc (km) [1]	Base Elevation (m) [2]	Stack Height (m)	Diameter (m)	Velocity (m/s)	Temperature (K)
All	-136.702	-239.551	108.6	143.3	12.82 [3]	15.0 [4]	332.3 [4]

1 Lambert Conic Conformal (LCC) coordinates with reference Latitude 49 North and reference Longitude 121 West.

2 Source elevation based on bilinear interpolation of the 4-km mesh size terrain used by CALMET

3 The units were simulated as a release from a single stack. The two stacks are next to one another and the flows were combined using an equivalent diameter calculated from the combined area of the two stacks

4 Velocity and temperature are based on the average measured data from 2003-2005

TABLE 5
PM10 SPECIATION

Case	$(NH_4)_2SO_4$	NH_4NO_3	OC	PMC	PMF	EC
Baseline [1]	22.68%	0.00%	5.67%	39.81%	30.67%	1.18%
Flex Fuels [1]	22.68%	0.00%	5.67%	39.81%	30.67%	1.18%
Flex Fuels w SNCR [1]	22.68%	0.00%	5.67%	39.81%	30.67%	1.18%

1. NPS PM_{10} profile for Dry Bottom Boiler burning pulverized coal with FGD and ESP assuming a sulfur content of 0.92%, an ash content of 14.9%, and a heat content of 7,961 Btu/lb

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TABLE 6

CALPUFF EMISSION RATES, TOTAL FOR BOTH UNITS

	Maximum 24-hour Emission Rates (lb/hr)								
Case	SO_2	SO_4	NOx	HNO_3	NO_3	OC[1]	PMC	PMF	EC
Baseline	4,522.0	40.0	4,984.0	0.0	0.0	13.7	96.4	74.3	2.9
Flex Fuels	1,854.0	40.0	3,936.0	0.0	0.0	13.7	96.4	74.3	2.9
Flex Fuels w SNCR	1,854.0	40.0	2,952.0	0.0	0.0	13.7	96.4	74.3	2.9

1. OC emissions were actually labeled secondary organic aerosols (SOA) in the CALPUFF input files to facilitate post-processing with CALPOST. This assumes all OC emitted forms SOA with the same molecular weight.

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TABLE 7

NUMBER OF DAYS WITH PREDICTED CHANGE TO THE HAZE INDEX GREATER THAN 0.5 DECIVIEWS

		Number of Days in 2003-2005 with Delta HI > 0.5 dv		
Area of Interest	**Period**	**Baseline**	**Flex Fuels**	**Flex Fuels w SNCR**
Alpine Lakes Wilderness	2003-2005	432	361	323
Glacier Peak Wilderness	2003-2005	275	202	168
Goat Rocks Wilderness	2003-2005	414	354	318
Mt. Adams Wilderness	2003-2005	329	271	241
Mt. Hood Wilderness	2003-2005	224	176	147
Mt. Jefferson Wilderness	2003-2005	130	89	77
Mt. Rainier National Park	2003-2005	505	462	428
Mt. Washington Wilderness	2003-2005	101	63	45
N. Cascades National Park	2003-2005	206	137	103
Olympic National Park	2003-2005	254	216	199
Pasayten Wilderness	2003-2005	141	82	55
Three Sisters Wilderness	2003-2005	105	68	51
CRGNSA	2003-2005	245	173	140
Overall	Min	101	63	45
	Mean	259	204	177
	Max	505	462	428

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TABLE 8

PREDICTED CHANGE TO THE 98TH PERCENTILE DAILY HAZE INDEX FOR 2003-2005

		98th Percentile Daily Delta HI (dv) [1]		
Area of Interest	**Period**	**Baseline**	**Flex Fuels**	**Flex Fuels w SNCR**
Alpine Lakes Wilderness	2003-2005	4.346	2.994	2.598
Glacier Peak Wilderness	2003-2005	2.622	1.905	1.532
Goat Rocks Wilderness	2003-2005	4.286	3.180	2.637
Mt. Adams Wilderness	2003-2005	3.628	2.591	2.147
Mt. Hood Wilderness	2003-2005	2.830	1.997	1.665
Mt. Jefferson Wilderness	2003-2005	1.888	1.267	1.053
Mt. Rainier National Park	2003-2005	5.489	4.225	3.501
Mt. Washington Wilderness	2003-2005	1.414	0.872	0.737
N. Cascades National Park	2003-2005	2.212	1.486	1.228
Olympic National Park	2003-2005	4.024	2.991	2.486
Pasayten Wilderness	2003-2005	1.482	0.999	0.822
Three Sisters Wilderness	2003-2005	1.538	0.993	0.819
CRGNSA	2003-2005	2.353	1.657	1.378
Overall	Min	1.414	0.872	0.737
	Mean	2.932	2.089	1.739
	Max	5.489	4.225	3.501

1. Based on the 22nd highest on a Class I area basis

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TABLE 9

YEARLY PREDICTED CHANGE TO THE 98TH PERCENTILE DAILY HAZE INDEX

		98th Percentile Delta HI (dv) [1]		
Area of Interest	**Year**	**Baseline**	**Flex Fuels**	**Flex Fuels w SNCR**
Alpine Lakes Wilderness	2003	3.599	2.490	2.092
	2004	4.871	3.564	2.949
	2005	3.856	2.841	2.306
Glacier Peak Wilderness	2003	2.070	1.399	1.153
	2004	3.615	2.403	2.049
	2005	2.554	1.857	1.525
Goat Rocks Wilderness	2003	4.207	3.002	2.440
	2004	4.993	3.676	3.069
	2005	3.826	2.815	2.308
Mt. Adams Wilderness	2003	3.667	2.646	2.194
	2004	3.628	2.591	2.128
	2005	3.379	2.543	2.096
Mt. Hood Wilderness	2003	2.773	1.939	1.586
	2004	3.471	2.346	1.978
	2005	2.159	1.470	1.225
Mt. Jefferson Wilderness	2003	1.570	1.059	0.867
	2004	2.079	1.399	1.150
	2005	1.182	0.813	0.656
Mt. Rainier National Park	2003	5.552	4.318	3.606
	2004	5.447	4.252	3.573
	2005	5.373	4.092	3.401

1. Based on the 8th highest on a Class I area basis

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TABLE 9 (Continued)

YEARLY PREDICTED CHANGE TO THE 98TH PERCENTILE DAILY HAZE INDEX

		98th Percentile Delta HI (dv) [1]		
Area of Interest	**Year**	**Baseline**	**Flex Fuels**	**Flex Fuels w SNCR**
Mt. Washington Wilderness	2003	1.374	0.925	0.755
	2004	2.027	1.323	1.106
	2005	0.945	0.594	0.485
N. Cascades National Park	2003	1.557	1.172	0.935
	2004	2.821	1.852	1.570
	2005	1.811	1.373	1.084
Olympic National Park	2003	3.848	2.824	2.432
	2004	4.645	3.192	2.695
	2005	3.629	2.734	2.214
Pasayten Wilderness	2003	1.131	0.767	0.618
	2004	1.954	1.287	1.075
	2005	1.172	0.771	0.622
Three Sisters Wilderness	2003	1.538	0.993	0.807
	2004	2.172	1.333	1.139
	2005	1.071	0.651	0.553
CRGNSA	2003	2.431	1.699	1.411
	2004	2.545	1.748	1.446
	2005	1.714	1.259	1.013
Overall	Min	0.945	0.594	0.485
	Mean	2.878	2.052	1.700
	Max	5.552	4.318	3.606

1. Based on the 8th highest on a Class I area basis

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600 • Olympia, WA 98504-7600 • 360-407-6000
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

June 18, 2010

Mr. Lou Florence,
TransAlta Centralia Generation LLC
913 Big Hanaford Road
Centralia, WA 9853

Dear Mr. Florence:

Regional Haze Best Available Retrofit Technology (BART) Determination
Order No. 6426

Best Available Retrofit Technology (BART) is required to reduce the regional haze impacts of emissions of your facility. The enclosed order #6426 contains our BART determination for your facility including a schedule for compliance.

If you have questions or requests relating to this order, please contact Alan Newman at (360) 407-6810 or by mail at the address above.

Sincerely,

Jeff Johnston, Ph.D.
Science and Engineering Section Manager
Air Quality Program

jj/lb

Enclosure

cc: Clint Lamoreaux, SWCAA
Alan Newman, Ecology
Richard DeBolt, TransAlta

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

IN THE MATTER OF AN ADMINISTRATIVE ORDER AGAINST: TransAlta Centralia Generation LLC	ORDER NO. 6426

TO: Mr. Lou Florence,
TransAlta Centralia Generation LLC
913 Big Hanaford Road
Centralia, WA 98531

This is an Administrative Order requiring your company to comply with WAC 173-400-151 by taking the actions that are described below. Chapter 70.94 RCW authorizes the Washington State Department of Ecology's Air Quality Program (Ecology) to issue Administrative Orders to require compliance with the requirements of Chapter 70.94 RCW and regulations issued to implement it.

Ecology has determined that portions of your facility are subject to the provisions of the state visibility protection program (WAC 173-400-151), which is implemented consistent with the requirements of the federal visibility protection program (40 CFR Part 51, Subpart P). The rules require that the State determine what technologies and level of emission control constitute Best Available Retrofit Technology (BART) for the eligible emission units at your facility. The rules also require the installation and use of those emission controls on the BART-eligible emission units. The emission controls are to be installed as expeditiously as possible, but in no event may the State allow them to start operation later than five years after the State's Regional Haze SIP amendment is approved by the United States Environmental Protection Agency (EPA).

FINDINGS

A. The TransAlta Centralia Generation LLC ("TransAlta") Centralia Power Plant is a coal fired power plant larger than 750 MW output subject to BART.

B. BART emission limitations for sulfur dioxide and particulate were determined by the Environmental Protection Agency in 2003. The Centralia Power Plant's Operating Permit incorporates the BART emission limitations determined by EPA.

C. BART for nitrogen oxides at the Centralia Power Plant is based on:

   a. Use of low NO_x burners with separated and close coupled over fire air systems (aka LNC3).

   b. Use of a sub-bituminous Powder River Basin coal or other coal that will achieve similar emission rates.

c. Use and installation of additional boiler heat recovery equipment and boiler tube cleaning equipment to maximize the extraction of fuel energy into boiler steam.

Additional information and analysis is available in the BART Determination Support Document for the Centralia Power Plant, by the Washington State Department of Ecology, November 2008, and the BART Analysis for the Centralia Power Plant, June 2008 and the BART Analysis Supplement, December 2008.

YOU ARE ORDERED: To install and operate in accordance with the following conditions:

BART Emission Limitations

1. Nitrogen Dioxide Emissions

1.1. Starting no later than the date in Condition 2, emissions of nitrogen dioxide from the two coal-fired utility steam generating units at the Centralia Power Plant are limited to a maximum of:

1.1.1. 0.24 lb/MMBtu, 30 day rolling average, both units averaged together for days (i.e., midnight to midnight) when either unit's generating load is 360 MW gross or greater.

1.1.2. In the event that during a given 30 day period, only one unit operated, the average of both units will be the 30 day average emission rate for the operating boiler.

1.2. Compliance will be determined by use of a continuous emission monitoring system.

1.3. Coal used shall be a sub-bituminous coal from the Powder River Basin or other coal that will achieve similar emission rates.

Schedule for Compliance

2. Compliance with the 30-day rolling average nitrogen dioxide emission limitation begins on the date of issuance of this Order, based on emissions for the prior 30 day period.

3. Determination of compliance with the rolling annual average nitrogen and sulfur coal content limitation will commence at midnight on the 365th day after issuance of this Order, based on coal nitrogen and sulfur content testing during the prior year.

Monitoring and Recordkeeping Requirements

4. Nitrogen Dioxide

4.1. Nitrogen dioxide emissions are to be quantified by means of a continuous emission monitoring system, consisting of a continuous nitrogen dioxide monitor, and a continuous flow rate monitor.

4.2. The continuous monitoring system shall comply with Condition M9 of the Centralia Power Plant's Air Operating Permit, SW98-8- R3 (issued September 16, 2009) ("Air Operating Permit") and corresponding monitoring conditions in future renewals of the Air Operating Permit.

5. Missing data requirements for nitrogen dioxide emission monitoring required by this order

5.1. For a unit with less than 12 continuous hours of missing CEM data, the substituted hourly emission rate will be the higher of (a) the average of emissions during the hour before and the hour after the period of missing data or (b) the average of emissions from the previous 720 operating hours of quality-assured data.

5.2. For a unit with 12 or more continuous hours of missing CEM data, the substituted hourly emission rate will be based on the 90th percentile of the previous 720 operating hours of quality-assured data.

5.3. Those 30 day periods which include substitute data for calculating 30 day averages shall be indicated in the emissions information reported in Condition 7.

6. Coal Quality Monitoring

6.1. Coal nitrogen and sulfur content shall be determined by taking a sampling coal conveyed by the transfer belt between the coal pile and coal silos. An alternate location that provides a sample representative of the coal fired by the boilers may be proposed to Ecology by TransAlta for approval for use.

6.2. A sample of coal for nitrogen and sulfur content analysis will be taken at least once per week when at least one coal fired boiler is in operation. The sample shall be taken following ASTM Method D2234/D2234M-07.

6.3. Coal nitrogen and sulfur content will be determined using ASTM Method D3176-89 (as reapproved in 2002). Note, other ASTM methods related to sample collection and preparation may need to be followed in order to perform this test.

6.4. As an alternate to coal nitrogen and sulfur content testing at the plant, certified results of testing by the coal mine operator of coal actually sent to the Centralia Power Plant may be used. Testing frequency should be no less frequent than required above.

Reporting Requirements

7. Malfunction of the emission control system must, at a minimum, be documented in writing and submitted to SWCAA and Ecology with the emissions monitoring data per Condition 7. Additional recordkeeping and notifications related to excess emissions may also be required by SWCAA regulation.

8. Continuous emission monitoring data shall be submitted to Ecology and to the SWCAA in accordance with condition R3 of the Centralia Plant's Air Operating Permit; SW98-8- R3 (issued September 16, 2009). In addition to the information required in condition R3, the report will include the 30 day rolling average lb. NOx/MMBtu and tons of NOx emitted during the current calendar year. The submittal shall be sent electronically in a format acceptable to the SWCAA. Reporting to Ecology under this condition will end if the Order has been rescinded as provided in Condition 10, below.

9. Coal nitrogen and sulfur content information shall be submitted to Ecology and to the SWCAA in accordance with schedule in condition R3 of the Centralia Plant's Air Operating Permit; SW98-8-R3 (issued September 16, 2009).

   9.1. Coal nitrogen and sulfur reporting during the first year (Oct. 30, 2009 through Oct. 30, 2010) shall include the date each coal sample is taken, the nitrogen and sulfur content of each coal sample analyzed, the running average content and the maximum and minimum concentrations found.

   9.2. After the first year, the report shall include the rolling annual averages for nitrogen and sulfur content plus the maximum and minimum concentrations in the prior year.

   9.2.1. The weekly coal sample test results shall be retained for at least 5 years and available for review by Ecology or SWWCAA upon request.

10. TransAlta may request this Order be rescinded after all of the following occur:

   10.1. The emission limitations in this Order have been incorporated into an enforceable order or permit issued by SWCAA under the criteria of RCW 70.94.152 or 70.94.153 and SWCAA implementing regulations, provided that BART emission limits for the Centralia Power Plant will not be reanalyzed or reconsidered in connection with SWCAA's issuance of such enforceable order or permit.

   10.2. The emission limitations in the enforceable order or permit have been incorporated into the Air Operating Permit issued by SWCAA for the Centralia Power Plant.

   10.3. EPA has incorporated the Order into the Regional Haze State Implementation Plan.

Failure to comply with this Order may result in the issuance of civil penalties or other actions, whether administrative or judicial, to enforce the terms of this Order. Ecology shall enforce the terms of this Order only until such time as SWCAA incorporates the terms of the Order into the Centralia Power Plant's Air Operating Permit or except as provided by RCW 70.94.785.

You have a right to appeal this Order. To appeal you must:

- File your appeal with the Pollution Control Hearing Board within 30 days of the "date of receipt" of this document. Filing means actual receipt by the Board during regular office hours.
- Serve your appeal on the Department of Ecology within 30 days of the "date of receipt" of this document. Service may be accomplished by any of the procedures identified in WAC 371-08-305(10). "Date of receipt" is defined at RCW 43.21B.001(2).

If you appeal you must:

- Include a copy of this document with your Notice of Appeal.
- Serve and file your appeal in paper form; electronic copies are not accepted.

To file your appeal with the Pollution Control Hearing Board:

Mail appeal to:		Deliver your appeal in person to:
The Pollution Control Hearings Board PO Box 40903 Olympia, WA 98504-0903	OR	The Pollution Control Hearings Board 4224–6th Avenue SE Rowe Six, Bldg 2 Lacey, WA 98503

To serve your appeal on the Department of Ecology:

Mail appeal to:		Deliver your appeal in person to:
Department of Ecology Appeals Coordinator PO Box 47608 Olympia, WA 98504-7608	OR	Department of Ecology Appeals Coordinator 300 Desmond Drive SE Lacey, WA 98503

And send a copy of your appeal packet to:

Alan Newman
Department of Ecology
Air Quality Program
PO Box 47600
Olympia, WA 98504-7600

For additional information, go to the Environmental Hearings Office website at http://www.eho.wa.gov.

To find laws and agency rules, go to the Washington State Legislature website at http://www1.leg.wa.gov/CodeReviser.

Your appeal alone will not stay the effectiveness of this Order. Stay requests must be submitted in accordance with RCW 43.21B.320. These procedures are consistent with Chapter 43.21B RCW.

DATED this 18 day of June, 2010 at Olympia, Washington.

Jeff C Johnston

Jeff Johnston, Ph.D.
Manager, Science and Engineering Section
Department of Ecology
Air Quality Program

BART DETERMINATION
SUPPORT DOCUMENT FOR
WEYERHAEUSER CORPORATION
LONGVIEW, WASHINGTON

Prepared by

Washington State Department of Ecology
Air Quality Program

August, 2009

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EXECUTIVE SUMMARY

The Best Available Retrofit Technology (BART) program is part of the larger effort under the federal Clean Air Act Amendments of 1977 to eliminate human-caused visibility impairment in all mandatory federal Class I areas. Sources that are required to comply with the BART requirements are those sources that:

1. Fall within 26 specified industrial source categories.
2. Commenced operation or completed permitting between August 7, 1962 and August 7, 1977.
3. Have the potential to emit more than 250 tons per year (tpy) of one or more visibility impairing compounds.
4. Cause or contribute to visibility impairment within at least one mandatory federal Class I area.

The Weyerhaeuser Corporation (Weyerhaeuser) operates an integrated Kraft, thermomechanical, and recycled paper, pulp and paper mill that produces a wide range of paper products, including paperboard, corrugating medium, newsprint, and fine papers. The mill is located in Longview, Washington. The mill produces emissions of particulate matter (PM), sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen oxides (NO_X), and hydrocarbons. The pollutants considered to be visibility impairing are PM, SO_2, and NO_X.

Kraft pulp mills are one of the 26 listed BART source categories. A pulp mill began operation on the site in 1931. The current mill was constructed in 1948 and expanded in 1956/57, but it has had many modernizations and upgrades since then. The mill's potential emissions exceed 250 tpy for at least one of NO_X, SO_2, or PM_{10}. Three units are BART-eligible by construction or reconstruction date. They are the No. 10 Recovery Furnace, No. 10 Smelt Dissolver Tank, and the No. 11 Power Boiler.

Modeling of visibility impairment was done following the Oregon/Idaho/Washington/EPA-Region 10 BART modeling protocol.[1] Modeled visibility impacts of baseline emissions show impacts on the 8th highest day in any year (the 98th percentile value) of greater than 0.5 deciviews (dv) at five of the 12 Class I areas within 300 kilometers (km) of the plant.

Weyerhaeuser prepared a BART technical analysis using Washington State's BART Guidance.[2]

The Washington State Department of Ecology (Ecology) has determined that the current level of emissions control is BART for the three BART-eligible units. A wide variety of additional controls was investigated for each unit. However, all were determined to be either technically or economically infeasible.

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[1] Modeling protocol available at http://www.deq.state.or.us/aq/haze/docs/bartprotocol.pdf.

[2] "Best Available Retrofit Technology Determinations Under the Federal Regional Haze Rule," Washington State Department of Ecology, June 12, 2007.

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1. INTRODUCTION

1.1 The BART Program and BART Analysis Process

The federal Clean Air Act Amendments of 1977 (CAA) established a national goal of eliminating human induced visibility impairment in all mandatory federal Class I areas. The CAA requires certain sources to utilize Best Available Retrofit Technology (BART) to reduce visibility impairment as part of the overall plan to achieve that goal.

Requirements for the BART program and analysis process are given in 40 CFR 51, Subpart P, and Appendix Y to Part 51.[3] Sources are required to comply with the BART requirements if they:

1. Fall within 26 specified industrial source categories.
2. Commenced operation or completed permitting between August 7, 1962 and August 7, 1977.
3. Have the potential to emit more than 250 tons per year of one or more visibility impairing compounds including sulfur dioxide (SO_2), nitrogen oxides (NO_X), particulate matter (PM), and volatile organic compounds (VOCs).

Emission units that meet the source category, age, and potential to emit criteria must also make the facility "cause or contribute" to visibility impairment within at least one mandatory federal Class I area for the facility to remain BART applicable. Ecology has adopted the "cause and contribute" criteria that the United States Environmental Protection Agency (EPA) suggested in its guideline. BART-eligible units at a source cause visibility impairment if their modeled visibility impairment is at least 1.0 deciview (dv). Similarly, the criterion for contributing to impairment means that the source has a modeled visibility impact of 0.5 dv or more.

The BART analysis protocol in Appendix Y Sections III–V uses a 5-step analysis to determine BART for SO_2, NO_X, and PM. The five steps are:

1. Identify all available retrofit control technologies.
2. Eliminate technically infeasible control technologies.
3. Evaluate the control effectiveness of remaining control technologies.
4. Evaluate impacts and document the results.
5. Evaluate visibility impacts.

Ecology requires an applicable facility to prepare a BART technical analysis report and submit it to Ecology. Ecology then evaluates the report and makes a final BART determination decision. This decision is issued to the source owner as an enforceable Order, and included in the State's Regional Haze State Implementation Plan (SIP).

[3] Appendix Y to 40 CFR 51 – Guidelines for BART Determinations Under the Regional Haze Rule.

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As allowed by the EPA BART guidance, Ecology has chosen to consider all five factors in its BART determinations. To be selected as BART, a control has to be available, technically feasible, cost effective, provide a visibility benefit, and have a minimal potential for adverse non-air quality impacts. Normally, the potential visibility improvement from a particular control technology is only one of the factors weighed for determining whether a control constitutes BART. However, if two available and feasible controls are essentially equivalent in cost effectiveness and non-air quality impacts, visibility improvement becomes the deciding factor for the determination of BART.

1.2 The Weyerhaeuser Corporation's Longview Mill

Weyerhaeuser operates an integrated timber products facility, including a Kraft pulp and paper mill located on the banks of the Columbia River in Longview, Washington. The facility produces a variety of timber, wood, pulp and paper products, including logs, dimensional lumber, bleached Kraft pulp, liquid packaging board, newsprint, and publication papers. Paper products are produced from bleached Kraft pulp, de-inked recycled paper, and thermomechanical pulp. The Kraft mill was constructed in 1948 and expanded in 1956/57, but it has had many modernizations and upgrades since then, including installation of a new Kraft Fiberline in 1993-1995. The combined Weyerhaeuser and NORPAC pulp and paper operations are regulated as a single facility operating under Air Operating Permit WA 000012-4. Ecology received a BART Analysis and Determination Report from Weyerhaeuser on December 20, 2007, which was revised and resubmitted on June 30, 2008.

1.3 BART-Eligible Units

A review of the emission at the facility found that:

1. Three of the plant's individual emission units are BART-eligible by construction date. They are the No. 10 Recovery Furnace, the No. 10 Smelt Dissolver Tank, and the No. 11 Power Boiler.

2. The three individual emission units in total have a potential to emit at least 250 tons/year of nitrogen oxides (NO_X), and sulfur dioxide (SO_2).

3. A Class I area visibility impact analysis was done using the maximum daily emissions during the 2003-2005 time period and the CALPUFF model. The model results indicated the visibility impact from the BART-eligible units exceeded the 0.5 dv contribution threshold in at least one Class I area.

1.3.1 Existing Recovery Furnace Emissions Control

Weyerhaeuser operates a non-direct contact evaporator (NDCE) recovery furnace with an electrostatic precipitator (ESP). The recovery furnace fires black liquor solids (BLS) and some fuel oil. The furnace is equipped with boiler tubes to recover thermal energy from the

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combustion of black liquor. As a result of the continuous operation of the Kraft process, the recovery furnace operates continuously at approximately the same rate all the time (a.k.a. "baseload" operation). The steam generated is used to produce electricity and provide process heat and steam.

A chemical recovery furnace is not simply a "boiler" designed to burn fuel and produce steam. It is a complex device which serves as a chemical reactor, a chemical recovery unit, an internal high efficiency SO_2 scrubber, and an energy recovery unit. Recovery furnaces operate by spraying concentrated spent pulping chemical liquids (black liquor) into the furnace. The organic chemicals in the black liquor (mostly lignins) are combusted. Combustion provides the energy to recover the inorganic pulping chemicals (sodium sulfide) for reuse. As with most recovery furnaces, this furnace is equipped with boiler tubes to generate steam for electrical generation and process needs.

This furnace utilizes tertiary over fire air combustion to maximize chemical recovery and minimize emissions. The black liquor is concentrated prior to introduction into the furnace. Heat energy is recovered as steam used for production of electricity and plant steam needs.

The major pollutants emitted from the furnace are SO_2, NO_X, and PM_{10}. SO_2 is generated in the recovery furnace from the oxidation of inorganic and organic sulfur compounds contained in the black liquor and hydrogen sulfide losses from the chemical recovery portion of the furnace. Additional SO_2 results from the oxidation of sulfur in fuel oil which may be used during the combustion process. The chemical recovery process scrubs out most of the SO_2 generated in the chemical recovery/combustion process in the furnace. SO_2 emissions from the furnace represent a loss of process chemical and are not desirable, so the furnace operation is optimized to minimize the loss of process chemicals, primarily sodium and sulfur.

NO_X may form as fuel NO_X and thermal NO_X. Technical literature suggests that NO_X formation from the chemical recovery process is primarily fuel NO_X since recovery furnace temperatures are not high enough for significant thermal NO_X formation.[4] NO_X emissions from recovery furnaces are typically low due to the low nitrogen concentration in the black liquor solids (approximately 0.1 percent), the low overall conversion of liquor nitrogen to NO_X (10 to 25 percent), and the existence of sodium fumes that can participate in "in-furnace" NO_X reduction or removal.[5]

The majority of particulate emissions are in the form of particulate matter less than 10 microns in size (PM_{10}). The majority of the PM_{10} emissions from the recovery furnace are sodium salts with about 80 percent of the PM_{10} being sodium sulfate and smaller amounts of potassium

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[4] NCASI Special Report 99-01, *A Review of NO_X Emission Control Strategies for Industrial Boilers, Kraft Recovery Furnaces, and Lime Kilns*, April 1999.
[5] NCASI Special Report No. 03-06, *Effect of Kraft Recovery Furnace Operations on NO_X Emissions: Literature Review and Summary of Industry Experience,* October 2003.

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sulfate, sodium carbonate, and sodium chloride.[6] These salts primarily result from the carryover of solids from the combustion and chemical recovery process plus sublimation and condensation of inorganic chemicals.[7] Some PM_{10} in the recovery furnace flue gas can be attributed to the combustion of fossil fuel. Most of the particulate generated in the furnace falls out in the economizer with the rest captured by the electrostatic precipitator. The particulate (known as "saltcake") captured in the economizer and ESPs, is recycled back to the process by mixing with black liquor before it enters the black liquor concentrators. The concentrated black liquor is then sent to the recovery furnace.

The recovery furnace is equipped with an electrostatic precipitator (ESP) to reduce PM/PM_{10}. The SO_2 and NO_X emissions are controlled through the design and careful operation of the recovery furnace's tertiary air system.

The NO_X, SO_2, and PM_{10} emissions from the No. 10 Recovery Furnace are subject to BACT emission limits in Prevention of Significant Deterioration (PSD) 92-03 and the requirements of 40 CFR 63 Subpart MM, as well as other less stringent limits. The most stringent of the applicable PM, NO_X, and SO_2 emission limits are shown in Table 1-1.

Table 1-1. RECOVERY FURNACE CURRENT EMISSION LIMITS

Pollutant	Emission Limit	Regulatory Basis
PM/PM_{10}	0.027 gr/dscf @ 8% O_2, and 0.020 gr/dscf @ 8% O_2 annual average	PSD 92-03, Amendment 4
NO_X	140 ppm @ 8% O_2	PSD 92-03, Amendment 4
SO_2	75 ppm @ 8% O_2	PSD 92-03, Amendment 4

1.3.2 Existing Smelt Dissolver Tank Emissions Control

A smelt dissolver tank is a part of the Kraft pulping chemical recovery process. Smelt is the molten chemicals collected in the bottom of a recovery furnace. Smelt is continuously withdrawn from the furnace into a smelt dissolver tank where it is dissolved in water and weak wash[8] to produce green liquor. Green liquor is mixed with lime from the lime kiln (not a BART-eligible unit at this plant) to produce white liquor for use in the chip digestion process.[9] During digestion, the white liquor is converted to black liquor.

PM/PM_{10} is the primary emissions from the smelt tank. The particulate is formed when the water solution is introduced to the hot smelt from the furnace. The relatively cooler water causes

[6] NCASI Technical Bulletin No. 725, *Particulate Matter Emissions from Kraft Mill Recovery Furnaces, Lime Kilns, and Smelt Dissolving Tanks*, November 1996.
[7] AP-42, Section 10.2, Chemical Wood Pulping, dated September 1990.
[8] This process water, also known as weak white liquor, is composed of all water used to wash lime mud and green liquor precipitates.
[9] The names of the various liquors denote their actual color.

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the smelt to shatter prior to dissolving into solution. The particles that enter the exhaust stream are small; 90 percent by weight are PM_{10} and 50 percent by weight are less than one micrometer in aerodynamic diameter. Chemically the particles are composed of inorganic compounds used to prepare the pulping liquor, principally sodium sulfate and sodium carbonate. Since no combustion occurs in a smelt tank, there are no NO_X emissions and SO_2 emissions are minimal.

The No. 10 Smelt Dissolver Tank is currently controlled with a high-efficiency wet scrubber permitted as BACT in 1993.[10]

The Smelt Dissolver Tank is currently subject to the BACT emission limit in PSD 92-03, Amendment 4 and 40 CFR 63 Subpart MM. The applicable PM, NO_X, and SO_2 emission limits are shown in Table 1-2.

Table 1-2. SMELT DISSOLVER TANK CURRENT EMISSION LIMITS

Pollutant	Emission Limit	Regulatory Basis
PM/PM_{10}	0.20 lb/ton BLS	NESHAP Subpart MM, 40 CFR 63.862(a)(1)(i)(b)
	0.120 lb/ton BLS	PSD 92-03
NO_X	N/A	N/A
SO_2	N/A	N/A

1.3.3 Existing No. 11 Power Boiler Emissions Control

The No. 11 Power Boiler is a spreader-stoker type boiler firing wood-waste, dewatered wastewater treatment plant sludge, and supplemental low sulfur western coal. Low sulfur (< 2 percent by weight) No. 6 fuel oil may be burned during startup, shutdown, and malfunction operations. During 2006, the boiler was upgraded and now has a rated capacity of 575,000 lb steam/hr and 1,016 million British thermal units per hour (MMBtu/hr) heat input. Actual emissions did not increase as a result of the upgrade project due to increased combustion efficiency and the addition of a trona-based SO_2 control. Actual 2007 operating rates are lower than the rated capacity, averaging 413,000 lb steam/hr and 724 MMBtu/hr heat input. Weyerhaeuser operates this boiler in conjunction with No. 10 Recovery Furnace, to provide process steam and steam to generate electricity. The No. 10 Recovery Furnace normally operates at a constant rate and the No. 11 Power Boiler varies its operating rate so the pair matches the steam demand of the rest of the plant. However, when either recovery furnace or the No. 11 Power Boiler is out of operation, the other unit plus other boilers on site must increase operating rate to meet the plant heat needs.

PM/PM_{10} emissions from this boiler results from inorganic materials contained in the fuels and unburned carbon resulting from incomplete combustion.[11] NO_X emissions from boilers are formed by two mechanisms, fuel NO_X and thermal NO_X. In the case of this boiler, both

[10] PSD 92-03, Amendment 4.
[11] NCASI Technical Bulletin No. 884, *Compilation of Criteria Air Pollutant Emissions Data for Sources at Pulp and Paper Mills Including Boilers,* August 2004.

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mechanisms exist, though it is expected that the fuel NO_X is the dominant source of the emissions.[12] SO_2 emissions primarily come from the coal and wastewater sludge. Some of the SO_2 formed is captured by the alkaline wood ash and removed by the ESP.[13]

Emission controls currently in place on the No. 11 Power Boiler are a multiclone to remove cinders and coarse particulate followed by dry trona[14] injection for SO_2, followed by a dry ESP for trona and fine particulates removal. The trona is injected into the flue duct on the boiler side of the ID fan and makes use of the ID fan to mix the trona with the fuel gas. NO_X emissions are controlled through use of good combustion practices to minimize emissions and maximize combustion efficiency.

The ESP was installed as part of a boiler upgrade project in 2006 and replaced the last electrified gravel bed particulate control device remaining in Washington. The trona injection was installed as part of the 2006 boiler upgrade project to assure that the post upgrade SO_2 emissions would not be higher than the pre-project emissions.

The No. 11 Power Boiler is currently subject BACT emission limitations in a state NSR permit and to 40 CFR 60 Subpart D NSPS. The most stringent applicable PM, NO_X, and SO_2 emission limits are shown in Table 1-3.

Table 1-3. NO. 11 POWER BOILER'S CURRENT EMISSION LIMITS

Pollutant	Emission Limit	Regulatory Basis
PM/PM_{10}	0.10 lb/MMBtu	NSPS Subpart D, 40 CFR 60.42(a)(1)
	0.050 gr/dscf @ 7% O_2	Ecology Order 94AQ-I080[15]
NO_X	0.30 – 0.7 lb/MMBtu, depending on fuel mixture	NSPS Subpart D, 40 CFR 60.44(a)
SO_2	0.80–1.2 lb/MMBtu, depending on fuel mix	NSPS Subpart D, 40 CFR 60.43(a)
	1000 ppmv, 1-hr average	WAC 173-400-040(11)(b)

1.4 Visibility Impact of the Weyerhaeuser Mill's BART-Eligible Units

Class I area visibility impairment and improvement modeling was performed by Weyerhaeuser using the BART modeling protocol developed by Oregon, Idaho, Washington, and EPA Region

[12] NCASI Corporate Correspondent Memorandum No. 06-0142006, *Information on Retrofit Control Measures for Kraft Pulp Mill Sources and Boilers for NO_X, SO_2 and PM Emissions*, June 2006.
[13] NCASI Technical Bulletin No. 884, *Compilation of Criteria Air Pollutant Emissions Data for Sources at Pulp and PaperMills Including Boilers*, August 2004.
[14] Trona is a natural mineral primarily composed of sodium carbonates.
[15] Weyerhaeuser requested a numerical limit be established under WAC 173-400-091 to replace a narrative limit in the original NOC approval. To assure clear limitations and enforceability within the AOP, the regulatory order established this numerical limitation.

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10.[16] This protocol uses three years of metrological information to evaluate visibility impacts. As directed in the protocol, Weyerhaeuser used the highest 24-hour emission rates that occurred in the 3-year period to model its impacts on Class I areas. The modeling indicates that the emissions from the three BART-eligible units at this plant cause visibility impairment on the 8th highest day in any one year and the 22nd highest day over the three years that were modeled.[17] For more information on visibility impacts of this facility, see Section 3.

2. BART TECHNOLOGY ANALYSIS

The Weyerhaeuser BART technology analysis was based on the five step process defined in BART guidance and listed in Section 1.1 of this report.

The following three tables identify and summarize control options considered in the BART Determination analysis for PM_{10}, NO_X, and SO_2 emissions from the Weyerhaeuser Mill. Sections 2.1 through 2.4 discuss emissions from each BART emissions unit.

Table 2-1. PM/PM_{10} CONTROL TECHNOLOGIES EVALUATED

Control Technology	Available for Emission Unit (Yes/No)[18]		
	No. 10 Recovery Furnace	Smelt Dissolver Tank	No. 11 Power Boiler
Fabric Filters (baghouse)	No	N/A[a]	Yes
Cyclone Separator (multiclone)	N/A	N/A	Currently used
Wet Scrubber	Yes	Currently used	Yes
Wet ESP	Yes	N/A	Yes
Dry ESP	Currently used	N/A	Currently used
Venturi Scrubber	Yes	Yes	Yes
[a] Not Applicable or Not Available			

Table 2-2. NO_X CONTROL TECHNOLOGIES EVALUATED

Control Technology	Available for Emission Unit (Yes/No)		
	No. 10 Recovery Furnace	Smelt Dissolver Tank	No. 11 Power Boiler
Staged Combustion	Currently used	N/A	Currently used
Good Operating Practices and Proper Design	Currently used	N/A	Currently used
Selective Non-Catalytic Reduction (SNCR)	No	N/A	Yes
Selective Catalytic Reduction (SCR)	No	N/A	Yes

[16] A copy of the modeling protocol is available at http://www.deq.state.or.us/aq/haze/docs/bartprotocol.pdf.
[17] A source causes visibility impairment if its modeled visibility impact is above one deciview, and contributes to visibility impairment if its modeled visibility impact is above 0.5 deciview.
[18] Availability based on whether control technology can be considered for each emission unit and has been applied in practice on this type of unit, not on technical feasibility.

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Table 2-3. SO_2 CONTROL TECHNOLOGIES EVALUATED

Control Technology	Available for Emission Unit (Yes/No)		
	No. 10 Recovery Furnace	Smelt Dissolver Tank	No. 11 Power Boiler
Flue Gas Desulfurization (FGD) with Wet Scrubber	Yes	No	Yes
FGD – Semi-Dry Lime Hydrate Slurry Injection with ESP or Baghouse	Yes	No	Yes
FGD – Semi-Dry Lime Hydrate Powder Injection with ESP or Baghouse	Yes	No	Yes
FGD – Spray Drying with ESP or Baghouse	Yes	No	Yes
FGD Dry Trona Injection with ESP	No	No	Currently used
Good Operating Practices/Inherent Dry Scrubbing	Currently used	No	N/A
High efficiency wet scrubber	N/A	Currently used	No

2.1 No. 10 Recovery Furnace Control Options

2.1.1 PM/PM_{10} Control Options

As discussed in Section 1.3.1, particulate emissions from the No. 10 Recovery Furnace are controlled by an ESP.

As noted in Section 1.3, the No. 10 Recovery Furnace is subject to BACT emission limitations that are more stringent than the standard for PM (used by EPA as a surrogate for hazardous air pollutant (HAP) metals) contained in 40 CFR Part 63 Subpart MM, *National Emission Standards for Hazardous Air Pollutants for Chemical Recovery Combustion Sources at Kraft, Soda, Sulfite, and Stand-Alone Semichemical Pulp Mills*. Compliance with the BACT limitation is achieved by the inclusion of a dry ESP for particulate control.

Of the available particulate emission controls for the recovery furnace, Weyerhaeuser was unable to locate an existing recovery furnace with either a wet ESP or a baghouse as the particulate control technology. They noted that the use of a fabric filter would not work due to the “sticky” nature of the particulate that would be collected; removing it from a fabric filter would be extremely difficult compared to the proven technique of an ESP.

Use of a **wet ESP** is feasible, but would not provide any greater particulate removal than is provided by the dry ESP currently installed. Weyerhaeuser was unable to locate an installation of a wet ESP on a Kraft recovery furnace.

Similarly, the EPA’s BACT/RACT LAER Clearinghouse shows that over the last 15 years, no U.S. recovery furnace has had a **venture scrubber or other wet scrubber** installed as the

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particulate control device as the result of new source permitting requirements. The primary reason is that wet scrubbers are not as effective at particulate removal as an ESP.

Weyerhaeuser did evaluate two options to further reduce particulate emissions from the recovery boiler. They evaluated **adding a venturi scrubber after the ESP** to further reduce condensable particulate and adding an additional field to the ESP to further enhance removal efficiency of primary particulate.

Adding a venturi scrubber to remove about 27 lb/hr (118.3 tpy) of condensable and additional solid particulate at an estimated cost effectiveness of $28,000/ton of PM reduced. The cost analysis did not include an evaluation of the potential impacts to the wastewater treatment system of receiving water from this scrubber.

Adding an **additional field to the ESP** is a more involved project than adding the venturi scrubber. Additional details on this option are given in Weyerhaeuser's BART Analysis Report. This alternative is estimated to reduce emissions by an additional 50 percent, or about 7.5 lb/hr (32.8 tpy) at a cost effectiveness of $122,000/ton PM reduced.

Weyerhaeuser considers the current BACT emission limit and dry ESP on the No. 10 Recovery Furnace PM as BART.

2.1.2 NO_X Control Options

To control NO_X from a recovery furnace, there are a limited number of options. The recovery furnace process utilizes staged combustion in order to maximize the recovery of the expensive pulping chemicals. As part of this chemical recovery process, the thermal NO_X emissions are minimized. In the Kraft process, the black liquor is already low in fuel nitrogen, further limiting the quantity of NO_X emitted.

Weyerhaeuser currently utilizes **"tertiary" staged combustion t**o maximize chemical recovery and minimize NO_X emissions. The addition of tertiary air in 1995 required extensive modification of the fire box. The modification required removal and lengthening the lower section of the furnace to increasing the volume of the primary combustion zone and allow space to add a third level of over fire air. Tertiary over fire air is considered the normal design for the best performing existing and most new recovery furnaces.

There are a few new recovery furnaces that have included a 4th stage of over fire air. This 4th stage has been shown to further increase chemical recovery and quality while reducing emissions of SO_2, NO_X and carbon monoxide. In order for Weyerhaeuser to add a 4th stage of combustion air would require the furnace to be rebuilt again to lengthen the fire box. The company believes such a project may also require the overall height of the recovery furnace building to be increased to accommodate a taller furnace. Whether the added height is provided at the top or bottom of the furnace, this would be a significant construction project, and put the Kraft portion

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of the plant out of operation for the duration of the construction project. The cost and potential emission reduction of this change was not determined.

"Boiler tuning" was briefly evaluated, but the potential effectiveness of this option to reduce NO_X is unknown. In "boiler tuning," the quantity of air supplied at each stage is adjusted to optimize the chemical recovery efficiency and minimize the NO_X and SO_2 emissions. At the conclusion of the project to add tertiary over fire air, boiler tuning was performed as part of the project. As a result, additional significant reductions are not anticipated.

SCR and SNCR have been reviewed for applicability on this recovery furnace. Weyerhaeuser and National Council for Air and Stream Improvement (NCASI) have both been unable to find a current installation of SCR or SNCR on a Kraft recovery furnace. A major impediment to the inclusion of SNCR on a recovery furnace is the effect of introducing ammonia into the chemical recovery process through addition of the ammonia contaminated fly ash to the smelt dissolver tank. The use of SCR on a recovery furnace results with questions about the potential of catalyst poisoning or blinding from the alkaline particulate from the furnace and difficulties in removing that particulate from the catalyst material. Since no known installation of SCR exists on a Kraft recovery furnace, to what degree the potential for the adverse affects would actually occur is unknown.

In 2003, NCASI specifically evaluated the options for reducing NO_X emissions from recovery furnaces. Their evaluation indicated that no operating Kraft recovery furnace currently utilized post-combustion control (such as SCR or SNCR) and there a very limited number of other NO_X reduction techniques are available.[19] A subsequent NCASI Corporate Correspondence Memorandum states:[20]

> Optimization of the staged combustion principle within large, existing Kraft recovery furnaces to achieve lower NOx emissions might be the only technologically feasible option at the present time for NOx reduction . . . Ultimately, the liquor nitrogen content, which is dependent on the types of wood pulped, is the dominant factor affecting the level of NOx emissions from black liquor combustion in a recovery furnace. Unfortunately, this factor is beyond the control of pulp mill operators.

Weyerhaeuser concluded that the current NO_X emission limitation and currently installed system of staged combustion is BART for this furnace.

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[19] NCASI Special Report No. 03-06, *Effect of Kraft Recovery Furnace Operations on NO_X Emissions: Literature Review and Summary of Industry Experience*, October 2003.

[20] NCASI Corporate Correspondent Memorandum No. 06-014, *Information on Retrofit Control Measures for Kraft Pulp Mill Sources and Boilers for NO_X, SO_2 and PM Emissions*, June 2006.

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2.1.3 SO_2 Control Options

Weyerhaeuser considered the addition of wet and dry SO_2 control options along with the possibility of combustion controls to further reduce the SO_2 emissions from the recovery furnace. Recovery furnaces are by definition chemical recovery units since sodium and sulfur are the major chemicals recovered from the used black liquor sent to the furnace. As a result of their primary purpose, a well designed and properly operated recovery furnace emits little SO_2 under normal, steady state operation. New recovery furnaces can be expected to have essentially no SO_2 emissions during steady state operations while existing recovery furnaces have continuous low rate SO_2 emissions. All recovery furnaces experience uncontrolled, highly sporadic, unpredictable, and short duration “spikes” in SO_2 emissions. The steady-state emissions occur most operating hours of the year. As a result, a wet lime or limestone scrubber would not actually remove much SO_2.

NCASI reports that neither a **wet lime nor a limestone scrubber** has been successfully demonstrated on a recovery furnace in the United States.[21] As a result, the ability of such a scrubber to reduce SO_2 emissions is theoretical, not demonstrated.

While the addition of a **Semi-Dry or Dry sorbent injection** system preceding the existing ESP is available technology, Weyerhaeuser did not evaluate this option in depth since this would not provide a substantial emission reduction compared to the existing system. A spray dryer system removes SO_2 by injecting a sorbent such as lime or sodium bicarbonate into the flue gas. The existing recovery boiler flue gas handling system inherently acts like and achieves comparable results to an add-on sorbent injection system. As noted earlier, the particulate collected emitted by the recovery furnace is composed largely of sodium carbonate and bicarbonate. These sodium salts are present in excess of the quantity of SO_2 in the flue gas and act as an acid gas sorbent scrubbing agent. The reacted flue gas particulate is then collected by the recovery furnace economizer and ESP and returned to the Kraft chemical recovery process. The addition of an external sodium based dry sorbent injection system or injection of sodium based sorbent into the furnace would be redundant to the sodium based scrubbing system existing in the recovery furnace.

Injection of calcium based sorbent in the flue gas would render the recovered saltcake unusable. The presence of calcium would cause unmanageable scaling and plugging in the black liquor mix tanks, black liquor concentrators, furnace feed lines, boiler tubes, and economizer passages, saltcake collection hopers, the smelt dissolving tank and associated piping. The contaminated saltcake is anticipated to become a waste requiring disposal rather than a recovered byproduct. The ash disposal costs have not been evaluated in detail, but Weyerhaeuser believes the costs would be considerable due to the large volume of material involved.

[21] Ibid.

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At this time, there are no known installations of semi-dry or dry sorbent injection to control SO_2 from a recovery furnace. Weyerhaeuser does not consider these technologies as technically feasible.

Weyerhaeuser proposes that the existing operations of the recovery furnace including tertiary air deliver and black liquor concentrators be considered as BACT for SO_2 from this furnace.

2.1.4 Weyerhaeuser's BART Proposal for the Recovery Furnace

For PM/PM_{10} control, Weyerhaeuser proposed BART is the existing ESP with an emission limit of 0.02 grain/dscf as BART.

For NO_X control, Weyerhaeuser proposed proper operation BACT of the existing tertiary, staged combustion system meeting the BACT emission limitation of 140 ppm NO_X as BART for control of NO_X emissions from the Recovery Furnace.

For SO_2 control, Weyerhaeuser proposed proper operation of the existing tertiary, staged combustion system meeting the BACT emission limitation of 75 ppm SO_2 as BART for control of NO_X emissions from the Recovery Furnace.

2.2 No. 10 Smelt Dissolver Tank Control Options

As discussed in Section 1.3.2, a wet scrubber is currently used to reduce PM/PM_{10} emissions. This wet scrubber also provides some reduction of sulfur compound emissions. A smelt dissolver tank's exhaust stream has high moisture content (typically 25 to 40 percent) and almost no flow rate, eliminating many control options that require a positive air flow for operation.

2.2.1 PM_{10} Control Options

For smelt dissolver tanks, various wet scrubbing systems are considered BACT level of control. The current BACT emission control system is a high efficiency wet scrubber. The No. 10 Smelt Dissolver Tank has a BACT emission limitation of 0.120 lb/ton black liquor solids. This is the most stringent BACT limitation in the EPA RACT/BACT/LAER database of permitted and constructed emission controls in the U.S. and is more stringent than the federal MACT standard of 0.20 lb/ton black liquor solids.

Weyerhaeuser did not evaluate improvements to or replacement of the current particulate control technology on the No. 10 Smelt Dissolver Tank.

Weyerhaeuser proposed the current particulate control system meeting the BACT emission limit of 0.12 lb/ton black liquor solids as BART for particulate emissions from the No. 10 Smelt Dissolver Tank.

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2.2.2 NO_X Control Options

NO_X control technologies are not evaluated for the Smelt Dissolver Tank. It is not a combustion source, and the materials processed are not a source of NO_X.

2.2.3 SO_2 Control Options

Smelt dissolver tanks are a negligible source of SO_2. As such, Weyerhaeuser did not evaluate additional controls in detail; though they note that adding a wet ESP could be technically feasible, but would likely result in an increase in reduced sulfur compound (odor) emissions. A smelt dissolver tank's exhaust stream has high moisture content (typically 25 to 40 percent) and almost no flow rate, making usage of a spray dryer/dry ESP system technically infeasible.[22]

2.2.4 Weyerhaeuser's BART Proposal for the No. 10 Smelt Dissolver Tank

For PM/PM_{10} control, Weyerhaeuser proposed to continue using the existing high efficiency scrubber meeting the BACT emission limitation of 0.120 lb PM/ton black liquor solids fired as BART. Weyerhaeuser proposes no additional controls for SO_2 or NO_X, as the No. 10 Smelt Dissolver Tank is not a source of those pollutants.

2.3 No. 11 Power Boiler Control Options

As discussed in Section 1.3.3, the No. 11 Power Boiler has an over fire air system to provide for efficient combustion. A multiclone followed by an ESP is currently used to reduce PM/PM_{10} emissions. Trona injection after the multiclone and before the ESP is used for SO_2 reductions and combustion control is used to achieve NO_X control.

2.3.1 PM/PM_{10} Control Options

Table 2-1 lists six identified PM/PM_{10} control technologies along with Good Operating Practices. Since the No. 11 Power Boiler currently uses a multiclone and an ESP, only those controls that provide at least as much control as the multiclone/ESP combination were considered in detail.

The use of **fabric filters** to control particulate matter emissions from wood-fired and combination fuel boilers has rarely been implemented. Their use on pulverized coal-fired utility boilers is relatively common, but there are operational and boiler exhaust temperature differences that reduce the comparability of these two uses. The use of fabric filters on wood-fired units is a potential fire hazard due to the potential of burning cinders escaping the multiclone, temperature excursions, and/or operating upsets. In pulverized coal boilers, there are no cinders as combustion is complete and there are exhaust gas cooling operations (economizers, air

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[22] NCASI, *Corporate Correspondence Memo CC-06-14: Information on Retrofit Control Measures for Kraft Pulp Mill Sources and Boilers for NO_X, SO_2, and PM Emissions*, June 4, 2006.

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preheaters, feed water heaters) that may not exist on wood-fired units. Fabric filters can ignite or melt depending on the fabric used and the quantity of combustible particulate on the filters. Because of this, fabric filters are rarely used on wood-fired and combination fuel boilers.

Fabric filters have been successfully used on some wood-fired boilers that burn wood residue or bark stored in salt water because the salt reduces the fire hazard. Weyerhaeuser does not use significant amounts of wood waste that has been stored in salt water. Therefore, the use of fabric filters to control particulate matter emissions from the No. 11 Power Boiler is proposed to be technically infeasible due to fire hazard.

The existing **dry ESP** was permitted in 2003/04 and began operation in 2006 as a RACT control technology. This new ESP installation replaced an old electrified gravel bed system. As part of this BART evaluation, Weyerhaeuser did evaluate adding an additional field to the new ESP system. Prior to looking at costs, Weyerhaeuser discounted the option due to the lack of space to install an additional field to the ESP. The site in the area of the ESP is very constrained due to underground and overhead utilities, the new stack, vehicle turning areas, and rail lines. More details are available in Weyerhaeuser's BART Analysis Report.

While replacing the current dry ESP with a **wet ESP** is an available approach in some cases, Weyerhaeuser did not evaluate that option. Wet ESPs work well in situations with large amounts of condensable particulate or high resistivity ashes. The removal efficiency of a wet ESP is the same as a dry ESP. This boiler with its multiclone system and the use of multiple fuels does not generate a high resistivity ash or a lot of condensable particulate matter. A wet ESP has a wastewater discharge that must be addressed. There is no advantage to the use of a wet ESP in this situation or increase in particulate removal to be achieved.

Weyerhaeuser proposed their current multiclone/dry ESP system, meeting an emission limit of 0.050gr/dscf, as BART for the No. 11 Power Boiler.

2.3.2 NO_X Control Options

As noted before, the No. 11 Power Boiler is a load-following spreader-stoker combination fuel boiler. It combusts wood-waste, sludge, western sub-bituminous coal, and No. 6 fuel oil. The spreader-stoker design uses a simple form of staged combustion, providing under fire air (air supplied under the fire grate), a small amount of air to spread the fuel in the boiler and one stage of over fire air above the elevation of the spreaders. Most combustion occurs on the fire grate at temperatures that favor fuel bound NO_X formation over thermal NO_X.

As part of the 2006 boiler upgrade project that resulted in installation of the new ESP, Weyerhaeuser also **replaced the air distribution system** in the No. 11 Power Boiler. The size and location of over fire air ports changed as well as the total quantity of air delivered to the firebox. The previous over fire air distribution system was undersized and provided little mixing of the over fire air with combusting fuel in the boiler. The revised over fire air system uses

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fewer air ports, and higher velocity air to allow the over fire air to penetrate to the center of the combustion zone and improve overall combustion efficiency.

As a follow-up to the over fire air system changes, Weyerhaeuser implemented a program to optimize the distribution of combustion air between the new over fire air system, the under fire air system, and the air used to spread the fuel on the grate. The optimization focused on reduction of emissions and maximizing fuel combustion efficiency. This has lead to a moderate reduction in NO_X emissions (10 to 20 percent) from the boiler compared to the pre-modification condition. Weyerhaeuser did not evaluate any additional combustion modifications that might reduce NO_X concluding it would be technically infeasible to implement any of the remaining available combustion modifications.

As part of their BART evaluation, Weyerhaeuser looked closely at the installation of **SCR and SNCR** on this boiler. They evaluated installation of an SCR unit between the boiler and the ESP and the addition of SNCR to the boiler.

SCR involves the injection of an ammonia or urea solution into the hot fuel gases prior to a catalyst. The catalyst reduces the temperature at which the reaction of nitrogen oxides and ammonia occurs. The nitrogen oxides and ammonia react to form nitrogen gas and water. Standard NO_X catalysts operate at approximately 850ºF while low temperature catalysts operate at about 450ºF.

Weyerhaeuser's evaluation of SCR indicated that to obtain the correct temperature for the standard catalyst to operate would require removal of some of the current boiler tubes. This would have the effect of reducing the maximum quantity of steam produced by this boiler requiring a non-BART boiler to be operated to replace the missing steam. There are construction and difficulties as well as issues related to installation location for an SCR unit placed immediately after the boiler. This area of the plant is very congested with underground utilities, overhead conveyors, and truck and rail routes. A cost evaluation of an SCR system in the boiler that would provide 75 percent reduction in NO_X would have a cost effectiveness of about \$13,000/ton NO_X reduced, for a reduction of 1,146 tons/year.

They did evaluate installation of the SCR unit after the ESP, but noted that the temperature at this location is below the optimum range for a low temperature catalyst and would require the combustion of fuel (probably natural gas) to reheat the flue gas to the necessary temperatures. Weyerhaeuser does not consider an SCR in this location to be technically feasible. As noted before, space in this area of the plant is limited.

SNCR was also evaluated for this boiler. In SNCR process, ammonia, an ammonia water solution, or a urea water solution is sprayed into the combustion zone at a location where the temperature is in the range of 1600 to 1800ºF. Since this boiler is a load-following boiler (while the recovery furnace is operated as a base load boiler), there will need to be several levels of ammonia injection into the flue gases.

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To date, there are no installations of SNCR on boilers of this type in the pulp and paper industry. There are load-following boilers in other industries that utilize SNCR. Their experience has provided the operational and design information necessary to successfully implement SNCR on load-following boilers. In spite of potential operational difficulties, Weyerhaeuser did evaluate the cost effectiveness of installing SNCR on this boiler. At an estimated removal efficiency of 25 percent, the cost effectiveness is estimated to be $6,686/ton NO_X reduced. The reduction in NO_X would be 382 ton/year.

Weyerhaeuser proposed to utilize its existing combustion control system as BART for NO_X emissions.

2.3.3 SO_2 Control Options

Weyerhaeuser currently operates a **dry sorbent (trona) injection system** on the No. 11 Power Boiler. This was installed as part of the boiler upgrade project and provides a small removal of SO_2 from the flue gas.

The current trona-based system is designed to remove 25 percent of the SO_2 from the boiler. The uncontrolled concentration of SO_2 in the boiler exhaust is 80 ppm. Trials after installation were made and the trona injection rate optimized to meet the removal guarantee. Trona was selected as the preferred sorbent due to cost and simplicity of equipment required compared to use of sodium bicarbonate or calcium based sorbents.

In addition to the SO_2 control provided by the trona system, boilers utilizing wood plus other fuels exhibit lower SO_2 emissions than a boiler burning only coal or fuel oil. This is due to the production and presence of calcium and sodium oxide from the minerals in the wood and dirt on the wood. The calcium and sodium oxides react with the SO_2 in the flue gas and produce sulfites and sulfate particulates that are removed by the particulate system.[23]

Continuous emission monitoring indicates the trona system and the fly ash SO_2 removal result in a controlled SO_2 emission rate of about 164 lb/hour or about 0.23 lb/MMBtu. Weyerhaeuser evaluated use of **low sulfur fuels** and the installation of a wet calcium scrubber instead of the current dry sorbent injection.

The primary fuels used in this boiler are waste wood, pulp mill sludges, low sulfur western coal, and No. 6 fuel oil. As a result of the sulfur content of the No. 6 oil and coal, Weyerhaeuser looked at the feasibility of replacement with lower sulfur fuel.

Weyerhaeuser is a small purchaser of coal. As a result, it is unable to negotiate for lower, preferred pricing or easily dictate coal contract terms. This limits its ability to acquire the lowest sulfur coal available on the market. The current coal they use is a Powder River Basin sub-

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[23] National Council for Air and Stream Improvement, Technical Bulletin 640, Sulfur Capture in Combination Bark Boilers.

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bituminous coal with 0.4 to 0.5 percent sulfur by weight. The coal used during the baseline emissions period was also a Powder River Basin coal from a different mine with a sulfur content of 0.5 to 0.9 percent.

All other boilers at the mill are equipped to utilize either natural gas or No. 6 fuel oil supplied by a single 30,000 gallon fuel tank. The No. 6 oil is used in the No. 10 Recovery Furnace for startup and flame stabilization when needed and for startup of the No. 11 Power Boiler. For the No. 11 Power Boiler, fuel oil supplies less than 0.5 percent of the annual heat input to the boiler. The current No. 6 oil is specified to contain less than two percent sulfur by weight. Any changes to the fuel oil supply to reduce SO_2 from the No. 11 Power Boiler would also affect the SO_2 emissions from all other boilers. Conversion of the system to use a lighter, lower sulfur fuel oil such as No. 2 oil would entail extensive replacement and upgrading of pumps, burners, and fittings to accommodate the less viscous, lighter fuel oil. Due to the low usage rate of fuel oil plant-wide, Weyerhaeuser concluded that converting the fuel oil system to handle a lighter, lower sulfur fuel oil would provide negligible SO_2 reductions from this boiler (and all other boilers capable of using fuel oil at the plant). As a result, Weyerhaeuser did not pursue this option further.

The opportunity to **replace the existing trona system** was evaluated. The primary option considered would substitute the dry trona injection system with a hydrated lime injection system. The damp lime dries quickly in the hot flue gases and is effective in removing SO_2 from the flue gas. Weyerhaeuser determined that the injection of hydrated lime would present some technical difficulties. If they were to utilize the available space for a hydrated lime system where the trona system currently exists, the hydrated lime would be injected upstream of the induced draft (ID) fan and utilize the ID fan for mixing of the sorbent with the flue gas.

The primary difficulty anticipated to occur would be the dried and drying lime collecting on the ID fan blades causing the ID fan to fail or be prone to significantly increased maintenance needs. Loss of the ID fan would cause the boiler to shutdown to prevent unsafe or explosive conditions from occurring in the boiler. Loss of the ID fan would result in the boiler being taken out of service until the fan was repaired. Catastrophic loss of the ID fan could cause boiler to explode or require emergency shutdown of the boiler so the fan blades could be cleaned or replaced. Such a shutdown would require other fossil fueled boilers at the plant be started up and used to provide necessary steam at the plant, adding significant costs to plant operations. These operational and cost difficulties caused Weyerhaeuser to conclude this option is not technically feasible.

Two **wet lime/limestone technologies** were evaluated for cost effectiveness using the EPA CUECost emission control cost model. A wet limestone/forced oxidation and a lime spray dryer system were evaluated for cost effectiveness. The wet limestone/forced oxidation system was based on using a conventional wet scrubber such as a spray tower with limestone slurry as the scrubbing liquor. In a lime spray dryer, the wet scrubber is replaced with a slurry injection into the flue duct and the resulting dry material is collected in the ESP. The capital cost to add a wet scrubber/forced oxidation system on the No. 11 Power Boiler is estimated to be about $75 million. The lime spray dryer technology is estimated to be at about $55 million.

In both cases, the cost effectiveness is above $17,000/ton and is not considered cost effective by Weyerhaeuser. One additional constraint not entirely accounted for in the CUECost model is the amount of existing new and old equipment that would need to be demolished to provide adequate space for the new wet scrubber and particulate control. Due to the location of this boiler, its support equipment and other plant process structures and underground piping, Weyerhaeuser has concerns if there is adequate space to install additional emission controls on this boiler.

Weyerhaeuser also evaluated installation of a wet lime/limestone scrubber after the ESP. Using a cost estimate for another Weyerhaeuser facility, scaling it to this boiler's size, but not including costs to relocate existing equipment and above and underground structures, indicates a cost effectiveness of $24,000/ton.

After considering the available control options, Weyerhaeuser proposed that the existing trona system combined with the existing low sulfur fuel mix as BART for SO_2 from this boiler.

2.3.4 Weyerhaeuser's BART Proposal for the No. 11 Power Boiler

For PM/PM_{10} control, Weyerhaeuser proposed continued use of the existing multiclone/ESP system meeting a limit of 0.050 grain/dscf as BART.

For NO_X control, Weyerhaeuser proposed continued operation of the boiler's current staged combustion system and fuel mix as BART.

For SO_2 control, Weyerhaeuser proposed continued use of low sulfur fuels and operation of the existing trona dry sorbent injection system as BART.

2.4 Weyerhaeuser's Proposed BART

A summary of the emission controls and emission limitations proposed as BART by Weyerhaeuser is shown in Table 2-4.

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Table 2-4. SUMMARY OF WEYERHAEUSER'S PROPOSED BART

Pollutant	Emission Unit	Proposed BART Control Option	Control Option Emissions Level or Control Efficiency
PM_{10}	No. 11 Power Boiler	Existing ESP	0.050 grain/dscf @ 7% O_2 (current limit)
	No. 10 Recovery Furnace	Existing ESP	0.027 gr/dscf, per test, and 0.020 grain/dscf, annual average (current BACT limits in PSD 92-03, Amendment 4)
	Smelt Dissolver Tank	Existing High Efficiency Wet Scrubber	0.120 lb/BLS (current BACT limit in PSD 92-03, Amendment 4)
NO_X	No. 11 Power Boiler	Existing Combustion System	(0.30x + 0.70y)/(x + y) lb per MMBtu (derived from solid fossil fuel, liquid fossil fuel and wood residue) (40 CFR 60.44(b) which also defines the variables)
	No. 10 Recovery Furnace	Existing Staged Combustion System	140 ppm @ 8% O_2 (current BACT limit in PSD 92-03, Amendment 4)
	Smelt Dissolver Tank	N/A	No limit required
SO_2	No. 11 Power Boiler	Fuel mix and trona injection system	1000 ppm @ 7% O_2, 1-hour average, (0.8y +1.2z)/(y +z) lb per MMBtu. (derived from burning a mixture of liquid and solid fossil fuel) (40 CFR 60.43(b) which also defines the variables)
	No. 10 Recovery Furnace	Good Operating Practices	75 PPM @ 8% O_2 (current BACT limit in PSD 92-03, Amendment 4
	Smelt Dissolver Tank	N/A	No limit required

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3. VISIBILITY IMPACTS AND DEGREE OF IMPROVEMENT

A Class I area visibility impact analysis was performed on the BART-eligible emission units at Weyerhaeuser using the CALPUFF model with four kilometer grid spacing as recommended by Washington's BART modeling protocol. The modeled 24-hour average visibility impacts at each Class I area within 300 km of the Weyerhaeuser Mill and the Columbia River Gorge National Scenic Area are shown in Table 3-1.

Table 3-1. BASELINE VISIBILITY MODELING RESULTS

Class I Area	8th High 2003 Δdv	8th High 2004 Δdv	8th High 2005 Δdv	2003/05 22nd High Δdv
North Cascades National Park	0.127	0.223	0.227	0.218
Glacier Peak Wilderness Area	0.214	0.287	0.206	0.248
Olympic National Park	0.470	0.654	0.638	0.583
Alpine Lakes Wilderness Area	0.274	0.513	0.398	0.400
Mount Rainier National Park	0.540	0.973	0.572	0.595
Goat Rocks Wilderness Area	0.384	0.535	0.457	0.457
Mount Adams Wilderness Area	0.433	0.440	0.436	0.440
Mount Hood Wilderness Area	0.725	0.677	0.628	0.689
Mount Jefferson Wilderness Area	0.440	0.375	0.287	0.367
Mount Washington Wilderness Area	0.303	0.345	0.229	0.289
Three Sisters Wilderness Area	0.340	0.361	0.257	0.291
Diamond Peak Wilderness Area	0.203	0.224	0.148	0.192
Class II Area Evaluated				
Columbia River Gorge National Scenic Area	0.809	0.662	0.637	0.675

The results presented in Table 3-1 indicate that the 98th percentile visibility impact calculated exceeds the 0.5 dv contribution threshold for five of the 12 Class I areas within 300 km of the plant (the shaded cells). The maximum 98th percentile visibility impact occurs at Mt. Rainier National Park.

The maximum 24-hour emission rates that were modeled are shown in Table 3-2. These are the maximum rates during the 2003-2005 time period and do not reflect any reductions that may have been achieved at the No. 11 Power Boiler through the replacement of the electrified gravel bed particulate control with the current ESP and trona injection system in 2006. This project occurred after the period of time modeled for visibility impacts, but did not result in the imposition of any new or lower emission limitations. As a result, no emission reduction was modeled to reflect this replacement control equipment.

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Table 3-2. MAXIMUM 24-HOUR AVERAGE ACTUAL EMISSION RATES

Emission Unit	NO_X (lb/hr)	SO_2 (lb/hr)	H_2SO_4 (lb/hr)	Filterable PM_{10}[a] (lb/hr)	Total PM_{10}[b] (lb/hr)
Recovery Boiler	222	2	4	10	22
Smelt Dissolver Tank	0	0	0	4	6
No. 11 Power Boiler	426	344	3	48	63

[a] Filterable PM_{10} represents the sum of the modeled filterable PM speciation groups of PMC, PMF, and EC.
[b] Total PM_{10} (TPM_{10}) represents the sum of the modeled filterable and condensable PM, including sulfuric acid (H_2SO_4).

Net Visibility Improvement

Weyerhaeuser did not evaluate the potential visibility reductions that could accrue from the emission controls evaluated. None of the controls evaluated were technically or economically feasible in Weyerhaeuser's opinion. As explained above, the actual emission reductions from the upgrades and modifications completed in 2006 to the No. 11 Power Boiler were also not modeled.

4. ECOLOGY'S BART DETERMINATION

Ecology has reviewed the information submitted by Weyerhaeuser. Ecology agrees with the analyses performed by Weyerhaeuser and has determined that the current levels of control are BART for the three BART-eligible process units. The controls and emission limitations are summarized in Table 2-4 and repeated in Table 4-1 below.

As noted above, Weyerhaeuser has noted a lack of physical space to install certain controls such as additional controls on the No. 11 Power Boiler. In February 2008, Ecology made a site inspection of all the BART eligible units at the Weyerhaeuser facility. Based on that inspection, we agree that there are site constraints on the No. 11 Power Boiler that prevent or would require costly modifications to existing infrastructure to provide space for upgrades and modifications to the particulate and SO_2 controls currently installed.

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Table 4-1. ECOLOGY'S DETERMINATION OF EMISSION CONTROLS THAT CONSTITUTE BART

Pollutant	Emission Unit	Proposed BART Control Option	Control Option Emissions Level or Control Efficiency
PM_{10}	No. 11 Power Boiler	Existing ESP	0.050 grain/dscf @ 7% O_2 (current limit)
	No. 10 Recovery Furnace	Existing ESP	0.027 gr/dscf, per test, and 0.020 grain/dscf, annual average (current BACT limits in PSD 92-03, Amendment 4)
	Smelt Dissolver Tank	Existing High Efficiency Wet Scrubber	0.120 lb/BLS (current BACT limit in PSD 92-03, Amendment 4)
NO_X	No. 11 Power Boiler	Existing Combustion System	(0.30x + 0.70y)/(x + y) lb per MMBtu (derived from solid fossil fuel, liquid fossil fuel and wood residue) (40 CFR 60.44(b) which also defines the variables)
	No. 10 Recovery Furnace	Existing Staged Combustion System	140 ppm @ 8% O_2 (current BACT limit in PSD 92-03, Amendment 4)
	Smelt Dissolver Tank	N/A	No limit required
SO_2	No. 11 Power Boiler	Fuel mix and trona injection system	1000 ppm @ 7% O_2, 1-hour average, (0.8y +1.2z)/(y +z) lb per MMBtu. (derived from burning a mixture of liquid and solid fossil fuel) (40 CFR 60.43(b) which also defines the variables)
	No. 10 Recovery Furnace	Good Operating Practices	75 PPM @ 8% O_2 (current BACT limit in PSD 92-03, Amendment 4
	Smelt Dissolver Tank	N/A	No limit required

4.1 No. 10 Recovery Furnace BART Determination

For PM_{10} emissions control, Ecology determined that BART is the current level of control provided by the existing ESP and BACT established emission limitation. No new technologies

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for controlling PM have become available since the BACT limitation was established, so Ecology accepts this BACT limit as BART.

For NO_X control, Ecology determined that BART is the current level of control established in PSD 92-03, which is proper operation of the existing tertiary, staged combustion system to both promote optimum combustion and control the Kraft recovery sodium sulfate reactions. Good combustion practices that optimize the staged combustion inherent in the design of the furnace are the only available technology for control of NO_X. All alternative NO_X control technologies were found to be technically or financially infeasible.

While not evaluated by Weyerhaeuser, the potential to install a LoTOx® system on the recovery furnace was evaluated by Ecology using information acquired through evaluations for its potential use at an oil refinery. To date, Ecology has been unable to find any other location that uses the LoTOx system on any combustion unit outside of the oil refining industry except for one lead smelter.

The principle problems with the use of the LoTOx technology on the Weyerhaeuser recovery furnace is the retrofit costs, determining where to locate the equipment, and what impacts may occur on the wastewater treatment system resulting from the new stream of nitrates being added. LoTOx operates best at a maximum temperature below 300°F. The installation of LoTOx on the recovery furnace would entail at a minimum rerouting of the ducting from the ESPs to the stack to the location of the new unit, installation of water supply, oxygen/ozone supply equipment, installation of the LoTOx reactor/scrubber and either a new stack or routing the wet scrubber exhaust to the existing stack. It is more likely that a new stack would be needed to handle the corrosion issues resulting from the “wet stack” conditions that will occur after the wet scrubber portion of the LoTOx system.

Ecology has not done an exhaustive cost analysis for installation of LoTOx on this furnace. We have reviewed the cost analysis performed for the CO boiler at the Tesoro Refinery and cost analyses performed in Texas as part of their cement kiln study and other reviews of the technology. Based on that review, we have found that given an equivalent “new” installation or where LoTOx is not required to add to or replace an existing control system that LoTOx and SNCR are approximately equal in cost effectiveness in $/ton removed. However, the much more extensive retrofit costs associated with this installation lead us to the conclusion that the cost will be much higher. We agree with Weyerhaeuser that the cost to install and use SNCR of $6,600/ton removed not cost effective for SNCR. With the cost for LoTOx anticipated to be higher yet, we conclude the technology while available and technically feasible is not financially feasible.

Again, for add-on SO_2 control, Ecology has also evaluated the opportunity to add a new wet scrubber to the recovery furnace system. Unlike the statements by NCASI that there are no SO_2 scrubbing systems operating on Kraft recovery furnaces, Ecology is aware that there are at least

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two such units operating in Washington.[24] In one case, an SO_2 emission limitation of 10 ppm was imposed by Ecology in permitting. In the other case, no emission removal credit was given to the unit, establishing an emission limit of 150 ppm based on capability of the recovery furnace. As with the LoTOx system, this would require extensive rerouting of fuel ducts from the existing dry ESPs to a new wet scrubber (or even to insert a wet scrubber between the furnace and the ESPs). As noted above, the existing stack is designed for "dry" conditions and is unlikely to be able to sustain continuous operation with a saturated flue gas before suffering corrosion failure. As a result, we do not believe that adding a "water only" wet scrubber for additional SO_2 control is an option.

For SO_2 control, Ecology has determined that BART is operation of the furnace using a tertiary air system, use of "good operating practices" and meeting the emission limitation in PSD 92-03, Amendment 4. Good operating practices entail promoting the efficient recovery of sulfur by maintaining the char bed at a level that results in maximum retention of sulfur in the smelt, and minimize emissions of SO_2. No add on SO_2 control technology was found to be technically or financially feasible for installation on this recovery furnace.

4.2 No. 10 Smelt Dissolver Tank BART Determination

For PM_{10} control, Ecology determined that BART is the current level of control provided by the existing wet scrubber to comply with the existing BACT limit of 0.120 lb PM_{10} per ton BLS. Since the No. 10 Smelt Dissolver Tank is not a source of NO_X and a negligible source of SO_2 no additional controls are required for those pollutants.

4.3 No. 11 Power Boiler BART Determination

For PM/PM_{10} control, Ecology determined that BART is the current level of control provided by the recently installed dry ESP. Ecology agrees with Weyerhaeuser that there are no new emission controls available that will remove more particulate matter than the current system. For NO_X control, Ecology determines that BART is to continue using good operation of the boiler's staged combustion system BART as optimized in 2006/07. Ecology agrees with Weyerhaeuser's analysis that no other NO_X reduction technology exists that is both technically and financially feasible for installation on this unit.

We have also evaluated the option to install a LoTOx system on this boiler. We believe that this technology is available and technically feasible for use on this power boiler. However, we could find no installation of the technology on a boiler using solid fuels. This then brings the technology transfer of this technique into question.

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[24] The units are advertised as heat recovery systems (heat recovery scrubbers) intended to provide hot water at about 140 to 150°F for use in plant processes. Prior to the hot water production, an alkaline scrubbing section is included to remove SO_2 and any particulates remaining after the particulate control system. In one case, Ecology recognized that the process removed SO_2 and issued a permit reflecting that situation. In another case, Ecology accepted the company's proposal that no additional removal was provided by the heat recovery scrubber system.

January 22, 2009

The area where a LoTOx system could be installed is already highly constructed with underground and overhead utilities and structures. The wet, potentially acidic nature of the exhaust gas from the control is incompatible with a dry ESP system. There is no opportunity on this boiler to add it to the outlet of the ESP system due to the simple lack of space to install it. For these and the reasons given for the recovery furnace, Ecology does not consider a LoTOx system to be a cost effective emission control system to install on this power boiler.

For SO_2 control, Ecology determines that BART is continued operation of the existing trona dry sorbent injection system, and to continue to practice good operation of the boiler aimed at minimizing fuel oil firing.

January 22, 2009

APPENDIX A. PRINCIPLE REFERENCES USED

CH2M-Hill, “Best Available Retrofit Technology Analysis Report, Weyerhaeuser Corporation Longview, WA,” December 2007, Revised June 2008.

Greg Bean et al. to Alan Newman, letters responding to comments on December 2007 BART report, March 7, 2008 and June 2008.

SNCR Committee, Institute of Clean Air Companies, “White Paper: Selective Non-Catalytic Reduction (SNCR) for Controlling NO_X Emissions,” February 2008.

Arun Someshwar and Ashok Jain, NCASI, “Forest Products Industry Boilers: A Review of Technologies, Costs and Industry Experience, Special Report No. 03-04,” August 2003.

Raytheon Engineers and Constructors, Inc. and Easter Research Group, Inc., “Coal Utility Environmental cost (CUECost) Workbook Users Manual and Excel Spreadsheet,” Version 1.0, provided by EPA, 1998.

Air and Waste Management Association, Editors, Anthony Buonicore and Wayne Davis, “Air Pollution Engineering Manual,” Von Nostrand Reinhold, 1992.

“EPA Air Pollution Control Cost Manual,” Sixth Edition, EPA/452/B-02-001, January 2002.

N. Confuorto and J. Sexton, “Wet Scrubbing Based NO_X Control Using LoTOx™ Technology – First Commercial FCC Start-up Experience,” presented at NPRA Environmental Conference, September 24-25, 2007.

Belco Technologies Corp., “Flue Gas Scrubbing of FCCU Regenerator Flue Gas – Performance, Reliability, and Flexibility – A Case History,” company report, undated.

William Ellison, P.E., “Simultaneous SO_2, NO_X and HG Removal in Dry/Semi-Dry FGD Operation,” presented at 29th International Technical Conference on Coal Utilization & Fuel Systems, April 2004.

BOC Gas Solutions, “Low Temperature Oxidation System Demonstration at RSR Quemetco, Inc, City of Industry California,” California Air Resources Board Innovative Clean Air Technology Grant ICAT99-2, report dated June 28, 2001.

January 22, 2009

APPENDIX B

Cost effectiveness calculation for SO_2 controls at Weyerhaeuser's No. 11 Power Boiler.

The values in the table are copied from the CUECost model output included in the Weyerhaeuser BART Analysis Report and are reformatted and converted into the annualized cost effectiveness value. The CUECost model is a conservative cost analysis model developed for EPA and is suitable for planning level cost analyses.

Interest Rate			0.07	based on annual average lb/hr rate.			
CRF			0.0944				
	Removal rate	Capital Costs (CUECost)	Annualized capital	O&M costs (CUECost)	Total annual cost	Controlled emissions	$/ton Controlled
LSFO	0.95	74193089	7003827.6	6305121	13308949	682.404	$ 19,503
LSD	0.9	55437854	5233333.4	5824429	11057762	646.488	$ 17,104

APPENDIX C. ACRONYMS/ABBREVIATIONS

BACT	Best Available Control Technology
BART	Best Available Retrofit Technology
BLS	Black Liquor Solids
dv	Deciview(s)
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
ESP	Electrostatic Precipitator
FCCU	Fluid Catalytic Cracking Unit
FGR	Flue Gas Recirculation
LAER	Lowest Achievable Emission Rate
LNBs	Low-NO_X Burners
MMBtu	Million British Thermal Units
NCASI	National Council for Air and Stream Improvement
NDCE	Non-Direct Contact Evaporator
NO_X	Nitrogen Oxides
NWCAA	Northwest Clean Air Agency
PM	Particulate Matter
ppm	Parts per Million
ppmdv	Parts per Million Dry Volume
ppmv	Parts per Million by Volume
RACT	Reasonably Available Control Technology
SCR	Selective Catalytic Reduction
SNCR	Selective Non-Catalytic Reduction
SO_2	Sulfur Dioxide
SRU	Sulfur Recovery Unit
SWS	Sour Water Stripper
Tesoro	Tesoro Refining and Marketing Company
TGU	Tail Gas Unit
tpy	Tons per Year
ULNBs	Ultra-low-NO_X Burners
VOC(s)	Volatile Organic Compound(s)

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600 ◦ Olympia, WA 98504-7600 ◦ 360-407-6000
711 for Washington Relay Service ◦ Persons with a speech disability can call 877-833-6341

July 7, 2010

Mr. Frank Busch
Weyerhaeuser Corporation
3401 Industrial Way
Longview, WA 98632

Dear Mr. Busch:

Regional Haze Best Available Retrofit Technology (BART) Determination

Best Available Retrofit Technology (BART) is required to reduce the regional haze impacts of emissions of your facility. The enclosed Order #7840 contains our BART determination for your facility.

If you have questions or requests relating to this order, please contact Alan Newman at (360) 407-6810 or alan.newman@ecy.wa.gov.

Sincerely,

Jeff Johnston, Ph.D.
Manager, Science and Engineering Section
Air Quality Program

jj/te

Enclosure

By certified mail

cc: Greg Bean, Weyerhaeuser Corporation
Marc Crooks, Industrial Section
Alan Newman, Ecology
Brian Wood, Weyerhaeuser Corporation

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

IN THE MATTER OF AN ADMINISTRATIVE ORDER AGAINST: Weyerhaeuser Corporation	]]]]]	ORDER NO. 7840

TO: Mr. Frank Busch
Weyerhaeuser Corporation
3401 Industrial Way
Longview, WA 98632

This is an Administrative Order requiring your company to comply with WAC 173-400-151 by taking the actions that are described below. Chapter 70.94 RCW authorizes the Washington State Department of Ecology's Air Quality Program (Ecology) to issue Administrative Orders to require compliance with the requirements of Chapter 70.94 RCW and regulations issued to implement it.

Ecology has determined that portions of your facility are subject to the provisions of the federal and state visibility protection program (WAC 173-400-151 and 40 CFR Part 51, Subpart P). The rules require that the State determine what technologies and level of emission control constitutes Best Available Retrofit Technology (BART) for the eligible emission units at your facility.

FINDINGS

A. The Weyerhaeuser Corporation (Weyerhaeuser) operates an integrated pulp and paper mill located in Longview, Washington, which contains three emission units that are subject to BART.

B. The BART-eligible emission units are the No. 10 Recovery Furnace, the No. 10 Smelt Dissolver Tank, and the No. 11 Power Boiler.

C. Emissions from BART units are controlled by:

   a. Use of an electrostatic precipitator (ESP) to control PM/PM_{10} emissions from the non-direct contact evaporator (NDCE) Recovery Furnace.

   b. Use of a tertiary air system for black liquor combustion in the No. 10 Recovery Furnace to control SO_2 and NO_X emissions.

   c. Use of a high efficiency wet scrubber to control PM/PM_{10} and SO_2 emissions from the No. 10 Smelt Dissolver Tank.

   d. Use of an ESP for control of PM/PM_{10} emissions from the No. 11 Power Boiler.

e. Use of a dry trona injection system to control SO_2 from the No. 11 Power Boiler.

D. Ecology has determined that the emission controls currently installed on these units meet the requirements of BART.

E. Ecology has determined that Weyerhaeuser has met the requirements of Administrative Order No. #5074, which required submittal of a BART Technical Analysis for the BART-eligible units at Weyerhaeuser's Longview facility.

Additional information and analysis is available in the BART Determination Support Document for Weyerhaeuser Corporation, Longview, Washington, prepared by the Washington State Department of Ecology, October 2008, and the Best Available Retrofit Technology Analysis Report, Weyerhaeuser Corporation Longview, Washington, December 2007, prepared by CH2M-Hill and revised June 2008.

YOU ARE ORDERED: To operate existing emission control equipment for the No. 11 Power Boiler, No. 10 Recovery Furnace, and No. 10 Smelt Dissolver Tank in accordance with the following conditions:

1. BART Emission Limitations

1.1. No. 11 Power Boiler

1.1.1. Meet the emission limitations for particulate matter found in Order DE 94AQ-I080, issued December 9, 1994.

1.1.2. Meet the emission limitations for nitrogen oxides found in 40 CFR 60.44(b), as published July 1, 2008.

1.1.3. Meet the emission limitations for sulfur dioxide found in 40 CFR 60.43(b), as published July 1, 2008.

1.2. No. 10 Recovery Furnace

1.2.1. Meet the emission limitations for particulate matter found in PSD 92-03, Amendment 4, Condition 3, issued December 7, 1999.

1.2.2. Meet the emission limitations for nitrogen oxides found in PSD 92-03, Amendment 4, Condition 7, issued December 7, 1999.

1.2.3. Meet the emission limitations for sulfur dioxide found in PSD 92-03, Amendment 4, Condition 5, issued December 7, 1999.

1.3. No. 10 Smelt Dissolver Tank

1.3.1. Meet the emission limitations for particulate matter found in PSD 92-03, Amendment 4, Condition 14, issued December 7, 1999.

1.4. Compliance will be determined as specified in Order DE 94AQ-I080, issued December 9, 1994, and PSD 92-03, Amendment 4, issued December 7, 1999, or 40 CFR 60.45(b)(2) or 40 CFR 60.45(b)(3), as published July 1, 2008, as appropriate.

2. Schedule for Compliance

2.1. Compliance with the emission limitations for particulate matter, nitrogen oxides, and sulfur dioxide is required upon the effective date of this Order.

3. Monitoring and Recordkeeping Requirements

3.1. Monitoring and recordkeeping requirements for particulate matter, nitrogen oxides, and sulfur dioxide are contained in Order No. DE 94AQ-I080, issued December 9, 1994, and PSD 92-03, Amendment 4, issued December 7, 1999.

4. Reporting Requirements

4.1. Reporting requirements for particulate matter, nitrogen oxides, and sulfur dioxide are contained in Order No. DE 94AQ-I080, issued December 9, 1994, and PSD 92-03, Amendment 4, issued December 7, 1999.

Failure to comply with this Order may result in the issuance of civil penalties or other actions, whether administrative or judicial, to enforce the terms of this Order.

You have a right to appeal this Order. To appeal you must:

- File your appeal with the Pollution Control Hearing Board within 30 days of the "date of receipt" of this document. Filing means actual receipt by the Board during regular office hours.

- Serve your appeal on the Department of Ecology within 30 days of the "date of receipt" of this document. Service may be accomplished by any of the procedures identified in WAC 371-08-305(10). "Date of receipt" is defined at RCW 43.21B.001(2).

If you appeal, you must:

- Include a copy of this document with your Notice of Appeal.
- Serve and file your appeal in paper form; electronic copies are not accepted.

To file your appeal with the Pollution Control Hearing Board:

Mail appeal to:		Deliver your appeal in person to:
The Pollution Control Hearings Board P.O. Box 40903 Olympia, WA 98504-0903	OR	The Pollution Control Hearings Board 4224–6th Avenue SE Rowe Six, Bldg 2 Lacey, WA 98503

To serve your appeal on the Department of Ecology:

Mail appeal to:		Deliver your appeal in person to:
Department of Ecology Appeals Coordinator P.O. Box 47608 Olympia, WA 98504-7608	OR	Department of Ecology Appeals Coordinator 300 Desmond Drive SE Lacey, WA 98503

And send a copy of your appeal packet to:

Alan Newman
Department of Ecology
Air Quality Program
P.O. Box 47600
Olympia, WA 98504-7600

For additional information, go to the Environmental Hearings Office website at http://www.eho.wa.gov.

To find laws and agency rules, go to the Washington State Legislator website at http://www1.leg.wa.gov/CodeReviser.

Your appeal alone will not stay the effectiveness of this Order. Stay requests must be submitted in accordance with RCW 43.21B.320. These procedures are consistent with Chapter 43.21B RCW.

DATED this 7 day of July, 20 10 at Olympia, Washington.

Jeff C Johnston

Jeff Johnston, Ph.D.
Manager, Science and Engineering Section
Department of Ecology
Air Quality Program

Air Quality Program
Notice of Public Hearing

Reducing Haze-Causing Emissions From Industrial Plants

Ecology will hold a public hearing to receive comments on plans to reduce emissions from six industrial plants in Washington. These plants emit air pollutants that cause or contribute to visibility-limiting haze in national parks and wilderness areas. The federal government has directed states to reduce regional haze. Air pollutants that cause haze include fine particles, sulfur dioxide, and nitrogen oxides.

How will emissions be reduced?

Ecology is working with the owners of six industrial plants:

- The BP Cherry Point refinery in Whatcom County;
- The Alcoa Intalco Works aluminum smelter in Whatcom County;
- The Tesoro refinery in Skagit County;
- The Lafarge cement plant in Seattle;
- The Port Townsend Paper Corporation mill; and
- The Weyerhaeuser Corporation paper mill in Longview.

Each of these plants will reduce their emissions through Best Available Retrofit Technology (BART). BART is used for emission units that never met current emission limits, because they were in use before those limits became effective. BART means the existing equipment is updated with technology to reduce its emissions as much as possible. To be selected as BART, a control technology must be available, technically feasible, cost effective, and improve visibility. It must also have a low chance of causing any other negative environmental effects.

Hearing schedule

A public hearing is scheduled for:

Tuesday, October 27, 2009
6:00 p.m.
Ecology Headquarters Building, Auditorium
300 Desmond Drive
Lacey, WA

How to review and comment

The proposed BART determinations and related documents will be available for review at the following locations:

Bellingham Public Library
210 Central Avenue
CS-9710
Bellingham, WA 98227-9710
360-778-7323

Mount Vernon City Library
315 Snoqualmie Street
Mt. Vernon, WA 98273
360-336-6209

Seattle Public Library – Central Library
1000 Fourth Avenue
Seattle, WA 98104
206-386-4636

Port Townsend Public Library
1220 Lawrence Street
Port Townsend, WA 98368
360-385-3181

Longview Public Library
1600 Louisiana Street
Longview, WA 98632
360-442-5300

Ecology will accept comments from September 15 through November 6, 2009. Send comments to:

Al Newman
Department of Ecology
Air Quality Program
P.O. Box 47600
Lacey, WA 98504-7600
AQcomments@ecy.wa.gov

For more information

For more information, contact:

Al Newman
Department of Ecology
Air Quality Program
(360) 407-6810
alan.newman@ecy.wa.gov

or go to:
http://www.ecy.wa.gov/programs/air/globalwarm_RegHaze/bart/bartinformation.html

If you need this publication in another format, please contact the Air Quality Program at (360) 407-6800. If you have a hearing loss, call 711 for Washington Relay Service. If you have a speech disability, call 877-833-6341.

DEPARTMENT OF ECOLOGY
State of Washington

CORRECTION TO NOTICE PUBLISHED 9/9/09

Air Quality Program
Notice of Public Hearing

Ecology/TransAlta Mediation Agreement – CORRECTED NOTICE

The notice published on September 9, 2009 gave the time of the public hearing as 7:00 p.m. This notice corrects the time to 6:30 p.m. All other information in the previous notice is correct.

Ecology and the owner of TransAlta have reached a proposed agreement for TransAlta's Centralia area coal-fired power plant to reduce its mercury and nitrogen oxide emissions. Ecology is holding a public hearing to receive comments on this agreement, and on Best Available Retrofit Technology for TransAlta.

What's in the agreement?

The agreement focuses on two air pollutants: mercury and nitrogen oxides (NOx).

- **Mercury**: TransAlta will voluntarily purchase and use technologies that will remove up to 50 percent of its mercury emissions by 2012. TransAlta has also voluntarily installed technology for measuring mercury, and will begin self-reporting mercury emissions in 2009.
- **NOx:** Ecology and TransAlta agree that TransAlta's existing emission technologies make up "Best Available Retrofit Technology" (BART) for the Centralia plant. Ecology will issue a regulatory order requiring BART at the plant. See the heading "What is Best Available Retrofit Technology," below, for more information.

What is Best Available Retrofit Technology?

Best Available Retrofit Technology (BART) is set for emission units that were in use before current emission control limits became effective, and therefore never met the current limits. BART means the existing equipment is updated with technology that will reduce its emissions as much as possible. The BART determination for TransAlta is required under the federal Regional Haze rules. Ecology will submit the TransAlta BART determination to EPA for approval as part of the Regional Haze State Implementation Plan. A State Implementation Plan is a plan for meeting air quality standards in a specific area.

Why use a voluntary agreement instead of a regulation or an order?

Right now, neither Washington nor the federal government have regulations that require coal-fired power plants to reduce their mercury emissions. Because there is no regulation, a voluntary agreement is the only way to get mercury reductions from power plants.

Ecology worked on a mercury regulation for nearly two years. Ecology based its regulation on the federal regulation. When a court threw out the federal regulation in February 2008, Ecology was forced to withdraw its state regulation as well.

TransAlta requested mediation to discuss a variety of environmental issues, including NOx emissions. When the mercury regulation was withdrawn, mercury emissions were added to those discussions.

Hearing schedule

A public hearing is scheduled for:

Tuesday, October 13, 2009
6:30 p.m.
Ecology Headquarters Building, Auditorium
300 Desmond Drive
Lacey, WA

How to comment

Ecology will accept comments on the proposed mediation agreement and BART determination from September 14 through November 9, 2009. Send comments to:

AQcomments@ecy.wa.gov

OR

Sarah Rees
Washington State Department of Ecology
Air Quality Program
P.O. Box 47600
Lacey, WA 98504-7600

For more information

For more information, see http://www.ecy.wa.gov/programs/air/TransAlta/TransAltaAgreement.html or contact:

Sarah Rees
Washington State Department of Ecology
Air Quality Program
(360) 407-6823
Sarah.rees@ecy.wa.gov

If you need this publication in another format, please contact the Air Quality Program at (360) 407-6800. If you have a hearing loss, call 711 for Washington Relay Service. If you have a speech disability, call 877-833-6341.

Ecology's Response to Comments on 6 Draft BART Technical Support Documents and Compliance Orders

Comments received on the proposed BART documents are provided below. There is an index table for written comments received. You can find the responses to each comment by going to the page numbers referenced in the table.

Written Comments	
Name / Organization	**Page #**
James C. Langford	1
US Forest Service	1, 7
National Parks Service	1, 3, 4, 8
Trinity Consultants	3
Tesoro Refining and Marketing	8
Lou Kings	9
Thea Levkotitz	9
Bill Pease	9

Response to general comments:

General comments:

1. James C. Langford
   I believe in emission controls but your group has no business in keeping on pushing for lower and lower limits when you are ignoring China and India and their air pollution that travels here. Seems like the only public you are interested in is destroying the US economy. I am told to test for fraud actions like your group would engender is to follow the money and how much are you asking? Come on!!!

Response:

Protecting the air quality in Washington State is an important component of air pollution control. As you correctly indicate, air pollution has been demonstrated to travel from Asia to North America. While this may be an important source of pollutants, the State of Washington is unable to affect those emissions. As part of the State's Regional Haze State Implementation Plan (RH SIP) we demonstrate that a portion of the visibility impairment on the worst days is due to air pollutants crossing the Pacific Ocean and from Canada. Control of those pollutants is the responsibility of the US National Government. Washington State is required to work to reduce the impacts from those sources of air pollution that we can control and identify the impacts that are out of our control.

A review of our proposed BART decisions would indicate that we have rejected costly emission controls that could be imposed on the various companies if cost were not a factor in the decision process.

2. US Forest Service and National Park Service
   In general both agencies are concerned with the lack of visibility improvement resulting from the BART process in Washington. The USFS recognizes that the federal guidance gives the state latitude in the importance given to the 5 BART decision factors; they are concerned that visibility improvement is not given enough importance. Instead of relying solely on a cost effectiveness

based on $/ ton of pollutants reduced, Ecology should use a measure such as $/dv improved as outlined in a Sept. 2008 memorandum from Scott Copeland of the USFS or as proposed by EPA Region 9 for use in their BART decision process for power plants located on Indian Reservations in Region 9.

For the National Park Service, this concern about evaluating visibility improvement is especially important when multiple Class I areas are affected by a single facility. Their opinion is that the visibility improvement at all affected Class I areas needs to be included in a cost effectiveness evaluation using a method similar to the ones included in the Sept. 2008 memorandum. They advocate for BART determinations to be based on a $/cumulative dv of improvement. Their compilation of proposed BART determinations indicates that the proposed decisions all result in a maximum cost effectiveness of $12 – 19 million/cumulative dv improved (with one exception at $50 million/cumulative dv).

Response:
Ecology is also concerned over the minimal improvement in visibility resulting from the BART process in Washington. We do note that evaluations performed in developing the Regional Haze Implementation Plan indicate that significant amounts of the visibility impairment at Washington's mandatory Class I Areas comes from Asian and Pacific Offshore sources and for some mandatory Class I Areas, Canada.

Ecology has utilized all 5 factors in the BART process in making its proposed BART decisions including the degree of visibility improvement factor. As noted, the state has latitude in determining the relative importance of the various factors. The EPA BART guidance only requires an evaluation of the degree of visibility improvement anticipated by the proposed emission controls[1]. The guidance does not suggest that the state set a minimum visibility improvement criteria or any other measure of visibility improvement as a determining factor in acceptability of any BART decision. Equivalently the guidance document does not suggest or require that visibility impacts and improvements beyond the nearest mandatory Class I Area to be modeled in great detail, indicating EPA expected states to focus modeling resources on the closest mandatory Class I Areas[2].

For cost effectiveness we are relying on a measure that we know and understand, the $/ton reduced. Between July, 2005 when EPA issued the final BART guidelines until the fall of 2008 when the first proposal from the FLMs was developed on how to do a $/dv measure, no state was using this measure and EPA provided no guidance in how to perform the calculation. Ecology has chosen to follow the lead of essentially all other states in evaluating BART control costs on a $/ton reduced.

To complicate matters more, the Sept. 2008 memorandum referenced by the Forest and Park Services proposes 2 variant methods to calculate cumulative deciviews, noting problems with each approach. An

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[1] EPA comments to S. Dakota DENR, Nov. 13, 2009, on the Big Stone I BART determination states in Comment #7, "The net visibility change between the pre-control and post-control emission control scenarios is the principal visibility related factor to be considered in determining BART limits." See also 40 CFR Part 51, Appendix Y, Section IV.D, Step 5 How should I determine visibility impacts in the BART determination?

[2] See 40 CFR Part 51, Appendix Y, Section III.A.3 Option 1 Individual source Attribution Approach (Dispersion Modeling) and, Section IV.D, Step 5 How should I determine visibility impacts in the BART determination? In both locations EPA advises to have a dense grid of receptors in the nearest Class I areas and for other Class I areas in close proximity to the source, model a few strategic receptors to determine whether affects may be greater than the nearest Class I area. This approach to modeling does not fit with the cumulative visibility improvement approach advocated by the Park and Forest Services.

EPA Region 9 Federal Register Notice concerning how Region 9 would evaluate visibility impacts from 2 power plants located on Navajo Tribal lands, proposed 2 more very different methods to implement a $/dv improved metric.

National Park Service documents appear to utilize variations on the approaches proposed in the Sept. 2008 memorandum. Which is the correct method to use to determine $/dv improved? What is the cost effectiveness threshold when using this approach? What is the basis for a $/dv cost effectiveness threshold? The approaches proposed by the FLMs and EPA Region 9 do not supply the answers or indicate where they lie. The only source of information on what might be an appropriate $/cumulative dv improved cost value is a compilation of proposed BART determinations by Mr. Shepherd of the National Park Service. While informative, the compilation contains information from BART proposals, not the final determinations by individual states.

Separately, Ecology undertook a review of BART determinations included in SIPs submitted to EPA by Western US states. This review indicates no state has relied on the $/dv improved measure to make a BART determination. The RH SIPs that have been submitted and reviewed by Ecology all utilize the $/ton reduced metric for BART. Two of the SIPs reviewed seem to utilize a $/dv measure to support additional further progress emission reductions volunteered by or imposed on individual plants.

Response to comments on Port Townsend Paper Company BART:

1. Trinity Consultants on behalf of Port Townsend Paper Company
   The consultant indicates that footnote ‘a’ to Table 2.6 in the Technical Support Document is inconsistent with the text on Page 28 and the company’s BART analysis regarding the cost effectiveness of adding or converting the existing dry ESP on the No. 10 boiler to a wet ESP and requests that the footnote be corrected.

Response:
Thank you for pointing out the inconsistency. The document will be corrected.

2. National Park Service
   Ecology should consider the visibility improvements that would occur at all of the Class I areas within 300 km of the BART source.

   Ecology should have included evaluations of upgrading and improving operations of existing control equipment, especially the ESP on the recovery furnace and wet scrubber on the power boiler.

   Ecology should expand its evaluation of the cost effectiveness of switching to a lower sulfur fuel oil as a means to reduce SO_2 emissions. Ecology inappropriately rejected the use of lower sulfur fuel oil on a cost basis without also evaluating the visibility benefit from the resulting lower SO_2 emissions. Since the Massachusetts Department of Environmental Protection has proposed that all residual fuel oil be limited to 0.5% sulfur, we believe that this should become the default presumption for SO_2 BART at PTPC.

> Ecology evaluated the visibility impacts of only two options—reductions of PM_{10} from the No. 10 Power Boiler and the Smelt Dissolving Tank. Therefore, the remaining BART determinations are incomplete.
>
> Addition of a wet ESP to control PM_{10} emissions from the Power Boiler #10 is cost-effective and represents BART.

Response:
The initial modeling of the facility covered all Class I Areas within 300 km of the plant. That modeling showed that emissions from the plant exceeded the contribute threshold only at the Olympic National Park. In order to save resources, we focused all subsequent modeling data analyses only on the effects at Olympic National Park, though the modeling domain still contained all the other Class I areas.

Ecology and Port Townsend Paper Company evaluated upgrades and improvements to the existing emission control equipment on the power boiler and recovery furnace as part of the project.

Ecology evaluated the costs of switching to lower sulfur fuel oil in addition to the work done by the company in its analysis. The evaluation is documented in the Technical Support Document and in supporting materials from the company posted on our BART web page, specifically BART Analysis, 2nd Addendum. As demonstrated in our Technical Support Document, the cost of switching to a lower sulfur fuel oil is excessive on a $/ton basis. Since the SO_2 reduction option was not cost effective, we determined that it did not need to have the visibility benefits from using it evaluated.

Based on the lack of information available publically about the Massachusetts Regional Haze SIP, we have reviewed information from Northeast States for Coordinated Air Use Management (NESCAUM) and Mid-Atlantic/Northeast Visibility Union (MANE-VU) about the low sulfur residual fuel proposal and The New Hampshire Regional Haze SIP. This oil sulfur content reduction is not proposed as BART but as a further progress element to achieve SO_2 reductions from all oil combustion (residential, commercial and industrial) sources in the NESCAUM area. There is a schedule of dates to phase in this oil fuel sulfur limitation, with the residual oil limit proposed to be met in 2018. As a result, Ecology cannot accept the NPS proposal that fuel oil with 0.5% sulfur content is presumptive BART for fuel oil used by PT Paper.

Ecology evaluated the visibility of only the 2 options that were possibly cost effective for implementation at the facility. As such, the evaluation is complete in accordance with our understanding of the requirements of the BART guidance.

Ecology respectfully disagrees with the National Park Service that adding a wet electrostatic precipitator to Power Boiler #10 is cost effective.

Response to comments on INTALCO Aluminum Corporation - Ferndale BART:

1. National Park Service
   Sodium based scrubbing systems have been evaluated by Canada and in the US for installation on primary aluminum smelters, including one in Washington. The technology is technically feasible for use, and needs further evaluation here. Ecology notes in its support document that sodium based

scrubbing systems are technically infeasible due to the inability to discharge wastewater. The cost to treat the resulting wastewater is part of the cost analysis step, not the technical feasibility step.

The cost analysis for limestone wet scrubbing appears to overestimate costs. One example is a doubling of the erection costs for the scrubbing system, a cost element present in all BART analyses the NPS has reviewed from Intalco. Other examples are the cost of operating labor and the cost for maintenance materials. Ecology needs to evaluate a one absorber tower configuration for the plant such as was done in Tennessee, but not presented to Ecology by Intalco.

Costs that deviate from the EPA Control Cost Manual approach and factors should be documented and justified by Ecology.

Based on a Rio Tinto–Alcon PSD application in Kentucky and the analysis presented, we believe that a sodium based scrubbing system is cost effective at \$4,387/ton SO_2 removed. Ecology should perform a full 5 factor evaluation of the use of a single vessel sodium based scrubbing system.

Intalco and Ecology should provide modeling results for all Class I areas within 300 km for the base case as well as the 95% potline SO_2 removal case. Ecology should explain how it objectively evaluated the resulting visibility benefits to all of those Class I areas. We believe that, when Ecology does so, it will conclude that 95% SO_2 scrubbing of potline emissions is BART at Intalco.

Response:
Ecology does agree that any wet scrubbing system to control SO_2 at INTALCO Aluminum Corporation - Ferndale (INTALCO) is technically feasible. What is in question is the ability to discharge treated wastewater to Puget Sound. The language of the Technical Support Document was in error or unclear in its statement that a sodium based scrubbing system is technically infeasible due to the inability to discharge wastewater. The cost and difficulty in discharging treated wastewater is however a significant cost impediment that exists at this site. The Technical Support Document will be corrected.

The portion of Puget Sound/Strait of Georgia where the INTALCO plant is located is part of an Aquatic Reserve that was established in 2000. The construction of any new intake and/or discharge structures within the Cherry Point Aquatic Reserve would require an impact analysis, assessment, and Washington Department of Natural Resources authorization of any environmental impacts from the new discharge. The Department of Ecology would have to issue a new National Pollutant Discharge Elimination System (NPDES) permit after the environmental impacts of the new discharge were evaluated. Due to issues with protection of spawning and rearing areas for herring (a primary forage fish for salmon) a new wastewater discharge to the Strait of Georgia/Puget Sound in the area of the INTALCO Smelter are effectively impossible to get. This would apply to the ability to discharge wastewater from any wet scrubbing system, sodium or calcium based. Similarly a land discharge of treated wastewater is difficult to get permitted as a result of wetlands issues.

As noted in the BART analysis from the company and reiterated in the Ecology Technical Support Document, there are regulatory hurdles that would need to be overcome to allow discharge of treated scrubber wastewater to the Georgia Strait at the location of the smelter.

The Park Service notes that four aluminum smelters, including the Goldendale Aluminum smelter, in Washington use a sodium based wet scrubbing system. For the Goldendale smelter, the wet scrubber was located after the fluoride and particulate control system. The primary system wet scrubber was designed to provide a 70% SO_2 reduction and at time of plant closure provided about 80% reduction in SO_2 but the permitting documents in our possession are inadequate to define this as a sodium based wet scrubbing system, only that sodium hydroxide is used for pH control. A clear water scrubber was utilized in the secondary control system, using recirculated water and pH control as needed to keep the pH above 6.0. The addition of the scrubbers to the plant halted its ability to discharge wastewater to the Columbia River. Fortunately, the higher temperatures of the Soderburg smelting process and the plant's location in Eastern Washington allowed it to develop a 'no discharge' wastewater handling system. The plant is currently not operating with 2 of the potlines already dismantled and the last potline is in the process of being dismantled. As a result there is little likelihood of this plant ever operating again. Similarly, another of the facilities identified by the National Park Service, a smelter in The Dalles Oregon, has been converted to a secondary aluminum facility. Based on the available public information on the smelters identified, most are Soderberg facilities, which have a higher gas stream temperature than a prebake facility like INTALCO.

Previously Ecology has evaluated SO_2 controls for the INTALCO facility as part of a PSD permitting exercise that the company abandoned. During that BACT review a number of SO_2 controls were evaluated, including dry and wet scrubbing options utilizing both calcium and sodium based scrubbing systems. These controls were not found to be cost effective at that time either, on both a capital and an annualized basis.

In our analysis of the costs of calcium based wet scrubbing of the potline emissions, INTALCO provided the information on a single vessel option and we did evaluate the effect of all the fine tunings of the cost model advocated by the Park Service. A synopsis of our evaluation of the single vessel option is included in the Technical Support Document. While our costs differ from those presented by the National Park Service, we find that the cost effectiveness of single vessel SO_2 control was higher than what we would require for a new facility, let alone an existing facility. The costs were higher on a $/ton basis than was applied to the coal-fired power plant in Centralia for its limestone based wet scrubbing system. The costs are also higher than what other states have been accepting as cost effective for BART for control of SO_2.

A review of Regional Haze SIPs for states with aluminum smelters and the BART determinations for other aluminum smelters indicates that states have found most smelters are not Subject to BART. Of those that are Subject to BART, the states have determined that the existing emission controls meet the requirements of BART.

We will amend the Technical Support Document to indicate the results of our 'fine tuning' of the LSFO cost effectiveness evaluation.

The applicability of the Rio Tinto-Alcan's analysis of a sodium based scrubbing system on a portion of that facility can only compare the air quality aspects of the installation. However, we have been able to acquire very little information from the State of Kentucky about the project other than to confirm that sodium based scrubbing is being evaluated as one of the SO_2 control options and that BACT has not yet been determined. A sodium based scrubbing system (along with a lime/limestone system) was evaluated as part of a proposed 1998 PSD project at this facility. Based on costs at that time, all wet scrubbing technologies were proposed by INTALCO to not be cost effective. Ecology did not make a BACT decision on this PSD application as the company withdrew their proposal.

The BART process is not focused solely on the air quality benefits of a particular emission control. We are also required under the BART guidelines to look at the non-air quality impacts of the proposed control technology. This is not required of a BACT determination for PSD permitting. As indicated above and in our Technical Support Document[3], Department of Ecology wastewater discharge policies and environmental protection for herring spawning and rearing areas reduces the opportunity for a new or expanded discharge of pollutants into Puget Sound at the INTALCO location. As a result, a no-discharge option for the scrubber wastewater is required. This area is also unable to provide for adequate evaporation to develop a no-discharge system to handle the scrubber wastewater and there are no existing POTWs near and large enough to send the excess scrubber water for treatment.

The visibility impacts at all Class I Areas within 300 km of the INTALCO facility have been modeled and are included in the modeling files. As for the cumulative visibility assessment the National Park Service indicates we should perform, see the general response to this issue given above.

2. The US Forest Service
   We are particularly concerned about the frequency in which this facility is modeled to cause or contribute to visibility impairment at eight Federal Class I areas, primarily due to SO2 emissions from its pot lines. While we recognize that Ecology has evaluated several control technologies and has concluded that none are appropriate to implement as BART, we remain concerned about the lack of improvement in reducing haze caused from this source.

Response:
Thank you for the comment. We have been involved with evaluating SO_2 controls for primary aluminum smelters for a number of years and continue to be concerned with the lack of viable controls for this location and industry as a whole.

Response to comments on Weyerhaeuser Company - Longview BART:

1. The US Forest Service
   The No. 11 Power Boiler at Weyerhaeuser has existing controls (i.e., dry sorbent injection) to reduce SO2 emissions. However that system was originally designed to achieve a 25% reduction in emissions to avoid New Source Review. Dry sorbent injection systems commonly achieve 50 to 90 percent removal. Improved SO2 removal efficiency may be accomplished through use of dry sorbent materials other than Trona, modifications to increase flue gas contact time, or through fine tuning of operational methods.

Response:
The application of dry sorbent injection using Trona at this facility reduces SO_2 at approximately the same level as dry sorbent injection (lime) is anticipated to provide at the Lafarge North America cement plant in Seattle. Alternative approaches were evaluated by the company for SO_2 control; including the use of calcium based sorbents rather than the sodium based Trona. Based on the information submitted by the company and an on-site evaluation of the Trona injection system and the electrostatic precipitator, we believe that there is little opportunity in the current configuration to improve the SO_2 removal efficiency.

[3] INTALCO BART Analysis Technical Support Document, Appendix A, Discussion of sea water scrubbing.

Response to comments on Tesoro Refining and Marketing Company BART:

1. Tesoro Refining and Marketing Company
   The company provided numerous detailed comments related to the internal consistency of the Support Document and one comment to edit proposed emission limitation in the proposed BART Order to be consistent with the requirements of the Order of Approval issued by NWCAA.

Response:
Ecology appreciates the inconsistencies being pointed out and will revise them as appropriate and necessary. The other edits and suggested changes to the Technical Support Document will be evaluated and revised as appropriate.

We also will make the requested correction to the proposed order to be consistent with the underlying regulatory requirement.

Where there are conflicts between the BART Technical Support Document, the comments from the company, and the recently issued (Jan. 26, 2010) Air Operating Permit for the facility, the information in the Air Operating permit will be used to resolve the differences. One example of this is the total heat input rate for heater F6650/6651.

2. National Park Service
   In general, the analyses presented appeared to be reasonable. However, Ecology should have adjusted the costs of plant-wide SO_2 control to account for the values of the additional sulfur recovered from the refinery gas.

   Ecology did not evaluate the visibility improvements that would result from any specific control option. This is especially problematic with respect to Ecology's rejection of plant-wide SO_2 reductions through reductions in the sulfur content of refinery gas.

   We have a fundamental concern with Ecology's decision to not consider the visibility improvements that would occur at all of the Class I areas within 300 km of the BART source.

   We agree that scheduling issues may make it more appropriate to implement the proposed controls under the Reasonable Progress provisions of the WA Regional Haze SIP.

Response:
The value of sulfur is low and the inclusion of an economic benefit from the additional sulfur available for sale is low. Ecology does not consider that its exclusion changes the overall cost effectiveness for implementing a lower refinery fuel gas sulfur level.

Ecology recognized the cost of modeling potentially 3 or 4 control scenarios at between 15 and 30 individual emission units at the 2 Subject-to-BART oil refineries. As a result, we directed the companies to focus modeling resources on the effects of control scenarios that were likely to be implemented.

The visibility impacts at all Class I areas within 300 km of the Tesoro refinery have been modeled and are included in the modeling files and the Support Document. As for a cumulative visibility assessment, see the general response to this issue given above.

Response to comments on Lafarge North America BART:

1. Lou Kings
   Lou Kings submitted a comment in support of the Proposed BART Determination.

Response:
Thank you.

2. Thea Levkotitz
   Request from Thea Levkovitz on behalf of the Duwamish River Cleanup Coalition that the BART hearing covering the Lafarge facility be held closer to the Duwamish Community which is located near the plant.

Response:
The Department held a single public hearing for 6 of the 7 BART determinations that have been proposed. This single hearing was held in Olympia due to the large geographic spread of the facilities involved. The hearing was held at the time and place in the public notice and no one showed up to talk in favor or against the proposals.

3. Bill Pease
   Bill Pease was concerned with holding a single public hearing in Olympia. He was also concerned with the BART process in general focusing on a select few industrial sources while many more are not being evaluated. His BART process concerns specifically are about the focus on the 6 facilities included in the public hearing that included the proposed BART determination for the Lafarge facility and why this made any sense.

Response:
See above response to the single hearing in Olympia comment.

The Best Available Retrofit Technology process is a component of the Regional Haze Program contained in Environmental Protection Agency rules. Those rules require a state to develop a plan for the state to meet the federal goals for visibility in 156 National Parks and large Wilderness areas (mandatory Class I Areas). The BART process is circumscribed in the federal Clean Air Act and Environmental Protection Agency rules to apply to a specific subset of all industrial plants in the country.

There are 7 industrial facilities in Washington that meet all the criteria to be in that group of industrial plants. These facilities all meet 4 criteria to be subject to the BART process. These criteria are:
- One or more sources of emissions initially started operation or began construction between Aug. 7, 1962 and Aug. 7, 1977,
- Is one of 26 specific source types listed in the federal Clean Air Act and EPA regulation,
- Has a potential to emit any visibility causing air pollutant at a rate above 250 tons per year, and

- Has a modeled visibility impact at a mandatory Class I Area that causes or contributes to visibility impairment.

The Lafarge North America facility in Seattle is one of the 7 industrial plants in Washington that meet all of these criteria.

ECOLOGY'S RESPONSE TO COMMENTS ON THE DRAFT TRANSALTA BART TECHNICAL SUPPORT DOCUMENT AND COMPLIANCE ORDER

Comments received on the proposed TransAlta Best Available Retrofit Technology (BART) determination are provided below. There is a separate index table for written comments and for verbal testimony received. You can find the responses to each comment by going to the page numbers referenced in the tables.

Two versions of form letters were received by e-mail from multiple stakeholders through Sierra Club's web site. The total number of e-mails for both form letters received prior to the close of the comment period was 1,896. This number does not account for duplicate e-mails that were sent by the same stakeholders. Ecology has consolidated responses to both versions of these form letters below.

Written comments and the content of the form letters can be accessed at http://www.ecy.wa.gov/programs/air/TransAlta/TransAltaAgreement.html.

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Janette K. Brimmer	Earthjustice (Counsel for National Parks Conservation Association, Sierra Club and NW Environmental Defense Center)	5
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Verbal Testimony		
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Response to comments from Dr. Ranajit Sahu:

1. One overall comment on the BART determination for this facility: a proper top-down BART analysis was not completed due to an inadequate analysis of the Selective Catalytic Reduction (SCR) alternative. The reviewer has specific issues with:

- SCR cost analysis submitted by TransAlta.
- Lack of Ecology investigation of combustion system modifications to reduce Nitrogen Oxides (NO_X) and subsequent size of SCR system required.
- No evaluation of alternative locations to install SCR unit such as after the Electrostatic Precipitators (ESPs) or wet scrubbers.
- Inadequate schematics provided to facilitate 3rd party review–unable to determine scale and subsequently distances between objects on the plot and profile drawings.
- No documentation of source for vender quote(s) in CH2MHill reports.
- SCR cost analysis not scrutinized for extraneous costs such as a 16% cost surcharge, the basis of balance of plant charges, why the cost of two SCRs simply double one SCR, since only one reagent system is needed, etc.
- How much catalyst is assumed in the SCR cost analysis? How many layers, etc.?
- Basis for assuming the NO_X emission rate of 0.07lb/MMBtu when a 90% reduction from 0.30 lb/MMBtu would result in a 0.03 lb/MMBtu emission rate, thus increasing the quantity of emissions used in determining cost-effectiveness.
- Additional similar questions related to details of the Selective Non-Catalytic Reduction (SNCR) control alternative.

Response:

Ecology briefly reviewed the SCR option during our review of the January and July BART analyses submitted by TransAlta. The information presented by TransAlta was consistent with information included in references reviewed in preparation for reviewing all BART analysis submitted in Washington. Familiarity of the Ecology staff and local permitting authority with the physical constraints on adding additional emission controls or reconfiguring exhaust gas flow paths to accommodate new add on emission controls lead us to agree that the costs for inclusion of SCR would have high installation costs.

As a result, we did not investigate the details of the cost analysis. We did use an alternative Environmental Protection Agency (EPA) cost model (CUECost) that EPA issued to replace the use of the Control Cost Manual for coal-fired power plants. The cost estimates from the CUECost model indicate that the SCR costs estimated by TransAlta are in the range expected for that type of facility. Experience in doing BACT cost analyses lead us to the opinion that even the fine tuning of the cost analysis presented by the company would not substantially change the total capital cost, the annual operating cost, or the annualized costs of the project.

At our request after the public hearing, TransAlta submitted more readily readable drawings and information on the basis of its SCR cost estimates (see Draft Support Document for BART Determination for TransAlta Centralia Generation, LLC Power Plant, Centralia, Washington, Washington State Department of Ecology, revised April 2010, p. 15).

We also did not delve into the actual emission limit that would reflect the use of SCR on the boilers at this plant. Such an evaluation might result in a different emission limitation, though a review of most power plant BART determinations in western states indicate that for the few facilities required (or volunteering) to install SCR for BART, none have an emission limitation below 0.07 lb/MMBtu.

Alternately, we did review the costs for SNCR in greater detail. The duplication of some costs such as those for reagent tanks might be reasonable to eliminate, but are not the significant cost for the use of SNCR. At our request after the public hearing, TransAlta supplied more information on the basis of its SNCR cost estimates (see Draft Support Document, p. 15)

2. Improved combustion control not evaluated.

- Literature review of combustion control effectiveness not obviously reviewed.
- No evaluation of why this installation if Low NO_X Combustion, Level 3 (LNC3) combustion controls are unable to meet the presumptive BART emission limitation EPA proposed in the BART guidance for this control on this type of boiler.
- Installation of neural net control/combustion optimization not required as part of BART.

Response:

The literature on combustion control effectiveness was reviewed in the context of all BART analyses performed by Washington. The review was not called out specifically in regard to this facility.

A review of the emission record for this facility indicates that since the combustion controls were first installed and before the company's decision to suspend mining coal at Centralia, the units had been subject to fine tuning for improved effectiveness of the combustion controls.

The change from Centralia to Powder River Basin (PRB) coals results in an immediate decrease in NO_X emissions resulting from a combination of factors including the reduced fuel nitrogen content and the higher heat net content of the PRB coals compared to the Centralia coal.

The neural net process could be installed and might actually result in a decrease in NO_X emissions. However, without the ability to quantify any potential for NO_X reductions, the cost-effectiveness of the installation cannot be evaluated. We do encourage the company to implement the process if their additional analyses indicate that it may provide positive benefits.

3. Numerous unexplained changes between the January 2008, the June 2008, and December 2008 submittals. Changes not explained or obvious to the reviewer. Vendor cost changes for SCR. Baseline emissions change in each of these submittals.

Response:

The June 2008 submittal was intended to replace the January 2008 submittal. Changes in vender costs reflected new information acquired by TransAlta's emission control analysis consultant.

TransAlta's consultant was involved in a number of additional BART analyses in the western U.S. during this period and used information collected for one project in others. At Ecology's request after the public hearing, TransAlta supplied additional information related to the basis of its SCR cost estimates.

We agree the baseline emissions changes between the submittals is troubling and not explained in the company submittals, but analysis of the emissions against data submitted to EPA's Clean Air Markets Division indicate the bases of these changes.

4. The Flex Fuels project might be subject to a New Source Review (NSR) permit as a major modification. Has this been investigated? It is not portrayed as an emission control technique. Not obvious how the use of Flex Fuels results in a 20% decrease in NO_X emissions.

Response:

Ecology has previously analyzed the Flex Fuels project for Prevention of Significant Deterioration (PSD) permit applicability. The review indicated that the project did not qualify as a major modification of a major stationary source.

The Black and Veatch analysis submitted as part of the PSD applicability analysis evaluated methods to restore steam generation capacity lost due to the slagging issues and reduced heat transfer resulting from the use of 100% PRB coals. As the report and the project's minor NSR permitting materials indicate the PRB coal's sodium content changed the fly ash/slag on the boiler tubes from a "light and flakey" ash very amenable to standard soot blowing techniques, to a glassy material requiring a different method of "soot blowing." We agree the Black and Veatch report does not portray this project as an emission control project.

The Flex Fuels project results in a 20% decrease in NO_X as a result of a number of factors including the reduction in fuel bound nitrogen in the coal reduced quantity of coal combusted due to the higher new heat content, and reduced firing rate to accommodate the coal slagging characteristics.

5. The focus of EPA on SNCR in its comments on a preliminary version of the BART determination and support document is premature. Ecology has not defeated SCR as BART for this facility.

Response:

Ecology's view is that EPA's focus on SNCR indicates that they agree with Ecology that SCR is not a feasible control technology for this power plant. The EPA staff involved with the comments was involved in the 1997 Reasonably Available Control Technology (RACT) process and is familiar with the configuration of the facility, difficulty of construction on the site, and the cost analysis methods used in Best Available Control Technology (BACT) determinations.

6. Due to the large visibility impact of the emissions from this facility, SCR cannot be ruled out as BART for the plant.

Response:

We recognize that this plant has a large impact on visibility at a number of mandatory Class I areas in Washington and Oregon. The proposed BART emission limitations will result in substantial reductions in visibility impacts at all mandatory Class I areas within 300 km modeling radius of the plant. The proximity of the plant to numerous mandatory Class I areas magnifies the impacts compared to other power plants of similar size in the U.S.

The Regional Haze program guidance from EPA allows the states to evaluate and balance all benefits and impacts of the installation of emission controls on a particular facility. Visibility impact and potential visibility improvement are only two of the factors to be considered in that determination. As such, the fact that this particular facility has a large visibility impact is not sufficient by itself to justify SCR as BART.

Response to comments from Earthjustice:

Earthjustice provided comment on the proposed settlement agreement on behalf of the National Parks Conservation Association, the Sierra Club, and Northwest Environmental Defense Center (collectively the "Conservation Organizations"). The comments are 17 pages in length. Below, Ecology has attempted to summarize the key points from this comment letter and respond to them instead of engaging in legal argument. The full comment letter from Earthjustice is available on line at http://www.ecy.wa.gov/programs/air/TransAlta/TransAltaAgreement.html.

1. It is extremely unfortunate and puzzling why Ecology feels compelled to reach this lopsided Agreement with TransAlta. This Agreement is not a compromise between two ends of a spectrum, but rather a capitulation. Ecology and the citizens of Washington get nothing from this "bargain" that TransAlta wasn't already going to give them. TransAlta gets exactly everything it wants: it is not subject to BART for NO_x; it is not required to do anything to control NO_X pollution that it's not already doing, and would do regardless of this Agreement; it can do minimal mercury control, well below industry standards, at its sole option with no repercussions if it does not achieve the reductions agreed to. In return, Ecology agrees to "hands-off" treatment for the next 10 years or more for the TransAlta coal plant on a number of pollution issues; the state agrees to become TransAlta's partner in seeking accommodation and/or positive treatment from the EPA on a number of pollution issues; and the state agrees to look kindly on a wide-ranging list of potential TransAlta proposals for dealing with coal ash waste. Conservation Organizations find that the Agreement provides nothing of benefit for the citizens and natural resources of this state and strongly urge the State to reject this Agreement and engage in a full-scale, thorough BART analysis for NO_x, and aggressive case-by-case mercury control in line with industry achievements of over 90% reduction.

Response:

Ecology disagrees with the commenter's characterization of the agreement. The agreement reached a quick and effective resolution of issues related to NO_x and mercury controls without the delay that would otherwise be caused through the regulatory process or potential litigation. Instead of litigating the question of whether TransAlta is subject to BART, Ecology and TransAlta were able to agree and move forward on a BART determination for NO_x that meet the requirements of the federal Regional Haze Rule. Instead of expending much time and resource in establishing a mercury rule for a single facility, Ecology secured an agreement to use state-of-the-art technology to reduce mercury emissions by at least 200 lbs per year beginning in 2012. This achieves substantial mercury reductions well in advance of the EPA action. Regarding ash handling, all Ecology has agreed to do is work with TransAlta to find solutions to potential future ash handling problems (which would be as a result of the new control technology) within the constraints of Ecology's solid waste rules. These results are all at tremendous benefit to Ecology, the state of Washington, and to the environment.

2. The proposed agreement and consent decree include various clauses and constraints that further weaken the agreement.

Response:

Ecology believes that the commenter's have misconstrued these clauses. To implement the mercury reductions, TransAlta is agreeing to install the controls and undergo substantial expenditures to make them work. In fact, TransAlta has already taken major steps in this direction by proceeding with testing and design of the controls. While Ecology has agreed to not require additional NO_X reductions until after 2018, Ecology believes this agreement is reasonable as stated in response to Earthjustice comment 4 below. Finally, Ecology is puzzled by the comment regarding "beneficial uses" of ash. "Beneficial use" is a term clearly defined in Ecology's solid waste rules, WAC 173-350 et seq., and is a well-known term of art. Further, the inference that TransAlta's ash handing could result in a coal ash spill such as that by the Tennessee Valley Authority (TVA) in December 2008 is misleading. TransAlta does not have ash ponds of this nature and its coal ash handling system is disposed in accordance with Ecology's solid waste rules, so such an outcome is not possible.

3. NO_X pollutants from the TransAlta coal plant negatively affect the air quality of at least one Class I area.

Response:

We agree and recognize that this plant has a large impact on visibility at a number of mandatory Class I areas in Washington and Oregon. The proximity of the plant to numerous mandatory Class I areas magnifies the impacts compared to other power plants of similar size in the U.S. The TransAlta coal plant is subject to BART for NO_x emissions.

4. The Flex Fuels project cannot properly be considered BART.

- Flex Fuels is not a NO_X reduction technology or project.
- There is no support in the record for the claimed NO_X reduction from the Flex Fuels boiler efficiency project.
- Even after the application of Flex Fuels, the TransAlta coal plant will cause visibility impairment in 12 Class I areas.

Response:

Ecology does not agree with the commenter's' characterization of the Flex Fuels project. The Flex Fuels project required the installation of boiler modifications to TransAlta's boilers so that they could burn low sulfur coal full-time. The lower sulfur content PRB coals also contains less fuel bound nitrogen and higher net energy content compared to coal from the Centralia coal field. TransAlta's boilers were originally designed to burn coal mined from Centralia, which has lower energy content than low sulfur coal from the PRB. Because the low sulfur coal provides more energy per pound burned, it also generates lower NO_X emissions. Less coal is burned to meet the same boiler energy input requirements, so less NO_X is emitted. As Ecology has explained, the Flex Fuel project will provide at least a 20% reduction in NO_X emissions from currently permitted levels at the facility. The Flex Fuel project is already installed, and Ecology has observed the reduction in NO_X emissions. In combination with the existing combustion controls, the average NO_X emissions for calendar 2008 from the TransAlta facility are approximately 0.21 lbs NO_X/MMBtu, a rate that is more than a 25% reduction from the currently permitted level of 0.30 lb/MMBtu.

TransAlta will still impact visibility at Class I areas from its NO_X emissions even with the Flex Fuel project. In fact, TransAlta will impact these Class I areas from its Sulfur Dioxide (SO_2) and Particulate Matter (PM) emissions, even though TransAlta has been determined by EPA to meet BART for those pollutants due to its existing controls. The evaluation and application of BART under the federal Regional Haze Rule (RHR) does not require that a facility have no residual impact on visibility at Class I areas. BART instead requires a multiple factor analysis of a facility and its attributes as further described in Response 6 below.

5. SCR technology is BART:

- SCR is technically feasible.
- There is no support in the record for the claims regarding physical space limitations.
- The record has no explanation for TransAlta's failure to control the unusually high boiler-out NO_X emissions at the TransAlta coal plant, a fundamental component of considering feasible BART technologies.
- There is no support in the record for TransAlta's high cost claims for the SCR technology.

Response:

Ecology strongly disagrees that SCR technology is BART for the TransAlta Centralia facility. Ecology acknowledges that SCR may represent BART for a different facility. However, the facts of the TransAlta facility show that SCR is far too expensive for the benefit achieved considering the controls that have already been installed.

It is important to remember that a BART determination is a multi-factor, fact-specific analysis. It does not require that a specific type of control technology be installed for all facilities. To be selected as BART, a control technology has to be available, technically feasible, and cost-effective, provide a visibility benefit, and have minimal potential for adverse non-air quality impacts. All of these factors have to be considered; no single factor is dominant.

As Ecology has more fully explained in the Technical Support Document for its draft BART determination for the TransAlta facility, when SCR is evaluated through the five factor BART analysis, it doesn't fall within acceptable limits for BART. Ecology agrees that SCR technology is available, technically feasible, and if implemented would provide a significant visibility benefit. However, there are several complicating circumstances that impede its application for the TransAlta facility.

First, there is inadequate physical space to locate a SCR control unit. As explained in the Technical Support Document for the TransAlta BART determination, "[t]he short distance between the boiler economizer and the entrance to the first ESP does not provide the room required for a catalyst bed with reasonable velocities to be inserted in the existing flue gas duct." (Draft Support Document for BART Determination for TransAlta Centralia Generation, LLC Power Plant, Centralia, Washington, revised April 2010, p. 15). This conclusion is based on the best professional judgment of the Ecology Air Quality Program's senior engineer, evaluating the space available and the velocities present in the boiler ducts. The modifications, duct rerouting, and structural support work required to install SCR in such a restricted footprint greatly increase the cost of the SCR controls, far exceeding the range of what is considered cost-effective under standard metrics. Ecology investigated these claimed costs for SCR in detail. The costs for the actual SCR equipment, catalyst beds, ammonia storage, injection systems, and operating controls, all fall within the costs expected for an installation on a boiler of this size. Based on this plus our knowledge of the construction difficulties at this facility that do not exist at other power plants, we concluded the costs identified by TransAlta appeared accurate.

As noted above, Ecology received more readily readable site drawings at larger scales for the administrative record. The larger scale allows easier analysis of the layout issues by non-engineers. In addition, in response to several comments, Ecology requested TransAlta to evaluate locating an SCR after the ESPs in the duct from the ESP to the Flue Gas Desulfurization (FGD) scrubber (a cold, clean location) and include the impacts of reheat. We have also requested the company to evaluate the installation of an SCR system in the duct between the boiler and the ESP inlet. The information supplied by TransAlta is discussed in the April 2010 revised draft Technical Support Document.

Section 3 of TransAlta's July 2008 BART analysis discusses the reasons for the higher than normal construction costs to install SCR at the Centralia plant. The discussion in the Company submittal starts on page 3-9. The TransAlta discussion doesn't indicate dimensions, but using the provided drawings in the report and information in the modeling report, indicates that the distance from the boiler outlet to the inlet of the first ESP is approximately 42 feet. This whole distance is used to evenly distribute the flow from the boilers to the ESP inlet to allow for proper operation of the ESP. The diverging ducts from the boilers to the ESPs are also located between 70 and 100 feet off the ground.

As TransAlta has proposed, the only location to install an SCR unit without having to reheat the flue gas is on top of the first ESP. What is obvious from the proposal drawings (Figures 3-3 and 3-4) is that TransAlta's consultant did not fully consider how to get the boiler exhaust to the SCR units and back into the ESP and still provide for even flow distribution to the ESP. A quick review of Figure 3-3 also indicates other issues of the tight construction site.

Capital costs for SCR systems reflect more than the costs of catalyst, ammonia storage, ammonia supply, and injection control systems. These equipment costs vary based on the flue gas volume and NO_X concentration. As a result, these equipment costs are relatively uniform between installations. The most significant cost factors for this facility are the result of the density of existing emissions controls immediately adjacent to the boilers resulting in:

- The tight construction site.
- Potential difficulty in finding a location for ammonia storage that is safe, does not impede access to other components, or interfere with underground or above ground utilities and ducting.
- Elevated construction location.
- Difficulty in ducting exhaust gas from the boiler through the SCR units to the ESPs while achieving even flue gas distribution across the SCR catalyst beds and within the ESP.

The potential to remove first of the two series ESPs on each boiler and replace it with an SCR unit has been suggested as an alternative method to install SCR. While this seems to be an attractive option, the cost of destroying the existing ESP is part of the capital costs to install a new SCR system. Revising the ductwork for the remaining ESP, potentially having to relocate the induced draft fans, are other cost considerations. Equally, the lost revenue from sales of fly ash from the first ESP is a negative cost in the cost analysis.

Removal of the first ESP coupled with the history of the installation of the two series ESPs also brings into question the ability of the facility to meet its PM emission limitation.[1] Achieving the current PM emission limit is based on both ESPs in operation and does not anticipate any removal through the FGD system. The second ESP was not anticipated to accept the full particulate load from the boiler, only to remove enough of the remaining particulate from the exhaust of the first ESP to meet the particulate limit of 0.010 grain/dscf[2] (filterable PM only).

The lack of the two ESPs removing particulate is anticipated to contaminate the gypsum produced for sale to a level that prevents its resale, resulting in a cost to landfill the gypsum rather than receive compensation for the gypsum as a raw material. The lack of gypsum supply

[1] See Section 1 of the Technical Support Document for the 1997 RACT order for information on the history of the ESPs.
[2] As referenced in the 1997 RACT analysis support document, the series ESPs comply with the permit limit, but neither alone can meet the limit.

to the wall board maker that purchases the gypsum will also adversely affect the price of that company's primary raw material.

Weighing the above factors, Ecology determined that SCR is not BART for the TransAlta facility.

The commenter's further question "the unusually high boiler-out NO_X emissions at the TransAlta coal plant." Ecology disputes this characterization of TransAlta's emissions. TransAlta currently has installed LNC3 low NO_X burners for NO_X control; this technology is the presumptive BART control technology for NO_X designated by EPA. These combustion controls meet their anticipated emission reduction of 0.30 lb/MMBtu, about 1/3 reduction from the pre-installation actual emission rate of 0.45 lb/MMBtu. The emission limitation presumed by EPA for these controls is 0.15 lb NO_X/MMBTU. While the TransAlta facility's permitted emissions are double this amount, it is not an unusually high level. When EPA set the presumptive BART emission level for NO_X, there were relatively few data points. A review of BART determinations in the western U.S. indicate that the TransAlta facility's current emission rate and our BART determination is not out of line with what is being determined to be BART by other states for their coal-fired power plants (see table following the response to Earthjustice Comment 6).

6. Step 5 of the required BART analysis appears almost entirely absent from Ecology's process.

- Ecology did not question TransAlta's calculations that dilute the visibility improvement expected from SCR.
- The record is devoid of evidence describing how Ecology balanced cost and visibility improvement, or any support indicating that Ecology necessarily struck the correct balance.

Response:

Here are the five steps in a BART analysis as outlined by EPA in Appendix Y of 40 CFR Part 51:

Step 1 – Identify All Available Retrofit Control Technologies
Step 2 – Eliminate Technically Infeasible Options
- The identification of available and technically feasible retrofit control options.
- Consideration of any pollution-control equipment in use at the source (which affects the applicability of options and their impacts).

Step 3 – Evaluate Control Effectiveness and Costs of Remaining Control Technologies
Step 4 – Evaluate Energy and Non-Air Quality Impacts
- The remaining useful life of the facility.
- The energy and non-air quality environmental impacts of compliance.

Step 5 – Evaluate Visibility Impacts
- The degree of visibility improvement that may reasonably be anticipated from feasible control options.

Step 5 in the EPA guidance document requires a determination of the visibility improvement that could accrue from the imposition of a control technology. The definition of BART in the regulation lists the 5th factor in determining BART as:

> "The degree of improvement in visibility which may reasonably be anticipated to result from the use of such technology." 40 CFR 51.301, definition of Best Available Retrofit Technology.

The analysis of the 5th factor is provided in Section 3 of the Technical Support Document, and the modeling analysis portion of TransAlta's BART analysis submittals. These analyses indicate that all control technologies evaluated in detail would provide a reduction in visibility impacts if installed and operated.

Under both the definition and the guidance from EPA, Ecology has a great deal of latitude to determine how to address the question of visibility improvement. In Section IV.5 of the BART Guidance Document, the state has "discretion to determine the order in which you should evaluate control options for BART. You should provide a justification for adopting the technology that you select as the "best" level of control, including an explanation of the CAA factors that led you to choose that option over the other control levels." Section 4 Ecology's Technical Support Document includes our analysis and rationale for selecting BART for this facility.

The costs of controls, energy impacts, non-air quality environmental impacts, and the visibility improvement were given equal weight in our analysis. Neither cost nor visibility improvement were given paramount importance in balancing the various factors in determining BART.

The cost calculations are not part of determining the degree of visibility improvement that might result from use of a particular control technology.

COAL-FIRED POWER PLANT BART DETERMINATIONS FOR NO_X IN PUBLICALLY AVAILABLE REGIONAL HAZE SIPS*

*Most states able to utilize CAIR are not represented on this list because they are mostly using CAIR as BART for those power plants.

State	Unit	NO_X Technology	lb/MMBtu 30-day average	Comments
EPA Region 8, Montana	Colstrip			No final decision publicly available
EPA Region 9, Navajo Reservation	Navajo			No final decision publicly available
	Four Corners			No final decision publicly available

State	Unit	NO_X Technology	lb/MMBtu 30-day average	Comments
Arkansas	Enbtergy Arkansas, Inc. White Bluff, Units 1 and 1		0.28 on bituminous coal 0.15 on sub-bituminous coal	Controls not given. Limits in State Regulation 19.1505
	SWEPCO Flint Creek Power Plant Unit 1		0.23	Controls not given. Limits in State Regulation 19.1505
California	No coal fired units subject to BART			
Colorado	Martin Drake Units 5 - 7	Install overfire air systems	0.39	Also limited to 0.35 lb/MMBtu, annual average
	CENC (Trigen) Unit 4	Limited by rule to combustion controls, LNC3	115 lb/hr	
	CENC (Trigen) Unit 5	Limited by rule to combustion controls, LNC3	182 lb/hr	
	Craig Unit 1	Limited by rule to combustion controls, LNC3	0.39	Also limited to 0.30 lb/MMBtu, annual average
	Craig Unit 2	Limited by rule to combustion controls, LNC3	0.39	Also limited to 0.30 lb/MMBtu, annual average
	Public Service of Colorado, Comanche Units 1 and 2	Low NO_X Burners	0.2	Also limited to 0.15 lb/MMBtu, annual average both units combined
	Public Service of Colorado, Cherokee Unit 4	Modify existing low NO_X burner and over fire air or install new burners	0.28	
	Public Service of Colorado, Hayden Unit 1	Modify existing low NO_X burner and over fire air or install new burners	0.39	
	Public Service of Colorado, Hayden Unit 2	Modify existing low NO_X burner and over fire air or install new burners	0.028	

State	Unit	NO_X Technology	lb/MMBtu 30-day average	Comments
Colorado (cont.)	Public Service of Colorado, Pawnee Unit 1	Modify existing low NO_X burner and over fire air or install new burners	0.23	
	Public Service of Colorado, Valemont Unit 5	Modify existing low NO_X burner and over fire air or install new burners	0.28	
Idaho	No coal-fired units			
Kansas	La Cynge Generating Station, Unit 1 and 2	SCR on Unit 1, Controls as needed on Unit 2	0.13, both units averaged together	
	Jeffrey Energy Center, Unit 1 and 2	Low NO_X Burners	0.15	
Minnesota	MN Power, Taconite Harbor Boiler No. 3	ROFA/Rotamix (Mobotec)	0.13	
	MN Power, Boswell Boiler No. 3	LNB + OFA, SCR	0.07	
	Rochester Public Utilities, Silver Lake, Unit #3 boiler	No additional controls	No Limit	
	Rochester Public Utilities, Silver Lake, Unit #4 boiler	ROFA/Rotamix (existing controls)	0.25	
	Xcel Energy, Sherco, Boiler 1	LNB + SOFA + Combustion Optimization	0.15	
	Xcel Energy, Sherco, Boiler 2	Combustion Optimization	0.15	
	Xcel Energy, Allen S. King, Boiler 1	SCR (existing controls)	0.1	
	Northshore Mining, Silver Bay, Boiler 1	LNB + OFA	0.4	
Minnesota (cont.)	Northshore Mining, Silver Bay, Boiler 2	LNB + OFA	0.4	

State	Unit	NO_X Technology	lb/MMBtu 30-day average	Comments
Iowa	Used CAIR for BART			
Louisiana	Used CAIR for BART			
Nebraska	Gerald Gentleman, Unit 1 and 2	Existing LNC3 on Unit 2, New LNC3 on Unit 1	0.23, both units averaged together	
	Nebraska City Station, Unit 1	LNC3	0.23	
Nevada	No coal-fired BART units			
New Mexico	San Juan Generating Station	No final decision publicly available		
North Dakota	Olds Unit 1	SNCR plus overfire air	0.19	
(All Lignite units)	Olds Unit 2	SNCR plus overfire air	0.35	
	Coal Creek Unit 1 and 2	Additional overfire air plus LNB	0.19	
	Stanton Unit 1	LNC3 plus SNCR for a 1/3 reduction	0.29	A 1/3 reduction
	Milton Young Station Unit 1	Advanced overfire air plus SNCR for a 58% reduction	0.36	
	Milton Young Station Unit 2	Advanced overfire air plus SNCR for a 58% reduction	0.35	
Oregon	Boardman	LNC3	0.28	Note SNCR to be installed by July 2014 @ 0.23 lb/MMBtu and SCR @ 0.07 lb/MMBtu required later. Neither is required as BART.
Oklahoma	OG&E Muskogee Generating Station Unit 4 and 5		0.15	
	OG&E Sooner		0.15	

State	Unit	NO_X Technology	lb/MMBtu 30-day average	Comments
	Generating Station Unit 1 and 2			
	AEP/PSO Northeastern Power Station Unit 3 and 4		0.15	
Texas	No coal-fired BART units subject to BART			
Utah	Hunter Power Plant, Unit 1 and 2	LNC3	0.26	Replacing LNC1 burners and add 2 levels of overfire air under minor NSR program.
	Huntington Power Plants, Unit 1 and 2	LNC3	0.26	Replacing LNC1 burners and add 2 levels of overfire air under minor NSR program.
Wyoming	Naughton Unit 1	LNC3	0.26	Wyoming Long-term Strategy requires SCR @ 0.07 lb/MMBtu by 2018.
	Naughton Unit 2	LNC3	0.26	
	Naughton Unit 3	LNC3 plus SCR	0.07	
	Jim Bridger Units 1-4	LNC3	0.26	
	Dave Johnston Unit 3	LNC3	0.26	
	Dave Johnston Unit 4	LNC3	0.15	
	Wyodak Unit 1	LNC3	0.23	
	Basin Electric Units 1-3	LNC3	0.23	

Responses to comments from the United States Department of the Interior, National Parks Service:

1. TransAlta and Ecology did not evaluate alternative locations where SCR system could be installed such as between the ESPs and the wet scrubbers. That location will require reheating the gas stream, though fuel may not be significant as waste heat can be used to reheat the gas stream after the ESPs.

Response:

As part of the initial review of this BART analysis, Ecology did not consider, or request TransAlta to consider, alternative locations to install an SCR system other than the cold, dirty location evaluated. An alternate location requested to be evaluated previously was in the duct between the boiler and the ESP inlet. To respond to several commenters who wanted this evaluation, Ecology requested TransAlta to evaluate locating an SCR after the ESPs in the duct from the ESP to the FGD scrubber (a cold, clean location) and include the impacts of reheat. The Technical Support Document has been revised to reflect the information supplied by TransAlta.

2. The emission limitation evaluated for SCR is not reflective of the capabilities of the control system. Ninety percent reduction easily accomplished, the emission rate used for cost-effectiveness does not reflect the 90% reduction achievable or the actual seasonal emission rates achieved by eastern power plants subject to seasonal NO_X reduction requirements for the ozone National Ambient Air Quality Standard (NAAQS). Suggest reasonable SCR emission limitations are applicable to this plant.

Response:

See response to Dr. Ranajit Sahu's Comment 1.

3. The SCR costs are overestimated and unsubstantiated. The EPA Control Cost manual has not been used as advised by EPA in the BART guidance. No information on source of vendor quotes. Did not use the methods and default factors included in the EPA Control Cost Manual to estimate costs. Instead used a model based on EPA's CUE Cost model. The NPS version of EPA's Control Cost Manual SCR cost method is provided to Ecology. No explanation of extra expenses and how the estimates were derived.

Response:

See responses to Dr. Ranajit Sahu Comment 1 and Earthjustice Comment 5.

4. Ecology should consider the cumulative effects of improving visibility at all 12 Class I areas affected within 300 km of the plant. Using cumulative visibility improvement results in a cost-effectiveness in line with other BART determinations made in the country.

Response:

The use of cumulative visibility effects is not reflected in the BART guidelines in 40 CFR Part 51, Appendix Y. EPA did not describe a method to utilize cumulative visibility changes as part of a BART determination process. Cost-effectiveness analysis using a metric like $/Deciviews (dv) is only a suggestion to consider in addition to standard $/ton pollutant reduced cost-effectiveness.

For cost-effectiveness, we are relying on a measure that we know and understand, the $/ton reduced. Between July 2005, when EPA issued the final BART guidelines until the fall of 2008 when the first proposal from the Federal Land Managers (FLMs) was developed on how to do a $/dv measure, no state was using this measure and EPA provided no guidance in how to perform the calculation. Ecology has chosen to follow the lead of essentially all other states in evaluating BART control costs on a $/ton reduced.

To complicate matters more, the September 2008 memorandum referenced by the USFS and the NPS proposes two variant methods to calculate cumulative dv, noting problems with each approach. An EPA Region 9 Federal Register notice concerning how Region 9 would evaluate visibility impacts from two power plants located on Navajo Tribal lands, proposed two more very different methods to implement a $/dv improved metric.

NPS documents appear to utilize variations on the approaches proposed in the September 2008 memorandum. Which is the correct method to use to determine $/dv improved? What is the cost-effectiveness threshold when using this approach? What is the basis for a $/dv cost-effectiveness threshold? The approaches proposed by the FLMs and EPA Region 9 do not supply the answers or indicate where they lie. The only source of information on what might be an appropriate $/cumulative dv improved cost value is a compilation of proposed BART determinations by Mr. Don Shepherd of the NPS. While informative, the compilation contains information from BART proposals, not the final determinations by individual states.

Separately, Ecology undertook a review of BART determinations included in regional haze State Implementation Plans (SIPs) submitted to EPA by western states. This review indicates no state has relied on the $/dv improved measure to make a BART determination. The SIPs that have been submitted and reviewed by Ecology all utilize the $/ton reduced metric for BART. Two of the SIPs reviewed seem to utilize a $/dv measure to support additional further progress emission reductions volunteered by or imposed on individual plants.

As a result of our review of the determinations by other states, Ecology is being consistent in using $/ton of pollutant reduced as the primary cost analysis measure to determine BART.

5. Ecology should evaluate cumulative visibility improvement from a control technology. Specifically, EPA Region 9 proposed two methods to consider cumulative visibility improvement methods. Wyoming evaluated cumulative visibility improvement for BART and reasonable progress determinations. Oregon considered cumulative benefits for the Boardman Power Plant SCR addition for reasonable progress.

Response:

See response to NPS Comment 4.
The Wyoming and Oregon SIP submittals do not reflect the use of cumulative visibility improvement as the determining factor for their BART determinations, only for determining reasonable progress. Oregon's BART determination is clearly based on a $/ton pollutant removed analysis.

Response to comments from the United States Department of Agriculture, National Forest Service:

1. Post combustion controls can do a better job of NO_X reduction and visibility improvement than what is proposed. Need to reconsider the value of visibility improvement and require additional controls through SCR or SNCR.

Response:

See responses to comments to NPS and Dr. Ranajit Sahu given above.

2. The proposed BART control does little to improve visibility at USFS Class I areas.

Response:

The proposed controls provide essentially the same degree of visibility improvement at the nearby USFS Class I areas as the adjacent NPS Class I areas. As noted in the Technical Support Document and in the BART analysis by the company, visibility improvements accrue at all Class I areas within 300 km of the plant as a result of implementing the proposed BART emission limits. One of the largest reductions from the proposed BART controls at TransAlta occurs at the Goat Rocks Wilderness, a USFS Class I Area.

3. Actual SO_2 emissions are far less than the permitted emissions. In 2008 reported to be 2318 tons per year compared to the permitted rate of 10,000 tons per year. While 2008 the plant operated only at 80% capacity, if a limit based on the 2008 actual emissions and 100% capacity, an emission limit reflecting 100% capacity would be approximately 2918 ton SO_2 per year. Ecology should establish a new emission limit for SO_2 from this plant.

Response:

The SO_2 emission limit of 10,000 tons per year has been determined by EPA to be BART for SO_2 from this facility. To reduce the SO_2 emission limitation below this level will have to be accomplished outside of the BART Compliance Order.

4. Ecology determined SCR to be technically feasible, but did not select it as BART due to costs on a $/ton removed basis. The SCR cost presented is accurate at a -20% / +50% level in contrast to the expected accuracy of ±30% in the EPA Control Cost Manual.

Response:

Ecology considers the EPA Control Cost Manual, EPA's newer control technology cost analysis software (CUECost), and the cost analysis produced by TransAlta's consultant to be equivalent in level of accuracy. The consultant's cost analysis tool is used on a routine basis by the consultant for other clients and in producing BACT determinations.

5. SCR Costs evaluated on a 15-year period contrasted with the 20-year lifetime in the Control Cost Manual and TransAlta's May 2008 response to comments.

Response:

The 6th edition of the Control Cost manual uses a 20-year lifetime for an SCR system. The 15-year period is reasonable for other reasons and the difference in annual cost from the 5-year difference is small.

State actions outside of the Regional Haze process will have an effect on the expected lifetime of this facility. Most notable is a Governor's Executive Order that requires Ecology to work with TransAlta on an agreed order that would reduce the emissions of greenhouse gases from the plant to meet the requirements of the Greenhouse Gas Emission Performance Standard in Chapter 173-407 WAC by 2025. In order to meet that standard, the plant will have to be functionally replaced by another generation source, have installed ad-on carbon dioxide capture technology, and have started sequestering that collected carbon dioxide. In either case, the lifetime of the facility and any new add-on emission controls are anticipated to be limited.

Since the agreed order required by the Governor's Executive Order has not been developed and signed, we have to assume that the lifetime of the plant is not a consideration in the calculation of cost-effectiveness for this facility.

6. Using $/ton of pollutant reduced offers no consideration of visibility improvement, let alone cumulative impacts at multiple Class I areas. While the BART guideline does not offer specific guidance on how to consider visibility in assessing cost-effectiveness, the guideline does mention the use of a metric such as $/dv. The FLMS developed draft guidance in Sept. 2008 and provided it to Ecology for its consideration. In addition, EPA region 9 developed a different methodology on proposed for consideration of visibility improvement in cost-effectiveness. The NPS has compiled proposed and final BART determinations that they have received. The cumulative cost-effectiveness from those proposed and final BART determinations show cumulative cost-effectiveness of $0.6 million/dv to $15.3 million/dv. Using this background, the cost-effectiveness of SCR is $8.5 million/ dv (sum of 98th percentile across all affected Class I areas) is reasonable and SCR is cost-effective. We advocate that Ecology reconsider the cost-effectiveness of SCR and the potential benefits.

Response:

See our responses to the NPS Comment 4.

7. Ecology should quantify the visibility improvement likely to occur from implementation of the Flex Fuels project both the SO_2 and the NO_X reductions that are proposed. Using only the visibility reductions from the NO_X reduction underestimates the actual visibility improvements anticipated.

Response:

After the public hearing, we requested that TransAlta analyze the expected visibility benefits from use of the Flex Fuels project using both the NO_X reduction and the anticipated SO_2 reduction resulting from use of the Flex Fuels project and PRB low sulfur coals. The use of PRB coals is anticipated to result in a reduction of 1,287 tons/yr from baseline SO_2 emissions rates. With the effect of the SO_2 reduction included in the modeling analysis, the minimum visibility improvement at a mandatory Class I Area is projected to be 0.067 dv. The modeling is discussed in Draft Support Document for BART Determination for TransAlta Centralia Generation, LLC Power Plant, Centralia, Washington, revised April 2010, p. 19.

8. Provisions associated with the BART determination (in the mediation agreement) should be separated from the voluntary mercury reductions to remove the non-enforceability provisions intended to cover the voluntary mercury reductions.

Response:

The BART determination language in the mediation agreement will be superseded by the BART regulatory order to be issued to the facility. As a result, the “non-enforceability” considerations of the BART portions of the mediation agreement go away.

9. Ecology should not limit itself from opportunities to reduce haze-causing emissions at the TransAlta Centralia plant for the next 20 years.

Response:

The mediation agreement does not limit our ability to come back to TransAlta for additional reductions in the context of reasonable progress toward meeting the visibility goal. The agreement only provides that through 2018 we will not impose any new requirements as a result of regional haze requirements. Such requirements could be imposed as part of the long-term strategy included in the 2018 regional haze SIP.

Response to consolidated comments in Form Letter #1, Sierra Club Members:

1. The Clean Air Act requires power plants to reduce haze-causing pollutants, including nitrogen oxides, and toxic chemicals like mercury. Washington should require the most effective pollution controls to reduce TransAlta's nitrogen oxide and mercury emissions. Without these controls, the Centralia coal plant will continue to unnecessarily obscure views and contaminate water and wildlife in our national parks and wilderness areas for decades to come.

Response:

Thank you for your comments on the proposed Settlement Agreement and Consent Decree between the Washington State Department of Ecology and TransAlta regarding the company’s coal-fired power plant near Centralia.

Staff members with Ecology's Air Quality Program reviewed your comments and offer these responses:

Sufficiency of nitrogen oxide controls: Staff analysis of the TransAlta facility near Centralia concludes that the terms of the Settlement Agreement satisfy requirements for Best Available Retrofit Technology (BART). BART is the standard that applies to this facility. Under BART, the selection of an emission control technology is based on a multi-factor analysis. These factors include non-air quality impacts, visibility impacts, cost of the equipment, and remaining expected plant life.

It is important to note that many of coal-fired power plants that are reporting 80 to 90 percent emission reductions did not have emission controls prior to the installation of this technology.

In addition, many of the 80 to 90 percent mercury reductions required by jurisdictions outside Washington only apply to new facilities, with lower or no requirements for existing facilities.

Thank you again for your comments and for your interest in helping to protect Washington's air quality and environment.

Response to consolidated comments in Form Letter #2, Sierra Club Members:

1. From health care professionals to park rangers to fishermen, the Washington public has grave concerns about what this plant generates in our communities. As the State's largest polluter for global warming, mercury and haze (from nitrogen oxide pollution), the cumulative impact of this plant affects Washingtonians from every walk of life. The State should not move forward with the Settlement Agreement as proposed until a more substantive review can take place.

There are three main problems with this Settlement Agreement with regard to haze as it now stands:

1. This agreement is insufficient in controlling nitrogen oxide, the main cause of haze in our national parks and wilderness areas.
2. The pollutant-by-pollutant process has distorted the pollution impacts of this plant on public health.
3. The public process has been insufficient.

Response:

Thank you for your comments on the proposed Settlement Agreement and Consent Decree between the Washington State Department of Ecology and TransAlta regarding the company's coal-fired power plant near Centralia.

Staff members with Ecology's Air Quality Program reviewed your comments and offer these responses:

1. **Sufficiency of nitrogen oxide controls:** Staff analysis of the TransAlta facility near Centralia concludes that the terms of the Settlement Agreement satisfy requirements for Best Available Retrofit Technology (BART). BART is the standard that applies to this facility. Under BART, the selection of an emission control technology is based on a multi-factor analysis. These factors include non-air quality impacts, visibility impacts, cost of the equipment, and remaining expected plant life.

2. **Plant impacts on public health:** A pollutant-by-pollutant approach is the only applicable scientific standard. At this point, no scientific method has been developed to measure combined pollutants' interactions and effects.

3. **Sufficiency of public process:** The State of Washington entered into confidential mediation on these issues at TransAlta's request. Mediation enabled the State to avoid potentially lengthy and costly litigation over these issues. Once the proposed Settlement Agreement was near completion and announced publicly, Ecology began its normal public participation process, which included a formal public comment period and a public hearing.

Thank you again for your comments and for your interest in helping to protect Washington's air quality and environment.

Response to testimony from October 14, 2009, Public Hearing on proposed TransAlta mediation agreement:

<u>Mark Quinn, Washington Wildlife Federation</u>:

Thank you for your views. The Governor's Executive Order, 09-05 plus the program in Chapter 70.235 sets up an approach to reducing our states greenhouse emissions and promoting 'greener' energy sources. One element of the Executive order directs the Department of Ecology to work with TransAlta to establish an agreed order for the company to reduce its emissions to meet the greenhouse gas emission requirement in Chapter 80.80 RCW by 2025.

<u>Randy King, Superintendent Mt. Rainier Natl. Park</u>:

Thank you for your views. As noted in our presentation at the hearing, Ecology is concerned with the mercury emissions from the facility and has worked with the company on a voluntary approach to reduce the emissions on a schedule that is faster than would be accomplished by waiting for EPA to complete new rules. We have addressed the concerns about the level of NO_X control more thoroughly in our response to written comments.

Johnathan Smith, Maia Face, Adam Fleisher:

We acknowledge your views that the mediation agreement doesn't result in enough mercury control, and that the nitrogen oxides reduction proposal in the BART order is inadequate. Ecology respectfully disagrees with your assessments, as more fully described in the responses to written comments.

Shane Macover:

When issued as final documents, the mediation agreement and BART order will be legally binding and enforceable documents, not listings of voluntary actions.

Janette Brimmer, Earth Justice:

Thank you for your views on nitrogen deposition, and climate change. Your oral comments on the BART determination and mercury control and other aspects of the Mediation Agreement are covered by our responses to written comments.

Donna Albert:

We appreciate your thoughtful views on the subject of coal free electric power and stopping the ongoing climate change.

Doug Howell, Sierra Club:

Thank you for your views on the Confidential Mediation process and your views of what would constitute adequate public involvement. Your direct questions and concerns about the Mediation Agreement and its content and process are covered in response to Earth Justice's written comments.

Your concerns about the Air Operating Permit process are outside of the scope of this hearing. Your concerns about greenhouse gas emissions from the TransAlta facility are outside the scope of this hearing, but are being addressed through the process included in the Governor's Executive Order 09-05.

Ecology's Response to Comments on the Draft TransAlta BART Technical Support Document and Compliance Order

Appendix

Written Comments and Hearing Transcript

Comments on

TransAlta Coal-fired Power Plant, Centralia, Washington

Preliminary BART Determinations for NOx and Proposed Voluntary Mercury Reduction

By

Dr. Ranajit (Ron) Sahu

1. I have been asked by the Sierra Club to review the ongoing assessment of the Washington Department of Ecology of existing and proposed controls of Nitrogen Oxide ("NOx") emissions from the coal-fired power plant located in Centralia, Washington and owned by TransAlta Centralia Generation, L.L.C. ("TransAlta"). I have also provided comments on the proposed voluntary mercury reduction program at Centralia.

2. My background and qualifications are as follows: I have a Bachelor of Technology Degree with Honors from the Indian Institute of Technology, and a Masters of Science in Mechanical Engineering and Ph.D. in Philosophy, both from the California Institute of Technology. I have over 18 years of experience in the fields of environmental, mechanical, and chemical engineering including program and project management services as well as design and specification of pollution control equipment. In that time I have successfully managed and executed numerous projects. This includes basic and applied research projects, design projects, regulatory compliance projects, permitting projects, energy studies, risk assessment projects, and projects involved the communication of environmental and technical data to the public. I have provided and continue to provide consulting services to numerous private sector, public sector, and public interest clients. My clients over the past 18 years have included steel mills, petroleum refineries, cement companies, aerospace companies, power generation facilities, various manufacturers of equipment, chemical distribution facilities and various public sector entities such as the Environmental Protection Agency, U.S. Department of Justice, California Toxic Substances Control, municipalities etc. I have performed projects in 45 states. In addition to my consulting work, I have taught and teach numerous courses at several Southern California universities, including University of California at Los Angeles (air pollution), University of California at

Riverside (air pollution and process hazard analysis), and Loyola Marymount University (air pollution, risk assessment, hazardous waste management).

3. I have reviewed a number of documents from TransAlta, consultants retained by TransAlta, and from the Department of Ecology, including analysis and reports by CH2M Hill and Black and Veatch. I have also had one telephone conversation with Mr. Al Newman of Ecology. Unfortunately, it appears that a number of documents that are relevant to the consideration of NOx controls have been withheld by the Department of Ecology which has hampered my ability to be sure that I have all the relevant information and it has hampered my ability to fully analyze emissions and control technologies for the TransAlta Centralia facility (the "Plant").

NOx BART

4. The electrical output of each of the two boiler units at the TransAlta coal-fired power plant located in Centralia, Washington, is 702.5 MW net.[1] The units are tangentially fired and currently use Powder River Basin ("PRB") coals. They are anticipated to use PRB coals for the foreseeable future. TransAlta and the Department of Ecology claim that Best Available Retrofit Technology ("BART") for NOx emissions from each boiler is the current set of combustion controls (called the "LNC3" combustion controls) along with the completion of the "Flex Fuels" project (so characterized by TransAlta) and the full use of PRB coals.[2] The expected NOx emissions reduction is around 20% of current (0.3 lb/MMBtu) emissions based on modeling conducted by the applicant. Thus, the expected post-Flex Fuels NOx levels are expected to be approximately 0.24 lb/MMBtu. Since the units already have the set of combustion controls (low NOx burners, close-coupled and separated OFA installed during 2000-2002) and already fire PRB coals, the expected 20% reduction is to accrue from the Flex Fuels project, which appears

[1] While there is no discussion of reduction of the Unit ratings in this matter, the applicant notes in its December 2008 submittal that it evaluated NOx emission rates for the "…maximum potential sustainable load (663 MW)…" It is not clear why the Vista modeling would be limited to this lower net load, nor it is clear if the imputed NOx reductions of 20% would be sustained at the higher and current maximum load of 702 MW. Ecology or the permitting entity should clarify this issue and analyze whether the 20% would actually be sustained at the higher load of 702 MW.

[2] It appears that the facility has been using PRB coal for quite some time and almost exclusively since late 2007.

to be something the Plant already wants to do for other reasons and which appears to have been a project the Plant was working toward since closing the Centralia mine around 2006. Thus, BART is to be met with no additional incremental effort at NOx reduction by TransAlta. Not surprisingly, the Plant collectively has significant visibility impacts for a number of Class I areas, even after implementation of the NOx BART option proposed by TransAlta that Ecology appears ready to accept.

5. From the description provided, it does not appear that the Flex Fuel project is geared towards NOx controls, per se. While combustion modeling may indicate that there may be a 20% reduction in NOx from Flex Fuels, this is incidental to the overall goals of what is essentially an efficiency improvement project. Unfortunately, no technical details for this combustion modeling are available on the record in order to determine the appropriateness of the assumptions made, and the overall usefulness or accuracy of the analysis. [3] It is therefore clear that Ecology has not reviewed the combustion modeling analysis. Even if, contrary to what appears in the file (see detailed discussion of NOx analysis below), the Flex Fuels project could be regarded as a NOx-reduction project, the record is wholly insufficient to know and understand whether a 20% reduction is at all realistic or meaningful.

6. The major error in the BART analysis is the rejection of Selective Catalytic Reduction ("SCR") as the NOx control option for the boilers. Although Ecology erroneously declares SCR to be technically infeasible, it is clear from the applicant's analysis and Ecology's own summary (see Table 2-1) that SCR is a technically feasible option. [4] The only impediment to its installation seems to be "…the lack of room…" at the boilers for an easy SCR installation. Although TransAlta claims that the configuration is tight, there is scant engineering detail regarding the congestion. In response to Ecology's questions regarding SCR as discussed in the initial BART application, the applicant provided three figures (3-3 through 3-5) in its revised BART application purporting to support its contention that space was unavailable for the SCRs. Specifically, see question 14 in Ecology's April 25, 2008 letter to TransAlta. In response, on

[3] Personal communication with Mr. Newman of Ecology, October 2009.

[4] Ecology notes in Section 4.1 of its January 9, 2009 document that "…the Flex Fuels project and SNCR are the only technically feasible controls…."

May 23, 2008, CH2M Hill notes that “the revised BART analysis will provide a more detailed explanation.” The additional detail was apparently the three figures 3-3 through 3-5 in the revised July 2008 application, which figures are inadequate to support or assess the assertions regarding physical limitations. Simple examination shows that these figures do not contain anywhere near the level of detail that Ecology asked for or would be needed to make a proper engineering assessment of the space or retrofit difficulty for SCR. These figures, at the scales provided, simply do not make the case that space may or may not be available for SCR. They certainly do not make the case for an engineering assessment of the degree of difficulty of the retrofit. Figure 3-3 is a plan view of the entire facility in which the scale and distances are barely legible. Figure 3-4 is an elevation with illegible details and a SCR box pasted onto the figure. Figure 3-5 is a photograph showing one single side view perspective of the connection between Unit 1 and its ESP. Collectively, they do not provide any details as to where the applicant assumed the one-SCR or two-SCR options would be located, the length of piping runs in the modified configuration, etc. In addition, the application does not discuss the potential for moving or re-configuring existing equipment (such as the ESPs) or piping runs that would render the retrofit less problematic. In order to do a proper evaluation of the SCR option, several details need to be provided as discussed below.

7. A fundamental question is the level of NOx emissions from the boilers themselves, prior to any control. As noted earlier, the current boiler NOx emissions are approximately 0.3 lb/MMBtu, dropping to 0.24 lb/MMBtu or so with the implementation of the Flex Fuels project. However, these emissions are still too high given what we know is happening elsewhere in the industry. Numerous existing PRB-fired coal boilers, currently operating (and operating for at least the last 5 years or more) have much lower boiler out NOx emission rates – generally well below 0.15 lb/MMBtu. A survey of the EPA’s acid rain database[5] shows, for example, lower NOx levels from pulverized coal boilers, including Scherer Units 1-4 (Georgia), Labadie Units 1-4 (Missouri), Rush Island Units 1-2 (Missouri), Meramec Units 1-2 (Missouri), Newton Units 1-2 (Illinois), and Deely Units 1-2 (Texas). Each of these older units burns PRB coals, from

[5] www.epa.gov/airmarkets

various mines in the PRB with likely considerable variability in the coal nitrogen content,[6] and none of these units uses SCR or SNCR so their NOx emission levels reflect the use of low NOx burners and other strategies (such as OFA) in the boiler itself – strategies that TranAlta claims it uses effectively at the boilers in question. Tables 1-6 provide the data.

8. It should also be kept in mind that the units referenced above are not subject to stringent NOx permit limits and are therefore not carefully maintaining NOx performance. In other words, likely even lower NOx emissions from the boiler are possible, with careful control or with the use of adaptive combustion controls such as NeuCo. Nonetheless, it is obvious from Tables 1-6 that boiler-out NOx emissions from a well controlled and operated PRB coal combustion unit should be no more than 0.10 to 0.15 lb/MMBtu. Within this range, as the data shows, it should be possible to achieve levels closer to or lower than 0.10 lb/MMBtu.

9. Further support for these levels of boiler-out NOx levels is provided in many recent technical papers that were not discussed in the record and in the development of the BART limits. Examples of these include:

- G.T. Bielawski, et. al., "How Low Can We Go? Controlling Emissions in New Coal Fired Power Plants," U.S. EPA/DOE/EPRI Combined Power Plant Air Pollutant Control Symposium: "The Mega Symposium," August 20-23, 2001 Chicago, Illinois, U.S.A. This paper states that "For PRB coal, emission levels down to 0.008 lb/MMBtu NOx , 0.04 lb/MMBtu SO_2, and 0.006 lb/MMBtu particulate with a high level of mercury capture can be achieved."
- A. Kokkinos et al., "Which is Easier: Reducing NOx from PRB or Bituminous Coal, Power 2003." This paper discusses retrofits at Georgia Power Company's Plant R.W. Scherer Units 3 and 4 (which burn PRB coal) with separated over fire air. The paper shows that Units 3 and 4 achieved 0.13 lb/MMBtu of NOx after the retrofit.
- Robert Lewis, et al., Summary of Recent Achievements with Low NOx Firing Systems and Highly Reactive PRB and Lignite Coal: as Low as 0.10 lb NOx/MMBtu

[6] As such, these NOx levels should also be achievable using the 50:50 blend coals that may be used as the alternate fuel in the proposed unit.

- Patrick L. Jennings, Low NOx Firing Systems and PRB Fuel; Achieving as Low as 0.12 LB NOx/MMBtu, ICAC Forum 2002.
- T. Whitfield, et al., Comparison of NOx Emissions Reductions with PRB and Bituminous Coals in 900 MW Tangentially Fired Boilers, 2003 Mega Symposium.
- Galen Richards, et al., Development of an Ultra Low NOx Integrated System for Pulverized Coal Fired Power Plants. This paper noted that use of the TFS 2000™ firing system achieved NOx emissions of 0.11 for PRB coals or approximately 70-75% reduction over the baseline NOx emissions. Additional NOx reduction of approximately 0.03 lb/MMBtu over the optimized TFS 2000™ levels was achieved using the Ultra-Low NOx firing system technology.

10. None of this was discussed or compared in the development of the BART analysis. It is striking that the Ecology did not review the technical literature above or the performance of other comparable PRB-fired units in assessing the NOx BART emissions levels. It would also appear that when Ecology asked TransAlta as to why their NOx emissions from the boilers was so high (i.e., 0.3 lb/MMBtu), that TransAlta had no technical answer or response.[7] In any case, there is no support for the contention that the boiler out NOx emissions levels should be as high as even 0.24 lb/MMBtu when using the supposed controls that the boilers have, along with firing PRB coals. Rather, it should be closer to 0.10 lb/MMBtu, especially for a well-run, baseload unit. This is a crucial component of NOx control and BART analysis that this plant and Ecology simply have not done.

11. The issue of boiler-out NOx emissions is crucial, not just for understanding and requiring best controls for NOx with existing technology, but also because minimizing boiler NOx emissions will require less NOx control after the boiler using add-on approaches such as SNCR or SCR. In particular, the impact on SCR will be considerable. For example, at a minimum, if the boiler-out NOx emissions are kept to the levels outlined above, it will mean that the subsequent SCR could be smaller in size, obviating or greatly reducing any of the space constraints that are claimed to be a problem at the Centralia facility. For example, there is no

[7] Personal communication with Mr. Newman of Ecology, October 2009.

analysis of how much SCR catalyst would be needed for various levels of NOx reductions, for example 90%, 80%, 70%, or even just 50% more than achieved with the boiler-out control levels discussed above. Even at 50% reduction, which would require the least amount of catalyst, the combined boiler-out NOx level of 0.10 lb/MMBtu and 50% reduction would result in a NOx emissions level of 0.05 lb/MMBtu, which is approximately a fifth of the current BART proposed limit of 0.24 lb/MMBtu. Such a reduction will also reduce NOx-related visibility impacts from Centralia by approximately 80%.The space and weight requirements for a 50% reduction SCR would be far smaller than a 90% or 80% reduction SCR. Yet, this crucial aspect and interconnectivity between boiler-out NOx emissions and SCR size seems to be entirely absent in TransAlta's analysis or Ecology's review. For this reason alone, it is premature to disregard and set aside SCR as has been done in TransAlta's BART analysis and Ecology's approval of it.

12. In fact, all of the arguments or rationales regarding physical space configurations at the existing Plant against a properly-sized SCR are not actually issues associated with the technical feasibility of SCR, but rather issues of how much TransAlta is willing to spend to adequately control NOx emissions. Further, on the issue of cost effectiveness of SCR for the Plant, the cost assumptions in TransAlta's materials do not appear to be tied to the supposed retrofit difficulty, since there is no supporting documentation for the size of the SCR, the physical limitations at the plant, or associated costs. The assertions are unsupported and the connections are not transparent. Yet, Ecology seems to have accepted the applicant's initial and revised cost assessments without question, a failure of Ecology's obligations relative to BART determinations. Numerous questions remain that must be answered and examined in order for Ecology, the permitting entity, and importantly, the public, to assess TransAlta's claims that SCR control technology is not BART, including:

(i) what was the boiler-out NOx emissions and why (especially in view of the discussion presented above)?

(ii) what was the basis for the SCR size used in the analysis?

(iii) what was the basis for the SCR cost estimates in the initial application, where the costs were ascribed to “vendor”?[8]

(iv) Who or what vendors provided data? What type of data were provided by the vendors? Were the vendors provided with engineering drawings (as opposed to Figures 3-3 through 3-5) in order to develop costs estimates?

(v) Why was the capital cost of two SCRs double that of one SCR? Two SCRs would or could share several components such as the reagent storage system, etc., making a simple “doubling” highly unlikely (further demonstrating cursory, as opposed to analytical, review by Ecology.)

(vi) What is the basis of assuming that construction costs and balance-of-plant (items not defined) costs are each an additional 50% of the SCR capital cost?[9]

(vii) What is the basis of the 16% surcharge?[10]

(viii) Finally, what was the basis for assuming that the NOx level with SCR would be 0.07 lb/MMBtu. Even with the current (or pre-Flex Fuel) NOx level of 0.30 lb/MMBtu and an SCR efficiency of 90%, the outlet NOx level would be 0.03 lb/MMBtu. Or, as discussed above, the combination of a boiler-out NOx emissions level to 0.1 lb/MMBtu and use of a 50% reduction SCR would result in a NOx emission level of 0.05 lb/MMBtu. Just dropping the NOx level from 0.07 lb/MMBtu to 0.03 lb/MMBtu or 0.05 lb/MMBtu would lower the calculated cost effectiveness, bringing it down to the range of acceptable cost-effectiveness, all other factors kept constant. Yet, this final NOx level was not examined critically by Ecology. Based upon what is readily known regarding SCR or combined SCR and boiler-out controls, NOx should be lower and therefore visibility more improved, than indicated by TransAlta’s analysis, accepted by Ecology. Further, there is no detail or support for why the baseline NOx emissions level of 0.30 lb/MMBtu could not be significantly lower. It appears from what is known, to be wholly inaccurate and/or inflated.

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[8] January 2008 BART Analysis for Centralia Power Plant, pp 43/80 (.pdf version). The SCR capital cost is noted as 204 million dollars and the Factor/Source is listed as ‘Vendor,” with no further explanation or detail that can be verified.

[9] Ibid.

[10] Ibid.

(ix) While cost is one factor in the BART determination, it must be weighed against visibility and the importance of preserving Class I resources. Ecology should give a detailed explanation of how it balanced these factors, and how it arrived at the final balance of these factors specific for the TransAlta facility at Centralia. In particular Ecology or the permitting entity should also clarify what the acceptable cost-effectiveness limit is for NOx.

(x) Why did the "vendor" basis change in the revised July 2008 application to CH2M Hill? How did the consultant CH2M Hill obtain its base cost estimates for SCR? Why are the form of the costs different than how costs were presented in the January 2008 analysis? Why are the SCR costs higher in the July 2008 analysis? What was or what were the retrofit factors that may have been applied to inflate the base costs for SCR? What was the basis for the retrofit factors? How were they supported by actual field conditions? What was the geometry and location for the single SCR (on one boiler) and two SCR configurations? Also, all of the questions posed earlier regarding the level of NOx after SCR (i.e., 0.07 lb/MMBtu) are also applicable.

(xi) What was the size or sizes of the SCRs assumed in the analysis? How many catalyst layers were assumed to be present? What are the details regarding the reagent and reagent processing or handling? Answers to these and related types of questions affect the physical layout, the degree of retrofit ease, and the costs of the project.

13. There seems to have been much confusion regarding the choice of baseline periods. Even though TransAlta initially accepted 2006-2007 as the proper baseline for cost effectiveness, in its December 2008 submittal, the applicant seems to have backtracked. While noting that the 2006-2007 period was "not representative" because "…emissions….were lower on average…than more representative periods…" and that there was "…emissions variability…" the applicant provides nothing factual or specific. It simply selects 0.30 lb/MMBtu as the baseline. While the actual impact of this may be small, Ecology should provide a thorough discussion regarding baseline in its Determination Document. The January 9, 2009 document does not discuss this issue in any detail.

14. Ecology notes that Transalta "continues to investigate" the use of neural net controls such as by NeuCo or others as a "potential supplementary or polishing" technology. It is not clear if such technologies will be implemented or not. Utilities have routinely expected and obtained 10-15% additional NOx reduction by implementing such techniques. It is not clear why these technologies are any less reliable in predicting NOx reduction than the Flex Fuel project. In the latter, the imputed NOx emissions derive from computational modeling of the project modifications – and do not appear to result from any specific changes to hardware. As such, it is not clear why Ecology would not expect and assume a further 10-15% NOx reduction from the implementation of neural net technology implementation.

15. Without answers to the above and related questions, it is simply impossible to verify the applicant's cost (and resulting cost-effectiveness) assumptions, and it appears that Ecology did not do so. As a result, without much greater detail in the record, it is entirely premature and incorrect to reject SCR as the BART choice for these two units. In combination with the expected 0.24 lb/MMBtu that would result from the existing controls and Flex Fuel, SCR at even 90% efficiency would imply a NOx emission rate of 0.024 lb/MMBtu. Or, in combination with a boiler NOx emissions level of 0.1 lb/MMBtu, a far smaller SCR would still provide a NOx emission level in the same range. These vastly reduced emissions would significantly lessen the adverse visibility impacts of the plant on numerous Class I areas, a key component of BART. As noted earlier, all NOx related visibility impacts from Centralia should be reduced by 80% or so.

16. From my analysis of the file, it is my opinion that SCR cannot be ruled out as BART for the Plant. Given the current very large, adverse impacts from the Plant to numerous Class I areas, Ecology's review and acceptance of the applicant's meager and unsupported analysis regarding SCR is puzzling, and not in keeping with BART and visibility requirements.

17. In view of the fact that SCR has not been properly analyzed, it is premature to focus any significant attention on the next lower control, namely SNCR. While EPA has provided extensive comments to Ecology relating to SNCR, it is improper to focus the control discussion on SNCR as opposed to SCR. Plainly, SNCR will cause greater emissions of ammonia as

opposed to SCR resulting in additional production of secondary nitrate aerosols with attendant visibility impacts. Also, SNCR NOx reduction levels will be far smaller than those which can be obtained from the use of SCR.

18. Ecology acknowledges a 5-step BART process (see January 9, 2009 BART Determination Support Document, Section 1.1). As can be seen above, Ecology has not properly completed that process. Also, as part of the 5-step BART process, Ecology notes that the state can consider additional controls beyond those that are available, but is not required to do so. This one plant has a significant impact on many Class I areas, and therefore Ecology must consider using its authority to consider additional controls. If Ecology does not do so for this Plant, it raises serious question regarding whether Ecology will consider adequate controls to address visibility impacts from any emissions in Washington state.

19. There is a question regarding whether the Flex Fuel project might trigger New Source Review ("NSR") that must be examined by either or both the permitting entity and Ecology. Ecology's summary contains contradictory statements. On page 10 of 25 of the January 9, 2009 document, it states that "[T]he Flex Fuel project….does not increase the boilers' potential steam generating capacity." Yet, later on the same page, it also states that "[T]he lower nitrogen content of the PRB coals combined with the lower total quantity of fuel required to produce the same heat input to the boilers along with the potential for additional steam production after the project has been completed…." TransAlta, the permitting entity and Ecology should clarify whether the Flex Fuel project is a purely efficiency driven project in which heat input and emissions will not increase or if it involves debottlenecking the boiler island in any manner. If the latter is possible, Ecology must examine the NSR aspects of this project.

Proposed Voluntary Mercury Reduction

20. It appears that TransAlta has committed to a voluntary emissions reduction effort with regards to mercury. The entirely voluntary effort also includes significant constraints, such as aiming for a goal of only 50% mercury reduction and a constraint of TransAlta not spending

more than 3 million dollars per year to achieve mercury reductions, regardless of whether the 50% is ultimately achieved.[11]

21. Based on conversations with Ecology,[12] it appears that TransAlta has completed and is in the midst of completing pilot and additional tests involving a variety of sorbents, boiler injection chemicals, and injection strategies in order to determine its path forward with regards to mercury reduction. Since none of the details, including results, of such tests are available, either to the public or to Ecology,[13] comments cannot be provided on any of these aspects.

22. However, it is clear that the stated goal of 50% mercury reduction, to be achieved at TransAlta's "sole discretion"[14] is a travesty. Far greater mercury reduction (over 90%) has been and can be obtained from PRB coals, as discussed below. It is not clear why Ecology feels that a goal of only 50% mercury reduction is acceptable.

23. Greater than 90% mercury removal has been achieved on a long term basis at PRB coal-fired power plants with activated carbon injection. For example, the Holcomb Unit 1 power plant, which burns PRB coal, achieved 93% mercury control in long term testing.[15] In addition, over a year of continuous mercury CEMS data is available for the WE Energies Presque Isle facility in Michigan, which burns PRB coal, and these data demonstrate that over 90% mercury control has been achieved on a continuous basis. This site is a Department of Energy test site, and the data is thus publicly available. Some of this data has been summarized in presentations and published articles[16]. Furthermore, at least two other full-scale, long-term mercury control demonstrations have been reported to continuously achieve 90%+ mercury control: at Rocky Mountain Power (Hardin) in Montana,[17] and at the Comanche Station in Colorado,[18] both of which burn PRB

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[11] See Ecology/TransAlta Settlement Agreement, Section B.4.
[12] Personal communication with Mr. Newman, October 2009.
[13] Ibid.
[14] Settlement Agreement, Section B.7.c.
[15] Sjostrom, Sharon, Evaluation of Sorbent Injection for Mercury Control, DoE Report Number 42307R27, December 2008.
[16] TOXECON™ Tests at PIPP Continue Successfully, PRECIP Newsletter No. 397, February 2009.
[17] Amrhein, J., Results of a Long-Term Mercury Control Project for a PRB Unit with an SCR,Spray Dryer and Fabric Filter, 11th Annual EUEC Conference and Expo Tucson, Arizona, January 30, 2008.
[18] Colorado Air Toxics Meeting Comanche 3 Project Update, Pueblo, CO, May 2009.

coal. It would also appear that Ecology was well aware that 90% mercury reduction is being obtained at numerous locations at US coal-fired power plants based on documents obtained from Ecology.[19]

24. The record does not appear to contain details of the current mercury levels in the PRB coal that is burned at the TransAlta boilers. Therefore, there is no discussion of what the expected mercury levels will be after TransAlta's voluntary effort (assuming, given its wholly-voluntary nature, that any reductions occur.) Providing this information (in lb/GW-hr or lb/TBtu) would allow for a direct comparison of the mercury emissions levels at other comparable PRB burning facilities.

25. For comparison purposes, we provide the mercury levels, tested back in 1999, as part of EPA's Information Collection Request (ICR), at various coal-fired power plants.

Unit	**1999 ICR Mercury Emission Rate, lb/TBtu**[20]
Kline Township Cogen, Unit 1	0.0816
Scrubgrass Generating Company, Unit 1	0.0936
Mecklenburg Cogeneration Facility, Unit 1	0.1062
Dwayne Collier Battle Cogen Facility, Unit 2B	0.1074
Valmont, Unit 5	0.1268
Stockton, Unit 1	0.1316
SEI Birchwood Facility – Unit 1	0.2379
Intermountain Power Plant, Unit 2	0.2466
Logan Generating Plant, Unit 1	0.2801
Salem Harbor, Unit 3	0.3348
Clover Power Station, Unit 2	0.3529
AES Hawaii, Unit A	0.4606
Clay Boswell, Unit 2	0.6633
Craig, Unit 3	0.7248
W.H. Sammis, Unit 1	0.8291

[19] See letter from Ms. Carolyn Slaughter, ICAC, to Mr. Jay Manning, Director, Ecology, March 30, 2009. See also the possibility of obtaining 90% mercury reduction at Minnesota Power's Boswell Unit 3, as noted in the exerpt from the Boswell Unit 3 Environmental Improvement Plan. See also the technical paper Cost Effective Mercury Emissions Control at the Newmont TS Power Plant, by Seeliger, J., August 2008.
[20] A copy of the spreadsheet of mercury emission rates measured at these and other electrical generating units as part of the 1999 ICR is available for download at http://www.epa.gov/ttnatw01/combust/utiltox/utoxpg.html.

Charles R. Lowman, Unit 2	0.9706
Shawnee Fossil Plant, Unit 3	1.0507
Cholla, Unit 3	1.2066
Presque Isle, Unit 6	1.2217
Presque Isle, Unit 5	1.2622
Widows Creek Fossil Plant, Unit 6	1.3986

Dated:___November 4, 2009________________

Ranajit Sahu

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Ranajit Sahu, Ph.D.

EARTHJUSTICE

ALASKA CALIFORNIA FLORIDA MID-PACIFIC NORTHEAST NORTHERN ROCKIES
NORTHWEST ROCKY MOUNTAIN WASHINGTON, DC INTERNATIONAL

November 9, 2009

Via Electronic Mail

Sarah Rees
Washington Department of Ecology
Air Quality Program
P.O. Box 47600
Lacey, WA 98504-7600

Re: Proposed Ecology/TransAlta Settlement Agreement and Consent Decree
TransAlta Centralia Generation, L.L.C., Centralia, Washington

Dear Ms. Rees:

Earthjustice submits these comments on the proposed Settlement Agreement and Consent Decree regarding the coal-fired power plant in Centralia, Washington, between the State of Washington, Department of Ecology ("Ecology") and TransAlta Centralia Generation, L.L.C. ("TransAlta"). These comments are submitted on behalf of the National Parks Conservation Association, the Sierra Club, and Northwest Environmental Defense Center (collectively the "Conservation Organizations").[1]

The National Parks Conservation Association ("NPCA") is a national organization whose mission is to protect and enhance America's National Parks for present and future generations. NPCA performs its work through advocacy and education. NPCA has over 310,000 members nationwide with its main office in Washington, D.C. and 24 regional and field offices. NPCA's regional Northwest office is located in Seattle, where it works on a variety of issues affecting Northwest National Parks such as Mt. Rainier, Olympic, and North Cascades National Parks. NPCA is active in advocating for strong air quality requirements in our parks, including submission of petitions and comments relating to visibility issues, regional haze State Implementation Plans, global warming and mercury impacts on parks, and emissions from individual power plants and other sources of pollutants affecting National Parks. NPCA's members live, work, and recreate in all the National Parks of the Northwest, including those directly affected by the TransAlta coal-fired power plant in Centralia, Washington.

The Sierra Club is a national organization founded in 1892, with more than 60 chapters throughout the U.S., including the Cascade Chapter located in Seattle, Washington. The Cascade Chapter's membership resides and recreates throughout the state. Sierra Club is devoted to the

[1] The Conservation Organizations, with the Washington Wildlife Federation, also filed a Petition to the U.S. Department of Interior, National Park Service, requesting certification to Ecology that visibility impairment in Mt. Rainier and Olympic National Parks is reasonably attributable to nitrogen oxide emissions from the TransAlta Centralia coal plant. The petition is pending.

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study and protection of the earth's scenic and ecological resources—mountains, wetlands, woodlands, wild shores and rivers, deserts, plains, and their wild flora and fauna. An important part of Sierra Club's current work at both the national and chapter level, is its Beyond Coal campaign which, among other things, focuses on retiring and reforming old coal-fired power plants that are significant contributors to health-harming soot and smog pollution, global warming pollutants, and hazardous pollutants such as mercury.

The Northwest Environmental Defense Center ("NEDC") is a regional non-profit organization, based in Portland, Oregon. NEDC works to protect the environment and natural resources of the Pacific Northwest, by providing legal support to individuals and grassroots organizations with environmental concerns, and engaging in litigation independently or in conjunction with other environmental groups. NEDC also provides hands-on experience for students to enhance their education in environmental law. NEDC is regularly involved in efforts to maintain or enhance the air quality of the Pacific Northwest by serving as a watchdog over Oregon's Department of Environmental Quality, Washington's Department of Ecology, and each state's respective permitting processes. Student volunteers regularly comment on proposals for new air permits and permit modifications, monitor current permits in search of violations, and monitor major air quality issues, such as changes in administrative regulations.

The Conservation Organizations object to the Settlement Agreement and Consent Decree (the "Agreement") as contrary to the law, not supported by the record or established engineering and science, and because the Agreement is contrary to the public interest.

I. THE NITROGEN OXIDE PROVISIONS OF THE AGREEMENT DO NOT COMPLY WITH THE REQUIREMENTS OF THE CLEAN AIR ACT AND ARE INADEQUATE TO CLEAN UP AND PROTECT THE AIR QUALITY OF WASHINGTON'S NATIONAL PARKS AND WILDERNESS AREAS.

A. Nitrogen Oxide Pollutants From The TransAlta Coal Plant Negatively Affect the Air Quality Of at Least Twelve Class I Areas

On an annual basis, the TransAlta Coal Plant in Centralia, Washington (hereinafter the "TransAlta coal plant") discharges approximately 12,000-16,000 tons of nitrogen oxides ("NOx").[2] NOx is a primary contributor to haze pollution. Haze pollution is adversely affecting the air quality in many of the region's national parks and wilderness areas.[3] The Clean Air Act

[2] EPA emissions database http://camddataandmaps.epa.gov/gdm/index.cfm.
[3] See enclosed extinction analyses and conclusions from National Park Service demonstrating TransAlta coal plant's NOx emissions will be an increasing source of haze pollution in Washington's Class I areas and which provide: "NO_X emissions from Centralia in 2002 were approximately 15,470 tons or approximately 36 percent of all point source NO_X emissions in the State. Based on [Western Regional Air Partnership] WRAP projections, Centralia will be approximately 10 percent of ALL mobile and point source emissions in the State by 2018. 2018 Projections: Nitrate will become more important than sulfate for extinction at Olympic and

("CAA") requires that national parks and wilderness areas, identified in the CAA as "Class I areas," must receive the highest degree of protection from all air pollution. 42 U.S.C. § 7472.

Almost twenty-five years ago, in 1985, the Department of the Interior ("Interior") certified to the Environmental Protection Agency ("EPA") that visibility in Mt. Rainier and Olympic National Parks, as well as all other Class I areas in the region, was impaired. Almost fifteen years ago, in 1995, the National Park Service ("NPS") formally notified the Southwest Air Pollution Control Authority (now known as the Southwest Clean Air Agency or "SWCAA") and Ecology that the impairment of visibility in Class I areas in Washington could reasonably be attributable to sulfur dioxide emissions from the coal plant in Centralia.[4]

The TransAlta coal plant currently employs a combustion control technology commonly-referred to as "Lo-Nox burners" (or "LNC3") to control haze-causing NOx pollutants.[5] At this level of control, the TransAlta coal plant is impairing visibility in at least twelve Class I areas in the region, the second largest cumulative impact of any coal-fired power plant in the nation.[6] According to EPA's Clean Air Markets Database, in 2007, the TransAlta coal plant was in the top 10 percent of worst polluters for NOx.

The CAA requires the clean-up of visibility pollution at Mt. Rainier and Olympic National Parks (as well as all other Class I areas in the region). 42 U.S.C. § 7491(a)(1). Despite some improvements in the TransAlta coal plant's emissions, the air quality at Mt. Rainier and Olympic National Parks, and other Class I areas remains impaired, with haze pollution still primarily caused by the TransAlta coal plant.[7] As part of the requirements to clean-up and protect Class I areas, the CAA and EPA regulations and guidance require states to develop a State Implementation Plan ("SIP") for addressing visibility impairment, 42 U.S.C. § 7491(b)(2) and 40 C.F.R. § 51.302, and as part of that SIP, to ensure that certain major sources of air pollutants, such as the TransAlta coal plant, employ Best Available Retrofit Technology ("BART") to control pollutants that cause or contribute to haze pollution, including NOx. Id. The critical aspect of the visibility protection program is the requirement for each applicable implementation plan in which Class I areas are located to contain "emission limits, schedules of compliance and other measures as may be necessary to make reasonable progress toward meeting the national goal. The SIP and the BART determinations within it are subject to public process and the states must consult with the Federal Land Managers ("FLMs") as part of the process. 42 U.S.C. §§ 7410 and 7491.

Mount Rainier according to the WRAP projections."

[4] See letters dated August 2, 1995 and October 16, 1995, enclosed with these comments.

[5] See Report of Dr. Ranajit Sahu, November 4, 2009, enclosed and incorporated herein.

[6] See enclosed graphs and material from NPS and TransAlta's own extinction analyses in Ecology's files.

[7] See Testimony of Mt. Rainier Acting Superintendent Randy King, October 13, 2009, copy enclosed.

To determine what constitutes BART for a source, Washington must employ a five-step process:

1. Identify all available retrofit control technologies;
2. Eliminate technically infeasible control technologies;
3. Evaluate the control effectiveness of remaining control technologies;
4. Evaluate impacts and document the results;
5. Evaluate visibility impacts.

Appendix Y to C.F.R. Part 51, Guidelines for BART Determinations Under the Regional Haze Rule, Section IV. See also 40 C.F.R. § 51.301 and 42 U.S.C. § 7491(g)(2).[8]

The proposed Agreement fails to conform to these BART requirements and processes.

B. The Flex Fuels Project Can Not Properly Be Considered BART.

The Agreement suggests that the TransAlta Coal Plant will be implementing "additional" NOx controls through the "Flex Fuels" project. Conservation Organizations disagree that the Flex Fuels project is an additional NOx control, or a NOx control that can be considered BART.

1. Flex Fuels is not a NOx reduction technology or project.

It is clear from the record that TransAlta has planned and implemented (and would have implemented regardless of any mediated agreement with Ecology), the Flex Fuels project over the course of the last several years.[9] It has been TransAlta's plan and intent for years to move away from burning Centralia coal to the exclusive use of Powder River Basin ("PRB") coal. Flex Fuels is a boiler efficiency project associated with the shift to PRB coal. Specifically, TransAlta, contrary to earlier representations and agreements with the state[10], closed the Centralia mine in late 2006. From that time to the present, TransAlta has been shifting away from Centralia coal to PRB coal. TransAlta's own website noted that the shift was complete at the end of 2007.[11] Any reduction in NOx emissions is entirely incidental to a project that has been proposed for non-NOx reduction reasons. Therefore, as noted in Dr. Sahu's report, the Agreement attempts to satisfy BART requirements with the Flex Fuels project, yet with no

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[8] Visibility and BART requirements have also been incorporated into Washington and SWCAA regulations. See e.g. WAC 173-400-030, 173-400-151, SWCAA 400-030, 400-151.

[9] See e.g. information from Ecology in response to questions by the Conservation Organizations (hereafter "Ecology Answers"), that in September 2007, TransAlta was already referring to the Boiler Efficiency Project. TransAlta later renamed the project "Flex Fuels" in January 2008 BART submissions. http://www.ecy.wa.gov/programs/air/TransAlta/Earthjustice.pdf..

[10] Including agreements that TransAlta would, in exchange for generous tax treatment from the state, keep the mine operating and the jobs associated with it. TransAlta has continued to receive the tax benefits, even after the mine closure.

[11] See also Ecology Answers.

additional incremental effort at NOx reduction by TransAlta beyond what it would be doing anyway.

2. There is no support in the record for the claimed NOx reduction from the Flex Fuels boiler efficiency project.

Even if Flex Fuels were appropriately in the running as a BART technology intended to address NOx and haze pollution in Class I areas, Ecology has not properly analyzed the Flex Fuels project and cannot rely on the claimed 20% NOx reduction. As set forth in Dr. Sahu's report, there are no technical details regarding combustion modeling in Ecology's record and therefore no way for the public to determine the appropriateness of the assumptions made, or the overall usefulness or accuracy of the analysis by either TransAlta or Ecology regarding the NOx reductions that may occur as an incidental benefit of the Flex Fuels boiler efficiency project. It appears that the information was not requested by, or provided to, Ecology.[12] Therefore, it also appears that Ecology did not actually analyze NOx reductions from the Flex Fuel project. Instead, Ecology has relied on a bare assertion by TransAlta. There is no way for Ecology or the public to determine whether a 20% incidental benefit is realistic or even meaningful. Flex Fuels cannot be considered as BART, because Ecology has failed to actually engage in at least steps 3 and 4 of the analysis and as a result, cannot have properly engaged in step 5. See 40 C.F.R. § 51.301.

3. Even after the application of Flex Fuels, the TransAlta coal plant will cause visibility impairments in twelve Class I areas.

Even after implementation of the Flex Fuels boiler efficiency project, the TransAlta coal plant will continue to cause significant visibility impairments at Mt. Rainier and Olympic National Parks as well as other Class I areas in the region and the Columbia River Gorge. As noted above, the TransAlta coal plant's NOx pollution impairs visibility in 12 Class I areas, including Mt. Rainier and Olympic National Parks. Even after application of the Flex Fuels project, the cumulative negative impact is 33 deciviews.[13] EPA considers a 1 deciview impact to be a cause of an impairment (and anything over .5 deciviews to be a contribution to impairment.) The TransAlta coal plant's impact on Mt. Rainier National Park alone will be 5 deciviews even after implementation of the boiler efficiency project—five times the level EPA considers a cause of a negative impact.[14] This indicates that even if Ecology were considering the boiler efficiency project as BART, Ecology has failed to adequately apply Step 5 of the BART analysis regarding improvements to visibility. See 40 C.F.R. § 51.301.

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[12] Sahu Report at paragraph 5.

[13] A deciview is a measure of visibility impairment.

[14] See generally enclosed information and extinction graphs from NPS.

C. Selective Catalytic Reduction Technology Is BART.

The CAA, EPA regulations and guidance, state law, and the record all support Selective Catalytic Reduction technology ("SCR") as BART. As pointed out by Dr. Sahu, rejection of SCR is a "major error" in TransAlta and Ecology's determination of BART for the TransAlta coal plant.

1. SCR is technically feasible.

SCR is technically feasible, despite Ecology's unsupported statement to the contrary. Dr. Sahu notes that while Ecology makes a bald statement that SCR is technically infeasible, such a claim is not actually made in TransAlta's analysis or Ecology's own summary.[15] The only impediment listed is the "lack of room" (i.e. physical space limitations), for easy SCR installation. This does not mean that SCR cannot be installed, but only that it could potentially be costly. Therefore, under the 5-step BART analysis, SCR is technically feasible.

2. There is no support in the record for the claims regarding physical space limitations.

Even if the physical space limitation were to be considered a technical as opposed to cost issue, the record contains no evidence to support TransAlta's assertion. Dr. Sahu notes there is little to no engineering detail regarding the congestion.[16] While Ecology asked questions on this issue early in the process, TransAlta failed to provide information adequate to the task and Ecology apparently never followed up.[17] The figures that TransAlta did provide are barely legible and do not contain the level of engineering detail requested by Ecology or that is necessary to assess the claimed space limitations.[18] The figures provide no support for the claim of physical limitation for SCR and according to Dr. Sahu "certainly do not make the case for an engineering assessment of the degree of difficulty of the [SCR] retrofit."[19] Finally, the information from TransAlta is incomplete in that it contains no discussion of the potential for moving or re-configuring existing equipment, or how that factors into the physical limitation and cost discussions. For example, TransAlta fails to provide any information regarding moving or replacing the electro-static precipitators ("ESPs") or reconfiguring piping runs that would render

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[15] In fact, it appears that Ecology has been imprecise in its language regarding BART and SCR. It appears that Ecology believes that SCR would be technologically feasible at the TransAlta coal plant, but accepts TransAlta's rejection of it based upon cost reasons. See also Ecology's answers to Conservation Organizations' questions that the cost of SCR is "extreme" yet providing no support or detail regarding the claimed cost.

[16] Sahu Report, paragraph 6.

[17] Id.

[18] Id.

[19] Id.

an SCR retrofit less problematic.[20] Therefore, even if cost due to space limitations is properly considered a technical issue for installation of SCR, the analysis and information provided is inadequate to actually assess the problem.

3. The record has no explanation for TransAlta's failure to control the unusually high boiler-out NOx emissions at the TransAlta coal plant, a fundamental component of considering feasible BART technologies.

TransAlta and Ecology have failed to analyze all potential, technically feasible, control technologies because TransAlta and Ecology have not adequately assessed the situation with NOx emissions from the boilers themselves and possible improvements at the boilers. The current boiler-out NOx emissions are approximately 0.3 lb/MMBtu. The emissions are predicted to drop to 0.24 lb/MMBtu with the Flex Fuels project. Dr. Sahu finds that these emissions are very high given operations elsewhere in the industry. Numerous existing PRB-fired boilers are operating with NOx emissions much lower than those reported by the TransAlta coal plant, generally well below 0.15 lb/MMBtu.[21] None of the scientific and engineering literature that is widely-available on the subject nor any of the boiler emissions information available from the EPA database was discussed, compared, or analyzed relative to the BART analysis for the TransAlta coal plant. While Ecology appears to have inquired into why TransAlta's boiler NOx emissions are so high, according to Ecology TransAlta had no technical response.[22] The is no reason that TransAlta's boiler-out NOx emissions should be as high as 0.24 lb/MMBtu when using the claimed controls for the boilers along with PRB coals. Given known information from the industry and the literature, the NOx emissions should be closer to 0.10 lb/MMBtu for a well-run, baseload unit.[23]

The issue with the boiler emissions is fundamental to Ecology's BART analysis and determination. Minimizing boiler-out NOx will require less NOx control from add-on technologies such as SCR. For example, if NOx emissions from the boiler were kept within the industry levels outlined in Dr. Sahu's report, SCR technology could be smaller in size, reducing or obviating physical constraint concerns at the plant. The attendant improvements in visibility in the national parks and wilderness areas of such a combined approach would be huge.[24] TransAlta and Ecology have failed to assess this crucial connection between improved boiler-out

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[20] Id. It should also be noted that the NPS believes there are benefits for both NOx and mercury reductions with the removal of one or both ESPs and the use of baghouses for mercury control. Removal of the ESPs then makes room for the SCR. See King testimony and enclosed email from Bruce Polkowsky, NPS.

[21] See, paragraphs 7-9, Sahu Report and Table 1-6 therein.

[22] See also Ecology Answers where Ecology said it does not know why the boilers and Lo-NOx burners do not meet the level of performance usually attained by this technology.

[23] Sahu report, paragraph 10.

[24] Sahu Report, paragraph 11.

NOx emissions and appropriately-sized SCR. As a result, Ecology has failed to properly complete Steps 1 through 3 of the BART analysis.

4. There is no support in the record for TransAlta's high cost claims for the SCR technology.

Ecology has also not examined TransAlta's arguments regarding cost of SCR technology. The cost assumptions submitted by TransAlta do not appear tied to the claimed physical difficulties as there is no supporting documentation for the size of the SCR (which can vary), the physical limitations at the plant, or how either of those things specifically affect the cost of the retrofit. For example, there is no information regarding cost estimates other than costs ascribed to "vendor". The "vendor" identification is not even disclosed. Further, it is unclear what the vendors might have had at their disposal when the "vendor" rendered the opinion; it is conceivable that the vendor was simply offering something rough and off the cuff.[25] There are also items such as a "surcharge" of 16% with no explanation of what that is or what it's for or why 16% is the proper amount. Or, there is the straight doubling of the cost estimate from one SCR unit to two. As pointed out by Dr. Sahu, that makes no sense on its face as two SCRs would share several components.[26] Overall, the cost assertions are entirely unsupported and opaque. Unfortunately, Ecology appears to have nonetheless accepted them wholesale.

If Ecology is going to reject SCR as BART because it costs "too much", TransAlta and Ecology must produce much more information regarding those costs and consider costs as one step within the context of the five-step BART process. On the current record, there is no support for the rejection of SCR based on "cost".

D. <u>Step 5 Of The Required BART Analysis Appears Almost Entirely Absent From Ecology's Process.</u>

While it is unclear under which step Ecology is actually rejecting SCR, it if is Step 5 of the BART process and based on a claim that the improvement in visibility is not "worth" the cost, far more information and analysis is required before that conclusion can be drawn. Step 5 requires an assessment of the visibility improvement from technically-feasible control technologies. Ecology has given no indication of how it has addressed Step 5 in the BART analysis and it appears that it has not adequately assessed TransAlta's characterization of visibility improvements from SCR. As part of that, Ecology may weigh cost against improvement, but it must document how and why it reaches a particular decision.

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[25] <u>See</u> Sahu Report, paragraph 12. It is also unclear whether and to what extent TransAlta or Ecology used the Control Cost Manual recommended by the EPA BART guidelines in analyzing the cost of SCR at the TransAlta coal plant. EPA recommends use of the Manual in order that cost estimates are transparent and consistent across the nation. The NPS also recommends use of the Manual.

[26] <u>Id.</u>

1. Ecology did not question TransAlta's calculations that dilute the visibility improvement expected from SCR.

TransAlta's assessment of visibility improvement is unsupported and appears to be too small by virtue of two mistakes (or at least questions) in their calculation. First, Dr. Sahu notes an unexplained change in the baseline for calculation of cost-effectiveness of SCR NOx controls. Initially, TransAlta and Ecology were using a 2006-2007 baseline for emissions in order to calculate improvements in NOx emissions and the attendant improvement in visibility in Class I areas. However, later in the process, with the unsupported explanation that the period was "not representative" or "lower than average," TransAlta unilaterally and apparently arbitrarily selected 0.30 lb/MMBtu as the baseline. Ecology provides no discussion regarding the shift in baseline in the proposed Agreement or supporting documents. There is nothing in the record to support the assertions that 2006-2007 was somehow out of the ordinary or otherwise not appropriate for use as the baseline.[27] The shift had the potential effect of making SCR controls look less promising for visibility improvement.

The National Park Service has also identified a way in which TransAlta's accounting of visibility improvement underestimates the potential gains for the Class I areas. TransAlta's assessment focuses solely on improvement in Mt. Rainier National Park. While Mt. Rainier is the most-impacted of the many Class I areas the TransAlta coal plant affects, it is not the only one. TransAlta must take into account its cumulative negative impacts on a large number of Class I areas, all of which must attain and maintain pristine air quality. The cumulative improvement to the many Class I areas negatively affected by TransAlta's coal plant, is significantly larger, improving the cost-effectiveness of the SCR technology option. Again, there is no indication in the record or Ecology's decision document or the Agreement itself that Ecology recognized these issues, assessed them, or what Ecology might have decided about them. Ecology has failed to properly apply Step 5 of the BART analysis.

2. The record is devoid of evidence describing how Ecology balanced cost and visibility improvement, or any support indicating that Ecology necessarily struck the correct balance.

Ecology has provided no explanation of how it balanced the factors in its cost-effectiveness determination. As noted above, Ecology accepted TransAlta's cost figures at face value with no support. Then, Ecology accepted TransAlta's visibility improvement estimates at face value without inquiring into the dilution of the numbers from a changed baselines and/or failure to count all Class I areas. Even accepting these figures, Ecology fails in Step 5 because Ecology does not explain where it strikes the balance between costs and visibility improvement and why. If, in fact, Ecology has disregarded or failed to give sufficient weight to visibility improvements from SCR technology, Ecology has failed to properly apply Step 5 in the BART process. Ecology, in accepting TransAlta's approach, failed to explain its reason for finding that

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[27] Sahu Report, paragraph 13.

approach reasonable and consistent with its CAA BART obligations.

The rejection of SCR technology and the apparently unquestioning acceptance of the cost effectiveness argument demonstrates a house of cards in Ecology's decision-making for the TransAlta coal plant. Ecology's decision regarding NOx controls is built upon unsupported assumptions resting on more unsupported assumptions. Even the simplest, most apparent questions do not appear to have been asked or answered. Therefore, the claimed BART determinations set forth in the Agreement are unfinished, unsupported, and inadequate. The Conservation Organizations object to the Agreement and strongly urge Ecology to reexamine the decision based upon the matters raised herein.

II. THE TRANSALTA COAL PLANT IS SUBJECT TO BART FOR NOX EMISSIONS.

Conservation Organizations disagree with Ecology's rationale for entering into an agreement that provides less protection for the State of Washington and the region's Class I areas than is required by federal law. TransAlta's expectation that it is not subject to BART is contrived and contrary to fact. Simple examination of the documents from the negotiations in the late 1990s demonstrates the flaws in TransAlta's position.[28]

First, the February 1998 order issued by SWCAA's predecessor agency is a RACT order, not BART. It says it is a RACT order on its face and each aspect of it provides that SWCAA is setting RACT for various pollutants at the TransAlta coal plant.

Second, also clear on the face of the RACT order, is the fact that the parties to the negotiation did not go through the BART process and did not meet all BART requirements for public process, consultations, and BART determinations. In fact the order itself pointedly states the parties' intentions to avoid the BART process by entering into the agreement and that the process was much more streamlined than a BART process would have been. Therefore, in keeping with its (or its predecessor's) own desired outcome at the time, TransAlta has not been subject to BART.[29]

Third, in approving the RACT order, EPA clearly and unequivocally found that the RACT order was not BART for NOx and that TransAlta would be subject to BART for NOx at

[28] The Conservation Organizations understand that TransAlta argues it is not subject to BART because it and its immediate predecessor participated in a collaborative process in the late 1990s that resulted in changes to the plant. The Conservation Organizations also understand that TransAlta has set forth its arguments in a "White Paper" dated June 2007. While most of the negotiations on that earlier agreement (if not all) were done by TransAlta's predecessor, it appears that TransAlta is the owner that made the changes to the plant that were required by the negotiated agreement and the resulting RACT order.

[29] It actually appears that TransAlta has not been subject to BART for any of the pollutants at issue in the late 1990s, including sulfur dioxide and particulates. Nonetheless, Conservation Organizations' arguments here will remain focused on NOx.

some point in the future.

Fourth, the NPS was an important and active participant in the negotiations that led up to SWCAA's RACT order for the TransAlta coal plant. It is plain from its submissions in this process, that the NPS did not consider the agreements and the resulting RACT order to constitute a BART process and that the TransAlta plant had not been subject to BART, at least as to NOx pollutants.

TransAlta cannot, based upon these statements and the content of the order, believe that it is not subject to BART for NOx.

III. ECOLOGY SHOULD RETAIN ITS AUTHORITY TO REQUIRE FURTHER NOX REDUCTIONS REGARDLESS OF TRANSALTA'S ARGUMENTS.

Finally, regardless of whether TransAlta is subject to BART, the State, as recognized by Ecology, has the continuing authority and obligation to make reasonable further progress on improving visibility in Class I areas. See e.g. 42 U.S.C. § 7491(b). With TransAlta being the largest source of emissions and cumulative effects in the region, Ecology can and should impose additional controls in order to ensure reasonable further progress by 2018—something that clearly will not happen under the Agreement proposed.

And yet even here, Ecology ties its own hands. The Agreement provides that Ecology will affirmatively waive its reasonable further progress authority, in TransAlta's favor, until 2018.[30] And even then, Ecology has agreed that it will not impose additional controls on TransAlta if, between now and 2018, SWCAA imposes some very minimal additional NOx standards on the coal plant. Those additional NOx standards are truly minimal—they are less than presumptive BART and less than what other plants are achieving with better boiler-out performance as discussed by Dr. Sahu. Ecology fails to use any of the tools at its disposal to address this second largest negative impact on Class I areas in the nation. As a result, the Agreement should be rejected as contrary to the CAA and contrary to the public interest.

IV. THE MERCURY PORTIONS OF THE PROPOSED AGREEMENT AND CONSENT DECREE ARE INADEQUATE AND NOT IN THE PUBLIC INTEREST.

A. The TransAlta Coal Plant Is Washington's Largest Source of Toxic Mercury Emissions.

Reports for 2007 at the TransAlta coal plant show a combined mercury emission (just for the coal-fired units) of a little over 372 pounds for the year, making it the largest emitter of mercury in the state.[31] Mercury is a toxic pollutant which, when released into the atmosphere from coal plants and other sources, deposits into lakes, rivers, streams and the ocean where it

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[30] Agreement at III (A)(2).

[31] Mercury Summary for 2007 and Air emissions Inventory for 2007, emissions units 1 and 2. Documents from SWCAA file for TransAlta Centralia Generation, L.L.C Centralia coal plant.

bioaccumulates in fish.[32] Ingestion of fish by humans leads to a variety of health problems, particularly for fetuses or children (whose nervous systems are still developing, making them particularly vulnerable to neurotoxins like mercury).[33] Nationwide, approximately 6-8% of women of childbearing age are at risk of having mercury blood levels that exceed levels associated with a variety of health risks and as a result, hundreds of children are born each year at risk of mercury-caused learning disabilities and other developmental problems.[34]

Recently, the NPS reported that Olympic and Mt. Rainier National Parks show high levels of mercury contamination in snow and in fish in mountain lakes. Some fish sampled exceeded health thresholds for human consumption while all fish from both parks exceeded health thresholds for one or more species of fish-eating wildlife.[35]

Ecology has claimed in public meetings and in their answers to Conservation Organizations' questions, that most of TransAlta's mercury enters the atmosphere, circles the world, and deposits over a large area.[36] Although Ecology summarily claims there is little local deposition, recent studies have shown that some types of mercury can deposit locally.[37] Ecology has not provided adequate analysis in the settlement agreement or supporting documentation that demonstrates that TransAlta mercury emissions do not have a local effect. It takes only a gram

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[32] See generally EPA information regarding mercury, e.g. http://publicaccess.custhelp.com/cgi-bin/publicaccess.cfg/php/enduser/std_adp.php?p_faqid=1824&p_created=1106159090&p_sid=zTcbbuLj&p_accessibility=0&p_redirect=&p_lva=&p_sp=cF9zcmNoPTEmcF9zb3J0X2J5PSZwX2dyaWRzb3J0PSZwX3Jvd19jbnQ9OSw5JnBfcHJvZHM9MjMzJnBfY2F0cz0mcF9wdj0xLjIzMyZwX2N2PSZwX3BhZ2U9MQ**&p_li=&p_topview=1 and http://www.epa.gov/mercury/advisories.htm

[33] Id.

[34] Report to Congress; U.S. Centers for Disease Control, Blood Mercury Levels in Young Children and Childbearing-Aged Women – United States, 1999-2002 (Nov. 5, 2004); Trasande, L., Landrigan, P.J., and Schechter, C., *Public Health and Economic Consequences of Methyl Mercury Toxicity to the Developing Brain.* Environmental Health Perspectives, 113(5), 590-596 (May 2005). See also http://www.epa.gov/ttn/atw/hlthef/mercury.html.

[35] http://www.nps.gov/olym/parknews/airborne-contaminants-study-released.htm. Western Airborne Contaminant Project, Feb. 2008.

[36] As noted by testifiers at the public meeting on October 13, 2009, the fact that a potent neurotoxin will likely affect other countries and their citizens rather than Washington's citizens is a poor reason to decline to strongly regulate the toxin.

[37] See Gerald J. Keeler, M.S. Landis, G.A. Norris, E.M. Christianson, and J.T. Dvonch, "Sources of Mercury Wet Deposition in Eastern Ohio, USA," Environmental Science and Technology (American Chemical Society), Vol. 40 (19), 5874-5881 (2006); Watkins, et al., EPA National Exposure Research Laboratory, Preliminary Results From Steubenville Hg Deposition Source Apportionment Study (April 27, 2005).

of mercury to contaminate a 20 acre lake such that the fish in that lake exceed the consumption standard for human health.[38] Clearly, if even a very small fraction of TransAlta's mercury is being deposited locally, Lewis County's and Washington's citizens are being greatly affected.

B. Contrary To Assertions In The Proposed Agreement, The State Has The Authority And The Obligation To Control Mercury Emissions From the TransAlta Coal Plant.

Ecology incorrectly asserts that it cannot regulate mercury from the TransAlta coal plant because it abandoned its rulemaking effort over a year ago when the federal Clean Air Mercury Rule was overturned by the U.S. Circuit Court of Appeals for the D.C. Circuit.[39] It further claims that now it must sit and wait for EPA to complete a MACT standard for mercury from power plants before Ecology can take any action to limit the large amount of this toxic pollutant from the TransAlta coal plant. Ecology's position on this issue is simply not supported by Washington or federal law.

WAC 173-400-040(5) provides that:

> No person shall cause or permit the emission of any air contaminant from any "source" if it is detrimental to the health, safety, or welfare of any person, or causes damage to property or business.

An air contaminant is defined to include vapor and gas, and air pollution is the presence of one or more air contaminants in such quantities or characteristics as to be or likely to be injurious to human health, plant, or animal life, or property or that unreasonably interferes with the enjoyment thereof. RCW 70.94.030; WAC 173-400-030. Washington law also requires that all emissions units be required to use RACT to control emissions. WAC 173-400-040. Clearly, Ecology has both the authority and the obligation under Washington law to regulate mercury from the TransAlta coal plant.

Moreover, there is no need for Ecology to engage in formal rulemaking in order to address TransAlta's mercury. Washington law provides that for categories where there are fewer than three sources (the case here as the TransAlta coal plant is Washington's only coal-fired power plant), Ecology may proceed to determine and apply RACT on a case by case basis, without rulemaking. RCW 70.94.154. RCW 70.94.154 further provides that Ecology may make a source-specific RACT determination where such a determination is needed to address specific air quality problems for which the source is a significant contributor. As noted above, TransAlta's coal plant is the single largest source of toxic mercury in the state.

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[38] http://www.newmoa.org/prevention/mercury/mercurylake.pdf and http://yosemite.epa.gov/opa/admpress.nsf/d0cf6618525a9efb85257359003fb69d/88c64f9ee84a23e4852574240004276d!OpenDocument

[39] See Agreement at II(17) (citing New Jersey v. EPA, 517 F.3d 574 (D.C. Cir. 2008)).

Nor is there a need to wait for the EPA to regulate mercury before the state takes action to regulate this toxic pollutant. The Clean Air Act clearly provides that states can always regulate air pollutants more stringently than the Clean Air Act and/or federal regulation. 42 U.S.C. § 7416; Exxon Mobil Corp. v. EPA, 217 F.3d 1246, 1255 (9th Cir. 2000) ("Air pollution prevention falls under the broad police powers of the states, which include the power to protect the health of citizens in the state."). In fact, many states are already leading the way and requiring significant mercury reductions, regardless of the status of rules from EPA.[40]

Ecology cannot argue a lack of authority as a reason for entering into this token Agreement regarding mercury.

C. The Industry Is Currently Achieving 90% And Better Reductions In Mercury Emissions, A Standard To Which TransAlta Should Be Held.

The voluntary 50% reductions in mercury emissions from the TransAlta coal plant fall far short of what is being achieved in the industry. Greater than 90% mercury removal has been achieved on a long-term basis at a number of PRB-coal-fired power plants using activated carbon technology.[41] The Government Accountability Office recently made similar findings: that activated carbon technology is allowing a number of coal-fired power plants to remove over 90% of the mercury in their emissions and to do so at a fairly low cost.[42] Finally, Ecology's own files on this matter contain scientific and engineering papers about 80%, 90% and even better mercury reduction at various power plants.[43]

Activated carbon injection technology is the very technology currently being tested at the TransAlta coal plant. Clearly, Ecology should receive more than TransAlta's minimal efforts on this toxic pollutant. It appears TransAlta could achieve much better than the 50% offered in the Agreement and it could do better with fairly minimal additional cost.

Finally, the NPS raised an interesting point, supported by the GAO Report, in Acting

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[40] See Appendix III, U.S. Government Accountability Office, "Mercury Control Technologies at Coal-Fired Power Plants Have Achieved Substantial Emissions Reductions," GAO-10-47 (October 2009) ("GAO Report").

[41] See examples discussed in Sahu Report, paragraphs 23-25.

[42] GAO Report generally.

[43] See e.g. R. Chang, et al., Development and Demonstration of Mercury Control by Dry Technologies: 2005 Update, EPRI Document # 1004263 (Feb. 2005). See also March 30, 2009 Letter from the Institute of Clean Air companies to Director Jay Manning, Ecology, regarding mercury removal technologies and Seeliger, J., Brown, J.H., Jankura, B., Redinger, K., "Cost Effective Mercury Emissions Control At the Newmont TS Power Plant" (2008) (presented at Power Plant Air Pollutant Control "Mega" Symposium, August 2008).

Superintendent King's testimony at the public meeting on October 13, 2009. Superintendent King noted that if the TransAlta coal plant were to install BART—SCR technology—for the control of NOx, the plant would also obtain increased mercury reduction benefits. This finding is echoed by the GAO Report that notes that plants that have installed technologies for the control of other pollutants, such as NOx, have found significant co-benefits for the control of mercury.[44]

Given the state of mercury control technology and the clear authority of the state to regulate mercury, the voluntary 50% mercury reduction at the TransAlta coal plant is far too minimal, not in compliance with Washington's Clean Air Act requirements, and contrary to the public interest.

V. THE PROPOSED AGREEMENT AND CONSENT DECREE INCLUDE VARIOUS CLAUSES AND CONSTRAINTS THAT FURTHER WEAKEN THE AGREEMENT.

In addition to the very weak standards for NOx and mercury control in the Agreement, the Agreement contains a number of other constraints on TransAlta's obligations, constraints on Ecology's enforcement of the Agreement terms, and vaguely-stated additional commitments by Ecology. These additional terms further demonstrate that the Agreement is weak and not in the public interest.

First, as noted above, the commitments by TransAlta regarding mercury are wholly voluntary. Therefore, TransAlta could, for a variety of reasons, choose to do nothing with respect to mercury reduction.[45] The Agreement's terms are clear that in that instance, Ecology cannot enforce even the 50% obligation. The Agreement also provides that, at its sole option, TransAlta could simply choose to spend up to a certain amount on mercury-related tasks, but no more, regardless of whether the 50% reductions are achieved. Further, if TransAlta and Ecology wished to reach a meaningful and enforceable agreement to reduce mercury emissions, they could use the legal mechanism that currently exists under Washington law: WAC 173-400-091 ("Voluntary limits on emissions"). That provision would allow Ecology to issue a regulatory order setting the mercury emission limit at the agreed-to level, and, after appropriate notice and comment, establish a federally-enforceable mercury limit. WAC 173-401-091(4)-(5). Therefore, even the 50% reduction, meager though it is, is in question.

As to NOx, in addition to requiring no additional NOx reduction beyond what the TransAlta coal plant already chooses to do, Ecology agrees to forego any further progress on

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[44] GAO Report, pp. 5-6.

[45] Ecology claims that it could, if TransAlta failed to follow-through on its voluntary commitments, engage in mercury rulemaking to compel mercury reductions. This is curious given Ecology's stated reasons for entering into the Agreement in the first instance. If Ecology has the authority do so, Ecology should exercise that authority to the benefit of the public and the environment and not settle for such a paltry result as represented by TransAlta's commitments in the Agreement. It is unclear at this juncture, just what Ecology believes its authority really is.

NOx reductions from the plant for almost ten years (and possibly longer). Again, Ecology relinquished authority that it could retain in order to ensure that, should the Class I areas remain significantly impaired by the TransAlta coal plant's pollution even after the agreed NOx reductions, it could impose additional reductions to obtain reasonable further progress on the impairment problem. In fact, the Agreement goes a step further in making commitments to TransAlta. Ecology agrees that it will not even require additional reductions in 2018, regardless of the status of the Class I areas, if SWCAA imposes a slightly lower NOx requirement on the TransAlta coal plant than that which is required in the Agreement. Again, the slightly lower NOx requirement would still not achieve the presumptive BART limit of 0.15 lb/MMBtu and would be well above even the boiler-out control of NOx that many PRB-fired plants currently achieve.

The Conservation Organizations further oppose the language of paragraph 11 of the Agreement regarding coal ash waste disposal. Ecology agrees to "support" any future proposal and measures by TransAlta to reduce the cost of dealing with its ash waste or other byproducts that have been contaminated with mercury (or other heavy metals that precipitate out into the ash as a result of pollutant controls.) The Agreement notes that such "support" may include <u>approval</u> of "beneficial uses". Beneficial uses is not defined. Again, this appears to be a provision where Ecology relinquishes regulatory authority for nothing in return. This is particularly troubling in light of recent coal ash disasters such as the TVA coal plant spill in December of 2008, or problems with groundwater contamination in communities that have allowed "beneficial uses" of coal ash in roads and as fill for recreational developments. This kind of advance approval of any and all coal ash projects that might "reduce costs" or be considered "beneficial" by TransAlta is per se arbitrary and capricious decision-making by Ecology. Inadequately disposed coal ash waste may lead to detrimental public health and ecological consequences. It is entirely inappropriate for Ecology to pledge and agree to support proposals without even knowing what those proposals are.

CONCLUSION

It is extremely unfortunate and puzzling why Ecology feels compelled to reach this lopsided Agreement with TransAlta. This Agreement is not a compromise as between two ends of a spectrum, but rather a capitulation. Ecology and the citizens of Washington get nothing from this "bargain" that TransAlta wasn't already going to give them. TransAlta gets exactly everything it wants: it is not subject to BART for NOx; it is not required to do anything to control NOx pollution that is it not already doing and would do regardless of this Agreement; it can do minimal mercury control, well below industry standards, at its sole option with no repercussions if it does not achieve the reductions agreed to. In return, Ecology agrees to "hands-off" treatment for the next ten years or more for the TransAlta coal plant on a number of pollution issues; the state agrees to become TransAlta's partner in seeking accommodation and/or positive treatment from the EPA on a number of pollution issues; and the state agrees to look kindly on a wide-ranging list of potential TransAlta proposals for dealing with coal ash waste. Conservation Organizations find that the Agreement provides nothing of benefit for the citizens and natural resources of this state and strongly urge the State to reject this Agreement and engage in a full-scale, thorough BART analysis for NOx and aggressive case by case mercury control in line with industry achievements of over 90% reductions.

Sincerely,

Janette K. Brimmer
Earthjustice
Counsel for National Parks Conservation Association, the Sierra Club, and Northwest Environmental Defense Center

cc: Doug Howell, SC
Mark Riskedahl, NEDC
Stephanie Kodish and Sean Smith NPCA
Don Shepherd, NPS
Region 10 EPA

United States Department of the Interior
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IN REPLY REFER TO:

November 20, 2009

N3615 (2350)

Mr. Stuart A. Clark
Air Quality Program Manager
Department of Ecology
Air Quality Program
PO Box 47600
Lacey, Washington 98504-7600

Dear Mr. Clark:

Thank you for providing information on the Best Available Retrofit Technology (BART) proposals for facilities in Washington that are subject-to-BART. We recognize that much time and effort went into the analyses conducted by the Department of Ecology (Ecology), and we appreciate the time Ecology has taken to discuss the difficult and important issues inherent in this major effort. These comments supplement the statement made by Randy King, Superintendent of Mount Rainier National Park, at the October 13, 2009, public hearing.

In general, we found the Ecology BART analyses to be informative and well-presented. We also recognize that the BART program is relatively new, which presents several challenges to all of us in its implementation. As a national office which conducts BART analyses for all Class I areas in the National Park System, we are able to call upon a growing information base and wish to take this opportunity to make that information available to Ecology. The State of Washington is fortunate to have an extraordinary number of magnificent national parks and wilderness areas within its borders and accessible to its citizens, as well as to numerous visitors. There are many reasons that the law mandates our highest levels of environmental protection for these special areas. National parks and wilderness areas are our natural and cultural heritage. Sociology studies confirm their importance, as do our individual experiences of recreation and renewal. We share your interest in insuring that these magnificent natural areas are protected for the benefit of all. As mentioned in our testimony at the October 13 public hearing, over 1.1 million people visited Mount Rainier National Park in 2008 and visitation as of the end of August of this year is already above the 1 million mark.

Regarding the economic benefits of the national parks, for example, in 2000, when our last visitor surveys were conducted, we learned that visitors to Mount Rainier and Olympic National Parks spent over $120 million in the area. The total economic impact of visitor spending was $95 million in direct sales, $38 million in personal income, $58 million in direct value-added and 2,530 jobs. With multiplier effects, created by the re-circulation of the money spent by tourists, visitor spending generated about $135 million in local sales, and an associated $52 million in personal income, $82 million in value-added and 3,102 jobs. These figures do not include park admission fees or the impacts of the NPS payroll and operations in the area, nor do they include the economic benefits resulting from visitation to North Cascades National Park or to the nine Class 1 wilderness areas and the Columbia River Gorge National Scenic Area that are also suffering from visibility impairment as a result of emissions from the Washington BART sources.

Our detailed comments on Ecology's BART proposals are enclosed. Based on our review, we believe the following pollution control technologies are technically feasible, cost-effective, and will substantially improve visibility in one of more of the 12 protected areas (including Mount Rainier and Olympic National Parks) included in Ecology's analyses:

- Selective Catalytic Reduction (SCR) to reduce nitrogen oxides emissions from the Centralia Power Plant
- Sodium-based scrubbing to reduce sulfur dioxide emissions from the potlines at the Intalco primary aluminum smelter
- Additional particulate control on the No. 10 Power Boiler and a limit of 0.5% sulfur on fuel oil burned at the Port Townsend Paper Company
- Low-NO_x and Ultra-Low-NO_x Burners proposed by Tesoro (and accepted by Ecology) to reduce nitrogen oxides emissions at its Anacortes refinery. (We recognize the timing issues and suggest that we work together to develop a Reasonable Progress strategy that will achieve the emission reduction goals proposed by Tesoro in a cost-effective, yet expeditious manner.)

Therefore, we ask that you revisit your BART proposals. It appears that that the key issue in these reviews is whether or not to consider the cumulative benefits of reducing emissions for multiple Class I areas. We address that issue below and in our enclosed comments.

Cost-Effectiveness Metrics

BART is not necessarily the most cost-effective solution. Instead, it represents a broad consideration of technical, economic, energy, and environmental (including visibility improvement) factors. We believe that it is appropriate to consider both the degree of visibility improvement in a given Class I area as well as the cumulative effects of improving visibility across all of the Class I areas affected. It simply does not make sense to use the same metric to evaluate the effects of reducing emissions from a BART source that impacts only one Class I area as for a BART source that impacts multiple Class I areas. And, it does not make sense to evaluate impacts at one Class I area, while ignoring others that are similarly significantly impaired. If we look at only the most-impacted Class I area, we ignore that the other Class I areas are all suffering from impairment to visibility "caused" by the BART source. It follows that, if emissions from the BART source are reduced, the benefits will be spread well beyond only the most-impacted Class I area, and that must be taken into account. .[1]

The BART Guidelines represent an attempt to create a workable approach to estimating visibility impairment. As such, they require several assumptions, simplifications, and shortcuts about when visibility is impaired in a Class I area, and how much impairment is occurring. The Guidelines do not attempt to address the geographic extent of the impairment, but assume that all Class I areas are created equal, and that there is no difference between widespread impacts in a large Class I area and isolated impacts in a small Class I area. To address the problem of geographic extent, we have been looking at the cumulative impacts of a source on all Class I areas affected, as well as the cumulative benefits from reducing emissions. While there are certainly more sophisticated approaches to this problem, we believe that this is the most practical, especially when considering the modeling techniques and information available.

One of the options suggested by the BART Guidelines to evaluate cost-effectiveness is cost/deciview. Compared to the typical control cost analysis in which estimates fall into the range of $2,000 - $10,000 per ton of pollutant removed, spending millions of dollars per deciview (dv) to improve visibility may appear extraordinarily expensive. However, our compilation[2] of BART analyses across the U.S. reveals that the **average cost per dv proposed by either a state or a BART source is $12 - $19 million,**[3] with a maximum of almost $50 million per dv proposed by Colorado at the Martin Drake power plant in Colorado Springs. For example, considering the 12 Class I areas impacted by Centralia, our calculations show that the cost per dv of installing SCR at Centralia would be $5 million, which is relatively cost-effective.

Please note that EPA is proposing to consider the cumulative benefits at multiple Class I areas approach in its own BART determinations. For example, in an August 21, 2009, Advance Notice of Proposed Rulemaking regarding BART for the Navajo and Four Corners power plants, EPA Region 9 discusses an approach to assess visibility improvement that considers multiple Class I areas. And, Oregon considered the cumulative benefits of adding SCR at the Boardman power plant in its determination that SCR would be installed there under the reasonable progress provisions of the Regional Haze Rule. Finally, the Wyoming Department of Environmental Quality explicitly cited[4]

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[1] For example, our analysis, which is described in detail in our enclosed comments, indicates that the cumulative benefits of reducing NO_x emissions from the Centralia power plant are seven times greater than the benefit at Mt. Rainier, the most-impacted Class I area, alone.

[2] Sent to Ecology on 11/13/09 and located at http://www.wrapair.org/forums/ssjf/bart.html

[3] For example, PacifiCorp has stated in its BART analysis for its Bridger Unit #2 that "The incremental cost effectiveness for Scenario 1 compared with the baseline for the Bridger WA, for example, is reasonable at $580,000 per day and $18.5 million per deciview."

[4] As stated by the Wyoming Department of Environmental Quality, "Tuning the existing LNB with OFA and installing SCR is determined to be BART for Unit 3 for NOx based, in part, on the following conclusions: 4. The cumulative 3-year averaged 98th percentile visibility improvement from the baseline

the cumulative benefits to the Bridger and Fitzpatrick Wilderness Areas in its conclusion that adding combustion controls plus SCR to the Naughton Unit #3 is BART.[5]

Over the past several months, we have worked with Ecology staff to evaluate the BART sources under EPA's BART Guidelines, and we are very appreciative of your expertise and assistance. We look forward to continuing this cooperative working relationship as this process advances. We believe that good communication and sharing of information will help expedite this process, and suggest that you contact Don Shepherd at (303) 969-2075 or email him at don_shepherd@nps.gov if you have any questions or comments.

Sincerely,

Christine L. Shaver
Chief, Air Resources Division

Enclosures

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summed across both Class I areas achieved by tuning the existing LNB with OFA, SCR, wet FGD, and installing a new full-scale fabric filter, Post-Control Scenario B, was 1.849 Δdv."

[5] In addition, the Wyoming Department of Environmental Quality (WY DEQ) explicitly considered "visibility improvement from new [control options] summed across the [multiple] Class I areas" in its BART determinations for the Bridger, Johnston, and WYODAK power plants. WY DEQ also determined that SCR would be installed on Bridger units #3 & #4 under the Reasonable Progress provisions of the Regional Haze Rule.

National Park Service (NPS) Comments[1] on TransAlta Centralia Generation LLC's Proposed Best Available Retrofit Technology (BART) Determination for TransAlta Centralia Generation November 20, 2009

Present Unit Operation

TransAlta Centralia Generation LLC Power Plant (TransAlta) operates a two-unit, pulverized-coal-fired power plant near Centralia Washington, and approximately 70 km from Mount Rainier National Park (NP). The plant is located within 300 km of 12 Class I areas,[2] which also include North Cascades and Olympic National Parks (which are also Class I areas administered by the National Park Service).

Source Description and Background

Units 1 and 2 were commissioned in 1971 and 1972, are both tangentially-fired on sub-bituminous coals from the Powder River Basin (PRB), and are each rated at 702.5 MW net output.

Sulfur dioxide (SO_2) control on the two coal-fired boilers is provided by a limestone-slurry-forced-oxidation wet scrubber system. This system removes over 95% of SO_2 in the flue gas from the boilers. The SO_2 controls were installed in the 1999 – 2002 time period.

Particulate control is provided by two Electrostatic Precipitators (ESPs) in series followed by the wet scrubber system. The first ESPs were part of the original construction of the plant. The second ESPs date from the late 1970's.

Current nitrogen oxides (NO_X) control is provided by combustion modifications incorporating Low-NO_X Burners with close-coupled and separated over-fire air. These combustion modifications are collectively known as "LNC3." The controls were installed in the 2000 – 2002 time period. The combustion controls were designed and optimized to suit Centralia mine coal.

For a variety of reasons, TransAlta stopped active mining at the Centralia coal mine and now purchases all coal from PRB coal fields. To accommodate the change, the company has modified the rail car unloading system to handle up to ten coal unit trains per week. Additional modifications are focused on the boilers. The boilers have been and will be modified to reduce temperatures in the flue gas to accommodate the higher Btu coal now being combusted. Additional changes include the reinstallation of specific soot blowers and installation of new soot blowing equipment (steam lances) necessary to accommodate the different ash characteristics of the PRB coals. Improved fire suppression equipment is being installed to accommodate the increased potential of PRB coals to catch fire spontaneously.

[1] Electronic files are included separately.
[2] Please see the attached map titled "Current Impacts of Centralia PP on Class I Areas."

TransAlta anticipates operating the plant until at least 2030. They acknowledge that operation beyond 2025 will require significant plant upgrades to assure safe and reliable operation into the future.

According to EPA's Clean Air Markets (CAM) database, Centralia was the 92nd-largest stationary source of NO_x (out of 1,228 plants) in the U.S. in 2008 at 10,839 tons.

TransAlta's analyses[3] indicate that Centralia's Baseline emissions **cause**[4] visibility impairment in all 12 Class I areas (and in the Columbia River Gorge National Scenic Area—CRGNSA) within 300 km. TransAlta causes the third-greatest cumulative impact upon Class I area visibility of any single source we have evaluated to date.[5]

PREDICTED CHANGE TO THE 2003-2005 98TH PERCENTILE DAILY HAZE INDEX (dv)[6]

Area of Interest	Baseline	Flex- Fuel	
		Imapct	**Improvement**
Alpine Lakes Wilderness	4.103	**2.737**	1.367
Glacier Peak Wilderness	2.742	**1.700**	1.042
Goat Rocks Wilderness	4.336	**2.912**	1.424
Mt. Adams Wilderness	3.554	**2.356**	1.198
Mt. Hood Wilderness	2.797	**1.730**	1.067
Mt. Jefferson Wilderness	1.609	0.987	0.621
Mt. Rainier National Park	5.454	**3.899**	1.555
Mt. Washington Wilderness	1.446	0.844	0.603
N. Cascades National Park	2.060	**1.326**	0.734
Olympic National Park	4.037	**2.646**	1.391
Pasayten Wilderness	1.416	0.854	0.563
Three Sisters Wilderness	1.590	0.880	0.710
CRGNSA	2.228	**1.426**	0.801
Cumulative	37.373	24.298	13.076
Cumulative-CRGNSA	35.146	22.871	12.274

TransAlta's analysis indicates that, even after implementation of the Flex-Fuels project, Centralia will **cause** impairment in eight Class I areas (and CRGNSA) and contribute[7] to impairment in four. TransAlta would continue to cause the third-greatest cumulative impact upon Class I area visibility of any single source we have evaluated to date.[8]

[3] From Geomatrix Table 4-3: "YEARLY PREDICTED CHANGE TO THE 98TH PERCENTILE DAILY HAZE INDEX"
[4] A source "causes" visibility impairment if it degrades visibility by one deciview (dv).
[5] The two BART sources with higher cumulative impacts are the Four Corners Power Plant (47 dv) and the Navajo Generating Station (39 dv), both located on the Navajo nation.
[6] Deciview (dv) is a measure of visibility impairment.
[7] A source "contributes to" visibility impairment if it degrades visibility by 0.5 deciview (dv).
[8] However, if the Four Corners Power Plant and the Navajo Generating Station adopt the BART controls we have recommended, their cumulative impacts would drop to 19 dv and 16 dv, respectively, leaving Centralia as the source causing the greatest cumulative visibility impairment.

The BART analysis five steps are:

Step 1 – Identify all available retrofit control technologies.
On coal-fired power plants, the most common type of Selective Catalytic Reduction (SCR) installation is known as the hot-side high-dust configuration, where the catalyst reactor is located downstream from the boiler economizer and upstream of the air heater and particulate control equipment. In this location, the SCR is exposed to the full concentration of fly ash in the flue gas that is leaving the boiler. An alternate location for an SCR system is downstream of the air heater or the particulate control device. In many cases, this location is compatible with use of a low temperature SCR catalyst or is within the low end of the temperature range of a conventional catalyst. Because the temperature of the flue gas leaving the air heaters and the ESPs is too cool for the low temperature versions of SCR catalyst to operate, the high-dust configuration was assumed by Ecology and TransAlta for Centralia.

A new installation type SCR was used as the basis for analysis at the Centralia Plant because of the lack of room to install an SCR catalyst in the existing flue duct and the higher removal rate provided by a new, full size catalyst bed. The short distance between the boiler economizer and the entrance to the first ESP does not provide the room required for a catalyst bed with reasonable velocities to be inserted in the existing flue gas duct. The ducts from each boiler to the ESP have a relatively high velocity, such that the amount of catalyst that could fit into the unmodified duct would have minimal effectiveness due to the short residence time through the catalyst bed.

While Ecology reviewed SCR in a high-dust location, it did not evaluate other feasible locations downstream of the ESPs. For example, Basin Electric Power Cooperative evaluated installation of SCR with reheat[9] downstream of the wet scrubbers proposed as BART for its Leland Olds Unit #2.[10] Because of the difficulties and costs associated with a conventional high-dust SCR location, TransAlta and Ecology should have evaluated both a low-dust location downstream of the ESPs and a tail-end location following the scrubbers.

Step 2 – Eliminate technically infeasible control technologies.
TransAlta believes that while the Rotating Over-fire Air (ROFA) and Rotamix technology are “available” control technologies as described in the BART guideline, the use of either ROFA as a replacement or addition to the current overfire air injection system or installation of the Rotamix process are not technically feasible technologies due to unknown difficulties with installation on their boilers. Due to perceived risks of scale-up to their unit size, TransAlta believes that these technologies are not applicable to their facility.

Step 3 – Evaluate the control effectiveness of remaining control technologies.
TransAlta has underestimated the effectiveness of SCR. While we agree with Ecology that SCR can reduce NO_x emissions by up to 95%, we disagree with TransAlta’s and Ecology’s estimate that the application of SCR could only achieve 0.07 lb/mmBtu on an

[9] Basin Electric estimated that, after recovering waste heat, natural gas would be required to increase the gas temperature by about 50 degrees Fahrenheit to achieve the proper SCR operating temperature.
[10] Basin Electric proposed the tail-end location to reduce the possibility of fouling of the SCR catalyst by constituents of the lignite burned at the plant.

annual basis. In estimating the annual cost-effectiveness of adding SCR, TransAlta and Ecology effectively assumed that SCR could only further reduce NO_x by 71% from the 0.24 lb/mmBtu level to be achieved through combustion controls, down to 0.07 lb/mmBtu. We believe that SCR can achieve lower emissions on an annual basis.

EPA's Clean Air Markets (CAM) data (Appendix A), state/source BART analyses,[11] and vendor guarantees[12] show that SCR retrofit to coal-fired EGUs can typically meet 0.05 lb/mmBtu (or lower) on an annual average basis. We found 34 examples (Please see Table A.1. in Appendix A.) of boilers that have been retrofitted with SCR and are achieving ozone-season emission rates below 0.06 lb/mmBtu. We were able to find 2006 hourly emissions in EPA's CAM database for 11 of those EGUs, and charts showing those emissions, as well as for 11 additional retrofit SCRs, are included in Appendix A. We believe that inspection of these data leads to the conclusions that

- SCRs retrofit to eastern EGUs burning bituminous coal can typically reduce NO_x emissions by 90%, and
- These units can achieve 0.05 lb/mmBtu (or lower) on a 30-day rolling average basis during the eastern ozone season.

Discussions of this data are also provided in Appendix A.

TransAlta and Ecology have not provided any documentation or justification to support the higher annual emission rates used in their analyses. Our review of operating data (Appendix A) also suggests that a NO_X limit of 0.06 lb/mmBtu is appropriate for LNB/OFA+SCR for a 30-day rolling average, and 0.07 lb/mmBtu for a 24-hour limit and for modeling purposes, but a lower rate (e.g., 0.05 lb/mmBtu or lower) should be used for annual average and annual cost estimates.

Step 4 – Evaluate impacts and document the results.

Following are excerpts from reports provided by TransAlta and by Ecology.

> As a result of electing to use a full scale, new installation type design, an adjustment was used for SCR cost estimates due to the Centralia Plant's extremely tight boiler outlet ductwork configuration and limited available space for new equipment. Installation of a full-scale SCR system requires reconfiguration of the flue ducts from the boilers, structural modifications of the ESP to accommodate the weight of the SCR catalyst and duct work, and realignment of the duct work from the SCR units to the ESP inlets. The restricted site layout, support structure needs, intricate duct routing, limited construction space, and complexity of erection increases the capital cost.
>
> Each boiler at the Centralia Plant has two exhaust gas ducts to aid in splitting the flow to the ESPs. As a result each boiler would require two smaller, separate catalyst vessels instead of a single large catalyst vessel. The capital cost of installing dual catalyst vessels for each unit is slightly greater than a single catalyst vessel for units of similar size.
>
> Costs for SCR were estimated using CH2M HILL's database. The capital costs are based on cost information gathered by CH2M HILL over the past 3 years for BART analyses developed for a number of utilities in the western U.S. The costs were adjusted upwards to account for the difficult retrofit requirements for the CPP units. EPA has published a

[11] Basin Electric Power—Leland Olds #2 @ 90%; PacifiCorp Naughton #1 @ 88% & #2 @ 87%; Great River Energy—Coal Creek @ 0.043 lb/mmBtu

[12] Minnesota Power has stated in its Taconite Harbor BART analysis that "The use of an SCR is expected to achieve a NO_X emission rate of 0.05 lb/mmBtu based on recent emission guarantees offered by SCR system suppliers."

similar cost analysis model called CUECost that was developed by Raytheon Engineers & Constructors and the Eastern Research Group in 1998. The cost estimates generated by CUECost are based on 10-year-old design and cost data that do not consider the large price increases that have occurred in the industry during this time period or the CPP's difficult retrofit requirements.

The emissions reduction for installation of SCR (at a 95% removal rate) on one unit would be 7,450 tons/year. The capital cost for including SCR on only one unit was estimated to be $290.1 million with a cost effectiveness of $8,205/ton NOx reduced.

The emissions reduction for installation of SCR (at a 95% removal rate) on both units would be 14,910 tons/year. The capital cost for including SCR on both units would be double that for one unit with a cost effectiveness of $9,091/ton NOx reduced.

For new coal fired power plants, SCR is becoming the BACT control technology of choice to reduce NOx emissions. In some cases, the use of SCR is being considered to be the technology to be implemented for BART. There are a number of technical difficulties to implementing SCR at the Centralia plant presented by TransAlta in its reports. The primary difficulties are a lack of space for the catalyst beds and ducts, leading to very high construction costs that far surpass ranges of acceptable cost effectiveness. Ecology concurs with TransAlta that the construction costs to overcome the technical difficulties of retrofitting an SCR system on its boilers given its current configuration render this technology economically infeasible for implementation at this time.

Following are summaries of TransAlta's and NPS' cost estimates for SCR.

Costs estimated by	**TransAlta/Ecology**		**NPS**	
Emissions Reduction (tpy)		7,450		5,456
Capital Cost	$	290,100,000	$	227,046,261
Capital Cost ($/kW)	$	413	$	323
O&M Cost	$	3,849,789	$	6,538,253
Total Annual Cost	$	35,706,198	$	31,466,712
Cost-Effectiveness ($/ton)	$	8,205	$	5,768

However, we have a major concern with the way in which TransAlta estimated the costs of adding SCR at Centralia, and believe those costs are overestimated. While TransAlta did present "line item" costs for SCR, it is not possible to determine from the information provided how those "line item" costs were derived. Instead of CUECost and internal and proprietary databases, the BART Guidelines recommend use of the EPA Control Cost Manual:

> The basis for equipment cost estimates also should be documented, either with data supplied by an equipment vendor (i.e., budget estimates or bids) or by a referenced source (such as the OAQPS Control Cost Manual, Fifth Edition, February 1996, 453/B-96-001). In order to maintain and improve consistency, cost estimates should be based on the OAQPS Control Cost Manual, where possible. The Control Cost Manual addresses most control technologies in sufficient detail for a BART analysis. The cost analysis should also take into account any site-specific design or other conditions identified above that affect the cost of a particular BART technology option.

EPA's belief that the Control Cost Manual should be the primary source for developing cost analyses that are transparent and consistent across the nation and provide a common means for assessing costs is further supported by this November 7, 2007, statement from EPA Region 8 to the North Dakota Department of Health:

> The SO_2 and PM cost analyses were completed using the CUECost model. According to the BART Guidelines, in order to maintain and improve consistency, cost estimates should be based on the OAQPS Control Cost Manual. Therefore, these analyses should be revised to adhere to the Cost Manual methodology.

TransAlta did not provide adequate justification or documentation for its cost estimates, and does not provide for a transparent method (as does the EPA Control Cost Manual) to determine how the costs were calculated.[13] We were not provided with any vendor estimates or bids for SCR. As a result, TransAlta's $413/kW estimate for Total Capital Cost is substantially higher than the $50 - $320/kW found in available cost surveys. (Please see "Cost Survey Results" and "SCR Cost Survey Report" in Appendix B.) While we understand that installation costs may be greater than average for Centralia due to space constraints, TransAlta should show the extra expenses and how they were estimated.[14] For these reasons, we believe that capital and annual costs are overestimated.

We conducted our own analysis using the EPA-recommended EPA Control Cost Manual,[15] but with some very important modifications. Although the Control Cost Manual approach incorporates a built-in retrofit factor[16] that adds $4 million to the Direct Capital Cost (DCC) of each unit at Centralia, we decided to assume that Centralia the would equal the most-expensive SCR retrofit (on a $/kW basis) in the cost survey literature by adding retrofit factors to escalate the DCC and the Indirect Capital Cost such that the Total Capital Cost would be about $320/kW, which is the cost of the most expensive SCR based upon the survey information in Appendix B. Nevertheless, even after we escalated those costs by applying "extra" retrofit factors of 3.0 – 3.5, we still derived the much lower costs shown in the table above.[17]

Step 5 – Evaluate visibility impacts.

As discussed previously, we have a fundamental concern with Ecology's decision not to consider the cumulative visibility improvements that would occur at all of the Class I areas within 300 km of the BART source.

TransAlta ran CALPUFF for SCR at 0.07 lb/mmBtu[18] and predicted that the greatest improvement would be at Mount. Rainier NP at 2.1 dv. The cumulative Class I area improvement would be 12.5 dv. (Please see the enclosed map titled "Benefits of SCRs at Centralia Power Plant on Class I areas.")

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[13] TransAlta submitted revised SCR retrofit costs in July 2008 to address increases in the price for steel, concrete, other building materials, and overall construction costs. Given the downturn in the economy and the resulting decreased demand for raw materials, these cost estimate increases seem unnecessary and inappropriate. The Chemical Engineering Plant Cost Index ("CEPCI") for 2008 is 575.4. The June 2009 index is 508.9, a 12% decline in 6 months.

[14] For example, TransAlta could use an approach similar to that discussed by William M. Vatavuk on pages 59 – 62 of his book Estimating Costs of Air Pollution Control.

[15] We attempted to adjust the cost derived by a direct application of the EPA Cost Manual by applying "extra" retrofit factors of 3.0 – 3.5 to the direct and indirect costs. Our "target" was to keep the capital cost of SCR around $320/kW, which is the cost of the most expensive SCR based upon the survey information in Appendix B.

[16] that applies to equation 2.39

[17] The Excel workbook we produced, which is based upon the approach provided in EPA's Control Cost manual, can be found in Appendix B.

[18] This is appropriate for a 24-hour average for SCR.

Geomatrix Table 4-3: YEARLY PREDICTED CHANGE TO THE 98TH PERCENTILE DAILY HAZE INDEX 98th Percentile Delta HI (dv)

Area of Interest	Baseline	Flex- Fuel		SCR	
		Imapct	Improve	Imapct	Improve
Alpine Lakes Wilderness	4.103	2.737	1.367	**1.224**	1.513
Glacier Peak Wilderness	2.742	1.700	1.042	0.774	0.927
Goat Rocks Wilderness	4.336	2.912	1.424	**1.302**	1.610
Mt. Adams Wilderness	3.554	2.356	1.198	**1.061**	1.296
Mt. Hood Wilderness	2.797	1.730	1.067	0.796	0.934
Mt. Jefferson Wilderness	1.609	0.987	0.621	0.423	0.564
Mt. Rainier National Park	**5.454**	**3.899**	**1.555**	**1.775**	**2.125**
Mt. Washington Wilderness	1.446	0.844	0.603	0.391	0.452
N. Cascades National Park	2.060	1.326	0.734	0.576	0.750
Olympic National Park	4.037	2.646	1.391	**1.240**	1.406
Pasayten Wilderness	1.416	0.854	0.563	0.381	0.473
Three Sisters Wilderness	1.590	0.880	0.710	0.416	0.464
CRGNSA	2.228	1.426	0.801	0.598	0.828
Cumulative	**37.373**	**24.298**	**13.076**	**10.956**	**13.341**
Cumulative-CRGNSA	**35.146**	**22.871**	**12.274**	**10.358**	**12.513**

Even with SCR, Centralia would continue to cuse visibility impairment in five Class I areas and contribute to impairment in three more (and the CRGNSA).

Determine BART

According to Ecology

> The Department of Ecology (Ecology) determined that BART for NO_X emissions is the current combustion controls combined with the completion of the Flex Fuels project and the use of a sub-bituminous coal from the Powder River Basin or other coal that will achieve similar emission rates. This change results in a 20% reduction of NO_X emissions from the baseline period emission rate. The use of low sulfur PRB coal also reduces SO_2 emission by about 60% from the same period. The NO_X reduction from the BART controls selected by Ecology will result in a visibility improvement from the baseline impacts at Mt. Rainier National Park of approximately 0.6 dv, with improvements of 0.2 to 0.6 dv at other affected Class I areas. The controls are to be installed and start continuously meeting the emission limitation by October 1, 2009.
>
> There will be federal requirements to reduce mercury emissions. The Flex Fuels project does not interfere with any potential mercury control technologies required by a future federal mercury control program.
>
> In order to meet the requirement of the Governor's Executive Order on Climate Change, TransAlta will be making significant financial and plant viability analyses of how best to comply with the Executive Order directive and the resulting Agreed Order between the company and Ecology.
>
> Meeting the requirements of the Executive Order will significantly affect the NO_X emissions from the plant. This would occur whether compliance was achieved through shutdown of the plant, adding biofuels, or performing carbon removal and sequestration.

Based upon our reviews of BART analyses across the U.S., we believe that cost-per-deciview ($/dv) of visibility improvement is the most-common and most-useful parameter for assessing the cost-effectiveness of strategies to improve visibility in Class I areas. Our compilation[19] of BART analyses across the U.S. reveals that the **average cost/dv proposed by either a state or a BART source is $12 - $19 million**,[20] with a maximum of almost $50 million/dv proposed by Colorado at the Martin Drake power plant in Colorado Springs. Using the information provided by TransAlta, we calculated the cost-effectiveness of its proposed combustion control option in $/ton and $/dv.

Cost-effectivenesss estimated by	**TransAlta/Ecology**	**NPS**
Cost-Effectiveness ($/ton)	$ 8,205	$ 5,768
Visibility Improvement (dv at Max Class I)	1.062	1.062
Cost-Effectiveness ($/98th % dv at Max Class I)	$ 33,611,106	$ 29,620,375
Visibility Improvement (dv at Summed Class I)	**6.257**	**6.257**
Cost-Effectiveness ($/98th % dv at Summed Class I)	**$ 5,707,056**	**$ 5,029,443**
Visibility Improvement (dv at Summed Class I+CRG)	6.671	6.671
Cost-Effectiveness ($/98th % dv at Summed Class I+CRG)	$ 5,352,718	$ 4,717,177

We believe that TransAlta has overestimated the costs and underestimated the benefits of SCR. However, we recognize that there are considerable uncertainties and differences between the TransAlta cost estimates and those we produced based upon the EPA Control Cost Manual approach. Nevertheless, either set of cost estimates, when placed into the context of cost per degree of cumulative visibility improvement (e.g., $/dv) and compared to the cost-effectiveness values accepted by other sources and states across the U.S.,[21] result in the conclusion that SCR at Centralia is relatively cost-effective.

Mercury Reduction

Addition of SCR may enhance mercury removal by oxidizing some of the elemental mercury to a form that is more-readily captured by the existing PM and SO_2 controls. Ecology may also consider a more-comprehensive approach in which an existing ESP is removed and replaced by SCR, powdered activated carbon injection, and a fabric filter. Such a multi-pollutant approach is underway at Minnesota Power's Clay Boswell station. PacifiCorp has also proposed to replace the existing ESPs with fabric filters at its Johnston and Naughton generating stations in Wyoming.

NO_x BART Conclusions

We believe that a valid "top-down" approach to reducing NO_x demonstrates that addition of SCR is BART for Centralia. We have conducted our own analysis using the procedures described in EPA's BART Guidelines and in EPA's Control Cost Manual.

- TransAlta and Ecology did not consider other, potentially less-expensive, locations for SCR

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[19] See http://www.wrapair.org/forums/ssjf/bart.html; a more-current compilation was sent to Ecology on 11/13/09.

[20] For example, PacifiCorp has stated in its BART analysis for its Bridger Unit #2 that "The incremental cost effectiveness for Scenario 1 compared with the baseline for the Bridger WA, for example, is reasonable at $580,000 per day and $18.5 million per deciview."

[21] We recently sent our latest compilations of BART proposals to Ecology. That transmittal contained summaries of BART proposals by sources and/or states to reduce SO_2 and NOx. The average cost/dv for the NO_x proposals was $12 million/dv; and $19 million/dv for SO_2. The combined average was $15 million/dv.

- TransAlta and Ecology have underestimated the ability of modern NO_x control systems. SCR is capable of reducing emissions below TransAlta's target, and the amount of the reductions will increase.
- TransAlta's SCR costs are overestimated and unsubstantiated. EPA guidance advises that its Control Cost Manual should be used; TransAlta should follow this guidance.
- Ecology should consider the cumulative effects of improving visibility across all of the 12 Class I areas affected. Our results estimate a cost-effectiveness value for addition of SCR of $4.7 million/dv, which is much less than the average cost-effectiveness accepted by the states and sources we have surveyed. Even when we use TransAlta's estimates of control-effectiveness and costs, addition of SCR is cost-effective at $5.4 million/dv.

United States Department of Agriculture | Forest Service | Pacific Northwest Region | 333 SW First Avenue (97204) PO Box 3623 Portland, OR 97208-3623 503-808-2468

File Code: 2580
Date: November 3, 2009

Sarah Rees
Air Quality Program
Washington State Department of Ecology
PO Box 47600
Lacey, WA 98504-7600

Dear Ms. Rees:

On September 16, 2009, the USDA Forest Service received notification of the proposed Settlement Agreement between the State of Washington Department of Ecology and TransAlta Centralia Generation LLC on air quality matters. The proposed agreement includes both the determination of Best Available Retrofit Technology (BART) for the NOx emission limits and voluntary mercury reductions at this facility. Based upon our review of the BART documents, we are providing the following comments.

In brief we conclude:

- The TransAlta facility contributes to visibility impairment at 12 Class I areas (9 are FS managed) plus the Columbia River Gorge National Scenic Area.
- This visibility impairment is modeled to occur up to 144 days per year at the most impacted FS-managed Class I area (Alpine Lakes wilderness). Mt. Rainier National Park is impacted even more frequently at 168 days per year.
- New NOx controls as described in the BART documentation and the Settlement Agreement will do little to improve visibility; reducing the number of days impaired by only 6% at Alpine Lakes to 135 days per year and only 3 % at Mt. Rainier to 163 days per year.
- Post-combustion control technologies are available that can do a better job of reducing NOx and improving visibility than the Flex Fuels project alone. We encourage you to reconsider the value of visibility in the Class I areas and require additional NOx reductions through either Selective Catalytic Reduction (SCR) or Selective Non-Catalytic Reduction (SNCR).
- We advocate a reduction in permitted SO_2 emission limits from the current limit of 10,000 tons per year (tpy) to approximately 2900 tpy. This emission level has been demonstrated to be achievable by the facility in the past two years and allows for upward adjustment for maximum heat input in the past 10 years.
- The provisions associated with the BART determination should be independent from provisions associated with voluntary mercury reductions, effectively removing the non-enforceability provisions intended for the voluntary mercury reductions.
- Ecology should not limit itself from opportunities to reduce haze-causing emissions at the TransAlta Centralia plant for the next 20 years.

The details of our concerns are presented below. Please direct questions to Rick Graw at 503 808-2918

Mary Wagner
Regional Forester

Enclosure

Forest Service Technical Comments on the Settlement Agreement between State of Washington Department of Ecology and TransAlta Centralia Generation LLC of Air Quality Matters

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Overall Comment

The Forest Service recognizes the substantial progress made by TransAlta in reducing its emissions of air pollutants from the Centralia electric generating facility in the past 10 years. Sulfur dioxide (SO_2) emissions have decreased by 98%. PM emissions are controlled by 99%. Recent testing has shown that mercury can be reduced by greater than 80%. However, NOx emissions have only been reduced by 40-50%. Due to its contribution to haze, we remain concerned about the proposed BART determination for NOx, as it does little to decrease the frequency and magnitude of visibility impairment in the 12 affected Federal Class I areas and the Columbia River Gorge National Scenic Area (CRGNSA). We would like to see NOx controlled to similar levels of control as the other pollutants.

Flex Fuels plus SNCR

In its support document for the BART determination, Ecology states that Flex Fuels plus selective non-catalytic control technology (SNCR) is both technically feasible and cost effective. While the rationale for not requiring installation of Flex Fuels plus SNCR technology are presented, these factors do not out-weigh the benefits of implementing this technology.

The benefits of implementing this control technology include:

- Increasing the level of visibility improvement at the 3 most heavily impacted Federal Class I areas due to NOx reductions by an additional 0.45 to 0.6 dv on the 98th percentile day, or about double that of flex fuels or SNCR alone.
- Reducing the NOx emissions to 0.18 lbs/mmBtu, much closer to the EPA presumptive limit (0.15 lbs/mmBtu) than achieved solely through the Flex Fuels program (0.24 lbs/mmBtu)
- Reducing annual NOx emissions by 8,022 tpy
- Achieve these at a cost of $2,162/ton.

The factors weighing against this control technology are manageable, conflict with EPA's view, and would simply delay measurable improvements in visibility. Ecology also recognizes that the energy and non-air quality environmental impacts of compliance will be manageable. Contrary to Ecology's argument that the LNC3 combination of combustion controls previously installed should be considered BART, EPA has stated that "while the NOx emission limitation may have represented BART when the emission limit in the RACT Order were negotiated, recent technology advances have been made. EPA cannot now say that the emission limitations in the RACT Order for NOx represent BART." The Forest Service advocates a similar position.

Finally, while green house gas emissions will be reduced by December 31, 2025 in order for the facility to meet the Governor of Washington's Executive Order, this does not guarantee reductions in NOx. Even if NOx emissions were further reduced by this deadline that still leaves at least a 15 year window in which impairment to visibility could be substantially reduced, a window in which 12 Class I areas and one National Scenic Area will still be impacted. Thus the benefits of implementing Flex Fuels plus SNCR to achieve an emission limit of 0.18 lbs NOx/mmBtu out-weigh the costs.

SCR Cost Effectiveness

Use of post-combustion technology such as Selective Catalytic Reduction (SCR) could reduce NOx by an additional 76% over the base line condition. As demonstrated by the modeling analysis, this would achieve far greater improvement in visibility as compared with the currently proposed 20% reduction.

Ecology has determined SCR technology as technically feasible, but did not select SCR technology as BART due to costs. Upon reviewing the basis for this decision, we note that Ecology relied solely upon the $/ton metric for determining that the technology is not cost effective. That metric has an acknowledged level of uncertainty of -20%/+50%[1]. This is considerably more than the ± 30 percent uncertainty typically used by EPA[2].

Additionally, the annualized costs of the SCR system are based upon a 15 year plant economic life. This should be revised to a 20 year life to be consistent with both the default assumption used in the EPA Cost Control Manual for SCR and TransAlta's response to comments to Ecology[3]. Correction of this error will reduce the estimated total annualized cost.

Performing a cost-effectiveness analysis based solely upon $/ton offers no consideration of visibility improvement, let alone cumulative impacts at multiple Class I areas. As this is a visibility rule, more transparency is needed in Ecology's determination of BART and how specifically it considered the visibility impacts from this facility.

While the BART guideline does not offer specific guidance on how to consider the visibility metric in assessing cost effectiveness, the BART guideline does mention use of such a metric as dollars per deciview ($/dv). The FLMs have developed draft guidance which has been provided to Ecology[4]. Additionally, EPA Region 9 has developed a draft methodology which also considers visibility in evaluation of cost effectiveness. As this is a visibility rule, and this source contributes to visibility impairment at 12 Class I areas and a National Scenic Area, a cumulative $/dv metric is appropriate and should be used.

In the most recent compilation of proposed and final BART determinations for NOx prepared by the National Park Service (which includes 46 EGUs from across the country), cumulative cost effectiveness ranges from $0.6 million/dv to $15.3million/dv (August 12, 2009). Using costs

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[1] BART Analysis for Centralia Power Plant. Prepared for TransAlta by CH2MHill, January 2008, Revised July 2008.
[2] US Environmental Protection Agency. Cost Control Manual, Chapter 2: Cost Estimation: Concepts and Methodology. EPA/452/B-02-001. January 2002.
[3] Preliminary Responses to Department of Ecology and SWCAA on the January 2008 TransAlta Centralia Power Plant BART Analysis. May 23, 2008.
[4] Estimating Regional Haze Cost/Benefit. Draft, September 25, 2008.

provided in the BART documentation for this facility, implementing SCR at Centralia is estimated to cost approximately $8.5 million/dv (sum of 98th percentile across all affected Class I areas). Thus from this perspective, SCR is cost effective.

Given the high degree of uncertainty in the cost estimate, and the frequency, magnitude and number of Class I areas impacted by this facility, we advocate that Ecology reconsider the cost effectiveness of SCR control technology and the potential benefits to our nation's natural resources in making its BART determination.

SO_2 Emission Reductions

The actual SO_2 emissions from this facility are far less than the currently permitted emission rates. According to the EPA Clean Air Markets database, the SO_2 emissions from this facility during 2008 were only 2318 tpy compared with their currently permitted emission rate of 10,000 tpy. This was accomplished through the increase efficiency of the wet scrubbing system as obtained through experience with the system and the reduction in sulfur content of the PRB coals compared with the coal from the local mine. We recognize that during 2008, the plant only operated at 80% of its historical capacity. If the plant operated at full capacity, it would have emitted approximately 2918 tpy of SO_2. Given the adverse effects of acid deposition caused by sulfuric acid and its significant role in causing haze, SO_2 should be limited to 2918 tpy at this facility.

Additionally, it would be helpful if Ecology would quantify and present the improvement in visibility likely to occur from both SO_2 and NOx emission reductions resulting from the Flex Fuels project. Looking at the change in impacts from reductions in NOx emissions alone, as was provided in the modeling analyses, underestimates the actual reductions in haze anticipated from both SO_2 and NOx emission reductions.

BART Compliance Section of the Settlement Agreement

The BART compliance section of the settlement agreement is missing a key provision proposed by Ecology in its Support Document for BART Determination (August 2009). In section 4.2 of that document, Ecology proposed BART to be the Flex Fuels project plus "use of a sub-bituminous Power River Basin coal or other coal that will achieve similar emission rates…" Since PRB coal contains approximately 1/3 of the sulfur content of the local TransAlta coal and 90% of the nitrogen content, this provision is key to keeping SO_2 and NOx emissions at or below the level achieved in recent years. As such, we advocate retaining this provision in the BART compliance requirements.

Continuous Improvement/Regional Haze Goal for NOx

The Forest Service objects to excluding the TransAlta facility from future evaluation for opportunities to reduce haze-causing pollutants before submission of the comprehensive periodic revision of the RH SIP due to EPA by July 21, 2018. This would effectively prevent any evaluation of advancement in new control technology for another 20 years (until the 2028 SIP). This seems unreasonable given the periodic advancements in air pollution control technology and the substantial impact caused by this facility at multiple Class I areas.

General Terms and Conditions

The last phrase of paragraph 2 of the Settlement Agreement is troublesome. It states conditions under which TransAlta, in its sole discretion, may terminate the Settlement Agreement. Because the TransAlta Centralia electrical generating facility is subject to BART, TransAlta should not have the right to terminate portions of the Settlement Agreement pertaining to compliance with BART. The BART compliance section of the Settlement Agreement ought to be addressed separately from the voluntary mercury reductions.

Early Mercury Emission Reductions

Mercury has been found in fish from remote areas in Washington at levels exceeding those thought safe for consumption by wildlife and humans and is a concern for the Forest Service. The Forest Service commends TransAlta's desire to reduce mercury prior to state or federal regulation.

The Settlement Agreement identifies sorbent injection as the sole technology planned to reduce mercury emissions by 50%. However, recent tests at the facility demonstrate that mercury may be reduced by greater than 80% using sorbent injection technology. As such, we would like to see incentives in place to encourage TransAlta to remove as much mercury as possible. Once federal and/or state regulations are developed for mercury, we would like to see emission limits in place which promote the maximum level of control achievable for this bio-accumulating toxic compound.

Section 7: Compliance Phase, Paragraph b. If construction of the sorbent injection system triggers New Source Review (NSR), please explain why TransAlta should be exempt from NSR.

Paragraph 13 creates a "hollow agreement" in that if TransAlta does not comply with the early reduction provisions of the Settlement Agreement, Ecology can effectively do nothing. This paragraph should be removed from the Settlement Agreement.

From: Rees, Sarah (ECY) on behalf of ECY RE AQComments
Sent: Thursday, April 29, 2010 5:32 PM
To: Schneider, Doug
Subject: FW: Comments on Proposed Agreement for TransAlta's Centralia Coal-fired Plant

Form Letter #1

-----Original Message-----
From: steve12698@comcast.net [mailto:steve12698@comcast.net]
Sent: Friday, October 09, 2009 9:27 PM
To: ECY RE AQComments
Subject: Comments on Proposed Agreement for TransAlta's Centralia Coal-fired Plant

Mr. Alan Newman
Air Quality Program, Wash. Dept. of Ecology
P.O. Box 47600
Lacey, WA 98504-7600

Dear Mr. Newman,

Thank you for the opportunity to comment on air pollution at TransAlta's coal-fired power plant. As a national park tourist and advocate for our national parks, I treasure the beauty and pristine air quality of Mount Rainier and Olympic National Parks and recognize that the State of Washington has a unique opportunity to protect these and other treasured public spaces. In order to preserve these park resources for present and future generations, it is important that air quality laws and regulations are strictly followed.

Mount Rainier and Olympic National Parks, as well as multiple wilderness areas, are threatened by air pollution from the Centralia coal plant. To protect these public spaces Washington must require that TransAlta significantly reduce its air pollution.

The Clean Air Act requires power plants to reduce haze-causing pollutants, including nitrogen oxides, and toxic chemicals like mercury. Washington should require the most effective pollution controls to reduce TransAlta's nitrogen oxide and mercury emissions. Without these controls, the Centralia coal plant will continue to unnecessarily obscure views and contaminate water and wildlife in our national parks and wilderness areas for decades to come.

Thank you for considering my comments.

Sincerely,
Steve Lovelace
PO Box 245
Wilkeson, WA 98396

From: Rees, Sarah (ECY) on behalf of ECY RE AQComments
Sent: Thursday, April 29, 2010 5:29 PM
To: Schneider, Doug
Subject: FW: Fight Coal Pollution in Washington!

Form Letter #2

-----Original Message-----
From: Sierra Club Membership Services
[mailto:membership.services@sierraclub.org] On Behalf Of Frank And Nola Allen
Sent: Monday, November 09, 2009 10:04 PM
To: ECY RE AQComments
Subject: Fight Coal Pollution in Washington!

Nov 10, 2009

Sarah Rees

Dear Rees,

I have the following concerns regarding the proposed Settlement Agreement between the Department of Ecology and the TransAlta corporation regarding its coal plant.

From health care professionals to park rangers to fishermen, the Washington public has grave concerns about that this plant generates in our communities. As the state's largest polluter for global warming, mercury and haze (from nitrogen oxide pollution), the cumulative impact of this plant affects Washingtonians from every walk of life. The State should not move forward with the Settlement Agreement as proposed until a more substantive review can take place.

There are four main problems with this Settlement Agreement as it now stands:

1. This agreement is insufficient in controlling nitrogen oxide, the main cause of haze in our national parks and wilderness areas.

2. The reductions required for toxic mercury emissions are insufficient and should be improved to 90 percent.

3. The pollutant-by-pollutant process has distorted the pollution impacts of this plant on public health.
4. The public process has been insufficient.

I hope the state will carefully consider our concerns. The TransAlta coal plant is the dirtiest form of energy in the state and is the leading source of top environmental problems. I know we can do better than the specifics in this Settlement Agreement and for the overall pollution problems caused by the state's only coal plant.

Sincerely,

Dr Frank And Nola Allen
2147 E Shelby St
Seattle, WA 98112-2027
(206) 323-3168

Jerry: We're gonna get started in just a few minutes. So if you want to find a seat that would be great. There's a hand-out on the outside table just outside these doors. If you didn't get a chance to pick one of these up and you'd like to have one just raise your hand, we'll have a staff person bring it to you. It's like a focus sheet so we'll have Kim bring some of these focus sheets in. Can you all hear me way there in the back? You guys can come on up front if you like.

Female: Okay.

Jerry: Can you hear me okay? All right. So good evening, my name is Jerry Feelin and I'll be the facilitator public hearings officer for tonight's public hearing. On behalf of the Department of Ecology I want to thank you for coming out here tonight to provide testimony for the proposed ecology TransAlta Mediation Agreement. Let the record show that it is 6:38 on Tuesday, September 13, 2009 and this public hearing is being held at the Department of Ecology Headquarters Building at 300 Desmond Drive in Lacy, Washington.

A couple of logistical things. If you have not already turned off or silenced your cell phone, PDA's, pagers, anybody even carry a pager anymore? If you would do that at this time that would be great. Restroom facilities back out through this set of double-doors. Don't take the big stairs up although there are some up there at the top of those stairs. Just go through to the little stairs for those of you who came down the elevator and on the right hand side where you get to the elevators there's signage once you get to that little foyer there.

You will find restroom facilities and you begin – okay, would you bring in a couple of the focus sheets please? There's some folks that would like to get a copy of that and we did. If you want to hold your hand back up. If you didn't get those we'll make sure that those get to you.

Female: Anybody else.

Jerry: And as you came in you were asked if you wanted to, if you would sign in on one of our attendance cards. We're required to do this for the security of the building. And there's also the opportunity for you to indicate whether you want – would like to testify or not. There's about eight or nine of you that have indicated such. If you didn't realize you had to check that box, don't worry. When I exhaust the list of those who have identified that they want to testify I'll come back, see who else wants to, or maybe you maybe changed your mind and you now want to testify. So just because you didn't check it on the way in doesn't mean that you still won't get a chance to do some testimony.

Basically the agenda is going to go like this. We're going to have a short presentation by a couple of staff folks from the air quality program. That will be followed by a short question and answer period. We'll have some – we have some marvelous microphones and we'll bring those up to you. Just raise your hand and we'll bring those to you. We'll facilitate the short question and answer period and then we'll get right into the formal public comment public testimony. So far, so good?

We're gonna run over just a couple of ground rules. Nothing earth-shattering or ground-breaking here. Most of the things are things that we learned about being nice to one another back in kindergarten. So we're gonna ask that you hold your questions during the presentation so we can get through the presentation and then we'll get – facilitate the questions of staff at the end of that. No distracting or destructive behavior. We request that you have respectful voices.

We could be recognized during the Q&A part and I'll do that recognition and then we'll have one of the microphone runners go to you. For the public comment I'm gonna call you up in the order in which you signed in, and again, if you didn't sign in or you didn't indicate that you wanted to testify and if you didn't so indicate we'll give you a chance to do so at the end. We have to use this one a lot sometimes.

We're gonna ask that you respect the right of others to have an opinion even if you don't agree with that opinion. Okay. You respect the right that they have – they have the right to have their opinion. We're gonna limit the testimony to some reasonable length of time. There's only like, say, nine or 10 of you that have indicated – we're probably gonna start at about five minutes. Hopefully you can get through in five minutes.

There's only a few of you. I'm gonna let that go a little bit. I won't let it go 12 or 15 minutes because there are people who are patiently waiting at the end of that list to testify. You have the parents' statement. If you'd like to turn that into us tonight that has the same weight as any oral testimony that you might present as does any of the written comments that you might submit during the public comment period. So I'll – we'll wait until we get all the cards in as a few other people are trickling in but we're probably gonna go somewhere in the five to seven minute range. That's definitely about an hour's worth or so in barely about an hour's worth of testimony. So that sound reasonable to you folks? Somewhere between five and seven minutes. I mean you can probably speak to your concerns during that time frame.

Okay. With that we're gonna turn it over to the ecology staff for their presentation. We have Sarah Rees and Al Newman and you can follow along with their slideshow here and, again, we'll ask you to hold your questions and we'll facilitate that question and answer at the end. Sarah?

Sarah: Great, hi. So can folks hear me? I was just getting close enough to the mic. So again, my name is Sarah Rees and I'm a manger with the Air Quality program and I'm gonna go over the basics of the mediation agreements and the mercury agreement that we have here and then I'm gonna turn it over to my Senior Engineer, Al Newman, who is gonna go over some of the details of our draft board determination.

So before I get into that I just wanted to give a little bit of a background on the TransAlta Centralia facility. It is the only coal fire power plant that we have in the State of Washington which is a bit unusual. In most states you'll have several of these but we only have the one. It started operating in 1971 so it's an existing facility. It's been around for quite a while. It's rated at 1400 megawatts of capacity which is a significant coal-fired power plant.

That generating capacity is important not only for the power that it produces but the location of that power. It's the only facility that's sized this side of the Cascades so it's really important for good stabilization.

Why we're taking action right now on this? As with all coal-fired power plants TransAlta generates mercury and it generates significant amounts of mercury. So in ecology mercury is a priority chemical for us and so it was important for us to work towards getting reductions of mercury emissions from the facility. It is the top source, single source of mercury in the states.

We also have some requirements that are triggered under the Federal regional haze rule and so because of the time the TransAlta was built and the type of facility it is there were some requirements we had to go through and we knew we needed to do something about that and work with the facility on that and we decided that the best way to go about doing that given these two issues was to go into mediation. There were significant environmental issues that we wanted to resolve, we started this mediation process in the Fall of 2007.

Jerry: Sarah, move that just a little bit closer. This is – it's up as far as it'll go.

Sarah: Okay.

Jerry: It's just hard to hear you in the back.

Sarah: Can you guys hear me? Is this better?

Jerry: Speak up.

Sarah: Sorry about that. So we started this mediation process in the Fall of 2007. It was subject to the Uniform Mediation Act so it was a confidential mediation and we did that for a couple of reasons. One, we wanted to have open discussions with the facility so that TransAlta would be able to share some information that might be confidential business information.

Because we're a public agency unless we do that under a confidentiality agreement we can't protect that information and so we wanted to be able to have that environment to have those discussions with the plants. There was also the threat of litigation here. Certainly under the Federal regional haze rules ecology had the position that that facility was subject to a review to see if there were additional controls required.

Doing this on the mediation allows us to proceed and to work through with the facility and get to some resolution without having to go through a lengthy litigation process. And we did agree going through the mediation that there would be a public process coming out of this. Before signing any agreement with TransAlta there would be an opportunity for public review and comment.

We had a public meeting in the end of March of 2009 and now today we're having this public hearing, we also have a public comment period that's open and that will be open through November 9.

So what did we agree to in this mediation? It's focused on significant air issues. For mercury TransAlta is gonna be making voluntary reductions in their mercury emissions. They're gonna be installing controls to do so. On regional haze, ecology has come up with a determination of what constitutes best available retrofit technology, also known as BARTS for nitrogen oxides.

It's important to note that this mediation agreement does not include any agreement on greenhouse gas emissions from TransAlta. I know there's a lot of interest about that because TransAlta is clearly a significant emitter of greenhouse gas emissions in this state but that's covered under executive order 0509 by Governor Gregoire. That executive order requires ecology to work with TransAlta to come up with ways to reduce greenhouse gas emissions from the facility by about 50 percent by 2025. So that will be an entirely separate process from this mediation agreement.

Now on mercury, and I mentioned that TransAlta is voluntarily reducing their mercury emissions. There's currently a regulatory gap for mercury. The Federal government had started a rule making for mercury from coal-fired power plants in 2005. That rule would have given Washington a budget for mercury. It would have then allowed plants that were subject to that budget to trade mercury nationally.

That rule by the Federal government was struck down by the D.C. Court of Appeals in February of 2008. So when that rule got struck down there was a gap left behind. The Federal government is currently proceeding with developing a max standard for mercury for coal-fired power plants. That standard would constitute basically the top 12 percent of technologies for mercury control from those facilities. That process is gonna take several years.

EPA is undergoing it right now. They're in the way of doing some information collecting but there likely won't be a standard in place until the 2016 or 2017 time frame. Meanwhile what we have with our agreement, TransAlta is currently testing controls. They've installed emission monitors so they'll be able to start self-reporting what their mercury emissions are to ecology this year and, because they're going through the testing and starting to look at this they're starting to get some reductions in mercury.

By 2012 they'll be reducing their mercury emissions by 50 percent. So going through this process really gives us the fastest path to get some mercury reductions today instead of waiting for a Federal process to work itself out. So the type of controls that they're installing, it's an activated carbon injection. You may also hear the term sorbent injection. Basically that is kind of like it sounds. You would inject activated carbon into the flu gasses of the facility. You pick an injection point where you want to maximize the contact of this activated carbon to the flu gasses and the carbon acts a little bit like a sponge and it takes up the mercury and separates it out from the flu gas.

These are state of the art controls for any existing coal-fired power plant. If you wanted to reduce mercury you would install this kind of system. As I mentioned before TransAlta is already testing this. They went out and hired a consultant and they've been running some tests through the summer and they've seen some pretty promising results coming out of this work, again, oriented towards a 50 percent reduction goal.

One thing I do want to mention is that there are some potential impacts to other processes as a result of activated carbon injection. When you move mercury from air it goes somewhere else and so one of the consequences of this process is that there will be – there may be some mercury contamination in fly ash from TransAlta. The plan is to have the controls fully-integrated into the system and operating by 2012 and the total cost to implement this would be about $20 to $30 million range.

So, as I mentioned, TransAlta is currently running tests to optimize mercury controls. These controls are not the kinds of things that you buy off the rack and you just slap onto the end of the tail pipe. They do require that there is a number of tests to go on to try to get the right point of injection, to try to get the right sorbents included, try to get the right injection rate.

And so there's a lot of work that has to go on to optimize this and make this work out right. From the current tests it does look like TransAlta will be able to get at least 50 percent reduction. The current emissions we believe are in the ballpark of 400 to 500 pounds per year.

So these are very significant reductions in mercury that we're looking at and, again, the preliminary test results look like it would be possible to go even higher than that. It's just preliminary results so we can't bank on those numbers but again the technology looks very promising.

So now I'm gonna turn this over to Al Newman and he'll give you some more detail on the regional haze rule and BARTS.

Al: All right. The – there's a Federal regional haze rule that was issued a number of years ago and, among other things, it requires ecology to submit a – what's known as a state implementation plan which is the outline of how we intend to get from the current visibility conditions in wildernesses and national parks to what's considered or defined as natural conditions by 2064.

The plan is in steps. It's in a number of 10-year steps and the first plan is considered a foundation plan upon which the others are based. As part of the initial set plan we have to make sure that all facilities that are BART eligible and subject to BART are evaluated for their emission controls and if a further emission reductions that meet the criteria of the best available retrofit technology definition exist and can be implemented on the plant to require those controls.

So the best available retrofit control technology applies to a family of 26 specific source categories. In Washington that includes the TransAlta plant and six other facilities. All of these facilities have equipment that was built in between August '62 and August 1977 which is a period of time defined by the Federal Clean Air Act. They all have the potential of their BART eligible equipment to emit at least 250 tons per year of one of the visibility impairing pollutants and that the actual emissions from these facilities either cause a visibility impairment through modeling of one deciview or greater, which is a metric of visibility impairment, or contribute to visibility impairment by having an impact of half of a deciview or greater.

In the BART analysis process as defined by EPA and their guidance where the process starts with identifying all of the available retrofit controls that can be applied to a facility and elimination of all of the control technologies that are infeasible to operate on the facility, evaluating the control effectiveness of all of the remaining opportunities, evaluating the various impacts of the – those controls and documenting the results of that analysis and evaluating the visibility impacts and potential improvements from the emission controls that are proposed for BART.

So in the case of TransAlta's power plant emissions the BART determination process is limited to the Nitrogen Oxides emissions only. There was a regulatory process operated by the Southwest Clean Air Agency starting in 1997 that resulted in the construction of emission controls for sulfur dioxide, nitrogen dioxides and particulate matter. Graphs on the side of the room here show the reductions that have occurred over that time due to those requirements for sulfur oxides and nitrogen oxides. As part of a 1999 visibility submittal, EPA approved in 2003, EPA accepted that the sulfur dioxide and particulate emission limitations that came out of that 1997 regulatory action represented BART for those pollutants and specifically said that nitrogen oxides did not currently represent BART or could not be defined whether it did or did not represent BART.

As a result this analysis that we've done is with the information developed in part by the company is limited to the nitrogen oxides portion of their emissions. So they evaluated a number of controls. The actual list started with the 37 different control technologies that were evaluated in 1997, looked at the most promising of the nitrogen oxide controlled technologies out of that list and added additional ones that had been found or developed in the meantime.

The primary new control technology that had showed up in the meantime has been over fire air – alternative over fire air systems and improved boiler optimization process, both of which were evaluated as part of this process. The more run of the mill and commonly applied technologies of selective catalytic reduction and selective non-catalytic reduction were evaluated in greater detail.

Both of these processes involve the injection of ammonia or urea into the flu gas from the boilers where it react – the urea or ammonia reacts with the nitrogen oxides to produce nitrogen gas and water. The big difference is the non-catalytic does not use a catalyst. The catalytic version uses a catalyst to achieve the controls at a lower temperature.

So one of the projects that I did not list on that was called the flexible fuels project or flex fuel project. It was a project that was ongoing with the plant at the time of the BART analysis and, as a result of the use of this project, nitrogen oxides were going to reduce approximately 20 percent. The primary reason for this was being able to operate on non-centralia coal. The target coal of the design has been a powder river basin type low sulfur sub-bituminous coal.

Along with this process and as part of the mediation agreement, the company has agreed to go – continue to work on how to further reduce the nitrogen oxides emissions over time and as a side benefit since the coals that are targeted from the flex fuel project contained lower sulfur than the Centralia coals that they are currently replacing there will be a significant reduction in sulfur dioxide emissions.

So there are a number of other considerations in the BART process that are looked at. Some of them which are not listed on the slide include the costs of compliance, the energy and non-air quality impacts of the potential to control technology, the existing controls already in place at the plant and the remaining useful life of the plant in addition to the degree of visibility improvement that might be achieved.

In the analysis in the end the flex fuels project and selective non-catalytic reduction result in approximately the same improvement in visibility and approximately the same emissions reduction. Along with that we have some legislation laws that exist that reflect the carbon dioxide emissions and also in that process limit the opportunities of the plant to make modifications that increase its emissions.

There's an economic impact of the fly ash recycling and sort of as an also-ran the Governor's Climate Change Executive Order has the potential of limiting the useful life of the facility.

So what follows this meeting? We will – and the public comment period on the BART analysis is that we will evaluate all of the comments that we receive and we will write up a response to those comments and as necessary make changes as appropriate to our BART determination.

Later after this, after we've reviewed the comments, the mediation agreement would be signed or otherwise and later in early 2010 this BART determination along with the other six BART determination and our regional haze SIP as a whole will be open for public comment again and that's it.

Jerry: All right. Thank you very much. Thank you for your patience in holding your questions. Appreciate that. I will now open it up for the next 15 or so minutes so – to take your questions. This will be the opportunity for them to respond directly to your questions. We'll set apart a little bit the process where we get to the public hearing. You can certainly ask a question of staff on the record but the staff will not be engaging in responding to that comment that you might make during that public hearing.

So if it's a question that you want an answer from tonight ask it during the Q&A. It goes onto the official hearing transcript. We're not gonna allow them to engage in dialog at that time. So we have Miriam and we have Tammy who will bring a microphone to you so that everyone can hear and I see a hand right here. We'll start right there. If you would stand and give us your name that would be great.

Brimmer: Hi, I love miseries. I'm Jennifer Brimmer with Earth Justice and I'm here on behalf of Sierra Club National Parks Conservation Association and the Northwest Environmental Defense Center and I actually have a question about questions. I have a lot of questions and it would probably show up more than the 15 minutes so I would like to make a proposal that I forego asking those questions here in the interest of speeding things along, and that I submit them to you in writing and you respond in writing but that we post those so that everyone that's here for the public hearing would get the benefit of the public exchange. Would that be an acceptable process?

Sarah: Let me get close to the mic here. Yeah, I think that would be an acceptable process and we'd be happy to do that.

Brimmer: I will submit those questions hopefully tomorrow, no later than next week.

Sarah: Thank you.

Brimmer: Thank you.

Jerry: All right. Who's next? Yes sir, right over here.

Quinn: Hello, my name is Mark Quinn. You mentioned that part of the agreement with TransAlta obligates them to begin addressing carbon dioxide emissions at some point up to 2025 to meet an early requirement for global warming emission, greenhouse gas emissions. I was just wondering how is that going to happen?

Sarah: Well again this agreement doesn't address carbon dioxide emissions. There's a separate process for doing that under Governor Gregoire's Executive Order 0509, and so that's ongoing right now and what that does is requires ecology to engage at TransAlta to work with them to get to a 50 percent reduction by 2025, and so getting that amount of reduction of greenhouse gas emissions from a traditional coal-fired power plant, it's gonna take a lot of looking at different technologies that are out there, potentially different fuels that would be used. That process is very much in the starting point so that we haven't thought through all of that but we're just embarking on that process to figure it out.

Jerry: Thank you. Anyone else? You must have questions. Did I see a hand?

Male: Yes.

Jerry: All right. Right back here in the – hand me your – we can get there to you.

Male: I was wondering do you know the potential impacts of these mercury emissions and also BARTSA's reduce emissions as much as possible. Do you have an estimate of what that would work out to as it's defined in the percentage compared to the current emission rate?

Sarah: Okay. On the mercury emissions the mercury that's emitted from TransAlta is likely in a form that is gonna deposit much further away from Washington State. It's – mercury in general, there's an atmospheric mercury pool. Most of what we get is from Asia for the most parts and it circles the world several times before falling out and some coal-fired power plants that don't have any controls on them like the ones you find out in the Ohio River Valley for example, their mercury is in a form that falls out pretty close to the plants.

But TransAlta is a facility that has installed sulfur dioxide scrubbers and other emission controls that put their mercury in a form that's gonna go up, join this global mercury budget and kind of circle around for a while. So it's hard really to trace an impact here in Washington on that. We do know overall that mercury is a very important and toxic biocumulative toxin and so it's something that's important for Washington that we take steps to reduce and given that this is our single largest source of mercury in the state it's important that we look at that.

And then for the BART question I think I'll let Al answer that.

Al: Yeah, could you repeat it so I understand? I want to make sure I answer the question you're asking. Okay. If you need to ask me questions afterwards about what it means don't be afraid to come up.

Jerry: Yeah, staff will stay around following the end of the close here of the public hearing to address any one on one questions or comments that you might want to have. Yes?

ACI: I have part of a two-part question. The activated carbon injection, I'm curious if this process has ever been proven before to work and how effective it is, where – how deep down is the mercury going? Could it ever get out? If you could explain a little bit more about what that's about, that would be great.

And my other question is is are you counting the 50 percent reduction in mercury within that or is the reduction coming from something else as well?

Al: Yeah, Activated Carbon Injection for mercury control is actually a very well-proven technology. It's used on municipal waste and hazardous waste incinerators routinely for a number of purposes. It's been used in Europe for two decades at least for mercury reductions.

The mercury enters the pour space on the activated carbon and if it's an oxidized form of mercury it then binds in the carbon. If it's an elemental form of mercury it doesn't bind as well and that's why halogenated versions of activated carbon are often better at removing mercury from flu gasses when there are low quantities of – or I should say when the mercury is primarily in an elemental form.

There's a lot of research around whether the mercury stays in the carbon over time and the bulk of it that I have read which, granted, is not the bulk of the research that's available, indicates that once the mercury is in the carbon it will stay there as long as you don't burn the carbon. Okay. And the other part of your question was –

ACI: Is that part of the 50 percent reduction?

Al: 50 percent reduction is entire – that is being evaluated here is entirely due to the carbon injection. There is some – in the case of the Centralia facility with the wet limestone scrubber system there is some additional small removal that can be achieved through the web scrubbing system but that's not part of the 50 percent as it's been evaluated to date in their testing.

Adam: My name is Adam and this is a question direct towards Sarah but I guess all of you. You had mentioned earlier that the mercury that would be emitted into our atmosphere and by "our" I mean the world would not directly – you know – would not really be affecting us in Washington, wouldn't be very near us. It would be spread out throughout the world and that most of our mercury in the atmosphere that we get is actually from Asia and that first strikes me as a little bit immoral to put our mercury on someone else, but first I want to just real quick read the Department of Ecology's mission and then I have the question.

The mission of the Department of Ecology is to protect, to preserve, and enhance Washington's environment and promote the wise management of our air, land and water for the benefit of current and future generations. In order to fulfill our mission and move Washington forward in a global economy the Department of Ecology has three goals: prevent pollution, clean up pollution and support sustainable communities and natural resources.

And a key word that you had mentioned that stuck out to me was "bioaccumulation," and I'm sure a lot of us have all heard about this and the fact that there is mercury build-up, especially in the fish that we eat, especially like the salmon which are so much an important element of our Washington culture.

And so my question is how is just putting our mercury on someone else wise management, let alone moral?

Sarah: And I – we do take mercury very seriously. It's one of the top priority chemicals of concern at ecology and that's one of the reasons why we worked with TransAlta to get a reduction in emissions and to get a very significant reduction in emissions faster than what the Federal government would require.

My statements as to the mercury traveling around the world and kind of joining this global mercury budget, I mean that's just really what happens with this type of mercury and it's a phenomenon that's pretty well-documented that most of what we do get in the U.S. is from coal-fired power plants in China.

That said, we take it very seriously that there is an emission source coming from Washington. It's gonna fall out somewhere. It doesn't necessarily not aware, and so that's why we're taking steps to reduce it to the extent we can.

You know we feel that going through this process with TransAlta, they're installing the best possible controls for mercury that are available and they are taking steps to do it as soon as they can. They're not waiting for any kind of later deadline, so we feel that this is making a very substantial step in reducing mercury emissions within this state.

Jerry: Any more questions? We have time for a couple more. Yes, way in the back?

Wilcox: Yeah, I'm Jim Wilcox of Trout Unlimited here. I just want to agree with Adam. It's real wise for a young man like him to say, "Are we not good neighbors in Washington? Should we be able to do like others and put our garbage in the air?"

And I'm curious about with mercury, I'm not sure about this, but how does that look like acid rain? What happens to the mercury when it – when we get rains? And then fish and wildlife as a member of Trout Unlimited is certainly important. In talking with a Fish and Wildlife biologist recently he said there's concerns about the salmon and other fish that the Orca whales are eating and causing problems. So there's some issues there and if we could get any of those touched on it would be great. Thanks.

Sarah: Okay. So again we do acknowledge that mercury is a significant issue within the state and most of what we get from deposition isn't coming from within Washington but, that said, we are taking steps to try to manage and reduce our sources internally.

As for the – what it looks like compared to acid rain, mercury that's emitted from coal-fired power plants that's in a form that would deposit locally, meaning from those facilities that don't have additional controls that TransAlta has, those would fall out closer to home kind of in the way that acid rain would work.

But the stuff that's mostly kind of going up and circling around in the global budget, we don't get as much of that. So it doesn't really line up for this particular case as much as well with the acid rain analogy.

Jerry: Time for one more, right up here.

Brimmer: Have you – Jennifer again. Have you sent a draft of this to EPA and solicited their input?

Sarah: A draft of the overall agreement?

Brimmer: The Mercury Environment Agreement.

Sarah: EPA has seen our draft BART analysis. We've not worked with them on the mercury.

Brimmer: What's been the reaction?

Sarah: BART's, they've had some comments and we've had some dialog about it. We – it's part of our normal course of working with EPA on any of our BART submissions.

Brimmer: What were EPA's comments?

Sarah: EPA has asked us some questions about our analysis, to ask us more about how we've justified using different technologies over the other and asked us for more supporting information.

Brimmer: Was EPA then critical?

Sarah: EPA has asked us for additional supporting information where they felt the analysis needed it.

Jerry: Okay. Any other questions? No? Oh, we have one. Okay. One more. This will be the final one and we'll move into the public hearing. Right back here.

Female: Now I'm just trying to figure out how much of this agreement was coming from TransAlta and how much of it was coming from you guys. How much pressure did you actually put on them to reduce their emissions and get the best possible agreement?

Sarah: It was a joint agreement. We worked with the facility because we had an interest in reducing mercury and we also needed to work through a process on reducing nitrogen oxide emissions for BART and so I think it was really a joint agreement that we reached.

Jerry: Take one more?

Female: Why not reduce emissions altogether? That would be a great goal to shoot for and eliminate, not produce any mercury at all.

Sarah: Elimination to not produce mercury at all would likely require this facility to be shut down and that's not where we were going with this agreement.

Jerry: We're gonna go ahead and wrap up the Q&A part at this time and move right into the public hearing. I don't like this microphone.

Male: Here, try that one.

Jerry: All right. Maybe this one isn't quite as sensitive. Okay. I'm gonna call you up in the order in which you signed in. I'll apologize in advance for any mispronounced names.

I'm gonna ask you to step into this microphone here, state your name and any affiliation that you might have, and again, we'll put a loose timer on you, somewhere between five and seven minutes as, again, we only have seven or eight folks that have currently identified that they want to testify.

If we go way beyond that I will apologize again in advance for interrupting you and asking you to submit to wrap up your comments or otherwise submit those in writing. Okay. First up, we have Donna Albert. She will come up and she will be followed by Mark Quinn. I'll have you speak right into that microphone.

Female: Donna Albert?

D. Albert: Right here, back here.

Jerry: Is that her back there?

Sarah: Is that mic on at all?

D. Albert: I'm not representing my employer but here as an individual representing my grandchildren: Austin, Donovan, Terrance.

Jerry: Okay. Tell me – then those are some – it's an emotional issue for a lot of people. Mark Quinn?

Quinn: My name is Mark Quinn. I'm here on behalf of the Washington Wildlife Federation. We are the state affiliate for the National Wildlife Federation and, like them, one of our top priorities is advocating for the establishment of a clean energy economy. We appreciate ecology's efforts to try to make emissions from the TransAlta coal – trying to reduce emissions from the TransAlta coal-fired power plant and make them cleaner and safer according to existing state and Federal rules which unfortunately don't do a very good job of making the air safe.

Even more unfortunately, the burning of coal to generate electricity is a process that even the most advanced technologies cannot make clean. Coal is the dirtiest source of energy on the planet and while we can argue that new technology makes it cleaner it's still the dirtiest way to generate electricity when burned coal produces almost twice as much carbon dioxide as natural gas, four times as much carbon monoxide, four and a half times as much nitrogen oxide, almost 2,600 times as much sulfur oxide particulates, mercury, one of the most toxic substances known, as well as radioactive uranium and thorium.

If that wasn't enough to make you want to stop burning coal you can look further to the destroyed landscapes that result from the mining of coal and the huge stockpile of 130 million tons a year of hazardous coal ash, the leftovers after the coal is burned.

Ads about clean coal and the notion that its development is just around the corner with carbon capture and sequestration are very disingenuous. There are huge technological obstacles to overcome. When you consider where to store approximately six billion tons of carbon dioxide annually from the nation's coal plants you begin to understand the complexity and insanity of such a proposal.

We should leave coal in the ground where it and the carbon locked in its molecules can be used to continue filtering our ground water. We want to see every effort taken to control toxic emission like nitrogen oxides and mercury, and eventually carbon dioxide at TransAlta but a better approach in Washington, a state that according to Governor Gregoire when she talked to the Washington Conservation Breakfast just a few days ago, she said she wants to make Washington a global leader in reducing greenhouse gas emissions.

So a better plan for Washington would be to slowly but surely phase out the burning of coal as a fuel source for electricity in the first place. It won't be easy but it will be much better for our long-term health and welfare, something that is clearly the responsibility of government to ensure. Please figure out a way to get this state out of the coal business once and for all and transition to a clean energy economy that can sustain our health and welfare and our economy.

That's the vision that we'll – that's the vision that we'll get Governor Gregoire and the State of Washington where she wants it, leading the nation and the rest of the world in the fight against climate change. Thanks.

Jerry: Thank you, very much. Next we have Randy King and he'll be followed by Jonathan Smith.

R. King: Good evening, I'm Randy King, the acting superintendent of Mount Rainier National Park and I appreciate this opportunity to present comments of the National Park Service on the proposed consent to create addressing best available retrofit technology BART emissions reductions at the Centralia facility.

Centralia facility is located in proximity to majestic national parks and wilderness areas whose resources are significantly affected by its nitrogen oxide emissions.

Mount Rainier National Park was established by the citizens of Washington in 1899 as the nation's fifth national park. It's about 50 miles away. Emissions from Centralia facility almost impact Olympic and North Cascades National Parks and I'm also speaking this evening on behalf of Superintendent Karen Gustin of Olympic National Park, and Superintendent Chip Jenkins of North Cascades National Park.

By law our nation strives to conserve on par national parks and wilderness areas in their natural state, protected from the adverse impacts of air pollution.

In 1995 we testified regarding the need for strong limits on emissions of sulfur dioxide at the Centralia facility to address the visibility impairment and other environmental concerns of the park and in the region caused by those emissions.

We note with appreciation that since those strong emission limits were put in place and the facility came into compliance there has been a dramatic reduction in measured sulfate at Mount Rainier and a corresponding statistically significant improvement in visibility on the 20 percent worst visibility measured at the park.

Today we note that the proposed consent to create does not require the best technology to reduce emissions of nitrogen oxide, also a key component and visibility impairment at the parks. Our review of the technical support documents provided by the state concludes that applying the best technology to reduce nitrogen oxide, an example of this led to cataylitic reduction technology, is both technically feasible and the most cost effective option when considering the visibility improvements that would occur at Mount Rainier, Olympic and North Cascades National Parks, and nine other class one wilderness areas administered by the U.S. Forest Service.

We are also concerned that the consent decree which addresses the BART component of the Environmental Protection Agency's 1999 regional haze SIP rules was negotiated without participation by the Federal land managers.

Since BART is a critical element of the State implementation plan for visibility protection it is uncertain if the state's consent decree process met the requirements and the spirit of the Federal land manager consultation provisions of the Clean Air Act.

On June 24, 2009 the Department of Interior was petitioned by the National Parks Conservation Association, Washington Wildlife Federation, Sierra Club and the Northwest Environmental Defense Center to certify that emissions and nitrogen oxides from the Centralia facility are reasonably anticipated to cause or contribute to visibility impairment at Mount Rainier and Olympic National Parks.

Such a certification would also require the State to specify BART for Centralia to address any reasonable attributable impairment under existing provisions of the state implementation plan. The Department of the Interior's initial response to the petitioners expressed the hope that the State's actions on BART for regional haze would address any concerns for reasonably attributable impacts. The consent decree as proposed does not adequately address these impacts.

The Department of the Interior will make a final decision regarding the petition pending the outcome of the Department of Ecology's actions for regional haze BART.

To remedy our concerns with the BART limits established in the consent decree we request that the Department of Ecology take a strong leadership role similar to its sulfur dioxide actions in 1995 and incorporate a BART requirement for selective catalytic reduction technology in the regional haze State implementation plan requirements for Centralia.

This would limit Centralia's emissions and nitrogen oxides to approximately 3,000 tons per year or approximately 12,000 tons per year less than that proposed in the consent decree.

Like the reduction in sulfur oxide clearly indicated such a reduction of nitrogen oxide would lead to a direct improvement in visibility of Mount Rainier National Park as well as contribute to improve visibility and increased health effects from fine particular matter region-wide.

While the focus of our concern is the nitrogen oxide emissions we are also concerned with mercury deposition at Mount Rainier and throughout the region. We note that addition of selected catalytic reduction technology, if appropriately designed, would be compatible with emissions reductions of mercury and would not interfere with future mercury emissions removal should pending new regulations from EPA require more reduction than the co-benefit resulting from sulfur dioxide, scrubbing and selected catalytic reduction.

In closing I would like you to think about the importance of Mount Rainier National Park to this region and the world for today's public and for future generations. There are many reasons that the law mandates our highest levels of environmental protection for these special areas. National Parks and wilderness areas are our natural and cultural heritage.

Sociology studies confirm their importance as do our individual experiences of recreation and renewal. Over 1.1 million people visited Mount Rainier National Park in 2008 to recreate and visitation as of the end of August of this year is already above the one million mark.

Regarding the economic benefits of the park, for example, in 2001 when our last visitor survey was conducted we learned that recreation visitors to Mount Rainier National Park spent $29.8 million within a 30-mile radius of the park. The total economic impact of visitor spending was $24 million in direct sales, $9 million in personal income, $13 million in direct value added in 649 jobs.

With multiplier effects created by the recirculation of money spent by tourists, visitor spending generated about $35 million in local sales and an associated $13 million in personal income, $20 million in value added and 812 jobs. These figures do not include park emission fees or the impacts of the MPSP role in operations in the area.

National Parks and wilderness areas not only guard the natural and cultural assets of our nation but they are also among our most sensitive gauges of environmental stewardship. Harm to these resources that our nation strives hardest to protect must signal an alarm for other resources and for us.

The National Park Service's desired outcome in this process is a solution and a decision that protects air and other important resources by using proven cost effective technologies to significantly reduce nitrogen emissions from the Centralia facility, to be clear an outcome that the National Park Service does not seek as a closure of the Centralia Power Plant.

Experience from other states and the success of the 1995 collaborative effort in reducing sulfur dioxide emissions from the plant tells us that these two outcomes achieving a significant reduction in nitrogen emissions and keeping an important facility operating are wholly compatible. We stand ready to work with all interested parties towards these outcomes.

This concludes my testimony. The National Park Service will be submitting detailed technical comments on a consent decree before the close of the public comment period. I thank you for the opportunity to testify on that. Thank you.

Jerry: Jonathan Smith, and he'll be followed by – is Maya Face?

Maia: Maia.

Jerry: Maia. Mr. Smith?

J. Smith: Hi, and I've worked for the past couple of years as a political campaigner and what I would call to light something that I think we're all pretty aware of. Right now coal is not very popular. It just isn't. People are waking up and becoming aware of coal as the dirtiest form of energy and we've seen a lot of campaign dollars come in to various campaigns and to TV ads and radio ads in our state making an awareness of coal.

Your comment was really enlightening when you responded to – I forget whose question but when you talked about keeping the facility open, this process of dividing C02 emissions, doing the closed door arbitration to talk about mercury reduction seems like a tailor-fit project to try to keep this facility open but this facility is not popular in Washington state.

I want to make you aware and I want to raise the issue up to the Governors through this comment period that this is not gonna work out as a positive – as a positive spin but it's going to play back politically, it plays back with the citizens of Washington state.

It may well prove at some point soon that siding with the bad guys against the will of the people may be a dicy prospect in a democracy. Thank you.

Jerry: All right. Thank you. Maia? And she'll be followed by Adam – is it Fleishman?

A. Fleisher: Fleisher.

Maia: Hi, my name is Maia. I'm another organizer and campaigner and I've seen a lot of different companies try to brainwash themselves and say that they're doing something good and in pretty much every single case the situation is that they're not actually doing nearly what they say that they're doing and that they're not doing even a small fraction of what they actually could be doing.

So basically I think you just gave yourself away saying that it was a collaborative process, basically saying that you guys don't have that much of a backbone to stand up against them and push for some more tough regulations and it's – it basically shows that you're not doing everything that you possibly can to reduce the mercury, to reduce the carbon dioxide and to reduce the nitrogen oxide.

I also, I wanted to bring up that there's – I don't know if people are aware that there is an online sludge pond from the mining that happened originally there that still hasn't been cleaned up and this plan doesn't address that at all and it'd be really great if that could get cleaned up some time. In my opinion it's also a big – it's a liability issue and there's also people who live near there so it's – the mercury there and the mercury that's being emitted from this plant is a huge danger to our health and to the – I was really happy to see this person from the National Park Service come because I think that this is having – I've studied mercury. It has a significant, significant impact on human health and on wild areas, and I think any level is unacceptable but 50 percent isn't nearly what is possible.

In states like Maryland and Illinois they have reduced their mercury emissions from 80 to 90 percent and this is all carbon – activated carbon where is the – how about out of the stack? You know, how about some reduction in mercury emissions from another source or how about – and still then addressing like you said the elemental mercury.

So I'm very concerned about that. I think that our first priority when we're talking about these issues should be reducing our consumption overall and then we can talk about increasing efficiency and then we can talk about alternative energy, and then – and after that we shouldn't need any coal-fired power plants.

So I just want to say that this is just the beginning. There's gonna be – we're gonna meet every step of the way. We have direct action groups who are ready to throw down for this. We have a whole slough of non-governmental organizations, non-profits behind this and we are very unhappy with this proposal and you made a grandmother cry.

Jerry: All right, thank you very much. Adam, you're next?

A. Fleisher: Hello, my name is Adam. I am a student here in Washington. I'm also a Washington state voter and a personal member of the Sierra Club but, for the record, I would just like to point out that the proposed agreement between the Department of Ecology and TransAlta contains, as we've been saying no controls for mercury but instead of voluntary mercury controls by TransAlta to reduce mercury – I think that 50 percent by 2012 was the number – while using well-established carbon injection technology which puts this mercury into the ground for my grandkids, for your grandkids, for everyone's grandkids in here, for the other people of this Earth's future including the plants and animals as well as using technologies which puts our mercury somewhere else for other peoples in the world.

And the fact that we get most of our mercury in Washington state from China doesn't mean that we should give the rest of the world our mercury that we expose. In addition this proposed agreement goes against the EPA suggestions that in fact the nitrogen oxide controls on the plant did not impact BART, that the EPA asked for more justification in these conclusions and, in fact, also not only EPA but now that the official statement of the National Park Service that this is not BART which is being agreed upon and that, in fact, would then be not legal.

And finally, like I said before, but just again for the public record it says in the Department of Ecology's mission that it is among other things the department's mission to promote the wise management of our air, land and water for the benefit of current and future generations and this agreement just to me does not seem to be doing that and, thus, it's breaking the department's own mission. Thank you.

Jerry: Thank you. We have a Shane – is it McCarter?

S. Macover: Macover.

Jerry: You said "maybe," on your testimony. Do you want to testify?

S. Macover: Yeah.

Jerry: Come on up.

S. Macover: All right. Mainly – hello? Yeah.

Jerry: You need to state your name and any affiliation for the record.

S. Macover: I'm Shane Macover. I'm not affiliated with any political group so I did once try to get a job with the environment in Washington but that fell through.

[Audience laughing]

S. Macover: Anyway.

Jerry: You can meet with him in the lobby afterwards, exchange business cards.

S. Macover: Anyway, the only thing I want to comment on really is that this says it's – the plant's volunteering mercury reduction which we have seen voluntary plans to do environmental benefits for a long time that happened with the EPA that we – would have made the Clean Air and Clean Water Act voluntary and typically it's a real surprise, they usually don't follow these voluntary compliances.

I think that, really, what we need is something with much more teeth than this and that the voluntary response is really just a way to throw some legislation and it and pretend it goes away. Thank you.

Jerry: Thank you and good luck on that job hunting. Next we have Jeanette – is it Brimmer?

Brimmer: Yes.

Jerry: And then Donna, you'll be back up if you're ready to go.

D. Albert: Yes. Do you want to go before me? You can.

Brimmer: Okay.

Jerry: Yeah, go ahead.

Brimmer: Hi, I'm Jeanette Brimmer. I'm with Earth Justice. As I stated previously I'm here on behalf of the Sierra Club Special Parks Preservation Association in the Northwest Environmental Defense Center.

I want to begin by noting that we will provide detailed written comments within the comment period which will include an – a report. We've engaged the services of Dr. Sabo to help us with that. I will note, as stated in an e-mail earlier today that constrained access to the documents, the fact that we're having trouble getting documents because of claimed mediation privileges and confidentiality has hampered that review and I hope that we can work toward getting access to those in a timely fashion so that we can, in fact, complete our review.

I'd like to echo Superintendent King that testified earlier that Washington is home to some pretty astounding resources. In fact I think our natural resources in many ways define this state. It's a hugely critical part of the region's economy from subsistence fishing to commercial fishing, tourism, agriculture and forestry, and I'm sure that the Department of Ecology doesn't need to be told that.

Mercury and nitrogen oxides emissions among others, global warming has been raised here tonight, CO2 emissions, are harming those industries, harming our resources, harming the industries that rely on them as well as public health, and TransAlta is the number one source of all of those harmful pollutants, and yet I have the feeling that we're not treating it like the number one source and not doing what we need to.

We are encouraging Washington to lead on these important issues, encouraging the governor to do so but we feel – we feel that this agreement and consent decree fail to demonstrate that leadership. They will simply perpetuate current haze conditions in particular and may do the same relative to mercury.

We also see that the State, the Department of Ecology appears to be tying its own hands in this agreement. We have a lot of concerns about some of the enforceability clause and some of the clauses with respect to promises about working with TransAlta in the future that's going to prevent ecology from stepping forward, protecting these resources and the health of its – of Washington's citizens and the economy.

So let me turn directly to some of the pollutants at issue. So we've got that BART and nitrogen oxides or NOx issue. As I said, TransAlta as a coal plant is the single largest source of these emissions in the state of Washington but here's a really important thing to keep in mind.

According to the National Park Service TransAlta is the single largest cumulative impact to class one areas – class one areas of course being National Parks and wilderness areas in the nation. Now Four Corners has the dubious distinction of being the largest impact to a single class one area, and that being the Grand Canyon National Park, but this, I would say that we should not be proud that TransAlta is in our back yard having this level of an effect.

As the Department of Ecology is very aware haze is a significant problem even at current emissions levels and current levels is what we believe – and I think that this will be born out in the experts report and our written comments – current levels are going to be maintained.

I also want to just make note that while haze is a significant problem a lot of people might say, "Oh geez, big deal, visibility," what would we do if we couldn't see Mt. Rainier? I think people would find that to be a big deal.

But nitrogen deposition is an emerging environmental problem. I'm increasingly seeing studies. I know the National Park Service has these concerns as does the Forest Service, that a lot of our most precious areas are actually having their ecosystems changed as a result of nitrogen deposition and that's a direct result of nitrogen oxide emissions and that's something that we cannot afford.

Particularly with the changes that are going to be wrought from global warming we need those resources. We need them for the adaptability of the species and others that are going to rely on those.

I also want to point out with respect to the BART issue, EPA has made abundantly clear years ago with respect to the whole '97-99 agreement, that the low announced burners in the current technology of the plant is not BART.

I also want to emphasize what Superintendent King pointed out that there was a failure to consult the Federal land managers with respect to that process, so that too would contribute to the legal response that that is note BART, and I want to point out that the emissions control systems at the facility right now do not meet EPA's presumptive BART limit.

I know that the State entered into this process because they felt they were perhaps vulnerable or they want to avoid litigation with TransAlta. If that's the best arguments TransAlta can come up with those are weak. I think you have the legal arguments to withstand that and I would like to see that leadership for the State.

The SCR technology is available and feasible. I think we've already heard that tonight. The only arguments that I have seen from TransAlta are monetary. They just don't want to spend the money and, in fact, I think that the analysis by our expert and apparently the analysis by the National Park Service and the Federal land managers will demonstrate that, perhaps, it is in fact cost effective and that perhaps TransAlta's numbers have been inflated with respect to the costs of the SCR technology.

Other states are imposing SCR and we'll include information on that. We're researching that in our written comments and certainly, I would think, our resources here in Washington deserve the level of protection that other states are affording there.

I would like to move then to mercury. I strongly, strongly disagree that this department cannot regulate mercury simply because the Federal government has not taken a stand. The States, in all instances, have independent authority and obligations to regulate air pollutants including mercury.

The states can always regulate to a stricter standard than the Federal government can and I would invite the State to take that seriously. You do not have to wait for the Federal government. Other states are not waiting for the Federal government.

States in the Midwest and the Northeast have moved forward. They are imposing, and in some instances, achieving 90 percent mercury reduction or better and they are doing it with this technology, activated carbon technology. It's simply a matter of how much of that technology you use, how much carbon you use, how you work the process. You can remove larger amounts of mercury than this agreement provides.

In fact, interestingly enough, TransAlta on their own website has indicated that they are achieving 70 percent mercury reduction and they applaud themselves for doing so, and yet they don't seem willing to do that here.

I would submit that perhaps, again, it is that they don't want to spend the money on the level of activated carbon injection necessary and that they do not want to forego the profits they make from selling their ash to the cement kilns in Seattle, a whole 'nother environmental problem, one that is fraught with environmental justice issues as well.

I think one of the most egregious – that's probably a little hyperbole. One of the most concerning components with respect to mercury is the voluntary nature and, it's not just that it's voluntary. We also put a money cap on it. They can only have to spend so much money and that, voluntarily.

And then it appears that ecology said, "You know, if you don't even abide by this agreement we won't enforce it, we won't enforce the consent decree, there's nothing we will do to you if you choose not to abide by this," meaning that you're not even going to assert contractual obligations that would normally arise from a settlement agreement. That actually makes me wonder why we're bothering with a consent decree in the first place.

I, again, really believe that a greater mercury reduction is doable. I think Washington's resources are worth it. I think the health of Washington's citizens are worth it, and I would urge the State to lead on that and take a much stronger stance with respect to mercury regulation here, and with that, I'll conclude my remarks and you can put that in writing. Thank you.

Jerry: Great. Thank you, very much. Donna, would you like to come back up?

D. Albert: My name is Donna Albert. I'm a Licensed Civil Engineer with a Master's Degree in Civil Engineering working for the State of Washington as an Energy Engineer. I am not representing my employer but here as an individual representing my grandchildren: Austin, Donovan, Terrance and Tristin, who will be in their 40's and 50's in 2050, very possibly with grandchildren of their own.

To dramatically reduce the greenhouse gas emissions due to our use of electricity in the Northwest we must stop burning coal. According to the Northwest Power Planning Counsel's sixth power plan, coal comprises only 13 percent of electric power capacity in the Northwest but is responsible for 85 to 90 percent of the carbon dioxide from the Northwest electricity sector.

In contrast coal is the major source of electric power in the United States as a whole. Why are we still burning coal in the Northwest? We have hydroelectricity waves, a mild climate west of the Cascades, plenty of great sunshine east of the Cascades. We have not accomplished all of the cost-effective energy conservation measures.

We are in the position to show that coal-free energy is possible now and essentially greenhouse gas emissions free electricity is possible in our future. We must do this. The UNEN Climate Science Compendium 2009 which is sort of an update from the IPCC report 2007, says that the actual warming since the IPCC's 2007 census report has exceeded all scenarios used in the 2007 report, including the business as usual scenario and appears to be accelerating.

The recent economic downturn slowed this but the trend is expected to continue upon recovery. Climate scientists are now warning that we need to act quickly to avoid catastrophic events and are now recommending more aggressive emissions reductions.

Sometimes they express this goal in terms of atmospheric concentrations of greenhouse gasses, 350 parts per million carbon dioxide. I believe that the State of Washington's goal of reducing emissions to 1990 levels by 2020 is no longer remotely in line with what we know about climate change today.

When my grandchildren are looking into the eyes of their own grandchildren in 2050 they will be living the consequences of our actions today. Arctic sea ice will be gone due to warming that is already in the pipeline due to the carbon dioxide accelerating the atmosphere.

The Maldives will be underwater, probably most of Bangladesh. The glaciers that feed rivers which people depend on for water in places like Pakistan and Chile will be gone. Hundreds of millions of people will be displaced or dead. We don't know how much agricultural land will be lost to flooding and drought.

Nations will be destabilized by conflict over shortages and refugees. We don't know what condition the oceans will be in by then but the possibilities frighten those who understand them now.

We don't know if methane stores in the permafrost and deep in the ocean will still be intact and we don't know how we would act if that happened.

The price of continuing to burn coal is too high. It is disingenuous to identify other pollutants from the TransAlta plant as dangerous and require mitigation while the most deadly pollutant of all continues to be ignored. We have no right to destroy the future of or grandchildren for convenience or narrowly-defined economics for pennies per kilowatt hour.

Other regions will find it much more challenging to close their coal plants than we will. The Pacific Northwest must lead the way. No more excuses. We must retire our coal plants now.

Jerry: Thank you. Next up we have Doug Howe.

D. Howe: Thank you. My name is Doug Howe. I'm with the Sierra Club and I have two general areas that I'd like to comment on, and the tremendous – the first is the tremendous disappointment we have about the public process.

When it came out in the press last March about the settlement agreement it was very clear that people were very concerned and there hadn't been adequate review. Then we had the climate legislation where there was a provision put in, a climate bill at the end of the season that never went through a public hearing, and I think it was in part because of that that that legislation failed for a lack of public process.

Then we have the – now the Governor has committed to a transparent process in her executive order in dealing with TransAlta and we are very hopeful that she delivers on that.

Then we had our Title 5 hearing of the Local Air Agency and we requested a public hearing on the Title 5 which is supposed to be the catch-all for all air pollutant issues but many issues were excluded in that permit and there was no public hearing in that Title 5 permit process.

Then we saw the settlement agreement and there was no opportunity to review that settlement agreement and, of course, there is gonna be a large public outcry when there was no opportunity to review and the provisions that we see on the agreement on the face of it appear week, but as Jeanette Brimmer mentioned, there has still been an issue about getting access to necessary documents to allow the public to do a full assessment. Again, that's a tarnish on the respect for public process.

And then when we had this process we had asked that we could have hearings in Seattle, Vancouver, even Olympia, to allow greater public process but again we were denied and even simple things like getting a phone in the room tonight so others could join in.

And when you look at the cataloging of where the public process has been snubbed, it is an extremely poor record and what we ask for is a large public process that's at the front end so that no settlement agreement or no negotiation gets too far down the track without meaningful public engagement. That's the first point to be made, a failure of public process.

The second major point to be made is that I believe it is extremely problematic to be dealing with the issues, the pollution issues associated with the TransAlta plant in isolation. Yes, you have Federal requirements to proceed with BART determinations. We understand that but that does not preclude ecology doing a more meaningful and all-inclusive process for the many liabilities that the plant has.

We know there are NOx liabilities and we know it's not just the haze but there could be an issue of nitrogen deposition that needs to be thoroughly reviewed. We need to know the impacts from mercury. We can't just have one hearing but we need to know what damage is being done from these mercury emissions.

Even if this agreement were to achieve the hoped-for 50 percent there is still huge amount of damage coming out for that remaining 50 percent. What is the public health risk for that remaining 50 percent if, in fact, that's what gets achieved?

And then we simply cannot separate it from the CO2 issues. The liability associated with CO2 is tremendous. Just under the Waxman-Markey alone if the estimate is $20.00 a ton and the plant puts out 10 million tons a year that's $200 million a year of carbon liability, and that carbon pricing as we talk about it under Waxman-Markey, that is going for reducing emissions. That does not reduce the fact of carbon damages which is in addition to carbon pricing as we know it which is only about for reducing emissions.

The rough estimates and the science on this, the economic science on monetizing climate damages is extremely difficult but some preliminary estimates from very esteemed economists like Sir Nicholas Stern, Chief Financial Officer or Advisor to Tony Blair, has tried to put a price tag on it and puts it at $80.00 a ton.

$80.00 a ton times 10 million tons a year from the TransAlta Coal Plant, $800 million a year in 2009 dollars. So then you want to add on potential violations that EPA is asking about about new source review, and then we want to look at the waste handling from SO2 scrubbers, and what about other hazardous air pollutants that were mentioned tonight, potential existing and ongoing liabilities to the mine waste, and what about the management of coal combustion waste.

And then we still don't get at the upstream damages happening in the Powder River basin from the coal being taken out of the ground in Montana and Wyoming. What we request is that you do public forums and bring all these environmental liabilities to the forefront, and when you do that, you will see a very large public outcry calling for the transition of that plant off of coal to cleaner sources of energy. We urge you to take that path. Thank you.

Jerry: Thank you. Thank you, very much. That exhausts the initial list of those of you who identified that you wanted to testify and I'll now ask if anyone has either changed their mind or perhaps didn't realize that you could have, should have marked that little 'X' in the box which would have allowed me to call you up here. Is there anyone now that would like to come up?

And this testimony, that would be great. While you're contemplating that prospect I'll remind you that the comment period runs through November 9 of this year, 2009, and if you picked up this focus sheet in the back, and if you haven't thrown it away or turned it into a paper airplane it shows the various ways in which you can provide that comment to us.

There's – there is a snail mail address as well as an AQComments@Ecology.wa.gov address that you can do this, make your comments on-line. So you can, regular mail or over the Internet. No one else? Seeing that there's no one else that wants to testify, let the record show that it is now 7:57 p.m. and this hearing is now closed. Thank you, very much.

[End of Audio]

SETTLEMENT AGREEMENT BETWEEN STATE OF WASHINGTON DEPARTMENT OF ECOLOGY AND TRANSALTA CENTRALIA GENERATION LLC OF AIR QUALITY MATTERS

This Settlement Agreement is entered into by the State of Washington Department of Ecology ("Ecology") and TransAlta Centralia Generation LLC ("TransAlta").. Ecology and TransAlta may be referred to collectively as "the Parties."

I. STATEMENT OF PURPOSE

This Settlement Agreement addresses matters related to: (a) questions of fact and law surrounding the requirement of the Clean Air Act, 42 U.S.C. §§7401 to 7671q, the Washington Clean Air Act, RCW 70.94 *et seq.* ("WCAA"), and regulations adopted pursuant thereto to install "Best Available Retrofit Technology" ("BART") to reduce emissions at TransAlta's coal-fired power plant located near Centralia, Washington ("Centralia Plant"), and (b) TransAlta's early reduction of mercury emissions at the Centralia Plant prior to the adoption of federal or state requirements. These matters have been settled by this Settlement Agreement between the Parties without trial or adjudication of any issue of fact or law.

The mutual objectives of the Parties in entering into this Settlement Agreement are:

1. To resolve the dispute between the Parties of whether the Centralia Plant previously met BART requirements of the U.S. Environmental Protection Agency ("EPA") and Ecology or whether it must meet the current regulations and guidelines for BART as adopted by EPA in 2005.

2. To set an emission limit for nitrogen oxides ("NOx") lower than BART which, if met, removes the Centralia Plant from consideration for additional NOx reductions during Ecology's adoption of the 2018 Regional Haze State Implementation Plan.

3. To set forth the schedule and general plan for TransAlta's voluntary testing and installing of early mercury reduction controls at the Centralia Plant and Ecology's commitment to support the plan .

4. To expeditiously resolve these matters without unilateral enforcement or litigation expenditure by the Parties.

II. RELEVANT BACKGROUND

Procedural Background

1. On October 10, 2007, TransAlta sent a letter to Ecology requesting the mediation of disputes involving air quality issues at the Centralia Power Plant (Plant). Ecology agreed to mediate, and the Parties commenced the mediation in October, 2007. Representatives of the Governor's Office and the Attorney General's Office participated in the mediation process.

2. The Honorable Daniel J. Berschauer served as the mediator. Several mediation sessions took place from October 2007 through November 2008. At the conclusion of the process, the Parties had reached an agreement on the key issues involved in the mediation, the details of which are set forth in this Agreement

Clean Air Act BART Requirements

3. Section 169A of the federal Clean Air Act (42 U.S.C. § 7491, adopted in 1977) requires the states to remedy visibility impairment at national parks and wilderness areas ("Class 1 Areas") due to man-made air pollution. The states must submit State Implementation Plans ("SIPs") that contain emission limits, schedules of compliance, and other measures necessary to make "reasonable progress" toward meeting the national visibility goal. 42 U.S.C. § 7491(b)(2).

4. The SIP requirements include BART for major stationary sources that "may reasonably be anticipated to cause or contribute to any impairment or visibility" in a Class 1 Area. The "BART-eligible sources" are those which:. (a) have the potential to emit 250 tons per year or more of a visibility-impairing air pollutant, e.g., SO_2, NOx, and PM10, (b) commenced operation between August 7, 1962, and August 7, 1977, and (c) fit within specified categories, e.g., "fossil-fuel fired steam electric plants of more than 250 million British thermal units per hour heat input." The Centralia Plant is a "BART-eligible source."

5. "BART" means:

 an emission limitation based on the degree of reduction achievable through the application of the best system of continuous emission reduction for each pollutant which is emitted by an existing stationary facility. The emission limitation must be established, on a case-by-case basis, taking into consideration the technology available, the costs of compliance, the energy and nonair quality environmental impacts of compliance, any pollution control equipment in use or in existence at the source, the remaining useful life of the source, and the degree of improvement in visibility which may reasonably be anticipated to result from the use of such technology.

 40 CFR 51.301.

6. In 1980, EPA adopted regulations to implement Section 169A. The 1980 regulations require each state to apply BART to each BART-eligible source "which may reasonably be anticipated to cause or contribute to impairment of visibility in any mandatory Class I Federal area where the impairment in the mandatory Class I Federal area is reasonably attributable to that existing stationary facility." 40 CFR 51.302(c)(4). EPA also issued BART Guidelines in connection with the Phase 1 visibility program to provide guidance to the states in setting BART emission limits for coal-fired power plants. See 40 CFR 51.302(c)(4)(III).

7. In 2005, EPA revised its regional haze regulations and issued new BART Guidelines for power plants. See 40 CFR Part 51, App. Y. The 2005 BART Guidelines are based on newer technologies that have become available since the original 1980

BART Guidelines. The 2005 Guidelines are the guidelines that are currently in effect.

8. Ecology and the Southwest Clean Air Agency ('SWCAA") implement BART requirements through their regulations. WAC 173-400-151; SWCAA 400-151.

BART Compliance

9. In 1996 the former owners of the Centralia Plant, Ecology, the U.S. Environmental Protection Agency, the National Park Service, the U.S. Forest Service and SWCAA implemented a collaborative process to develop BART emission limits. The collaborative process concluded with an agreement by all participants on SO_2 and NOx emission limits. The emission limits were incorporated in a 1997 RACT order issued by SWCAA.

10. Between 2000 and 2002 the Centralia Plant installed the emission controls to comply with the RACT order. SO_2 "scrubbers" were installed at a capital cost of $190 million with an annual O&M cost of $23 million. They reduce emissions by 80,000 tpy (about 90%). The low NOx burners (Level III) were installed at a capital cost of $14 million. They reduce emissions by an estimated 7000 tpy (about 30%) compared with the baseline emission rate during the 1990s.

11. In 2006 and 2007, Ecology commenced implementation of EPA's 2005 BART guidelines in Washington. In June 2007, TransAlta submitted a "white paper" to Ecology which took the position that the 2005 BART requirements were not applicable to the Centralia Plant. This position was premised on the 1996 collaborative process and the RACT order.

12. Ecology sent a letter to TransAlta dated June 28, 2007, informing it of Ecology's plan to "issue regulatory orders in July 2007 requesting submittal of a BART analysis." On the same day, Ecology sent an e-mail to TransAlta stating that it would not issue the regulatory order to TransAlta until it had completed its review of the white paper's analysis.

13. Ecology and TransAlta were unable to agree on the legal question of whether the 2005 BART regulations apply to the Centralia Plant. However, the parties agreed to resolve this issue through this Settlement Agreement rather than litigate applicability of BART to the Plant.

14. In reaching this Settlement Agreement on BART limits for the Centralia Plant, Ecology applied the criteria of the 2005 EPA BART Guidelines, including: consideration of emissions achievable with current technology and coal-type; the limited visibility improvements from BART limits compared with historical, baseline emissions; the total and incremental cost of technology to achieve additional reductions; BART emission limits set for other power plants; the energy and non-air quality environmental impacts of further reductions; and other relevant regulatory considerations.

History of EPA Clean Air Mercury Rule and Ecology's Implementation

15. EPA adopted the Clean Air Mercury Rule, 40 CFR Part 60, Subpart GGGG ("CAMR") on May 15, 2005. The CAMR allocated allowances of mercury emissions to each state and established a nationwide mercury trading system. The CAMR granted the states discretion to allocate mercury allowances.

16. Ecology initiated a stakeholder process in 2006 to develop a mercury rule for the State of Washington that would meet the CAMR requirements. Through the stakeholder process, Ecology developed a proposed rule to be published for comment in early 2008.

17. On February 8, 2008, the United States Court of Appeals for the District of Columbia held in the case of New Jersey v. EPA, No. 05-1097, that the CAMR was invalid. As a result of this decision, Ecology terminated the process to adopt a rule to implement CAMR. Ecology considered its other options to address mercury emissions, including the possibility of promulgating a rule under state law only.

18. Despite the invalidation of the CAMR rule, TransAlta remained committed to taking action to reduce its mercury emissions. Thus, the Parties continued in the mediation process to discuss options for reducing mercury emissions and reached the agreement described herein.

III. EMISSION TERMS AND CONDITIONS

A. BART Requirements for NOx

1. BART Emission Limits

   a. TransAlta agrees to decrease its emission limit for NOx to 0.24 lb/million Btu, which represents a 20% reduction from the current limit. TransAlta shall not cause or allow the 30-day rolling average of NOx emissions to exceed 0.24 lb/million Btu, both units averaged together, for days (i.e., midnight to midnight) when a unit's generating load is 360 MW gross or greater. If only one unit operates during a particular month, the rolling average emissions from that unit is the average of both units.

   b. Continuous emission monitoring ("CEM") for BART compliance will be performed pursuant to Condition M9 of the Centralia Plant's Air Operating Permit, SW98-8-R3 (issued September 16, 2009) ("Air Operating Permit") and corresponding monitoring conditions in future renewals of the Air Operating Permit.

   c. For a unit with less than 12 continuous hours of missing CEM data, the hourly emission rate will be based on the higher of (a) the average of emissions during the hour before and hour after the missing data or (b) the average of emissions from the previous 720 operating hours of quality-assured data.

d. For a unit with 12 or more continuous hours of missing CEM data, the hourly emission rate will be based on the 90th percentile of the previous 720 operating hours of quality-assured data.

e. The BART emission limits for NOx will become effective October 1, 2009, and the first compliance date will be midnight of October 30, 2009. This compliance date allows a period of time following the installation of new equipment in Centralia Plant Unit 1 in June 2009 for testing and "tuning" to promote operations with low NOx emissions.

f. Ecology will issue a Regulatory Order (RO) pursuant to WAC 173-400-151 incorporating the BART requirements of this Settlement Agreement.

g. Consistent with the Washington Clean Air Act and its implementing regulations, the SWCAA will be responsible for enforcement of the RO.

h. Ecology will incorporate the BART RO into the Regional Haze SIP revision planned for submission to EPA in 2010.

i. SWCAA may incorporate the requirements of the BART RO as a state-only condition in the Air Operating Permit during its next renewal. Following EPA's approval of the Regional Haze SIP and the BART RO, SWCAA may modify the Air Operating Permit to incorporate the requirements of the BART RO as federally-enforceable conditions.

j. Consistent with 40 CFR 51.302(c)(4)(III)(B) and WAC 173-400-151(4), Ecology agrees not to reanalyze BART for the Centralia Plant in the future or to impose BART limits in the future more stringent than set under this Settlement Agreement.

Continuous Improvement/Regional Haze Goal for NOx

2. Ecology agrees not to require NOx emission reductions by the Centralia Plant in addition to the BART limits set under this Settlement Agreement before submission of the comprehensive periodic revision of the Regional Haze SIP due to EPA by July 31, 2018 under 40 CFR 51.308(f) ("2018 Regional Haze SIP"). If TransAlta requests SWCAA to issue a regulatory order limiting the Centralia Plant's potential to emit NOx to a limit of 0.22 lb/million Btu on a 30-day rolling average to be effective on or before January 1, 2017, Ecology agrees not to submit in its 2018 Regional Haze SIP additional NOx emission reductions by the Centralia Plant

B. Early Mercury Emission (Hg) Reductions

1. TransAlta agrees to implement halogenated sorbent injection technology or equally effective alternative technology to reduce mercury emissions from the two boiler units at the Centralia Plant. The major components of the sorbent injection technology are anticipated to include a silo to store the sorbent, a flue gas sorbent injector system, and blower/feeder trains to deliver the sorbent to the injectors. In its sole discretion, TransAlta will select the vendor and specific technology and may select viable, alternative technology.

2. TransAlta's total expenditure on development and implementation of the selected sorbent injection or alternative technology, including capital and test costs, from 2009 through 2011 is projected to be in the range from $10 to $14 million. During the Compliance Phase beginning in 2012, TransAlta, at its option, will either: (1) demonstrate an annual (calendar year) removal efficiency of 50 percent of the mercury content of the coal fired in the boilers, or (2). expend $3 million per year on operation and maintenance costs including, but not limited to, routine operations and maintenance, sorbent costs, byproduct disposal costs associated with mercury capture, and monitoring costs.

3. Beginning in January 2009, TransAlta agrees to monitor mercury emissions using a continuous emission monitoring system. On or before January 2012, the monitoring will comply with 40 CFR Parts 60 and 75 (as in effect for the CAMR).

4. <u>Development Phase</u>

   a. During 2009, TransAlta will conduct a full scale test on one unit during which control technologies and sorbents will be tested.
   b. During 2010, TransAlta, at its option, may conduct a long term test with alternative sorbents and operational conditions.
   c. During 2010 and 2011, TransAlta may perform tests and evaluations, as appropriate, and will perform equipment design, procurement and installation.
   d. TransAlta will submit quarterly status reports beginning the first quarter in 2009. The reports will be submitted within 30 days following the end of each quarter and will include a summary of hourly, daily and monthly mercury monitoring data for the period.
   e. Tests affecting emissions will require SWCAA construction permits implementing RCW 70.94.153 but will not be subject to new source review, RACT, or BACT requirements. The permits will be based on the attached sample permit.

5. <u>Compliance Phase</u>

   a. TransAlta will operate the sorbent injection or alternative technology on a continuous basis commencing January 1, 2012.
   b. Construction of the sorbent injection or alternative technology will require a SWCAA construction permit but will not be subject to new source review. Said permit will be based on the attached sample permit.
   c. TransAlta, in its sole discretion, will decide on the method for determining mercury removal efficiency after considering comments by Ecology and SWCAA.

6. TransAlta will submit annual reports to Ecology documenting compliance with cost or mercury removal efficiency requirements beginning March 31, 2013, for the year 2012.

7. TransAlta or its technology vendor may certify that information about the sorbent injection or alternative technology and pilot test results submitted to Ecology is proprietary and confidential under RCW 70.94.205 of the Clean Air Act. Information that is certified as confidential by TransAlta or its vendors is presumed to meet the requirements for confidentiality under RCW 70.94.205 and is therefore presumptively exempt from public disclosure under the Washington Public Records Act and Clean Air Act. However, if Ecology determines that any records certified as confidential are

not exempt from public disclosure, Ecology shall notify TransAlta at least 72 hours prior to release of the records to a member of the public. TransAlta may seek injunctive or other relief to prohibit release of the records. The parties acknowledge that reported emission data is public information as provided by the federal and state Clean Air Acts..

8. As long as TransAlta is in compliance with the mercury reduction provisions of this Agreement, Ecology agrees not to adopt mercury emission reduction regulations applicable to the Centralia Plant until EPA adopts a federal rule. The Early Mercury Reduction provisions of this Settlement Agreement will become null and void upon the effective date of a federal rule or of a state rule adopted to comply with a federal rule applicable to the Centralia Plant's mercury emissions.

9. Ecology agrees to support future proposals and measures by TransAlta to reduce costs of managing, recycling and disposing of ash and other byproducts that have been contaminated through mercury reduction technologies, which may include beneficial use approvals and decreases in the bottom ash to fly ash ratio for disposal in TransAlta's limited purpose landfill.

10. Ecology agrees to support banking credits for TransAlta's early mercury reductions in future federal mercury laws or regulations.

11. In the event that TransAlta does not comply with the early mercury reduction provisions of this Settlement Agreement, Ecology's sole remedy is to terminate those provisions of the agreement.

IV. GENERAL TERMS AND CONDITIONS

1. The Settlement Agreement will be enforceable as a contract between the Parties subject to the election of remedy provision indentified in paragraph III(B)(11).

2. If Ecology fails to adopt the Settlement Agreement's BART provisions in a Regulatory Order, if EPA disapproves the BART limits in the 2010 Regional Haze SIP revision or other proceeding, or if a citizens' suit or other third party lawsuit successfully challenges the BART provisions in the Regulatory Order or a decision by EPA approving the BART provisions in a SIP revision, TransAlta, in its sole discretion, may terminate the Settlement Agreement.

3. TransAlta reserves the right to appeal and litigate actions or decisions by Ecology, EPA, or third parties that are inconsistent with this Settlement Agreement and may assert any grounds or affirmative defense as a basis for such appeal or litigation, including, without limitation, the position that the Centralia Plant is exempt from BART for the reasons explained in TransAlta, "White Paper: Centralia Power Plant 1997 BART Determination Exempts Plant from BART Reanalysis" (June 2007)."

4. Ecology may terminate the provisions of the Settlement Agreement related to Early Mercury Reductions in the event that TransAlta fails to substantially comply with the Development Phase or Compliance Phase requirements. Either Party may terminate the provisions of the Settlement Agreement related to Early Mercury Reductions in the event that a change in state or federal law requires Ecology to take actions inconsistent with the Early Mercury Reductions of this Settlement Agreement.

5. The Parties acknowledge that the terms of the Settlement Agreement may be subject to modification as required by future federal or state legislation. Either Party may terminate the Settlement Agreement in the event that future federal or state legislation subjects the Settlement Agreement to a significant modification. Termination of the Settlement Agreement under paragraph 3 or 4 of this section must be made in writing and delivered to the opposing party's representative.

6. The Parties agree not to challenge the terms and conditions of this Settlement Agreement in any proceeding to enforce this Settlement Agreement before any state administrative body or judicial forum.

7. The Relevant Background statements contained in Section II of this Settlement Agreement are provided as context for the Agreement. Neither party admits nor denies the factual or legal determinations contained in the Relevant Background statements. Any action undertaken by TransAlta pursuant to this Settlement Agreement and any statement, term or provision of this Settlement Agreement agreed to by TransAlta shall not constitute an admission of liability by TransAlta with respect to its operations, or conditions at the Centralia Plant. Both parties expressly reserve, and shall be accorded, the right to challenge any and all Relevant Background statements that are described in this Settlement Agreement in any further proceeding that may take place outside of the confines of this Settlement Agreement and expressly reserve all rights and defenses they have with respect to it or otherwise.

8. This Settlement Agreement was negotiated, mutually drafted and executed by the Parties in good faith. Neither the execution of this Settlement Agreement nor any action taken hereunder, is an admission of any fact, liability or wrongdoing of any kind regarding any matters addressed herein. Accordingly, with the exception of actions to enforce this Settlement Agreement, this Settlement Agreement shall not be admissible in any judicial or administrative proceeding for use against any party over the objection of that party.

9. Nothing in this Settlement Agreement shall be construed to create any rights in, or grant any cause of action to, any person not a party to this Settlement Agreement.

10. This Settlement Agreement constitutes the entire agreement by the Parties and may be modified only upon mutual written agreement of the Parties. The Parties agree that Ecology may extend any deadlines set forth herein, and upon agreement of such extension by the Parties, such extension shall constitute a modification to this Settlement Agreement.

11. This Settlement Agreement applies to and is binding upon the Parties, their agents, employees, successors in interest, and assigns.

VIII. NOTICES

Unless otherwise specified, any report, notice, or other communication required under this Settlement Agreement shall be sent to:

For Ecology:

Stuart Clark, Air Quality Program Manager
Washington Department of Ecology
PO Box 47600
Olympia, WA 98504

For TransAlta:

Richard DeBolt
USA External Relations
913 Big Hanaford Road
Centralia, WA 98531

Richard L. Griffith
Richard L. Griffith, LLC
1580 Lincoln St., Suite 700
Denver, CO 80203

IX. SIGNATORIES

The Signatories to this Settlement Agreement represent that they have authority to bind their respective parties.

WHEREFORE, Ecology and TransAlta hereby enter into this Settlement Agreement effective as of the date executed by the Director of Ecology.

FOR TRANSALTA CENTRALIA GENERATION LLC

By: [signature]
Lou Florence, President
Date: 5/19/10

FOR THE STATE OF WASHINGTON DEPARTMENT OF ECOLOGY

By: [signature]
Ted Sturdevant, Director
Date: 5/25/10

CH2M HILL

9193 South Jamaica
Street

Englewood, CO
80112-5946

Tel 303.771.0900

Fax 720.286.9250

March 11, 2010

Mr. Richard L. Griffith, LLC
1580 Lincoln Street, Suite 700
Denver, CO 80203

Subject: Centralia BART Control Technology Analysis
Partial Response to Department of Ecology Questions

Dear Mr. Griffith:

Regarding the questions presented by the Washington Department of Ecology for the Centralia BART analysis, this letter provides responses to Questions 1 and 3. Also attached are five sets of the dimensioned general arrangement sketches requested in Question 1.

CH2M HILL continues to work on responses to remaining Ecology questions, and will forward responses when they are completed. Please contact us if you have any questions.

Sincerely,

CH2M HILL

Robert L Pearson

Robert Pearson, Ph.D.
Vice President

Attachments:

CENTRALIA BART
RESPONSES TO ECOLOGY QUESTIONS

Question 1:

To help answer questions about the 'lack of space' to install SCR, please provide scale drawings of the plant site and specific process areas, including plan and profile drawings of the boilers, the ductwork to and between the Koppers and Lodge-Cottrell ESPs, the duct work to the set scrubbers and the wet scrubbers and the new stack. The drawings need to indicate dimensions and distances, not the general arrangement of components. The drawings can cover multiple pages, must contain readable dimensions, and can be in a CAD interchange format file or equivalently detailed PDF format file instead of paper.

Response:

A. The following drawings are attached in response to the question from the Washington Department of Ecology:

   Plan and elevation general arrangement drawings from the Centralia BART report revised June 2008 depicting SCR equipment layouts, have been revised and presented to include dimensions. CH2M HILL developed sketches with proportional probable dimensions, and 11" by 17"sketches are included as an attachment.

B. As described within the BART report, the Centralia site conditions have the potential of significantly impacting the cost estimates for all emissions control options. In general, any site condition which restricts construction activities will likely increase overall project costs. These site conditions may include space restrictions inhibiting material and equipment installation, access limitations which limit the free movement and placement of construction equipment, interferences which may require pre-construction demolition or design change considerations, operational constraints which may impact construction approach and schedule, and construction staging issues such as laydown area and employee parking availability.

   Specifically for the Centralia plant, many of these site conditions are projected to significantly contribute to increased project costs for any construction activities. In large part due to previous environmental retrofit installations at Centralia, the available space for new equipment installation at the Centralia plant site is very limited. This limitation resulted in the consideration of locating a potential SCR installation over existing electrostatic precipitators, instead of being located closer to the boiler in order to minimize cost. Restricted site area may also impact costs for longer duct work runs and remotely located ancillary equipment.

Question 3:

Ecology has requested details of the SCR cost analysis produced by CH2M-Hill, specifically the analysis contained in the July, 2008 analysis. Specific issues with the cost analysis:

- *Explanation of all cost elements in the CH2M [sic] cost estimating spreadsheet, including discussion of differences on specific cost elements from the EPA Control Cost Manual defaults, especially the cost items not explicitly included in the EPA Control Cost Manual.*

  The summary table below compares the specific cost elements of the CH2M HILL SCR capital cost estimate with the default values from the EPA Air Pollution Control Cost Manual. Table A is intended as a response to the Ecology request.

  The cost estimating equations in Section 4.2, Chapter 2 "Selective Catalytic Reduction" of the EPA Air Pollution Control Cost Manual are based on equations developed by The Cadmus Group, Bechtel Power and SAIC in 1998 and follow the costing methodology of EPRI. CH2M HILL used alternative estimating methodologies which have extensively been utilized to develop budgetary cost estimates for utility power and air pollution control projects.

  The EPA Cost Manual methodology is generally applicable for new or existing sources, and allows inclusion of unique site-specific retrofit or lost generation costs. It should be noted that at a "study" level estimate of +/- 30% accuracy, the Manual states that "a retrofit factor of as much as 50 percent can be justified". Therefore, it is difficult to make a direct comparison of all of the cost elements, since the two methodologies breakdown costs differently.

  Because the EPA Cost Manual contains default values which are provided for a range of general applications, CH2M HILL considers the estimating methodology utilized for the Centralia BART analysis to be more accurate since specific site information and conditions were considered. In addition, current vendor cost information was utilized in developing the estimates.

TABLE A
Economic Analysis Summary for Both Units 1 and 2
CPP

Parameter	SCR		
NO_x Emission Control System	SCR		
SO_2 Emission Control System	Forced Oxidation Limestone Scrubber		
PM Emission Control System	Dual ESPs		
CAPITAL COST COMPONENT	**Cost**	**CH2M HILL Basis**	**EPA Control Cost Manual Basis**
Major Materials Design and Supply ($)	277,685,000	CH2M HILL factored estimate	EPA control cost manual
Eng, Startup, & Indirect ($)	57,500,000	CH2M HILL factored estimate	20% of total direct capital costs
Total Indirect Installation Costs (TIIC)	**335,185,000**		
Contingency ($)	50,277,750	15% of total indirect installation costs	15% of total indirect installation costs
Sales Tax ($)	26,814,800	8% of total indirect installation costs	Included in total direct capital costs
Plant Cost (PC)	**412,277,550**		
Margin ($)	41,227,755	10% of plant cost	No margin
Total Plant Cost (TPC)	**453,505,305**		**Includes 2% of total plant cost, AFUDC and cost to store 29 wt% aqueous ammonia for 14 days**
Owner's Costs ($)	45,350,531	10% of total plant cost	No owners costs
Allows for funds during construction (AFUDC) ($)	54,420,637	12% of total plant cost	No AFUCD
Lost Generation ($)	27,014,400	Calculated at $20/MW-hr and 42 days	
TOTAL INSTALLED CAPITAL COST ($)	**580,290,872**		
FIRST YEAR O&M COST ($)			
Operating Labor ($)	351,250	CH2M HILL estimate	Assumed none required for SCR
Maintenance Material ($)	702,500	CH2M HILL estimate	Combined with maintenance labor, 1.5 % of total capital cost
Maintenance Labor ($)	351,250	CH2M HILL estimate	
Administrative Labor ($)	0		
TOTAL FIXED O&M COST	**1,405,000**		
Reagent Cost	1,783,475	Anhydrous ammonia at $0.20/lb	Anhydrous ammonia at $0.058/lb
SCR Catalyst	2,107,500	Catalyst cost estimated at $3000/m^3	Catalyst cost at $85/ft^3
Electric Power Cost	2,403,603	Power cost estimated at $50/MW-hr	Power cost at $0.05/kW-hr, 1795 kW
TOTAL VARIABLE O&M COST	**6,294,577**		
TOTAL FIRST YEAR O&M COST	**7,699,577**		
FIRST YEAR DEBT SERVICE ($)	63,712,819	Calculated using 7% annual interest rate for 15 years	Calculated using 7% annual interest rate for 15 years
TOTAL FIRST YEAR COST ($)	**71,412,396**		
Power Consumption (MW)	**7.03**		
Annual Power Usage (kW-Hr/Yr)	**48.1**		
CONTROL COST ($/Ton Removed)			
NO_x Removal Rate (%)	**72.0%**		
NO_x Removed (Tons/Yr)	**7,855**		
First Year Average Control Cost ($/Ton NO_x Rem.)	**9,091**		

- *Basis of 16% multiplier in the calculations*

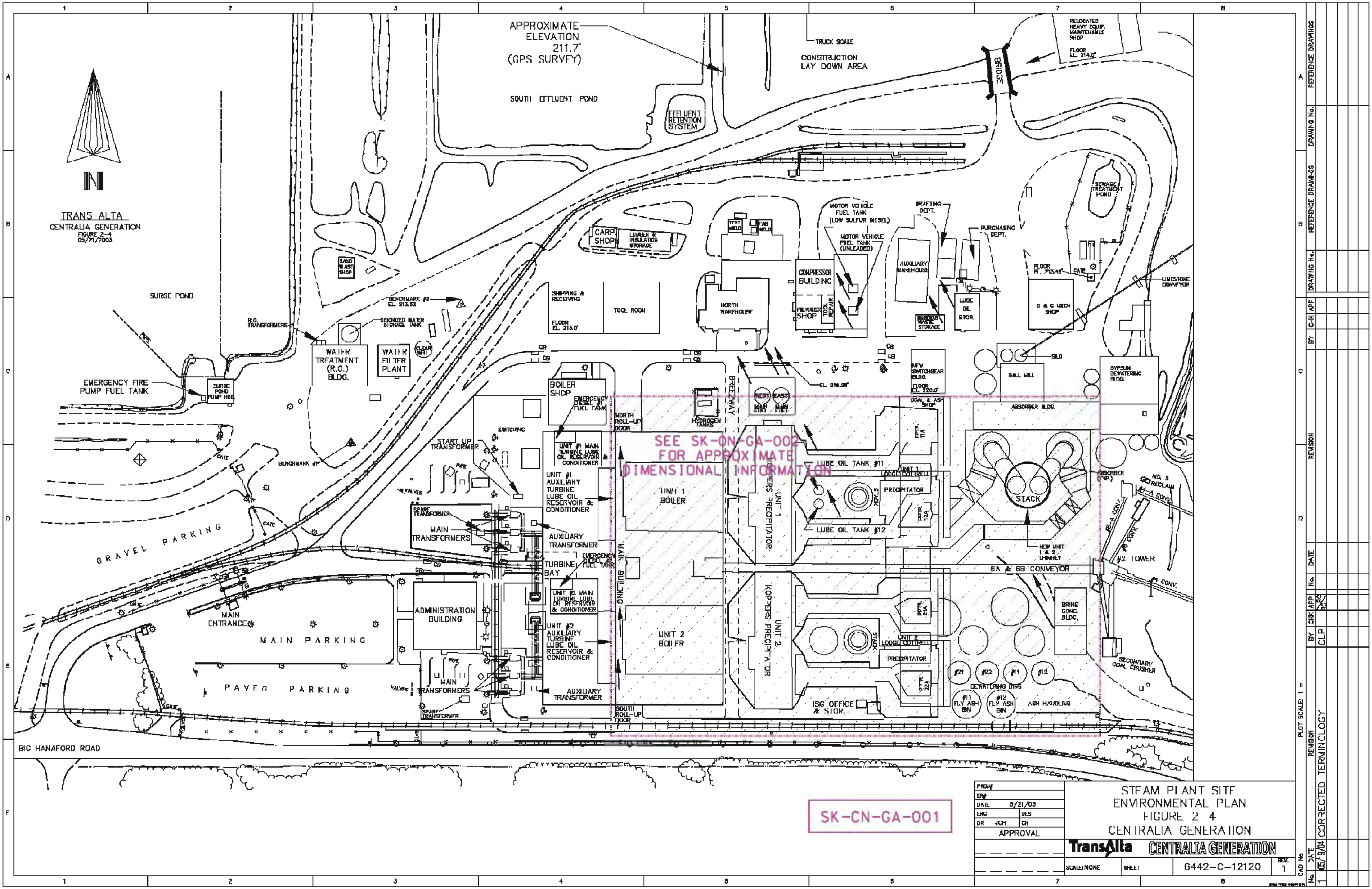
  We assume that Ecology is referring to the 15% Project Contingency in the SCR cost estimate. When developing a cost estimate, there is always an element of uncertainty since costs are based upon several assumptions and variables. Contingency provides an amount added to an estimate, which covers project uncertainties and added costs which experience dictates will likely occur. The magnitude of the contingency used in the CH2M HILL cost estimate is typical of contingency utilized in similar budgetary estimates, and matches the default 15% Project Contingency shown in Table 2.5 "Capital Cost Factors for an SCR Application" on page 2-44 of Section 4.2, Chapter 2 of the EPA Air Pollution Control Cost Manual, Sixth Edition.

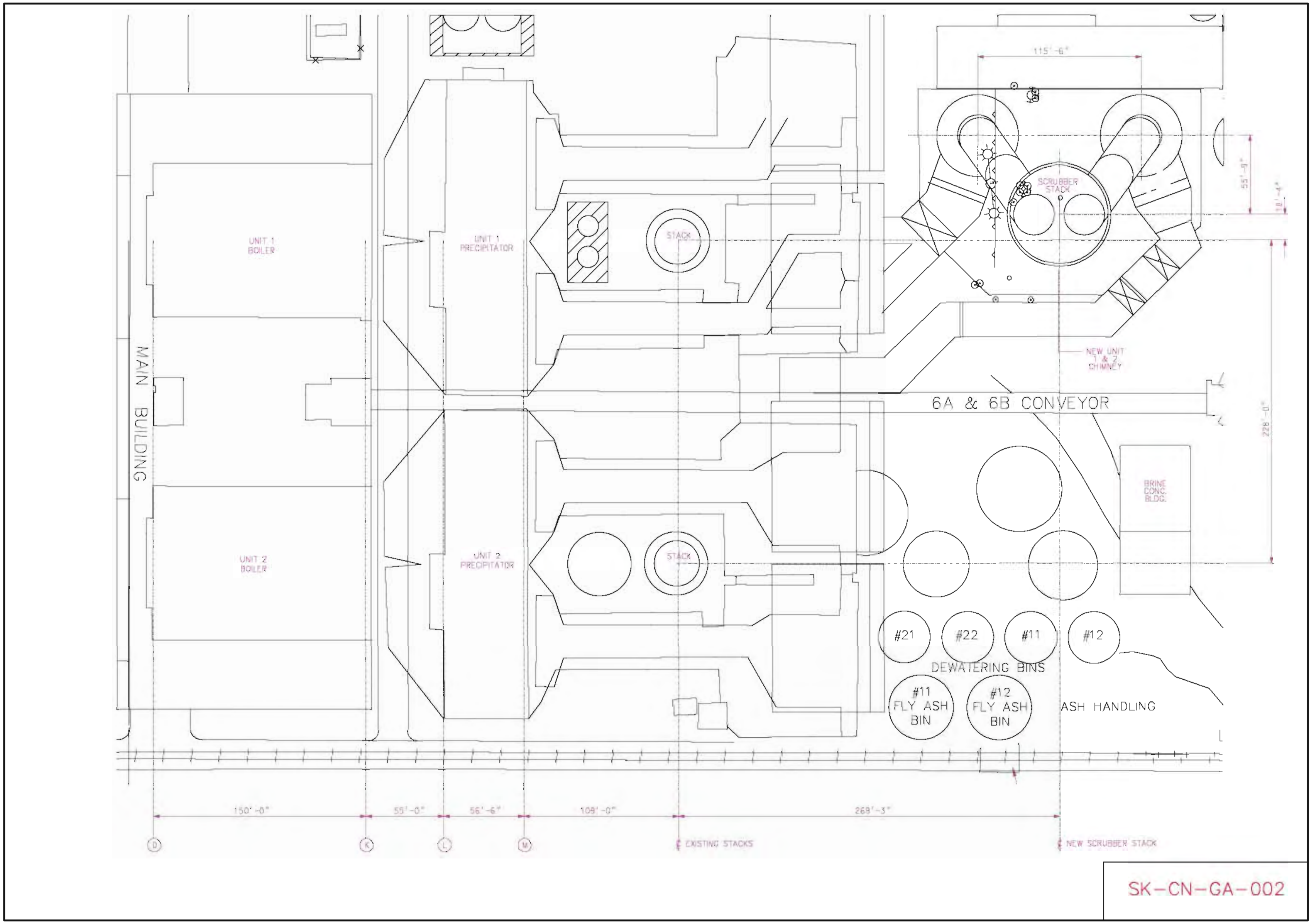
- *Sources of 'vender quotes' referenced in the CH2M HILL documents*

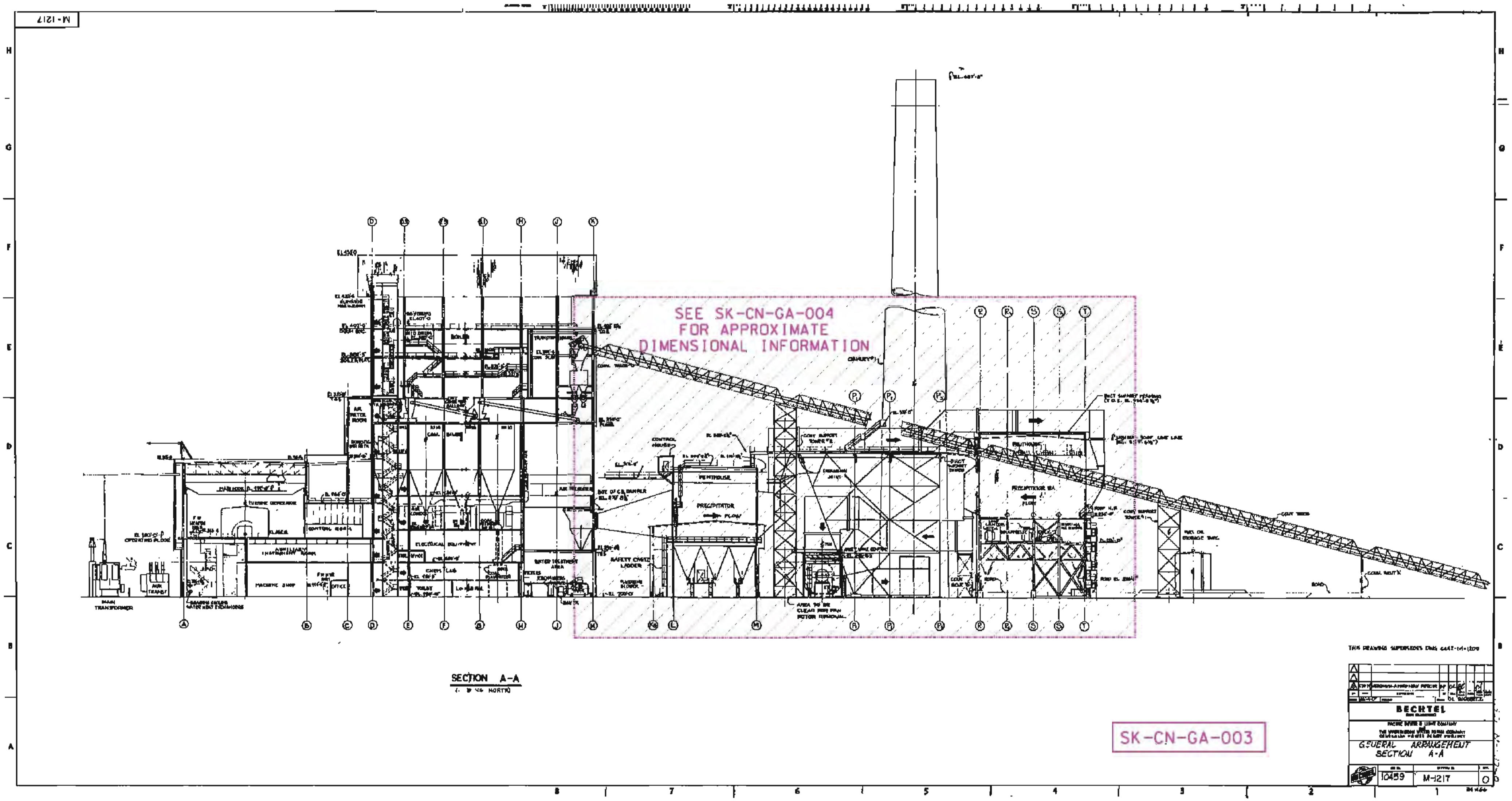
  The cost estimates were developed as "budgetary estimates", therefore CH2M HILL did not use vendor quotes for the SCR cost estimate. A factored approach was utilized for the determining the SCR capital cost which utilized in-house cost information, and consists of compilation of vendor and previous project information.

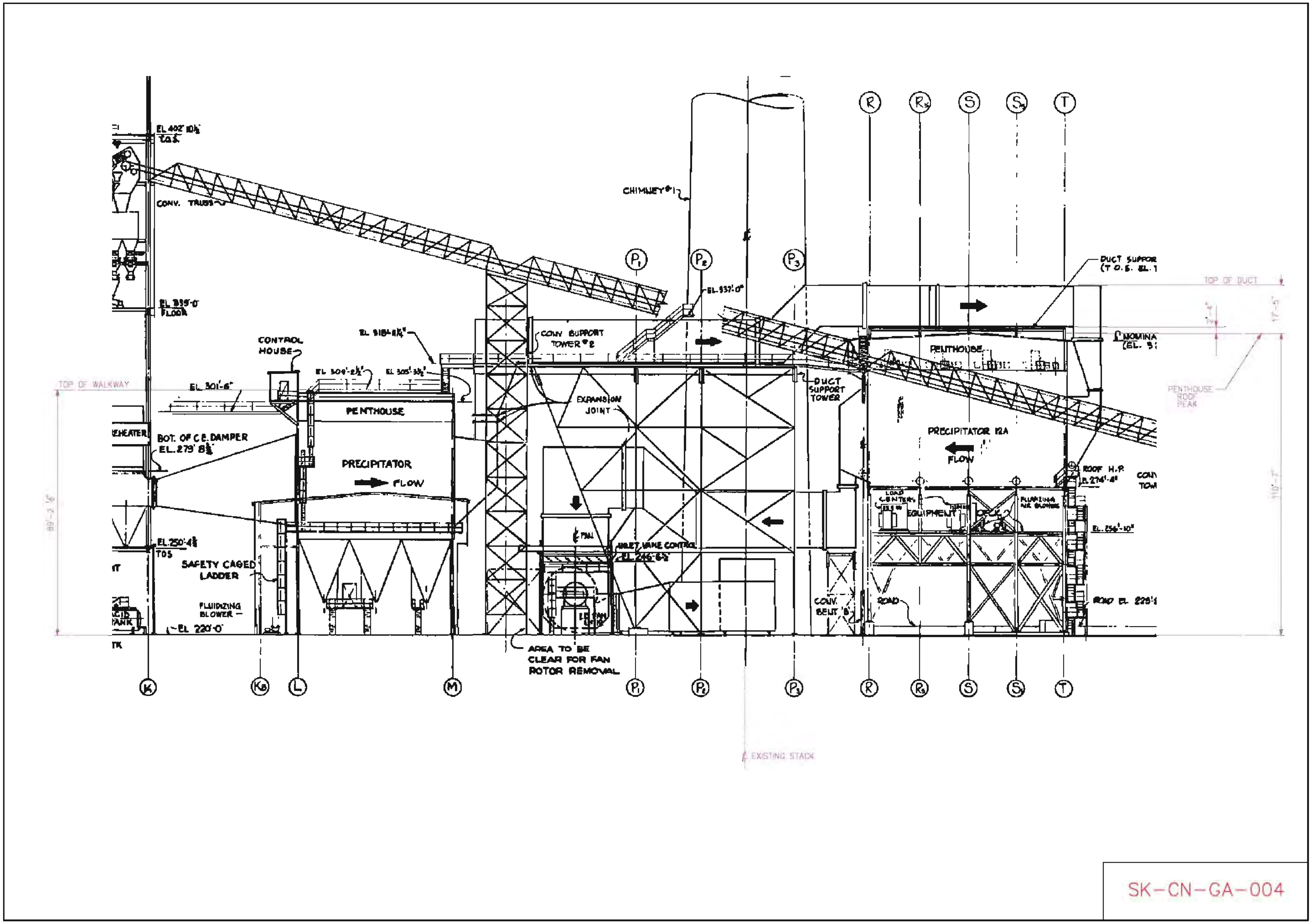
- *Whether any structural analyses were done in support of SCR cost analysis and the results of the analyses*

  Detailed structural analyses were not performed for the SCR cost analysis. However, a cursory review of structural requirements was completed to locate the SCR reactor and ductwork. CH2M HILL assumed a separate structure for the SCR reactor and ductwork because the existing ESP structure was not designed for these additional loads.


APPROXIMATE ELEVATION 211.7' (GPS SURVEY)
TRUCK SCALE
CONSTRUCTION LAY DOWN AREA
BRIDGE
RELOCATED HEAVY EQUIP. MAINTENANCE SHOP
SOUTH EFFLUENT POND
EFFLUENT RETENTION SYSTEM
N
TRANS ALTA
CENTRALIA GENERATION
SURGE POND
R.O. TRANSFORMERS
WATER TREATMENT (R.O.) BLDG.
WATER FILTER PLANT
EMERGENCY FIRE PUMP FUEL TANK
CARP SHOP
SHIPPING & RECEIVING
TOOL ROOM
COMPRESSOR BUILDING
NORTH WAREHOUSE
AUXILIARY WAREHOUSE
PURCHASING DEPT.
STACK
BOILER SHOP
START UP TRANSFORMER
MAIN TRANSFORMERS
AUXILIARY TRANSFORMER
TURBINE BAY
MAIN BUILDING
BREEZWAY
SEE SK-CN-GA-002 FOR APPROXIMATE DIMENSIONAL INFORMATION
UNIT 1 BOILER
UNIT 2 BOILER
UNIT 1 KOPPERS PRECIPITATOR
UNIT 2 KOPPERS PRECIPITATOR
LUBE OIL TANK #11
LUBE OIL TANK #12
BALL MILL
GYPSUM DEWATERING BLDG.
ABSORBER BLDG.
6A & 6B CONVEYOR
#2 TOWER
BRINE CONC. BLDG.
SECONDARY COAL CRUSHER
DEWATERING BINS
ASH HANDLING
ISG OFFICE & STOR.
ADMINISTRATION BUILDING
MAIN ENTRANCE
MAIN PARKING
PAVED PARKING
GRAVEL PARKING
BIG HANAFORD ROAD
SK-CN-GA-001
STEAM PLANT SITE
ENVIRONMENTAL PLAN
FIGURE 2-4
CENTRALIA GENERATION
TransAlta
CENTRALIA GENERATION
6442-C-12120
CORRECTED TERMINOLOGY


MAIN BUILDING
UNIT 1 BOILER
UNIT 2 BOILER
UNIT 1 PRECIPITATOR
UNIT 2 PRECIPITATOR
STACK
STACK
SCRUBBER STACK
115'-6"
NEW UNIT 1 & 2 CHIMNEY
6A & 6B CONVEYOR
228'-0"
BRINE CONC. BLDG.
#21
#22
#11
#12
DEWATERING BINS
#11 FLY ASH BIN
#12 FLY ASH BIN
ASH HANDLING
150'-0"
55'-0"
56'-6"
109'-0"
269'-3"
D
K
L
M
℄ EXISTING STACKS
℄ NEW SCRUBBER STACK
SK-CN-GA-002


SEE SK-CN-GA-004
FOR APPROXIMATE
DIMENSIONAL INFORMATION
SECTION A-A
SK-CN-GA-003
BECHTEL
GENERAL ARRANGEMENT
SECTION A-A
10459
M-121T


CHIMNEY #1
CONV. TRUSS
EL 335'-0" FLOOR
CONTROL HOUSE
CONV SUPPORT TOWER #2
TOP OF WALKWAY
EL 301'-6"
PENTHOUSE
BOT. OF C.E. DAMPER EL. 279' 8"
PRECIPITATOR
FLOW
EXPANSION JOINT
DUCT SUPPORT TOWER
PRECIPITATOR 12A
FLOW
TOP OF DUCT
PENTHOUSE ROOF PEAK
EL 250'-4" TOS
SAFETY CAGED LADDER
FLUIDIZING BLOWER
EL 220'-0"
INLET VANE CONTROL
AREA TO BE CLEAR FOR FAN ROTOR REMOVAL
CONV. BELT 'B'
EQUIPMENT
ROAD
EXISTING STACK
SK-CN-GA-004

CH2MHILL

CH2M HILL
9193 South Jamaica Street
Englewood, CO 80112-5946
Tel 303.771.0900
Fax 720.286.9250

March 31, 2010

Mr. Richard L. Griffith
1580 Lincoln Street, Suite 700
Denver, CO 80203

Subject: Centralia BART Control Technology Analysis
Second Response to Department of Ecology Questions

Dear Mr. Griffith:

This letter provides responses to Washington Department of Ecology's (Ecology) Questions 4 and 5, regarding the Centralia BART analysis. Also included is additional cost estimating background information for SCR and SNCR, in response to Ecology's request.

A response to Ecology Question 2, which was prepared by TransAlta, is also included in this response. Therefore, CH2M HILL does not have knowledge of, or accept responsibility for, the information presented within the Question 2 response.

In response to the last bullet of Question 2, we are submitting on behalf of TransAlta confidential, proprietary documents that are enclosed in a separate envelope marked "Confidential Business Information." Pursuant to RCW 43.21A.160, TransAlta certifies that the Alstom Power Instruction Manual, TransAlta Centralia Generation LLC, Centralia Plant Unit 2, cover page and p. 1-3 (Rev. 1, 06/21/01) relate to processes of production unique to TransAlta or may affect adversely the competitive position of TransAlta if released to the public or to a competitor. Accordingly, TransAlta requests that those records be made available only to the Director and appropriate personnel of the Department of Ecology.

We believe this transmittal completes CH2M Hill's responses to Ecology questions.

Please contact us if you have any questions.

Sincerely,

CH2M HILL

Robert L Pearson

Robert Pearson, Ph.D
Vice President

Cc: Mr. Alan Newman, State of Washington Department of Ecology
Mr. Richard DeBolt, TransAlta USA
Mr. Gary MacPherson, TransAlta USA

Attachments:

CENTRALIA BART
RESPONSES TO ECOLOGY QUESTIONS

Question 2 (Response prepared by TransAlta):

A copy of all reports on combustion analyses performed on the installed LNC3 combustion control system. Include a copy of the original LNC3 burner system specifications and vendor/contractual guarantee for the system currently installed. The information supplied needs to assist Ecology in answering specific comments on the proposed BART determination related to the NO_x reduction effectiveness of the installed combustion control system.

Response: TransAlta is not aware of any reports on combustion analyses performed on the LNC3 system.

Specific questions needing to be evaluated include:

- All analyses and test programs to improve the effectiveness of the installed system to reduce thermal NO_x emissions since the equipment installed in the boilers. Reports could have been produced by TransAlta or by PacifiCorp prior to the ownership change.

  Response: TransAlta is not aware of such analyses or reports.

- Any specific analysis that addresses the ability or inability of the system to meet the EPA presumptive BART emission limitation must be included (whether performed by or for TransAlta or PacifiCorp).

  Response: TransAlta is not aware of any such analysis.

- Design intent of the original LNC3 installation and whether the installation of LNC3 met its design intent.

Response: For original design specifications, see attached Alstom Power Instruction Manual, TransAlta Centralia Generation LLC, Centralia Plant Unit 2, cover page and p. 1-3 (Rev. 1, 06/21/01) (These pages are enclosed in a separate envelope marked "Confidential Business Information." Pursuant to RCW 43.21A.160, TransAlta is requesting that these documents not be released to the public.) The same design specifications apply to Unit 1. The Instruction Manual, p. 1-3, estimates emissions from the "low NO_x concentric firing system level III" installed at the Centralia Plant to range from: (a) 0.33 lb/mmBTU NO_x for eastern bituminous coal with a nitrogen content of about 1.48 lb/mmBTU and an oxygen to nitrogen content ratio of 5, and (b) about 0.35 lb/mmBTU for western subbituminous coal with a nitrogen content of about 0.82 lb/mmBTU and an oxygen to nitrogen content ratio of 20.

- What are the physical differences and similarities between these specific boilers and other similar boilers that have been able to achieve the presumptive BART limit of 0.15 lb/MMBtu through the use of LNC3 control?

Response: A major engineering study by an engineering firm would be required to answer this. Ecology agreed not to require such a study.

- What can be done to the configuration of overfire air ports or by replacing the low NO_x burners to reduce thermal NO_x formation?

Response: TransAlta considered these types of controls and boiler reconstruction but did not identify any that would achieve the presumptive BART levels or that would be more cost-effective than Flex Fuel or SNCR.

Follow-up Information to Question 3:

While an initial response to Question #3 was previously prepared and submitted, Ecology requested additional detail regarding vendor information. As previously noted, CH2M HILL utilized a factored approach in the development of SCR costs for the Centralia BART analysis. In addition, previous CH2M HILL and other BART analysis SCR costs were considered when completing the cost estimates. In response to Ecology's request, a compilation of SCR BART analysis information was prepared and presented in Attachment 1. Previous project information was considered in applying a factored approach to developing SCR costs.

In addition, an updated SCR Economic Analysis Summary was prepared which clarifies responses regarding the EPA Cost Manual Basis for Total Fixed O&M Costs. The revised summary is presented as Attachment 2.

The following information provides additional explanation regarding the CH2M HILL cost estimating approach for the Centralia BART analysis:

Centralia Capital Cost Estimating Approach

For the Centralia BART analysis, CH2M HILL cost estimates were developed for the SCR and SNCR NO_x control technology alternatives. As explained within the BART analysis, the level of accuracy of the cost estimate can be broadly classified as "Order of Magnitude", which can be categorized as a -20/+50 percent estimate.

The approach utilized for Centralia is consistent with previous BART analyses completed by CH2M HILL; where the level of accuracy of cost estimating matches the preliminary nature of the level of BART engineering and design. In depth design information for each emissions control technology was not completed for Centralia, due to time and resource limitations. In addition, the accuracy of BART study estimates is only intended to allow economic comparison of alternatives. In order to increase the level of accuracy of the estimate, a preliminary engineering design would have been needed that would require significantly greater site information, more engineering effort, firm vendor quotations, a thorough constructability review, and a definitive estimating approach.

CH2M HILL visited the Centralia site to examine boiler outlet ductwork configuration, space availability for new equipment, and construction requirements and potential limitations. A restricted site impacted the SCR cost estimate primarily due to the limited space to install an SCR catalyst reactor vessel. Since each unit has separate flue gas exhaust trains, the resultant design has one SCR system for each outlet exhaust duct from the economizer that would be located on top of the existing electrostatic precipitators. The congested site with limited access would also significantly influence construction costs and schedule. Therefore, as an overall assessment, the Centralia site was considered to be a difficult retrofit for an SCR installation with a resulting higher cost compared to other power plant units of similar size.

Background estimating information was assembled through re-evaluation of historical information, updated with current project equipment, material, and construction costs. Construction costs were estimated for the Centralia area, and were developed from preliminary engineering sketches.

In addition to consideration of the site specific information, a factored approach was utilized in developing the Centralia SCR and SNCR cost estimates. With this approach, common historical cost basis from previous projects are used to develop an estimate for the project under consideration. For example, a common cost comparison factor for an SCR installation between different project sites may be based on size of unit ($/Kilowatt) or flue gas flow rate ($/Actual Cubic Feet Minute). This factor from a baseline unit is then utilized to calculate the approximate cost for another unit.

For the Centralia BART analysis, a $/KW factor was primarily utilized in calculating the total project cost estimate. In estimating the SCR equipment and installation costs, a factor of approximately $200/KW was used. This factor was based on other project cost information, with allowance for specific Centralia site information retrofit considerations. Centralia was considered to be a very difficult SCR retrofit installation, and this was reflected in the ultimate cost estimate.

Estimates from previous CH2M HILL and other BART analysis were also considered when reviewing and verifying reasonableness of the total cost estimate. A compilation of previous SCR and SNCR BART information was prepared and presented in Attachment 1—"SCR BART Cost Estimate Information", and Attachment 3---"SNCR BART Cost Estimate Information". While this previous project cost information was considered in applying a factored approach in developing the SCR cost estimate, no specific project information was utilized. Information from Attachments 1 and 3 were primarily used as a comparative check for reasonableness of estimate. Two other BART analyses, Boardman Station and Nebraska City 1, were completed by B&V and HDR respectively with SCR $/KW costs comparable to Centralia. While the Centralia SCR cost estimate of 413 $/KW is the largest value on the list, CH2M HILL considers this reasonable given the retrofit difficulty. BART analysis cost estimates from Attachment 3 demonstrate that the Centralia SNCR estimate is consistent with other units.

CH2M HILL's approach to preparing the SCR and SNCR order of magnitude cost estimate for the Centralia BART analysis may be summarized as follows:

1) Determine preliminary background information regarding each technology
2) Establish site specific information, including any limitations or restrictions
3) Review comparable project information, both internal and external, to establish factors used for estimating
4) Complete an estimating reasonableness review utilizing similar SCR and SNCR estimates

While several sources of information were used as background information in developing the SCR and SNCR cost estimates, no single piece of information was exclusively utilized as the basis for the cost estimates.

Question 4:

Ecology has requested details of the SNCR cost analysis produced by CH2M HILL, specifically the analysis contained in the July, 2008 analysis. Specific issues with the cost analysis:

- *Explanation of all cost elements in the CH2M [sic] cost estimating spreadsheet, including discussion of differences on specific cost elements from the EPA Control Cost Manual defaults, especially the cost items not explicitly included in the EPA Control Cost Manual.*

  The summary table below (Table B, Attachment 4) compares the specific cost elements of the CH2M HILL SNCR capital cost estimate with the default values from the EPA Air Pollution Control Cost Manual. Table B is intended as a response to the Ecology request.

  The cost estimating equations in Section 4.2, Chapter 2 "Selective Catalytic Reduction" of the EPA Air Pollution Control Cost Manual are based on equations developed by The Cadmus Group, Bechtel Power and SAIC in 1998 and follow the costing methodology of EPRI. CH2M HILL used alternative estimating methodologies which have extensively been utilized to develop budgetary cost estimates for utility power and air pollution control projects.

  The EPA Cost Manual methodology is generally applicable for new or existing sources, and allows inclusion of unique site-specific retrofit or lost generation costs. It should be noted that at a "study" level estimate of +/- 30% accuracy, the Manual states that "a retrofit factor of as much as 50 percent can be justified". Therefore, it is difficult to make a direct comparison of all of the cost elements, since the two methodologies break down costs differently.

  Because the EPA Cost Manual contains default values which are provided for a range of general applications, CH2M HILL considers the estimating methodology utilized for the Centralia BART analysis to be more accurate since specific site information and conditions were considered. In addition, current vendor cost information was utilized in developing the estimates.

- *Basis of 16% multiplier in the calculations*

  We assume that Ecology is referring to the 15% Project Contingency in the SNCR cost estimate. When developing a cost estimate, there is always an element of uncertainty since costs are based upon several assumptions and variables. Contingency provides an amount added to an estimate, which covers project uncertainties and added costs which experience dictates will likely occur. The magnitude of the contingency used in the CH2M HILL cost estimate is typical of contingency utilized in similar budgetary estimates, and matches the default 15% Project Contingency shown in Table 1.4 "Capital Cost Factors for an SNCR Application" on page 1-32 of Section 4.2, Chapter 1 of the EPA Air Pollution Control Cost Manual, Sixth Edition.

- *Sources of 'vender quotes' referenced in the CH2M HILL documents*

  SNCR cost estimates were developed as "budgetary estimates", and preliminary vendor equipment cost and estimated NO_x reduction efficiencies were provided by Fuel Tech. CH2M HILL completed the economic analysis through a combination of utilizing a factored approach from in-house cost information, previous project information, and vendor information. A summary of previous CH2M HILL and other BART analysis SNCR costs is provided as Attachment 3. Previous project information was considered in using factored estimates in developing SNCR costs.

  For additional explanation regarding the SNCR cost estimate, please see the response to Question 3 above.

- *Whether any structural analyses were done in support of SNCR cost analysis and the results of the analyses*

  Detailed structural analyses were not performed in completing the SNCR cost analysis.

Question 5:

A number of questions specific to the SCR system have been posed which the information TransAlta has already submitted does not answer. These are:

- *Specific information about the design of the SCR system evaluated by CH2M [sic]which may include a discussion or drawings for adding SCR to the plant, including flow paths, placement of catalyst (vertical or horizontal placement), catalyst cleaning method, ducting to the Boilers and ESPs.*

Response:

The preliminary design of the SCR presented with the Centralia BART analysis assumed that the full flue gas flow would be extracted from the boiler temperature region conducive to good SCR performance (580 degrees F to 750 degrees F). This temperature region on a coal fired boiler is typically located after the boiler economizer and before the air heater. The SCR design proposed for the Centralia units was a full scale system, where the flue gas is routed to a separate SCR reactor vessel which has cross-sectional area greater than the ductwork. An expanded reactor vessel allows lower flue gas velocity through the catalyst, as opposed to an in-duct SCR where the catalyst is placed in the existing ductwork with resulting higher velocity.

The flue gas would be extracted the boiler ductwork at the appropriate temperature region, pass through the SCR system, and then would be returned to the boiler discharge ductwork at a point just downstream of the extraction point. If space allows, an in-duct configuration may also include an expanded ductwork reaction chamber in order to reduce flue gas velocity and increase residence time.

For the Centralia BART analysis it was assumed that the full scale SCR catalyst would be installed in a horizontal configuration, with the flue entering the catalyst from the top of the catalyst and exiting from the bottom. Ammonia would be introduced ahead of the catalyst. For purposes of the conceptual layout and budgetary estimate for BART analysis, no detailed design was completed regarding catalyst cleaning methodology.

- *A discussion of alternate locations to install an SCR system such as in the duct from the ESPs to the wet scrubber. This location would include and need an evaluation of gas stream reheat requirements and costs. Include an evaluation of how much catalyst could be placed inside the duct at its current dimensions and the NO_x reduction which could be accomplished without expanding the existing ducts.*

Response:

The flue gas from the Centralia ESPs to the wet scrubber is approximately 300 degrees F, which is well below the desired temperature range of 580 to 750 degrees F. Operating an SCR system outside of the optimum temperature window will significantly decrease NO_x reduction efficiency. After the ESPs, the particulate loading in the flue gas has been reduced which would lessen the potential for SCR catalyst erosion. Consistent with typical utility design, the current ESP to scrubber full load ductwork flue gas velocity is assumed to be approximately 60 ft/sec. As requested, this analysis was based on utilizing the current ductwork dimensions, which maintains existing ductwork flue gas velocity.

In order to allow the in-duct SCR system to within the optimum temperature window, increasing the flue gas temperature ahead of the SCR would be required. This could be achieved through the installation of a flue gas heating system such as a regenerative heat exchanger or duct burner arrangement. While implementing a flue gas reheat system is a technically feasible alternative, utilizing this approach in the duct work from the ESPs to the scrubber creates significant operating concerns for an SCR system in this location.

If the flue gas is reheated to approximately 700 degrees F, the calculated velocity in the existing ductwork would be increased from 60 ft/sec to approximately 90 ft/sec.

Typical catalyst flue gas velocity design values are generally in the range of 15 to 20 ft/sec, which is approximately one-fifth of the reheated flue gas velocity. From discussions with an SCR catalyst supplier, a 90 ft/sec velocity level would render the SCR essentially ineffective. The primary ramifications from higher SCR velocities are greater potential for catalyst erosion, less time available for chemical reactions to occur, and increased pressure drop across the SCR system. From a catalyst vendor response, this configuration was considered infeasible.

- *For the SCR option, evaluate the quantity of catalyst that can be installed in the ducts from the boiler to the ESP, and how much NO_x reduction could be accomplished with that quantity of catalyst. Also, a cost estimate for this installation location. This analysis was requested previously.*

Response:

While meeting many design criteria is necessary for good SCR operation, the following issues may be especially essential to an in-duct configuration:

- Flue gas residence time through the catalyst
- Good mixing of ammonia prior to entering SCR catalyst
- Ammonia slip, or un-reacted ammonia passing through the catalyst
- Catalyst erosion
- Maintain reasonable pressure drop

The SCR system evaluated within the BART report was located in an area between the boiler outlet and ESP inlet, in the optimal flue gas temperature region between the economizer outlet and the air heater. This system was assumed to consist of ductwork to and from an expanded SCR reactor vessel, where the flue gas velocity through the catalysts would operate at approximately 20 ft/sec.

The above question requests an evaluation for the "ducts from the boiler to the ESP", which consists of flue gas entering the air heater at approximately 700 degrees F and flue gas temperature exiting the air heater is approximately 300 degrees F. For this analysis it was assumed that the current ductwork dimensions would be maintained, and no expansion of the ductwork size was considered. Since a review of an SCR system located in the 300 degree F temperature region has been addressed in the responses to the previous question, only an in-duct SCR system utilizing the existing ductwork dimensions between the economizer outlet and the air heater inlet will be considered. The flue gas in this area would be within the optimum SCR temperature region, therefore no flue gas reheat would be required for this configuration.

The design criteria for an in-duct SCR unit were developed from information provided by TransAlta. The boiler flue gas from the economizer sections on each unit passes through two separate sections of ductwork, one for each of the two air heaters for each unit. The ductwork to the air heater appears to be tapered and expands toward the air heater, and mid-duct dimensions were estimated from general arrangement drawings to be 43 feet by 14 feet. There appears to be approximately 17 feet of ductwork length available to install catalyst.

Utilizing the tested flow rate from each unit and the estimated cross-sectional area of the ductwork, the flue gas velocity in this ductwork from the economizer to the air heater inlet was calculated to be approximately 50 to 60 ft/sec. This is approximately three times the desired SCR design target velocity. While in-duct SCR catalysts have been installed, most have been designed to operate in a "polishing" mode with upstream NO_x reduction occurring through an SNCR system. The use of this configuration allows the SCR catalyst to utilize any ammonia slip from the SNCR system. In order to achieve an overall high level of NO_x reduction, dual systems are required due to the lower anticipated NO_x reduction efficiency from a stand-alone SNCR or in-duct SCR installation.

Preliminary SCR design information, and a budgetary cost estimate, was requested and received from a catalyst vendor for the in-duct configuration described above. The catalyst vendor response confirmed that the in-duct configuration resulted in duct velocities about three times higher than recommended, which would cause significant erosion concerns. However, with this alternative one layer of catalyst was estimated to reduce NO_x emissions by approximately 5% with an additional 5 inches water gage pressure drop. Two catalyst layers were estimated to achieve about 12% NO_x reduction at an additional 10 inches water gage pressure drop. Therefore, with the anticipated low NO_x reduction potential, significant additional pressure drop, and potential for erosion, this in-duct SCR configuration is not considered a practical alternative for Centralia.

Attachments

ATTACHMENT 1
SCR BART Cost Estimate Information

Unit Name	Unit size (kW)	Total Installed Capital Cost/unit	$/kW	Source
Dave Johnston Unit 3	250000	67,000,000	268	CH2M HILL
Colstrip	307000	25,300,000	82	TRC
Wyodak	365000	99,000,000	271	CH2M HILL
Dave Johnston Unit 4	360000	99,900,000	278	CH2M HILL
Jim Bridger Unit 3	530000	120,900,000	228	CH2M HILL
Laramie River 1	550000	99,000,000	180	B&V
Boardman	584000	223,000,000	382	B&V
Nebraska City 1	650000	244,400,000	376	HDR
Navajo 1	750000	210,000,000	280	ENSR
CPP Unit 1 & 2	1405000	580,300,000	413	CH2M HILL

ATTACHMENT 2
Table A – SCR Economic Analysis Summary

CPP

Parameter	SCR		
NO_x Emission Control System	SCR		
SO2 Emission Control System	Forced Oxidation Limestone Scrubber		
PM Emission Control System	Dual ESPs		
CAPITAL COST COMPONENT	**Cost**	**CH2M Hill Basis**	**EPA Control Cost Manual Basis**
Major Materials Design and Supply ($)	277,685,000	CH2M HILL factored estimate	EPA control cost manual
Eng, Startup, & Indirect ($)	57,500,000	CH2M HILL factored estimate	20% of total direct capital costs
Total Indirect Installation Costs (TIIC)	**335,185,000**		
Contingency ($)	50,277,750	15% of total indirect installation costs	15% of total indirect installation costs
Sales Tax ($)	26,814,800	8% of total indirect installation costs	Included in total direct capital costs
Plant Cost (PC)	**412,277,550**		
Margin ($)	41,227,755	10% of plant cost	No margin
Total Plant Cost (TPC)	**453,505,305**		Includes 2% of total plant cost, AFUDC and cost to store 29 wt% aqueous ammonia for 14 days
Owner's Costs ($)	45,350,531	10% of total plant cost	No owners costs
Allows for funds during construction (AFUDC) ($)	54,420,637	12% of total plant cost	No AFUCD
Lost Generation ($)	27,014,400	Calculated at $20/MW-hr and 42 days	
TOTAL INSTALLED CAPITAL COST ($)	**580,290,872**		
FIRST YEAR O&M COST ($)			
Operating Labor ($)	351,250	CH2M HILL estimate	Assumed none required for SCR
Maintenance Material ($)	702,500	CH2M HILL estimate	Combined with maintenance labor, 1.5 % of total capital cost
Maintenance Labor ($)	351,250	CH2M HILL estimate	
Administrative Labor ($)	0		
TOTAL FIXED O&M COST	**1,405,000**		
Reagent Cost	1,783,475	Anhydrous ammonia at $0.20/lb	Anhydrous ammonia at $0.058/lb[2]
SCR Catalyst	2,107,500	Catalyst cost estimated at $3000/m^3	Catalyst cost at $85/ft^3 [1]
Electric Power Cost	2,403,603	Power cost estimated at $0.05/kW-hr, 7025 kW	Power cost at $0.05/kW-hr, 1795 kW
TOTAL VARIABLE O&M COST	**6,294,577**		
TOTAL FIRST YEAR O&M COST	**7,699,577**		
FIRST YEAR DEBT SERVICE ($)	63,712,819	Calculated using 7% annual interest rate for 15 years	
TOTAL FIRST YEAR COST ($)	**71,412,396**		
Power Consumption (MW)	**7.03**		
Annual Power Usage (kW-Hr/Yr)	**48.1**		
CONTROL COST ($/Ton Removed)			
NO_x Removal Rate (%)	**72.0%**		
NO_x Removed (Tons/Yr)	**7,855**		
First Year Average Control Cost ($/Ton NO_x Rem.)	**9,091**		

Notes:

1 - Catalyst cost used for EPA Cost Manual calculations based on current cost estimate of $3000/m^3. Cost manual recommends using the current cost estimate for catalyst cost.

2 – Calculated based on pure anhydrous ammonia, and not a 29% solution as listed in the EPA Cost Manual.

ATTACHMENT 3
SNCR BART Cost Estimate Information

Unit Name	Unit size (kW)	Total Installed Capital Cost/unit	$/kW	Source
Navajo 1	750,000	10,000,000	13	ENSR
Coal Strip	307,000	6,076,000	20	TRC
CPP - One Unit	702,000	16,600,000	24	CH2M HILL
RG1, 2, 3	100,000	2,497,500	25	CH2M HILL
Jim Bridger Unit 3	530,000	13,273,632	25	CH2M HILL
Jim Bridger 1, 2, 4	530,000	13,427,239	25	CH2M HILL
Dave Johnston Unit 4	360,000	10,105,779	28	CH2M HILL
Boardman	584,000	17,400,000	30	B&V
Wyodak	335,000	10,195,654	30	CH2M HILL
Laramie River 1	550,000	17,777,778	32	B&V
Tracy 3	113,000	3,661,875	32	CH2M HILL
Dave Johnston Unit 3	250,000	8,135,543	33	CH2M HILL
FC 1, 2, 3	113,000	3,760,313	33	CH2M HILL
Cholla 4	425,000	14,706,000	35	CH2M HILL
Cholla 2, 3	300,000	11,610,000	39	CH2M HILL
Apache 2, 3	195,000	7,781,130	40	CH2M HILL
Tracy 2	83,000	3,661,875	44	CH2M HILL
Naughton Unit 3	356,000	15,788,530	44	CH2M HILL
Apache 1	85,000	4,250,000	50	CH2M HILL
Naughton Unit 2	226,000	12,378,764	55	CH2M HILL
Naughton Unit 1	173,000	10,226,855	59	CH2M HILL
Tracy 1	55,000	3,661,875	67	CH2M HILL

ATTACHMENT 4
Table B – SNCR Economic Analysis Summary

CPP

Parameter	SNCR		
NO_x Emission Control System	SNCR		
SO2 Emission Control System	Forced Oxidation Limestone Scrubber		
PM Emission Control System	Dual ESPs		
CAPITAL COST COMPONENT		**CH2M Hill Basis**	**EPA Control Cost Manual Basis**
Major Materials Design and Supply ($)	14,711,977	Based on quote from Fuel Tech	EPA control cost manual
Eng, Startup, & Indirect ($)	5,400,000	Based on quote from Fuel Tech	20% of total direct capital costs
Total Indirect Installation Costs (TIIC)	**20,111,977**		
Contingency ($)	3,016,797	15% of total indirect installation costs	15% of total indirect installation costs
Sales Tax ($)	1,608,958	8% of total indirect installation costs	Included in total direct capital costs
Plant Cost (PC)	**24,737,732**		
Margin ($)	2,473,773	10% of plant cost	No margin
Total Plant Cost (TPC)	**27,211,505**		Includes 2% of total plant cost, AFUDC and cost to store urea for 14 days
Owner's Costs ($)	2,721,150	10% of total plant cost	No owners costs
Allows for funds during construction (AFUDC) ($)	3,265,381	12% of total plant cost	No AFUCD
Lost Generation ($)			
TOTAL INSTALLED CAPITAL COST ($)	**33,198,036**		
FIRST YEAR O&M COST ($)			
Operating Labor ($)	281,000	CH2M HILL estimate	Assumed none required for SNCR
Maintenance Material ($)	562,000	CH2M HILL estimate	Combined with maintenance labor, 1.5 % of total capital cost
Maintenance Labor ($)	281,000	CH2M HILL estimate	
Administrative Labor ($)			
TOTAL FIXED O&M COST	**1,124,000**		
Reagent Cost	909,012	Urea at $0.185/lb	Urea at $0.85/gal
SCR Catalyst			
Electric Power Cost	480,721	Power cost estimated at $0.05/kW-hr, 1405 kW	Power cost at $0.05/kW-hr, 158 kW
TOTAL VARIABLE O&M COST	**1,389,733**		
TOTAL FIRST YEAR O&M COST	**2,513,733**		
FIRST YEAR DEBT SERVICE ($)	3,644,966	Calculated using 7% annual interest rate for 15 years	
TOTAL FIRST YEAR COST ($)	**6,158,699**		
Power Consumption (MW)	**1.41**		
Annual Power Usage (kW-Hr/Yr)	**9.6**		
CONTROL COST ($/Ton Removed)			
NO_x Removal Rate (%)	**25.0%**		
NO_x Removed (Tons/Yr)	**2,727**		
First Year Average Control Cost ($/Ton NO_x Rem.)	**2,258**		

Additional Information on Costs for the TransAlta Centralia Generation LLC Facility

As part of the BART analysis, Ecology evaluated the costs associated with SCR. Cost information was supplied by TransAlta's consultant, CH2M Hill. The costs reflect CH2M Hill's experience working with this type of facility and this particular facility's layout. Ecology also examined SCR costs based on EPA's Cost Control Manual. The cost information is included in the Technical Support Document.

The project cost information from CH2M Hill differs from the project costs based on EPA's Control Cost Manual. Ecology decided to accept CH2M Hill's capital cost estimate for this comparison. The consultant's experience with SCR and this type of facility reflects more current knowledge than provided by exclusive use of the EPA Cost Manual.

The cost information from both CH2M Hill and Ecology is presented in the table below. Both adjustments in the total capital costs and annual costs resulting from use of the Control Cost Manual factors still rule out SCR as a cost effective means of reducing NO_2 emissions.

CH2M Hill Cost Analysis			Ecology Analysis Using EPA's Control Cost Manual Factors			
CH2M Hill's Cost Component	CH2M Hill Cost	Cost Basis	Default Value	Ecology's EPA Control Cost Manual Calculation*	Manual Cost Element	Notes
Major Materials Design and Supply [Direct Capital]	$277,685,000	CH2M HILL factored estimate	From calculation or vendor's quote	$277,685,000	Direct Capital	Catalyst cost $240/cuft, initial charge default
Eng, Startup, & Indirect	$57,500,000	CH2M HILL factored estimate (20.7%)	Total Indirect 20%	$55,537,000	Indirect capital	
Total Indirect Installation Costs (TIIC)	$335,185,000		Direct + Indirect Costs	$333,222,000	Total Installation	
Contingency	$50,277,750	15% of total indirect installation costs	Contingency 15%	$49,983,300	Contingency = Total Installation times 15%	
Sales Tax	$26,814,800	8% of total indirect installation costs				
Plant Cost (PC)	$412,277,550		Total plant	$383,205,300	Total Plant = Total Installation + Contingency	
Margin	$41,227,755	10% of plant cost				
Total Plant Cost (TPC) [TPC = PC + Margin]	$453,505,305	Includes 2% of total plant cost, allowance for funds during construction (AFUDC) and cost to store 29% aqueous ammonia by weight for 14 days		$383,205,300		

CH2M Hill Cost Analysis			Ecology Analysis Using EPA's Control Cost Manual Factors			
CH2M Hill's Cost Component	CH2M Hill Cost	Cost Basis	Default Value	Ecology's EPA Control Cost Manual Calculation*	Manual Cost Element	Notes
Owner's Costs	$45,350,531	10% of total plant cost				
Allowance for funds during construction (AFUDC)	$54,420,637	12% of total plant cost	Assumed 0% for SCR			
Royalty Allowance			Assumed 0% for SCR			
Preproduction Cost			2% of plant cost + 2% of royalty cost	$7,664,106		
Inventory Capital			Cost of first fill of reagent tanks			
Initial Catalyst and Chemicals			Assumed 0% for SCR - included in capital cost			
Lost Generation ($) 27,014,400 Calculated at $20/MW-hr and 42 days	$27,014,400	Calculated at $20/MW-hr and 42 days				
TOTAL INSTALLED CAPITAL COST	$580,290,872		TOTAL	$390,869,406		

FIRST YEAR OPERATING AND MAINTENANCE (O&M) COST ($)						
Operating Labor	$351,250	CH2M HILL estimate				
Maintenance Material	$702,500	CH2M HILL estimate	1.5% total Capital Cost (row 24)	$5,863,041		
Maintenance Labor	$351,250	CH2M HILL estimate	Equal to maintenance labor			
Administrative Labor	$0					
TOTAL FIXED O&M COST	$1,405,000			$5,863,041		

CH2M Hill Cost Analysis			Ecology Analysis Using EPA's Control Cost Manual Factors			
CH2M Hill's Cost Component	CH2M Hill Cost	Cost Basis	Default Value	Ecology's EPA Control Cost Manual Calculation*	Manual Cost Element	Notes
Reagent Cost	$1,783,475	Anhydrous ammonia at $0.20/lb	$0.101/lb @29% ammonia solution concentration	$900,655		
SCR Catalyst	$2,107,500	Catalyst replacement cost estimated at $3000/m3	Catalyst Replacement Cost $290/cuft	$2,397,843		Total catalyst repalcement cost divided by 3, assuming replacement every 3 years.
Electric Power Cost	$2,403,603	Power cost estimated at $50/MW-hr	Power cost estimated at $50/MW-hr	$2,403,603		
TOTAL VARIABLE O&M COST	$6,294,577			$9,161,539		
TOTAL FIRST YEAR O&M COST [FIXED + VARIABLE]	$7,699,577			$15,024,580		
FIRST YEAR DEBT SERVICE	$63,712,819	Calculated using 7% annual interest rate for 15 years	7% annual interest rate, 20yr lifetime or remaining boiler design lifetime	$36,898,072		

TOTAL FIRST YEAR COST	$71,412,396			$51,922,652		

Power Consumption (MW)	7					
Annual Power Usage (kW-Hr/Yr)	48					

CH2M Hill Cost Analysis			Ecology Analysis Using EPA's Control Cost Manual Factors			
CH2M Hill's Cost Component	CH2M Hill Cost	Cost Basis	Default Value	Ecology's EPA Control Cost Manual Calculation*	Manual Cost Element	Notes
CONTROL COST ($/Ton Removed)			CONTROL COST ($/Ton Removed)			
NOx Removal Rate (%) assumption = 90% removal rate times 80% availability of control device	72%		NOx Removal Rate (%) assumption = 90% removal rate times 80% availability of control device	72%		
NOx Removed (Tons/Yr)	7855		NOx Removed (Tons/Yr)	7855		
First Year Average Control Cost ($/Ton NOxRem.)	$9,091		First Year Average Control Cost ($/Ton NOxRem.)	$6,610		

CH2M Hill Cost Analysis			Ecology Analysis Using EPA's Control Cost Manual Factors			
CH2M Hill's Cost Component	CH2M Hill Cost	Cost Basis	Default Value	Ecology's EPA Control Cost Manual Calculation*	Manual Cost Element	Notes
ADDITIONAL CONTROL COST ANALYSIS COMPLETED BY ECOLOGY						
NOx Removal Rate (%) assumption = 90% removal rate times 100% availability of control device	90%		NOx Removal Rate (%) assumption = 90% removal rate times 100% availability of control device	90%		
NOx Removed (Tons/Yr)	9819		NOx Removed (Tons/Yr)	9819		
First Year Average Control Cost ($/Ton NOx Removed)	$7,273		First Year Average Control Cost ($/Ton Nox Removed)	$5,288		

* For illustration purposes Ecology used CH2M-Hill's estimated cost

Washington State Regional Haze SIP

Appendix M

Model Performance Evaluation

Overview

The Western Regional Air Partnerships (WRAPs) Regional Modeling Center (RMC) evaluated the performance of the Community Multi-Scale Air Quality (CMAQ) model for modeling visibility in the WRAP region. The key finding of the RMC's model performance evaluation is that CMAQ modeling can be used in combination with the Relative Response Factor (RRF) approach for the following purposes:

(1) Evaluation of emission reduction strategies for all particulate matter species except for coarse mass
(2) Projection of visibility changes at Class I Areas for regional haze planning purposes

Under the RRF approach, the projected concentration at an Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring site is calculated by applying a RRF to the measured baseline period concentration. The RRF is the ratio of the future-year modeling result to the current-year modeling result.

The RMC compared CMAQ model-simulated concentrations with 2002 ambient monitoring data from a large number of sites to determine that the CMAQ model's performance was sufficiently accurate to justify use of the model for simulating future conditions. The "Final Report for the WRAP 2002 Visibility Model Performance Evaluation" (Tonnesen, et al, 2006) discusses the model performance evaluation in detail.

This appendix presents additional analysis performed by Ecology on CMAQ visibility modeling for the mandatory Class I Areas in Washington. Ecology performed a 3-step process. As the first two steps, Ecology examined two sets of WRAP-produced graphics for mandatory Class I Areas in Washington:

(1) Time-series concentrations of visibility-impairing pollutants from IMPROVE monitoring of each of the mandatory Class I Areas in Washington for the 2000-2004 baseline period
(2) IMPROVE monitoring data and CMAQ modeling results for each of the mandatory Class I Areas in Washington for 2002

Using these graphics, Ecology performed a basic analysis of the modeling results in comparison to the monitored data at the mandatory Class I Areas.

The visibility-impairing pollutants addressed in the Appendix are Sulfate (SO_4), Nitrate (NO_3), Organic Mass Carbon (OMC), Elemental Carbon (EC), fine soil, and Coarse Mass (CM). The graphics used in this Appendix from the WRAP's Technical Support System (TSS) refer to the visibility-impairing pollutants in a slightly different way. Table M-1 below provides a cross-walk.

Table M-1 Crosswalk between Washington's Regional Haze State Implementation Plan and the Western Regional Air Partnership's Technical Support System

Regional Haze SIP	Technical Support System
Sulfate (SO_4)	ammSO_4
Nitrate (NO_3)	ammNO_3
Organic Mass Carbon (OMC)	OMC
Elemental Carbon (EC)	EC
Fine Soil	Soil
Coarse Mass (CM)	CM

Baseline Period Monitoring Data Time-Series Analysis

Ecology used the IMPROVE monitoring data for Washington's mandatory Class I Areas to examine monitored fluctuations of visibility-impairing pollutants over the 2000-2004 baseline period. This examination provided an understanding of the relative importance and recurring patterns of monitored concentrations. The use of multiple years of monitoring data facilitated the recognition of annual patterns of pollutant concentrations.

Overall, mandatory Class I Areas in Washington have the following characteristics:

- SO_4, OMC, and CM are the most prominent visibility-impairing pollutants (by mass)
- SO_4, OMC, and CM exhibit seasonality with the highest concentrations occurring in the summer.
- Generally NO_3 is a relatively minor visibility-impairing pollutant that lacks clear seasonality.
- The three northern mandatory Class I Areas (North Cascades National Park, Glacier Peak Wilderness, and Pasayten Wilderness) exhibit fine soil concentration spikes.

A more detailed discussion of each mandatory Class I Area is provided in Chapter 5.

Comparison of 2002 Monitoring Data and Modeling Results

Ecology compared IMPROVE monitoring data from 2002 to CMAQ modeling results for 2002 for each IMPROVE site in Washington to gain an understanding of how well CMAQ simulated monitored concentrations of visibility-impairing pollutants. The CMAQ results are from the simulation of the Plan02d inventory, which is a later, improved version of the BASE02a inventory used by the RMC to conclude that CMAQ was suitable for visibility modeling. The Plan02d simulation did not include CM. The RMC had found such significant model performance issues with the simulation of CM in its model performance evaluation of the Base02a CMAQ modeling results that CM modeling was discontinued.

Monitoring data and corresponding modeling results for each IMPROVE site are shown in Figures M-1 through-M-6. These figures use monitoring and modeling graphics from the WRAP's TSS. The top graphic shows monitoring data for the IMPROVE site and the bottom graphic, the corresponding CMAQ modeling results.

Some caution must be taken in reviewing the figures. While IMPROVE sampling is scheduled to occur every third day, the actual monitoring record may have missing days due to missing or invalidated samples, sampler malfunction, or other reasons. TSS spaces the available IMPROVE record across the page. The CMAQ results, on the other hand, reflect all *scheduled* IMPROVE sampling days (every third day). As a result, a monitoring day may not be lined up (be directly above) the corresponding modeled day.

Overall, the comparison of IMPROVE monitoring data to modeling results may be characterized as follows:

- The seasonality of higher SO_4 and OMC in the summer found in the IMPROVE monitoring record may be less evident or absent from the modeling results.
- The modeling results have spikes and periods of high NO_3 and sometimes soil that are not consistent with the IMPROVE monitoring results.
- The days and relative size of peak concentrations generated by the CMAQ modeling simulation may differ from those measured by the IMPROVE monitoring results.

A review of each IMPROVE site is provided below.

The CMAQ modeling results for the OLYM1 site representing Olympic National Park show winter seasonality for NO_3 that is not reflected in the IMPROVE monitoring data (Figure M-1). Soil is another prominent feature of the CMAQ modeling results that is not reflected in the IMPROVE monitoring data. The CMAQ model is forecasting different and higher spikes and periods of high concentrations than the IMPROVE monitoring data, especially in the latter months of the year.

The CMAQ modeling results for the NOCA1 site representing North Cascades National Park and Glacier Peak Wilderness have a different pattern of peak concentrations from the IMPROVE monitoring data (Figure M-2). The summer seasonality of SO_4 and OMC concentrations is not so apparent in the CMAQ results. While NO_3 concentrations are almost always a fairly insignificant part of the total IMPROVE monitored mass, CMAQ modeling results show NO_3 to be a small but significant part of the total mass virtually throughout the year.

The CMAQ modeling results for the SNPA1 site representing Alpine Lakes Wilderness have a different pattern of peak concentrations from the IMPROVE monitoring data (Figure M-3). NO_3 concentrations are a prominent part of the IMPROVE monitoring data in November and part of December. In contrast, the CMAQ modeling results indicate the NO_3 is a significant part of the total mass virtually throughout the year.

The IMPROVE monitoring data and the CMAQ monitoring results for the MORA1 site representing Mount Rainier National Park have different patterns of high concentrations (Figure M-4). The CMAQ modeling results indicate high peak concentrations in the fall and winter that are not reflected in the IMPROVE monitoring results. Both NO_3 and soil have a more significant role in the CMAQ modeling results than in the IMPROVE monitoring data.

The IMPROVE monitoring data and the CMAQ modeling results for the WHPA1 site representing Goat Rocks Wilderness and Mount Adams Wilderness have different patterns of high concentrations (Figure M-5). The CMAQ modeling results indicate relatively high NO_3 concentrations during the first and fourth quarters of the year (the winter season). The CMAQ modeling results are not reflected in the IMPROVE monitoring data. The CMAQ modeling results predict higher OMC concentrations than is measured by the IMPROVE monitoring data.

The IMPROVE monitoring data and the CMAQ modeling results for the PASA1 site representing Pasayten Wilderness have different patterns of high concentrations (Figure M-6). The CMAQ results show a single day of high concentration composed mainly of OMC on September 26. The IMPROVE monitoring data have, in declining order, lesser peaks mainly of OMC on October 17, July 25, November 13, and September 26. The CMAQ modeling results indicate winter NO_3 seasonality that is absent from the IMPROVE monitoring data. The CMAQ model results indicate generally higher concentrations at the beginning and end of the year.

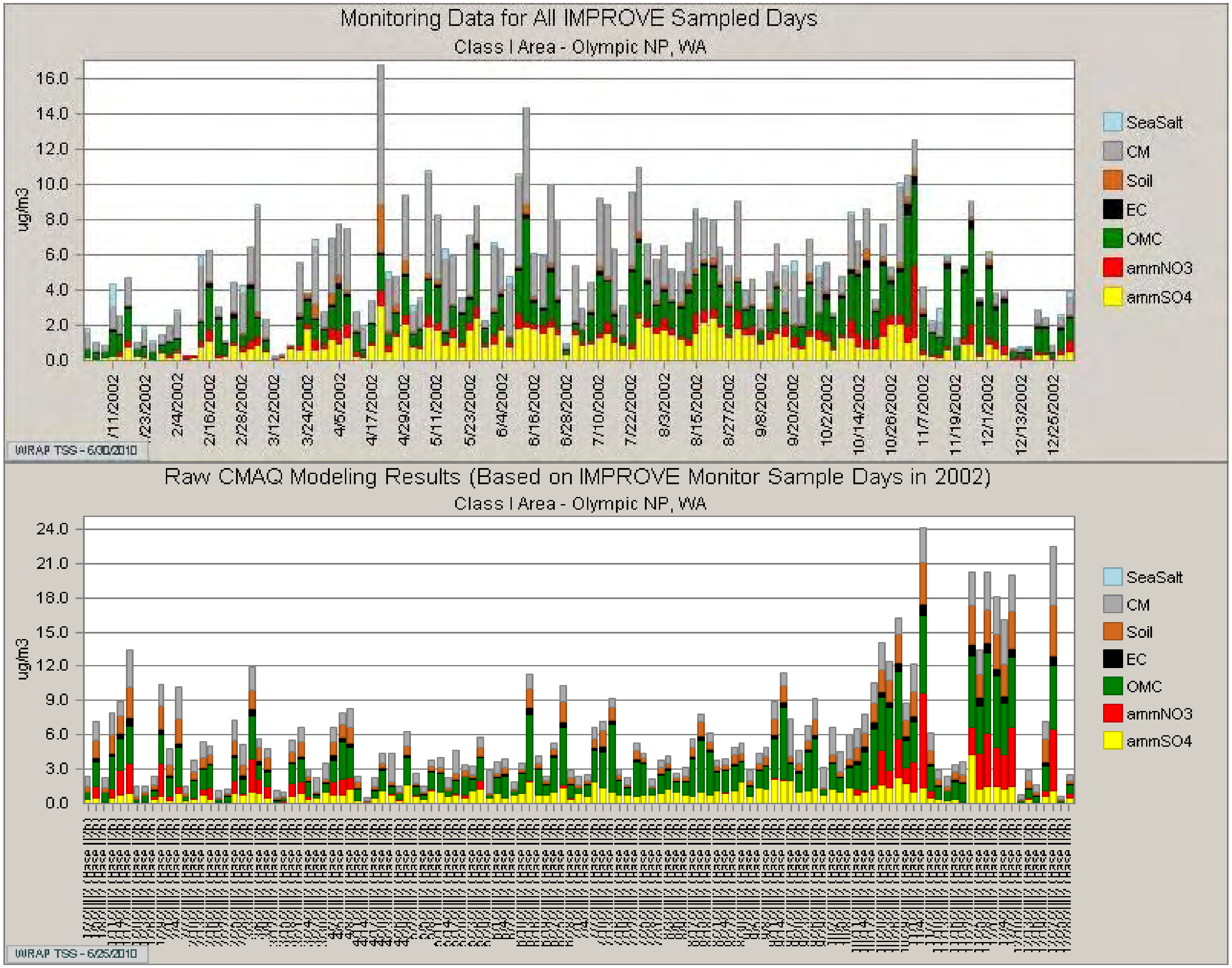


Figure M-1 OLYM1 Interagency Monitoring of Protected Visual Environments Monitoring Data and Community Multi-Scale Air Quality Model
Modeling Results for 2002

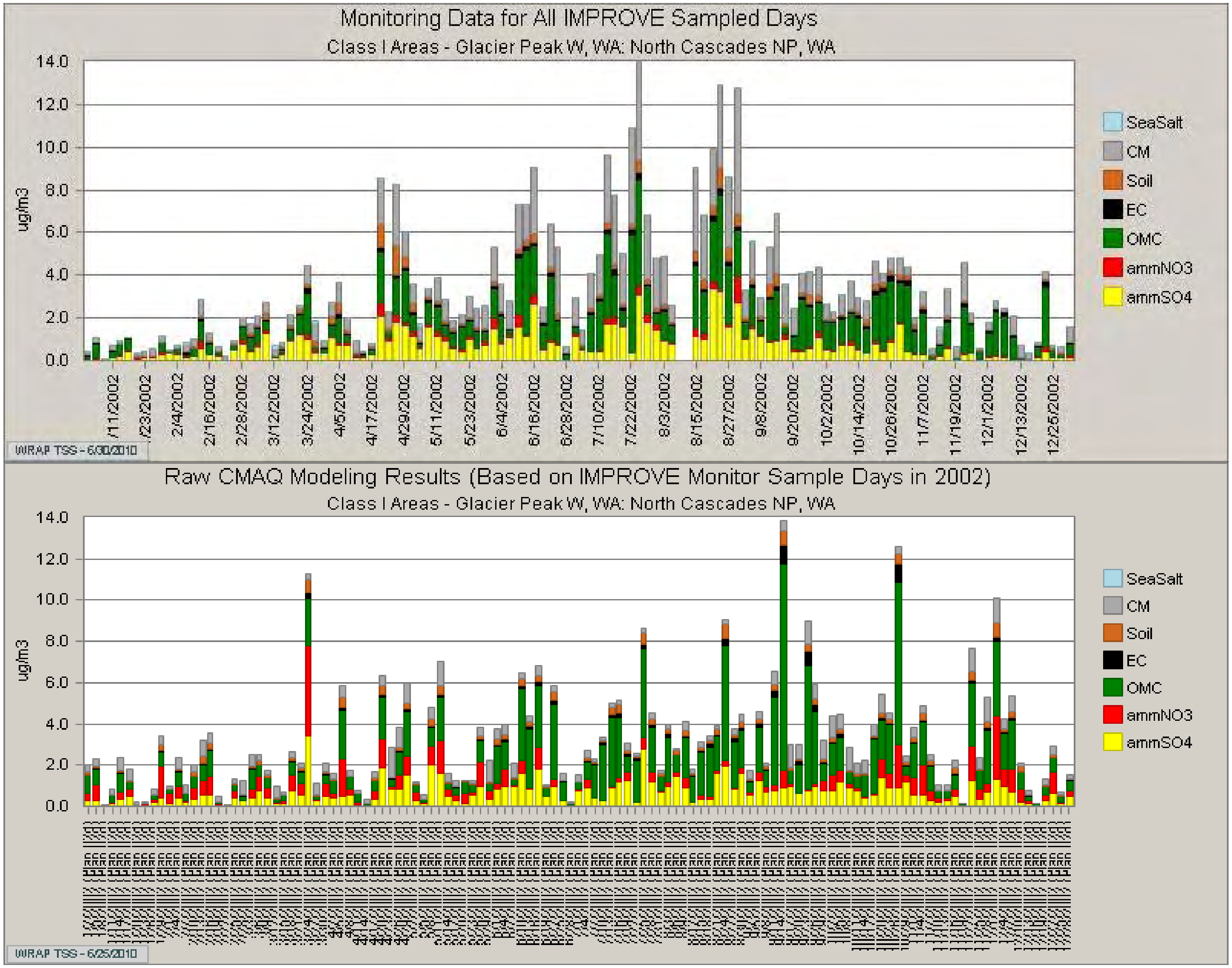


Figure M-2 NOCA1 Interagency Monitoring of Protected Visual Environments Monitoring Data and Community Multi-Scale Air Quality Model
Modeling Results for 2002

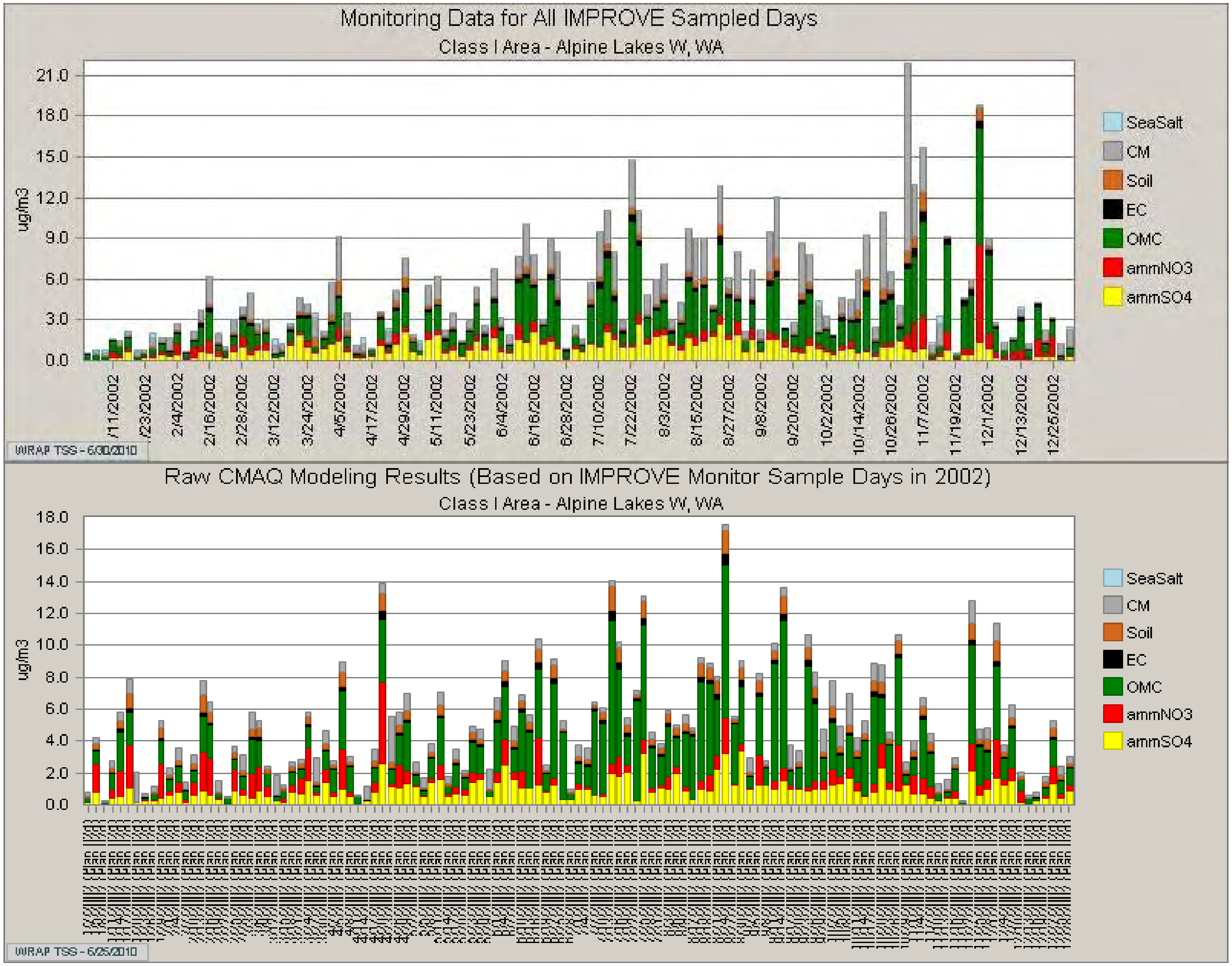


Figure M-3 SNPA1 Interagency Monitoring of Protected Visual Environments Monitoring Data and Community Multi-Scale Air Quality Model
Modeling Results for 2002

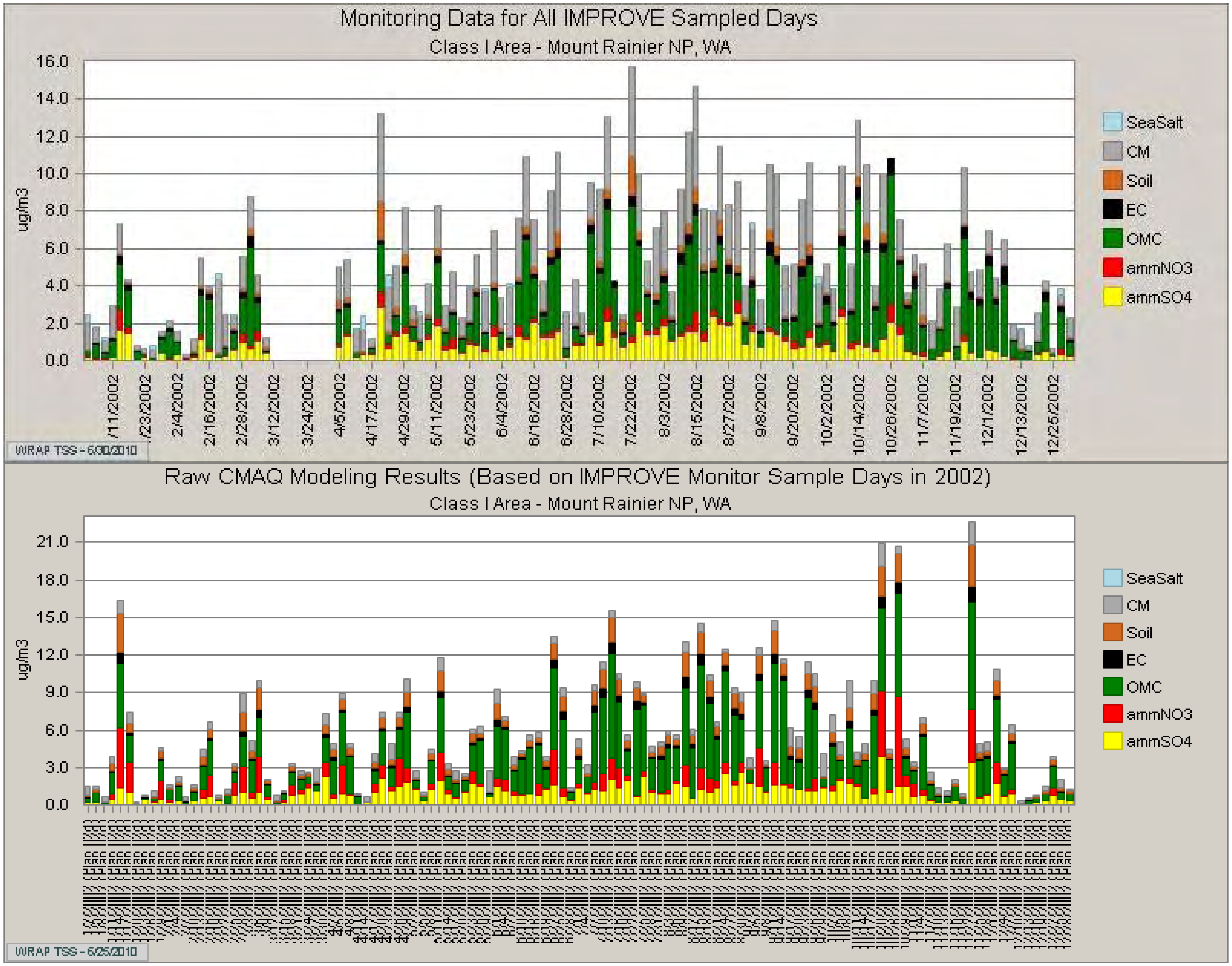


Figure M-4 MORA1 Interagency Monitoring of Protected Visual Environments Monitoring Data and Community Multi-Scale Air Quality Model
Modeling Results for 2002

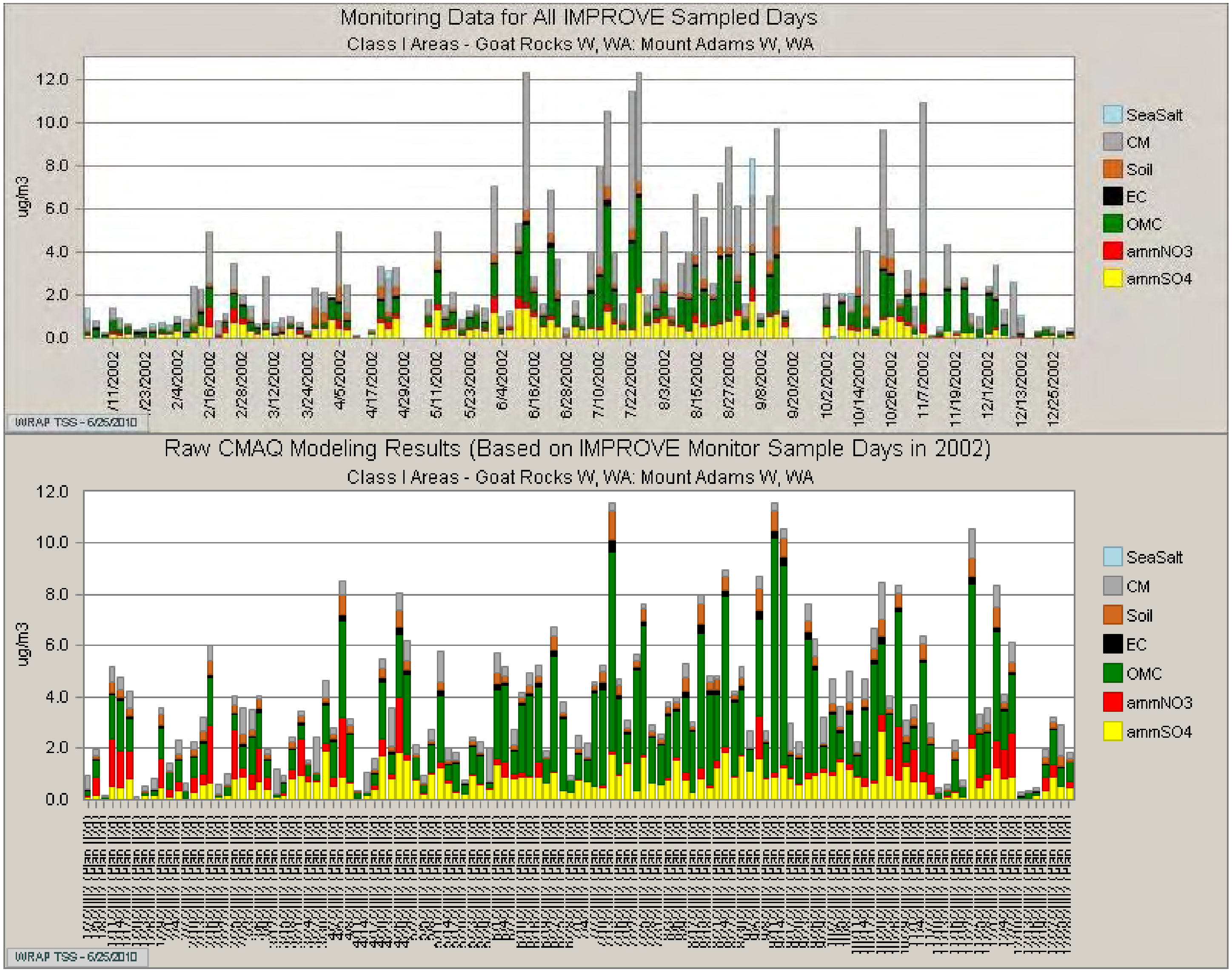


Figure M-5 WHPA1 Interagency Monitoring of Protected Visual Environments Monitoring Data and Community Multi-Scale Air Quality Model
Modeling Results for 2002

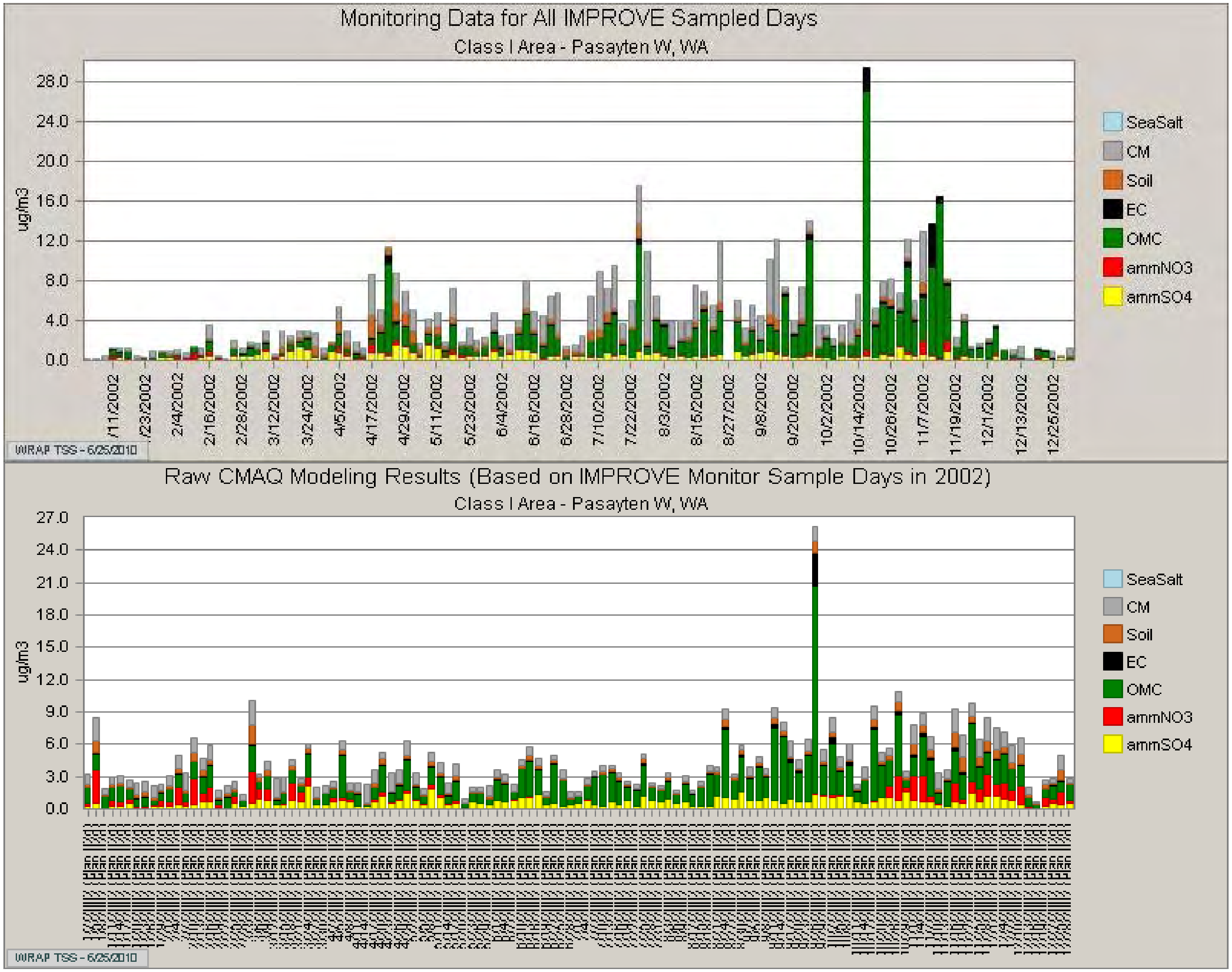


Figure M-6 PASA1 Interagency Monitoring of Protected Visual Environments Monitoring Data and Community Multi-Scale Air Quality Model
Modeling Results for 2002

Community Multi-Scale Air Quality Model Analysis

Ecology did an analysis of IMPROVE monitoring data and CMAQ modeling results for the Most Impaired Days and the Least Impaired Days to gain a better understanding of how well the CMAQ modeling results simulated the IMPROVE monitoring data. For this analysis, Ecology calculated ratios of CMAQ modeling results to IMPROVE monitored data for each of the visibility-impairing pollutants at each mandatory Class I Area. Ecology determined ratios for the Most Impaired Days, the Least Impaired Days, and winter and summer subsets of each. The winter subset consisted of the first and last quarters of the year and the summer subset, the second and third quarters. Ecology considered model performance to be acceptable if the modeled-to-monitored ratio was between 0.5 and 2.0. The results are presented in Table M-2 below.

Overall, CMAQ modeling results for SO_4 are acceptable especially on the Most Impaired Days. SO_4 meets the acceptance criteria for the Most Impaired Days and its two subsets. SO_4 meets the acceptance criteria for the Least Impaired Days except for overprediction at the SNPA1 site representing Alpine Lakes Wilderness and the WHPA1 site representing Goat Rocks Wilderness and Mount Adams Wilderness. The subsets for the Least Impaired Days show winter and summer overprediction at the PASA1 site representing Pasayten Wilderness and summer overprediction at the MORA1 site representing Mount Rainier National Park.

In contrast, CMAQ modeling results for NO_3 are usually unacceptable. NO_3 generally does not meet the acceptance criteria on either the Most Impaired Days or the Least Impaired Days. NO_3 is usually overpredicted but underprediction also occurs in the summer.

OMC generally meets the acceptance criteria on the Most Impaired Days and its winter and summer subsets. OMC concentrations tend to be overpredicted on the Least Impaired Days.

CMAQ modeling results for EC are generally acceptable. EC meets the acceptance criteria on the Most Impaired Days except for the PASA1 site representing Pasayten Wilderness, which has a ratio just below the lower acceptance criteria limit. EC meets the acceptance criteria on the Least Impaired Days except for overprediction at the OLYM1 site representing Olympic National Park and PASA1 site representing Pasayten Wilderness.

CMAQ modeling results for soil are generally unacceptable. An exception is the acceptable summer subset of the Most Impaired Days in which only modeling results for the MORA1 site representing Mount Rainier National Park are overpredicted.

CMAQ modeling results for CM are generally unacceptable on the Most Impaired Days due to underprediction. On the other hand, CMAQ modeling results for the Least Impaired Days are generally acceptable except for overprediction at SNPA1 representing Alpine Lakes Wilderness and underprediction at MORA1 representing Mount Rainier National Park. The RMC found significant model-performance issues with the simulation of CM and did not include CM in any CMAQ modeling after the Base02a model performance evaluation.

The causes of the significant under- and over-prediction by the model compared to the monitored values is difficult to discern. There are some potential causes that can be considered to contribute the poor agreement in Washington compared to other WRAP states. One consideration is how the emissions from point, mobile, and area sources are 'dispersed' into the model's input data grid cells. Another is the topographical smoothing effect caused by the selected modeling grid size. A final consideration is the location of major point sources and mobile sources. These sources often reside in either the grid cell with the monitor or in an adjacent grid cell.

Based on its general analysis of ratios of CMAQ modeling results to IMPROVE monitoring data, Ecology draws the following conclusions about the acceptability of CMAQ modeling results. CMAQ modeling results are acceptable for the following visibility-impairing pollutants and, where noted, visibility conditions:

- SO_4 especially on the Most Impaired Days
- OMC on the Most Impaired Days
- EC
- CM for the Least Impaired Days (with the caveat that the RMC found model performance for CM to be unacceptable in its model performance evaluation)

CMAQ modeling results are unacceptable for the following visibility-impairing pollutants and, where noted, visibility conditions:

- NO_3
- OMC on the Least Impaired Days
- Soil
- CM on the Most Impaired Days

Table M-2 Community Multi-Scale Air Quality Model Performance Evaluation for Interagency Monitoring of Protected Visual Environments Monitors Representing Washington's Mandatory Class I Areas

EVALUATION				RATIO MODELED/MONITORED					
THE MOST IMPAIRED DAYS									
IMPROVE Monitor	Class I Area	Year	N	SO_4	NO_3	OMC	EC	Soil	CM
OLYM1	Olympic National	2002	24	0.82	1.48	1.48	1.62	3.51	0.48
NOCA1	North Cascades NP &	2002	24	1.00	3.45	1.72	1.09	1.52	0.22
SNPA1	Alpine Lakes	2002	25	0.82	0.43	0.86	1.48	2.31	2.22
MORA1	Mount Rainier	2002	23	1.22	8.08	2.01	0.74	0.66	0.10
WHPA1	Goat Rocks W &	2002	23	1.12	2.03	2.21	1.53	1.53	0.20
PASA1	Pasayten Wilderness	2002	24	1.09	3.98	0.91	0.48	0.43	0.49
	Mean			1.01	3.24	1.53	1.16	1.66	0.62
THE LEAST IMPAIRED DAYS									
IMPROVE Monitor	Class I Area	Year	N	SO_4	NO_3	OMC	EC	$PM_{2.5}$	CM
OLYM1	Olympic National	2002	23	1.30	4.11	2.44	2.67	21.00	1.57
NOCA1	North Cascades NP &	2002	23	1.75	6.33	2.79	1.00	4.00	1.20
SNPA1	Alpine Lakes	2002	24	2.18	3.56	2.68	1.00	5.25	2.15
MORA1	Mount Rainier	2002	22	1.82	2.00	1.77	1.00	5.33	0.47
WHPA1	Goat Rocks W &	2002	22	5.88	9.00	6.30	1.67	8.00	1.59
PASA1	Pasayten Wilderness	2002	22	2.00	4.60	5.25	3.00	1.30	1.10
	Mean			2.49	4.93	3.54	1.72	7.48	1.35
					outside 0.5–2.0 acceptance limit				

THE MOST IMPAIRED DAYS, Winter (Q1 & Q4)

IMPROVE	Class I Area	Year	N	SO_4	NO_3	OMC	EC	$PM_{2.5}$	CM
OLYM1	Olympic National Park	2002	11	1.30	2.44	1.60	1.86	8.56	1.30
NOCA1	North Cascades NP &	2002	4	1.67	20.38	1.88	1.04	3.60	0.88
SNPA1	Alpine Lakes Wilderness	2002	8	0.94	0.56	0.63	0.41	1.38	0.29
MORA1	Mount Rainier National	2002	7	1.12	4.61	1.13	0.98	5.54	1.02
WHPA1	Goat Rocks W & Mount	2002	6	1.08	3.66	1.83	1.00	1.18	0.16
PASA1	Pasayten Wilderness	2002	8	1.04	1.26	0.61	0.98	4.68	6.24
	Mean			1.19	5.48	1.28	1.05	4.16	1.65

THE MOST IMPAIRED DAYS, Summer (Q2 & Q3)

IMPROVE	Class I Area	Year	N	SO_4	NO_3	OMC	EC	$PM_{2.5}$	CM
OLYM1	Olympic National Park	2002	13	0.58	0.14	1.33	1.21	1.42	0.21
NOCA1	North Cascades NP &	2002	20	0.91	2.17	1.70	1.10	1.38	0.18
SNPA1	Alpine Lakes Wilderness	2002	17	0.63	0.07	0.78	1.11	1.03	1.14
MORA1	Mount Rainier National	2002	16	0.88	2.07	1.74	1.18	2.16	0.46
WHPA1	Goat Rocks W & Mount	2002	17	1.13	1.21	2.28	1.69	1.62	0.21
PASA1	Pasayten Wilderness	2002	16	1.14	0.58	1.12	0.86	0.86	0.30
	Mean			0.88	1.04	1.49	1.19	1.41	0.42

outside 0.5–2.0 acceptance limit

THE LEAST IMPAIRED DAYS, Winter (Q1 & Q4)

IMPROVE Monitor	Class I Area	Year	N	SO_4	NO_3	OMC	EC	$PM_{2.5}$	CM
OLYM1	Olympic National Park	2002	18	1.65	5.88	2.88	3.00	36.00	1.91
NOCA1	North Cascades NP &	2002	19	1.91	5.00	2.86	1.00	4.00	1.32
SNPA1	Alpine Lakes	2002	16	2.50	4.63	2.75	0.86	6.33	2.03
MORA1	Mount Rainier National	2002	18	1.79	1.50	1.61	0.67	4.67	0.45
WHPA1	Goat Rocks W &	2002	18	6.50	10.50	6.18	2.00	18.00	1.61
PASA1	Pasayten Wilderness	2002	17/18	2.36	7.25	6.30	3.00	2.80	1.59
	Mean			2.78	5.79	3.76	1.75	11.97	1.48

THE LEAST IMPAIRED DAYS, Summer (Q2 & Q3)

IMPROVE Monitor	Class I Area	Year	N	SO_4	NO_3	OMC	EC	$PM_{2.5}$	CM
OLYM1	Olympic National Park	2002	5	0.82	0.18	1.26	1.50	7.00	0.89
NOCA1	North Cascades NP &	2002	5	0.89	18.00	2.92	0.67	1.40	0.61
SNPA1	Alpine Lakes	2002	8	1.78	1.92	2.43	1.13	4.00	2.47
MORA1	Mount Rainier National	2002	4	2.11	5.00	2.41	2.50	5.40	0.54
WHPA1	Goat Rocks W &	2002	4	0.84	0.38	1.01	0.45	0.74	4.61
PASA1	Pasayten Wilderness	2002	5	2.50	13.04	2.38	5.56	7.29	0.12
	Mean			1.49	6.42	2.07	1.97	4.31	1.54

outside 0.5–2.0 acceptance limit

Conclusion

IMPROVE monitoring data show that SO_4, OMC, and NO_3 are usually the largest contributors to visibility impairment in mandatory Class I Areas in Washington. Only the OLYM1 site representing Olympic National Park meets the modeling acceptance criteria for these 3 visibility-impairing pollutants on the Most Impaired Days. The NOCA1 site representing North Cascades National Park and Glacier Peak Wilderness, the SNPA1 site representing Alpine Lakes Wilderness, and the PASA1 site representing Pasayten Wilderness meet the modeling acceptance criteria for only 2 of the 3 visibility-impairing pollutants, SO_4 and OMC.

NO_3 is generally overpredicted on the Most Impaired Days for mandatory Class I Areas in Washington. Only the OLYM1 site representing Olympic National Park meets the modeling acceptance criteria. IMPROVE monitoring data show that the contribution of NO_3 to total light extinction for the Most Impaired Days is smaller than the contribution of SO_4 or OMC.

EC and soil are relatively minor contributors to visibility impairment on the Most Impaired Days for mandatory Class I Areas in Washington. EC generally meets the modeling acceptance criteria and soil does not.

Overall, OLMY1 representing Olympic National Park meets more modeling acceptance criteria on the Most Impaired Days than other mandatory Class I Areas. Olympic National Park meets the criteria for SO_4, OMC, NO_3, and EC. Yet as noted in the comparison of IMPROVE monitoring data and CMAQ modeling results, the CMAQ modeling results differ from the IMPROVE monitoring data in ways with the potential to affect projected visibility impairment:

- The CMAQ model forecasts different and higher spikes and periods of higher concentrations than the IMPROVE monitoring data, especially in the latter months of the year.
- The CMAQ modeling results indicate winter seasonality for NO_3 that is not reflected in the IMPROVE data.

The RMC concluded that the model overpredicted the concentrations of visibility-impairing pollutants on the Least Impaired Days. This appears to be generally true for mandatory Class I Areas in Washington. Only MORA1 representing Mount Rainier National Park meets the modeling acceptance criteria for all of the 4 largest contributors to visibility impairment (SO_4, OMC, NO_3, and EC) on the Least Impaired Days.

Ecology's review of IMPROVE monitoring data and CMAQ modeling results has raised questions about how well the CMAQ modeling results simulate concentrations of visibility-impairing pollutants for the mandatory Class I Areas in Washington. The RMC focused on the entire WRAP region to come to the conclusion that the CMAQ modeling could be used to project visibility changes in all Class I Areas for regional haze planning purposes.

Ecology lacks the means and resources to further evaluate the regional modeling. Ecology is using the WRAP results to forecast changes to concentrations of visibility-impairing pollutants and resultant visibility with the understanding that the CMAQ modeling results are the best tool available to forecast concentrations of visibility-impairing pollutants and projected visibility in 2018, the end of the first control period covered by the state of Washington's Regional Haze SIP. Pollutant concentrations and hence visibility are likely to be overpredicted on the Least Impaired Days. The impact of modeling is not so clear for the Most Impaired Days. CMAQ modeling results for SO_4 and OMC, 2 of the most important pollutants affecting visibility, are generally expected to be acceptable, but concentrations of NO_3, the other important pollutant affecting visibility are likely to be overpredicted.

Reference

Tonnesen, Gail et al., Final Report for the Western Regional air Partnership (WRAP) 2002 Visibility Model Performance Evaluation, WGA Contract Number: 30203, Western Regional Partnership, Denver CO (February24, 2006).