REPORT TO THE LEGISLATURE

DEPARTMENT OF ECOLOGY
State of Washington

Clean Fuel Standard Program Progress in 2024

Executive Summary

Washington's Clean Fuel Standard (CFS) is a market-based policy that curbs climate pollution from the transportation sector by increasing the availability and affordability of low-carbon and renewable transportation fuels. Implemented by the Washington Department of Ecology, it's part of a suite of climate policies that work together to reduce 95% of greenhouse gas emissions by 2050.

The Clean Fuel Standard statute (RCW 70A.535.090) requires Ecology to report annually to the Legislature on the program's implementation, including the number of credits and deficits generated by fuel producers and suppliers participating in the program, fuel volumes, greenhouse gas emissions reduced, and average credit prices. The findings in this report are based on data from 2024, the second year that the CFS was in effect. During 2024, the CFS reduced carbon intensity in transportation fuels more than required: 3.8% compared to the 1% carbon intensity reduction standard established in Chapter 70A.535 RCW. This is the continuation of a trend that began in 2023, when the CFS reduced carbon intensity by 1.3% compared to the 0.5% carbon intensity reduction standard. The CFS is driving investment in the decarbonization of the transportation sector more quickly than expected, offering more fuel choices for consumers, reducing tailpipe pollution, and helping Washington meet statutory limits on greenhouse gas emissions.

Over 3 million credits were generated from renewable transportation fuels in 2024, at an average of $46 a credit, alongside over 1 million deficits. This is over 1 million more credits than in the program's first year, with a 50% lower average credit price compared to 2023. Because the CFS incentivizes credit-generators to invest proceeds back into clean transportation, over time, this will result in millions of dollars in revenue for clean transportation investments, such as electric vehicle charging and renewable liquid fuels. Based on the number of credits generated, the CFS contributed to the reduction of over 3 million metric tons of greenhouse gases, which is roughly equivalent to taking over 700,000 gas-powered cars off the road for one year.

As the program continues, the CFS will generate environmental, public health, and economic benefits. An independent economic analysis performed in 2022 estimated that by 2038 the reduction in air pollution from the CFS, combined with other transportation initiatives, will result in an economic benefit of $1.8 billion from improved health impacts. This is mainly due to the reduction in tailpipe pollution like particulate matter (PM2.5), which refers to small inhalable particles that can cause respiratory and cardiovascular diseases, and the resulting

avoided healthcare costs in Washington. These benefits will only grow as the program continues and as the greenhouse gas reduction requirements strengthen over time.

RCW 70A.535.090 also directs Ecology to contract an independent consultant to estimate the potential costs and cost-savings of the program. Ecology then must use those findings to estimate a range of costs associated with reducing a ton of carbon dioxide in the program. Greene Economics LLC was contracted to perform this analysis; their report is included in Appendix A.

Greene estimated the possible cost impact of CFS in 2024 as $0.0008 to $0.0027 per gallon of gasoline and $0.0007 to $0.0026 per gallon of diesel. They developed a statistical analysis of fuel prices from 2024; it describes the uncertainty in determining commodity price impacts, as well as the significant challenge of isolating the impacts of the CFS from other climate and transportation policies and regional supply chain issues, such as pipeline disruptions.

Introduction and background

Washington's CFS is one of several market-based climate policies that work together to reduce statewide greenhouse gas emissions. Other policies include the Climate Commitment Act (CCA) and zero-emission vehicle standards. California, Oregon, British Columbia, New Mexico, and the Canadian federal government also have clean fuel policies. The United States has the federal Renewable Fuel Standard, which mandates blends of biofuel.

Implemented by the Washington Department of Ecology, the CFS works by setting a carbon intensity standard for transportation fuels that declines each year. The required reductions are laid out in RCW 70A.535.025. Fuels are assessed and assigned carbon intensity scores based on the greenhouse gases emitted during their full lifecycle: from the time raw materials are produced to when the finished fuel is consumed. In 2024, the required reduction in carbon intensity was 1% below the 2017 baseline.

The Clean Fuel Standard statute (RCW 70A.535.090) requires Ecology to report to the Legislature on the program's implementation:

> (1) Beginning May 1, 2025, and each May 1st thereafter, the department must post a report on the department's website that includes the following information regarding the previous calendar year of clean fuels program activities:
>
> (a) The program-wide number of credits and deficits generated by entities participating in the clean fuels program;
>
> (b) The volumes of each transportation fuel and average price per credit used to comply with the requirements of the clean fuels program;
>
> (c) The best estimate or range in probable costs or cost savings attributable to the clean fuels program per gallon of gasoline and per gallon of diesel, as determined by an independent consultant whose services the department has contracted. The estimate or range in probable costs or cost savings from the independent consultant must be announced in a press release to the news media at the time that the report under this subsection (1) is posted to the department's website, and must be simultaneously

reported to the transportation committees of the house of representatives and the senate;

(d) The total greenhouse gas emissions reductions attributable to the clean fuels program isolated from the greenhouse gas emissions reductions attributable to other state and national programs on the same fuels; and

(e) The range in the probable cost per ton of greenhouse gas emissions reductions attributable to fuels supported by the clean fuels program, taking into account the information in (c) and (d) of this subsection.

Ecology is reporting on Jan. 1, 2024 – Dec. 31, 2024 to capture the second full year of the program's implementation. This report summarizes information submitted by CFS participants in their quarterly and annual fuel transaction reports. Fuel transactions occurring in 2024 were submitted by CFS participants in their annual reports which were due to Ecology on April 30, 2025. Final data for fuel transactions in 2025 were due April 30, 2026 and are currently being analyzed. Because this report is due on May 1, 2026, the day after the 2025 annual reporting deadline, it is not possible to analyze and report on data for the immediately preceding year.

Ecology published a 2023 CFS progress report covering data submitted for fuel transactions occurring between Jan. 1, 2023 – Dec. 31, 2023. The 2023 report introduced trends that continued in 2024, including a steady increase in supply of low carbon fuels and a declining average credit price. The increase in availability of clean fuels resulted in more emissions reductions than were required by law and an oversupply of credits relative to deficits, leading to lower credit prices. Because the market significantly overperformed, the Legislature took action in 2025 to further reduce the annual carbon intensity reduction requirements in House Bill (HB) 1409. The updated requirements will create more demand for credits and a stronger incentive to bring clean fuels to Washington.

2024 was the second year that participants reported to Ecology. Producers and suppliers of high-carbon fuels like gasoline and diesel are required to participate, and most producers and suppliers of low-carbon alternative fuels may opt-in voluntarily. In-state producers and suppliers of low-carbon liquid fuels like ethanol are required to participate to incentivize the lowest-carbon production possible for these fuels. As the carbon intensity standard decreases over time, alternative fuel producers and suppliers will generate credits based on their fuel carbon intensity relative to the declining standard, and additional credits if they also continue decreasing the carbon intensity of their fuel. Fuels that do not decrease in carbon intensity will generate fewer credits each year as their carbon intensity gets closer to the standard, and some may even become deficit generating when the carbon intensity of their fuel becomes higher than the standard. Due to this relationship, the CFS will incentivize both the use of alternative fuels and lead to innovation in reducing the carbon intensity of the production processes of those fuels.

Approximately 350 companies and organizations participated in the program over the course of the second year. These participants spanned multiple industries and fuel types: fossil fuel producers, forklift fleets, municipalities, transit agencies, renewable liquid fuel producers, trucking companies, electric vehicle manufacturers, rural and urban electric utilities, and more.

In 2024, low-carbon fuels generated over three million credits, corresponding to over three million tons of carbon dioxide-equivalent reduced. Participants can monetize these credits and invest the revenue in further low-carbon transportation fuel production and supply.

Ecology's focus during 2024 was strengthening the impact of the program by building on progress made in the first year of implementation. This included opening a rulemaking to make improvements based on early lessons learned, refining a process for carbon intensity certification, expanding the number of certified carbon intensities that are eligible for reporting in the program, and working with participants to prepare for the first compliance deadline in 2025.

After the second year of reporting, each participant was required to account for all credits and deficits generated during the first two years of the program. The deficits in these reports each represent one metric ton of carbon dioxide equivalent (MT CO_2e) emitted in excess of what was allowed by the annual carbon intensity standard. Participants with deficits were required to retire an equal number of credits. Each credit represents one MT CO_2e reduced by fuels with a carbon intensity below the annual standard. By matching deficits with credits, the program ensures that the state as a whole remains on track to reduce overall emissions to the levels required by the CFS. In the 2023-2024 compliance period, 100% of participants submitted annual reports with sufficient credits to fully offset their reported deficits. Over the first two years of the program, clean fuel producers and suppliers reduced more than three million MT CO_2e beyond the minimum reductions required by the carbon intensity standard.

During the program's second year in operation, there was significant progress in increasing the availability of clean fuels in Washington. Credits from clean fuels increased by 55% compared to 2023. Due to the absence of a history of reported data prior to 2023 and the array of state and national climate policies driving reductions in greenhouse gas emissions, isolating the CFS's impact on cost per gallon and greenhouse gas emissions reductions is a challenge. Ecology has made an effort to do so, while also noting areas of potential uncertainty.

Clean Fuel Standard progress in 2024

Credits and deficits generated in 2024

RCW 70A.535.090(a) The program-wide number of credits and deficits generated by entities participating in the clean fuels program;

Companies and organizations participating in the CFS must report to Ecology on a quarterly basis.[1] They report when fuel is sold or moved within the state, the volume of fuel, and the carbon intensity of that fuel. Cleaner fuels — those with a carbon intensity score below the standard — generate credits. Fuels with a carbon intensity score above the standard generate deficits. The number of credits or deficits is determined by how far below or above the standard the fuel is as well as how efficiently the fuel is used in vehicles.

By each compliance deadline, participants with deficits must acquire enough credits to offset their compliance obligation. In Figure 1, you can see the number of credits and deficits

[1] Clean Fuel Standard data & reports

generated in the program during 2023 and 2024. In 2024, the statute required a 1% reduction in carbon intensity. A total of 3,022,185 credits were generated from renewable transportation fuels in 2024, alongside 1,059,563 deficits.

Credits that have been generated beyond the number required for yearly compliance are banked by participants and accumulate over time, as credits never expire. These are represented by the credit bank line in Figure 1. The required carbon intensity reduction of 1% in 2024 did not drive significant deficit generation compared to credit generation: at the end of 2024, the cumulative credit bank reached 3,001,846 credits. An oversupplied credit bank can result in low demand for credits and a lower average credit price, because the supply of credits outweighs the demand for them. When there are far more credits than deficits in the market, credits tend to lose value and renewable fuel producers may choose to sell their cleanest product in a state with a higher credit price. The Legislature took action to address this issue in 2025, passing House Bill (HB) 1409 which will significantly lower the annual carbon intensity reduction targets, resulting in more deficits generated and therefore more demand to purchase credits to come into compliance. Higher demand for credits means the state will have a stronger incentive for producers and suppliers of low-carbon fuels to bring their fuel to Washington.

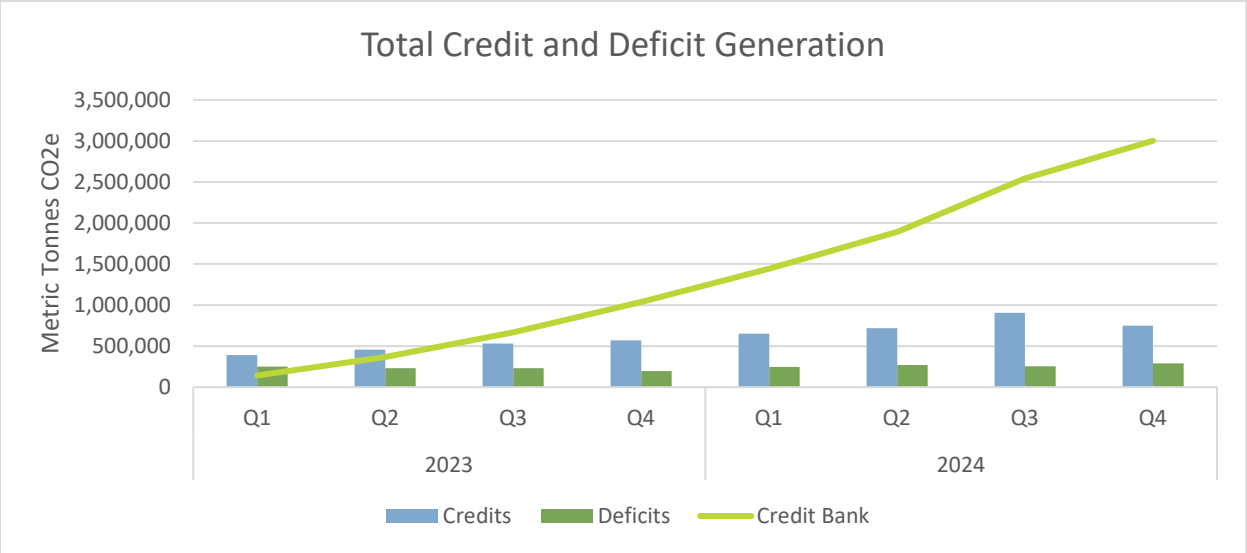

Figure 1: Total number of credits and deficits generated in the Clean Fuel Standard in 2023 and 2024

Washington has seen growth in the production and supply of lower-carbon fuels and the generation of credits. Several factors have influenced this progress, including electric vehicle (EV) sales, which reached 21% of new vehicle sales in the state[2] and resulted in a consistent increase in EV charging credited in the CFS; continued growth in the amount of biofuel supplied in the state through most of 2024; and new organizations joining the program and entering Washington's market.

[2] Get Connected: Electric Vehicle Quarterly Report 2024 (Q4), Alliance for Automotive Innovation

Fuel volumes and average price per credit

RCW 70A.535.090(b) The volumes of each transportation fuel and average price per credit used to comply with the requirements of the clean fuels program;

Fuel volumes

The table below expresses the volumes of each regulated and opt-in transportation fuel by quarter in 2024. Most fuels are measured in gallons. Compressed natural gas (CNG) is measured in therms, electricity is measured in kilowatt hours (kWh), and hydrogen is measured in kilograms (kg). Participants report transportation fuel data to Ecology in the Washington Fuels Reporting System, the program's online reporting platform.

Table A: Fuel volumes reported in the Clean Fuel Standard in 2024

Fuel Type	Unit	Q1	Q2	Q3	Q4
Electricity	kWh	197,490,125	214,189,751	237,601,173	255,249,515
Bio-CNG	therms	1,435,726	1,770,699	1,911,197	2,208,276
Fossil CNG	therms	235,326	241,830	313,942	138,702
Fossil LNG	gal	15,529	27,517	26,852	18,103
Hydrogen - Forklifts	kg	-	-	-	19,763
Propane – Forklift	gal	608,937	508,785	489,154	468,393
Propane – HDV	gal	364,859	419,451	413,061	453,548
Ethanol	gal	66,295,410	58,510,457	76,686,257	52,943,343
Biodiesel	gal	3,718,338	7,207,717	6,749,471	8,794,885
Renewable Diesel	gal	24,665,957	31,381,165	49,224,163	30,160,679
Gasoline	gal	505,707,785	582,707,619	568,696,637	539,396,570
Diesel	gal	163,874,522	149,056,568	180,501,569	165,435,045

Volumes of both gasoline and diesel fluctuated throughout 2024. Seasonal differences can affect the volumes quarter-to-quarter, such as increased driving in the summer. Liquid fuel alternatives are sensitive to the same seasonal trends as well as other unique policy drivers like the Washington Cap-and-Invest Program and the federal Renewable Fuel Standard. Towards the end of 2024, renewable diesel volumes began to decrease in WA. This mirrored a similar trend in other west coast jurisdictions with similar policies which continued into 2025.

In contrast, electricity experienced a consistent increase over the course of 2024: the number of kilowatt hours used for transportation increased by 16-23 million per quarter. Electricity used to charge a vehicle or vessel is an opt-in fuel in the CFS. Participants can generate credits for charging electric vehicles, cargo-handling equipment, ocean-going vessels, and transit systems, among others.

The consistent increase in electricity throughout the year is a sign of increasing demand for electric vehicles and charging infrastructure, which the CFS incentivizes by offering credits for kilowatt hours of charging. The program not only incentivizes more electric vehicle charging, but more charging using renewable electricity: the lower carbon intensity the electricity, the more credits a registered party can claim.

So far, no biomass based CNG, also referred to as renewable natural gas (RNG), originating in Washington or along pipelines serving Washington has been claimed in the program. All of the Bio-CNG in the table above represents fuel that was produced and consumed in other states. The fuel is claimed in Washington based on an accounting practice called book-and-claim, where fuel volumes are separated from the environmental attributes. This is described in greater detail below in the Renewable natural gas reporting section.

Average price per credit

Ecology does not set credit prices. Instead, credit prices are negotiated directly between each buyer and seller. Because credit prices are determined by the market, they vary over time.

Credit transactions usually happen privately between CFS participants or in secondary markets. The credit transfers must be reported in the Washington Fuels Reporting System to be validated. Ecology posts monthly credit transaction reports showing the number of transactions and prices, and provides a monthly average price per credit, for market transparency.

In 2024, the monthly average credit price ranged from $23.88 to $89.89, with an annual volume-weighted average price of $45.92. Ecology uses credit price averages in decision-making and to compare against the California and Oregon clean fuel programs to determine the relative performance of Washington's program.

The imbalance between credits and deficits in 2024 (Figure 1) can be explained by oversupply of credits, which likely lowered the average credit price. When the updated CFS standards take effect in 2026, the number of deficits should become more balanced with the number of credits over time.

Independent economic analysis

RCW 70A.535.090(c) The best estimate or range in probable costs or cost savings attributable to the clean fuels program per gallon of gasoline and per gallon of diesel, as determined by an independent consultant whose services the department has contracted.

Ecology hired Greene Economics, LLC to analyze the cost impact of the CFS. The firm started by estimating the change in the average price of gasoline and diesel in Washington in 2024 relative to prices in years prior to the CFS. These state-level price changes in Washington were then compared statistically to price changes in other states across the same years in an effort to isolate Washington policy impacts on gas prices from macroeconomic ones. This analysis resulted in a range of possible impacts to the price of gasoline and diesel. Greene Economics estimated that the average cost of a gallon of gasoline in Washington rose by $0.07 - $0.24 in 2024, while the average cost of a gallon of diesel rose by $0.0695 - $0.24.

Based on Argus Media estimates of 2024 CFS cost per gallon, Greene Economics estimated that the CFS contributed to 1% of the total price changes. Isolating costs attributable to the CFS was challenging, as discussed in Greene's report, given other factors that impact consumer fuel process such as global macroeconomic factors, other state and federal policies, and one-time incidents such as pipeline closures. Greene estimated the possible cost impact of the CFS as $0.0008 to $0.0027 cents per gallon of gasoline and $0.0007 to $0.0026 cents per gallon of diesel. However, they had to contend with a number of uncertainties in their analysis, including significant challenges isolating the impact of CFS from other climate and transportation policies and regional supply chain disruptions.

Greene Economics' report also found that compared to 2023, the fuel market stabilized substantially in 2024, with the difference in Washington prices verses comparable states declining. This suggests that fuel markets stabilized their response to new policies as time passed. In future reports, we will continue to monitor this trend.

Greene Economics' full report can be found in Appendix A.

Total greenhouse gas emissions

RCW 70A.535.090(d) The total greenhouse gas emissions reductions attributable to the clean fuels program isolated from the greenhouse gas emissions reductions attributable to other state and national programs on the same fuels; and

In 2024, the CFS contributed to the reduction of 3,022,185 MT CO_2e of lifecycle greenhouse gas emissions. The reduction can be measured by the total number of credits generated by the CFS. Each credit generated is equal to one MT CO_2e reduced. 3,022,185 credits were generated in 2024.

However, because of the comprehensive climate work being done in Washington, the fuels leading to these emissions reductions benefit from multiple incentives. Due to these stacked incentives, it is difficult to isolate the impact of the CFS from the impact of our other state policies.

Other policies driving greenhouse gas emissions reductions in the transportation sector are:

- The Cap-and-Invest Program, which caps and reduces greenhouse gas emissions from Washington's largest emitting sources and industries.
- Washington's zero-emission vehicle standards, which lower emissions from the transportation sector by increasing the availability of new clean vehicles for sale in Washington. These standards were in effect in 2024, but enforcement was paused in 2025 due to changes in federal policy.
- The Clean Energy Transformation Act, which requires Washington utilities to supply 100% clean electricity by 2045.
- The federal Renewable Fuel Standard, which mandates volumes of renewable fuels blended with conventional transportation fuels in the U.S.
- Federal tax preferences that incentivize certain biofuel feedstocks and domestic biofuel production. Changes to these policies directly impact the volume of biofuels supplied in Washington.

One way to isolate the impact of CFS is to look at the number of deficits generated during the year, rather than the number of credits. Deficits generated in the program represent the total greenhouse gas emissions that regulated parties are responsible for reducing solely as a result of the CFS carbon intensity standard. In 2024, there were 1,059,563 deficits generated, meaning we can isolate a reduction of at least 1,059,563 MT CO_2e attributable to the CFS. This is approximately equivalent to over one billion pounds of coal burned.[3]

The CFS is unique because it is the only state policy that directly incentivizes a reduction in the lifecycle greenhouse gas emissions of transportation fuels. The program transitions Washington away from fossil gasoline and diesel by incentivizing lower carbon replacement fuels. Fuel producers must continue lowering the carbon intensity of their production processes to keep generating credits in the program. As producers adapt over time, we should see the isolated impact of the CFS by looking at the decrease in fuel carbon intensity.

Figure 2 shows the average carbon intensities of all fuels based on data reported in 2024. Individual fuels fluctuated over the course of the year, but all alternative fuels were already well below the standard on average. Over time, the stronger long-term carbon intensity reduction requirements in the amended CFS statute will likely send market signals that incentivize more, lower-carbon transportation fuels to be produced in or brought to Washington. The amended requirements include a 5% reduction in 2026, a 4% reduction in 2027, and a 3-4% reduction per year between 2028 and 2038. Ecology is currently undertaking a rulemaking, expected to be complete before 2028, to specify the reduction schedule between 2028 and 2038. It will take time to see how this accelerated reduction schedule impacts future market trends.

[3] EPA Greenhouse Gas Equivalencies Calculator

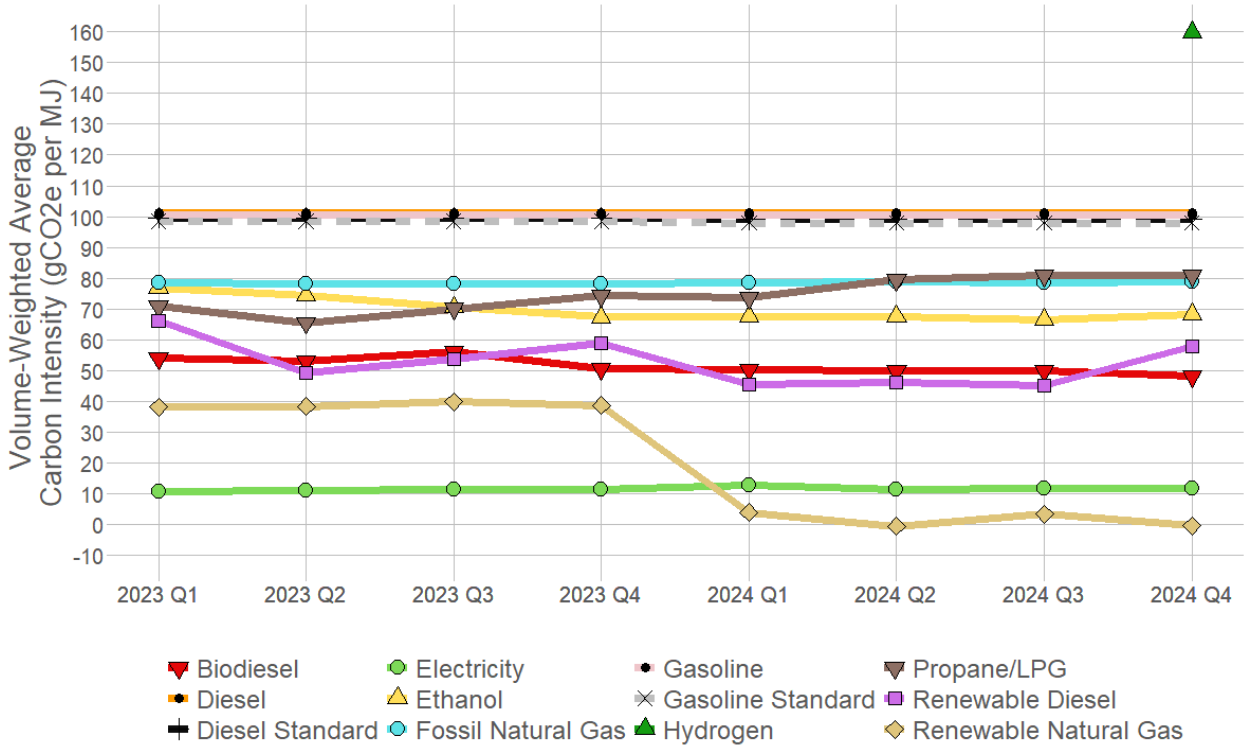

Figure 2: Volume Weighted Average Carbon Intensity of CFS Fuels in 2024

In 2024, the CFS reduced the carbon intensity of transportation fuels more quickly than required by statute. Based on the carbon intensities of fuels consumed in Washington that year, the overall carbon intensity was 3.8% below the baseline. Figure 3, below, shows the reduction in carbon intensity required by statute compared to the actual reported reduction in carbon intensity.

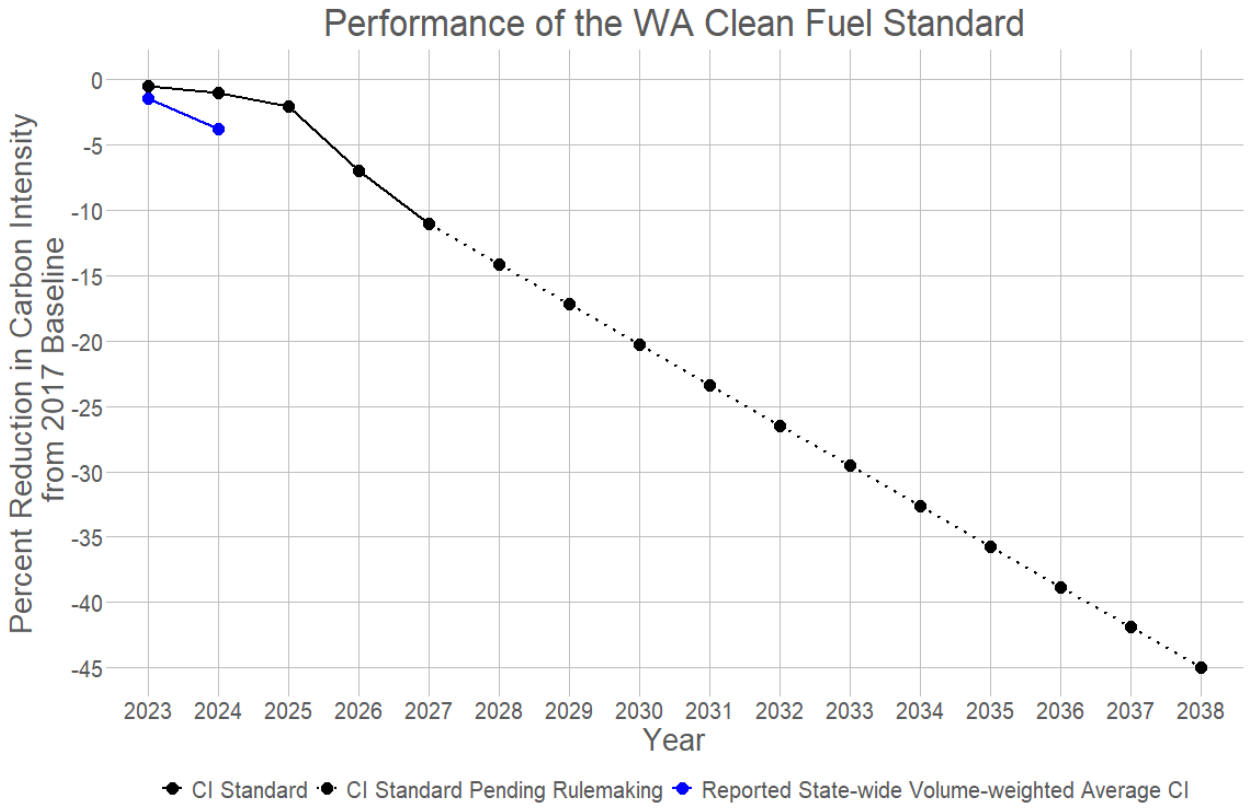

Figure 3: 2024 performance of the Clean Fuel Standard in carbon intensity reduction. Targets between 2028 – 2038 are subject to an open rulemaking.

Estimated cost per ton of greenhouse gas emissions reduction

RCW 70A.535.090(e) The range in the probable cost per ton of greenhouse gas emissions reductions attributable to fuels supported by the clean fuels program, taking into account the information in (c) and (d) of this subsection.

The cost per ton of greenhouse gas emissions reduction estimates what it costs to reduce a MT CO_2e and then applies that cost to fuels such as gasoline and diesel. This is an effort to estimate the cost impact of greenhouse gas emissions reductions on the prices of these fuels.

The value that best represents the average cost per ton of greenhouse gas emissions reduction is the volume-weighted average price of credit transfers. This price is agreed upon by market participants when they enter into an agreement to buy or sell credits. One credit represents one MT CO_2e reduced relative to the annual standard. In 2024, the average price of all credit transfers was $45.92. This is the average amount that deficit generators paid for each MT CO_2e emitted above the annual standard.

Since the first documented credit transfers in August 2023 through the end of 2024, the average price per MT CO_2e has been declining, as shown in Figure 4. Though the scope of this report is limited to 2024, it is important to note the downward trend in credit price over time reflects the impact of the excess credits generated compared to the deficits generated. The number of credits reached nearly three times the number of deficits in the market, leading to the decline in credit price over time. Lower credit prices reduce the cost of compliance, but also weaken the incentive to produce and sell cleaner fuels. When credit prices are lower,

alternative fuel producers earn less revenue and cannot invest as much in low-carbon fuels. Ecology has a statutory mandate to maintain a stable credit market, which involves balancing these factors. The balance of credits and deficits is expected to improve after the updated carbon intensity reduction targets established under HB 1409 take effect in 2026.

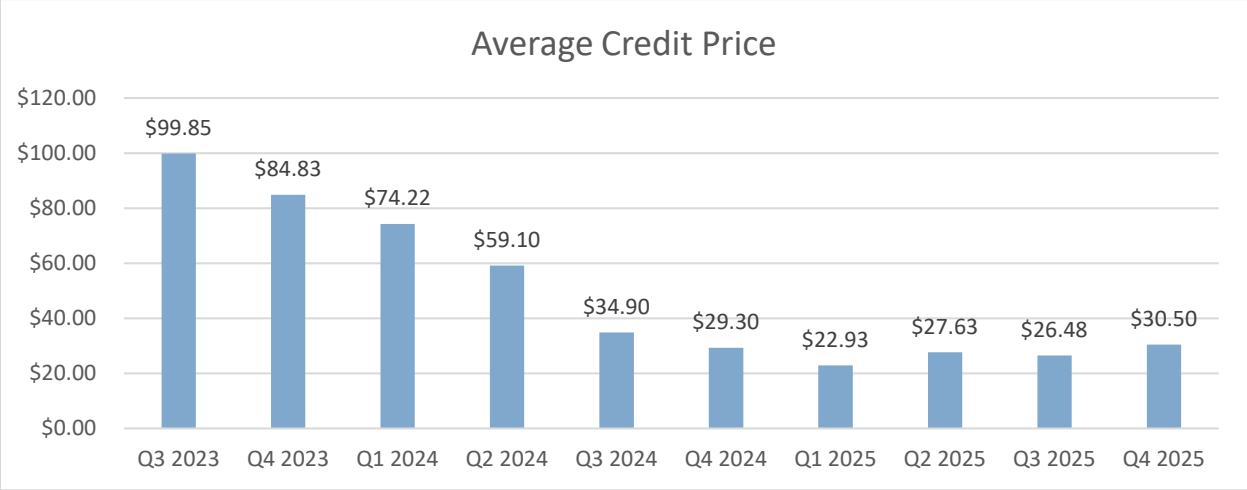

Figure 4: Average price per credit over time. This represents the actual cost of compliance per ton of greenhouse gas emissions reduced since the start of the program.[4]

As required by the CFS Statute[5], we also estimated the cost per MT CO_2e based on the independent contractor's estimates of costs and benefits attributable to the program, and total greenhouse gas emissions reduced in 2024. We found the following estimated ranges in cost:

Table B: Estimated cost of the CFS per metric ton of CO_2e reduction

	Gasoline	Diesel
Estimated cost per metric ton of CO_2e	$2.08-$7.02	$0.68-$2.20

This cost estimate is based on the volume of fuel consumed, credits and deficits generated, and the actual price of fuel in the state. While these factors all contribute to the actual average credit price and cost of reducing emissions, they do not encompass all market decisions made by credit sellers and buyers. In actual credit transactions, participants are considering a variety of market conditions including future carbon intensity reduction targets, future expectations of clean fuel availability, other state and federal policies, and other factors that are not possible to capture with modeling.

The methodology for estimating the cost per ton of greenhouse gas emissions reduced, broken out into costs per ton of gasoline and ton of diesel emissions reduced, can be found in Appendix B.

[4] Additional data on credit prices is posted monthly on the CFS Data and Reports webpage.

[5] RCW 70A.535.090(1)(e)

Renewable natural gas reporting

RCW 70A.535.150(2): The department must include in the report required by RCW 70A.535.090(1) information that includes the amount, generation date, and geographic origin of renewable thermal certificates representing the biomethane environmental attributes claimed by each reporting entity for the fuels described in this subsection.

In 2023, the Legislature passed Senate Bill 5447 to promote the production and consumption of alternative jet fuel, also called sustainable aviation fuel, in Washington. In that bill, the Legislature directed Ecology to include in this report the amount, generation date, and geographic origin of renewable thermal certificates representing the biomethane environmental attributes claimed by each producer or supplier of alternative jet fuel.

So far, no RNG originating in Washington or along pipelines serving Washington has been claimed in the program. All of the RNG reported in the CFS has utilized book-and-claim accounting. Book-and-claim accounting is a system that allows fuel producers to document the climate benefit of a fuel produced in one location and assign the climate benefit to fuel consumed in another location. This is done by separating fuel volumes from the environmental attributes (in this case, lower greenhouse gas emissions). A formal document called a renewable thermal certificate is created to represent the environmental attributes of the fuel, then the renewable thermal certificate is separated from the original fuel volume and associated with an equal volume of fuel in a second location.

The table below summarizes all the RNG claimed in the CFS during 2024 including the location where the RNG was produced, the date the renewable thermal certificate was created (also referred to as the vintage of the certificate), and the amount of fuel associated with each certificate.

Table C: Geographic origin, generation date, and amount of RNG reported in the CFS in 2024

Geographic Origin	Vintage	Amount in dekatherms
New York	Sep-23	15,706
New York	Dec-23	7,923
Michigan	Jan-24	3,069
Michigan	Feb-24	3,884
Texas	Mar-24	106,237
Michigan	Mar-24	4,277
New York	Mar-24	2,470
Michigan	Apr-24	12,314
Michigan	May-24	11,929
Texas	Jun-24	103,968
Michigan	Jun-24	11,215
New York	Jun-24	26,373
Michigan	Jul-24	12,496
Michigan	Aug-24	12,591
Texas	Sep-24	107,271
Michigan	Sep-24	13,221
New York	Sep-24	25,531
Michigan	Oct-24	14,852
Michigan	Nov-24	15,133
Texas	Dec-24	118,128
Michigan	Dec-24	15,206
New York	Dec-24	28,215

In 2024, all of this RNG was claimed in Washington for use in heavy-duty spark ignition engine vehicles or in light- or medium-duty internal combustion engine vehicles that run on natural gas. Examples of vehicles in Washington that run on natural gas include garbage trucks and transit buses.

Conclusion

The CFS drives private investment in clean energy used in the transportation sector. Fuel producers that earn revenue through the program are likely to reinvest it in production processes that further lower fuel carbon intensity, importing alternative fuels, and more low-carbon fuel infrastructure. The policy also provides an incentive to decarbonize electricity generation in support of the Clean Energy Transformation Act by allowing electric utilities to earn revenue based on how clean their electricity is. To build on this success, the program must be responsive to a rapidly evolving transportation fuel market while still providing regulatory certainty for participants of the program.

In 2024, the CFS incentivized increased adoption of low-carbon transportation fuels in Washington. Several hundred participants across a range of industries generated over three million credits. The revenue generated from these credits sent a strong signal that low-carbon liquid, gaseous, and electric fuels have a market in Washington. This will result in more clean transportation projects ranging from biofuel production, EV charging stations, electric vessels – including the state's ferry fleet – and vehicles, biomethane from landfills and dairy farms turned into fuel, hydrogen fueling, and light rail projects and other electrified public transit.

2024 marked the second full year of fuel reporting in the CFS, which, in addition to 2023, covers the first compliance period. New fuel producers and new fuels regularly enter the market, resulting in new questions for the program to address and new opportunities as the transportation fuel market rapidly evolves. Ecology has also performed a biennial technology and innovation review with the goal of monitoring new and emerging transportation fuels and energy technologies. As the transportation fuel market evolves, so will the CFS.

In 2024, low-carbon fuels met and exceeded the compliance requirement to reduce emissions by 1% below the 2017 baseline. This means that the program is successfully incentivizing clean transportation fuels in Washington. However, when there are significantly more credits than deficits, it can result in a lower average price per credit. Washington saw this throughout 2024. California and Oregon have experienced the same issue in the past and demonstrated that the strongest method to rebalance the credit market is to increase the carbon intensity standard and drive more demand for CFS credits.

In 2025, HB 1409 increased the total required reduction in carbon intensity from 20% below the 2017 baseline by 2038 to 45% by 2038. The bill also gives Washington the option to increase the required reduction to as much as 55%, if certain conditions are met. This legislation is expected to help rebalance the market by creating more deficit generation and driving more value per credit while helping Washington meet its statewide limits on greenhouse gas emissions.

Appendix A

Clean Fuel Standard

Possible Costs and Cost-Savings on the Price of Consumer Transportation Fuels

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February 12, 2026

- **Executive Summary**

Implemented and enforced beginning January 1, 2023, The Clean Fuel Standard (CFS) reduces greenhouse gas emissions by gradually requiring fuel producers and suppliers to lower the carbon intensity, or lifecycle greenhouse gas emissions, for transportation fuels. The CFS uses a market-based system, by setting a carbon intensity standard for transportation fuels that decline each year. Producers and suppliers of fuels above the standard generate deficits, while those below the standard generate credits. At the end of each compliance period, producers and suppliers with deficits must purchase enough credits from low-carbon fuel producers and suppliers to make up the difference. This incentivizes the production and use of low-carbon fuels and aims to make them more available and affordable[6]. How these program costs are passed through to fuel prices and eventually to customers is the focus of this report.

In this document, we describe our approach and methodology for determining costs directly attributable to the CFS in 2024, while separating macroeconomic and other exogenous impacts to costs per gallon of gasoline and diesel. Though it is challenging to isolate the cost impacts of the CFS from other market factors, we estimate that a percentage burden of the policies relative to the total increase in 2024 consumer gasoline and diesel prices. In doing so, we estimate the CFS attributed $0.0008 to $0.0027 in increases to gasoline prices, and $0.0007 to $0.0026 in diesel.

As a result of many factors, including multiple new state policies, global macro-economic factors, and regional supply chain issues, we estimate that the prices of gasoline in Washington increased between $0.07 to $0.24, compared to pre-policy price expectations, and diesel from $0.0695 to $0.242 in the 2024 calendar year, depending on market point of comparison. Note that these increases are “at-the-pump" prices and are a result of all market factors. We explain the share of this range that is due exclusively to the CFS later in this report. Higher price impacts are found when comparing the Washington market to all states for which high quality data were found, whereas lower price increases were found when comparing Washington price changes to California and Oregon, which share supply chains with Washington.

A similar analysis conducted on fuel prices in 2023[7] found that when comparing Washington to California, the estimate is that gasoline prices increased $0.15 in 2023, presumably due to the policy changes. When compared to just Oregon, prices increased $0.20 relative to Oregon markets. When comparing Washington to the combined trends in both Oregon and California simultaneously, the estimate was that gasoline prices increased $0.17 on average during 2023, over and above what would have been expected absent the policy changes in 2023. The updated analysis for 2024 shows that

[6] 2023 CFS progress report

[7] Greene Economics, 2025. Clean Fuel Standard - Possible Costs and Cost-Savings on the Price of Consumer Transportation Fuels, Prepared for Washington State Department of Ecology, June 20. Available here.

when comparing 2024 prices to the pre-policy period (2015 to 2022) Washington prices were $0.07 higher than California (note much less than the $ 0.15 in 2023), $0.22 compared to Oregon (somewhat higher than in 2023), and $0.14 higher than California and Oregon combined as a point of comparison (compared to $0.17 in 2023).

In the previous year's analysis, the impact of the CFS was estimated by attributing approximately 2 percent of the observed 2023 gasoline price increase in Washington to CFS compliance costs, reflecting average per-gallon costs of roughly half a cent relative to an overall price shock of approximately $0.34 per gallon. Updated analysis indicates that gasoline markets stabilized substantially in 2024, with the Washington price differential relative to comparable states declining to approximately $0.14 per gallon.

Much of the costs to consumers can be explained by the simultaneous implementation of multiple state policies in 2023, as well as other macro-economic and regional factors discussed in this report. In 2024, the changes experienced in 2023 began to decrease. This is what one might expect, given the nascency of the market, and the transition towards equilibrium prices. Given the inability to separate the impacts of multiple policies, and in isolating other market factors, we estimate a percentage burden of the policies relative to the total increase in 2024 consumer gasoline and diesel prices. We explain the data, methodology, and uncertainty for our estimates in the following sections: **Section II** provides an overall introduction, **Section III** describes the data used**,** **Section IV** explains the approach, **Section V** presents results from our analysis, **Section VI** isolates CFS effects from CCA and macro-economic effects, and **Section VII** concludes the document with a summary of findings and forecast for how results might translate toward 2025 prices and beyond.

I. Introduction

The purpose of this report is to conduct an analysis that estimates the range of possible costs and cost-savings associated with the Clean Fuel Standard (CFS) on the price of consumer transportation fuels for the State of Washington Department of Ecology, pursuant to Washington State legislature RCW 70A.535.090:

> *"The best estimate or range in probable costs or cost savings attributable to the clean fuels program per gallon of gasoline and per gallon of diesel, as determined by an independent consultant whose services the department has contracted."*

In addition, this analysis will focus on the question of how impacts of the CFS in 2024 may be different from the impacts during 2023, the first year of implementing the CFS. The research will focus on how much of the impact is attributable to the CFS and other forces, with a discussion of the confidence about the analysis.

II. Data

Building on the analysis of consumer "prices at the pump" of gasoline and diesel and the impact of the CFS policy in 2023,[8] an updated analysis has been conducted for 2024. As with the previous study, data needed to satisfy two requirements. First, the data needed to be sufficiently robust and longitudinal in nature so that we might have a better understanding of the trends in gas prices over time, preferably over a multiple year time period. Second, the data not only needed to have observations of Washington state prices, but price history from other states as well. Observations outside Washington help to serve as a "control" group. In this case, states that did not implement the CFS or similar greenhouse gas emissions policy will allow us to see what prices were doing at a macro, national level, giving us insight into how Washington prices would have behaved absent of the CFS, the Climate Commitment Act (CCA), and anything else affecting gas prices in Washington.

The same two datasets used last year met those requirements. For the gasoline analysis, the United States Energy Information Administration (EIA) historical price data is appropriate, and similar data from the American Automobile Association (AAA). Both datasets report a weekly statewide average price. While the AAA dataset also has historical diesel prices, much of 2023, the year of the policy change, was not available, so it would be unwise to assume an accurate analysis could be achieved with much of the data during the policy effect missing. With no similar dataset for the diesel market with historical prices at the state level, we implement diesel data from the EIA and compare it with gasoline trends to arrive at an expected impact of CFS on diesel prices. For gasoline, the EIA has weekly gas prices dating back to 2000 for nine states: California, Colorado, Florida, Massachusetts, Minnesota, New York, Ohio, Texas, and Washington. For the AAA dataset, there are historical gasoline prices also back to 2000, for three states: Washington, Oregon, and Idaho.

Analysis in the 2023 report demonstrates near identical observations across datasets, and we find this relationship holds more recent data. We can confidently compare gas prices across states without need for correction or manipulation to the prices.[9]

We adjust all prices based on inflation to January 2024 dollars using the Consumer Price Index (CPI). Figure 1 displays a more national look at trends in the average monthly gas price for each state in the EIA dataset since 2015. Also mapped alongside state gas prices is the U.S. average monthly price of crude oil per barrel. In Figure 2, we present a similar figure, this time more regionally, displaying the West and Pacific Northwest via California, Oregon, Idaho, and Washington.

[8] Greene Economics, 2025. Clean Fuel Standard - Possible Costs and Cost-Savings on the Price of Consumer Transportation Fuels, Prepared for Washington State Department of Ecology, June 20. Available here.

[9] See the 2025 report on 2023 impacts for a detailed comparison of the two datasets.

What can be seen in Figures 1 and 2 is that for the most part, statewide prices tend to behave similarly, all while following the general trend of crude oil prices. At times, regional supply chain issues may cause deviations, but this is the trend by and large. When there is a decrease in price in one state, there is generally a drop in price in all other states as well. Washington, in the fuchsia-colored dotted line, is no exception to this trend. Also for the period between 2015 and 2022, it is clear that Washington gas prices are in general lower than California gas prices, very similar and in line with Oregon, but higher than the other states in the series (Idaho, Colorado, Florida, Massachusetts, Minnesota, New York, Ohio, and Texas). However, if we look at Figure 3, which is this same graph as Figure 1 with bounds placed on 2023, there appears to be a "shock" to Washington's trending gasoline prices in 2023, where they seem to increase at a different pace compared to the other states, and even slightly surpass California prices in July as the highest in the country. This "shock" was studied at length in the 2023 report and is attributed partly due to the state's implementation of the CCA and CFS, among other factors.

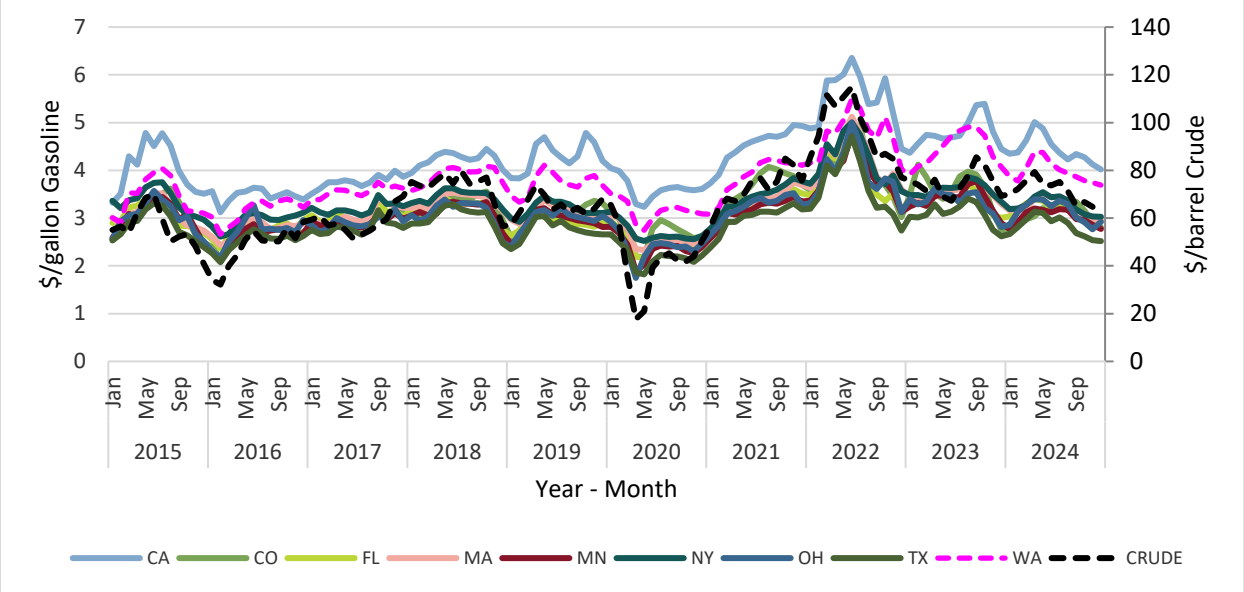

Figure 1. Average Monthly Gasoline Prices by States Nationwide Since 2015

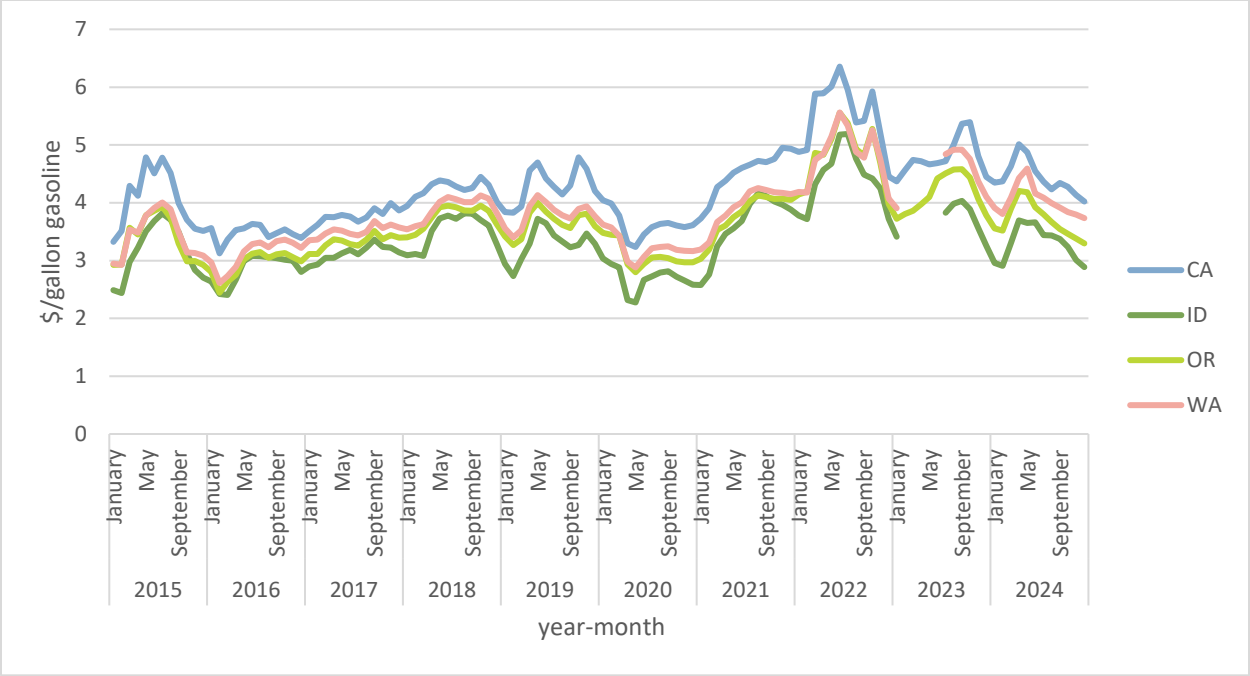

Figure 2. Average Monthly Gasoline Prices in Western States Since 2015

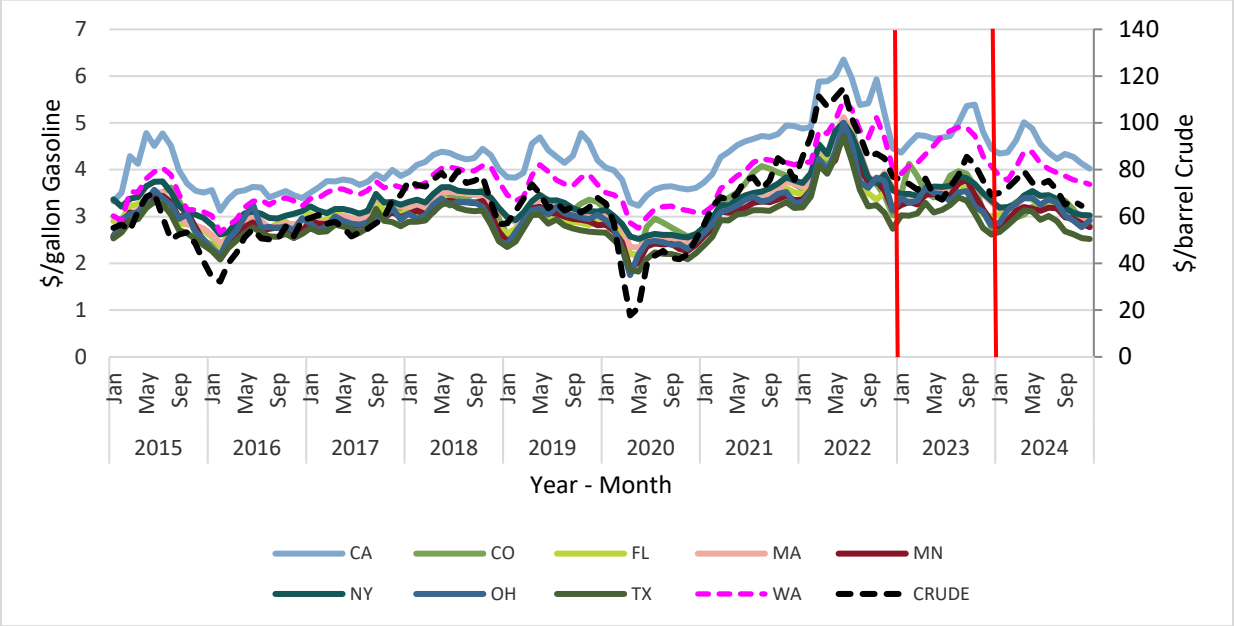

Figure 3. Average Monthly Gasoline Prices by State since 2015 (2023 Denoted by Red Bands)

Similar to the analysis for 2023, it appears that there may be a differentiation in 2024 Washington gas prices that was not observed elsewhere in the country. Note that this is not the same as saying prices increased year-over-year. It is clear from the graph that prices for all states are trending downwards in 2024. The goal of this report is to determine 2024 prices relative to those across time and space in which there is no CFS policy so that we can attribute portions of price changes to the CFS separate from other

factors. The same differentiation appears relative to Oregon and Idaho prices as well. While this points to the differentiation being a result of CCA and CFS policy implementations, a more rigorous analysis is needed to determine the magnitude, certainty, and cost-share that is directly attributable to the CFS. Events that affected regional supply chains, such as production issues at California refineries in late summer 2023 and the closure of the Olympic Pipeline in December 2023, likely played a role too.

Looking further into the data, we can examine the year-over-year prices (YoY), which are popular with news media and reporting outlets to give a sense of changes that consumers might feel relative to an anchor point from the past. In the first year (2023) of the report, this figure showed substantially higher YoY prices relative to 2022. Figure 4 shows an updated figure, comparing 2024 to 2023 (YoY). In this figure, Washington appears to have mostly comparable, if not lower YoY changes between 2023 and 2024. Given the high price changes in 2023, these results could imply that the market is starting to absorb policy shocks one year in. Also of note is that there appears to be a slight increase in California, Oregon, and Washington prices in April of both years, which may be associated with the compliance period for the CFS. Appendix Table A1 to this report shows all the YoY price changes by state for 2023-2024.

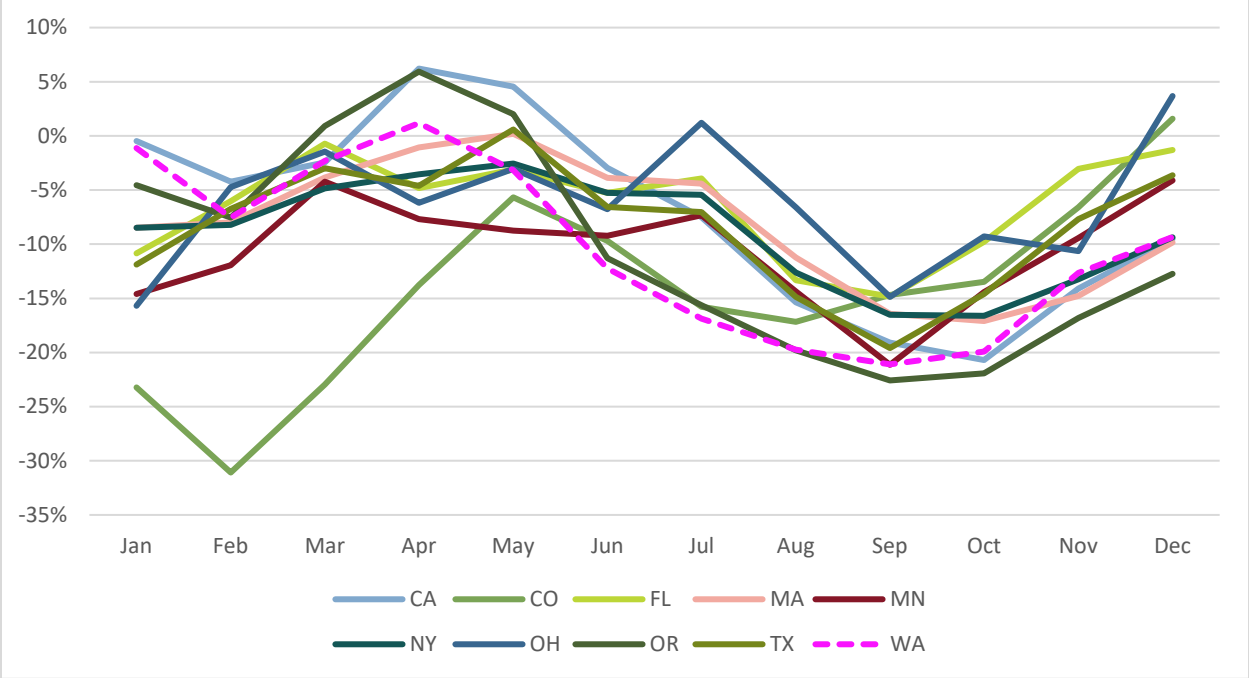

Figure 4. Year over Year Percentage Change in Monthly Gas Prices 2023 to 2024

This analysis further enables a high-level assessment of the effects that policies implemented in 2023 may have had on gasoline prices in 2024. Shown in Table A1, we explore "counterfactual" scenarios to examine what would have happened to Washington prices absent of policy changes. First, we explore Washington prices if they had followed other state price fluctuations. We then compare this to the actual prices

seen in Washington during 2024 to arrive at a hypothetical "what-if" scenario for the state had these policies not been implemented. For example, let's look at January prices. In 2023-2024, California experienced a two-cent decrease (0.5% from $4.37 to $4.35), Oregon dropped 17 cents (4.6%), while the average for all states was a thirty-seven-cent decrease, 11.16 percent. January 2023 prices in Washington were $3.92/gallon. If we consider the scenarios where Washington behaved like California, we would expect to see January 2024 prices at $3.90 (representing a 0.5 percent decrease from the previous year). In actuality, January 2024 prices in Washington were $3.87/gal. This is more of a price decrease when compared to the expected California, but less of a price decrease compared with the same calculation for an Oregon counterfactual price and expected all-states counterfactual price. We do this every month of the year, and on average, we find that Washington experienced prices around 15 cents lower than we would have expected to see in California, 10 cents lower than what we would expected had Washington prices followed the Oregon counterfactual, and 15 cents lower following the all states patterns, absent the CCA, CFS and any other statewide factors. Washington prices seemed to fall significantly faster than anywhere else in the country, which demonstrates stabilization within the policy period (2023 to 2024) and now the goal is to determine these prices in comparison to those pre-2023, before there were any policies.

While this is useful insight, it still does not account for yearly and monthly seasonal trends at the macroeconomic level. For example, though 2022 was the most recent year prior to policy implementation, as we see from Figures 1 and 2, those prices were higher nationwide than at any other point in the last ten years. Analyzing price changes over a longer time period with proper controls will allow us to separate the true effects of the policy from "noise" or shocks in the data that can sometimes arise if a sample size is too small.

After reviewing the data and better understanding its properties and trends, we developed a regression model to estimate the impact of the policies on gasoline prices at the pump for 2024 following up on the methods used last year to examine the impacts in 2023. As stated in the Executive Summary, it is impossible to separate the CFS impacts from other economic and policy impacts at this time, given that data is statewide, the policies began at the exact same time, and there were events that impacted supply of fuel for large portions of the state and some neighboring states. Therefore, any observation of statewide gasoline prices in a week would be subject to all factors simultaneously. We explain later how we apportion a percentage of the cost burden to two of the state's most significant policies, the CCA and the CFS.

III. **Approach**

Our empirical approach is a standard difference-in-differences (DiD) methodology to examine the effect of 2023 policies on Washington state gasoline prices relative to other states in the country that did not experience policy changes. DiD models are a powerful means of causal inference that compares differential impacts of treatment (in this case 2023 CCA and CFS policies and the impact of these policies on 2024 prices) in treated areas (Washington) relative to control areas (in this case other states) that did not have a treatment (policy changes). DiD models have been applied to examine policy impacts in health care and environmental matters, and most notably have been used in examining changes in energy prices due to state or county legislature changes.[10]

Equation 1. Econometric model

$$y_{is} = \alpha + \beta washington_{is} + \gamma 2024year_{is} + \delta washington2024_{is} + pipeline + \pi YM_{is} + \mu S_{is} + \varepsilon_{is} \quad (1)$$

Where:

i denotes week of observation and s denotes the states included in the analysis. Our dataset runs from 2015 through 2024.

y_{is} is the weekly price of gasoline for week i in state s.

"Washington" is an indicator variable equal to one if the observation comes from Washington.

"2024year" is an indicator variable equal to one if the observation took place during a week in 2024.

Pipeline is a binary variable equal to one if the observation came from a week where there were pipeline constraints due to maintenance or fire, and subsequent gasoline blend disruptions. (June 21-30, 2023, and Dec 11-18, 2023).

πYM is a vector of year and month fixed effects to help control for unobservable price trends across time, such as seasonality, regional supply chain issues, or even macroeconomic factors like wars, COVID, or political elections that might impact prices.

μS is a vector of state level fixed effects to control for any time invariant unobserved characteristics of the states in the study.

εis is the error term, which is clustered at the state level.

δ is the coefficient of interest, and we interpret it as the difference in gasoline prices during 2024, between Washington and unaffected states as compared to pre-2023 policies.

[10] Clo, Stefano, and Elena Fumagalli, 2019. The Effect of Price Regulation on Energy Imbalances: A Difference in Differences Design, Energy Economics 81 754-764.

The result of this approach is that the coefficient will be able to tell us how much of the change in prices during 2024 in Washington was likely due to Washington-unique changes (e.g., policies CCA and CFS) and how much of the price change was simply due to economic factors that all other states or states that Washington shares a supply chain with experienced. Similar to the simple YoY comparison above, we run this regression for several counterfactual scenarios, one comparing Washington to only California, only Oregon, and several combinations of states entered into the model. The 2024-Washington effects are isolated with the inclusion of a treated time control variable to analyze the policy impacts in 2024. The output in Table 1, below, identifies the differences between Washington prices in three cases: 1. Using all control states, 2. Using only California as the control state, and 3. Using only Oregon as the control state.

Table 1. DiD Interpretation and Results Using Average Prices

Model	Pre-2023	2023	2024	2024 Difference with Pre-2023	2024 Difference with 2023
Model 1 All Control States	$3.24	$3.46	$3.17	-$0.07	-$0.29
WA	$3.95	$4.59	$4.03	$0.08	-$0.56
		DiD		**$0.15**	**-$0.27**
Model 2 CA Control	$4.49	$4.79	$4.43	-$0.06	-$0.36
WA	$3.95	$4.59	$4.03	$0.08	-$0.56
		DiD		**$0.15**	**-$0.20**
Model 3 OR Control	$3.84	$4.15	$3.70	-$0.13	-$0.45
WA	$3.95	$4.59	$4.03	$0.08	-$0.56
		DiD		**$0.22**	**-$0.12**

In either case, the first “difference” of the “DiD models is to look at the change in price across time for each of the “state” categories. For example, All Control States, pre-2023 had an average price of $3.24. During 2024, the average price for these states was $3.17, resulting in a difference (a decrease) of seven cents between pre-2023 and 2024. Doing the same for Washington, we see that their average price increased from $3.95 to $4.03, a difference of eight cents. The next “difference” of the DiD model then is to subtract these two price changes from one another, hence the “second difference”. In this case, we would find that the difference was 15 cents, suggesting that while Washington state gas prices went up eight cents from pre-2023 levels, the unique-state level impacts in 2024 are opposite of the national trends. If Washington behaved similar to that of the nation, gas prices should have dropped. In essence, this is why the gap

relative to the national trend is greater than state level changes. The same process would hold for the California and Oregon examples, where we would find 15 to 22 cents of the Washington price increase was attributable to 2023 policies. Relative to 2023 however, prices are much lower, and have decreased faster in Washington in this timeframe than any of the three control groups. While this is very similar to what is happening in the regression, influence from explanatory variables can yield a different result than what is seen here using averages.

The comparison between 2024 and 2023 prices provides additional context for the market correction. In all three models, the DiD estimate for 2024 versus 2023 is negative, ranging from -12 cents to -27 cents. This negative value reflects the fact that Washington's prices fell more sharply in 2024 than the prices in the control groups. While this correction reduced the larger gap observed in 2023, the pre-2023 comparison confirms that Washington has not yet returned to its original pricing baseline. Instead, the state appears to have settled into a new equilibrium where gasoline costs remain measurably higher than they would have been, absent the current policy landscape.

IV. **Results**

We estimated the DiD model for several scenarios using Equation 1 and present the results in Table 2 below. The DiD model explains about 84 percent of the variance in gas prices throughout the years for all models. Looking at the top row of the table, it is clear that all coefficients from the 2024 models are smaller than the coefficients for the 2023 models (the second labeled row in the table), implying that CFS impacts were less in 2024 than in the inaugural 2023 year. The Washington-2024 coefficients are very similar to what we found in our “averages” DiD interpretation tables. Gas price increases due to 2024 Washington state policies were seven cents relative to California, and 21.5 cents relative to Oregon. Compared to the AAA national average (one nationwide price per week) and an EIA model with all states (fixed effects), prices in Washington rose by 24 cents in both models. Washington rose significantly higher than Idaho in 2024, but looking at the graphs in Section 2, Idaho is missing a significant portion of 2023 data, so we posit that this is a biased estimate in Column 4. Finally, in Column 6, we run a California Oregon Washington, or “COW” model, where our control group is California and Oregon, two neighboring states that are most similar in terms of supply chain and fuel markets, as well as historical gas price trends. It is no surprise that this estimate is 14 cents, roughly halfway between the two estimates in Columns 3 and 5. These estimates were statistically significant at the 99 percent confidence level, suggesting that there is very high certainty that the 2023 policies had a non-zero impact on gas prices in Washington, making the change in gas prices highly likely attributable to the two policy changes.

Table 2. Abbreviated DiD Regression Model Results

VARIABLES/ Control Group	(1) AAA US Avg.	(2) All States FE	(3) OR	(4) ID	(5) CA	(6) COW
Washington_2024	0.240***	0.240***	0.215***	0.365***	0.0724	0.143***
	(0.0491)	(0.0313)	(0.0578)	(0.0576)	(0.0587)	(0.0503)
Washington_2023	0.514***	0.360***	0.287***	0.486***	0.252***	0.273***
	(0.0556)	(0.0380)	(0.0539)	(0.0509)	(0.0624)	(0.0520)
Constant	2.664***	3.904***	3.048***	2.778***	3.681***	3.684***
	(0.0419)	(0.0233)	(0.0428)	(0.0456)	(0.0514)	(0.0403)
Observations	976	6,683	1,009	978	1,011	1,531
R-squared	0.857	0.821	0.833	0.842	0.828	0.839

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

V. CFS Attribution

As stated, the price impacts found in our results suggest that there were effects in Washington during 2024 that were unique in this state that were not experienced elsewhere. This suggests price increase effects from the CFS, CCA, and other regional and global macro-economic factors. Other factors, such as pipeline closures or economic trends for globally traded commodities, have impacts in addition to these two policies but should be controlled for in the model absent unexplained noise in the data. Unable to fully isolate the CFS effects in time and space, we now set out to estimate the portion of costs attributable to each policy as a function of their estimated compliance costs. We utilize data from Argus, a company that conducts analysis on oil and gas prices around the globe.[11] Specifically, they estimate the compliance costs associated with active environmental policies. The 2024 yearly average Washington estimates are shown in Table 3 along with nearby states California and Oregon for comparison. Argus estimates for CCA compliance costs as shown in the table below under the label CAR. CAR stands for Cap-at-the-Rack and refers to a standardized method used by Argus to distribute the full price of a CCA allowance to fuels on a per-gallon basis. CAR bears the brunt of both California and Washington's total compliance obligations. Oregon, not having a CCA initiative has a smaller total cost burden, but higher CFS costs most likely

[11] https://www.argusmedia.com/en

due to a more mature market and more restrictive carbon intensity standards than Washington has at the current moment.

Table 3. Argus Cents per Gallon Compliance Cost Estimates for 2024

	Gasoline			Diesel		
	CAR	CFS	Total	CAR	CFS	Total
WA	32.01	0.36	32.37	40.42	0.43	40.86
CA	29.69	8.94	38.63	38.19	10.16	48.34
OR	-	4.79	4.79	-	5.46	5.46

Interestingly, the total cost estimates from Table 3 are in line with our DiD estimates for price-at-the-pump differences, suggesting an almost complete shifting of the cost burden from suppliers to consumers. Table 3 estimates from Argus would imply that California and Washington gasoline prices should differ by about 6.26 cents. We estimate this difference to be 7 cents. A similar result occurs when comparing Washington and Oregon. Argus compliance costs estimates would explain a difference just north of 27 cents, and we estimate 21.5. Given that Argus is only looking at compliance estimates from the two policies, this gives us more belief that our results and differences in prices between states are due to the policies in Washington.

In 2023, the price increases outpaced the total compliance cost estimates, so there were additional impacts attributed to each policy before isolating the CFS effects. This year, we conduct a similar exercise, but for different reasons. With price increases in 2024 being less than the estimated compliance costs, it is likely that cost-saving measures were taken, or perhaps the knowledge of market behavior in 2023 that allowed for gas prices to remain relatively lower. That being said, it is impossible to know which policy was the impetus for such changes. Thus, we examine the relative cost share of each policy and impose that on the overall cost range of the increase. For gasoline, 0.36 cents from the CFS is roughly 1.12 percent of the total estimated compliance cost. Applying this ratio of compliance costs to the total price increase results from our models, we find that roughly $0.0008 to $0.0027 of gasoline price increases can be attributed to implementation of the CFS in 2024. This is a result of taking our model estimate range ($0.07 for the CA model to $0.24 from the All States model) and multiplying by 1.12 percent.

As discussed, the DiD results also suggest that 2024 CFS price impacts are much less than the initial shock to 2023 prices. The lower Argus estimates of cost burden in 2024, relative to 2023, could explain this. With a full year of policy implementation in place, suppliers might have more awareness, experience, and better forecasting around the CFS. It is also possible that the relatively “easy” regulations of the CFS early on (lower CI

requirements) have allowed suppliers to more readily meet the regulations and carbon intensity standards in the early years of the policy. With that in mind, the Argus burden calculations for 2025 appear slightly higher, so we expect a continued stabilization of prices in that year. It will be interesting to see the development and impact of the policy as carbon intensity standards tighten. Argus predicts a large increase in cost burden in 2026 when this happens and the share of "at the pump" prices will need to take this into consideration. Higher CFS (or similar policy) burdens in other states such as California and Oregon have led to higher gas prices on average and will serve as important comparisons to Washington as the CFS continues into the future.

With no similar dataset for diesel, we resort to the nearest metric. Figure 5 plots monthly gasoline prices in Washington, relative to West Coast (excluding California) diesel prices, and the ratio of the two. For the majority of pre-2023, Washington had nearly a near one-to-one ratio with West Coast diesel prices. The price ratio does seem to rise above one (diesel prices were higher than gasoline) at the onset of 2023, and then below one (diesel prices less than gasoline) for the middle months of 2023 and 2024. For the 2023 yearly average, diesel was 1.01 times higher than the price of gasoline and for 2024 it was .96 as high as diesel. With this in mind, we posit that if our estimate for gasoline is 7 to 24 cents, the impact is most likely in the same range for diesel prices give or take a few percentage points.

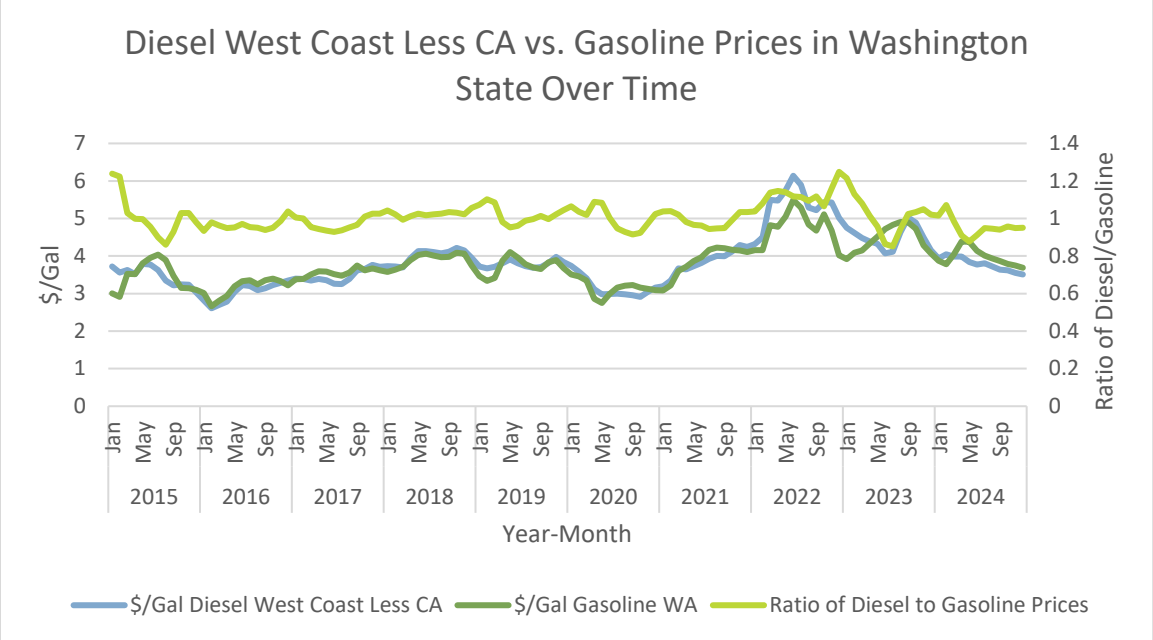

Figure 5. Diesel West Coast Less CA, Gasoline Prices in Washington, and Ratio of Two

Without fully knowing the diesel prices in the state and no ability to run a DiD regression similar to the gasoline market, instead of using the ratios of gasoline to West Coast diesel, which suggested diesel's price level is 0.96-1.01 times that of gasoline, we can also look at the ratios of cost of compliance burdens to get a sense of magnitude in price

change. The estimated cost of compliance of diesel was 0.43 cents, less than half a penny more expensive than gasoline. The share of CFS compliance costs again using Table 5 for a similar exercise as we did with gasoline is 1.05 percent. We first adjust the estimated "at-the-pump" price range in 2024 due to the policies in Washington. We adjust the left tail of our estimate using the lesser of the two factors (.96 using the gasoline/diesel ratios) and we apply the more conservative factor (1.01) to the upper end of our estimate. The result, through similar calculations as performed for gasoline, is that diesel prices could have been somewhere between $0.0695 to $0.2424 higher at the pump due to 2023 policies. Applying our 1.05 percent cost share burden for the CFS, we find that the CFS attributed between $0.0007 and $0.0026 in higher diesel prices.

Conclusion and Discussion

This document evaluates the impact of the Washington state CFS on 2024 gasoline and diesel prices, alongside broader economic factors including the state CCA, which was also implemented in 2023. Using a DiD methodology, the analysis compares gasoline price trends in Washington with other states that did not adopt similar policies. The results indicate that these policies likely contributed to a 7 to 24 cent increase in gasoline prices in 2024, with diesel showing a similar trend. However, due to events in 2024 such as macroeconomic impacts, regional production variability, and the ongoing concurrence of the CCA, isolating the effects of the CFS is challenging. The cost of compliance with the CFS, as estimated by the Department of Ecology and Argus, is minimal per gallon of fuel, suggesting that price increases also stem from the CCA, expectations about the anticipated cost of compliance, early investments in low-carbon infrastructure, and other market factors. Ultimately, the estimated cost burden from the CFS in 2024 is likely within a potential range of $.0008 to $.0027 per gallon, depending on the type of fuel and on the higher end of this range for gasoline.

We have a range of estimated prices due to the differences in the models, specifically in what states we include as a control. When including California or Oregon only, less of a price effect is seen compared to when we include all states as controls. This is likely due to California also being a cap-and-trade state, and also having a CFS policy. Hence this might be a more accurate control state to consider, since California has similar refinery processes and costs associated with emissions credit markets. Oregon, which borders Washington, is importantly relevant as a state of comparison because supplies and demand are similar and somewhat comingled at the border. When we include all states, the estimates of price increases of gasoline and diesel associated with Washington policies are much higher, as many of these states do not have similar fuel-related policies as Washington and the West Coast states. Absent the policies, it is possible the price movement in Washington would have mirrored a more nationwide trend. Ultimately, the true increase attributable to the CFS is probably in the range of these two numbers: $0.0008 to $0.0027 for gasoline and $.0007 to $.0026 for diesel.

Also important in the analysis of 2024 prices, is that the policy impact estimate was lower in Washington relative to 2023. This is seen in the fact that the YoY decrease for Washington was faster than almost anywhere else in the country. This suggests that while there was an initial shock to the fuel markets in 2023, prices are stabilizing as time goes on. However, as more restrictive carbon intensity burdens associated with the CFS become policy, it is likely prices associated with CFS credits in Washington will increase. This is what has been seen recently in California and Oregon, as more stringent carbon intensity requirements have developed. More data and precise observations would be useful to yield a more accurate assessment of updated impacts from the CFS as fuel standards and emission targets are lowered each year.

Supplemental Data: Monthly Gas Prices 2022-2023 by State

Table A-1. Year over Year Monthly Prices by State (2023 to 2024)

State	Year/Month	1	2	3	4	5	6	7	8	9	10	11	12
CA	2024	4.35	4.37	4.63	5.01	4.87	4.55	4.37	4.23	4.34	4.28	4.13	4.02
	2023	4.37	4.57	4.74	4.72	4.66	4.69	4.72	5.00	5.36	5.39	4.81	4.45
	Difference	-0.02	-0.19	-0.12	0.29	0.21	-0.14	-0.35	-0.77	-1.02	-1.12	-0.68	-0.42
	%	-0.46%	-4.23%	-2.45%	6.21%	4.56%	-2.96%	-7.51%	-15.38%	-19.10%	-20.70%	-14.11%	-9.52%
CO	2024	2.67	2.84	2.97	3.04	3.21	3.20	3.26	3.29	3.34	3.15	2.91	2.81
	2023	3.48	4.12	3.86	3.53	3.40	3.54	3.87	3.97	3.91	3.65	3.12	2.76
	Difference	-0.81	-1.28	-0.89	-0.49	-0.19	-0.34	-0.61	-0.68	-0.58	-0.49	-0.21	0.04
	%	-23.23%	-31.08%	-22.95%	-13.78%	-5.69%	-9.68%	-15.77%	-17.16%	-14.69%	-13.49%	-6.58%	1.58%
FL	2024	3.03	3.17	3.31	3.39	3.36	3.20	3.29	3.21	3.05	2.98	2.96	2.97
	2023	3.40	3.37	3.34	3.57	3.47	3.38	3.42	3.70	3.58	3.30	3.05	3.00
	Difference	-0.37	-0.20	-0.02	-0.17	-0.11	-0.18	-0.13	-0.49	-0.53	-0.32	-0.09	-0.04
	%	-10.85%	-6.04%	-0.72%	-4.82%	-3.11%	-5.27%	-3.92%	-13.33%	-14.84%	-9.78%	-3.05%	-1.30%
ID	2024	2.96	2.91	3.30	3.70	3.65	3.66	3.44	3.44	3.37	3.24	3.01	2.88
	2023	3.41	-	-	-	-	-	3.83	3.98	4.03	3.89	3.56	3.26
	Difference	-0.46	2.91	3.30	3.70	3.65	3.66	-0.39	-0.55	-0.66	-0.65	-0.55	-0.37
	%	-13.35%	-	-	-	-	-	-10.17%	-13.75%	-16.33%	-16.71%	-15.55%	-11.40%
MA	2024	3.16	3.16	3.21	3.40	3.52	3.43	3.45	3.36	3.13	3.02	2.96	2.97
	2023	3.45	3.43	3.34	3.44	3.51	3.57	3.60	3.78	3.75	3.64	3.48	3.30
	Difference	-0.29	-0.27	-0.13	-0.04	0.01	-0.14	-0.16	-0.42	-0.62	-0.62	-0.51	-0.32
	%	-8.49%	-7.97%	-3.83%	-1.07%	0.19%	-3.89%	-4.40%	-11.23%	-16.44%	-17.10%	-14.76%	-9.83%

State	Year/Month	1	2	3	4	5	6	7	8	9	10	11	12
MN	2024	2.77	2.92	3.12	3.20	3.17	3.12	3.19	3.18	2.98	2.96	2.86	2.77
	2023	3.24	3.32	3.26	3.47	3.47	3.44	3.44	3.71	3.78	3.46	3.16	2.89
	Difference	-0.47	-0.40	-0.14	-0.27	-0.30	-0.32	-0.25	-0.53	-0.80	-0.50	-0.30	-0.12
	%	-14.60%	-11.93%	-4.23%	-7.70%	-8.74%	-9.23%	-7.33%	-14.35%	-21.14%	-14.43%	-9.44%	-4.11%
NY	2024	3.19	3.20	3.27	3.45	3.55	3.44	3.45	3.37	3.19	3.08	3.03	3.03
	2023	3.48	3.49	3.44	3.57	3.64	3.63	3.65	3.86	3.82	3.69	3.50	3.34
	Difference	-0.30	-0.29	-0.17	-0.13	-0.09	-0.19	-0.20	-0.49	-0.63	-0.61	-0.46	-0.31
	%	-8.48%	-8.22%	-4.86%	-3.55%	-2.56%	-5.27%	-5.45%	-12.62%	-16.51%	-16.62%	-13.25%	-9.36%
OH	2024	2.86	3.13	3.29	3.39	3.39	3.25	3.37	3.29	3.02	2.91	2.77	2.92
	2023	3.39	3.29	3.34	3.62	3.50	3.48	3.33	3.52	3.54	3.21	3.10	2.81
	Difference	-0.53	-0.16	-0.05	-0.22	-0.11	-0.24	0.04	-0.23	-0.53	-0.30	-0.33	0.10
	%	-15.69%	-4.73%	-1.44%	-6.17%	-3.03%	-6.77%	1.20%	-6.59%	-14.85%	-9.28%	-10.64%	3.68%
OR	2024	3.55	3.52	3.90	4.21	4.18	3.92	3.80	3.67	3.54	3.46	3.38	3.30
	2023	3.72	3.81	3.86	3.97	4.10	4.42	4.51	4.57	4.58	4.44	4.06	3.78
	Difference	-0.17	-0.29	0.03	0.24	0.08	-0.50	-0.71	-0.91	-1.03	-0.97	-0.68	-0.48
	%	-4.55%	-7.54%	0.90%	5.93%	2.02%	-11.28%	-15.65%	-19.81%	-22.58%	-21.92%	-16.82%	-12.74%
TX	2024	2.67	2.81	2.98	3.14	3.11	2.93	3.01	2.90	2.68	2.62	2.54	2.52
	2023	3.03	3.02	3.07	3.29	3.09	3.14	3.24	3.41	3.34	3.07	2.75	2.62
	Difference	-0.36	-0.20	-0.09	-0.15	0.02	-0.21	-0.23	-0.51	-0.65	-0.45	-0.21	-0.09
	%	-11.88%	-6.75%	-2.99%	-4.60%	0.59%	-6.56%	-7.03%	-14.86%	-19.59%	-14.60%	-7.70%	-3.63%
WA	2024	3.87	3.78	4.05	4.38	4.38	4.14	4.02	3.94	3.87	3.79	3.75	3.69
	2023	3.92	4.09	4.14	4.33	4.52	4.72	4.83	4.91	4.90	4.73	4.29	4.07
	Difference	-0.04	-0.31	-0.10	0.05	-0.14	-0.58	-0.81	-0.97	-1.03	-0.94	-0.54	-0.38
	%	-1.12%	-7.53%	-2.31%	1.18%	-3.16%	-12.24%	-16.86%	-19.75%	-21.10%	-19.92%	-12.64%	-9.34%

Appendix B

Method for estimating the cost per ton of greenhouse gas emissions reduced

The estimates were made by dividing the probable cost per gallon of fuel provided in section (c) by the ratio of MT CO_2e reduced discussed in section (d) to gallons of fuel reported. This is shown in the formula below.

$$\frac{Price}{\mathrm{MTCO_2e}\ reduced} = Probable\ cost\ per\ gallon\ of\ fuel \div \left(\frac{Total\ Credits\ or\ Deficits}{Gallons\ of\ fuel\ reported}\right)$$

Where:

$Probable\ cost\ per\ gallon$ is the value estimated for 2024 by an independent consultant given in section (c) of this report

$Total\ Credits\ or\ Deficits$ is the MT CO_2e relative to the 2024 carbon intensity standard as described in section (d) of this report.

$Gallons\ of\ fuel\ reported$ is the number of gallons or gallon equivalents reported in the Washington Fuel Reporting System during 2024

Estimated cost per ton of gasoline emissions reduced

Because section (c) provides a range of possible cost impacts on retail gasoline, we calculated a range of estimated costs per ton of greenhouse gas emissions reduced by gasoline and gasoline alternatives.

$$(\$0.0008 \leq x \leq \$0.0027) \div \left(\frac{964{,}936\ gasoline\ and\ alternative\ fuel\ credits}{2{,}509{,}020{,}712\ gasoline\ and\ alternative\ fuel\ gallons}\right) = (\$2.08 \leq x \leq \$7.02)$$

Where:

$(\$0.0008 \leq x \leq \$0.0027)$ is the range of possible costs per gallon impacts on E10 gasoline provided in section (c) of this report

$964{,}936\ gasoline\ and\ alternative\ fuel\ credits$ are the net credits generated by gasoline and gasoline alternatives in 2024

$2{,}509{,}020{,}712\ gasoline\ and\ alternative\ fuel\ gallons$ is the sum of gasoline and gasoline alternatives in gallons or gallon equivalents reported in 2024

Estimated cost per ton of diesel emissions reduced

Because section (c) provides a range of possible cost impacts on retail diesel, we calculated a range of estimated costs per ton of emissions reduced by diesel and diesel alternatives.

$$(\$0.0008 \leq x \leq \$0.0027) \div \left(\frac{234{,}763\ diesel\ and\ alternative\ fuel\ credits}{976{,}843{,}830\ diesel\ and\ alternative\ fuel\ gallons}\right) = (\$0.68 \leq x \leq \$2.20)$$

Where:

$(\$0.0008 \leq x \leq \$0.0027)$ is the range of probable costs per gallon impacts on B2.5 diesel provided in section (c) of this report

$1{,}002{,}282.00\ diesel\ and\ alternative\ fuel\ credits$ are the net credits generated by diesel and diesel alternatives in 2024

$848{,}317{,}762\ diesel\ and\ alternative\ fuel\ gallons$ is the sum of diesel and diesel alternatives in gallons or gallon equivalents reported in 2024

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