Appendix E
Energy Resource Analysis Report

June 2022

Proposed Goldendale Energy Storage Project

Energy Resource Analysis Report

Prepared for

Department of Ecology
State of Washington

Prepared by
Trinity Consultants, Inc.
702 West Idaho Street Ste. 1100
Boise, ID 83702

Table of Contents

List of Tables

List of Figures

List of Attachments

Acronyms and Abbreviations

EIS	Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
KPUD	Public Utility District No. 1 of Klickitat County
kV	kilovolt
MTCA	Model Toxics Control Act
MVA	megavolt amperes
MW	megawatt
NWPCC	Northwest Power and Conservation Council
SEPA	State Environmental Policy Act
WAC	Washington Administrative Code
WSI	West Surface Impoundment

Summary

This report describes the energy resources existing conditions in the study area. The study area includes the proposed project area, local energy resources in the vicinity of the project area, and a broader consideration of regional energy resources. The analysis of potential impacts related to energy from the proposed project and No Action Alternative focused on the following specific elements:

- Construction and operational fuel use
- Operational electricity use
- Operational efficiency of energy use
- Off-site energy use
- Adjacent uses of energy sources
- Consistency with local and regional energy plans

Table 1 summarizes anticipated impacts on energy resources. The findings of the analysis showed no significant and unavoidable adverse impact.

Table 1
Energy Resources Impact Summary

TYPE OF IMPACT	SIGNIFICANT ADVERSE IMPACT FINDING	MITIGATION REQUIRED BY PERMIT	ADDITIONAL MITIGATION PROPOSED	SIGNIFICANT AND UNAVOIDABLE ADVERSE IMPACT
Proposed Project: Construction				
Direct energy use	No	None	None	No
Indirect energy use	No	None	None	No
Impacts on adjacent uses of energy sources	No	None	None	No
Proposed Project: Operations				
Direct energy use	No	None	None	No
Efficiency of energy use	No	None	None	No
Consistency with local and regional energy plans	No	None	None	No
Indirect energy use	No	None	None	No
Impacts on adjacent uses of energy sources	No	None	None	No
No Action Alternative				
Energy use	No	None	None	No
Impacts on adjacent uses of energy sources	No	None	None	No

1 Introduction

Free Flow Power Project 101, LLC (the Applicant) proposes to build a pumped-water energy storage system that is capable of generating energy through release of water from an upper reservoir down to a lower reservoir. This will be referred to as the “proposed project.” This report describes the impacts of the proposed project on energy resources within the study area and assesses probable significant impacts on such resources from construction and operation of the proposed project and a No Action Alternative. Chapter 2 of the State Environmental Policy Act (SEPA) Environmental Impact Statement (EIS) provides a more detailed description of the proposed project and No Action Alternative.

1.1 Resource Description

In this report, the following key features of energy resources are analyzed:

- Amount of energy required
- Rate and efficiency of energy use
- Sources and availability of energy resources
- Renewable and nonrenewable energy resources

Potential impacts on utility providers are analyzed in Section 4.5, Public Services and Utilities, of the Draft EIS.

1.2 Regulatory Context

Table 2 identifies the laws, plans, and policies relevant to the evaluation of energy resources in the study area.

Table 2
Applicable Laws, Plans, and Policies

REGULATION, STATUTE, GUIDELINE	DESCRIPTION
Federal	
Title 18 of the Code of Federal Regulations Chapter I Federal Energy Regulatory Commission (FERC), Department of Energy	• Regulates the conservation of national power and water resources • A permit under FERC jurisdiction is required for the project. An application was submitted by the Applicant in June 2020 and is currently being considered by FERC.
Pacific Northwest Electric Power Planning and Conservation Act (Northwest Power Act), 16 United States Code Chapter 12H	• The Northwest Power Act directs the Northwest Power and Conservation Council (NWPCC) to prepare a plan to protect, mitigate, and enhance fish and wildlife of the Columbia River Basin that have been affected by the construction and operation of hydroelectric dams while also assuring the Pacific Northwest an adequate, efficient, economical, and reliable electric power supply.
State	
Washington Administrative Code (WAC) Title 194: Commerce, Department of (Energy)	• Outlines requirements under the Washington Department of Commerce (Energy) • Provides specific regulations for emergency petroleum allocation, electric energy curtailment, allowable greenhouse gases emissions output, use of energy by state and local government operations, energy independence, the Clean Energy Transformation Act, and adoption of ASHRAE building standards.

REGULATION, STATUTE, GUIDELINE	DESCRIPTION
WAC 51.11C: State Building Code Adoption and Amendment of the 2018 Edition of the International Energy Conservation Code, Commercial	• Outlines the Washington State Energy Code and includes requirements for commercial buildings for the conservation of energy over the life of each building
Local	
Klickitat County Energy Overlay Zone, Chapter 19.39 of Klickitat County Code	• Has the purpose of providing areas suitable for energy resource operations and to provide siting criteria for the utilization of wind and solar energy resources.

2 Methodology

2.1 Study Area

The study area for energy resources includes the proposed project area, resources that could be locally affected (i.e., electricity, liquid fuels, and other energy sources), and a broader consideration of electricity resources at the regional level within the Columbia River Basin (Washington, Oregon, Idaho, and portions of Western Montana). Potential impacts on energy resources depend on the types of resources present or available locally and the types that would be used to construct and operate the proposed project.

2.2 Technical Approach

Construction phase energy impacts were determined based on a review of estimated energy requirements from construction activities. Reasonable projections of the magnitude and type of construction activities were made, along with assumptions of the associated energy requirements for each. An estimate of the total construction energy impacts was calculated (see Attachment 1). Associated emissions of air pollutants and greenhouse gasses were estimated on the same basis as energy usage; information on the energy use basis for the calculations is included in Attachment 1 to the *Air Quality and Greenhouse Gases Resource Analysis Report* (Appendix D of the EIS; Trinity 2022).

Operation phase energy impacts were determined for on-site engine-generator set (generator) fuel usage and for net efficiency of the pumped storage system. No energy storage system is 100% efficient. The ratio of recoverable energy generated by the proposed project as compared to the energy requirements to pump water to the upper reservoir is the principal metric, referred to as the "net efficiency."

Actual project energy storage and generation utilization would have large fluctuations based on ambient weather conditions, seasonal climate variability, and hour-by-hour regional electricity demand and dispatch of other generating sources. Net efficiency is used in lieu of total system energy usage due to the fluctuation of storage and generation utilization and the overall purpose of the proposed project to offset fossil fuel powered electricity generation and enhance stability for renewable generation resources.

2.3 Impact Assessment

The assessment of potential impacts focused on whether there would be an adverse impact relative to existing energy resources and contextualizing potential impacts within the regional energy supply. The evaluation of impacts focused on the following specific elements:

- Construction and operational fuel use
- Operational electricity use
- Operational efficiency of energy use
- Off-site energy use from vehicle travel
- Adjacent uses of energy sources
- Consistency with local and regional energy plans

Impacts on these elements are evaluated relative to direct and indirect impacts from construction and operation of the proposed project and from the No Action Alternative. Detailed energy requirement calculations are included in Attachment 1.

3 Technical Analysis and Results

3.1 Overview

This section describes the affected environment, or the conditions before any construction begins (Section 3.2), as well as findings of probable impacts on energy resources from the proposed project (Section 3.3) and No Action Alternative (Section 3.4). For the proposed project, required permit conditions and planning document requirements that could address the impacts are identified (Section 3.3.3). This report also identifies mitigation measures that could avoid, minimize, or reduce the potential impacts (Section 3.3.4) and determines if there would be significant and unavoidable adverse environmental impacts remaining after mitigation (Section 3.3.5).

3.2 Affected Environment

3.2.1 Regional

The NWPCC develops and maintains a regional power plan based on the Northwest Power Act, with the goal of balancing the Pacific Northwest's environment and energy needs. In 2016, the NWPCC developed the Seventh Northwest Conservation and Electric Power Plan (NWPCC 2016). This plan was updated with a Midterm Assessment in 2019 (NWPCC 2019). In the update, NWPCC found that regional population is projected to grow to approximately 16.7 million people by 2035, compared to the 2019 regional population of 14.7 million. This predicted growth includes approximately 981,000 single family homes, 536,000 multifamily homes, and about 46,000 manufactured homes. Within the commercial sector, preliminary estimates show that during the next 20 years, commercial floor space will increase from 3.47 billion square feet in 2016 to more than 4.3 billion square feet by 2035. In the industrial sector, growth is projected at approximately 0.70% (NWPCC 2019). These changes are projected to result in electricity demand growth of an additional 1,800 to 4,400 average megawatts (MW) from 2015 to 2035 (NWPCC 2016). This is confirmed by the range found in the Midterm Assessment (NWPCC 2019). An average MW is the annual average electricity demand metric that accounts for daily and seasonal fluctuations.

For Washington, based on 2019 data from the Western Electricity Coordinating Council (WECC 2019), approximately 21,225 MW (69%) of the state's total generating capacity of roughly 30,600 MW was derived from hydroelectric generation. This was followed by roughly 6,300 MW (20%) from baseload resources and 3,000 MW (10%) from wind resources. Of the baseload resources, roughly 53% were derived from natural gas combustion, 21% from coal combustion, and 18% from nuclear generation. The remaining 2% were derived from biogas, petroleum, and wood combustion.

The NWPCC is currently updating the Northwest Conservation and Electric Power Plan and published a draft of the plan in September 2021. It focuses on regional goals for decarbonization of generation, the reduced economic viability of coal generation, and increased economic viability of the renewable wind and solar generation. The plan outlines the introduction of resource strategies to drive 750 to 1,000 average MW of energy efficiency and at least 3,500 MW of energy generation from renewable resources, and to introduce low-cost deployable demand response resources (e.g., Simple Cycle Natural Gas Turbines) by 2027 (NWPCC 2021).

Baseload Resources: Electricity generation that operates continuously to meet the minimum level of demand over time

Demand Response Resources: Also referred to as peaking generation, such capacities are available for generation in periods of high demand only

Based on data from the U.S. Energy Information Administration (U.S. EIA 2021a), Klickitat County has a mix of energy generating facilities including the major generating projects listed in Table 3.

Table 3
Klickitat County Electricity Generation Facilities

NAME	GENERATING CAPACITY (MW)	GENERATION TYPE	OPERATOR
Goldendale Generating Station	284.3	Natural gas fired combine cycle plant	Puget Sound Energy Inc.
Tuolumne Wind Project	136.3	Onshore wind turbine project	Turlock Irrigation District
Windy Flats Wind Project	262.2	Onshore wind turbine project	Windy Flats Partners LLC
Linden Wind Energy Project	50.0	Onshore wind turbine project	Los Angeles Department of Water & Power
Goodnoe Hills	103.4	Onshore wind turbine project	PacifiCorp
White Creek Wind Farm	204.0	Onshore wind turbine project	White Creek Wind 1 LLC
Harvest Wind Project	98.9	Onshore wind turbine project	Harvest Wind Project TIC
Big Horn Wind Project	199.0	Onshore wind turbine project	Avangrid Renewables LLC
Big Horn Wind Project II	50.0	Onshore wind turbine project	Avangrid Renewables LLC
Juniper Canyon I Wind Project	151.2	Onshore wind turbine project	Avangrid Renewables LLC
John Day	2,160.0	Hydroelectric project	U.S. Army Corps of Engineers Northwestern Division
The Dalles	1,819.7	Hydroelectric project	U.S. Army Corps of Engineers Northwestern Division
Roosevelt Biogas 1	36.5	Biogas fired generation	KPUD
SDS Lumber Gorge Energy Division	10.0	Wood/wood waste biomass generation	SDS Lumber Co

Public Utility District No. 1 of Klickitat County (KPUD) uses the following energy generating facilities for power resources (KPUD 2021):

- The White Creek Wind Farm and the Roosevelt Biogas 1 facilities (see Table 3).
- The McNary Fishway Hydro Project, owned jointly by KPUD and Northern Wasco Public Utility District. This facility is located on the Columbia River about 180 miles east of Portland, Oregon, and consists of a 10 MW turbine.
- A 230 kilovolt (kV) substation and associated transmission lines to connect to regional power grids.

3.2.2 Project Area

Energy Provision

KPUD is the exclusive provider of retail electric service in Klickitat County and provides electricity service to the proposed project area. Potential impacts on utility providers are analyzed in Section 4.5, Public Services and Utilities, of the Draft EIS.

Electrical Transmission and Distribution

Two major 500 kV transmission lines traverse Klickitat County from southwest to northeast: one entering the county in the southwest corner and exiting in central Klickitat County near Highway 97, the second entering the county near John Day Dam and exiting in central Klickitat County north of Bickleton. A 345 kV transmission line traverses Klickitat County from east to west along the southern edge of the county. Finally, a 500 kV transmission line traverses the southern edge of the county commencing at John Day Dam and extending east to the southeast corner of the county.

A network of smaller transmission lines also traverse the county including multiple 230, 115, and 69 kV distribution lines. The network in the immediate vicinity of the proposed project includes multiple 230 and 115 kV transmission lines (WECC 2019).

Natural Gas Distribution

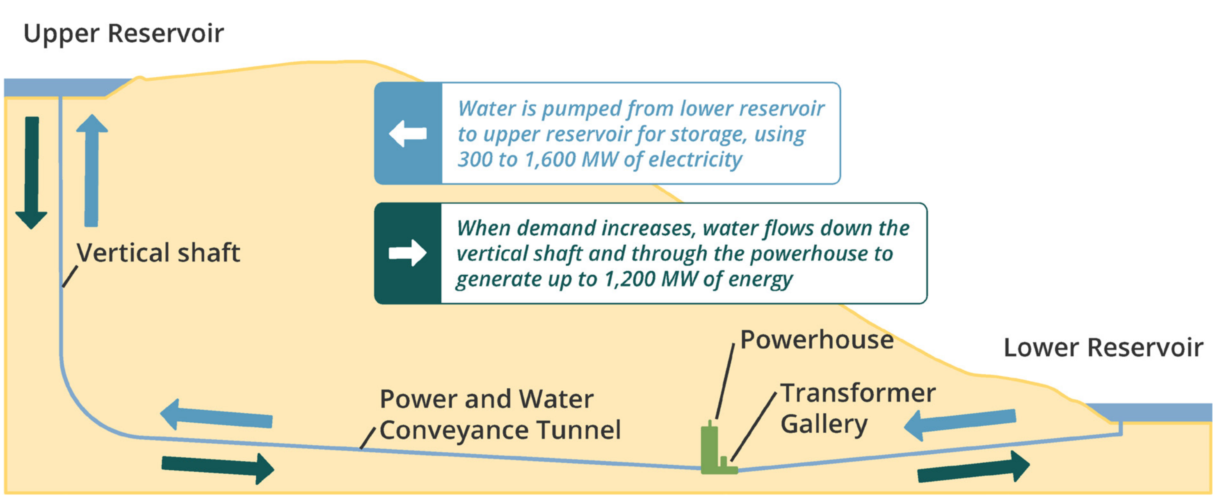
A single 26-inch high-pressure natural gas transmission pipeline traverses Klickitat County from east to west along the southern edge of the county. The pipeline, operated by the Williams Pipeline Company and known as the “Northwest Pipeline,” delivers gas from supplies in the Rocky Mountain states to western Washington and western Oregon population centers. Williams Pipeline maintains two compressor stations in Klickitat County, near Goldendale and Roosevelt. The pipeline has a peak system design capacity of 3.8 million dekatherms per day (Williams 2021).

3.3 Proposed Project

The Applicant proposes to build a pumped-water energy storage facility that is capable of generating energy through release of water from an upper reservoir down to a lower reservoir. Electrical power to pump water to the upper reservoir would be purchased from electrical grid sources during periods of low demand and the resultant gravitational hydroelectric generation would be sold back to the grid as required for energy supply stability during peak demand hours.

The rated generating capacity of the proposed project is 1,200 MW, resulting in approximately 1,600 MW of electricity usage during operation (Figure 1).

Figure 1
Energy Use and Generation of the Proposed Project



3.3.1 Impacts from Construction

3.3.1.1 Direct Impacts

Energy Use

On-site energy usage during construction would consist of diesel fuel combustion to operate material haul trucks, non-road mobile vehicles, a single large generator for tunneling operations, and various portable small equipment such as lights and lifts. The on-site concrete batch plants and aggregate crushing and screening operations will be powered by connection to the electrical grid.

Diesel fuel usage was calculated using the total amounts of anticipated soil and rock cut/fill volume, on-site concrete production, estimated road distances and haul track capacities, typical fuel efficiencies, Applicant-specified hours of operation for non-road mobile vehicles and generators, and estimated portable generator capacity requirements. Soil and rock haul truck calculations conservatively used a 10 cubic yard capacity to represent the lower end of the range of average hauling capacities of full-size dump trucks.

Contrary to on-site travel, off-site construction activities have a large degree of uncertainty due to variable travel distances to nearby construction material sources or populated areas. As discussed in Chapter 2 of the Draft EIS, the proposed project would require approximately 1 million cubic yards of imported fill to construct underground tunnels, substation and switchyards, utility infrastructure tie-ins, internal access roads, temporary construction laydown and parking areas, and construction access road extensions. Sources of this imported fill have not been identified by the Applicant at the current level of design, resulting in uncertainty in travel distances that would be required. Driving distances from the lower reservoir to the nearest populated areas are: 17 miles to Rufus, Oregon; 20 miles to Goldendale, Washington; and 32 miles to The Dalles, Oregon. Construction materials may also be sourced from locations at greater distances than these examples, which introduces additional uncertainty to quantification of off-site fuel usage.

A portion of the lower reservoir would be located within the West Surface Impoundment (WSI) area associated with the former Columbia Gorge Aluminum smelter. Investigation of contamination and development of cleanup actions are proceeding through a separate process, but it is currently assumed that as part of the proposed project, the WSI would be removed and would require the excavation of 145,550 cubic yards of soil (ERM 2021). It is currently assumed that this volume of excavated cleanup site material would require transportation via truck to a suitable off-site disposal location. Additional information about the WSI and potential material disposal is in the *Environmental Health Resource Analysis Report* (Appendix I of the EIS; Aspect and Anchor QEA 2022) and Section 4.5, Public Services and Utilities, of the Draft EIS. As discussed in the report and EIS sections, any soil from the WSI would be disposed of at appropriate landfills, depending on soil characteristics, facility permit requirements, and economic factors. The facilities that could potentially accept contaminated soil (if present at the WSI) would include Roosevelt Regional Landfill in Klickitat County, the Wasco County Landfill in The Dalles, Oregon, or Chemical Waste Management in Arlington, Oregon.

Other direct impacts from construction include employee vehicle travel for commuting to and from the project from nearby locations. Construction would require anywhere between 126 and 805 construction workers, depending on the phase of construction (FFP 2021). Section 4.13, Transportation, of the Draft EIS estimated 826 daily worker commute trips, which is used as the basis for the calculations for energy resources. It is assumed that most of these construction workers would come from and live within Klickitat County or surrounding areas.

Contrary to on-site travel, off-site travel has a large degree of uncertainty due to variable travel distances to nearby construction material sources or populated areas. For example, the driving distances from the lower reservoir to the nearest populated areas are: 17 miles to Rufus, Oregon; 20 miles to Goldendale, Washington; and 32 miles to The Dalles, Oregon. Calculations for employee commuting fuel usage estimated an average one-way travel distance of 25 miles and the usage of gasoline powered passenger vehicles with an average fuel usage rate of 20 miles per gallon.

Detailed calculations are included in Attachment 1. The total estimated diesel usage for the construction phase is 9,309,822 gallons of diesel and 1,342,250 gallons of gasoline over the 5-year construction period. Fuel would be supplied by licensed fuel distributors in nearby cities or transported from regional bulk storage terminals in the Pasco, Washington, or Portland, Oregon, areas. The amount of fuel products anticipated to be consumed during proposed project construction would not be expected to adversely affect locally available resources. Therefore, there would be no significant adverse impacts with respect to energy usage during construction.

3.3.1.2 Indirect Impacts

Impacts on Adjacent Uses of Energy Sources

Construction of the proposed project would be adjacent to existing wind turbines owned by the Turlock Irrigation District. Construction equipment and erected structures that are planned for the proposed project would not have prominence above ground level tall enough to affect the generating potential of adjacent wind turbines. Therefore, there would be no significant adverse impacts with respect to adjacent energy uses during construction.

3.3.2 Impacts from Operation

3.3.2.1 Direct Impacts

On-Site Energy Use

Operational on-site energy use consists of electricity used to pump water to the upper reservoir, diesel fuel used in generators for maintenance and emergencies, and electricity used from the grid for operational support activities. On-site vehicle-related fuel usage would be insignificant due to short travel distances within the proposed project area and a low magnitude of daily vehicle travel.

Operational energy usage includes the electricity used to pump water to the upper reservoir. This would be accomplished with the three 400-MW pump-turbine units that have an overall cycle efficiency of approximately 80% (FFP 2020). Depending on how many pump turbine units are in operation, approximately 300 MW to nearly 1,600 MW would be required to pump water up to the upper reservoir. This electricity would be drawn from the Western Interconnection grid. The Applicant's proposed project includes an intent to draw power during times of surplus in the regional energy system. This often occurs during times of high-volume generation from renewable sources such as wind and solar. Without storing this energy locally, the surplus generation may be transmitted long distances to far away markets. There is an inherent loss of energy during any electricity transmission over a distance, and the farther that electricity is transmitted the more energy gets lost to transmission inefficiencies. The Proposed Project may purchase electricity from different utility districts based on availability and market conditions, allowing for greater utilization of generation from renewables.

Nearly all of the energy used by the project will be returned to the grid at a later time when water is released through the turbines to the lower reservoir. As discussed in Section 2.2, actual project energy storage and generation utilization would have large fluctuations based on ambient weather conditions, seasonal climate variability, and hour-by-hour regional electricity demand and dispatch of other generating sources.

Transmission infrastructure will be added to connect the project to the existing transmission grid. Intermediate transformers at the project site will step up the voltage from 115 to 500 kV. A new 500 kV transmission line will connect the project to the interconnection point at John Day Dam. This interconnection was determined to be the preferred connection point based on a 2017 feasibility study by the Bonneville Power Administration (FFP 2020). The location, number of circuits, voltage, and configuration of the interconnection with the regional electricity network will be finalized in conjunction with the Bonneville Power Administration transmission planning group.

A 2019 feasibility study (BPA 2019) evaluated the feasibility of connecting the proposed pump/generator to the John Day 500 kV yard. Preliminary power flow studies showed that the operation of the project in pump or generation mode would result in some transmission facilities in the area to load above their thermal ratings. The mitigation of these thermal overloads requires the project to participate in re-dispatching the pump/generation unit output as appropriate. For this reason, the interconnection of the project does not require any system reinforcement. The existing system would be able to fully support the entire load (up to 1,600 MW) or generation (up to 1,200 MW) request without any system reinforcement.

The two 1,500 kW emergency generators and the single 150 kW portable generator for maintenance operations would both combust diesel fuel. Maintenance operations may use the portable generator to operate electrically powered tools in areas without appropriate voltage, current, or phase supply such as at the substation or tunnel entrance areas. Potential maintenance activities include repair or replacement of equipment components. The emergency generator fuel use calculations assume 100 hours of annual operation, in alignment with air emissions related limits in Code of Federal Regulations 40.60 Subpart IIII. The portable generator fuel use calculations assume operation during half of a normal work week (operating 20 hours per week) for 52 weeks per year. The operational fuel usage is estimated to be 31,460 gallons per year and expected to have a minimal impact.

The proposed project would also consume utility grid electricity during the operation phase for support activities such as lighting, computers, and maintenance tools. The average energy usage is estimated to be 39,000 megawatt-hours plus or minus 25% annually. This is based on an estimated station service load demand of 5 to 7 megavolt amperes (MVA) and a total connected load of 10 MVA (not including the energy needed to pump water from lower to upper reservoir), and plant operations 24 hours per day, all year.

This energy usage is compared to the energy usage of residential homes to provide context for the magnitude of impact. The average residential utility customer in the United States consumed 10,715 kilowatt hours of electricity in the year 2021 (U.S. EIA 2021b). Therefore, the estimated operational on-site energy usage is equal to roughly 3,640 American homes annually. There were 10,667 housing units in Klickitat County in July 2019 (U.S. Census Bureau 2019). Impacts related to operational electricity usage in the proposed project would not be significant, due to the low energy usage as contextualized to the residential energy usage of Klickitat County. In other words, the rate of energy usage from the Proposed Project would not be great enough to cause a significant electricity shortage in the surrounding area. Additionally, the intent of the Proposed Project is to draw energy from the grid during times of surplus such that the local energy grid would not be overly stressed with greater demand than supply.

Efficiency of Energy Use

The net efficiency of an energy storage system is the amount of energy available for discharge compared to the amount of required input energy, expressed as a percentage. Net efficiency is used in lieu of total system energy usage due to the fluctuation of storage and generation utilization and the overall purpose of the proposed project to offset fossil fuel powered electricity generation and enhance stability for renewable generation resources. All energy storage systems have inherent levels of inefficiency due to miniscule losses to mechanical friction, hydrological head loss in channels, electrical resistance, or other sources. In Table 4, the net efficiency determination for the proposed project's pumped storage hydro system is contextualized with the net efficiency of other types of energy storage systems that offer similar storage capacities.

Table 4
Energy Storage Technologies Efficiency Comparison

ENERGY STORAGE TECHNOLOGY	POWER GENERATION RATING (MW)	NET EFFICIENCY RANGE (%)
Pumped hydro storage	100–1,000[a]	70–85
Compressed air energy storage	10–1,000	40–75
Na-S battery	10–100	70–90
Li-ion battery	0.1–100	85–98
Flow battery	1–100	60–85

Source: Deloitte 2015
Note:
a. Deloitte (2015) specifies power rating for pumped hydro storage as 100-1,000 MW; however, the proposed project will have an installed capacity of 1,200 MW.

The intent of this this comparison is to show that the net efficiency of pumped hydro systems is comparable or better than other energy storage options of similar capacity. In other words, the goal of the proposed project to store energy may not be better achieved to a significant degree if other types of energy storage were selected instead. Other forms of energy storage have additional feasibility and environmental impact considerations as well, which is outside the scope of this report. Conceptual plans and preliminary arrangements for pumped storage in the general project location have been studied by various developers for decades. Variations of reservoir capacity and placement, tunnel arrangement, number and capacity of pumps, and extent of overall project footprint have been reviewed by multiple parties. The current project represents the best-known utilization of site characteristics and available technology to maximize generating capacity while limiting the overall project footprint.

Consistency with Local and Regional Energy Plans

The Klickitat County Energy Overlay zone (codified in Klickitat County Code Chapter 19.39) has the purpose of providing areas suitable for energy resource operations and developing siting criteria for the utilization of wind and solar energy resources. The Energy Overlay Zone creates a separate zoning and building permit program for energy resource projects located within the overlay zone (Klickitat County 2004). The proposed project is consistent with the intended purpose of the area for energy resource operations.

Washington Administrative Code (WAC) Title 194 outlines state and local government and industry regulations administered by the Washington Department of Commerce (Energy). Specific regulations apply for emergency petroleum allocation, electric energy curtailment, allowable emissions output of greenhouse gases, use of energy by state and local government operations, energy independence, the Clean Energy Transformation Act, and adoption of building standards for energy efficiency. The proposed project would comply with any state actions regarding energy curtailment as needed. Other standards within WAC Title 194 are not applicable to the proposed project or the proposed project would have no significant adverse impact on the implementation of the regulations.

WAC 51.11C outlines the Washington State Energy Code and includes requirements for commercial buildings for the conservation of energy over the life of each building. The proposed project includes few buildings that would consume energy and these buildings would comply with the energy conservation goals and requirements of WAC 51.11C.

3.3.2.2 Indirect Impacts

Off-Site Energy Use

Indirect impacts from operation include service vehicles and employee vehicle travel to nearby locations outside the proposed project boundary. Similar to the construction phase, there is a large degree of uncertainty in the actual travel distances that would be experienced by employees and service vehicles. Operation of the proposed project would require approximately 40 to 60 employees. Up to half of these workers are assumed to be from Klickitat County, with the remaining residing elsewhere in Washington or in Oregon (FFP 2020). Driving distances from the lower reservoir to the nearest populated areas are: 17 miles to Rufus, Oregon; 20 miles to Goldendale, Washington; and 32 miles to The Dalles, Oregon. Service vehicles may travel from farther distances if specialized service is required, adding additional uncertainty to travel distances. The uncertainty in off-site travel distances prohibits an accurate analysis of these indirect impacts. However, the amount of fuel products anticipated to be consumed would not be expected to adversely affect locally available resources. Therefore, there would be no significant adverse impacts with respect to off-site energy use during operation.

Impacts on Adjacent Uses of Energy Sources

Additional structures that could impede airflow could have the potential to reduce the generating capacity of adjacent wind turbines owned by the Turlock Irrigation District. However, the structures that are planned to be part of the operating proposed project would not have prominence above ground level tall enough to affect the generating potential of adjacent wind turbines. No operational impacts on adjacent uses of energy sources are expected.

The purpose of the operational proposed project is to store renewably generated electricity that is produced during times of non-peak electricity demand, and then release the stored electricity at peak demand hours. The intended effect of the proposed project is to reduce the dependence on fossil fuel generation during peak demand hours. Therefore, there would be no significant adverse impacts with respect to the use of adjacent energy sources.

The project would influence the energy flow at the interconnection point to the surrounding grid. As discussed in Section 3.3.2.1, a 2019 feasibility study concluded that additional reinforcement is not necessary for transmission infrastructure near the interconnection point, provided that the project participates in re-dispatching the pump/generation unit as appropriate. These conclusions indicate that the project would have no significant adverse impacts on adjacent energy sources with respect to energy flow fluctuations.

3.3.3 Required Permits

The following permits related to energy would be required for construction and operation of the proposed project:

- **License for a Major Unconstructed Project (Federal Energy Regulatory Commission [FERC]):** A permit under FERC jurisdiction is required for the project. An application was submitted by the Applicant in June 2020 and is currently being considered by FERC as FERC Project No. 14861.
- **Permit Pursuant to Washington Energy Code (Washington State Building Code Council):** A permit is required to ensure registration with the state and compliance with the provisions of WAC 51.11C.

3.3.4 Proposed Mitigation Measures

No mitigation measures would be required because there would be no significant impacts. Although not required to reduce any significant impacts, mitigation strategies may be proposed by the Applicant related to the energy efficiency of the individual construction and operational processes to facilitate further reduction of potential effects. Potential mitigation measures may include efficiency improvements for construction equipment such as reduction of travel distances or usage of more efficient energy sources.

Operational phase mitigation measures may include practices to maintain and/or enhance the energy efficiency of the pumped hydro energy storage system. The project design has incorporated elements to maximize efficiency of the system, as discussed in Section 3.3.2.1. Practices such as preventative and routine maintenance as well as continuous improvement of equipment and operating procedures would further promote energy efficiency of the proposed project and are inherently in the interest of the operator. Other operational phase efficiency improvements could include use of more efficient energy sources for power generation including alternative fueled generators or use of renewable resources.

There may also be specific conditions required by regulatory agencies as part of permitting for the proposed project (see Section 3.3.3).

3.3.5 Significant and Unavoidable Adverse Impacts

There would be no significant adverse impacts related to energy resources from construction or operation of the proposed project.

3.4 No Action Alternative

Under the No Action Alternative, the proposed project facilities would not be constructed. The wind energy project and other existing energy infrastructure would continue to be operated. Local and regional energy plans, including the Klickitat County Energy Overlay Zone (codified in Klickitat County Code Chapter 19.39), would remain in place. Investigation of contamination of the Columbia Gorge Aluminum smelter site and development of associated cleanup actions would continue through a separate Model Toxics Control Act (MTCA) cleanup process. In the absence of the proposed project fully removing the WSI, it is unknown what cleanup action would be required for the WSI through the full site's MTCA cleanup process, which is underway.

For purposes of evaluating the No Action Alternative, it is assumed that the MTCA disproportionate cost analysis conducted as part of the feasibility study would conclude that the incremental cost to fully remove the WSI would be greater than the incremental environmental benefit achieved relative to the continued containment, inspection, and monitoring of the WSI. Therefore, under the No Action Alternative, it is assumed that the WSI would remain intact. However, the WSI would remain within the ongoing MTCA cleanup process for the smelter site and could be subject to additional remedial actions potentially requiring long-term stewardship measures and land-use restrictions for that area.

A cleanup action could involve some energy use during construction; however, the magnitude of energy use is not precisely estimated due to uncertainties in the extent of cleanup work that would be required. No significant adverse impacts related to energy resources would be expected from the No Action Alternative.

4 References

Aspect and Anchor QEA (Aspect Consulting, LLC and Anchor QEA, LLC), 2022. *Environmental Health Resource Analysis Report*. Proposed Goldendale Energy Storage Project. SEPA Draft Environmental Impact Statement Appendix I. June 2022.

BPA (Bonneville Power Administration), 2019. *Transmission Planning Generation Interconnection Report - Feasibility Study.* May 14, 2019.

Deloitte (Deloitte Development, LLC), 2015. *Energy Storage: Tracking the Technologies That Will Transform the Power Sector.* Accessed October 11. Available at: https://www2.deloitte.com/content/dam/Deloitte/us/ Documents/energy-resources/energy-storage-tracking-technologies-transform-power-sector.pdf.

ERM, 2021. Prospective Purchaser Agreement – Detailed Proposal, Former Columbia Gorge Aluminum Plant. May 28, 2021.

FFP (FFP Project 101, LLC), 2020. Goldendale Energy Storage Hydroelectric Project: Final License Application for FERC Project No. 14861. Includes Exhibits A through G. June 22, 2020.

FFP, 2021. Response to Washington Department of Ecology Request for Information (RFI) #1. July 15, 2021.

Klickitat County, 2004. *Energy Overlay Zone Final Environmental Impact Statement.* Accessed October 12, 2021. Available at: https://www.klickitatcounty.org/283/Index-to-Final-Energy-Overlay-Zone-EIS-F.

KPUD (Klickitat Public Utilities District), 2021. *Power Resources*. Accessed November 19, 2021. Available at: http://www.klickitatpud.com/topicalMenu/about/powerResources.aspx.

NWPCC (Northwest Power and Conservation Council), 2016. *Seventh Power Plan.* Accessed October 12, 2021. Available at: https://www.nwcouncil.org/reports/seventh-power-plan.

NWPCC, 2019. *Seventh Power Plan Midterm Assessment.* Accessed October 12, 2021. Available at: https://www.nwcouncil.org/sites/default/files/7th%20Plan%20Midterm%20Assessment%20Final%20Cncl%20Doc%20%232019-3.pdf.

NWPCC, 2021. *Draft 2021 Northwest Power Plan.* Accessed October 12, 2021. Available at: https://www.nwcouncil.org/reports/draft-2021-northwest-power-plan.

Trinity (Trinity Consultants, Inc.), 2022. *Air Quality and Greenhouse Gases Resource Analysis Report*. Proposed Goldendale Energy Storage Project. SEPA Draft Environmental Impact Statement Appendix D. June 2022.

U.S. Census Bureau, 2019. *Quick Facts* [used for multiple states and counties]. Accessed October 11, 2021. Available at: https://www.census.gov/quickfacts/.

U.S. EIA (U.S. Energy Information Administration), 2021a. *Data Tools, Apps, and Maps* (various files and maps). Available at: https://www.eia.gov/tools/.

U.S. EIA, 2021b. *FAQs: How much electricity does an American home use?* Accessed October 11, 2021. Available at: https://www.eia.gov/tools/faqs/faq.php?id=97&t=3.

WECC (Western Electricity Coordinating Council), 2019. *Capacity by State.* Accessed October 12, 2021. Available at: https://www.wecc.org/epubs/StateOfTheInterconnection/Pages/Capacity-by-State.aspx.

Williams (Williams Pipeline Company), 2021. *Northwest Pipeline.* Accessed October 12, 2021. Available at: https://www.williams.com/ pipeline/northwest-pipeline/.

Attachment 1
Energy Utilization Calculations

Table 1-1.a
Construction Truck Hauling Diesel Usage

TRUCK TYPE	TOTAL NUMBER OF ONE WAY TRIPS[1]	AVERAGE MILES PER ONE WAY TRIP[1]	TOTAL VMT[1]	TOTAL CONSTRUCTION DIESEL USAGE (GALLONS)
Concrete - upper reservior	10,437	0.40	8,350	1,670
Concrete - lower reservior	19,384	0.50	19,384	3,877
Aggregate	30,000	20	1,200,000	240,000
Soil and rock - imported fill	100,000	20	4,000,000	800,000
Soil and rock - to landfill	14,550	35	1,018,500	203,700

Notes:

1. Total number of trips based on concrete batch plant throughput, 1 million cubic yards of imported fill, 145,500 cubic yards of contaminated soil hauling to landfill, and estimated truck capacities. Total vehicle miles traveled based on estimated onsite road distances for concrete trucks and total travel distances for aggretate and soil & rock import haul trucks assuming material will be sourced at locations on average a similar distance from the project to Goldendale, WA. Aggregate trucks bring concrete raw materials to project and concrete trucks travel between the batch plants and reservoirs. Soil and rock hauling to landfill based on driving distances to potential nearby landfills.

2. Estimated average truck fuel economy (assumed equal for all truck types): 5 mpg

VMT: vehicle miles traveled

Table 1-1.b
Non-Road Mobile Vehicles Diesel Usage

EQUIPMENT TYPE	TOTAL HOURS OF OPERATION (HOURS)	ESTIMATED ENGINE POWER RATING[1] (HORSEPOWER)	ESTIMATED FUEL USAGE RATE[2] (GALLONS/HOUR)	TOTAL CONSTRUCTION DIESEL USAGE[3] (GALLONS)
Exavators	20,000	162	8	166,685
Loaders	70,000	973	50	3,503,987
Dozers	30,000	247	13	381,215
Compactors	15,000	142	7	109,580
Graders	15,000	183	9	141,219
Water Trucks	17,000	300	15	262,375
Pickup Trucks	57,000	370	19	1,084,996
Cranes	14,000	282	14	202,831
Jumbos	20,000	275	14	282,860

Notes:

1. Engine power ratings estimated based on general industry knowledge and comparisions.
2. Fuel usage rate calculated from horsepower rating based on brake-specific fuel consumption and diesel heating value in AP-42 Table 3.3-1 (10/96) and diesel density in AP-42 Appendix A Pg. A-7 (9/86).
3. Total constuction fuel usage based on applicant specified total hours of operation for non-road mobile vehicles and estimated equipment power rankings.

Table 1-1.c
Construction Tunneling Generator and Portable Small Equipment Diesel Usage

EQUIPMENT TYPE	TOTAL HOURS OF OPERATION (HOUR)	ESTIMATED ENGINE POWER RATING[1] (kW)	ESTIMATED FUEL USAGE RATE[2] (GALLONS/HOUR)	TOTAL CONSTRUCTION DIESEL USAGE[3] (GALLONS)
Tunneling Generator	31,200	750	52	1,614,371
Total of Various Portable Small Equipment	30,000	150	10	310,456

Notes:

1. Total power rating estimated based on general industry knowledge and comparisions.

2. Fuel usage rate calculated from power rating based on brake-specific fuel consumption and diesel heating value in AP-42 Table 3.3-1 (10/96) and diesel density in AP-42 Appendix A Pg. A-7 (9/86).

3. Total constuction fuel usage based on applicant specified total hours of operation and estimated equipment power rankings.

kW: kilowatt

Table 1-1.d
Operation Stationary Generators Diesel Usage

EQUIPMENT TYPE	ENGINE POWER RATING[1] (kW)	ANNUAL OPERATING HOURS	ESTIMATED FUEL USAGE RATE[2] (GALLONS/HOUR)	TOTAL ANNUAL DIESEL USAGE[3] (GALLONS)
Portable generator	150	1040	10	10,762
Total of on-site emergency generators	3000	100	207	20,697

Notes:

1. Total power rating estimated based on general industry knowledge and comparisions.
2. Fuel usage rate calculated from power rating based on brake-specific fuel consumption and diesel heating value in AP-42 Table 3.3-1 (10/96) and diesel density in AP-42 Appendix A Pg. A-7 (9/86).
3. Total constuction fuel usage based on operation of earthmoving equipment for 11 hours per day, 5 days per week, for all five years of construction.

kW: kilowatt

Table 1-1.e
Construction Employee Off-Site Commuting

AVERAGE NUMBER OF DAILY CONSTRUCTION WORKER TRIPS	AVERAGE ONE WAY TRAVEL DISTANCE (MILES)	ESTIMATED AVERAGE VEHICLE FUEL USAGE RATE (MILES/GALLON)	TOTAL CONSTRUCTION GASOLINE USAGE (GALLONS)
826	25	20	1,342,250

Table 1-1.f
Total Fuel Usage

PROJECT PHASE	TOTAL FUEL USAGE (GALLONS)	TIME BASIS FOR FUEL USAGE
Construction - diesel	9,309,822	5 years
Construction - gasoline	1,342,250	6 years
Operation	31,460	Annual