



Clean Fuels Standard

State Transportation Investment Credit Revenue Generation Forecast

October 2023

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Introduction

The Washington State [Clean Fuel Standard](#) (CFS) requires fuel suppliers to gradually reduce the lifecycle carbon intensity of transportation fuels to 20 percent below 2017 levels by 2034. Entities required to meet the CFS may reduce the carbon intensity of their fuels or purchase CFS program credits¹ from others who are providing transportation fuels with emissions below the requirement. The emissions reduction requirement will decline in stages over the coming years.

The program allows the generation of credits from state transportation investments funded in an omnibus transportation appropriations act that reduce greenhouse gas emissions and decarbonize the transportation sector.

The Washington State Department of Transportation (WSDOT) must, in coordination with the Washington State Department of Ecology (Ecology), identify the amount of credit revenues likely to be generated from transportation investments funded in an omnibus transportation appropriations act.²

The law also requires that WSDOT annually present a detailed projection of the credit revenues generated and a preferred reinvestment strategy for the revenues for the following 10-year period to the Joint Transportation Committee.³ This report focuses on electrification projects because current program rules provide a pathway for alternative fuels. Although eligible under the statute, at this time program rules but do not provide a pathway for active transportation, transit expansion, complete streets, or multimodal investments to generate credits.

This is WSDOT's second annual Clean Fuels Standard report.⁴ This report describes the pathways for projects to be eligible to generate credits; describes the multistep process to generate the revenue forecast for eligible projects; identifies calculation methods to determine fuel use, estimate credits, and forecast credit revenue; lists current investments for inclusion in the forecast; and, lastly, identifies WSDOT's preferred approach to reinvesting credit revenue. At this time, insufficient project data are available to estimate credit revenue and generate a revenue forecast.

Requirement

Under [RCW 70A.535.050](#), WSDOT is required to identify credit revenues likely to be generated from state transportation investments funded in an omnibus transportation appropriations act and prepare a detailed projection of credit revenues from these investments. The agency must also identify a preferred reinvestment strategy for this credit revenue. RCW 70A.535.050(5) states (emphasis added):

¹ Clean Fuel Standard credits are different from carbon cap and invest program allowances.

² [RCW 70A.535.050\(5\)\(a\)](#)

³ [RCW 70A.535.050\(5\)\(b\)](#)

⁴ The first report is available online: <https://wsdot.wa.gov/sites/default/files/2022-10/Clean-Fuels-Program-Credit-Revenue-Generation-Forecast-October2022.pdf>

(a) In coordination with the department, the Washington state department of transportation must immediately begin work on **identifying the amount of credit revenues likely to be generated** under subsection (3) of this section from the state transportation investments funded in an omnibus transportation appropriations act, including the Move Ahead Washington transportation package. It is the intent of the legislature that these credits will be maximized to allow further investment in efforts to reduce greenhouse gas emissions and decarbonize the transportation sector including, but not limited to, additional funding in future years, for ferry electrification beyond four new hybrid electric vessels, active transportation, and transit programs and projects.

(b) Beginning November 1, 2022, and annually thereafter, the Washington state department of transportation must **present a detailed projection of the credit revenues** generated under subsection (3) of this section and a **preferred reinvestment strategy** for the revenues for the following 10-year time period to the joint transportation committee.

Investment eligibility for credit generation

Generation of Clean Fuels Standard credits requires the generation or transfer of a fuel with a carbon intensity lower than the standard set by Ecology. In addition, the entity generating or transferring the fuel must be an eligible and registered reporting entity or credit generator, and the fuel must have a pathway for determining its carbon intensity and calculating credits. [WAC 173-424](#) sets requirements for the generation of credits and deficits for transportation fuels. Credit- and deficit-generating entities are described below.

First fuel reporting entities

The first fuel reporting entity is the first entity responsible for reporting within the CFS program. This entity is the credit or deficit generator for this fuel and may transfer credits or deficits per program rules. WAC 173-424 identifies the first fuel reporting entities and credit generators for liquid fuels, gaseous fuels, and electricity.

Liquid fuels ([WAC 173-424-200](#))

The first fuel reporting entity for liquid fossil fuels is the producer or importer of the liquid fossil fuel. For liquid fuels that are a blend of liquid alternative fuel components and a fossil fuel component, the first fuel reporting entity is both the producer or importer of alternative fuels for the alternative fuel component and the producer or importer of liquid fossil fuels for the fossil fuel component. Within a defined transfer period, liquid fuels can be transferred with or without the credit status, which would be determined by contract between the parties involved in the transfer.

Gaseous fuels ([WAC 173-424-210](#))

The first fuel reporting entities for gaseous fuels are determined based on the fuel and vehicle types:

- **Bio-CNG, bio-LNG, renewable propane**, and products including a portion of these biogenic fuels blended with fossil fuels. The first reporting entity is the producer or importer of the biomethane.
- **Fossil CNG, LNG, L-CNG, and propane**, including the fossil portion of any blend with a renewable fuel component. The first fuel reporting entity is the entity that owns the fueling equipment through which the fossil fuel is dispensed to motor vehicles for transportation use.
- **Fossil propane and fossil-based hydrogen used in fuel cell forklifts**. The first fuel reporting entity is the forklift fleet owner.
- **Hydrogen used in motor vehicles**. The first fuel reporting entity for fossil-based hydrogen is the entity that owns the fueling supply equipment through which hydrogen fuel is dispensed to motor vehicles for transportation use.
- **Renewable hydrogen**, including the renewable portion of any blend with fossil hydrogen. The first fuel reporting entity is the producer or importer of the renewable hydrogen.

Electricity ([WAC 173-424-220](#))

The first fuel reporting entity for electricity used in transportation depends on the equipment the electricity is used to power.

- **Residential electric vehicle (EV) charging equipment**. The entities eligible to earn credits are, in order:
 1. Electric utility.
 2. Backstop aggregator.⁵
 3. EV manufacturers.
- **Nonresidential EV charging** (e.g., public EV charging, fleet vehicles, workplace charging, or multifamily housing sites). The entities eligible to earn credits are, in order:
 1. Owner of charging equipment.
 2. Electric utility.
 3. Backstop aggregator.

⁵ Backstop aggregators are entities approved by Ecology that capture the value of electric vehicle charging when electric utilities do not opt into the CFS.

- **Public transit systems**, such as transit buses, light rail, and ferry vessels. The transit agency operating the system is eligible to generate credits for the electricity used to propel the system.
- **Electric forklifts, electric cargo handling equipment**. The forklift or cargo handling equipment fleet owner is the first fuel reporting entity and is eligible to generate credits. The owner must notify the operator that the owner is generating credits and provide the estimated annual credits and revenue. If the fleet owner does not generate credits, the operator may accept program responsibilities and generate credits.
- **Electric transport refrigeration units (eTRU)**. The eTRU fleet owner is the reporting entity and credit generator.
- **Electric power for ocean going vessels and electric ground support equipment**. The owner of the electric supply and charging equipment is the first fuel reporting entity and credit generator. If the charging equipment owner does not generate credits, the operators may by contract, become the fuel reporting entity and credit generator.

Credit pathways

For a project to earn credits, Ecology must establish a pathway through rulemaking to determine the credits for that fuel type and use case. Part 5 of WAC 173-424 provides the compliance rules and credit pathway requirements. In addition to general calculations, [WAC 173-424-540](https://app.leg.wa.gov/WAC/default.aspx?cite=173-424-540)⁶ provides pathways for fixed guideway vehicles, electric forklifts, and residential EV charging. [WAC 173-424-560](https://app.leg.wa.gov/WAC/default.aspx?cite=173-424-560)⁷ describes generating and calculating credits for zero-emission vehicle (ZEV) fueling infrastructure pathways.

State-funded transportation investments eligible for credits

Of the activities eligible to generate credits, current state-funded transportation investments have the potential to generate credits based on first fuel reporting entity status for electricity. Current eligible state-funded project types include

- Ferry vessel fleet electrification, including terminal charging infrastructure.
- Zero emission fueling infrastructure, including EV charging and green hydrogen refueling infrastructure.
- Transit electrification and other activities that result in the conversion to lower carbon-intensity fuels (such as hydrogen or propane).

⁶ <https://app.leg.wa.gov/WAC/default.aspx?cite=173-424-540>

⁷ <https://app.leg.wa.gov/WAC/default.aspx?cite=173-424-560>

- Electrifying port and rail vehicles and associated infrastructure, as well as providing electric shore power for hoteling vessels.

Although listed in [RCW 70A.535.050\(3\)](#) as project types that must allow the generation of credits, at this time, program rules do not currently provide a pathway for active transportation, transit expansion, complete streets, or multimodal investments to generate credits.

Credit ownership from state-funded investments

Omnibus transportation appropriation act funds support WSDOT investments, grants that WSDOT makes to others, and pass-through funding to others that are managed by WSDOT. Eligible project types noted in the section above fall into all three categories of project funding arrangements. The sections below identify which entities will earn credits from the various types of investments and funding arrangements. Appendix A lists all identified credit eligible investments and funding programs in the 2023-2025 biennial transportation budget.

WSDOT-owned equipment

WSDOT has received funding to continue work to electrify ferry vessels. As the owner of the fleet and charging infrastructure, and as the transit operator, Washington State Ferries (WSF) will be the credit generator for these ferry electrification investments.

Non-WSDOT projects

WSDOT manages grant programs that fund project types eligible for credit generation. WSDOT also manages agreements for pass-through funding that goes directly to non-WSDOT entities named in the transportation budget. The entities receiving funding for these projects, or the users of these project-funded infrastructure improvements if they choose to register and participate, will be the credit generators for these investments.

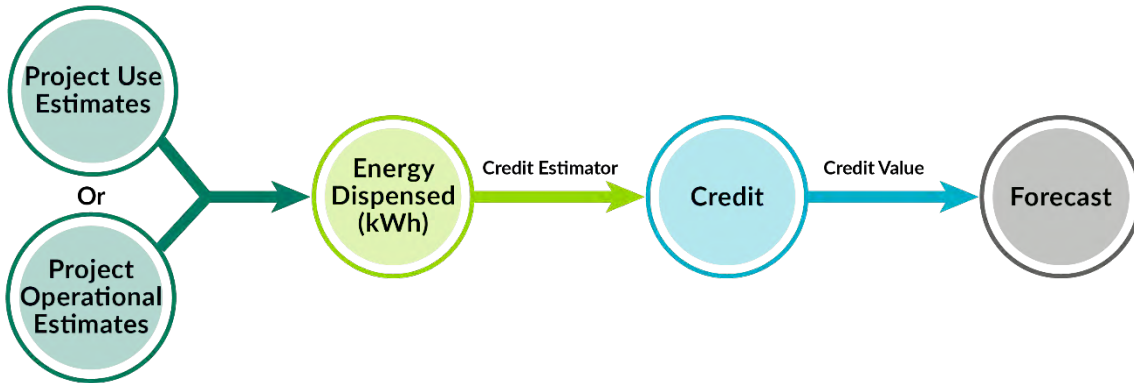
Reporting and forecasting process

Each year, WSDOT must generate a 10-year credit revenue forecast for investments made in an omnibus transportation act that are eligible for credit generation.

Determining project credits and creating the 10-year credit revenue forecast is a four-step process, see Exhibit 1:

1. Determine energy dispensed and forecast it over 10 years.
2. Estimate the number of credits for each investment for 10 years.
3. Determine and assign the value of credits.
4. Forecast credit revenue for the next 10 years.

Exhibit 1 – Credit forecast process



Determine energy dispensed

Program credits are based on the type and quantity of energy dispensed and the type of equipment the energy is used in.

The first step in the process is to determine the quantity of energy dispensed; how this will be done depends on the implementation status of the investment:

- The most accurate information will be a full year of actual energy-dispersed data collected once the project is operational.
- Prior to projects being able to provide use data, fuel dispensed may be estimated based on project features. See Appendix B for information on how various project types can estimate energy dispensed.

Where project energy dispensed must be calculated, specific project information is needed. There may be categories of investments that, while funded, do not have sufficient detail to estimate energy dispensed and credits. Sufficient details for currently eligible projects were not available in time to estimate energy dispensed and credits for this report.

As more detailed project information is available, energy-dispersed values will be provided.

Estimate credit generation

Ecology's Obligation Estimator tool allows program participants to estimate credits and deficits outside of Ecology's reporting system. Because state investments are generating credits, not deficits, this report only addresses the credit estimator portion of the tool.

This tool is useful in determining the expected number of credits an investment can make; however, the final number of credits will be determined when actual use data is reported through Ecology’s online reporting system.

The estimator calculates the credits for a project based on the type and quantity of energy dispensed. The tool includes energy efficiency ratios (EERs) for many fuel and equipment types to determine the credits from changes in fuel use. Work is underway to develop EERs for WSF that will be unique to these vessels and routes.

The results of the tool are the number of credits a project will generate each year from the current year through 2038.

Assign credit value

The value of credits generated will be based on market price and will vary over time. Although Ecology tracks credit transfers, they do not manage the market or set prices.

WSDOT anticipates presenting a range of forecast credit revenues. Over the next year, WSDOT will identify how best to establish credit values for the forecast. Several potential information sources include:

- The [Clean Fuel Standard Cost Benefit Analysis Report](#)⁸ forecasts credit values under two scenarios: least cost and accelerated reduction. In both scenarios, the carbon abatement costs were estimated to be \$156 per million metric tons of carbon dioxide equivalents for the first 10 years of the program.
- Ecology posts monthly credit trading activity reports on its website.⁹ In August 2023, four transactions transferred a total of 27,055 credits. The average price of these credits was \$106.66. At the time of this report, no additional credit transfers had taken place.
- The history of credit prices in [Oregon’s Clean Fuels Program](#) provides insight into how prices have developed over time under a similar program.

Forecast credit revenue

WSDOT must submit a forecast of credit revenue for the upcoming 10 years.

This forecast will be based on the number of credits Ecology’s credit calculator tool estimates for projects funded to date that have sufficient information to calculate energy dispensed multiplied by the best estimate of future credit prices for each for each of the next 10 years.

⁸ <https://ecology.wa.gov/Asset-Collections/Doc-Assets/Climate-change/Reducing-carbon-pollution/20220512CfsCba>, May 12, 2022. Credit price info begins page 40.

⁹ https://www.ezview.wa.gov/site/alias_1962/37916/DesktopDefault.aspx?PageID=37916&alias=1962&utm_medium=email&utm_source=govdelivery

Because CFS took effect at the beginning of 2023, this report identifies only projects funded in the current biennium. In future years, the forecast will be updated with calculations as additional data become available and with newly funded investments.

Calculations methods, tools, and inputs

This section provides details on the reporting and forecasting tools, methodologies, and data inputs that will be used. Specific formulas and individual data inputs are identified in Appendix B.

Energy-dispensed calculation approaches

When available, actual energy-dispensed data will be used to estimate credits. Absent a full year of energy-dispensed data being available, if sufficient project details are available, a project may calculate expected energy dispensed based on these details.

There are two general approaches to calculating energy dispensed based on project details. Specific approaches and inputs to calculate energy dispensed for the project types funded in the 2023-2025 transportation budget are detailed in Appendix B.

Activity-based estimation

Multiplying activity data by an estimated energy use factor results in energy use.

$$\text{[activity value]} \times \text{[energy use factor]} = \text{energy use}$$

- Activity value is the amount of activity, e.g., miles or hours of use.
- Energy-use factor is the kWh per mile or hour of use.

An energy-use factor may be available from manufacturer information, peer-reviewed literature, or project engineering calculations.

This approach may be applicable in two situations:

- One entity owns both the vehicles (or equipment) and the charging equipment, e.g., a bus in a transit fleet or a forklift in a warehouse.
- Adding a vehicle to an existing fleet; the use of existing chargers will go up, but new chargers are not installed.

Energy transfer estimation

This approach estimates the energy use of charging infrastructure based on assumptions about how the chargers will be used.

$$\text{[number of charging episodes]} \times \text{[energy transferred per episode]} = \text{energy use}$$

- Number of charging episodes is the number of charges provided over a period of time (e.g., week, month, year).
- Energy transferred per episode is the average energy provided during one charging episode.

This approach is applicable to chargers that supply energy to vehicles or equipment from more than one owner, such as publicly available vehicle chargers where the charging equipment owner will claim the credits.

Clean Fuel Standard Obligation Estimator

To sell credits under CFS, participants must register and use the [Washington Fuels Reporting System](#).¹⁰ Users will input the quantity of low-carbon fuel dispensed, identify the use case (EV charging, forklifts, shore power, etc.), and identify project-specific details. Ecology provides a number of [program documents](#)¹¹ to guide users through the process.

The backbone of estimating credit revenue from investments is Ecology’s Clean Fuel Standard Obligation Estimator,¹² often referred to as the “credit estimator.” This tool allows program participants to estimate the likely credits from investments based on the quantity of fuel dispensed without using the fuels reporting system. While the estimator uses the same equations and factors and should provide the same results, final credit results are determined in the reporting system based on actual fuel dispensed data.

The factors necessary to determine the change in emissions are built into the credit estimator, this includes emission factors for conventional and substitute fuels, fuel energy intensity values, and EERs for most use cases.

EERs are part of the calculation of how much fuel would have been used absent the investment. For example, the amount of gasoline a vehicle would have needed if it were not electric. Generally, these ratios are built into the credit estimator, but some less common equipment types will need to provide this factor. This is the case for WSF. WSDOT has engaged a consultant to develop the necessary EERs for WSF electric ferries based on the vessel type and route. This work is underway, and factors for the Jumbo Mark II vessel conversions will be available for the next reporting cycle.

The credit estimator provides the number of credits a project may earn each year out to 2038. The number of credits varies each year based on annual program carbon intensity requirements and the carbon intensity of the fuels used. In particular, the carbon intensity of electricity will drop over time as utilities bring on additional renewable resources to phase out coal and natural gas power plants to meet Clean Energy Transformation Act requirements.

¹⁰ <https://ecology.wa.gov/Air-Climate/Reducing-Greenhouse-Gas-Emissions/Clean-Fuel-Standard/Requirements>

¹¹ https://www.ezview.wa.gov/site/alias_1962/37847/clean_fuel_standard_guidance_documents.aspx

¹² Available at: <https://www.ezview.wa.gov/DesktopDefault.aspx?alias=1962&PageID=37847>

Forecasting

Forecasts will present the anticipated credit revenue by year for the next 10 years. Annual forecasts are calculated by multiplying the credits-generated results from the credit estimator by anticipated annual credit values.

Determining credit value

Actual credit values will be determined by the market. Although Ecology tracks credit transfers, it does not price credits or regulate the credit market.

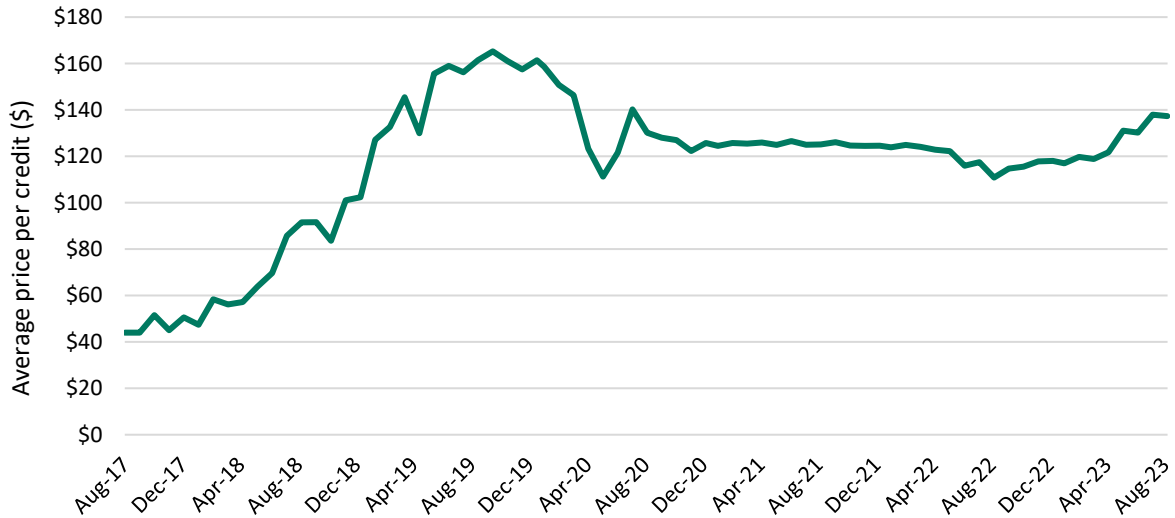
As mentioned above, WSDOT anticipates using several sources of information to establish a range of future credit values: recent values, Oregon's historical Clean Fuels Program values, and the economic analysis conducted for Ecology.

At any point, current credit prices will likely be the best indicator of near-term prices. Values in the more distant future, however, are less certain. As discussed above, to date, Washington has had one month of credit transfers at an average cost of \$106 per credit, with a range of \$105 to \$108.

In 2016, [Oregon established a Clean Fuels Program](#) that is similar to Washington's program. Reviewing the prices of credits exchanged to meet Oregon's compliance requirements provides insight into potential credit prices in the Washington program. Oregon's first credit transfers took place in November 2016, and transfers were made intermittently until August 2017. Beginning in August 2017, credit transfers have happened every month.

Through mid-2018, credit prices remained approximately \$50 per credit. From mid-2018 through the end of 2019, prices rose steadily to about \$160 per credit. Since then, prices have leveled out at about \$125 per credit. See Exhibit 2.

Exhibit 2 – Oregon Clean Fuel Standard program credit price over time



In 2022, Ecology engaged a consultant to prepare the [Clean Fuel Standard Cost Benefit Analysis Report](#).¹³ Among other things, this report forecast credit values under two scenarios: a least cost scenario and an accelerated reduction scenario. In both scenarios, the carbon abatement costs were estimated to be \$156 per million metric tons of carbon dioxide equivalents for the first 10 years of the program.

WSDOT anticipates selecting a high and low credit value to develop a credit revenue forecast range. However, because there are insufficient project data to calculate potential credits at this time, this report does not identify credit values.

The value of credits will be adjusted each year as more information becomes available, the market matures, and the program progresses.

Forecast uncertainty

Multiple sources of uncertainty will affect the credit revenue forecast. Discussion below includes the factors with the most uncertainty and the planned approach for addressing the uncertainty.

As the program matures, project-specific data will help narrow the range of uncertainty on many of these factors, and updated assumptions and approaches will improve forecasting accuracy.

¹³ <https://ecology.wa.gov/Asset-Collections/Doc-Assets/Climate-change/Reducing-carbon-pollution/20220512CfsCba>, May 12, 2022. Credit price info begins page 40.

Price of credits

The price of credits will vary over time based on the demand for credits; market dynamics will influence credit pricing significantly. As the market develops in Washington, credit price forecasts will become less uncertain.

Credit price at time of sale

CFS does not place requirements on how long credits may be held or when they must be sold. Owners of credits can decide when to sell their credits based on their needs. When to sell credits may depend on the current price and the seller's desire for the revenue at a particular time. Selling credits will also depend on a buyer being available to purchase credits.

Insufficient energy-dispensed data

As described above, calculating credits requires energy-dispensed data. Project-specific energy data will be the most accurate estimate of future credit generation and is required to generate credits for sale. However, until such data are available, estimates are needed to generate the revenue forecast.

When sufficient project information is available, energy dispensed can be estimated using the methods provided in Appendix B. Once actual data are available, project credit estimates will be updated.

Although past project performance is a good indicator of future performance, credits will only be generated based on actual energy-dispensed data, and actual project energy dispensed will vary from year to year.

Improving project type energy dispensed estimates

Actual energy-dispensed data will be reviewed each year to determine how it can inform energy-dispensed estimates from similar new projects. As more data become available, the accuracy of estimates should improve.

Current Investments

The tables in Appendix A identify projects and programs funded in the 2023-2025 biennial transportation budget that are expected to be eligible to generate credit revenue.

Credit revenue forecast

WSDOT has identified the investments funded in the 2023-2025 biennium that are eligible to generate credit revenue under the current program rules. Projects and programs have not sufficiently progressed to supply data to estimate potential credit generation from these investments and to forecast associated potential revenue.

WSDOT anticipates having sufficient project data from some of this biennium's investments in time to include an initial credit forecast in the 2024 version of this report.

Reinvestment strategy

Transportation investments funded in an omnibus transportation appropriations act will generate credit revenues. [RCW 70A.535.050\(5\)](#) requires WSDOT to present annually to the Joint Transportation Committee a preferred reinvestment strategy for those revenues that are anticipated to be generated for the following 10 years.

Legislative intent

The Legislature stated that, “these credits will be maximized to allow further investment in efforts to reduce greenhouse gas emissions and decarbonize the transportation sector including, but not limited to additional funding in future years for ferry electrification beyond four new hybrid electric vessels, active transportation, and transit programs and projects.”¹⁴

Reinvestment approach

After seeking input across the agency and considering the legislative intent, WSDOT identified three criteria to use in combination to identify reinvestment priorities:

- **Reinvest in projects with potential to maximize WSDOT’s credit-generation and reinvestment potential.** WSDOT intends that investments made with credit revenues maximize WSDOT’s ability to generate additional credits. This criterion supports the legislative intent that “credits will be maximized to allow further investment in efforts to reduce greenhouse gas emissions.”
- **Seek to maximize the carbon reduction per dollar invested.** Seeking investments that maximize the amount of carbon reduction per dollar invested supports state efforts to meet greenhouse gas reduction limits by maximizing additional emission reductions. In addition, where these investments are eligible to earn additional credit revenue, this approach will enable greater credit revenue and carbon reduction.
- **Locate investments to benefit vulnerable populations and overburdened communities.** WSDOT is working to ensure that its transportation system investments serve all Washingtonians. To this end, the agency is in the process of determining how environmental justice principles will be incorporated into relevant decision-making processes so that vulnerable populations and overburdened communities will benefit from the investments equitably.

¹⁴ [RCW 70A.535.050](#)

Reinvestment in ferry vessel electrification

Currently, ferry vessel electrification is the only investment type eligible to generate credit that returns revenues to WSDOT. WSDOT intends to reinvest credit revenues into additional ferry electrification efforts. By investing in the project type through which WSDOT can earn additional credits, reinvesting credit revenue in ferry electrification will maximize the generation of credit revenues.

In addition, WSF vessels operate in the Puget Sound region; exhaust from these diesel vessels contributes to air pollution in the area. According to the [Washington State Health Disparities Map](#),¹⁵ areas near the Puget Sound, particularly on the east side of the sound, have some of the highest health disparities. Dramatically reducing the exhaust from the vessels will reduce the pollution burden for people living and working in the region, particularly close to ferry routes and terminals.

Reinvestment strategy implementation by partners

In addition to credit revenues that WSDOT will generate, transportation partners receiving state funding may be eligible to generate credits. Where WSDOT plays a part in funding investments by partners (i.e., through grant disbursements or as the pass-through agency), the agency is using various mechanisms to ensure that credit revenue is reinvested to further reduce emissions.

EV infrastructure grants

For Zero-emission Vehicle Infrastructure Partnership grant agreements, WSDOT uses the following WAC and grant guidelines, “bidders and their private sector partners can reinvest any proceeds from ongoing operations to upgrade equipment and expand the site to accommodate higher utilization rates in the future.”

Green Transportation Capital grants

WSDOT is including language in the Green Transportation Capital grant agreements that requires recipients that generate credit revenue from the funded project to reinvest in services and projects consistent with the grant program.

Port electrification grants

The port electrification grant program is being developed. WSDOT intends to require recipients that receive credit revenue from grant-funded investments to reinvest credit revenue consistent with the grant program.

Directly funded projects

The 2023-2025 transportation budget identifies funds that WSDOT is to distribute to specific entities. WSDOT is working through contracting processes to determine how best to ensure credit revenues from these investments are reinvested to provide additional emission reductions.

¹⁵ <https://fortress.wa.gov/doh/wtnibl/WTNIBL/>

Next Steps

This second credit revenue forecast report identifies current investments and how WSDOT will generate a credit forecast when sufficient investment details are available. The 2024 report will include an initial revenue forecast from current investments that have sufficient details available next year. Operating data will become available in subsequent years.

In the interim, WSDOT is undertaking several activities to support this work:

- Working with current funding recipients to collect project data to estimate energy dispensed
- Reviewing options and data for future year credit values
- As new contracts are established, including language to ensure project data is available to forecast credit generation and to direct the reinvestment of credit revenues into additional emission reduction efforts
- Establishing and filling two newly funded positions that will be responsible for the next annual report

Improvements over time

As projects are developed and implemented, the ability to accurately estimate credit revenue will improve:

- **Estimate by project type.** In the future, the state may be able to estimate credit generation based on project type and funding level. However, to develop these estimates, the state must first collect sufficient project-specific data to develop representative estimates. Until that is available, reporting will describe projects funded, but it will not provide initial estimates based on program funding levels alone.
- **Estimate by project details.** Once projects are sufficiently scoped and include assumptions about project effects, initial energy-dispensed estimates can be calculated. Required details for this type of estimate are outlined for currently funded project types in Appendix B. When data are available, these estimates will be used to develop revenue forecasts. Project estimation approaches will be updated as improved assumptions and data become available.
- **Project energy dispensed data.** After investments have been in service for at least 12 months, actual project energy-dispensed data will be used to estimate credits generated. Once a project has this level of data, WSDOT will update revenue forecasts to include specific data.

Appendix A: List of investments funded for the 2023-2025 biennium

The following table lists projects and programs funded in the 2023-2025 transportation budget that may generate Clean Fuels Standard credits consistent with credit pathway requirements established through Ecology’s rulemaking. The list also includes investments with funds reappropriated from the 2021-2023 biennium.

Ferry vessel electrification

Exhibit A.1 – Ferry vessel investments

Project Owner	Program Name	Funding	How Funded	Description
WSDOT	WSF Electrification	\$46,818,000	Direct to WSDOT	Acquisition of a 144-car hybrid electric vessel.
WSDOT	WSF Electrification	\$74,067,000	Direct to WSDOT	Conversion of M/V Wenatchee and M/V Tacoma; preliminary engineering for the Seattle, Bainbridge, and Clinton terminals; and electrification system engineering and program management.
WSDOT	WSF Electrification	\$25,792,000	Direct to WSDOT	Conversion of two Jumbo Mark II vessels to be used on the Seattle/Bainbridge route.
WSDOT	Seattle-Bainbridge Island Terminal Electrification	\$9,300,000	Direct to WSDOT	Engineering and construction of terminal electrification.
Skagit County	Guemes Island Ferry Replacement Project	\$14,000,000	Pass through – managed by Local Programs	Funding to replace the current 40-year-old M/V Guemes with a new all-electric ferry. The ferry is expected to enter full service by 2025.

Electric vehicles

Exhibit A.2 – Investments in electric vehicles and charging

Project Owner	Program Name	Funding	How Funded	Description
Grant recipients	Zero-Emission Access Program (ZAP)	\$3,200,000	Grants – managed by WSDOT PTD ¹⁶	Funds carshare pilot programs in underserved and low- to moderate-income communities that have limited access to public transportation or are in areas where emissions exceed state or federal standards.

¹⁶ Public Transportation Division

WSDOT Clean Fuels Standard – 2023 Credit Revenue Generation Forecast Report

Project Owner	Program Name	Funding	How Funded	Description
Grant recipients	Zero-Emission Vehicle Infrastructure Partnership (ZEVIP) Grants	\$33,746,000	Grants – managed by WSDOT PPP ¹⁷	For the clean alternative fuel vehicle charging and refueling infrastructure program. Grant prioritizes projects that install DC fast chargers along priority corridors to NEVI minimum standards.
Grant recipients	Zero-Emission Cargo Handling Equipment Incentive Program	\$2,500,000	Grants – managed by WSDOT PPP	Support ports in retiring their diesel equipment early and replacing them with zero-emission (battery-electric or hydrogen) equivalent units.
Voucher recipients	Clean Off-Road Equipment Incentives	\$5,000,000	Grants – managed by WSDOT PPP	Encourage off-road equipment users to purchase or lease commercially available zero-emission off-road equipment. Funding held by Office of Financial Management (OFM) until Joint Transportation Commission (JTC) completes medium- and heavy-duty and cargo handling and off-road equipment infrastructure and incentive strategy.
Facility owner	Co-located H2 fueling and DCFC station (Wenatchee)	\$1,500,000	Pass through – managed by PPP	Install co-located direct current fast chargers (DCFC) and hydrogen fueling stations near a state route or publicly owned facility.
Equipment owners	Zero-emission commercial vehicle infrastructure incentives, replace school buses	\$120,000,000	Grants – managed by WSDOT PPP	Incentivize zero-emission commercial vehicle infrastructure and replace fossil-fuel powered school buses with zero-emission buses, including refueling infrastructure. <ul style="list-style-type: none"> • \$20,000,000: expedited funding to zero-emission commercial vehicle infrastructure demonstration projects. • \$100,000,000: unallocated until JTC completes the medium- and heavy-duty vehicle infrastructure and incentive strategy.
Facility owners	Hydrogen refueling infrastructure investments	\$3,000,000	Grants – managed by WSDOT PPP	Funding for advancing hydrogen infrastructure. Currently unallocated until JTC completes the medium- and heavy-duty vehicle infrastructure and incentive strategy.
Facility owner	Mount Vernon Library Commons charging megasite	\$2,100,000	Pass through – managed by PPP	Funding for electric vehicle charging infrastructure for the electric charging megasite project at the new Mount Vernon Library Commons.

¹⁷ Public Private Partnerships Division

Project Owner	Program Name	Funding	How Funded	Description
Grant recipients	Sustainable aviation grant program	\$1,476,000	Grants – managed by WSDOT Aviation	For grants recommended by the department under the sustainable aviation grants program that advance sustainable aviation technology and lead to future innovation. May include, but are not limited to, pilot projects using: <ul style="list-style-type: none"> • Mobile battery charging technology. • Hydrogen electrolyzers and storage. • Electric ground equipment. • Hanger charging technology.

Transit electrification

Exhibit A.3 –Investments in transit electrification and hydrogen

Project Owner	Project Name	Funding	How Funded	Description
Everett Transit	Induction charging infrastructure	\$1,824,000	Grant – managed by PTD ¹⁸	Install two 300kW inductive chargers at each of three locations: College Station, Everett Station, and Seaway Transit Center.
Everett Transit	Replace diesel buses w/ electric	\$6,376,000	Grant – managed by PTD	Purchase five battery electric buses and five cabinet chargers.
Everett Transit	2023-2025 State Bus and Bus Facilities Grant for electric buses	\$5,120,000	Grant – managed by PTD	Replace four diesel buses that have surpassed their useful life with four low-floor battery electric buses and charging infrastructure. The buses will have dual-charging capabilities, allowing them to use both cabinet and inductive chargers.
Intercity Transit	Green hydrogen fuel cell electric bus demonstration project	\$6,857,740	Grant – managed by PTD	Acquire two hydrogen fuel cell buses, fueling infrastructure, and upgrade facility safety. Demonstrate hydrogen fuel cell vehicles as diesel replacements on the most demanding Intercity Transit routes with no degradation to safety, reliability, operating or scheduling efficiency, or public confidence.
Intercity Transit	Zero-emission hydrogen demonstration project	\$6,192,557	Grant – managed by PTD	Purchase three hydrogen-powered fuel cell electric buses to use on select routes, with a 2-year lease on a portable green-hydrogen fueling facility.
Jefferson Transit	JTA E Bus Application	\$1,000,000	Grant – managed by WSDOT (PTD)	Replace two 35-foot diesel buses with two 35-foot battery electric buses to sustain current fixed-route service levels.

¹⁸ Public Transportation Division

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Project Owner	Project Name	Funding	How Funded	Description
King County Metro	Route 48 Electrification	\$1,571,000	Grant – managed by PTD	Install new trolley overhead contact system infrastructure (i.e., trolley wires, poles, and switches) along two segments of 23rd Avenue and at the Mt. Baker Transit Center.
King County Metro	Burien Transit Ctr Layover Charging Infrastructure	\$4,974,311	Grant – managed by PTD	Deploy charging infrastructure for battery-electric buses in the field at layover (on route) site in South King County.
King County Metro	Interim Base Electrification	\$7,000,000	Grant – managed by PTD	Fully electrify Interim Base at South Campus to operate a 120-bus fleet.
King County Metro	South Annex Base Electrification	\$9,000,000	Grant – managed by PTD	Construct a new bus base at Metro's South Campus facility that will support up to 250 new battery electric buses.
King County Metro	Interim base chargers and zero emissions fleet conversion	\$5,412,000	Grant – managed by PTD	Purchase equipment and construct three battery electric bus chargers to support the conversion to zero emissions operations at the new South Base Campus Interim Base. Purchase three 60-foot extended-range battery electric buses to replace aging diesel electric hybrid transit buses.
Kitsap Transit	Inductive Charging Infrastructure	\$3,840,000	Grant – managed by PTD	Install up to 12 inductive charging stations at transit centers to maximize electric vehicle use.
Kitsap Transit	Inductive charging units for transit centers	\$1,412,558	Grant – managed by PTD	Install eight inductive chargers at transit centers throughout Kitsap County.
Link Transit	Urban Bus Fleet Electrification	\$5,942,718	Grant – managed by PTD	Transition to a fully operational fleet of full-sized, extended-range, fast-charged transit buses.
Pullman Transit	Battery-electric bus and charger	\$555,286	Grant – managed by PTD	Purchase one battery electric bus and charging station to replace a 1990s diesel bus.
Spokane Transit	2023 Fleet Electrification	\$4,950,000	Grant – managed by PTD	Replace six diesel buses with three 35-foot and three 40-foot battery electric buses
Twin Transit	Southwest Washington Corridor e-Transit Station	\$717,000	Grant – managed by PTD	The station will include electric bus wave induction charging, electric car charging, ample parking, and visual enhancements.
Twin Transit	Southwest Washington e- transit corridor	\$2,772,480	Grant – managed by PTD	Purchase two hydrogen buses to operate along the I-5 and Highway 12 corridors.

Project Owner	Project Name	Funding	How Funded	Description
Twin Transit	Zero-emission vehicle infrastructure and equipment	\$907,720	Grant – managed by PTD	Purchase one vehicle and equipment lift and two electric charging pads and control equipment to service the zero-emission fleet. Construct two bus pullouts: one at the Lewis County Mall and one at the Chehalis Library. Purchase 12 in-vehicle annunciators and monitors to improve ADA accessibility and coordination of transfers from various routes.

Port electrification projects

Exhibit A.4 – Investments in port electrification

Project Owner	Program Name	Funding	How Funded	Description
Grant recipients	Competitive Grants for Port Electrification	\$26,500,000	Grants – managed by RFP ¹⁹	A port must first adopt a policy that requires vessels that dock at the port to use shore power if the vessel is capable of using such power and when such power is available at the port.
Seaport Alliance	Shore Power Demonstration Project	\$14,000,000	Pass through – managed by RFP	Funding for a zero-emission shore power infrastructure demonstration project.
Seaport Alliance	Drayage Truck Demonstration Project	\$6,300,000	Pass through – managed by RFP	Funding for a zero-emission drayage truck demonstration project.
Tacoma Rail	Zero-Emissions Locomotives	\$5,000,000	Pass through – managed by RFP	Replace two diesel-electric switcher locomotives with zero-emission battery-electric switcher locomotives and install on-site charging equipment at a Tacoma rail facility.
Port of Bremerton & Port Orchard	Breakwater Shore Power	\$2,000,000	Pass through – managed by RFP	Port electrification, which may include the purchase and installation of zero-emission port shore power systems and other zero-emission infrastructure, equipment, and technology.
Port of Anacortes	Port Electrification	\$500,000	Pass through – managed by RFP	Port electrification, including the purchase and installation of zero-emission port shore power systems at Curtis Wharf and fleet conversion to battery electric vehicles.

¹⁹ Rail, Freight, and Ports Division

Appendix B: Calculation methods and tools

The energy-dispensed calculations below are used to determine the quantity of fuel dispensed by project type and cover project types funded in this biennium. Projects fall into five categories, each with its own calculation method:

1. Ferry electrification.
2. Electric vehicle charging infrastructure.
3. Transit electrification.
4. Shore power for ocean-going vessels.
5. Port equipment electrification (off-road equipment).

WSDOT will identify fuel calculation methods and tools for additional project types as they are funded in future years.

Each section below identifies the calculation method and data inputs that funding recipients will need to collect and report:

- **User-provided** requires data from the project.
- **User selection** means that the user will need to select from a list of options.
- **Default** assumption means that the calculation or tool provides default data.

In some cases, the calculation allows either default or user input of project-specific data. User input is preferred, but default data may be used when project-specific data are not available.

To provide one reference that includes all inputs for each investment type, data inputs noted below also include data elements needed to use the credit estimator and calculate the revenue forecast.

Electric vehicle charging infrastructure

This methodology applies to projects that facilitate a transition to electric vehicles by installing EV charging infrastructure. This method applies to charging infrastructure for any type of electric vehicle, from light-duty passenger to large trucks, e.g., drayage trucks.

Credit generation will be forecast based on the energy dispensed at charging stations. Before energy dispensed data are available, energy dispensed can be estimated based on use assumptions. Where estimated energy-dispensed values are used in the forecast, they will be updated with actual data as that becomes available.

This category of investments will use the [AFLEET tool](#)²⁰ to estimate energy dispensed prior to project-specific use data use being available. Exhibit B.1 shows the inputs needed to use the tool. The tool uses the following formula:

²⁰ <https://afleet.es.anl.gov/infrastructure-emissions/public/>

$$[\text{number of chargers, by utilization level}] \times [\text{annual fuel consumption per charger}] = \text{kWh}^{21}$$

- Number of chargers is the number of chargers being installed, by charger type (Level 2 and direct current fast chargers [DCFC]) and utilization level (low, medium, or high).
- Annual fuel consumption per charger default values by utilization level are provided by the tool, but can be updated by the user if better data are available.

Exhibit B.1 – Inputs for vehicle charging and fueling infrastructure

Fuel dispensed inputs	Units	Source
Location	state	user selection
Number of Level 2 chargers at low, medium, and high utilization levels	quantity	user provided
Number of DCFC chargers at low, medium, and high utilization levels	quantity	user provided
OPTIONAL: Annual fuel use per utilization level	kWh	default or user input
OPTIONAL: percentage light duty or heavy duty use	percent	user provided
Results: Fuel Dispensed	kWh	Calculated

Inputs for credit estimator	Units	Source
Utility provider		user provided
Project year of opening	year	user provided
Life of equipment	years	user provided
Displaced fuel type	diesel or gasoline	user provided

Transit electrification

The following methodology is applicable to transit projects transitioning to electric vehicles. This calculation estimates the energy dispensed when operating an electric bus instead of a diesel bus. This approach may also be applicable for situations where the fleet and charging infrastructure owners are the same, such as for a truck fleet.

Energy use information may be based on the following sources:

- Transit agency calculations used to design and engineer the system.
- Transit agency planned vehicle use information (miles).

While no specific tool is available, energy use can be estimated using the following equation and information:

$$[\text{miles per year}] / [\text{average bus efficiency}] = \text{kWh}$$

- Miles per year is the distance the bus is expected to travel each year.

²¹ kWh = kilowatt hours of electricity

- Average bus efficiency in miles per kWh. This information is available from bus manufacturers, reputable research articles, and transit agency experience.

Because this approach calculates the energy dispensed for miles traveled in an electric bus, the calculations are independent of other project elements, such as charging infrastructure or electrical upgrades.

Exhibit B.2 – Inputs for transit vehicles and infrastructure

Fuel dispensed inputs	Units	Source
Miles per year	quantity	user provided
Vehicle efficiency (kWh/mile)	quantity	user provided default
Results: Fuel Dispensed	kWh	Calculated

Inputs for credit estimator	Units	Source
Utility provider		user provided
Project year of opening	year	user provided
Life of equipment	years	user provided
Displaced fuel type	diesel or gasoline	user provided

Port electrification: Shore power

The 2023-2025 transportation budget includes funding for grants to electrify port activities. Shore power, providing electrical power to oceangoing vessels to reduce their diesel engine use while docked, is an applicable use of these grant funds.

The equipment and energy needed depends on the type of vessel that is serviced by the shore power system. The [International Maritime Organization](#)²² provides [information on typical system requirements](#) to support various vessel types, along with approximate cost ranges.²³ The [US Environmental Protection Agency’s \(EPA\) Shore Power Emissions Calculator tool](#)²⁴ estimates the emissions and energy from shore power used for hoteling vessels. The tool includes factors for different vessel types.

The following equation estimates energy use from a shore power system in the Shore Power Emissions Calculator:

$$[\text{average hours per session}] \times [\text{sessions per year}] \times [\text{average energy use/per hour}] = \text{kWh}$$

- Average hours per session is the average number of hours per session by vessel type.

²² The IMO is the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine and atmospheric pollution by ships.

²³ <https://glomeep.imo.org/technology/shore-power/>

²⁴ <https://www.epa.gov/ports-initiative/shore-power-technology-assessment-us-ports>

- Number of sessions per year is the number of powering sessions per station per year by vessel type.
- Average energy use per hour is the energy used by a vessel for one hour of hoteling. This factor is built into EPA’s Shore Power Emissions Calculator tool.

If shore power equipment supplies power to multiple vessel types over the course of a year, this calculation must be completed for each vessel type.

Exhibit B.3 – Inputs for shore power

Fuel dispensed inputs	Units	Source
Vessel type		user selected
Number of vessel calls per year by vessel type	quantity	user provided
Average hours per vessel call by vessel type	quantity	user provided
OPTIONAL: eGRID Region ²⁵		user selected
OPTIONAL: Fuel/Engine Tier		user selected
Results: Fuel Dispensed	kWh	Calculated

Inputs for credit estimator	Units	Source
Utility provider		user provided
Life of equipment	years	user provided
Displaced fuel type	diesel or gasoline	user provided
Project year of opening	year	user provided

Port electrification: Off-road vehicle electrification

This calculation applies to vehicles used within a port facility, marine or airport.

Electrification of drayage trucks, which transfer cargo from a port to nearby facilities, are treated as electric vehicles; their energy use should be estimated using the EV charging infrastructure or transit electrification, depending on ownership of vehicles and charging infrastructure.

The 2023-2025 biennial budget lists the following equipment types as eligible:

- Forklifts.
- Electric transport refrigeration units (eTRU).
- Electric cargo handling equipment (eCHE).
- Electric ground support equipment.

In general, methods will need to be developed in partnership with grant recipients. Calculations are likely to follow this equation. If more than one type of equipment is funded with a grant, this equation must be repeated for each equipment type.

[equipment use] x [energy use rate] = kWh

²⁵ eGRID region and fuel/engine tier is not needed for energy dispensed calculation, but the tool uses these inputs calculate emissions.

- Equipment use is the hours or miles of use in 1 year.
- The energy use rate is the average energy use per mile or hour of use; this information should be available from manufacturers or project engineering.

Exhibit B.4 – Inputs for off-road vehicle electrification

Fuel dispensed inputs	Units	Source
Equipment type		user provided
Number of vehicles or equipment	quantity	user provided
Average annual activity (total miles or hours)	quantity	user provided
Average energy use per mile or hour	quantity	user provided
Results: Fuel Dispensed	kWh	Calculated

Inputs for credit estimator	Units	Source
Utility provider		user provided
Life of equipment	years	user provided
Displaced fuel type		user provided
Project year of opening	year	user provided

Ferry vessel electrification

Ferry vessel electrification will generate credits based on energy dispensed at terminal charging stations by vessel and route.

An EER is a numerical factor that compares the energy efficiency of two propulsion systems using different fuels, such as electricity and diesel fuel. This factor is critical in calculating credit generation because it accounts for the difference in fuel quantities needed for different fuel types. For example, electric motors use energy more efficiently than diesel and gasoline engines.²⁶ The EER takes into this difference in how much energy different fuel types use to provide the same amount of work.

For the vehicle types discussed thus far, Ecology has incorporated appropriate EERs into the credit estimator or otherwise has the information available.

Ecology does not have an EER available for ferry vessels. However, [WAC 173-424-620](#)²⁷ provides a process for entities to apply to use an application-specific EER. WSDOT has initiated this process with Ecology and has engaged consultants to determine the EER for two vessel types (Jumbo Mark II Class and Hybrid-Electric Olympic Class) on specific routes. This work is ongoing, and the EER will be available to prior to the next report.

²⁶ According to fueleconomy.gov, “EVs convert over 77% of the electrical energy from the grid to power at the wheels. Conventional gasoline vehicles only convert about 12%–30% of the energy stored in gasoline to power at the wheels.” <https://www.fueleconomy.gov/feg/atv-ev.shtml>

²⁷ <https://app.leg.wa.gov/WAC/default.aspx?cite=173-424-620>

Because the WSF EERs will be specific to WSF vessels and routes, other ferry systems cannot use these values. Other ferry vessel owners wanting to generate and sell credits from vessel electrification projects would need to develop specific EERs through the application process identified in WAC 173-424-620..

For initial credit estimates, WSDOT will use energy-dispensed quantities developed during vessel planning and engineering. As with other investment types, once operational, WSDOT will collect energy-dispensed data to use in the credit estimator tool. WSDOT will also provide the EER to use in the credit estimator.

The information listed in Exhibit B.5 will need to be provided for each combination of vessel, route, and utility provider.

Exhibit B.5 – Inputs for ferry vessels and infrastructure

Fuel dispensed inputs	Units	Source
Vessel name		user provided
Vessel class		user provided
Route		user provided
Estimated electricity use	kWh	user provided
Results: Fuel Dispensed	kWh	User provided

Inputs for credit estimator	Units	Source
Utility provider		user provided
Life of equipment	years	user provided
Displaced fuel type		user provided
Energy efficiency ratio		user provided
Project year of opening	year	user provided

Battery-electric switcher locomotive engines

The 2023-2025 biennium transportation budget includes funding for Tacoma Rail to replace two diesel-electric switcher locomotives with zero emission battery-electric switcher locomotives, including the on-site charging equipment. Similar to ferry vessels, to generate credits in CFS, Tacoma Rail would need to develop specific EERs through the application process identified in [WAC 173-424-620](https://app.leg.wa.gov/WAC/default.aspx?cite=173-424-620).²⁸

²⁸ <https://app.leg.wa.gov/WAC/default.aspx?cite=173-424-620>

Exhibit B.6 – Inputs for battery-electric switcher locomotive engines

Fuel dispensed inputs	Units	Source
Number of locomotives		user provided
Average energy use per locomotive		user provided
Results: Fuel Dispersed	kWh	Calculated

Inputs for credit estimator	Units	Source
Utility provider		user provided
Energy efficiency ratio		user provided
Life of equipment	years	user provided
Displaced fuel type	diesel or gasoline	user provided
Project year of opening	year	user provided

Applicable Obligation Estimator use cases

The Obligation Estimator, or “credit estimator” includes 19 scenarios that cover common fuel and equipment types. This list identifies the credit estimator use case(s) for each project type identified for funding in the 2023-2025 biennium:

EV charging infrastructure

- Utility-specific electricity in an on-road light-duty vehicle.

Hydrogen fueling infrastructure

- Hydrogen in a heavy-duty on-road vehicle.
- Hydrogen in a light-duty on-road vehicle.

Electric transit buses

- Utility-specific electricity in an on-road heavy-duty vehicle (truck or bus).

Electric shore power

- While the credit estimator does not have a section set up to estimate credits from shore power investments, appropriate factors are available. WSDOT will work with Ecology to appropriately estimate credits from shore power investments as they are identified.

Electric forklifts

- Utility-specific electricity in a post-2022 forklift.
- Utility-specific electricity in a pre-2023 forklift.

Electric transport refrigeration units (eTRU)

- Utility-specific electricity in an on-road heavy-duty vehicle (truck or bus).

Electric cargo handling equipment (eCHE)

- Utility-specific electricity in an on-road heavy-duty vehicle (truck or bus).

Electric ground support equipment

- Utility-specific electricity in an on-road light-duty vehicle.
- Utility-specific electricity in an on-road heavy-duty vehicle (truck or bus).

Ferry vessel electrification

- Same equation in rest of credit estimator, but use vessel-specific EER.

Battery-electric switcher locomotive engines

- WSDOT will consult with Tacoma Rail and Ecology to determine if Tacoma Rail intends to develop an application-specific EER and apply for credits.