

FINAL REPORT

Washington State Medium- and Heavy-Duty Zero-Emission Vehicle and Infrastructure Incentive Program Design Strategy

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Acronyms

ACT	Advanced Clean Trucks regulation
ACF	Advanced Clean Fleets regulation
AFDC	Alternative Fuels Data Center, U.S. Department of Energy
CCA	Climate Commitment Act regulation
CDL	Commercial driver's license
CERA	Carbon Emissions Reduction Account
CMAQ	Congestion Mitigation and Air Quality Improvement
CO₂	Carbon dioxide
COU	Consumer-owned utility
DC	Direct current
EnergIIZE	Energy Infrastructure Incentives for Zero-Emission Commercial Vehicles Project
EPA	U.S. Environmental Protection Agency
FCEV	Fuel cell electric vehicle
FHWA	Federal Highway Administration
GHG	Greenhouse gas
GVWR	Gross vehicle weight rating
HVIP	Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project
IRS	Internal Revenue Service
JTC	Joint Transportation Committee of Washington State
kW	Kilowatt
kWh	Kilowatt-hour
lbs.	Pounds
LTL	Less-than-truckload
MHDV	Medium- and heavy-duty vehicle
MMT	Million metric tons
MOR-EV	Massachusetts Offers Rebates for Electric Vehicles
NEVI	National Electric Vehicle Infrastructure program
NJ ZIP	New Jersey Zero-Emission Incentive Program
NWSA	Northwest Seaport Alliance
NYT VIP	New York Truck Voucher Incentive Program
OEM	Original equipment manufacturer

PANYNJ	Port Authority of New York and New Jersey
PNWER	Pacific Northwest Economic Region
PNWH2	Pacific Northwest Hydrogen Association
PSE	Puget Sound Energy
PUD	Publicly owned utilities
RGGI	Regional Greenhouse Gas Initiative
SIBA	Somali Independent Business Alliance
SUV	Sports utility vehicle
TES	Washington Transportation Electrification Strategy
VW	Volkswagen Clean Air Act Civil Settlement
WSDOT	Washington State Department of Transportation

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User Guide

The following document is a multi-purpose tool for a variety of users.

The **Research and Stakeholder Engagement** portion of this document takes a comprehensive look at the current medium- and heavy-duty vehicle (MHDV) landscape for the public sector, reviews existing zero-emission incentive programs in the United States and Canada, and provides insight into the existing zero-emission MHDV incentive programs available in Washington state. This section also discusses the major themes, ideas, and perspectives from a variety of MHDV stakeholders both in Washington state and beyond. The analysis conducted for this portion of the report informs the user guide and policy recommendations in later sections.

Legislators, policymakers, state agency staff, and the general public can use this section to better understand the vehicles discussed under this incentive program, the programs and policies that are or are not working to incentivize zero-emission technologies for MHDVs, and the on-the-ground perspectives of these programs, including how they can be more useful moving forward.

The **User Guide for Implementing Agency** portion of this report builds on the findings of the previous section to identify key attributes of an incentive program designed for Washington state. The Implementation Plan outlines how the implementing agency can carry out this zero-emission MHDV incentive program, including the steps and timeline needed to successfully put this program together.

State agency staff and legislators can use this to guide their next steps toward program implementation.

The **Policy Recommendations** portion discusses the future policy needs and considerations that are outside the scope of this report but will be necessary to successfully accelerating the adoption of zero-emission MHDVs in Washington state.

Legislators, policymakers, state agency staff, and the general public can use these recommendations to guide future investments in areas outside of this incentive program.

Research and Stakeholder Engagement

[II. Understanding the MHDV Landscape](#)

[III. Review of Existing Zero-Emission MHDV Incentive Programs](#)

[VI. Review of Existing Zero-Emission MHDV Programs in Washington](#)

[V. Stakeholder and Industry Engagement](#)

User Guide for Implementing Agency

[VI. Key Attributes of an Incentive Program for Washington State](#)

[VII. Implementation Plan](#)

Policy Recommendations

[VIII. Policy Gaps, Recommendations, and Future Considerations](#)



Executive Summary

Washington state has an immediate and powerful opportunity to transform its commercial transportation sector by introducing a point-of-sale voucher incentive program to encourage the faster adoption of zero-emission medium- and heavy-duty vehicles (MHDVs). This ambitious initiative should build upon and be modeled after lessons learned from similar successful programs in California, New York, and New Jersey, and be designed to accommodate a wide range of zero-emission commercial vehicles, including off-road vehicles and equipment. Unlike most other MHDV voucher incentive programs, a critical recommended innovation will be including an incentive for infrastructure installation as an integral part of the Washington state incentive program. A hallmark of this program that drives its design is its commitment to equitable access, including for small commercial fleets, and ensuring that the benefits of zero-emission MHDV adoption reach all industry segments and all communities, especially those most impacted by transportation pollution.

While Washington has many innovative incentive, grant, and support programs, the need to create a program targeted specifically on MHDVs—which the state currently lacks—and to combine incentives at the point of purchase for vehicles and infrastructure were strong and recurrent themes among several important findings that emerged during dozens of stakeholder engagement discussion sessions, interviews, and research. The recommended incentive program has been deeply informed by stakeholders' insights and is devised to overcome the key identified barriers to purchasing zero-emission MHDVs. It is designed to build on the best practices of and findings from existing programs and to address the most frequently expressed concerns common across all commercial fleet segments, such as:

- Vehicle cost and the need for help at the time of purchase;
- Infrastructure cost and the difficulty in aligning the timeline of infrastructure installation with vehicle delivery; and
- The confusion about how to match existing technology with current fleet vehicle needs and the assistance needed to bridge this gap.

Manufacturers and dealers also expressed the need for better coordination between Washington and California programs, particularly regarding vehicle eligibility, to facilitate a smoother transition. A lack of information and understanding about the transition to zero-emission has been highlighted by legislators who are seeking a roadmap to strong zero-emission MHDV technology adoption. To this end, strong fleet advisory programs and targeted sector-based outreach leveraging established partners have been recognized as instrumental components for sharing information and aiding the transition. Section II details the current state of the MHDV marketplace, while Section V outlines the stakeholder engagement and feedback findings from this project.

Among the key program design and structure elements that are recommended, several strategic approaches mark the proposed incentive program driven by the findings of this report:

- Combine all zero-emission vehicles and equipment (on-road and off-road) into a single program and user interface;
- Simplify eligibility requirements for industry and maintain consistency across regions by aligning eligibility and incentive levels with California and other state programs;
- Include simplified infrastructure incentives in the same program as vehicle incentives to streamline the user planning process;
- Make incentives “stackable” (i.e., able to be combined with other incentives) to the maximum level possible for both vehicles and infrastructure, promoting comprehensive financial support that allows for the combining of incentives to cover a larger portion of vehicle and infrastructure costs;
- Provide financial enhancements for select populations such as vehicles in disadvantaged communities and small, minority-owned businesses, with considerations for supporting the secondary market;
- Create a centralized user and manufacturer portal for information, application, and assistance, with a priority placed on ease of use;
- Support smart and effective fleet implementation via a robust fleet assistance and qualification program that is structured to guide a fleet to find the right vehicle and infrastructure plan for their current and future needs; and
- Operate the program via a skilled third-party administrator to ensure a streamlined and efficient participant experience, faster program launch, and reduced state government staffing requirements.

Combined Vehicles and Equipment, Streamlined Eligibility: It is essential to delineate the eligibility criteria that serve as the foundation for participation. The program encompasses many vehicles, including on-road vehicles starting from Class 2b—heavy work pickups and vans—and extending through Class 8—heavy tractor-trailer units and refuse trucks. Uniquely, the proposed program also directly includes zero-emission off-road equipment, allowing fleets with both on- and off-road equipment the simplicity of one site to process all their needs. Importantly, the recommended program is inclusive of all zero-emission product options and incorporates both battery-electric and hydrogen fuel cell electric models. To streamline the eligibility process for industry, the program will recognize all vehicles recognized under California's Clean Truck and Bus Voucher Incentive Project (HVIP) and those under the federal Commercial Clean Vehicle Credit program. Additionally, manufacturers have the flexibility to petition for vehicle certification for any unique vehicles needed for Washington's specific operating conditions. The program's inclusivity also applies to off-road equipment, covering most commercial and municipal-use vehicles, with eligibility criteria mirroring California's Clean Off-Road Equipment (CORE) Voucher Incentive Project model, recognizing equipment qualified for federal program funding, and providing a petition process for

manufacturer consideration. This comprehensive eligibility framework ensures that a wide range of zero-emission vehicles and equipment can benefit from the program, supporting Washington state's environmental objectives and adopting clean transportation technologies while reducing industry and administration workload.

Consistency across state programs is demonstrated by the recommended vehicle voucher amounts (Table 1).

Table 1. Recommended Base Vehicle Voucher Amounts

Gross Vehicle Weight Rating (lbs.)	Vehicle Class	Voucher Amount
8,501–10,000	Class 2b	\$7,500
10,001–14,000	Class 3	\$45,000
14,001–16,000	Class 4	\$60,000
16,001–19,500	Class 5	\$60,000
19,501–26,000	Class 6	\$85,000
26,001–33,000	Class 7	\$85,000
33,001+	Class 8	\$120,000

In addition, it is recommended that infrastructure be supported and integrated via a simplified incentive and that some vehicle segments receive modifiers of increased or reduced incentives based on the vehicle type, environmental impact, or fleet size (Table 2).

Table 2. Recommended Voucher Modifier Type

Voucher Modifier Type	Amount Above Base
Class 8 Drayage	+ 25%
More Impacted Environmental Risk	+ 15%
Small or Minority-Owned Fleet	+ 25%
In-Use Converted/Remanufactured	- 50%
Used Vehicle	- 50%
Electric Vehicle Supply Equipment (capped at \$30,000)	+ 50% of the base vehicle voucher amount

Flexible Incentives/Benefits for All Communities and Users: The incentive structure is designed to be robust and flexible, allowing participants to combine various funding sources for maximal financial support. Incentive amounts will be scaled according to gross vehicle weight rating, ensuring a tailored approach to different vehicle classes. Moreover, the program proposes enhanced incentives for vehicles serving disadvantaged communities and for small, minority-owned businesses, as well as reduced incentives for secondary market vehicles, to promote broad-based adoption.

Simplified Processes, Centralized Design: Enrollment and certification processes are designed to be intuitive, with continuous support provided to fleets and vehicle sellers to ensure compliance with program requirements. To guarantee a successful launch and sustainable operation, the program will be rolled out in phases, with an emphasis on planning, execution, and ongoing refinement. Legislative support will be crucial for the program's longevity, with annual reviews of funding to ensure it meets evolving demands.

Smart and Effective Fleet Implementation: An innovative pre-approval process will be in place to evaluate participant eligibility, readiness for fleet deployment, and infrastructure preparedness, thus paving the way for a successful transition to zero-emission MHDVs. The program will incorporate a front-end pre-approval process for eligibility and paperwork verification, integrated technical assistance, and targeted sectoral engagement efforts to enhance program outcomes and user experience. To support participants through this transition, the technical assistance services will provide fleets with the necessary information and support to embrace new technologies. Moreover, sector-specific engagement strategies will facilitate collaboration with industry stakeholders, promoting awareness and adoption of zero-emission MHDVs through trusted partners.

Third-Party Administrator: For effective administration and implementation, the incentive program should be a collaborative approach that combines the strengths of the Washington State Department of Transportation (WSDOT) for oversight and the day-to-day operational skills of a third-party administrator. A skilled, external third party can bring a deep bench of specialized operational expertise to launch a program quickly, ensure a streamlined and user-friendly experience for participants, and minimize undue impacts on state agencies. Doing so will reduce the number of staff hours WSDOT would need to implement the program from approximately 530 hours a week to 60 hours a week. The partnership will also foster proactive collaboration with utilities and ensure that the program's infrastructure support meets the state's needs. A dynamic evaluation and adaptation plan will be key to maintain the program's effectiveness over time.

See Sections III and IV for a review of existing national and state incentive programs, successes, and lessons, and see Sections VI and VII for full details on the proposed program design rationale.

Rapid Implementation: This report includes a detailed, phased implementation plan for enacting the recommendations presented. Under the proposed approach, Washington could begin key elements of the recommended program within months and launch a fully functioning incentive program in less than a year. See Section VII for complete details on phased implementation.

Possible Modifications: The proposed zero-emission vehicle incentive program strategically focuses its resources on segments of the transportation sector that would benefit most from point-of-sale vouchers while suggesting exclusions for certain vehicle types and users. Specifically, it is recommended that school districts and their school buses should not be directly eligible for this program due to their current eligibility for \$20 million in funding from the Washington State Department of Ecology. This funding will support the transition of school buses to zero-emission technologies. This approach allows for the potential of leveraging these funds as local matches for federal grant programs, thereby amplifying the impact of government investment. Nevertheless, school districts will maintain access to vital fleet advisory services to assist in their transition. Similarly, transit agencies are advised to continue utilizing and enhancing the funding provided by WSDOT's Green Transportation Capital Program, rather than the proposed voucher program. These agencies, too, will benefit from fleet advisory services, ensuring they are not left without support. It is important to note that buses primarily used for commercial purposes remain eligible, ensuring that the program's benefits extend to a broad range of commercial transportation needs.

Future Policy Considerations: Finally, the report identifies several vital areas of future work that could further reduce barriers to accelerated and widespread zero-emission MHDV adoption. Some of these concepts could take the form of state initiatives or could be organized/facilitated by the state but be operated by private industry. Examples of such future approaches include: a residual value guarantee program, which could stabilize and reduce lease and loan costs by providing a known vehicle value at end of use; an insurance risk pool to help underwrite and reduce the often-higher cost of zero-emission MHDV insurance coverage; and a "reverse auction" process for speeding infrastructure installation. See Section VIII for more discussion.

Washington state is in a unique position to leverage the lessons learned from other successful incentives and create an effective incentive program of its own. The state's comprehensive and forward-looking approach to incentivizing zero-emission MHDV adoption promises to position it as a leader in sustainable commercial transportation. With significant investment and a clear implementation plan, the state is on the threshold of a major shift toward cleaner, more efficient commercial vehicles, marking a significant step toward environmental sustainability and inclusivity in economic growth. By addressing economic, informational, and infrastructure barriers, and by placing a premium on equity, the program is set to facilitate a smooth and inclusive shift toward a cleaner, more sustainable transportation future. With a phased implementation plan and the potential for legislative backing, the program is well positioned to make a significant impact on the state's environmental goals and the health of its communities. Washington state's proposed incentive program is a comprehensive response to the commercial sector's call for support in the transition to zero-emission vehicles.

I. Introduction

Transportation is the largest contributor of greenhouse gas (GHG) emissions in Washington state. Medium- and heavy-duty vehicles (MHDVs), including buses, big trucks, and delivery vans, make up approximately 10 percent of the vehicles on Washington’s roads but are responsible for 30 percent of the state’s on-road GHG emissions and even higher percentages of fine particulates (53 percent) and nitrogen oxides (59 percent).¹ These tailpipe pollutants disproportionately contribute to reduced air quality in low-income and overburdened communities. Battery-electric and hydrogen fuel cell trucks and buses, collectively called zero-emission vehicles, eliminate toxic tailpipe pollutants compared with their conventional counterparts and reduce carbon emissions.

In March 2020, the Washington State Legislature passed the Motor Vehicle Emission Standards – Zero-Emission Vehicles law (RCW 70A.30.010), which directs the Department of Ecology to adopt California’s vehicle emissions standards.^{2,3} This includes new requirements to gradually increase the number of new zero-emission vehicles sold in Washington state. In April of 2023, the federal Environmental Protection Agency (EPA) granted a waiver that allows Washington state—and other states that follow California’s advanced clean truck standards—to start transitioning medium- and heavy-duty trucks from diesel power to zero-emission technology. The waiver clears a path for the Department of Ecology’s Clean Trucks program to take effect. The program requires truck manufacturers to sell and register an increasing percentage of new zero-emission alternatives to diesel, starting with model year 2025.

In July 2020, Washington Governor Jay Inslee, alongside 15 other states, Washington D.C., and Quebec, signed a Multi-State Zero Emission MHDV Memorandum of Understanding. It called for the development of a Multi-State Zero Emission MHDV Action Plan, which was published in July of 2022.⁴ The Action Plan includes more than 65 strategies and recommendations for policymakers to accelerate electric truck and bus adoption, including recommendations for incentives for zero-emission MHDV purchases and infrastructure.

In 2021, the Washington State Legislature passed the Climate Commitment Act (CCA), which establishes a comprehensive program to reduce carbon pollution and achieve GHG limits set in state law.⁵ CCA creates a market-based “cap-and-invest” program that sets a cap on overall carbon emissions in the state and requires businesses to obtain allowances equal to their covered GHG emissions. These allowances are obtained through quarterly auctions hosted by the Department of Ecology or bought and sold on a

¹ chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.ucsusa.org/sites/default/files/2021-09/wa-clean-trucks-report_0.pdf

² <https://ecology.wa.gov/regulations-permits/laws-rules-rulemaking/closed-rulemaking/wac-173-423-400>

³ <https://app.leg.wa.gov/rcw/default.aspx?cite=70A.30.010>

⁴ <chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.nescaum.org/documents/multi-state-medium-and-heavy-duty-zev-action-plan.pdf>

⁵ <https://ecology.wa.gov/Air-Climate/Climate-Commitment-Act>

secondary market. The quarterly auctions generate substantial revenues that are deposited into three specified accounts and then invested into climate projects throughout the state. The Carbon Emissions Reduction Account (CERA) is for projects that reduce emissions from the transportation sector and increase access to public and alternative transportation. The 2023-25 Transportation Budget allocates revenues from CERA and other CCA accounts.

CCA aligns with the requirements of the Healthy Environment for All Act and includes provisions to ensure communities in Washington that are disproportionately impacted by climate change and air pollution benefit from cleaner air.⁶ In addition to the GHG reductions that will result from the cap-and-invest program, CCA also calls for the reduction of criteria air pollutants, such as ozone and particulate matter, in overburdened communities highly impacted by air pollution.

The Washington State Legislature established a new Interagency Electric Vehicle Coordinating Council in 2022 to facilitate better collaboration amongst state agencies on efforts to accelerate electric vehicle adoption and reduce transportation-sector GHG emissions.⁷ The Council is currently engaged in the development of a statewide transportation electrification strategy with a goal of finalizing the strategy by the end of 2023. The Council is also charged with identifying and coordinating state and federal electric vehicle-related funding criteria.

Purpose of Study

The Joint Transportation Committee (JTC) was directed to oversee a project to design and document an infrastructure and incentive strategy to drive the purchase and use of zero-emission MHDVs, as well as cargo handling and off-road equipment, in the state, including but not limited to programs for tractor trucks, box trucks, drayage trucks, refuse trucks, step and panel vans, shuttles, transit buses, school buses, on- and off-road terminal tractors, transport refrigeration units, forklifts, container handling equipment, airport cargo loaders, and railcar movers.

JTC has partnered with zero-emission MHDV experts CALSTART, Pacific Northwest Economic Region (PNWER), and S Curve Strategies—known collectively henceforth as the project team—to perform this work.

In the 2023-25 transportation budget, the following allocations from CERA are held in unallocated status until the completion of this project:

- \$100 million for “implementation of zero-emission commercial vehicle infrastructure and incentive programs and for the replacement of school buses powered by fossil fuels with zero-emission school buses, including the purchase and installation of zero-emission school bus refueling infrastructure” (Sec. 215 (7)(b))
- \$3 million for hydrogen refueling infrastructure investments (Sec. 215 (8))

⁶ <https://ecology.wa.gov/About-us/Who-we-are/Environmental-Justice/HEAL>

⁷ <https://www.commerce.wa.gov/growing-the-economy/energy/clean-transportation/ev-coordinating-council/>

- \$2.5 million for zero-emission cargo handling equipment incentives (Sec. 215 (10))
- \$5 million for clean off-road equipment incentives (Sec. 215 (11))

The goals of the voucher incentive program are to:

- Build a zero-emission MHDV market in Washington state;
- Design an implementation plan that enables smooth integration into agency operations for an incentive program deployment in early 2025;
- Incorporate stakeholder feedback from Washington state to ensure the proposed program works well; and
- Ensure recommendations align with the Washington State Transportation Electrification Strategy (TES).

II. Understanding the MHDV Landscape

Vehicle Type

The U.S. Department of Transportation Federal Highway Administration (FHWA) and EPA classify vehicles based on vehicle type (e.g., automobile, bus, van, truck) and gross vehicle weight rating (GVWR). Using the FHWA classification system, medium-duty vehicles include Class 3–6 vehicles weighing between 10,001–26,000 pounds (lbs.). Heavy-duty vehicles include Class 7 and Class 8 vehicles weighing between 26,001–33,001+ lbs. Later parts of the report discuss EPA Class 2b vehicles, which weigh between 8,501–10,000 lbs., and generally include delivery vans and commercially-used pickup trucks.

Table 3 presents the U.S. MHDV classification system. Figure 1 illustrates the vehicle types by FHWA class.

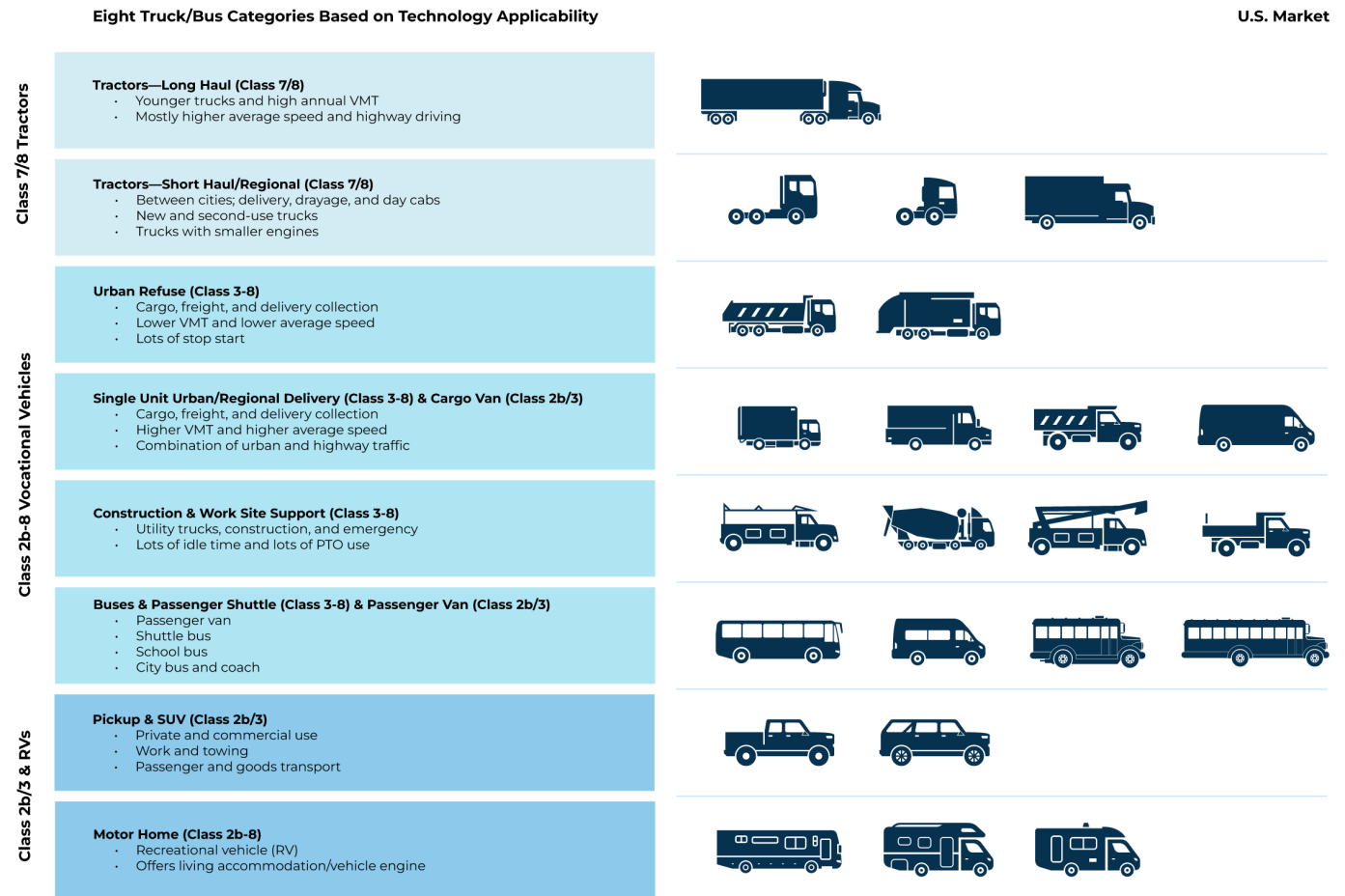
Table 3. Truck Classification in the U.S. Market

GVWR (lbs.)	Vehicle Class	FHWA Classification
8,501–10,000	Class 2b	Light Duty
10,001–14,000	Class 3	Medium Duty 10,001–26,000 lbs.
14,001–16,000	Class 4	
16,001–19,500	Class 5	
19,501–26,000	Class 6	
26,001–33,000	Class 7	Heavy Duty >26,001 lbs.
33,001+	Class 8	

Source: Department of Energy Vehicle Weight Classes & Categories.⁸ Design modifications made by CALSTART.

⁸ [https://afdc.energy.gov/data/10380#:~:text=FHWA%20categorizes%20vehicles%20as%20Light,\(GVWR%20%3E%208%2C501%20lb](https://afdc.energy.gov/data/10380#:~:text=FHWA%20categorizes%20vehicles%20as%20Light,(GVWR%20%3E%208%2C501%20lb)

Figure 1. MHDV Type by Vehicle Class



Source: Global Sales Targets for Zero-Emission Medium- and Heavy-Duty Vehicles – Methods and Application Report.⁹ Design modifications made by CALSTART.

State of Zero-Emission MHDV Technology in 2023

Since zero-emission vehicle manufacturing has not reached the necessary production scale, resale markets do not exist, and aftermarket parts are not available, the upfront cost and total cost of ownership over the life of the vehicle have not reached parity with their diesel and gasoline counterparts in most MHDV segments. Due to this price gap, fleets need help offsetting these costs.

Due to this price gap, fleets need help offsetting these costs.

Zero-emission MHDV sales targets over the eight vehicle segments show early adoption for zero-emission buses and passenger shuttles and vans, reflecting how battery-electric buses have become commercially

⁹ <https://globaldrivetozero.org/publication/global-sales-targets-zemhdvs/>

available from global and national manufacturers with high acceptance and uptake by transit fleets in Washington as the technology has matured and continues to prove its reliability. Targeted subsidies have also been strategically deployed to accelerate the bus segment further and deepen market penetration. Single-unit urban, regional delivery, and short/regional-haul trucks all benefit from traveling relatively shorter distances in urbanized environments and usually charge overnight at depots, like transit buses.

For regional delivery tractors, models are commercially available from national manufacturers but have only recently started deployments in more specific applications where technology is operationally viable. It is essential to highlight the robust availability of vehicle models in the Washington market that can fulfill the duty-cycle requirement of a traditional truck and save fleets operational expenses over the vehicle's life. Today's battery technology is most suitable for regional-haul and drayage applications due to available weight, range, and infrastructure availability (mostly private at depots), with long-haul tractor electrification following slightly later. Fuel cell tractors, which offer ranges sufficient to meet long-haul applications, have yet to be widely commercially available.

Zero-emission specialty vehicles (e.g., construction, refuse, fire, and emergency trucks) have a relatively late start and slow adoption curve due to their lower production volumes and vocation-specific duty cycle to be designed around. Specialty vehicles span many drive cycles and applications, complicating technology readiness and fleets' perceptions of available models. These vehicles often haul weighty loads and may have additional power requirements of a power take-off unit (i.e., a mechanism that helps power other vehicle tools like lifts and cranes).

Off-Road Equipment

The transition of off-road equipment types to electric power is a critical step toward reducing GHG emissions, mitigating climate change, and improving air quality.¹⁰ In the construction sector, electric excavators, loaders, and cranes can operate more efficiently and with less noise, benefiting both workers and surrounding communities. Agricultural equipment, such as electric tractors and combine harvesters, not only cuts emissions but can also reduce the long-term fuel costs for farmers.¹¹ Material handling equipment, including electric forklifts and conveyors, enhances indoor air quality and reduces operational costs in warehouses and distribution centers. Airport ground support vehicles, such as tugs and belt loaders, are ideal candidates for electrification; their fixed routes and duty cycles allow for convenient charging opportunities. Electrifying railroad equipment, particularly yard switchers and maintenance vehicles, can significantly lower emissions along rail corridors, often located near densely populated areas.

The marine industry stands to benefit from the adoption of electric technologies through the electrification of vessels like harbor tugs and ferries, which frequently operate in ecologically sensitive areas. Converting these types of equipment to electric not only aligns with Washington state's GHG emissions reduction goals but also presents an opportunity for operational savings and compliance with increasingly stringent environmental regulations.

¹⁰ <https://pubmed.ncbi.nlm.nih.gov/29660715/>

¹¹ <https://calstart.org/off-road-assessment/>

Charging Infrastructure

Charging support for the electrification of MHDVs is a vital component in the effort to lower GHG emissions, demanding an infrastructure of charging stations that cater to their unique energy requirements. Level 2 chargers are suitable for vehicles with longer dwell times, providing a cost-effective charging solution during off-peak hours or overnight stays, ideal for fleets with predictable schedules and routes. Conversely, direct current (DC) fast chargers are essential for vehicles requiring rapid, high-power charging, accommodating tight schedules and quick turnarounds that are critical for long-haul trucks and buses with limited downtime. The role of these chargers is pivotal in ensuring that electric fleets can operate with minimal disruption, thereby maintaining operational efficiency while reducing carbon footprints.

For fleet owners, partnering with local utility companies is of paramount importance to align charging infrastructure efforts with grid capabilities and to potentially avail of special programs or incentives that utilities may offer. Such partnerships can lead to optimized energy management; cost savings on electricity rates; and infrastructure that is robust, scalable, and capable of supporting the growing demand for electric vehicle charging—a collaboration that underscores the shared commitment to environmental sustainability and the successful transition to an electrified transport sector.

Hydrogen Fuel Cell Vehicles and Refueling

Hydrogen fuel cell vehicles are often considered a better replacement technology for some MHDV use cases, especially long-haul trucking, because the refueling model is like current diesel refueling and the range between refueling is longer. While many MHDV manufacturers are piloting hydrogen fuel cell vehicles, there are not many options for hydrogen fuel cell trucks on the U.S. market today.

Another added consideration for hydrogen fuel cell technology is the need to install entirely new region-wide refueling apparatus. The U.S. Department of Energy is providing initial funding for these efforts through the Regional Clean Hydrogen Hubs program. Seven billion dollars in federal funding will be awarded to between 6–10 regional clean hydrogen initiatives across the United States over the next nine years. Phase 1 of this initiative is slated to begin in 2024 and will include initial planning and analysis activities to ensure that the overall H2Hub concept is technologically and financially viable, with input from relevant local stakeholders.

Market Overview of MHDVs in Washington State

Understanding the MHDV market in Washington state involves looking at vehicle registration and annual sales. The following analysis was conducted using IHS Markit data of vehicle registrations in Washington state. This analysis of the registration data shows at least 95 percent of Washington state's MHDVs are owned and operated by the private sector, with the balance owned by federal, state, and local agencies. This reality is why this recommended voucher program design focuses on the private sector.

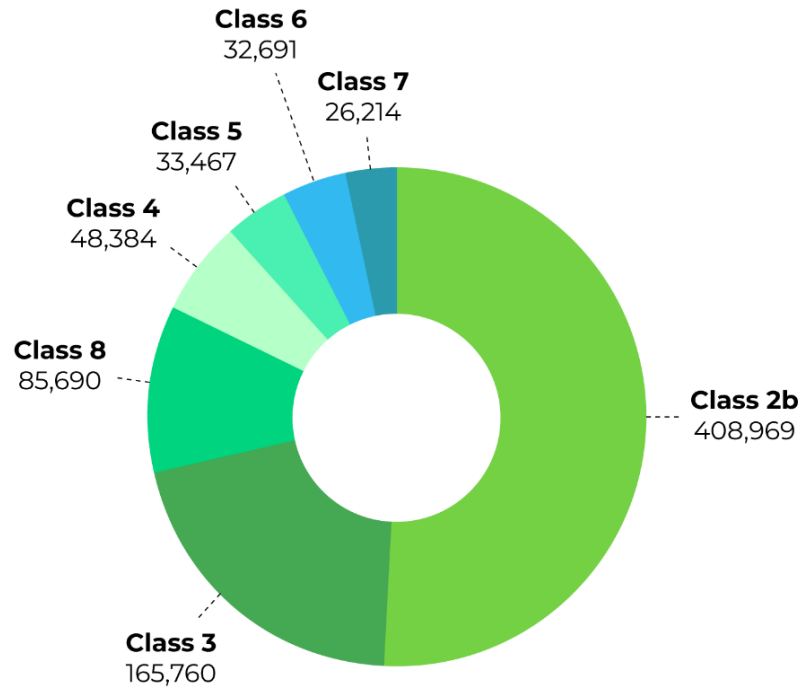
At least 95 percent of Washington state's MHDVs are owned and operated by the private sector.

All vehicles are required to register with the Washington State Department of Licensing to operate, especially for commercial purposes. Registration data gives insight into the number and types of vehicles that are operating within Washington. When matched against annual sales data, this provides a snapshot of the typical fleet turnover rate for each vehicle category. Sales data has been included in this report for the most recent year of sales, identifying the relative market size for each class of vehicle and providing an indicator of the needs of manufacturers.

Washington state had 292,206 registered MHDVs (Class 3–8) as of June 2023, setting a baseline as to how many such vehicles the state currently has and to assist with future vehicle projections. When Class 2b sports utility vehicles (SUVs) and pickup trucks are included, registrations more than double to 798,175. While the data does not determine the number of Class 2b vehicles that are used for commercial purposes, it is recommended as part of this voucher program design that Class 2b vehicles be included to provide fleets that own and operate pickup trucks the opportunity to transition these vehicles to zero-emission.

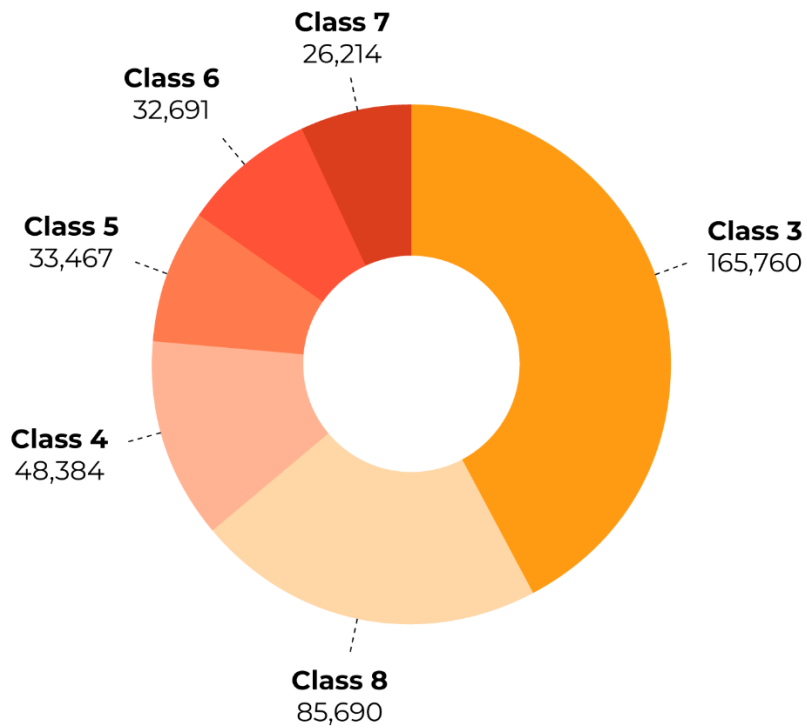
Vehicle sales represent vehicle replacement trends and market growth. They can be used in the short term to predict the opportunity for manufacturers to enter the market and add new models or technology. MHDV annual sales do vary from year to year, sometimes by as much as a four-fold difference. Annual sales are impacted by many factors, including market economy, policy, new model/technology launch time, and fleet purchase plans. Figure 2 illustrates the proportion of registrations by Classes 2b–8. Figure 3 illustrates registrations without Class 2b, as of June 2023.

Figure 2. Washington Vehicle Registrations Classes 2b–8 as of June 2023



Data source: S&P Global (IHS Polk) DMV as of June 2023.

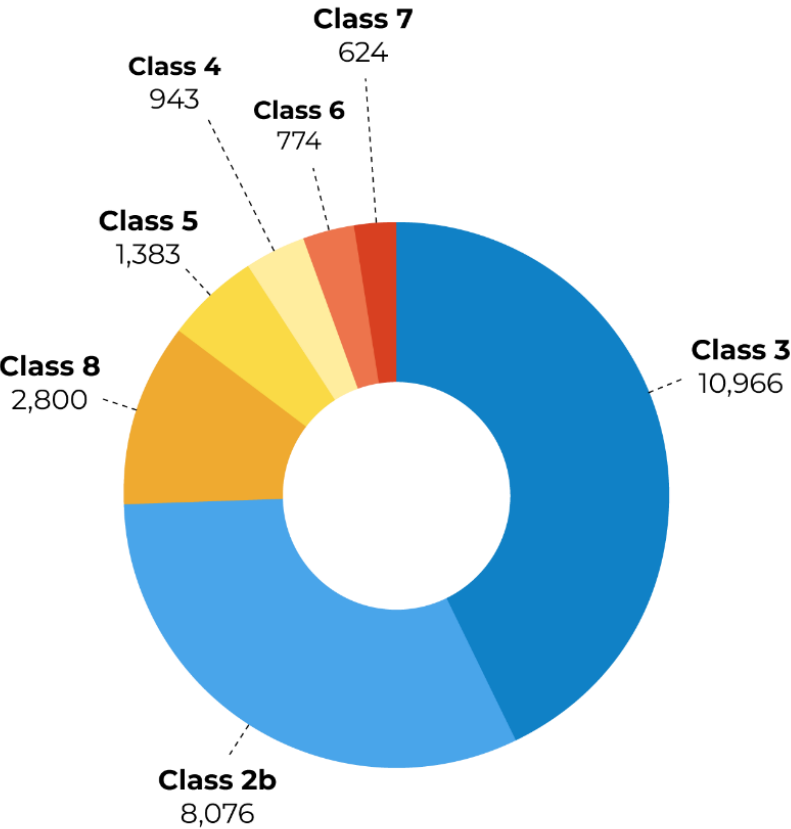
Figure 3. Washington Vehicle Registrations Classes 3–8 as of June 2023



Data source: S&P Global (IHS Polk) DMV as of June 2023.

Figure 4 illustrates the proportion of 2022 sales by Classes 2b–8. It demonstrates there were higher sales of Class 3 vehicles (10,966), which are larger and heavier trucks, than there were of Class 2b vehicles (8,076).

Figure 4. Washington Vehicle Sales Classes 2b–8 in 2022



Data source: S&P Global (IHS Polk) DMV as of June 2023.

Washington state has 693 zero-emission MHDVs on the road as of 2023. City buses account for 54 percent of the vehicles, and cargo vans are the next highest category with 33 percent. Approximately 0.09 percent of all registered MHDVs in Washington are zero-emission. If Washington state wants to reach net-zero by 2050, additional action is needed to accelerate adoption of zero-emission MHDVs.

Addressable Market in Washington State

Leveraging the IHS data, the updated market size of MHDVs in Washington that have a reasonable zero-emission use case and are eligible is 148,325 vehicles, with annual sales at 4,291. By 2030, more than 11,000 medium- and heavy-duty electric trucks are projected to be on the road in Washington.

The targeted size of the market and technology sustainability were evaluated based on the addressable market within each vehicle segment. The addressable market considers vehicle technology availability, applicability, and technology limitation to each specific vehicle segment under vehicle location, vocation, and type. Each vehicle segment will have a different profile of suitability. For example, zero-emission technology has been more readily available for cargo vans and urban transit buses than for long-distance

truck applications early on. The electrification of motorhomes and construction truck vehicles will follow in the long term.

The addressable market of the proposed incentive program in Washington was created by removing non-eligible vehicle segments and vehicle segments without reasonable zero-emission technology options from the dataset. This excludes Class 2b vehicles, which are primarily privately owned and dominated by pickup trucks, and specialty vehicles including emergency trucks, long-haul trucks, street sweepers, and motor homes.

Leveraging the IHS data, the updated market size of MHDVs in Washington that have a reasonable zero-emission use case and are eligible is 148,325 vehicles, with annual sales at 4,291.

Impact of MHDVs on Emissions in Washington State

Trucks and buses represent just 10 percent of vehicles on Washington's roads and highways but are responsible for 30 percent of the state's global warming emissions and 59 percent of nitrogen oxide and 53 percent of particulate pollution emitted by on-road vehicles.¹²

Long-term exposure to diesel exhaust has been linked to lung cancer, stroke, heart disease, pulmonary disease, chronic respiratory illnesses, asthma, bronchitis, and other adverse health effects. A 2023 *State of the Air* report by the American Lung Association noted that 36 percent of Americans live in communities impacted by unhealthy levels of ozone and particulate pollution.¹³ These metrics are based on metrics set by EPA. Many of these sources of ozone and short- and long-term particulate pollution are attributable to transportation-related emissions.

The report also notes that people of color are disproportionately impacted by these pollution impacts, accounting for 54 percent of the nearly 120 million people living in counties with at least one failing air quality metric, despite only being 41 percent of the overall population in the United States. Of the 18 million residents in the United States living in counties with failing grades for ozone and short- and long-term particulate pollution, 72 percent are people of color while 28 percent are white.

Within Washington state, this correlation between increased levels of truck and vehicle traffic and relatively higher levels of negative health impacts due to transportation-related emissions is clearest along the I-5 corridor, specifically in the Puget Sound corridor between Tacoma and Everett. There are other transportation-related burden hot spots across Washington, including the Yakima Valley, Kennewick, and Spokane.

Many of the communities identified by the Washington State Department of Health as having disproportionately high levels of transportation pollution are also disadvantaged communities as defined

¹² <https://www.ucsusa.org/about/news/washington-state-adopts-new-rules-reduce-polluting-emissions-vehicles-1>

¹³ <https://www.lung.org/getmedia/338b0c3c-6bf8-480f-9e6e-b93868c6c476/SOTA-2023.pdf>

by EPA. The disproportionate negative health outcomes seen in these communities are directly tied to the presence of heavy levels of traffic—including MHDV traffic—in and around these communities. While transitioning MHDVs to zero-emission technology is beneficial for all communities in and around roadways, these findings indicate that the benefits of emissions reductions will most directly benefit communities with higher burdens of transportation-related negative health outcomes. Consequently, Washington state can connect the outcomes of programs like a zero-emission MHDV incentive program to the increased public good of better air quality and improved health outcomes.

The speed of the transition to zero-emission MHDVs is influenced by a range of factors including vehicle cost, technology readiness, vehicle availability constraints, charging infrastructure availability, and the information fleets have about these new technologies. This incentive program is primarily geared toward commercial fleet owners and operators of MHDVs and off-road equipment who will face increasing regulatory pressures to transition their fleets but are currently ineligible for many of the state's existing grant programs.

As will be explored later in Section IV, Washington state has few programs that are accessible to the private sector. This incentive program will drive the purchase and use of zero-emission MHDVs, along with other cargo handling and off-road equipment, by reducing the upfront costs of investing in this new technology.

Key Takeaways from Washington's MHDV Landscape

With at least 95 percent of MHDVs in the state owned by the private sector, the proposed voucher program is primarily tailored to address these fleets' needs. Utilizing registration data and sales trends, this report provides a comprehensive analysis of the vehicle types, turnover rates, and adoption of zero-emission technologies within these fleets. Additionally, it explores the crucial role of battery technology, off-road equipment electrification, and the importance of collaboration with local utility companies in supporting this transition.

- **At least 95 percent of Washington state's MHDVs are owned and operated by the private sector,** with the balance owned by federal, state, and local agencies.
 - This reality is why the recommended voucher program design focuses on the private sector.
- **Registration data gives insight into the number and types of vehicles that are operating within Washington.**
 - When matched against annual sales data, this provides a snapshot of the typical fleet turnover rate for each vehicle category.
 - Of Class 2b–8 MHDV sales in 2022, a majority came from the Class 3 vehicle type.
 - There are currently 693 zero-emission MHDVs registered in Washington as of 2023.
- **By 2030, more than 11,000 zero-emission MHDVs are projected to be on the road in Washington state.**

- **The price gap between upfront costs and total cost of ownership creates a significant need** to fill this gap for the voucher incentive program to be successful.
- **It is important to understand MHDV Classes 2b–8 and their use cases** to develop a voucher incentive program that will assist fleets in overcoming barriers to program participation.
- **Today’s battery technology is most suitable for regional-haul and drayage applications** due to available weight, range, and infrastructure availability (mostly private at depots), with long-haul tractor electrification following slightly later.
- **The transition of off-road equipment types to electric power is a critical step** toward reducing GHG emissions, mitigating climate change, and improving air quality.
 - In the construction sector, electric excavators, loaders, and cranes can operate more efficiently and with less noise, benefiting both workers and surrounding communities.
 - The electrification of agricultural equipment, such as electric tractors and combine harvesters, not only cuts emissions but can also reduce the long-term fuel costs for farmers.
- **Partnering with local utility companies is of paramount importance** to align charging infrastructure efforts with grid capabilities and to potentially avail of special programs or incentives that utilities may offer.
 - Such partnerships can lead to optimized energy management; cost savings on electricity rates; and infrastructure that is robust, scalable, and capable of supporting the growing demand for electric vehicle charging.

The insights gleaned from vehicle registration and sales data reveal a significant shift toward zero-emission vehicles, with projections indicating a substantial increase by 2030. Understanding the specific needs and use cases of MHDV Classes 2b–8 is essential in tailoring the voucher incentive program effectively. Current battery technologies show promising applicability, particularly in regional-haul and drayage operations, with the potential for broader application in the near future. The transition to electric power in off-road equipment further underscores the commitment to reduce emissions and enhance efficiency. Crucially, partnerships with local utilities emerge as a strategic component in aligning charging infrastructure with grid capabilities, underscoring the collaborative nature of this endeavor. Together, these factors paint a hopeful picture of Washington state's capabilities and commitment to lead the charge in zero-emission transportation, setting a benchmark for others to follow.



III. Review of Existing Zero-Emission MHDV Incentive Programs

Methodology

The project team provided an impartial review of zero-emission MHDV incentive programs for vehicles and electric charging/fueling infrastructure in other jurisdictions across the United States. The analysis highlights the strengths, weaknesses, and lessons learned to inform the development of an effective incentive strategy for Washington state. The review included interviews with program administrators and online research of jurisdictions with incentive programs from California, Hawaii, Massachusetts, New York, New Jersey, the province of Quebec, and New York City. The analysis included an understanding of each program's effectiveness and considered vehicle adoption rates, emissions reduction impacts, stakeholder feedback, market share, charging infrastructure development, and industry and economic impact.

Tools to Incentivize Adoption

There are several ways to encourage adoption of new technologies. Benefits and drawbacks are outlined below.

Grants

Grants are a flexible incentive tool generally used by the public sector to provide funds to an initiative or project without the expectation of repayment. Organizations must compete for grant funding by submitting an application or undergoing an evaluation process. Grants can be awarded by state, local, or federal agencies, private foundations, or corporations.

Grant funding often has reporting requirements and oversight mechanisms to ensure the funding was spent responsibly and according to what was outlined in the approved application.

- **Eligibility:** Most grant funding opportunities have strict eligibility requirements to ensure the funding is reaching its target audience. The agency releasing the funds can set eligibility requirements as they see fit or as is directed by enabling legislation. A major obstacle for zero-emission MHDV adoption related to grant funding is that many of the owners and operators of MHDVs are not eligible for current grant opportunities.
- **Competitive:** Organizations seeking grant funding must identify the correct agency to fund their need, write a competitive application, and are generally selected based on the merit of their funding proposal. However, many grant programs are oversubscribed and have repeat applicants with each new funding cycle. Grant applications can be highly technical and difficult to navigate.

- **Tax Burden:** Grants are counted as taxable income at the federal level. If vehicle incentives are distributed as grants to businesses to purchase zero-emission MHDVs, the company will be liable for paying additional taxes on the grant amount.

Point-of-Sale Voucher

A point-of-sale voucher incentive program reduces the purchase price of a new zero-emission vehicle at the time of purchase. By doing so, it changes the business case for users and directly influences the purchase decision. It is a well-structured, highly transparent tool that government agencies can use to attract industry participants, engage fleets, and distribute public funding efficiently, equitably, and directly to clean and zero-emission vehicle deployments.

The common principles of a successful voucher program are:

- **Simplicity of Design:** The prime strategy of all voucher programs is to reduce the cost of purchase at the time of sale. Such designs make it easy for fleets to understand the amounts available and how to manage them while reducing the administrative burden on sponsoring state agencies.
- **Transparency and Certainty of Outcome:** The clearly outlined and transparent approval structure shared among all programs provides a funding guarantee in advance of purchase if all rules are followed. This creates certainty of outcomes for manufacturers, vendors, and fleets, in addition to the state sponsoring agency.

Most importantly, point-of-sale voucher programs make fleet acquisition of zero-emission trucks, buses, and other commercial vehicles easier and more affordable. The effort uses public funds to reduce the incremental cost difference between a conventionally fueled vehicle and a comparable zero-emission vehicle. Caps for each category of vehicle may set an upper limit of public funds for each vehicle. Dealer networks help fleets navigate the voucher program process and take on the responsibility of completing voucher redemptions. As a result, fleets see a lower purchase cost, while dealers receive the full price—public funds make up the difference between the invoice price and the voucher-reduced price the user pays.

For the administration of the voucher program, a voucher processing center guides participants through the voucher request and redemption process and tracks documentation. Voucher program participants fit into three categories: manufacturers, vendors, and fleets.

Manufacturers are the original equipment manufacturers or equipment modifiers that produce eligible vehicles and submit vehicle information for listing on program websites.

Vendors connect manufacturers and fleets to coordinate sales and usher parties through the voucher application and documentation processes. Frequently, vehicle dealers or manufacturers serve the role of the vendor, which is the party that works most closely with the program administrator and processing center to complete the voucher process. These parties work to deliver clean vehicles to fleets, who are the end users that operate the vehicles according to the terms set forth by the program administrator and agency sponsor (e.g., term of ownership or lease).

The administrator works with vehicle manufacturers to sign up eligible vehicles in the program and assign voucher amounts. Vendors who sell those vehicles are trained on the processing center and assigned user accounts. The voucher program process begins when a sale is arranged. Vendors request vouchers on behalf of the fleet purchasers.

Fleet is a general term for the purchaser of the vehicle or equipment as part of this process. Fleets are the parties responsible for assembling paperwork for their voucher and ensuring they follow the requirements of the program.

Upon delivery of the vehicle, the fleet pays the vendor for the cost of the vehicle, reduced by the value of the voucher, which will be reimbursed to the vendor through a voucher redemption request that begins at vehicle delivery. Vendors are responsible for collecting information from all parties and managing the voucher application through every phase of the program, including redeeming the voucher once the vehicle is ready for delivery to the customer.

The processing center tracks the voucher status and, upon vehicle delivery and satisfactory documentation, approves the voucher for payment. The vendor must submit the voucher redemption information and all required sales documentation to the processing center. Once all the information is verified, the program administrator or sponsor pays the voucher amount to the vendor.

In California's Clean Truck and Bus Voucher Incentive Project (HVIP), the time between document approval and payment is typically less than two weeks. At the end of the process, the manufacturer and vendor will have completed the sale of one or more clean vehicles and received full payment, while a fleet operator will be reducing emissions and saving money on operations through a discounted truck or bus.

Tax Credits

Tax credits function as a rebate to consumers after the time of purchase by providing a partial reimbursement or discount to the taxable entity's tax burden. Tax credits have an application and detailed paperwork process, but unlike grants, are not competitive. Tax credit amounts vary widely based on the program and eligibility, but in the national zero-emission vehicle context, can vary between \$2,500 and \$40,000.

Federal tax credit regulations are set by Congress and enforced by the Internal Revenue Service (IRS). State legislatures can also create tax credit programs that are enforced by the state's Department of Revenue.

Traditionally tax credits are viewed as more politically viable incentive structures at the federal level as they do not require direct funding. Rather than appropriating funds, a tax credit simply reduces future government revenue. Tax credits have been valuable in advancing consumer light-duty vehicle uptake, though rebates that reduce the upfront purchase price have been shown to be more effective than incentives distributed through tax credits.

Other Funding Opportunities

The high cost of transitioning fleets to zero-emission technologies has resulted in several innovative private sector opportunities to help address this financing gap between diesel and zero-emission vehicles. At the time of this report's creation, these business models are still new and emerging within the zero-emission MHDV context, though some pull from existing trucking models. A brief explanation of some proposed or available third-party financing options is explored below.

“As-a-Service” Third-Party Financing

The high costs and risks of acquiring zero-emission MHDVs and installing adequate refueling infrastructure have resulted in several third-party companies offering various elements of this transition “as a service.” Three of the most seen examples of this are “Leasing-as-a-Service,” “Charging-as-a-Service,” and “Truck-as-a-Service.”

Each of these business models allows fleets to contract out pieces of the transition to a third party that specializes in an area. Charging-as-a-Service, for example, enables a third party to facilitate the electric vehicle charging infrastructure installation and maintenance for zero-emission MHDV fleets. Charging-as-a-Service providers take responsibility for electric vehicle charger site assessment and design, necessary utility upgrades, installation, maintenance, power-rate negotiations, and charging-schedule optimization. The business model is adaptable for both public charging along major highways and depot charging for various fleets. Charging-as-a-Service can operate on a subscription or fixed-cost model, providing fleet operators with predictable operational expenses.

Under the Charging-as-a-Service model, the zero-emission vehicle is not included. Acquiring the vehicle is the responsibility of the vehicle owner and/or operator.

Leasing as-a-Service for electric fleet trucks and buses is a business model where a third party leases the zero-emission vehicle to operators and integrates a variety of value-added services. Leasing-as-a-Service often includes regular maintenance, repairs, and potentially even upgrades to the leased vehicles, ensuring they remain operational and efficient. At the end of the lease term, the Leasing-as-a-Service provider might handle the resale or recycling of the electric vehicles, relieving the lessee of the responsibility for the vehicle's end-of-life processes.

Truck-as-a-Service is very similar to Leasing-as-a-Service but generally includes both the vehicle and the infrastructure. The Truck-as-a-Service model can also use a “lease to own” model for drivers that want to own their vehicle.

Pros of the “as-a-Service” Models: In the rapidly evolving field of zero-emission MHDVs and infrastructure where technology and regulations can change quickly, the service provider allows the fleet owners to stay up to date with the latest technology without the risk and capital expense of owning the vehicles or infrastructure. This is seen as an effective way to transition or trial run an electric fleet by offering flexibility, reduced risk, and potentially lower overall costs.

Cons of the “as-a-Service” Models: Many trucking companies, large and small, have historically preferred to own their own vehicles, and the leasing model does not automatically allow them to outright own that asset at the end of the lease term. A limited number of leasing companies are offering this service. Because many incentives are designed with the assumption that owners and operators of the vehicle in question are the same entity, several incentives are not designed to work with this leasing structure.

For the Charging-as-a-Service providers, this model does not solve the fundamental issue of energy resource adequacy or reliability.

There is also concern that a fleet might be locked into an unfavorable contract for several years with a provider and not have a reasonable alternative option. As the industry develops, the benefits and downsides to these models will become clearer, and other solutions may emerge.

Policies and Regulations

There are many federal, state, and local policies, regulations, and incentives that could have an impact on the Washington state’s incentive program. A list of each of their requirements, the progress that has been made, and how they might impact the incentive program is provided below.

Federal

The federal government has accelerated and ramped up efforts to encourage more equitable and sustainable transportation, including a combination of major funding (i.e., Inflation Reduction Act, Infrastructure Investment and Jobs Act), research, efforts to update rules and regulations, further development of the Justice40 map and definitions, and directions to states regarding GHG emissions calculation.

At the federal level, there are a collection of regulations and requirements that would apply to programs where the funding source is federal. These may be more applicable to the fleets and site developers who may stack available federal dollars with state incentives, such as transit agencies, schools, Tribes, rural communities, and corridor developers. Depending on the program, the applicable rules may be competitive procurement, Buy America standards, local match, and Federal Acquisition Regulation accounting requirements.

Aside from regulatory and policy, these federal entities do conduct research and build tools that may be of interest to the State of Washington. The Alternative Fuels Data Center (AFDC) has a collection of definitions, maps, and data sets of charging infrastructure and other fueling sites; however, these may not contain all private charging locations. Most of the items listed under federal law are grants, incentives, tax credits, studies, and other support—not generally requirements of states to take certain action.

Below is a subset of these measures which may be of interest as well as a couple recent announcements:

- Transportation Decarbonization Support: “The U.S. Department of Energy, Transportation, U.S. Department of Housing and Urban Development, and the U.S. Environmental Protection Agency

(Signatory Agencies) joined in signing a memorandum of understanding to accelerate the development and adoption of affordable and equitable clean transportation.”¹⁴

- Electric Vehicle Working Group: “The Secretaries of Transportation and Energy must jointly establish an EVWG to make recommendations regarding the development, adoption, and integration of light-, medium-, and heavy-duty electric vehicles into the transportation and energy system of the U.S.”¹⁵
- Joint Office of Energy and Transportation: “The U.S. Department of Transportation and the U.S. Department of Energy will establish a Joint Office of Energy and Transportation to study, plan, coordinate, and implement joint issues.”¹⁶
- National Alternative Fuels Corridors: “The U.S. Department of Transportation Federal Highway Administration designates a national network of electric vehicle charging and hydrogen fuel cell, propane, and natural gas fueling infrastructure along national highway system corridors.”¹⁷
- National Highway Performance Program: The program provides support to improve the condition and performance of the National Highway System and construct of new facilities on the system. Eligible activities include the installation of electric vehicle supply equipment and natural gas refueling stations along the system as part of the construction of fringe and corridor parking lots (e.g., park-and-ride lots), as well as truck parking rest areas.¹⁸
- Global Memorandum of Understanding: In 2022, the United States signed onto the Global Memorandum of Understanding on Zero-Emission MHDVs.¹⁹
- National Performance Management Measures; Assessing Performance of the National Highway System, GHG Emissions Measure: “This final rule amends FHWA's regulations governing national performance management measures and establishes a method for the measurement and reporting of GHG emissions associated with transportation. It requires state departments of transportation and metropolitan planning organizations to establish declining carbon dioxide targets for the GHG measure and report on progress toward the achievement of those targets.”²⁰

Considerations for MHDVs vs. Light-Duty Vehicles

Individuals and their businesses have for years been able to claim reductions on their tax burden in amounts of up to \$7,500 under Internal Revenue Code 30D. These credits go toward light-duty passenger vehicles under 14,000 lbs. and are treated differently than the Commercial Clean Vehicle Tax Credit. The Inflation Reduction Act of 2022 changed the rules for this credit for vehicles purchased from 2023 to 2032.

¹⁴ <https://afdc.energy.gov/laws>

¹⁵ Ibid.

¹⁶ Ibid.

¹⁷ Ibid.

¹⁸ Ibid.

¹⁹ <https://www.prnewswire.com/news-releases/the-biden-administration-signs-ambitious-global-agreement-to-accelerate-zero-emission-transport-301681180.html>

²⁰ <https://www.federalregister.gov/documents/2023/12/07/2023-26019/national-performance-management-measures-assessing-performance-of-the-national-highway-system>

Some additional considerations with respect to light-duty vs. commercial vehicles (i.e., those with a GVWR of greater than 14,000 lbs.) may include but are not limited to:

- Options for businesses to purchase or lease a light-duty, clean vehicle and claim the applicable credit are currently more widely utilized, given the maturity of that industry and other factors.
- Businesses that wish to pursue the purchase or lease of a commercial vehicle with a GVWR of greater than 14,000 lbs. may be eligible to receive up to \$40,000 in tax credits.
- Dealers who sell commercial vehicles may not have the same options to implement the Commercial Clean Vehicle Tax Credit as those who sell light-duty passenger vehicles.

California Policies and Regulations

The federal Clean Air Act allows the State of California to seek a waiver to set and enact its own emissions standards for new motor vehicles that are stronger than federal standards set by EPA. Following the successful EPA waiver process, other states may choose to follow California's motor vehicle emissions standards. California's Air Resources Board is responsible for creating these standards, filing the appropriate documentation, and enforcing these standards in California.

Two key authorizations related to MHDVs are outlined below:

- **Advanced Clean Trucks (ACT):** Beginning with model year 2025, truck manufacturers will be required to sell an increasing percentage of zero-emission MHDVs in California annually. The scale of sales requirements varies depending on weight class. The program rewards sellers of zero-emission trucks with credits, which can be banked and traded, and imposes penalties on sellers who do not meet the requirements. Once a year, truck manufacturers send reports to examine for compliance. In addition, they can submit reports as far back as model year 2021 to earn "early action credits," which can also be banked and used for compliance when regulations take effect for model year 2025.
- **Advanced Clean Fleets (ACF):** A 100 percent zero-emission sales mandate for all truck classes by 2035 builds on the success of the ACT rule. The key components are:
 - **Manufacturer sales mandate:** Manufacturers may sell only zero-emission MHDVs in California starting in 2036.
 - **Drayage fleets:** Drayage trucks are in-use Class 7 and 8 on-road vehicles that transport containers and bulk goods to and from seaports and intermodal railyards. Land ports of entry, which provide controlled entry to or departure from the United States, are not considered seaports or intermodal railyards. Beginning December 31, 2023, trucks must be registered in the Truck Regulation Upload, Compliance, and Reporting System to conduct drayage activities in California. Non-zero-emission "legacy" drayage trucks may register in the system through December 31, 2023. Legacy drayage trucks can continue to operate through their minimum useful life. Beginning January 1, 2024, only zero-emission drayage trucks may

register in the system. All drayage trucks entering seaports and intermodal railyards are required to be zero-emission by 2035.

- o High priority and federal fleets: These fleets may purchase either zero-emission vehicles or near-zero-emission vehicles, or a combination of zero-emission vehicles and near-zero-emission vehicles, until 2035. Starting in 2035, only zero-emission vehicles will meet the requirements. These fleets must initially submit a compliance report by February 1, 2024, and comply with the model year schedule or may elect to use the optional zero-emission MHDV Milestones Option to phase zero-emission vehicles into their California fleets.
- o Model year schedule: Fleets must purchase only zero-emission vehicles beginning 2024 and, starting January 1, 2025, must remove internal combustion engine vehicles at the end of their useful life, as specified in the regulation.
- o Zero-Emission MHDV Milestones Option (optional): Instead of the model year schedule, fleet owners may elect to meet zero-emission MHDV targets as a percentage of the total fleet starting with vehicle types that are most suitable for electrification.
- o State and local agencies: California state and local government fleets, including city, county, special district, and state agency fleets, would be required to ensure 50 percent of vehicle purchases are zero-emission beginning in 2024 and 100 percent of vehicle purchases are zero-emission by 2027. They must also initially submit a compliance report by April 1, 2024. Small government fleets of 10 or fewer vehicles and those in designated counties would start their zero-emission MHDV purchases beginning in 2027. Alternatively, state and local government fleet owners may elect to use the Zero-Emission MHDV Milestones Option. State and local government fleets may purchase either zero-emission vehicles or near-zero-emission vehicles, or a combination of zero-emission vehicles and near-zero-emission vehicles, until 2035. Starting in 2035, only zero-emission vehicles will meet the requirements.

Incentives and Grants

There are several incentives, grants, and rebate programs at the federal level and across other states that can provide a helpful comparison as well as lessons learned as Washington considers different options and structures for the incentive program.

Federal

The federal government has a combination of tax credits and grants available for fleets and site owners. A selection of key incentives is noted below, as well as the recently awarded Pacific Northwest Hydrogen Hub.

Internal Revenue Code 45W outlines a significant incentive for the adoption of commercial zero-emission vehicles in the form of a tax credit of up to \$40,000. This credit aims to encourage businesses to invest in eco-friendly transportation solutions, fostering a transition toward a more sustainable and environmentally friendly fleet. Zero-emission vehicles, such as electric trucks and buses, contribute to reducing GHG

emissions and dependence on fossil fuels, aligning with broader national goals for clean energy and environmental conservation.

Tax credits function as a rebate to consumers after the time of purchase by providing a partial reimbursement or discount to the taxable entity's tax burden. Tax credits have an application and detailed paperwork process, but unlike grants, they are not competitive. They have been valuable in advancing consumer light-duty vehicle uptake, though rebates that reduce the upfront purchase price have been shown to be more effective than incentives distributed through tax credits.

To qualify for the commercial clean vehicle credit, businesses and tax-exempt organizations must purchase or lease eligible zero-emission vehicles, such as electric or hydrogen fuel cell vehicles, for business purposes. IRS is still finalizing a form for use in claiming this credit. The credit is typically applicable to new vehicles above a certain weight threshold like those listed in Table 4.

Table 4. Light-Duty Tax Credit

GVWR Limits	Plug-in Hybrid Electric Vehicle	Electric Vehicle and Fuel Cell Electric Vehicle
<14,000 lbs.	15% of Purchase Price, or \$7,500 (whichever is less)	30% of Purchase Price, or \$7,500 (whichever is less)
14,000 lbs.+	15% of Purchase Price, or \$40,000 (whichever is less)	30% of Purchase Price, or \$40,000 (whichever is less)

Option 1 – Claim to Reduce Taxes Payable

The Commercial Clean Vehicle Credit is a nonrefundable tax credit, meaning it may offset the taxpayer's tax but will not result in a check being dispersed to the taxpayer. While buyers of passenger vehicles under 14,000 lbs. may take their savings in the form of reduced vehicle pricing at a qualified dealer (pursuant to Internal Revenue Code 30D and 25E), IRS is currently finalizing a form for businesses and tax-exempt organizations to claim a Commercial Clean Vehicle Credit under Internal Revenue Code 45W.

Option 2 – Leases

A taxpayer that leases clean vehicles may be able to claim the qualified Commercial Clean Vehicle Credit depending on the ownership status of the vehicle for federal income tax purposes. The owner of the vehicle is determined based on whether the lease is respected as a lease or recharacterized as a sale for federal income tax purposes. Based on longstanding tax principles, the determination of whether a transaction constitutes a sale or a lease of a vehicle for tax purposes is a question of fact. Features of a vehicle lease agreement that would make it more likely to be recharacterized as a sale of the vehicle for tax purposes include but are not limited to:

- A lease term that covers more than 80–90 percent of the economic useful life of the vehicle.
- A bargain purchase option at the end of the lease term (i.e., the ability to purchase the vehicle at less than its fair market value at the end of the term) or other terms/provisions in the lease that economically compel the lessee to acquire the vehicle at the end of the lease term.
- Terms that result in the lessor transferring ownership risk to the lessee (e.g., a terminal rental adjustment clause that requires the lessee to pay the difference between the actual and expected value of the vehicle at the end of the lease).
 - Note that special rules exist under § 7701(h) for qualified motor vehicle operating agreements that contain such a clause.

Pacific Northwest Hydrogen Hub

The Pacific Northwest has been awarded up to \$1 billion in federal funds to build out a regional hydrogen hub and accelerate the development of hydrogen fuel cell technology and clean hydrogen production. The Pacific Northwest Hydrogen Association (PNWH2), co-led by Washington Department of Commerce and which includes projects spanning Washington, Oregon, and Montana, is a non-profit coalition of public and private entities and will include up to eight production nodes within the region, including Bellingham, Centralia, East Wenatchee, and Kennewick, with additional downstream projects and partners.

The Northwest hub will significantly advance the clean energy economy and assist in decarbonizing key sectors like heavy-duty transportation and heavy industry through the production of emissions-free, green hydrogen fuel produced from clean electricity. Funded via the Bipartisan Infrastructure Law, the Regional Clean Hydrogen Hubs program was created through the Department of Energy's Office of Clean Energy Demonstrations and has awarded funding to seven regional hubs throughout the United States to help kickstart a national ecosystem for clean hydrogen and scale up the supply-side production, demand-side markets, and infrastructure network. The Northwest hub is expected to reduce GHG emissions by 1.65 million metric tons (MMT) per year.

Funding negotiations are expected to take place through early 2024. The PNWH2 Hub is eligible to receive up to \$1 billion in federal funding over four Department of Energy-defined development phases spanning nine years, with \$20 million allocated for Phase 1. The Department of Energy will evaluate the hub's activities and deliver go/no-go decisions at each phase. Phase 1 will encompass initial planning and analysis activities to ensure that the overall H2Hub concept is technologically and financially viable, with input from relevant local stakeholders. The available \$1 billion will be utilized to develop production along key transportation corridors and provide clean fuel for hard-to-decarbonize heavy transportation. Partnership opportunities exist with initiatives such as the West Coast Truck Charging and Fueling Corridor. Additional funding will come from project developers and private entities.

California Incentives

California has several incentive mechanisms to encourage the adoption of clean vehicles. Below are programs covering MHDVs and equipment along with charging and refueling infrastructure. Also included below is a technical assistance program.

Clean Truck and Bus Voucher Incentive Project (HVIP)

- **Funding Agency:** California Air Resources Board
- **Project Focus:** Zero-Emission MHDV Vouchers
- **Term:** 2009–Present
- **Budget:** Recent average \$500 million per year
- **Summary:** HVIP provides point-of-sale vouchers to make zero- and near-zero-emission vehicles more affordable, with an average 29 percent savings per vehicle. The project uses a catalog-based system with approved battery-electric and hydrogen fuel cell vehicles that are Class 2b and above. A network of approved dealers applies on the fleet/vehicle purchaser's behalf. The vouchers are available on a first-come, first-served basis for purchases or leases, with an additional incentive for vehicles to be domiciled in disadvantaged and low-income communities or purchased/leased by a California Native American Tribal government. The standard HVIP program does not require scrappage.
- **Results:** 12,000 vouchers issued to date. Sixty percent of the zero-emission trucks on the road in California are HVIP-funded as of January 2022.
- **Website:** <https://californiahvip.org/>

Clean Off-Road Equipment (CORE) Voucher Incentive Project

- **Funding Agency:** California Air Resources Board
- **Project Focus:** Off-Road Equipment Vouchers
- **Term:** 2019–Present
- **Budget:** \$500 million since inception
- **Summary:** This voucher incentive project is intended to encourage California off-road equipment users to purchase or lease currently commercialized zero-emission off-road equipment. This streamlined voucher incentive project helps offset the higher cost of zero-emission technology with a point-of-sale discount. This project uses a catalog-based system with approved zero-emission off-road equipment and mobile power units that can be purchased or leased through a network of approved dealers. There is no scrappage requirement, and additional funding is available for charging and fueling infrastructure and for equipment deployed in disadvantaged communities. There are no technical requirements for this additional charging or refueling infrastructure funding. It also piloted a landscaping program.

- **Results:** \$277 million for 2,200 vouchers across all categories.
- **Website:** <https://californiacore.org/>

Energy Infrastructure Incentives for Zero-Emission (EnerglIZE) Commercial Vehicles Project

- **Funding Agency:** California Energy Commission
- **Project Focus:** Medium- and Heavy-Duty Infrastructure Incentives
- **Term:** 2021–Present (through 2026)
- **Budget:** \$276 million
- **Summary:** EnerglIZE Commercial Vehicles is a block grant incentive project focused on administering statewide incentives for electric vehicle charging and hydrogen refueling infrastructure for MHDVs and equipment. This project has an equity target of 60 percent of incentives going to priority populations, including disadvantaged, Tribal, and low-income communities. The incentive is provided on a reimbursement basis for eligible costs through funding waves, with one wave on a first-come, first-served basis and three waves on a competitive application basis. Fleets, operators, site developers/owners, or approved vendors may apply for private, shared, or public sites. Charging equipment can include Level 2, DC fast charge, wireless, and vehicle-to-grid technology, but must meet technical requirements and standards and be on either the program or a utility’s approved products list. Dual port chargers must have one connector meeting technical requirements and may include a proprietary connector or non-combined charging system connector (e.g., CHAdeMO, North American Charging Standard) on the remaining port. Hydrogen refueling stations are required to submit a hydrogen safety plan but do not have an approved products or equipment list. This incentive may be stacked with other funding sources and does not have match requirements. Funding maximums are per application, up to \$500,000 for charging sites (or \$750,000 if meeting equity criteria) and up to \$3 million for hydrogen refueling sites (or \$4 million if meeting equity criteria).
- **Results:** Over \$100 million in incentives awarded across 120 projects statewide, over 78 percent of which meet equity criteria.²¹
- **Website:** <https://energiize.org/>

Carl Moyer Memorial Air Quality Standards Attainment Program, On-Road Heavy Duty Voucher Incentive Program & Infrastructure Program

- **Funding Agency:** Air Quality Management Districts, Air Pollution Control Districts, California Air Resources Board
- **Project Focus:** Zero-Emission MHDV Vehicle Vouchers and Infrastructure

²¹ <https://calstartorg.maps.arcgis.com/apps/dashboards/93ba3501edad4f51beb4d8d4dda46647>

- **Term:** 1998–Present (overall Carl Moyer program), updates in 2015 from Senate Bill 513 to advance zero- and near-zero technologies, Infrastructure program rolled out in 2018
- **Budget:** \$95 million in 2020–2021 (overall Carl Moyer program)
- **Summary:** “The On-Road Heavy-Duty Voucher Incentive Program (VIP) provides funding opportunities for fleet owners with 10 or fewer vehicles to quickly replace, their older heavy-duty diesel or alternative fuel vehicles to zero-emission. Air Districts have the discretion to set certain local eligibility requirements based upon local priorities.”²² This program requires scrappage for eligible diesel or alternative fuel vehicles six years or older to the current calendar year. Purchasers fill out and submit an application and required documentation at a participating dealership, which then forwards the application to a participating air district. This is a point-of-sale voucher with voucher amounts ranging from \$20,000 to \$520,000. The Carl Moyer Infrastructure program provides funding for projects installing battery charging, hydrogen refueling, marine shore power, and stationary agricultural pump electrification. The infrastructure program covers eligible costs up to a designated percentage of total project cost, including equipment, design and engineering, installation, on-set power generation, and fees. When receiving Carl Moyer infrastructure funds, the funded equipment may not be used to generate Low Carbon Fuel Standard credits. Charging equipment must use a valid and universally accepted charge connector protocol (i.e., CCS1, CHAdeMO). The Carl Moyer program has additional incentive programs for off-road equipment, other on-road vehicle sectors, locomotives, marine vessels, and light-duty vehicles.
- **Results:** In the most recent Carl Moyer Program Statistics report, published in 2021 and updated in 2023, about 17 percent of funds over the life of the program were awarded to projects from the on-road source category. The overall program allocated nearly \$1.6 billion with about \$222.5 million going to on-road projects and about \$31 million going to infrastructure projects over 23 years of funding. Between funding years 8–23, 18 zero-emission vehicles and 33 zero-emission infrastructure stations were funded, for a combined \$10.4 million.
- **Website:** https://ww2.arb.ca.gov/sites/default/files/2023-10/2021%20Moyer%20Statistics%20ADA1004_0.pdf

Innovative Small e-Fleets

- **Funding Agency:** California Air Resources Board
- **Project Focus:** Zero-Emission MHDV and Infrastructure Vouchers for Small Fleets
- **Term:** 2022–Present
- **Budget:** \$118 million since launch
- **Summary:** The goal of the Innovative Small e-Fleet set aside is to implement innovative solutions to assist small fleets (20 or fewer trucks) in making the transition to zero-emission trucks, including but

²² <https://ww2.arb.ca.gov/our-work/programs/road-heavy-duty-voucher-incentive-program>

not limited to flexible leases, short-term rentals, Truck-as-a-Service, assistance with infrastructure, individual owner planning assistance, increased available funding, and other mechanisms. The barriers to zero-emission truck adoption, such as high upfront costs, limited financing, insurance options, and complex planning for fueling infrastructure, present an even more significant challenge to small fleets and owner-operators. By dedicating a portion of HVIP funds to small fleets, HVIP can position itself to better understand the specific needs of this traditionally underserved group and support their transition to zero-emission.

- **Results:** Fully subscribed both years.

Colorado Incentives

Colorado has modeled its MHDV and infrastructure programs on HVIP and EnergIIZE, with some notable distinctions. Colorado's programs do not use a catalog or approved products list. Colorado's fleet vehicle and infrastructure programs are separate from its school bus program. Colorado is also in the process of developing an MHDV corridor application type for its charging infrastructure program. All programs are reimbursement basis and cover costs incurred after award due to limitations of Colorado law. Like EnergIIZE, Colorado does enable infrastructure incentives for public and shared sites. Private-fleet sites for the usage of single fleets may install any charger protocol that meets their needs, while shared and public sites must meet requirements to promote interoperability.

Clean Fleet Vehicle and Technology Grant Program

- **Funding Agency:** Colorado Department of Public Health and Environment
- **Project Focus:** Clean Light and MHDV Fleets
- **Term:** March 2023–Present
- **Budget:** \$14 million
- **Summary:** This program provides reimbursement-based grants for electric, fuel cell electric, and recovered methane vehicles on a competitive application basis. Scrapage is not required but strongly encouraged, and fleets choosing to scrap vehicles are eligible for additional funding. Conversion vehicles are eligible on a case-by-case basis. Maximum incentives vary by class of vehicle on either a flat rate or percentage of new vehicle cost basis. School buses are not eligible for this program.
- **Results:** 17 projects were selected for award in the first round of funding.²³
- **Website:** <https://cdphe.colorado.gov/clean-fleet-vehicle-technology-grant-program>

²³ <https://cdphe.colorado.gov/press-release/colorado-state-health-department-announces-selected-projects-for-grant-programs-to>

Colorado Electric School Bus Grant Program

- **Funding Agency:** Colorado Department of Public Health and Environment
- **Project Focus:** Electric School Buses and Charging Infrastructure
- **Term:** March 2023–Present
- **Budget:** \$24 million
- **Summary:** This program provides incentives for new battery-electric vehicles for school districts and charter schools. These incentives are calculated as a maximum flat rate per vehicle for non-bus student transportation and types A–D school buses and on a maximum flat rate per port based on the power level of charging infrastructure. There are additional miscellaneous costs covered as a maximum fixed amount for scrappage, project start-up, and high voltage training. These incentives can be combined with other incentives. Conversion vehicles may be considered on a case-by-case basis. Applicants are required to retire (i.e., scrap) or convert a minimum of 20 percent of the vehicles requested.
- **Results:** 13 projects were selected for the first round of the program.²⁴
- **Website:** <https://cdphe.colorado.gov/electric-school-buses>

Fleet Zero-Emission Resource Opportunity (Fleet-ZERO)

- **Funding Agency:** Colorado Energy Office
- **Project Focus:** Zero-Emission Light MHDV Infrastructure
- **Term:** 2023–Present
- **Budget:** \$3 million
- **Summary:** This project is a competitive grant program for charging sites for fleets and public and semi-public charging sites. Eligible entities include public, private, and nonprofit fleets; independent owner-operators; Charging-as-a-Service providers; and property owners, developers, and managers. This program requires a 20 percent match with a likely maximum funding per applicant per round between \$250,000 to \$500,000, depending on the power level of equipment. Incentives are per charger or per dual port charger. Enhanced incentives and reduced match are available for qualifying entities. Funding is available in funding rounds, with rolling applications accepted only for qualifying entities. Funds are provided on a reimbursement basis for purchase and installation of equipment as well as networking and warranty costs. Funding may be stacked with other non-Colorado state incentives. There is no prescribed charging protocol or ratio. Shared fleet, Charging-as-a-Service, public or semi-public fleet sites are required to ensure charging stations are non-proprietary and include one J1772 plug if installing Level 2 and one CCS plug if installing DC fast chargers; sites may include additional connectors when paired with a non-proprietary plug for dual-port stations.

²⁴ <https://cdphe.colorado.gov/press-release/colorado-state-health-department-announces-selected-projects-for-grant-programs-to>

Charging stations owned, operated, and utilized by a single fleet may select the connector protocol that best fits their needs. Charging for electric school buses is not eligible. This does not currently include hydrogen refueling stations.

- **Results:** The program launched in 2023.
- **Website:** <https://energyoffice.colorado.gov/fleet-zero>

Hawaii Incentives

Hawaii has a replacement-based rebate program for heavy-duty vehicles (Classes 5–8) and school buses that includes up to one charger per vehicle. Hawaii also has a Zero Emission Bus Program in the planning stages which seeks to purchase 12 battery-electric buses using Volkswagen Clean Air Act Civil Settlement (VW) funds and other funding. As of this writing, Hawaii did not have a charging infrastructure incentive for MHDV infrastructure outside of this allowable cost as a part of the rebate program. Utilities do offer make-ready programs for charging infrastructure.

Diesel Replacement Rebate Program

- **Funding Agency:** Hawaii State Energy Office and Hawaii Department of Health
- **Project Focus:** School Buses and Class 5–8 Trucks and Buses
- **Term:** 2021–Present
- **Budget:** \$2.1 million (Year 1), \$1.2 million (Year 2)
- **Summary:** This program incentivizes the replacement of school buses and heavy-duty (Class 5–8) trucks and buses. Under the Year 2 program guidelines, non-road vehicles are also eligible. Replacement in Year 2 can be battery-electric or hydrogen fuel cell. This program requires scrappage and provides incentives for up to 45 percent of project costs and up to one charger per vehicle. There are no enhanced incentives for applicants meeting equity criteria. Funds are reserved on a first-come, first-served basis.
- **Results:** Year 1 has closed. Applications for Year 2 opened in February 2023.
- **Website:** <https://energy.hawaii.gov/what-we-do/financial-assistance-and-grants/diesel-replacement/>

Massachusetts Incentives

Massachusetts has both a vehicle incentive program and targeted technical assistance program. Massachusetts Department of Environmental Protection does have an electric vehicle infrastructure grant program called MassEVIP, but it is focused on Level 1 and Level 2 alternating current (AC) chargers and does not appear to cover DC charging.²⁵

²⁵ <https://www.mass.gov/how-to/apply-for-massevip-workplace-fleet-charging-incentives>

Massachusetts Offers Rebates for Electric Vehicles Trucks Rebate Program (MOR-EV)

- **Funding Agency:** Massachusetts Executive Office of Energy and Environmental Affairs' Department of Energy Resources
- **Project Focus:** MHDV Vouchers
- **Term:** 2014–Present (Trucks program since 2021)
- **Budget:** \$10 million in initial funding, 2021
- **Summary:** This program incentivizes new battery-electric vehicles and fuel cell electric vehicles (FCEVs), including pickups and Class 2b trucks and Class 3–8 MHDVs with a sales price of \$2 million or less. Charging equipment is not funded. This program does not require scrappage. Applicants are eligible for an additional 10 percent if 50 percent of operations are in environmental justice communities. The funding is in the form of a rebate, the amount of which varies by class of vehicle up to \$90,000. Vehicles must be on the list of eligible vehicle models.
- **Results:** According to the program website, there are 597 of 600 vouchers remaining for trucks Class 3–8 which opened August 2023. The program statistics webpage contains information for all electric vehicle vouchers for the MOR-EV and the MOR-EV Trucks program combined; between both programs, \$85.9 million rebate dollars have been reserved and issued.
- **Website:** <https://mor-ev.org/>

Mass Fleet Advisor

- **Funding Agency:** Massachusetts Clean Energy Center
- **Project Focus:** Free Technical Assistance for MHDV Fleets
- **Term:** 2022–Present
- **Budget:** \$1 million²⁶
- **Summary:** This program provides free assistance and a detailed and personalized plan for electrification to assist fleets in their transition to electric vehicles. It does not require a vehicle purchase and does not provide funding. These plans include potential vehicle options, charging options, and rebate options. Phase 1 provides limited benefits for up to 65 fleets meeting eligibility criteria and is still open. Phase 2 will provide more detailed analysis for up to 15 fleets. Phase 3 will provide ongoing assistance in procurement and deployment for up to five fleets. To participate, a fleet must have at least one domicile location in Massachusetts, with vehicle assessments available for all vehicles in the fleet but virtual site assessments only available for sites in Massachusetts. Fleets must be eligible to receive MOR-EV Truck funding for at least one fleet vehicle.

²⁶ <https://www.masscec.com/press/baker-polito-administration-awards-1-million-fleet-vehicle-electrification-planning-services>

- **Results:** Phase 1 is currently open and has been assisting fleets since 2022. As of April 2023, about 30 spots were remaining.
- **Website:** <https://www.massfleetadvisor.org/>

New Jersey Incentives

New Jersey has incentive programs for MHDVs and off-road equipment as well as a diesel replacement program. Electric vehicle charging infrastructure is eligible through one of the programs listed below as well as through the state’s Board of Public Utilities programs. The state also provides a comparison chart.²⁷

New Jersey Zero-Emission Incentive Program (NJ ZIP)

- **Funding Agency:** New Jersey Economic Development Authority, funded by Regional Greenhouse Gas Initiative (RGGI)
- **Project Focus:** MHDV Vouchers
- **Term:** 2021–Present
- **Budget:** \$90 million
- **Summary:** The pilot program offers vehicle vouchers for new zero-emission vehicles from Class 2b–8, exclusive of retrofits and repowers of previously owned vehicles. Scrappage is only required for vehicles that are directly replacing a vehicle that is model year 2009 or older. The applicant must operate 75 percent of vehicle miles in New Jersey and register the vehicle in New Jersey. The purchaser must be a commercial, industrial, or institutional organization registered in New Jersey. Charging equipment is not funded.
- **Results:** Across two phases of the pilot program, \$120.4 million in voucher applications have been received, \$81.6 million has been awarded, and \$12 million in vouchers have been redeemed as of December 8, 2023.
- **Website:** <https://www.njeda.gov/njzip/>

New Jersey WorkClean: Diesel Modernization Program (Equipment Modernization Program)

- **Funding Agency:** New Jersey Department of Environmental Protection
- **Project Focus:** Marine, On-Road, and Non-Road Diesel Vehicle Replacement + EV Charger
- **Term:** 2017–Present
- **Budget:** Approximately \$107.8 million, including RGGI, VW, EPA, and Congestion Mitigation and Air Quality Improvement (CMAQ) funding
- **Summary:** This project combines state and federal funding, requiring compliance with all state and federal procurement laws. This is a reimbursement-based program where the participant applies to

²⁷ zipandrggi.pdf (nj.gov).

the state including information about the vehicle to be replaced and the replacement vehicle, executes a contract with the state, then purchases the new equipment, provides proof of decommissioning, and receives reimbursement. Reimbursement is for up to 30 percent for non-road diesel vehicle replacements and up to 40 percent for marine engine replacements. Replacements can be old diesel to clean diesel or to electric. This program also provides funding through its RGGI Vehicle Electrification project for on-road passenger and non-passenger vehicle Class 2b–8 projects through specific solicitations. This incentive also requires scrappage and includes a Level 2 or DC fast charging station.

- **Results:** New Jersey has awarded \$87.1 million across 98 project locations since January 2018.
- **Website:** <https://dep.nj.gov/stopthesoot/equipment-modernization-program/>

New Jersey Clean Fleet EV Incentive Program

- **Funding Agency:** New Jersey Board of Public Utilities, using RGGI funding
- **Project Focus:** Local and State Governments for Light-Duty, Classes 2b–6, and Level 2 Charging Stations
- **Term:** 2022–Present
- **Budget:** Approximately \$12 million in fiscal year 2024 among state and local fleets²⁸
- **Summary:** This program offers incentives for local and state governments to transition fleets to electric toward the purchase of light-duty vehicles, Class 2b–6 vehicles, and Level 2 or DC fast chargers for public use or private-fleet use. Incentives also include make-ready. There are also award caps based on population in terms of number of electric vehicles and number of charging stations. All charging equipment is for dual-port chargers. Leases are not eligible. Expenses prior to grant application submission are also ineligible.
- **Results:** Applications closed in November 2023 for the fiscal year 2024 program. \$1.485 million was awarded in fiscal year 2022.
- **Website:** <https://www.njcleanenergy.com/files/file/EV/FY24/Revised%20Applications/EVs%20-%20CLF%20Application%20FY24.pdf>

New Jersey RGGI Medium- and Heavy-Duty Electric Vehicle Charging Program

- **Funding Agency:** New Jersey Board of Public Utilities
- **Project Focus:** Zero-Emission MHDV Charging Infrastructure
- **Term:** 2022–Present
- **Budget:** \$16.2 million²⁹

²⁸ <https://njcleanenergy.com/files/file/BPU/FY24/Budget%20Documents/FY24%20Budget%20Board%20Order.pdf>

²⁹ <https://nj.gov/bpu/pdf/boardorders/2022/20221026/8B%20ORDER%20RGGI%20EV%20Program.pdf>

- **Summary:** This program offers incentives in the form of reimbursement grants toward the purchase and installation of 150 kilowatt (kW) or greater dual-port, networked DC fast chargers and make-ready for community charging (publicly available) and private fleet charging. Applicants may apply for up to six charging stations with a maximum of \$225,000 for community charging or \$175,000 for private fleet charging. Private fleet charging participants must prove participation in NJ ZIP. DC fast chargers of any brand are eligible as long as the equipment is a dual-port station and has network capability with one of the state’s pre-certified network service providers. Periodic data sharing is required. Stacking with other state incentives is not allowed but is allowed with other utility programs within certain limitations.
- **Results:** Applications closed May 2023.
- **Website:** [https://njcleanenergy.com/files/file/EV/FY23/RGGI_MHD_Application_Final_1_12\(1\).pdf](https://njcleanenergy.com/files/file/EV/FY23/RGGI_MHD_Application_Final_1_12(1).pdf)

New York Incentives

The State of New York’s main program for MHDVs is the New York Truck Voucher Incentive Program (NYT VIP) program, which incentivizes the replacement of qualifying vehicles for new or repowered vehicles. The rebate covers the incremental difference between the new vehicle and a comparable diesel vehicle. The point-of-sale rebate makes it easier to participate by reducing the upfront cost, however, the scrappage requirement can limit participation. Allowing for vehicle repowering adds flexibility and may allow for quicker vehicle acquisition where new vehicles have long lead times for delivery.

New York Truck Voucher Incentive Program (NYT VIP)

- **Funding Agency:** New York State Energy Research and Development Authority
- **Project Focus:** MHDV Replacement Vouchers and Port Cargo Handling Equipment
- **Term:** 2013–Present
- **Budget:** \$66.3 million
- **Summary:** This program offers vouchers for Class 3–8 electric MHDVs and Class 4–8 hydrogen FCEVs as a point-of-sale voucher with coverage of up to 80 percent of the incremental cost difference between the purchased vehicle and a comparable diesel vehicle. Repowered vehicles may be eligible with documentation and additional requirements. Vehicles must be eligible according to certain criteria and purchased from an authorized contractor. This program requires scrappage of an eligible vehicle. Port cargo handling equipment is also an eligible category.
- **Results:** In the first five years of the program, NYT VIP disbursed 594 vehicle vouchers to 60 fleets worth a combined \$14.5 million. A total of \$18 million was available during this time. The program was renewed in 2019 with an additional \$20 million available.
- **Website:** <https://www.nyserda.ny.gov/All-Programs/Truck-Voucher-Program>

New York City

New York City has a voucher rebate program focused on medium- and heavy-duty truck replacement for eligible vehicles serving New York City Industrial Business Zones and located in the tri-state area of New York, New Jersey, and Connecticut. Though not specific to zero-emission vehicle technology, operators can use this funding to purchase a zero-emission vehicle. The point-of-sale voucher rebate makes it easier to participate, though the scrappage requirement does limit those who may not have a qualifying older vehicle or who may want to pilot the technology first before replacing their fleet.

New York City Clean Trucks Program

- **Funding Agency:** New York City Department of Transportation
- **Project Focus:** Medium- and Heavy-Duty Trucks Replacement
- **Term:** 2020–Present (current program), 2012–2020 (previous program)
- **Budget:** \$9.8 million (2020), \$20.8 million (2012–Present)
- **Summary:** This program offers vouchers for Class 4–8 trucks to truck owners and operators serving New York City Industrial Business Zones. New replacement trucks must be new all-electric or an EPA emissions compliant alternative-fueled diesel trucks and must be replacing a truck equipped with a model year 1992–2009 engine. This is a point-of-sale voucher. The replacement truck must operate 70 percent of the total vehicle miles traveled within the tri-state area of New York, New Jersey, and Connecticut, and operate within the program approved zones at least two times per week for five years. Fleets with 15 or more trucks are not eligible for funding.
- **Results:** The program has funded 67 truck replacements between June 2020 and June 2023. The program was expanded from the pilot program Hunts Point Clean Trucks Program, which ran from 2012–2020 and funded 592 trucks. The combined programs have awarded a total of \$20.8 million.³⁰
- **Website:** <https://www.nycctp.com/>

Port Authority of New York and New Jersey Incentives

In addition to New York State, New Jersey State, and New York City incentives, there is also additional funding available for drayage trucks serving the Port Authority of New York and New Jersey. Though not specific to zero-emission vehicles, there are elevated incentives for electric trucks.

PANYNJ Truck Replacement Program

- **Funding Agency:** Port Authority of New York and New Jersey (PANYNJ), using funding from CMAQ and EPA
- **Project Focus:** Drayage Trucks Replacement

³⁰ <https://www.nycctp.com/program-success/>

- **Term:** 2010–2013, 2015–Present
- **Budget:** At launch, the program had a \$28 million budget.³¹
- **Summary:** Grant funding for independent owner-operators and licensed motor carriers that own Class 8 port drayage vehicles serving the port. New vehicles must be engine model year 2014 or newer. The vehicle to be replaced must be scrapped. This program lists eligible dealerships and eligible scrap yards to be used. Funding covers up to 50 percent of the cost of the replacement truck, a maximum of \$25,000 per truck, and a maximum of two trucks per applicant. This program is not specific to electric or zero-emission vehicles.
- **Results:** As of December 2020, 847 trucks were replaced under this program.³²
- **Website:** <https://www.panynj.gov/port/en/our-port/sustainability/truck-replacement-program.html>

Quebec Incentives

Quebec’s sustainable transportation programs are largely split among sectors and not by vehicle class. There are programs for municipalities, passenger transportation, freight transportation, and schools— inclusive of broad vehicle classes and active transportation methods. Aside from school districts, the programs appear to have charging infrastructure supported under a separate funding program. Vehicle programs are inclusive of new, used, and converted vehicles and do not require scrappage.

Quebec Eco-Trucking Program

- **Funding Agency:** Ministry of Transport and Sustainable Mobility
- **Project Focus:** Hybrid or Electric Vehicles for Freight Transportation
- **Term:** 2021–Present (2.0)
- **Budget:** \$86.5 million CAD for 2021–2024³³
- **Summary:** This program is focused on vehicle incentives for freight transportation, with a broad categorization including plug-in hybrid, battery-electric, fuel cell, and cleaner fuel vehicles across heavy-duty vehicles, off-road heavy vehicles, light-duty commercial vehicles, low-speed vehicles, and electrically assisted cargo bikes. Incentives are in the form of a purchase rebate for acquisition (purchase or lease) and installation of vehicles and vehicle technologies. There is an additional component available for acquiring used heavy vehicles for a lump sum based on the age of the vehicle. The manufacturer, supplier, or distributor applies to the Ministry for the rebate. Within this program, there is also a component to fund studies for pilot projects for eligible applicants for “Collaborative Shared and Electrical Delivery Project.” There are separate funding programs for

³¹ <https://www.fleetowner.com/emissions-efficiency/article/21658881/ny-and-nj-port-launches-28-million-truck-replacement-program>

³² <https://www.sciencedirect.com/science/article/abs/pii/S2213624X22001006>

³³ <https://www.quebec.ca/nouvelles/actualites/details/programme-ecocamionnage-20-apres-les-voitures-quebec-sattaque-a-lelectrification-des-camions-37781>

transit and school buses. Charging and refueling infrastructure are funded under a separate program.

- **Results:** As of April 2023, the program had awarded \$17 million CAD to support 847 projects, with funds used to acquire nearly 400 electric vehicles.
- **Website:** <https://www.transports.gouv.qc.ca/fr/aide-finan/entreprises-camionnage/aide-ecocamionnage/Pages/aide-ecocamionnage.aspx>

British Columbia Incentives

Commercial Vehicle Pilots Program

- **Funding Agency:** Ministry of Energy, Mines and Low Carbon Innovation
- **Project Focus:** MHDV and Infrastructure Vouchers
- **Term:** Until March 31, 2028, or all funds are exhausted (and all vehicles funded have completed their required data collection period)
- **Budget:** \$11 million CAD
- **Summary:** The program aims to promote and accelerate the adoption of zero-emission MHDVs, aircraft, marine vessels, rail, and other off-road equipment, both on- and off-road vehicles. The program consists of two primary components: first, funding support covering up to one-third of total project costs for qualifying zero-emission MHDV and infrastructure; and second, collection, analysis, and sharing of data and insights acquired from the project.

Go Electric Rebates

- **Funding Agency:** Ministry of Energy, Mines and Low Carbon Innovation
- **Project Focus:** Light and MHDVs (those not included in the CleanBC Go Electric passenger vehicle rebate program)
- **Term:** No set end date; ongoing until all funds are exhausted
- **Budget:** \$31 million CAD
- **Summary:** The Go Electric Rebate Program encourages and accelerates the adoption of various zero-emission vehicles through rebates offered by the Ministry of Energy, Mines and Low Carbon Innovation; the program is administered by Fraser Basin Council. The program offers rebates for motorcycles and neighborhood zero-emission vehicles to a wide range of purchasers. Rebates for cargo e-bikes, on-road MHDVs, utility vehicles, airport and port specialty vehicles, and some low-speed vehicles are only available to businesses, nonprofits, or public-sector organizations. The following rebates are available for on-road MHDVs:
 - Class 2b: \$10,000 CAD
 - Class 3: \$55,000 CAD

- Class 4–5: \$75,000 CAD
- Class 6–7: \$100,000 CAD
- Class 8: \$150,000 CAD

CleanBC Go Electric Fleets Program

- **Funding Agency:** Natural Resources Canada's Zero Emission Vehicle Infrastructure Program
- **Project Focus:** Technical Assistance and Rebates for Electric Infrastructure Upgrades to Support Fleet Electric Vehicle Charging
- **Term:** Rebates will be offered until March 31, 2025, or until funds are fully expended
- **Budget:** \$7.7 million CAD
- **Summary:** The CleanBC Go Electric Fleets Program is a sector of British Columbia's Go Electric Programs, which are designed to encourage adoption of zero-emission vehicles by reducing financial barriers. The Fleets program is administered by Fraser Basin Council Society on behalf of the Ministry of Energy, Mines and Low Carbon Innovation. The Ministry is responsible for overall program design, management, and oversight. The program offers a suite of technical assistance rebates, as well as the following infrastructure support:
 - Up to \$20,000 CAD in rebates for electrical infrastructure upgrades to support fleet electric vehicle charging
 - For a limited time, up to \$5,000 CAD in rebates for the purchase and installation of Level 2 charging stations
 - For a limited time, up to \$75,000 CAD in rebates for the purchase and installation of fast chargers

Canadian Incentives for Zero-Emission MHDVs

- **Funding Agency:** Transport Canada
- **Project Focus:** MHDV Vouchers (Class 2b and higher)
- **Term:** 2022–March 31, 2026, or until available funds are fully exhausted
- **Budget:** \$547.5 million CAD
- **Summary:** This program offers incentives that cover approximately 50 percent of the vehicle price difference between electric and combustion vehicles. The program provides a maximum coverage of up to \$200,000 CAD per vehicle and can be combined with provincial and territorial incentives. However, there are limitations to consider: individuals are eligible for one incentive per calendar year, while businesses, organizations, or governments can apply for a maximum of 10 incentives annually or reach a total cap of \$1 million, whichever limit is met first.

Key Takeaways from Evaluating Existing Programs

Washington state stands on the cusp of a significant advancement in sustainable transportation with the proposal of a point-of-sale voucher program for MHDV fleets, along with the requisite infrastructure support. This evaluation of existing voucher programs across the United States and Canada highlights key takeaways from the successful components of these programs and underscores innovative strategies aimed at accelerating program participation by fleets throughout Washington. Based on these best practices, the Washington state voucher program design has been carefully crafted to address specific needs and challenges, ensuring a comprehensive and effective approach to reducing emissions and promoting cleaner transportation technologies.

- **Voucher Amount Plus-Ups:** The program should introduce “plus-ups” or modifiers for the voucher amounts, specifically targeting vehicles that operate in disadvantaged communities and those owned by small, minority-owned businesses. This focused approach aims to promote equity and inclusivity in the transition to zero-emission fleets.
- **Stackable Vouchers:** The ability to stack vouchers with other federal, state, or local incentives is a key feature, providing an additional financial lever to support fleet owners in their transition to zero-emission vehicles.
- **Third-Party Administration:** A crucial aspect of this program is the involvement of a third-party administrator, essential for ensuring an impartial and efficient execution of the voucher system, thereby enhancing the program’s integrity and effectiveness. Such a component significantly reduces the number of staff hours needed by the state agency administering the program, and the agency can leverage the expertise, industry relationships, and efficiencies that can be delivered.
- **Integrated Technical Assistance for Fleets:** The development of integrated technical assistance is a strategic move to guide fleet operators through the complexities of adopting zero-emission technologies, providing them with the necessary knowledge and support.
- **Proactive Coordination with Utilities:** Streamlining coordination with utilities is crucial for ensuring that the necessary infrastructure is in place, thus facilitating a smoother transition for fleets to electric vehicles.
- **Single Program Online Portal:** The creation of a unified online portal for fleet applications, encompassing both on-road and non-road vehicles, simplifies the application process, making it more accessible and user-friendly.
- **Front-End Pre-Approval Process:** Implementing a front-end pre-approval process for applications enhances the efficiency of the program, ensuring that all compliance and eligibility requirements are met beforehand.

- **Sector-Specific Education and Outreach:** Tailoring education and outreach efforts to specific sectors with customized messaging addresses the unique concerns and needs of different fleet types, enhancing the program’s relevance and impact.

Washington state’s proposed point-of-sale voucher program for zero-emission MHDV fleets represents a comprehensive and thoughtfully designed initiative to drive forward the state’s environmental goals. By integrating innovative approaches such as targeted incentives, streamlined processes, and educational outreach, the program is poised to facilitate a significant shift toward cleaner, more sustainable transportation. This forward-thinking strategy not only underscores Washington’s commitment to reducing GHG emissions but also demonstrates a keen understanding of the diverse needs within the fleet sector, ensuring that the transition to zero-emission vehicles is inclusive, equitable, and efficient.



IV. Review of Existing Zero-Emission MHDV Programs in Washington State

Methodology

A comprehensive online information review was conducted to determine relevant zero-emission MHDV policy and incentive mechanisms in Washington state. The purpose of the review was to gain a foundational understanding of the state's current initiatives to decarbonize the medium- and heavy-duty transportation sector to better inform a complementary incentive program design.

Online research was conducted on relevant government agency websites to develop a list of policies that guide the adoption of zero-emission technology in the MHDV industry. Each policy deemed relevant to the design of this incentive program was analyzed and extracted for compilation. Four policies were identified and examined in-depth to understand their scope, requirements, and implications for this incentive program design.

Current Washington state incentives, grants, and strategy programs were analyzed to identify existing decarbonization initiatives relevant to industries that use medium- and heavy-duty equipment. Program goals, eligibility criteria, funding opportunities, and timelines were evaluated and compiled to reflect the current landscape of Washington initiatives to ultimately shape the recommendations for the proposed incentive program.

Evaluating current policies and incentives in the region enables the proposed incentive program to better serve industries and agencies that are underserved by existing programs. Eight strategies and incentive programs were identified that represent and accelerate the state's goals of moving toward a zero-emission transportation sector.

Analysis of existing Washington policies and incentives aids in designing an incentive program that addresses sectors, vehicles, and agencies that otherwise do not have access to financial assistance in making the adoption to zero-emission technologies; by broadening the breadth of incentives available, the state will be better positioned to meet its climate action goals.

EPA Clean School Bus Funding

Washington state is uniquely positioned to coordinate with EPA's electric school bus funding efforts, since that program will operate separately from the incentive program that is the subject of this paper. States like New York have already developed effective models for collaboration with EPA's program, offering blueprints for others to follow. Moreover, the program emphasizes the need to complement federal funds with other incentive schemes. This approach not only maximizes resources but also aligns timelines and requirements, such as those for bus scrapping, creating a cohesive and efficient funding ecosystem. Finally,

the program highlights the significance of prioritizing diversification in funding. By targeting districts or fleet types that may not be the primary focus of EPA’s program, state funding can ensure funding has more reach, allowing a wider array of districts and fleets to benefit from these incentive programs. This section outlines the key attributes of federal EPA funding.

This five-year, \$5 billion federal incentive program is available for qualifying school bus replacements, with priority given to high-need districts. It provides incentives to replace school buses with low- and zero-emission models. Half of the program’s funding is dedicated to zero-emission school buses and half is dedicated to clean school buses, which can also include zero-emission models. Electric school buses qualify under both funding categories. EPA can make awards of up to 100 percent of the cost to replace buses and acquire charging or fueling infrastructure. EPA can award funding through rebates, grants, and/or contracts. In 2022, the EPA Clean School Bus Program provided rebate incentives for zero-emission buses by vehicle size as shown in Table 5.

Table 5. Round 1 Rebate Incentives for Vehicle Class Size and School District Eligibility

Prioritization Status	Zero-Emission Class 7+	Zero-Emission Class 3–6	Zero-Emission Infrastructure
School District that Meets One or More Prioritization Criteria	\$375,000	\$285,000	\$20,000 per bus
Other Eligible School Districts	\$250,000	\$190,000	\$13,000 per bus

Source: U.S. Environmental Protection Agency Clean Bus Program.³⁴

For the initial round of funding (application period closed in August of 2022), EPA allocated rebates via a lottery system, providing \$965 million for recipients to adopt new buses and infrastructure. For the second round, EPA will allocate funding through a grant solicitation (application period closed August of 2023). Incentive levels per bus for the grant round are provided in Table 6.

Table 6. Round 2 Grant Incentives for Vehicle Class Size and School District Eligibility

Prioritization Status	Zero-Emission Class 7+	Zero-Emission Class 3–6
School District that Meets One or More Prioritization Criteria	Up to \$395,000 (Bus + Charging Infrastructure)	Up to \$395,000 (Bus + Charging Infrastructure)
Other Eligible School Districts	Up to \$250,000 (Bus + Charging Infrastructure)	Up to \$395,000 (Bus + Charging Infrastructure)

Source: U.S. Environmental Protection Agency Clean Bus Program.³⁵

³⁴ <https://electrificationcoalition.org/resource/2023-csb-grant-program/>

³⁵ <https://www.epa.gov/cleanschoolbus/clean-school-bus-program-grants>

For the third round, EPA will allocate funding through another rebate solicitation (application period closes January of 2024). Incentive levels per bus for the grant round are provided in Table 7. It is important to note that this round of incentive amounts is lower than the first round of rebate amounts.

Table 7. Round 3 Rebate Incentives for Vehicle Class Size and School District Eligibility

Prioritization Status	Zero-Emission Class 7+	Zero-Emission Class 3–6
School District that Meets One or More Prioritization Criteria	Up to \$345,000 (Bus + Charging Infrastructure)	Up to \$265,000 (Bus + Charging Infrastructure)
Other Eligible School Districts	Up to \$200,000 (Bus + Charging Infrastructure)	Up to \$145,000 (Bus + Charging Infrastructure)

Source: U.S. Environmental Protection Agency Clean Bus Program.³⁶

It is expected that EPA will issue additional rounds of funding alternating between the two distribution types through 2026 with incentive amounts per vehicle stepping down over time. Eligible participants for this program include public school districts, Tribes, and third-party entities that can deploy clean or zero-emission school buses. The program has set certain criteria for the replacement buses, which are as follows: the buses must be models from 2022 or later; powered by battery-electric, compressed natural gas, or propane; and cannot be pre-ordered or supported by other federal funds. To mark a decisive step away from fossil fuels, this program requires phasing out older diesel-powered buses, specifically those from the 2010 model year or earlier.

The success and structure of the EPA Clean School Bus Rebate Program offers valuable lessons for incentive design.

DERA EPA National Competitive Diesel Emission Reductions Act Grants

Administered by EPA, the Diesel Emission Reductions Act (DERA) National Grants Program funds projects that provide significant reduction in diesel emissions and exposure with an emphasis on fleets operating in areas with poor air quality. Priority for funding will also be given to projects that engage and benefit local communities already overburdened by air pollution, protect grant-funded investments from severe weather events caused by climate change, and demonstrate their ability to promote and continue efforts to reduce emissions after the project has ended. Awards may reach up to \$100 million annually through 2024. However, the historical average funding per year has ranged from \$20 million to \$50 million. For the 2022–2023 round of funding (application period closed December 2023), EPA anticipates awarding approximately \$115 million. Awards will be selected and managed by EPA’s 10 regional offices. EPA anticipates 4–10 cooperative agreements awards per EPA region, subject to the availability of funds.

³⁶ <https://www.epa.gov/cleanschoolbus/clean-school-bus-program-rebates>

Washington State Policies

For years, Washington state has been a proactive leader in the nation's climate conversation, progressing legislation and developing incentives to accelerate the adoption of zero-emission technologies in the transportation sector. The state's demonstrated proactivity is represented through strategic policy and financial incentive programs that empower individuals and public agencies to participate in an accessible and equitable zero-emission vehicle transition.

Washington state's 2021 State Energy Strategy asserts that the transportation sector must reduce GHG emissions from 40.3 MMT carbon dioxide (CO₂) in 2019 to 20 MMT CO₂ or lower to support climate goals outlined in RCW 70A.45.020.³⁷ Electrifying vehicles and transitioning the transportation sector to lower-emission technologies are important tools in reaching these targets.

Washington state's climate goals are made achievable through a robust collective effort to see a climate-conscious transportation network come to fruition. The state's efforts to reduce carbon emissions are signified through a suite of policies, regulations, and incentives that work in tandem to reduce transportation carbon emissions.

Existing policies and incentives not only function to accelerate the zero-emission vehicle transition but also serve as a foundation for future legislation and incentive designs that strive to increase accessibility and equity in the transition. Current Washington policy and incentive work serves as a catalyst for novel programs by providing a precedent that underscores the importance of state-supported initiatives. The following policies, strategies, and incentives, while not exhaustive, capture relevant state-supported initiatives that help to inform the proposed zero-emission MHDV incentive program design.

Key Washington State Policy and Regulations

Key Washington state policies and regulations that impact this voucher incentive program are as follows:

- **Advanced Clean Trucks (ACT):** Adopted in November 2021 and beginning with model year 2025, truck manufacturers will be required to sell an increasing percentage of zero-emission MHDVs in Washington every year. The scale of sales requirements varies depending on weight class.³⁸ The program rewards sellers of zero-emission trucks with credits, which can be banked and traded, and imposes penalties on sellers who do not meet the requirements. Once a year, truck manufacturers send reports to examine for compliance. In addition, they can submit reports as far back as model year 2021 to earn "early action credits," which can also be banked and used for compliance when regulations take effect for model year 2025.

³⁷ <https://www.commerce.wa.gov/wp-content/uploads/2020/12/Washington-2021-State-Energy-Strategy-December-2020.pdf>

³⁸ <https://ecology.wa.gov/blog/april-2023/electric-trucks-to-join-state-s-clean-transportati>

- **Climate Commitment Act (CCA):** A Washington State Department of Ecology-led act that caps and reduces GHG emissions from the state’s largest emitting sources and industries. The goal is to reduce Washington state’s GHG emissions by 95 percent by 2050.
 - 2020 → reduce to 1990 GHG levels
 - 2030 → reach 45 percent below 1990 GHG levels
 - 2040 → reach 70 percent below 1990 GHG levels
 - 2050 → reach 95 percent below 1990 GHG levels and achieve net-zero emissions

Cap-and-Invest: The program limits overall carbon emissions in the state and requires businesses to obtain allowances equal to their covered GHG emissions. The allowances are obtained through auctions hosted by the Department of Ecology or are bought and sold on a secondary market.

Progress: The first auction was held February 28, 2023, with quarterly auctions to follow. As of September 2023, the program’s proceeds were \$1.276 billion, a higher than anticipated amount.³⁹

Implications for Incentive Strategy: Auction revenues provide funding source for zero-emission MHDV incentive program via CERA.⁴⁰ CCA requires 35 percent of funds to be invested in projects that benefit overburdened communities, and a minimum of 10 percent goes to projects with Tribal support.

- **Clean Energy Transformation Act:** Signed into law in 2019, it commits Washington to an electricity supply free of GHG emissions by 2045. Washington State Department of Commerce is a key implementing agency for this legislation and develops rules, reporting procedures, and regular assessments to ensure success of the program. Elements of this strategy include assisting utilities to ensure energy assistance programs and funding are available to low-income households, developing clean energy implementation plans, working with the Utilities and Transportation Commission to discuss resource adequacy, and developing the 2021 State Energy Strategy. This strategy is a comprehensive roadmap to meeting Washington’s state GHG emissions reduction limits while maintaining and growing its economy.
- **Clean Vehicles Program:** A program derived from the Department of Ecology adopting new vehicle emissions standards consistent with California’s zero-emission vehicle program. This will take effect in 2024. The program includes requirements for:
 - Passenger cars – vehicles designed to transport up to 12 people
 - Light-duty trucks – vehicles weighing less than 8,500 lbs.
 - Medium-duty passenger vehicles – vehicles weighing less than 10,000 lbs. designed to transport people

³⁹ <https://apps.ecology.wa.gov/publications/documents/2302061.pdf>

⁴⁰ <https://ecology.wa.gov/air-climate/climate-commitment-act/auction-proceeds>

- Medium-duty vehicles – vehicles weighing less than 10,000 lbs.
- **Encouraging High Consumption Fuel Users to Use Electric Vehicles:** The Washington State Legislature’s JTC was directed to study opportunities for high-consumption fuel users to adopt electric vehicles and make recommendations to the committees and governor by July 1, 2023. JTC was tasked with identifying and determining the following:
 - Number of users that could utilize electric vehicles for a high percentage of their driving needs
 - Fuel savings and gallons of fuel displaced if users switch to electric vehicles
 - User attitudes and perceptions of electric vehicles
 - Policies and messages that encourage electric vehicle adoption
- **Healthy Environment for All Act:** Passed into law in 2021, this is the first statewide law to create a coordinated and collaborative approach to environmental justice in Washington state. It requires Washington state agencies and other organizations including the Puget Sound Partnership to identify and address environmental health disparities in overburdened communities for vulnerable populations. Department of Ecology develops metrics to measure progress on key environmental justice goals, conducts environmental justice assessments on agency actions, and is the lead agency for incorporating environmental justice engagement and outreach to overburdened communities and Tribes in Washington state.⁴¹
- **Move Ahead Washington:** Move Ahead Washington is a 16-year transportation package passed by the Washington State Legislature in 2022. The funding package outlines pathways to invest \$17 billion in Washington state’s transit systems, bridges, roads, and other critical transportation infrastructure over the next several years. Several key elements in the legislation further accelerate the transition to decarbonize transportation systems, including the establishment of the Interagency Electric Vehicle Coordinating Council (EV Council). Approximately \$5.4 billion from CCA is directed toward electrification and expanding multimodal transportation options, funding everything from electric vehicle charging stations to bicycle and pedestrian grants.
- **Transportation Electrification Strategy (TES):** The Washington EV Coordinating Council (EV Council), a joint agency effort between the Departments of Transportation, Commerce, Ecology, and others, was created by the Washington State Legislature and directed to develop a transportation electrification strategy to ensure electric vehicle incentives and infrastructure are available and accessible to Washington residents. The final TES will be presented to the Washington State Legislature in January 2024. The objectives are:
 1. Complete a statewide TES that can be delivered by the EV Council to the Washington State Legislature by January 2024.

⁴¹ <https://ecology.wa.gov/About-us/Who-we-are/Environmental-Justice/HEAL>

2. Ensure TES reflects information and preferences representative of communities across Washington, including close coordination with the EV Council's Advisory Committee.
3. Ensure TES benefits vulnerable and overburdened communities.
4. Identify electric vehicle infrastructure grant-related funding available to persons living in Washington, including existing and future state, federal, and other opportunities.
5. Create a detailed implementation roadmap through 2035 within TES, including a scoping plan benchmarked to the state's 2030 electric vehicle target.
6. Create an engagement plan for effective public engagement through 2035 consistent with the Washington Healthy Environment for All Act.
7. Create an education plan detailing needed actions by the state to provide clear information and education about electric vehicles to ensure adoption in rapidly changing electric vehicle markets.

TES was under development at the same time as the incentive program, and the program development team worked with agency staff to ensure coordination between the MHDV recommendations in TES and the incentive program design. A full debrief of the policies and recommendations from TES that align with the incentive program are included as Appendix B.

- **Motor Vehicle Emission Standards – Zero Emission Vehicles Law:** Under the federal Clean Air Act, the State of Washington can implement either federal motor vehicle emissions standards or California motor vehicle emissions standards for passenger cars, light-duty trucks, and medium-duty passenger vehicles. Washington has opted into and adopted California's higher motor vehicle standards since 2005 to "increase consumer choices of cleaner vehicles, provide better warranties to consumers, and provide sufficient air quality benefit to allow additional business and economic growth in the key airsheds of the state while maintaining conformance with federal air quality standards" (2005 c 295 § 1). In March 2020, the Washington State Legislature passed the Motor Vehicle Emission Standards – Zero-Emission Vehicles law (RCW 70A.30.010), which directs the Department of Ecology to adopt California's vehicle emissions standards. Implementation of this falls under Chapter 173-423 of the Washington Administrative Code. For this report's purposes, there are two key California policies influencing the adoption rate of zero-emission MHDVs in Washington state: ACT and ACF. More information on these policies is available in Section III. Review of Existing Zero-Emission Incentive Programs: Policies and Regulations.

Washington State Incentives

Washington state agencies have a robust history of investing in the infrastructure and technologies to support transportation electrification and overall lowering the emissions profile of the transportation sector. A review of incentive and grant programs available in Washington state is outlined below.

Despite the investments featured in Table 8, 9, and 10, these programs do not serve MHDV users in the private sector, either because private entities are not eligible applicants or because the program is not designed for the vehicles they use.

Table 8. Washington State On-Road Vehicle Incentives

Agency	Investment	23-25 Amount	Summary
Local agency	EPA Clean School Bus Grant	\$1,975,000	EPA Clean School Bus Grants to School Districts of Tekoa, Toppenish, South Whidbey (5 buses) Awarded 8/2022
Commerce	Electric vehicle incentives	\$50,000,000	Increase the adoption of light-duty battery electric vehicles through point-of-sale rebates and other incentives
Ecology	ZEV school buses and diesel emissions reduction	\$15,600,000	Electrify school buses and support idle reduction and other diesel equipment engine replacements
Ecology	VW settlement – medium-heavy duty	\$16,300,000	Funding to replace diesel with zero-emission refuse vehicles, street sweepers, freight switchers, and port cargo handling equipment
WSDOT	ZAP EV car share	\$3,200,000	Zero-emission car-share programs in underserved communities where access to public transportation is less available
WSDOT	Commercial vehicle incentives & charging	\$100,000,000	Funding for medium- and heavy-duty zero emission vehicle and charging incentives, with program design being developed by the JTC (pending JTC study)
WSDOT	Green Transit Capital Program	\$51,400,000	Funding for reducing carbon intensity of transit operations through clean vehicles and associated charging and fueling
WSDOT	E-bike Rebates and Micromobility	\$7,000,000	Funding for incentives of \$300-\$1,200 for e-bikes depending on income eligibility; to develop an e-bike lending library and ownership grant (\$5M rebates, \$2M lending library)
Subtotal		\$245,475,000	

Source: Washington State Transportation Electrification Strategy.⁴² Design modifications made by CALSTART.

⁴² <https://deptofcommerce.app.box.com/s/uphekt6rwpmtvbhojyi6eifjxdwttdvh>

Table 9. Washington State Non-Road Vehicle Incentives

Agency	Investment	23-25 Amount	Summary
Commerce	Hard-to-decarbonize project grants	\$50,000,000	Funding to create a “hard to decarbonize” grant program that funds decarbonization projects in aviation, marine, and industrial sectors
Commerce	Port electrification – pass through	\$5,000,000	Pass-through funding to install shore power at Port of Everett
WSDOT	Clean off-road equipment	\$5,000,000	Funding for clean off-road equipment (pending JTC study)
WSDOT	Clean cargo handling equipment	\$2,500,000	Funding for cargo handling equipment (pending JTC study)
WSDOT	Ferry electrification	\$169,977,000	Funding to convert ferries to hybrid electric
WSDOT	Port electrification – competitive	\$26,500,000	Competitive program for shore power at public ports
WSDOT	Port electrification – pass through	\$22,800,000	Pass-through funding for the Ports of Seattle and Tacoma of \$6.3M for electric drayage trucks; and funding for shore power \$14M Seattle and Tacoma, \$2M Bremerton, 0.5M Anacortes
WSDOT	Tacoma rail locomotive electrification	\$5,000,000	Pass-through funding to replace two Tacoma rail diesel-electric switcher locomotives with zero emission battery-electric switcher locomotives and to install on-site charging equipment at a Tacoma rail facility
WSDOT	Sustainable aviation projects	\$1,510,000	Projects to pursue cleaner airport operations and funding to design a grant program
Subtotal		\$288,287,000	

Source: Washington State Transportation Electrification Strategy.⁴³ Design modifications made by CALSTART.

⁴³ <https://deptofcommerce.app.box.com/s/uphekt6rwpmtvbhojyi6eifjxdwttdvh>

Table 10. Washington State Agency Incentives

Washington State Agency Incentives	Funding Amount	Eligible Applicants	Summary
Air Quality Clean Diesel Grant Program Department of Ecology ⁴⁴	\$2.4 million total Transit: \$1.2 million Yard Trucks: \$1 million	Cities, counties, state agency, Tribal government, ports, clean air agency, transit authority, and non-for-profit entity	Scrap and replacement of diesel-fueled transit buses with new fuel cell powered transit buses; scrap and replacement of diesel-fueled yard trucks with new electric yard trucks; infrastructure costs not eligible.
Air Quality Clean School Bus Grant Program Department of Ecology ⁴⁵	\$10 million	School bus owners that transport students to approved schools in Washington state	Scrap and replacement of diesel-fueled school buses with all-electric powered school buses.
Alternative Fuel Commercial Vehicle and Vehicle Infrastructure B&O or PUT tax credit Department of Revenue ⁴⁶	\$6 million annual credit cap; renews annually	Businesses that use commercial vehicles to transport commodities, merchandise, produce, refuse, freight, animals, or passengers, using vehicles that use clean alternative fuel; the vehicle must display a Washington license plate	Purchases or leases of new commercial vehicles and qualifying used commercial vehicles with propulsion units that are principally powered by a clean alternative fuel. This includes: costs to modify a commercial vehicle to be principally powered by a clean alternative fuel, including parts incorporated into the vehicle and labor or service charges to modify the vehicle; purchases of alternative fuel vehicle infrastructure component parts, as well as related installation and construction costs.
Cleaner Diesel Vehicle Replacements Department of Ecology ⁴⁷	\$12 million funded by VW Program	School districts in Washington; Northwest Seaport Alliance Clean Truck Program	Replace diesel vehicles with new, cleaner diesel vehicles to improve air quality in areas where zero-emission technology did not meet fleet needs in 2019.

⁴⁴ <https://ecology.wa.gov/about-us/payments-contracts-grants/grants-loans/find-a-grant-or-loan/clean-diesel-grants#:~:text=Clean%20diesel%20grants%20will%20reduce,other%20diesel%20equipment%20engine%20replacements>

⁴⁵ Ibid.

⁴⁶ <https://dor.wa.gov/taxes-rates/tax-incentives/credits>

⁴⁷ <https://ecology.wa.gov/air-climate/air-quality/vehicle-emissions/investing-in-cleaner-transportation/vw-clean-transportation-projects#:~:text=Cleaner%20diesel%20vehicle%20replacements&text=In%20alignment%20with%20Washington's%20Beneficiary,similar%20grants%20in%20the%20past>

Local Programs and Incentives

From the Northwest Ports Clean Air Strategy to the City of Seattle's Drayage Pilot Program, local programs and policies to encourage the transition to zero-emission MHDVs play a critical role in supporting state goals. They provide avenues to test and explore strategies to incentivize zero-emission MHDV adoption, and lessons learned from their experiences have informed the incentive program design.

Several of Washington's larger utilities offer electric vehicle charging incentives for fleets and/or for off-road equipment like forklifts. These programs are growing on-staff knowledge about the power and technical needs of zero-emission MHDV customers. Utilities are critical partners to successfully electrify MHDV transportation.

Northwest Ports Clean Air Strategy

The Northwest Ports Clean Air Strategy guides air quality and sustainability programs at the Port of Seattle, Port of Tacoma, Northwest Seaport Alliance (NWSA), and Port of Vancouver, British Columbia.

Goal: To phase out emissions from seaport-related activities by 2050, supporting cleaner air for local communities and fulfilling a shared responsibility to help limit global temperature rise to 3.4 degrees Fahrenheit.

Objectives: The strategy seeks to reduce emissions from key operational sectors, including drayage trucks and cargo handling equipment, among others.

- Implement programs that increase efficiency; phase out old, high-emitting equipment; and increase use of lower-emission fuels.
- Facilitate collaboration among government, utilities, fuel providers, and industry to ensure the infrastructure needed to enable zero-emission technologies is in the place at the right time, addressing key constraints as soon as possible before 2030.
- Facilitate collaboration toward commercialization and drive adoption of zero-emission technology before 2050.

Progress: The strategy was implemented in 2008. The four ports collectively met the 2020 emissions intensity targets, as of the 2015–2016 emissions inventories. The ports estimate their emissions every five years as part of the Puget Sound Maritime Air Emissions Inventory.

Website: <https://www.nwseaportalliance.com/environment/clean-air/northwest-ports-clean-air-strategy>

NWSA Puget Sound Zero-Emission Truck Collaborative

NWSA's Puget Sound Zero-Emissions Truck Collaborative (Collaborative) convenes over 25 stakeholder groups to develop a strategy for the transition to zero-emission drayage trucking in the Puget Sound region by 2050. NWSA relies on 4,500 heavy-duty trucks that provide cargo-hauling services in and out of the terminals in Seattle and Tacoma; most of these vehicles are owned by independent owners or by small trucking companies. Almost all drayage vehicles used are diesel-powered and provide emissions that affect the air quality in communities near the ports.

Goal: The Collaborative's goal is to develop a decarbonizing drayage roadmap by the end of 2024 that outlines strategies for utilizing financing solutions (such as state and federal funding) and addressing key challenges (such as the need for charging and fueling infrastructure).

Roadmap Objectives:

- Emphasize voluntary, non-regulatory, and partnership-based solutions that can achieve emissions reductions at the scale and pace needed to meet port, local, and state decarbonization goals while also ensuring the continued economic vitality of the Northwest ports gateway and region.
- Emphasize facilitating a just and equitable transition to zero-emission trucking, with an emphasis on solutions that make zero-emission trucks affordable and available for a range of operators.
- Be informed by consultation with near-port communities experiencing environmental health disparities and small, lower income trucking companies and independent owner-operators.
- Be data-driven and use a learning-by-doing process, informed by regional pilots and related efforts.

Progress: NWSA, with support from WSDOT, hired a consulting team to coordinate the Collaborative in 2022. The Collaborative was established in June 2023. The stakeholder group meets bimonthly to discuss roadmap principles and collect feedback.

- Meeting 1: June 30
- Meeting 2: August 18
- Meeting 3: October 13
- Meeting 4: December 11

Implications for MHDV Voucher Incentive Program Design: Participation in the Collaborative has been a key part of the incentive strategy development process. The Collaborative's research and data collection has been critical in better understanding and articulating the challenges of transitioning the drayage sector to Class 8 zero-emission vehicles.

Website: <https://www.rossstrategic.net/Zero-Emission-Truck-Collaborative/>

City of Seattle Heavy Duty Truck Electrification Incentive Pilot

The City of Seattle’s incentive pilot program will provide point-of-sale rebates for drayage drivers serving the Port of Seattle to obtain new Class 8 electric vehicles. The program is one of the first MHDV incentive programs piloted by a city and aims to bring new electric drayage trucks to the Duwamish Valley in the next two years. With \$1.7 million in funding available, the incentives will cover approximately 40 percent of the cost of a new battery-electric Class 8 truck up to \$180,000. Equity is a major focus of this pilot, resulting in sustained engagement with the drayage driver community within the region.

Requirements: This incentive is open to all current and new drayage fleet owners based in Washington state servicing the Port of Seattle, based in the city of Seattle, or based in the Duwamish Valley. Priority was given to independent owner-operators, small drayage fleets, and women- and minority-owned businesses.

Progress:

- 2021: The program was awarded grant funding in 2021 for an 18-month zero-emission drayage truck feasibility project.
- 2022: The program drafted an incentive structure.
- 2023: The program guide was completed, and application form was released; applications are under review.
- 2024: First truck orders are set to be placed mid-2024.

Implications for MHDV Voucher Incentive Program Design: This pilot program focused on drayage electrification, which is a good use case for existing zero-emission truck technology. However, many of the drayage drivers serving the Ports of Seattle and Tacoma are immigrants, often underbanked, and in an industry with notoriously small profit margins. Container volumes are down at the ports, which puts further economic pressure on the drivers. This pilot provides insight into the potential problems a state incentive program might run into and ways to avoid those issues moving forward. The lessons learned from this are captured in Section V. Stakeholder and Industry Engagement and a stakeholder engagement plan for the drayage community in the Puget Sound.

Website: <https://www.seattle.gov/environment/climate-change/transportation-transportation-electrification/heavy-duty-truck-electrification>

Utility Incentive Programs

Many energy utility providers in Washington state—both investor-owned utilities and publicly owned utilities (PUDs)—have fleet electrification programs and commercial EV charger incentives for vehicles and equipment. The programs require the customer to be within their service district, and many will provide fleet assessments or site visits as part of their programs.

[Avista Utilities](#) offers an incentive to install electric vehicle charging stations at businesses, as well as a forklift incentive program. Avista will install a Level 2 charger at the place of business with no equipment fee and

will pay 50 percent of the premise wiring costs up to \$2,000 per port connection. Customers are responsible for the remaining premise wiring costs.

[Seattle City Light's](#) Fleet Electrification Program provides fleet advisory services and other assistance at no cost to assist Seattle residents with making the transition to electric vehicles. Rebates vary by technology and charger size. Forklift chargers are eligible for \$1,000 rebate, while yard truck chargers or rail yard equipment charger rebates vary from \$3,000 (Level 2 wall mount) to \$100,000 (DC fast charger 350 kW+). Seattle City Light will fund up to 100 percent of the costs of behind-the-meter make-ready infrastructure and to-the-meter make-ready infrastructure for Level 2 and DC fast chargers.

[Tacoma Power](#) previously had a cargo and material handling equipment incentive program and is in the process of developing a zero-emission MHDV infrastructure incentive program similar to Seattle City Lights' program. The cargo and material handling equipment incentive program provided up to 50 percent of the construction and electrical equipment costs and up to 100 percent of the electrical upgrade costs to replace diesel, gas, or propane forklifts, hostler trucks, or loaders with new battery-electric cargo handling equipment. This program included a free assessment to determine whether the local utility infrastructure is equipped to handle increased electric loads, and helped companies apply for a grant to cover the cost of rolling stock, plus a free estimate of lifecycle costs and benefits of the zero-emission equipment.

The [Puget Sound Energy](#) (PSE) Up and Go Electric for Fleet program offers up to \$250,000 in incentives per charging location. The program offers several ownership models for installing electric vehicle supply equipment, including the PSE-owned turkey service where PSE plans, designs, installs, and maintains charging equipment for incentives up to \$10,000 per Level 2 charging port and up to \$125,000 per DC fast charging port. For customer-owned and -maintained equipment, incentives vary between \$6,000 per Level 2 charging port and up to \$100,000 per DC fast charger port. PSE also runs an equity-focused Empower Mobility program for community-based organizations, Tribal entities, government agencies, and BIPOC-owned small businesses—who directly serve and/or benefit highly impacted communities and vulnerable populations.

The PSE program requires the customer to procure at least two owned or leased electric vehicles (or one for qualified Empower Mobility customers) for their fleet by the time charging at the site is installed and activated. Customers must also agree to operate the charging equipment for 10 years.

Taken together, the existing programs in Washington show there is interest from utilities in providing support to commercial customers, but more work is needed to ensure utilities have complementary programs to support future MHDV customers in transitioning to zero-emission on- and off-road vehicles.

Key Takeaways from Evaluating Washington State Programs

Evaluating Washington's array of programs designed to facilitate the transition to zero-emission MHDVs reveals a diverse landscape of local and regional initiatives. These programs, ranging from the Northwest Ports Clean Air Strategy to localized electrification pilots in Seattle, represent a concerted effort to not only incentivize but also gather vital insights into the challenges and opportunities associated with zero-emission MHDV adoption. By examining these programs collectively, it becomes evident that their lessons learned and outcomes significantly inform the development of broader statewide incentive strategies, serving as foundational pillars for the overarching goal of advancing zero-emission transportation technologies.

- **Importance of Local Initiatives:** Local programs like the above are pivotal in testing and refining strategies to incentivize zero-emission MHDV adoption. These programs have provided Washington with the necessary momentum to continue these efforts and essential insights that informed this broader statewide incentive program design.
- **Need for Comprehensive Support:** Little to none of the current Washington programs target commercial zero-emission vehicles, though interest from customers is high. Programs like PSE's Up & Go Electric for Fleet and Avista's incentives for electric forklifts showcase the significance of multifaceted approaches in supporting zero-emission MHDV infrastructure readiness and adoption throughout the state.
- **Role of Utilities:** Larger utilities in Washington offer electric vehicle charging incentives for commercial customers, enhancing their understanding of the technical needs of zero-emission MHDV customers. Collaborations with utilities are crucial for the successful electrification of MHDV transportation.



V. Stakeholder and Industry Engagement

Methodology

A comprehensive strategy was created to hear directly from stakeholders on incentive strategies that could help them overcome barriers to replacement of internal combustion MHDVs with zero-emission vehicles. Industry outreach was conducted with owners and operators of various vehicle and equipment types, vehicle manufacturers, zero-emission MHDV dealers, utilities, and infrastructure installation experts. The stakeholder engagement and outreach strategy for developing the zero-emission MHDV incentive program in Washington state included:

- Coordinating with existing zero-emission MHDV-focused groups and initiatives in Washington state;
- Attending the Green Transportation Summit & Expo industry event;
- Hosting 22 ninety-minute focus groups (some groups met two times during the study);
- Hosting 18 one-on-one interviews with trucking companies, industry leaders, and original equipment manufacturers (OEMs);
- Distributing a 21-question survey;
- Coordinating with a staff work group including representatives from JTC, House Transportation Committee, Senate Transportation Committee, Washington State Department of Transportation (WSDOT), Department of Ecology, and Department of Commerce;
- Outreach to Washington State Legislators; and
- Hosting a final stakeholder review session.

Stakeholder feedback was collected between August and December 2023. Communication engagement methodologies included email outreach, surveys, individual one-on-one meetings, legislator engagement, and tailored focus groups by vehicle or industry types.

Focus groups were generally organized by industry and use case, though vehicle class and segmentation were considered. Utilities were invited to focus groups to discuss readiness for zero-emission MHDV infrastructure deployment and how to integrate local and state infrastructure incentives. Finance and commercial insurance vehicle experts provided insight to the financial and procedural challenges faced by customers looking to acquire zero-emission MHDVs. Table 11 lists focus group categories and vehicle types discussed by the stakeholders. Efforts were made to ensure a relatively wide geographic distribution of participants.

Table 11. Focus Group Categories and Vehicle Types

Focus Group	Vehicle Type(s)
Agriculture and Farming Equipment	Off-Road Equipment (Tractors)
Construction Equipment	Classes 4–7 Construction Trucks
Dealerships of Medium-Duty, Heavy-Duty, and Off-Road Vehicles	All
Drayage	Tractor Trucks
Finance: Commercial Vehicle Finance	All
Food Trucks	Panel Vans; Step Vans
Independent Owner-Operator (Not Drayage)	Tractor Trucks; Box Trucks
Mid-Sized Businesses Operating MHDVs	Step/Panel Vans; Tractor Trucks
Minority-Owned Small Businesses Operating MHDVs	Step/Panel Vans; Tractor Trucks
Original Equipment Manufacturer	All
Off-Road Equipment: Port/Airports	Cargo Handling and Off-Road Equipment; Airport Cargo Loaders; Forklifts; On- and Off-Road Terminal Tractors
Off-Road Equipment: Railroad	Cargo Handling and Off-Road Equipment; Railcar Movers; Forklifts; On- and Off-Road Terminal Tractors
School District	School Buses
Small Businesses Operating MHDVs	Pickup Trucks; Box Trucks; Food Trucks; Cargo Vans
Transportation Refrigeration Units	Transportation Refrigeration Units
Utilities	Infrastructure
Insurance: Commercial Vehicle Insurance Providers	All
Long-Haul Trucking	Tractor Trucks; Box Trucks
Port Districts	Forklifts, Maintenance Vehicles, Port Vehicles

Focus Group	Vehicle Type(s)
Private Fleet	Tractor Trucks; Box Trucks
Public Agency: State, County, City (Not Transit)	Box Trucks; Vans; Other
Shipping/Logistics/ Warehousing	Tractor Trucks; Box Trucks
Transit Agency	Buses
Zero-Emission Refueling Infrastructure Provider	Infrastructure

Common Themes in Stakeholder Discussions

Although the various sectors had unique feedback on their needs for the proposed incentive program, there was consensus around the following themes:

- Cost Differential:** The predominant challenge observed across conversations was the stark cost disparity between existing, predominantly used vehicle fleets and newer zero-emission technologies. The high initial investment for electric or alternative fuel-powered trucks poses a significant barrier to adoption.
- Infrastructure:** Throughout all conversations, infrastructure was raised as a major barrier to zero-emission MHDV transitioning. The current lack of existing charging and refueling infrastructure along major highways and routes challenges the logistics industry’s trust in zero-emission MHDVs. Long timelines to get infrastructure installed, and requirements from some utilities for a vehicle purchase order before beginning MHDV charging installation, are major facets of this issue.
- Technology:** Concerns centered on technology viability and performance were prevalent across most conversations. Today’s 200-mile battery-electric range for MHDVs is not sufficient for many industry use cases of MHDVs, which generally travel 200+ miles in a duty cycle and would not have sufficient time to charge with current operational procedures. Additional weight from these electric vehicle batteries poses a complicated challenge for many heavy industries. Currently, companies are already near the Washington weight limits to maximize payloads, but the addition of extra weight from a battery pack would decrease their payload capacity. Other technological concerns raised centered around the performance of zero-emission vehicles in harsh climates or rural regions. Truck routes that go over the mountain range into Eastern Washington face various weather conditions throughout the year (i.e., battery charge is drained through air conditioning or heating unit).
- Vehicle Availability:** The owners and operators of MHDVs often rely on fully customized vehicles to perform specific functions, and that level of customization is not yet available. Vehicle manufacturers are actively working with customers to address this need. Additionally, while hydrogen fuel cell

vehicles may be a longer-term solution to the above technology challenges, there are not any models available on the U.S. market today.

- **Interest in Transitioning to Zero-Emission:** Despite the overall challenges, most industry representatives understand that they will need to start making this transition to zero-emission technology soon. There is general interest in moving toward low- and zero-emission vehicles, but many stressed the magnitude of the barriers they are facing and the lack of information, resources, and support to make the transition. Even large fleets are struggling to understand where and how to start transitioning their fleets to zero-emission technologies.

Consultation with Legislators

The project team met with Washington State Legislators virtually and in person to discuss the incentive program development. The team met with several legislators one-on-one to collect further feedback and give updates as new challenges arose during the project development.

The team presented to legislators background information about the importance of decarbonizing the MHDV transportation sector and an overview of the JTC study. This was an opportunity to educate state legislators about the current landscape and gain feedback on the proposed incentive design of the program.

Legislators provided the following guidance in one-on-one and group discussions:

What the Incentive Program Should Do:

- Move the zero-emission MHDV market without leaving significant on- or off-road vehicles behind.
- Encourage a gradual, realistic transition to zero-emission technologies.
- Utilize models industry already understands and build from there.
- Measure air quality improvement benefits from the program and ensure these benefit disadvantaged communities.
 - Hyperfocus the program so the most money is going to the highest polluting vehicles with the worst air impacts.
- Integrate into existing work at other Washington state agencies, including TES.
- Invest in emerging markets and technologies, not those that are well established.

What the Report Should Do:

- Provide a snapshot of where the MHDV market is today.
- Outline the vehicles the voucher program is targeting.
- Provide data-driven justification for the investments recommended, tying into available technology if possible.
- Articulate why the state should invest in private-sector fleets.

- Outline market indicators, metrics to monitor to adjust program in the future, and interagency relations and responsibilities in implementing the program.
- Identify ways existing state programs could be expanded for this work.
- Provide a comprehensive solution that looks at different elements within the transportation funding system and leverages existing resources (e.g., how to layer federal tax credits, state funding, etc.).
- Articulate existing information, data gaps, and the resources needed to address those gaps moving forward.

Comments on Program Design:

- Funding allocation should be balanced between small and large fleets.
 - The incentive program must build credibility and develop success stories within its first year to encourage participation.
- Sectors that are prepared should be allocated ample funding to foster a sense of success; this will drive adoption in smaller, less-prepared fleets.
- Adequate funding should be allocated to industries (e.g., drayage trucks) that have use cases aligned with current electrification technologies, as well as mechanisms to drive adoption in other areas.
- Small fleets will require additional assistance in understanding and adopting zero-emission vehicles.
 - Robust education components will help with this.
 - The burden of new technology should not be placed on small fleets before larger fleets help to build out a market for workforce, etc.; long wait times for mechanics will be an obstacle for small fleets.
- Build in yearly analysis and adjustment period to best fit needs and preparedness level of industries in state; program will be successful in some areas early on but will require tweaks as it grows and adapts to fit the market.
- Phased approach will work well to encourage early adopters and more wary fleets in making the transition.
- Benefits of decarbonization should be quantified in easily digestible ways, especially for small fleets.
 - Quantifying, both monetarily and regarding health, the benefit of transitioning to a zero-emission vehicle is an important component in outreach to small and disadvantaged fleets.

Coordination with Staff Work Group

Coordinating efforts with a dedicated staff work group composed of representatives from JTC, House Transportation Committee, Senate Transportation Committee, WSDOT, Department of Ecology, and Department of Commerce was a pivotal step in aligning in recommendations. During these engagements,

comprehensive presentations were delivered to provide overviews of the study and facilitate discussion. Input was collected about opportunities, challenges, and concerns related to the proposed zero-emission MHDVs and infrastructure incentive program.

Importantly, these interactions were an opportunity to align with agencies on their respective proposed working initiatives and recommendations, such as the Department of Commerce and their recently drafted statewide TES. Many of the agencies have been working collaboratively on decarbonizing the transportation sector through the state EV Coordinating Council. This EV Council will continue to be an important tool in encouraging coordination between agencies as they implement policies and programs to reduce emissions in Washington state.

Coordination with the staff work group resulted in the following guidance:

Comments on Program Design:

- Avoid duplication of effort with existing programs in the state.
- Like the HVIP market growth, the program should build the supplier base of zero-emission MHDVs quicker than it would otherwise grow.
- Coordinate between agencies including WSDOT, Department of Ecology, and Department of Commerce; encourage coordination with neighboring states including Oregon and California.
- An emphasis on planning, education, and technical support is critical in executing a successful program.
- Technical assistance should be provided in an easily accessible format.
 - This should be supported in person through community-based organizations.
 - A statewide resource center can be developed to host funding opportunities.
- Third-party administrators are critical in delivering prompt reimbursements to dealers.
- Third-party administration should be outlined clearly so agencies understand what the bid process should look like.
- Program funding should be available to match federal dollars so fleets can leverage available funding.
- There should be a mechanism for legislative recommendations and requests.

What the Report Should Do:

- Outline the roles of WSDOT staff when interacting with the third-party administrator, including the legal and administrative processes that need to be in place to ensure a smooth rollout of funding once made available.
- Include a discussion of what Washington state is already doing to accelerate transportation decarbonization.

- Identify how much it would cost to effectively move the needle on zero-emission MHDVs.
- Communicate how the zero-emission MHDV sector is different than the light-duty sector.
- Illustrate major trade-offs in how the incentive program is designed.
- Articulate the difference between publicly owned MHDVs (e.g., city buses, municipal fleets) vs. privately owned MHDVs (e.g., food trucks, short- and long-haul).
- Discuss workforce development needs for mechanics and electricians.

Other Comments:

- State investment in infrastructure must be taken into account in the budget to support electrification efforts and avoid delays for fleets waiting for adequate charging opportunities.

Industry Engagement and Outreach

Given the project timeline, leveraging existing networks and getting feedback from a wide variety of MHDV types and use cases was prioritized to ensure efficiency and breadth of outreach. The PNWER team partnered with Washington-based organizations [Seattle Latino Metropolitan Chamber of Commerce](#) and [Clean and Prosperous Washington](#) to further outreach efforts. The Seattle Latino Chamber hosted two focus groups in English and Spanish to collect stakeholder feedback from the Latino small business community in Washington state. Clean and Prosperous Washington hosted eight focus groups and assisted in data analysis of the survey results.

Early into project development, the PNWER team participated in the Green Transportation Summit & Expo as an exhibitor on August 22–24, 2023, to engage with industry representatives, truck owners, and other key stakeholders to disseminate information about the JTC study. This early engagement was an opportunity to open lines of dialogue with fleets, answer any questions about the creation of a zero-emission MHDV incentive program, and encourage involvement through the project development.

Collaborative engagement efforts extended to existing zero-emission MHDV-focused groups in Washington state. The team participated in NWSA’s Puget Sound Zero Emission Truck Collaborative to collect information on the drayage sector and share information about the JTC study process. The team also participated in Clean and Prosperous Washington’s established zero-emission MHDV working group to share information and collect stakeholder feedback during monthly meetings.

In parallel to industry engagement, the team published a 21-question survey. The survey collected information to provide a baseline assessment of top barriers to decarbonizing MHDVs, level of knowledge about zero-emission MHDV technologies, level of knowledge about zero-emission MHDV incentive programs in other states, level of knowledge about zero-emission infrastructure needs, and general attitudes toward zero-emission technologies. The survey was open from October to early December. It was offered in both English and Spanish to provide broader reach in participation and was translated by the Seattle Latino Chamber of Commerce.

The engagement strategy also included hosting 22 virtual focus groups via Zoom, supplemented by 12 one-on-one interviews with industry leaders. Some focus groups met two times during the study. These interactions gathered direct feedback on challenges, opportunities, and concerns regarding the proposed zero-emission MHDV and infrastructure incentive program. Discussion questions based on specific focus group areas were used to guide the discussion and obtain feedback from participants. These questions can be found attached to each of the stakeholder interview summaries in Appendix D. More than 12 one-on-one individual interviews allowed industry leaders to share candid feedback about the challenges and barriers they face when decarbonizing their vehicle fleets.

A final stakeholder review session concluded the engagement process. The final stakeholder review session was open to all previous and new focus-group participants that wanted to give feedback. A final presentation was given to participants on common themes and findings that were identified in previous focus groups, and the project team showcased the draft incentive design for final remarks. This was an opportunity to validate consensus among participating stakeholders and create alignment on key themes and proposed incentive design. The final review session identified remaining gaps or unaddressed issues and was well attended by a cross section of industries.

Feedback collected from these engagement efforts were passed along to the CALSTART team for integration into the final program design. High-level comments and themes from the stakeholder focus groups are included below.

Please note that the following comments are not a reflection of the opinions or perspectives of the CALSTART, PNWER, or other support teams.

Dealerships, OEMs, and Vendors

Vehicle vendors, often dealerships, are important to distributing vouchers under the HVIP incentive program in California and will likely play a similar role in Washington. Consequently, an effort was made to speak with dealerships, OEMs, and vehicle vendors in California and Washington to get their insight and perspective.

Dealerships:

- Like the point-of-sale voucher system, they widely accept that this as best approach for zero-emission MHDV incentives. Any other system puts larger burden on customers for financing.
- A point-of-sale voucher is technically a rebate from dealership perspective.
- In California, dealerships are doing fleet analysis and eligibility analysis for their customers. They feel that they are becoming consultants and administrators of complex public policy programs without adequate resources.
- Long delays on getting reimbursed for the cost of vouchers are major issue. They want quicker turn-around and/or better parameters about who holds liability. Dealerships do not want the level of liability they are holding in California multiplied by several states.

Infrastructure:

- Infrastructure readiness will be a major barrier to timely zero-emission MHDV deployment. In California, MHDV charger installations can take years and are not matched with vehicle acquisition timelines, so voucher orders are cancelled while the infrastructure is put into place.
- Customer conversations with utilities about site readiness need to happen before they place an order for a vehicle. Site assessments should be done early in the process of exploring zero-emission deployment.
- There should be an emphasis and priority on charging infrastructure with an acknowledgement that wait times are long.
- Utilities should know dealerships in their area that are selling electric MHDVs.

Program Design:

- Pre-screening/pre-approval/formal customer education process would be helpful.
- Dealerships would be interested in having a third party do some of the pre-analysis, including eligibility analysis, ahead of time to help relieve administrative burden of incentive program. This would require customers to go through learning systems before applying, including learning about what needs to happen so they can deploy a zero-emission fleet, where public chargers are, how to interface with utilities, etc.
- This could be done by a Department of Transportation or other organization that puts it together so there is learning before qualifying for a voucher.
- Dealerships would be interested in providing feedback on education program as it is put together.

Insurance:

- Commercial vehicle insurance for zero-emission vehicles is difficult to obtain and a growing obstacle for deploying zero-emission fleets. Big fleets can self-insure, but small- to medium-sized fleets and independent owner-operators have a hard time finding coverage options, so they cannot complete the purchase of a zero-emission truck.
- Number of unknowns with zero-emission MHDVs make them hard to insure, and many commercial vehicle insurance providers do not have policies available for zero-emission MHDVs.
- High deductibles are attractive for insurance carriers to cover costs of these unknowns, but not for small fleets that may be unable to handle the financial burden.

Program Administration:

- If there is a voucher already in process, programmatic changes should not be applied retroactively. Changes to the program should be published clearly.
- There should be a longer redemption window of 24–30 months for the Washington program (vs. 18 in HVIP because dealers constantly need to ask for extensions).

- Provide single source of information on the program, eligibility, etc. that clearly lays out the process and helps users navigate through (i.e., Step 1, Step 2, Step 3...).
- Clarify/clearly define what small business means.

Recommendations for Washington:

- Offer longer redemption window for vouchers between 24–30 months to avoid needing to request extensions on the redemption window. This is approximately how long the process takes today in other states, but the shorter formal window means they need to constantly ask for extensions.
- Provide a single zero-emission MHDV infrastructure program or state-level of parameters that utilities could conform to.
- Understaffing at the implementing agency can be a major issue, even with a third-party administrator.
- Need clear identification of who holds liability in case of rejection in voucher redemption process.
- Hold public engagement workshops for companies interested in getting an electric truck.
- Provide sales tax exemption for zero-emission MHDVs to help lower cost of vehicles.

Secondary Market:

- A secondary market is necessary to meet decarbonization goals, would increase adoption rates, and create more comfort for hesitant customers.
- The value between new and used zero-emission vehicles is unknown, but it is estimated at 50 percent of the initial value of the vehicle. This number is contingent on the number of years the vehicle was used.

Other Comments:

- Smaller fleets will face additional challenges with navigating the program and transitioning to electric vehicles; provide additional support here is necessary.
- Disadvantaged communities require special education components to make an informed transition. The lack of infrastructure is especially felt in these communities.
- Direct-to-consumer sales should be considered in the Washington program.
- Customers tend to shop for vehicles in different states.

Vehicle Finance

Financing and Insurance Challenges:

- The higher costs associated with a zero-emission MHDV compared to diesel counterparts are a huge concern, especially for small businesses and disadvantaged communities.

- Insurance concerns are centered around the likeness of high deductibles and limited carriers willing to cover these vehicles. There is a need for more data to assess risks properly and potentially state support to encourage insurance providers to offer reasonable coverage.

Flexibility in Financing Options:

- Restrictive financing could limit participation, so offering a range of options could encourage broader adoption of zero-emission vehicles.

Clarity and Consistency in Program Requirements:

- It is important for incentive programs to have clear, consistent requirements. Changing requirements mid-program can cause frustration and confusion among participants.
- Tax implications and usage requirements within the state should be explicitly defined.

Insurance:

- Insurance providers are hesitant in entering this space of zero-emission commercial vehicles due to uncertainty around properly determining risk.
- The concept of a shared risk pool or state backing for insurance providers was positively received and discussed as a potential solution to the insurance challenges.
- Insurance availability for zero-emission MHDVs was named as second largest concern after overall cost of vehicle.

Program Design:

- The point-of-sale voucher system was seen as a best practice to move forward.
- Support the idea of using a third-party administrator to handle the vouchers, similar to California's HVIP model.
- Include a wide variety of vehicles and vehicle types in the program, taking a technology neutral approach.
- Need to consider the whole vehicle in the incentive design; include specialized equipment and not just the chassis.
- A percentage-based incentive might be more equitable across different fleet sizes and vehicle types.

Utilities

Major Challenge: Long timelines for electric vehicle infrastructure deployments for sites that can accommodate MHDVs.

- In California, the industry is seeing a major mismatch between infrastructure readiness and vehicle deployments. Some vehicles are not able to be picked up because the infrastructure to refuel them is not ready yet.

- MHDVs require more space and power for their charging than light-duty vehicles because the vehicles themselves are larger and have more battery recharging needs.

Utility Perspectives:

- Early engagement with utilities was emphasized as key to successful zero-emission MHDV charger deployment.
- Customers need to understand why and how utilities should be involved in the electrification process. Encourage customers to inform utilities as soon as they have plans for electrification projects to help utilities better plan and facilitate electrification projects.
- Size and staff capacity of the utility matters a lot. Well-resourced utilities are already preparing for fleet electrification and MHDV charging needs, but smaller utilities may need assistance providing energy consulting for customers interested in electrifying.
- Keep utilities updated and informed about the incentive program and ways they can participate in this process.

Infrastructure Needs:

- Larger requests for power, equivalent to a city's worth of load, indicates the scale of demand in the electric vehicle industry is high and needed.
- It is important to look at both energy generation and transmission at the state level to ensure adequate power to meet electrification goals.
- Permitting is a major roadblock to building out these sites.

Supply Chain:

- Supply-chain and lead-time issues need to be accounted for.
- Transformers procurement could be a challenge due to the supply chain.
- Lead times for site electrification can range from 6–12 months on average. DC fast charger projects are noted to have longer lead times, with around 18 months on average.

Workforce:

- The recurring issue of workforce development challenges in the context of electrification projects is a significant hurdle that needs to be addressed. There is currently a shortage of skilled workers in the field, indicating a potential barrier for project implementation.
- Staff capacity and number of employees directly impacts the level of assistance and services the utility can provide to customers interested in electrifying. Providing administrative assistance to take paperwork burden off of customers, site assessments, and other activities are not possible without adequate staffing.

- Larger utilities host apprenticeship programs that have potential to educate a cohort on electrification. These existing programs could be expanded to accommodate larger classes and a subsequently larger workforce equipped with skills to manage fleet electrification infrastructure.

Infrastructure Components of Program Design:

- Utilities in Washington state should be tied into the incentive design process where possible. They can inform prospective customers on technology and infrastructure lead times and expenses.
- Voucher application process should include informational materials on grid readiness and include ways to gauge the readiness level of the site prior to continuing with the application process.
- It would be helpful to begin developing an approved vendor database or list for MHDV installation as the industry matures.
- Ownership of the charging infrastructure should be taken into consideration, and the program should be flexible to accommodate utility ownership and customer ownership of the charging infrastructure.
- The program will need to be able to layer incentives for larger fleet infrastructure to accommodate higher charging needs.

General Program Design Comments:

- Better coordination is needed at the state level to leverage federal funding effectively.
- Equity-focused customers, including those in disadvantaged communities, should be a priority for incentives and support.
- Support mechanisms are needed to assist the transition to electric fleets, such as tax incentives modeled after federal tax credits for different vehicle classes or different levels of charging.
- The point-of-sale voucher was seen as a good approach vs. a post-purchase rebate to alleviate potential tax implications for businesses, especially smaller entities.

Trucking Companies

Companies of various sizes representing the breadth of Washington state's trucking and logistics industries participated in focus groups and one-on-one interviews for their opinions on the challenges and opportunities for decarbonizing the heavy-duty trucking segment. Individuals interviewed are in senior management positions in trucking and logistics companies in Washington state, ranging from small family-owned trucking companies to national companies. Operations included long-line hauls (including agricultural hauls), less-than-truckload (LTL), heavy-duty and local box trucks, with 24/7 operations to Monday–Friday operations. Size of fleets ranged from 30 trucks to more than 500. Drivers with these companies included union-represented hourly employees, non-union employees, mileage-based drivers, and independent owner-operators.

Below is a summary of their comments, along with potential solutions suggested by industry leaders. The comments are condensed from individual meetings and separate focus groups including long-haul trucking, private fleet, and drayage focus groups.

Technology:

Industry members noted that there are significant operational concerns about the battery-electric technology. These concerns include:

- *Reduction of payload due to extra weight of electric batteries (or fuel cells).* For heavy-duty trucks, current technology in electric batteries adds 3,000–6,000 lbs. of additional weight, substantially reducing the amount of freight a truck can haul based on current weight allowances. This reduction of payload will require trucking companies to purchase additional trucks simply to haul the same amount of freight as they do currently. For trucking companies, these additional trucks will also require additional drivers, additional space for parking, additional insurance, etc.—substantially increasing operating costs. Additional trucks will also affect the state’s transportation and logistics chain, with more containers needed to haul the same amount of freight, more trucks on the state highway system, and more trucks entering the ports.
 - Washington state’s heavy-haul corridors around the Port of Tacoma will be especially impacted by these weight restrictions.
- *Reliability and range.* Current battery range technology has not yet advanced to meet the requirements of long-line hauls across Washington. Reduction of range in colder temperatures is a concern for trucking companies hauling freight from Eastern Washington.
- With technology as it stands today, hydrogen and renewable diesel are better options for long-haul trucking to replace diesel trucks, as long as they are affordable. Electric trucks are difficult to run because of routes (e.g., terrain, distance, no ‘home base’), loads, and additional power needs for these trucks.

Insurance:

- *Lack of availability and cost of insurance for electric/fuel cell trucks.* Insurance products for electric trucks are not yet widely available; currently available insurance products are three times the cost of traditional insurance.

Financing:

- *The full cost of conversion to electric trucks is substantially more than the purchase price of the truck.* This includes: cost of the electric truck + federal excise tax + state sales tax + cost of installing chargers + additional yard space needed for trucks while charging + down time of trucks during charging + additional drivers required (charging time cuts into service hours) + cost of battery replacement.

- Federal incentives are not nearly enough to cover the costs of zero-emission trucks, and electric trucks remain substantially more expensive. They may not even cover additional insurance or tax burden of the vehicle.
- Important to cover these financial hurdles—without the support, it is too easy to say no to this new, expensive technology.
- Currently, zero-emission trucks have no residual value because there are not many on the market, which makes them difficult to finance.⁴⁸ Having the state back the residual value of a zero-emission truck could help with financing by guaranteeing a value on the secondary market.
- Marking up the price differential to be comparable to diesel or three-year out of pocket goes a long way. Grants can be part of this.

Infrastructure:

Infrastructure costs and readiness were the second most-discussed topic amongst the participants after zero-emission vehicle costs. Concerns about electrification infrastructure include:

- Cost of installing charging infrastructure on private facilities can be prohibitively expensive.
- The “charging challenge”: Most of the facilities where charging is needed for the private sector are rented (not owned) by the vehicle/fleet owners, so there is no incentive for large, long capital investments in charging infrastructure. Trucking companies frequently move locations in pursuit of low rent prices, which disincentivizes landlords from making the investment in charging infrastructure.
- Lack of adequate space in yards to install chargers. (Example: 10 electric chargers will displace parking spots for 50 trailers.)
- Significant lag time with utilities to install power. Trucking companies report that utilities 1) are requiring electric truck purchase orders before agreeing to install power, and 2) will not put chargers on private property without long-term (10 year+) leases, which are not standard for the industry, in order to recoup investment.
- Availability of power and charging infrastructure in smaller/rural communities and outside state lines. An adequate, wide-reaching refueling infrastructure network for zero-emission trucks will be required to scale operations.
- Many depot charging options will be behind-the-fence, which does not align well with many grant program requirements, making funding these sites more difficult.
- Permitting is a big roadblock to getting sites up and running.

⁴⁸ <https://calstart.org/wp-content/uploads/2021/03/Taking-Commercial-Fleet-Electrification-to-Scale-White-Paper.pdf>

- Public charging needs to get much more reliable to be an option for commercial use; dedicated time slots and space to charge are also needs. The I-90 corridor does not have enough truck parking as is, part of a nationwide truck-parking problem.
- Moving some of the regulatory and cost hurdles to deploying infrastructure can help get investments at the speed and scale needed to meet future demands.
- Different use cases and vehicles will have different charging patterns. Forklifts, drayage trucks, and short-run vehicles will primarily use at-home charging and supplement with available opportunity charging. Long-haul trucks are a different circumstance.

Impact on Drivers:

- Time to charge trucks will reduce drivers' hours of service; this is especially impactful on independent owner-operators and drivers paid by the mile.
- The current driver shortage will be exacerbated by the need for additional drivers if the battery weight/payload reduction issue is not addressed and more trucks are required to haul the same amount of freight.
- Potential solutions:
 - Increase state funding for expanded commercial driver's license (CDL) training at high schools and community/technical colleges.

Program Design:

- Provide support (e.g., bundling incentives, pre-approval support), but avoid it being mandatory.
- To use funds effectively, the program should cover different use cases, which could mean either accessing incentives, technical assistance, or both.
- HVIP and other state incentive systems are generally working well, but administrative burden is on dealerships. Pre-approval process could be beneficial to alleviate that burden.
- Incorporating an innovative, small-fleet, equity, and infrastructure focus into one program could be beneficial.
- Line up eligibility with other state programs rather than having a separate process.
- It would be nice to have the option to do infrastructure and vehicle incentive at the same time, but it should not be a requirement.

Other Comments:

- Outreach and additional financing services should be provided to small businesses. Understanding the vehicles is less of an issue than fully understanding the costs and the infrastructure to use them.
- Conduct outside-the-box outreach to build confidence across use cases that the technology is able to do what a company needs it to do.

- Prioritize technologies that have business buy-in rather than a blanket approach promoting technologies that have no business case. It is important to prioritize technology that fits.
- Renewable diesel is important.
- Be prepared on the legal side; California was, New Jersey was not, and it impacted how quickly the program was deployed.

Industry-Suggested Solutions

Operational Concerns with Battery-Electric Technology – Suggested Solutions:

- 1. Reduction of payload due to extra weight of electric batteries (or fuel cells).*
 - Increase weight allowances to adjust for the weight of the batteries. This may be difficult because Washington state already allows heavier trucks than neighboring states.
 - Align state policy with neighboring states (Oregon, Idaho, Montana, Nevada) by permitting triple-trailers on certain freight routes (one triple-trailer removes one truck from the highway). This would reduce emissions by taking every third truck off the road and increase efficiency of the supply chain.
- 2. The full cost of conversion to electric trucks is substantially more than the purchase price of the truck.*
 - Provide incentives for the full cost of ownership. Examples: exemptions from state sales tax, incentives for installation of chargers, discounts on additional battery purchases.
 - Long-term financing programs are needed (beyond the conventional five-year period), particularly for small- to medium-sized companies.
- 3. Reliability and range.*
 - Focus state incentives on developing the short-haul market first (example: Class 8 yard trucks, box trucks) until technology exists for long-line hauls.
- 4. Lack of availability and cost of insurance for electric/fuel cell trucks.*
 - Provide incentives to the insurance market to provide electric/fuel cell battery at costs competitive to standard truck insurance rates.
- 5. General concerns about charging and refueling infrastructure availability.*
 - State investment in and build out of infrastructure should be a top priority for the Legislature.
 - Create a streamlined permitting process for infrastructure development.
 - Include all utilities (public and private) statewide in evaluating power availability and charging installation.
 - Provide incentives for commercial landlords to install charging infrastructure for tenants.

- e. Ensure financial incentives/grants are broadly available across the state, not just in low-income neighborhoods.
 - f. Provide incentives for utilities to work with municipalities to plan and offer charging to the general public.
 - g. Provide technical assistance to private companies to analyze the use case for commercial charging in order to optimize investments (example: analyze duty cycles).
 - h. Work with adjacent states (especially Oregon and Idaho) on developing interstate charging infrastructure.
6. *Current driver shortage will be exacerbated by the need for additional drivers.*
- a. Increase state funding for expanded CDL training at high schools and community/technical colleges.
7. *General comments and suggestions about statewide zero-emission adoption:*
- a. The operational complexities for long-haul and heavy-haul trucking are immense. Start with transitioning short-haul fleets and provide a longer transition period for heavy/long-haul trucking as necessary statewide infrastructure and new technologies come online.
 - b. Provide immediate incentives for alternative fuels such as renewable diesel or hydrogen internal combustion engine, which provide immediate emissions reduction during the transition period.
 - c. Provide a specific schedule for achieving zero emissions, so companies have time to adequately plan.
 - d. Mandates should not occur unless/until electric charging is available.
 - e. State investment should look at all zero-emission options (example: hydrogen, ethanol), not just electrification, and program design should be flexible in including hybrid options.
 - f. It is unrealistic for companies to be able to transition their entire fleet quickly and efficiently without proven, cost-effective solutions.

Public Agencies

Where municipal money has gone (i.e., transit and school buses), there has been a lot of uptake, so once funding is available, there will be those ready to use it at public agencies.

Technology:

- Certain zero-emission applications make sense; other vehicles are too heavy or energy intensive still, so there is no good zero-emission alternative to diesel vehicles.

Infrastructure:

- Time constraints and limits on money available are tough, because it takes a long time to get the process done and the equipment. Time limits should not be there for infrastructure because timelines are so unpredictable right now.
- If utility consultations are a requirement, it is important to staff and fund PUDs that do not have capacity to do this. A third party or agency liaison may work best to provide these services.
- Old municipal infrastructure will need a lot of support, funding, and improvements to meet electrification targets. Some PUD planning is underway for this, which can lead to a better idea of projected costs, but there is not available money to do the upgrades now.

Program Design for Public Agencies:

- Incentives have to be a reimbursement after the vehicle purchase for public fleets, not a voucher at the time of purchase.
- Money allocations or grants are best for public fleets. Tax rebates and vouchers do not work well. A direct pay option can allow savings to be transferred directly to municipal fleets that do not have tax liabilities, for example.
- Have an easily documented reimbursement process with certainty that the money comes back in a reasonable timeline. It is important to make that reimbursement simple and trackable for the applicant so it goes to the right department within the municipality.
- Clearly define “equity” and “equitable distribution” so it is clear to the applicant what these terms mean.
- Set money aside for smaller and medium cities. There is an equity issue of money going to the largest population centers that have easily identifiable disadvantaged communities, which leaves smaller and mid-sized communities out.
- Steady third-party support is necessary for equitable outcomes. This includes technical and application support.

Supply Chain:

- Do not include Buy America requirements in this program.
- Switchboard availability (and Buy America requirements) is really slowing everything down.

School Districts**Infrastructure:**

- Infrastructure readiness is a major concern for school districts.
- Many districts, especially in rural or underserved areas, know that it will take several years and lots of money to get their infrastructure ready to charge electric buses.

- Districts with early-release schedules and rural routes would require additional infrastructure to support mid-day and mid-route charging.
- School districts have concerns over where to charge and store buses, as many of them cannot accommodate the entirety of an electric fleet in one location.

Technology Readiness:

- School districts, especially those in rural communities, are concerned about the impact of heating the vehicle on battery range. This creates additional challenges for rural communities with sparse charging opportunities.

Workforce:

- School districts are concerned about the maintenance factor of electric bus adoption as it relates to specialized training needed to perform upkeep.
- More education is needed about charging infrastructure, how it works, and what it needs to be successful for zero-emission MHDVs.

Funding:

- There is not enough funding available at the state or federal level for school districts to adopt electric buses.
- There should be a two-track funding designation system based on adoption preparedness level. This concept would provide funding to support districts ready to adopt electric buses, and different levels and types of support to districts that need additional funding or support to prepare to adopt electric buses.
- Allow districts to leverage state funding for federal grant opportunities.

Program Design:

- Account for a district's preparedness level to quickly deploy electric buses in funding options. Have dual tracks of funding opportunities for different readiness stages and needs within the transition to zero-emission buses.
- Establish centralized point of contact about funding programs at relevant state agencies.
- Establish "case study database" to share lessons learned as more fleets adopt zero-emission vehicles.
- Proposed model of incentive may not work well with the way that school districts interact with bus OEMs or procure buses.

Further Research/School Districts:

- Analyze tax disparities in small and rural school districts. Bridge gaps created by inaccessibility to Transportation Vehicle Fund dollars.

- Districts would benefit from having a contact list of state officials with whom they can discuss electric bus programs and funding mechanisms.

Transit Agencies

Program Design for Transit Agencies:

- Point-of-sale vouchers typically do not work in the transit agency setting. Grants or allocations work much better for planning and acquisition cycles of transit agencies.
- Four years for grant programs work better than a biennium to give more time.
- Fleet transition plans are being funded and completed, so in a lot of cases support is not needed there, but funding is needed to see them through. Transit agencies will use any and all funding, so any assistance would be helpful. They are “not in the game” without meaningful state and federal incentives.
- Program should provide support especially to smaller agencies that are paying consultants to develop plans.
- Stackability of incentives (federal, state, local) is very important.

Infrastructure:

- Long-term transition plans are in place for many transit agencies, but utility cooperation and coordination are necessary to scale.
- Labor (electricians, technicians) and components (switchboards) are a major obstacle to timeframes and deployment. Workforce is a big consideration. Infrastructure development will have a positive job outcome.
- Charging infrastructure and service being compromised by power outages is something they think a lot about.
- Shop, modifications, and upgrades are part of infrastructure, as that work is required and done internally.

Other Comments:

- Use cases for hydrogen (e.g., long routes, power outages, cold weather) are important to make sure the program works for agencies across state and more rural areas.
- Insurance concerns are out there with cost premium and fire risks.
- Prepare capacity to deal with used batteries as they come.

Minority-Owned and Small Businesses

Program Design for Small/Minority-Owned Businesses:

- Small businesses often use Class 2b vehicles for their operations, which are largely driven only during daytime hours.
- A technical assistance program is critical to assist small businesses with the transition to zero-emission technologies, as most small businesses will be adopting a zero-emission vehicle for the first time.
- The program should have a robust educational program to explain what the costs and benefits are of making the transition to zero-emission technology, especially as it relates to small businesses.

Infrastructure:

- Commercial on-site vehicle charging infrastructure is not a major concern for small businesses.
- Many local businesses would opt for vehicle charging during off-use hours overnight and off-site at their personal homes. Vehicles used by small and minority-owned businesses are often in use during daytime hours and rarely exceed 200 miles.

Outreach:

- Small and minority-owned businesses require in-depth outreach and informational materials to understand the zero-emission vehicle landscape and make informed decisions about adopting the technology for their use case.
- The implicit costs and return on investment should be quantified in an accessible manner via communication vehicles that meet small and minority-owned businesses where they are. Local chambers of commerce, print and digital media, and social media were recognized as potential mechanisms to disseminate the benefits of zero-emission technologies in business operations.
- Accompanying information on adjacent federal and state incentive programs would be useful to small and minority-owned businesses as they strive to embrace climate-forward technologies and business practices in areas other than vehicles.

Challenges to Zero-Emission MHDV Adoption

While private-sector vehicle consumers are generally more responsive to total cost of ownership advantages than passenger vehicle consumers, use-case fit of the vehicle technology is also critically important. Existing zero-emission MHDV technology does not fit many of the duty cycles of current diesel-based operations. One example of this is “slip seating,” where one truck will continuously run for 20+ hours by swapping out drivers. Given the time it takes to recharge batteries today, the company will need to buy two trucks to do that same route to allow for adequate charging.

Off-Road / Agriculture & Farming Equipment

The agriculture and farming equipment sector needs to be addressed individually, since it operates differently than other fleets. Financing and incentive programs should be shaped from feedback collected from the industry.

Producers build strong relationships with their equipment vendors. Use them as a trusted resource in the purchasing process. Vendors should be educated about incentive program opportunities and the process of purchasing a zero-emission vehicle with the voucher program.

Producers are the best advocates for adopting a new technology. Word of mouth will be a powerful tool in convincing farmers to decarbonize their operations. Decarbonization needs to have proven, upfront benefits before industry will want to readily adopt the technology.

Technology:

- Electric farm equipment (specifically tractors) has limitations related to needed horsepower and 24/7 operational requirements. Example: Electric plows may not provide enough torque for a long period to compete with diesel power. Also, farmers cannot take time to recharge during critical seasons as they often run nearly 24/7 during harvest time. Hydrogen power is possibly an option more farms would explore related to zero emissions.
- Many commodities are high weight (e.g., potatoes, apples, etc.) products and this impacts the size of loads that electric trucks can handle. Some farms use smaller sized vehicles (e.g., vans, pickup trucks, etc.) that could be a fit for electric vehicles, but there is limited knowledge about the benefits and availability.
- How do you define a personal use pickup truck vs. a commercial farming vehicle? Many smaller trucks are used around farms and for short transport. Example: Most flower farms use smaller vans for transport locally on a daily basis.
- Most producers lease or contract out trucking services and do not directly own trucks that transport commodities.
- Many farms are small and have interest in limiting carbon footprints and would be interested in learning more about these types of programs, but there is limited knowledge about the topic of zero-emission farm equipment.
- Washington allows loads of up to 105,000 lbs. The weight of an electric truck would limit the size of the load for many commodities. Other states have lower weight limits than Washington.
- Smaller alternative vehicles such as drones, robotics, autonomous sprayers, etc. could be a good place to explore electrification incentives in farming. These costs are much lower than vehicles.

Program Design:

- It is good that the purchaser does not need to complete the paperwork for the incentive; this makes the program easier to use.
- The incentive design will motivate farmers to purchase equipment if it reduces the price to that of a diesel vehicle.
- Vendors can play a part in facilitating the process of beginning the technical assistance aspect of the voucher program.

Infrastructure:

- There is a lot of interest by dairy farms in producing power for charging electric vehicles; this could be something to explore further.

Agriculture-Specific Considerations:

- Many agriculture producers want to modernize operations and reduce carbon but are very careful to minimize risk. Farming is very expensive, so investment in a new technology will require incentives.
 - Could these incentive programs be combined with some climate smart technology grants to help offset costs and get more interest? The clean energy fund cannot be used for transportation, but there is interest by farmers in exploring options.
- The definition of a small agriculture business is different for the Department of Agriculture than what a small business is as defined by the Department of Commerce. About 89 percent of Washington farms are small farms with limited budgets to invest in new equipment.
- Some kind of pilot program to help show the success of zero-emission vehicles in specific farming operations would be useful to get more interest.
- One of the big needs of agriculture includes refrigerated containers, especially at the port.

Outreach:

- Need to do a coordinated outreach effort to explain the advantages of this program to small and underserved farms.
- The incentive process must involve vendors and dealers. Farmers are loyal to their vendors and trust their vehicle suggestions. It is critical that these vendors are informed and promote the incentive program for farmers to adopt the technology.
- There is a lack of knowledge around what vehicles are available for decarbonization. Outreach and education efforts must be robust to raise awareness of opportunities to transition to a zero-emission technology.

Off-Road / Port Equipment

General Comments:

- Ports and port tenants are unlikely to decarbonize without adequate incentives and funding support to do so.
- The lack of data for the efficacy of electric vehicles concerns purchasers. This is especially true for the kinds of specialized heavy-duty equipment that many ports and port tenants use.
- Challenges associated with installing infrastructure make purchasers hesitant to transition to zero-emission vehicles.
- Rail locomotives are far from being decarbonized and will be very difficult to make zero-emission. There are no battery-electric locomotives operating commercially right now, but they are in testing phases.

Vehicle Eligibility:

- A mechanism to petition for eligibility of a vehicle will allow ports and other fleet operators to ensure their zero-emission equipment is eligible for the incentive program.
- Ports would benefit from Class 2b vehicles being included in a Washington incentive program, as most ports operate multiple Class 2b trucks for maintenance purposes.

Program Design:

- An incentive program for off-road MHDVs would help support the goals and objectives outlined in TES.
- Because a lot of port equipment is very specialized, purchasers generally deal directly with manufacturers. Vendors and dealers will help facilitate the program if the certification process is easy, affordable, and accessible. An overly complicated process for vendors may disincentivize them from making the zero-emission equipment available in Washington.
- Allowing an opt-out process for the consultation services portion of the program will lower barriers to entry for fleets or organizations that are more ready.
- Some ports are planning to offer incentives to their customers and want the state incentive to be stackable with their more local incentives.
- The incentive program (or related programs) should host a platform for funding mechanisms to transition to zero-emission technology. Having these in one place will make it easier for customers to purchase the technology.

Outreach:

- Outreach must be done intentionally and in methods catered to the audience in question. For example, truckers will require additional assistance and prefer in-person workshops on the weekends or evenings. Written materials will not work well for them.
- Port tenants trust ports to provide information and recommendations. Ports are well connected and trusted and can assist in the dissemination of information pertaining to the incentive program to their tenants and other uses of port equipment.
- Building awareness around the program will be necessary in and outside of Washington, as many fleets will purchase their equipment out of the state.

Industry Case Studies

The PNWER team conducted 12 one-on-one interviews with leaders in the trucking and logistics industries to understand the nuances of the shift toward zero-emission vehicles. A diverse range of companies operating in and around the Pacific Northwest was represented, providing critical insight into the concerns and barriers of adopting zero-emission vehicles for their operations. Common themes derived from the interviews include concerns about the weight of batteries and the resulting reduction in payload capacity, financial strain due to high battery-electric truck costs, and the lack of reliability and range data. Interview participants also noted concerns with infrastructure readiness, which was corroborated in the 22 industry focus groups. Several suggestions to improve statewide zero-emission vehicle adoption were revealed during the interviews, encouraging the state to consider additional incentive programs and postpone zero-emission MHDV mandates, among other considerations. Industry case studies aid in understanding the complexities of making the transition to zero-emission vehicles for various use cases and operations. The following industry case studies reveal critical factors that helped to guide the proposed incentive program and future considerations.

Organization: Signature Transport

Signature Transport is a family-owned trucking company based in the small Washington town of Kelso. The company's operations primarily include hauling wood products and operating warehousing facilities in Oregon and Washington through close collaboration with regional sawmills and paper mills. A fleet of 75 eight-axle trailers and four-axle tractors operate 22 hours a day in two shifts. They maintained a competitive advantage by exploring zero-emission vehicle options for the Signature fleet but admitted wariness around committing to charging infrastructure and time commitments. They determined the sacrifice required to accommodate an electric battery in a heavy-duty truck to uphold Washington state weight requirements is a significant barrier in decarbonizing. Maintaining an edge against market competition relies on the ability to move large quantities quickly; to uphold market competitiveness while concurrently making the state-driven transition to zero-emission vehicles, Signature Transport urges policymakers to increase weight allowances and provide ample incentives for decarbonization.

Organization: Fastway Freight

“I compete with trucking companies 16 miles away across state lines that don’t have these costs to transition to zero-emission.”

Fastway Freight is a 30-year-old LTL freight company that owns freight terminals in Wenatchee, Washington, and Lewiston, Idaho. The company's 60 trucks operate in partnership with shipping companies to deliver freight across Washington and Idaho. The company's operations run during the day Monday through Friday and include transporting building materials, rebar, and structural steel, among others. Because of the local nature of the deliveries, they recognize Fastway Freight's box trucks as a good use case for electrification due to their light payloads and low travel distances. Although the company has had grid conversations with Avista, its utility, Fastway Freight shared the belief that a combination of technologies will be needed to fully transition the fleet to a zero-emission operation. In an effort mirroring Washington's neighbor state, they advocated for integrating triples into the Washington transportation network as a method of decarbonizing the Class 8 sector. The company urges policymakers to consider adopting this as a mechanism to meet decarbonization goals while the zero-emission market is in development. They acknowledged the theme of steep sales taxes associated with the purchase of new zero-emission vehicles as a major roadblock for companies and individuals with less disposable income. For example, Spokane County has a 12 percent sales tax, which they assume will add nearly \$100,000 to an already \$450,000 vehicle. While the cost of a zero-emission vehicle is digestible for larger fleets, a possibly consequential financial commitment is felt by smaller fleets without capital to support it.

Organization: Mercer Logistics

Mercer Logistics has served the Pacific Northwest for over 20 years with long-haul and port-to-facility operations. The company's team of employees and partner owner-operators operate three customs except stations in Seattle, Tacoma, and Blaine, which handles Canadian border crossings. The company operates several facilities throughout the Pacific Northwest that are staffed with employees directed by government contacts under prevailing wage criteria. Mercer Logistics is economically sensitive and is in the process of transitioning to a full-service lease trucking model to reduce costs.

The company is a member of the Clean Truck Coalition and understands the nuances of making the transition to a decarbonized transportation network. They outlined the barriers to decarbonizing the Mercer fleet, outlining parking and distance challenges, power requirements, and the lack of awareness around available technologies, noting that the unknown around battery technology instills fear in many people. Mitchell also outlined the possibility of a monopolization of the drayage industry within port operations.

The long-term commitment that a truck loan bears has created hesitancy to purchase vehicles instead of leasing them. Investing in a zero-emission vehicle technology without the data to support its efficacy creates additional concerns, as the capital expense to purchase a vehicle and install infrastructure can place

a heavy burden on small fleets and lower income operators. The company owner grew up in Los Angeles and has memories of the smog that engulfed the area, solidifying the impact of pollution on marginalized communities and surrounding areas and reinforcing the need for equitable financing opportunities that will drive the adoption of environmentally sustainable vehicles. His recent trip to California revealed the positive impact of today's trucking technology and that he'd never seen the air so clear.

Organization: Hogland Transfer Company

“New solutions need to be found. But how do you make it pencil out and viable for everybody?”

Hogland Transfer is a family-owned business that operates in Everett and Moses Lake. The company has been in business for 90 years and primarily serves Feeney Industries and Boeing for just-in-time deliveries of construction and lift equipment. Hogland Transfer's operations utilize primarily used vehicles that typically run for 10–15 years before being retired. Forty-five drivers operate the trucking line, which runs up to a 200-mile span from Everett to Moses Lake; some hauls are made locally within the Moses Lake area.

For small- and medium-sized fleets, the transition to zero-emission vehicles can be a daunting commitment. Like Hogland Transfer, many of these companies opt to purchase their vehicles used and at a discounted rate. They recognize smaller fleets are likely to wait for their larger counterparts to explore zero-emission technologies before making the financial commitment to purchasing new vehicles due to financial, infrastructure, and feasibility concerns. They suggested that robust incentives directed by a well-informed legislature are integral to encouraging small and medium fleets to be early adopters of zero-emission technology. The impact of transitioning a fleet to a decarbonized operation is nuanced and not well understood by policymakers, Hogland noted, adding that financial incentives, reasonable insurance rates, and cold weather-optimized vehicles are necessary to make the switch.

Organization: DKS Associates

“The loads are growing and diversifying. There are opportunities to buy charging to tap into the incredible amount of power that's becoming available, so the utilities are going to have to reinvent themselves.”

DKS Associates is a transportation planning and engineering firm that unites technology and innovation to advance integrated, functional, and implementable transportation solutions. The company specializes in consulting for municipalities, including the City of Seattle, Port of Tacoma, and Port of Everett, as well as a large portfolio of clients in California.

They work to decarbonize municipalities by identifying engineering solutions. One focus is the effort to remove charging infrastructure barriers by partnering with utilities and determining innovative shared

areas for infrastructure installation. As a method to optimize the investment in charging infrastructure, they evaluate fleet use cases and duty cycles to encourage fleet operators to share charging infrastructure. DKS Associates recommends the state's program incorporates incentives for shared charging opportunities at truck plazas and industrial areas at key intersections and loading docks to meet trucks where they are already traveling. As the need for charging increases, utility involvement will be increasingly important.

Organization: Lynden Transport

“They give the federal incentive for 2,000 lbs. for having an electric truck. But if you give that incentive for the full weight, then you’re not losing that payload amount. If you’re losing 8,000 lbs. of your payload, that’s cutting into very small margins.”

The Lynden family of companies provides transportation and logistics solutions in Alaska, Canada, the Pacific Northwest, Hawaii, and around the world. Lynden has air, land, and sea operations. Their trucking operations service is Lynden Transport. Lynden operates Milky Way (milk haul) trucks for Darigold and operates Lynden Transport out of Tacoma, Washington. Lynden Transport’s company fleet is approximately 400–500 trucks and includes independent owner-operators of approximately 50–100 operators. Lynden Transport operates long-haul trucking from Texas to the North Slope in Alaska, as well as shorter hauls within Washington, from Eastern Washington to Ports of Seattle and Tacoma.

Lynden Transport expressed a conservative approach to decarbonization and waiting until further technology reliability, citing their biggest concerns around the weight and range limitations of battery-electric trucks, especially for long-haul operations. They discussed the limitations of existing incentives, particularly for independent owner-operators, and emphasized the importance of policy changes to address weight limitations by providing incentives for greater weight limits and considering the operational and financial implications for trucking companies. The potential for hydrogen as a viable alternative could be a greater possibility than battery-electric, but the discussions around the cost and limiting infrastructure remains a barrier to adopting this technology.

Organization: Peninsula Trucking

“Once they quit getting funding, fleets can’t decarbonize anymore.”

Peninsula Trucking is an LTL company serving Washington, Oregon, and Idaho that operates 70 forklifts, 362 on-road diesel vehicles, and 25 terminal trailers. In Washington, the company operates doubles across the state overnight. In Oregon and Idaho, the fleet is registered to haul triples.

With a tight 18-hour window on the weekend when trucks are not in operation, Peninsula has a limited use case for decarbonizing its entire fleet. The company is optimistic about the benefits of decarbonizing technology, conveying the shared, nonpartisan desire for cleaner air, but recognizes the large cost barrier

that accompanies the adoption of a new technology. They noted the financial burden of purchasing a new zero-emission vehicle places on a fleet, adding that the cost goes far beyond the vehicle itself. The steep vehicle cost is joined by high-cost elements of charging installation, subsequent purchases, and a decrease in payload—all factors making fleets hesitant to make the transition to zero-emission technology. Grant funding and state incentives for vehicles motivate fleets to purchase vehicles, as they make decarbonization a more attainable option. Such programs succeed with continued financial support from policymakers and sponsor agencies; until the transportation industry is comprehensively transitioned away from diesel, funding will need to supplement the cost of the technology. They noted colleagues in California who paused their adoption of zero-emission technology due to a lack of grant funding, effectively preventing them from decarbonizing.

Organization: Oak Harbor Freight

Oak Harbor Freight is a privately owned and operated LTL service carrier serving Arizona, California, Idaho, Nevada, Oregon, Utah, and Washington. The company is headquartered in Auburn, Washington, and operates over 850 tractors and 2,400 trailers throughout its service area. Company operations include in-city deliveries and terminal-to-terminal routes; trucks operating on longer routes travel a combined 100,000 miles a year.

Oak Harbor Freight has ordered 24 electric trucks for their facilities in California. A combination of state-led electric infrastructure investment and grant funding has incentivized the company to transition some of its short-route fleet vehicles. These vehicles fit well into the company's in-city delivery use case and will join the company's electric vehicle portfolio that includes five electric yard trucks. They said performing maintenance on two existing electric trucks has been a challenging yet informative method of testing the feasibility of adopting electric MHDVs into company operations.

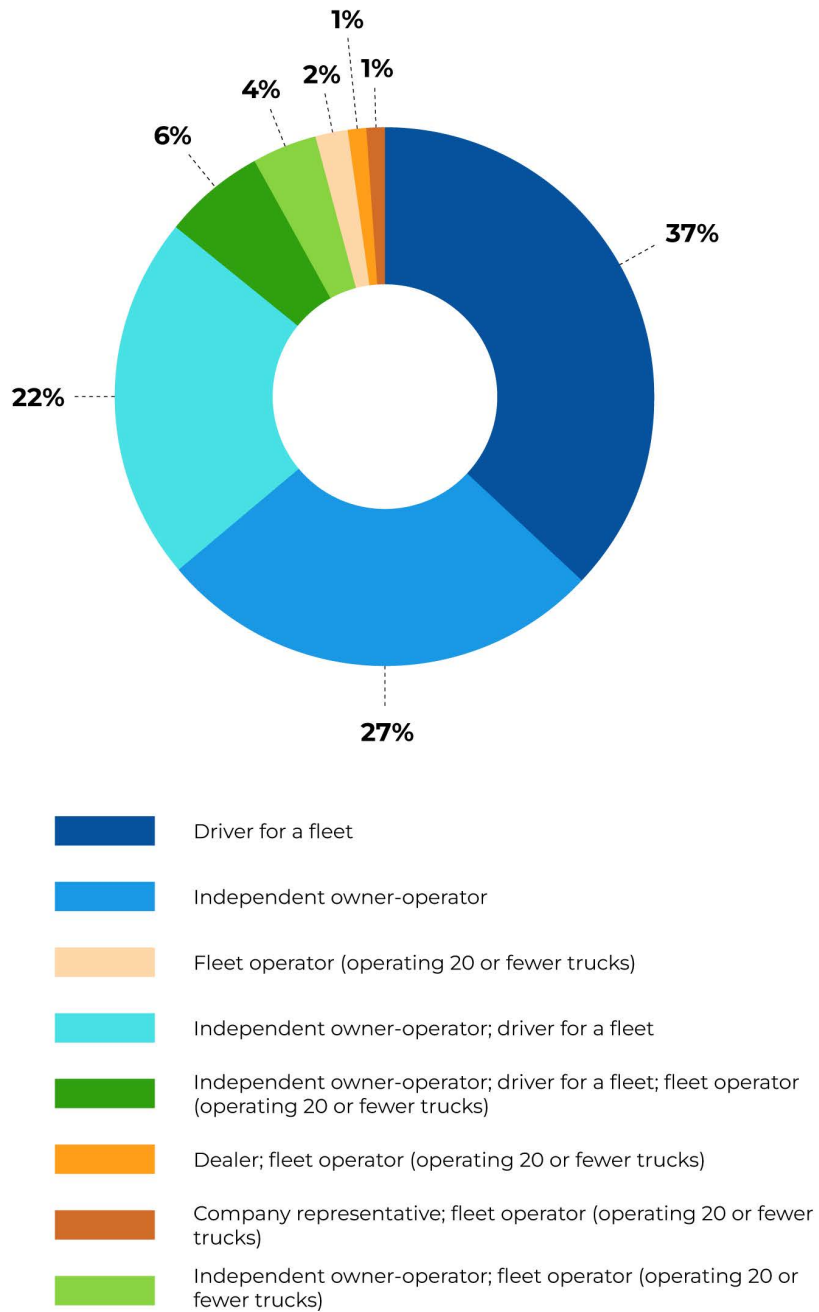
City of Seattle Drayage Electrification Pilot Project Report

The City of Seattle Heavy Duty Vehicle Electrification Incentive Pilot Program, outlined in Section IV, aims to deliver rebates of up to \$180,000 for the purchase of a new battery-electric Class 8 tractor-trailer truck to drayage drivers serving the Port of Seattle, based in Seattle, or based in the Duwamish Valley. The pilot program sought to select eight drivers to receive the incentive through a comprehensive application and data collection process. An initial 110 participants began the application process, 54 participants reached later phases, and 11 participants ultimately completed the submission process.

The Somali Independent Business Alliance (SIBA) led the project in collaboration with the Duwamish River Community Coalition, African Chamber of Commerce of the Pacific Northwest, the International Council on Clean Transportation, Seattle City Light, Seattle Department of Transportation, and Port of Seattle, among others. SIBA conducted community outreach to involve interested Seattle drayage drivers in the incentive acquisition process.

Data collection of the initial 110 participants revealed a diverse range of driver roles of individuals within the service area. Driver role demographics are reflected in Figure 5.

Figure 5. Fleet Driver Role Demographics



Source: City of Seattle's Electric Trucks Incentive Pilot.⁴⁹ Design modifications made by CALSTART.

⁴⁹ <https://www.seattle.gov/environment/climate-change/transportation-/transportation-electrification/heavy-duty-truck-electrification>

Additional participant demographics of note include:

- Average applicant age was between 30-55 years.
- Zip code 98168 was the most common resident location.
- Out of the 110 participants who began the application process, only two were female.
- Majority of the applicants identified as minorities.

SIBA and its partners hosted in-person meetings and informational webinars to build relationships and increase awareness of the pilot program among relevant groups. The outreach sessions allowed participants to convey attitudes and concerns about the electrification of drayage trucks, as well as develop a concrete understanding of the incentive program and its goals. To assist drivers through the program application process, SIBA provided technical assistance through informational flyers, facilitation of networking opportunities, and connectivity to financial resources.

The pilot program demonstrated a need for a comprehensive technical assistance program throughout the incentive application process. SIBA noted that the application process was complex and required hands-on assistance from staff to address language complexity, computer navigation, and time requirements. Barriers seen in the pilot program lay a foundation for areas of improvement in future incentive program design and serve as a testament to the criticality of a well-staffed incentive assistance program.

SIBA noted several common themes derived from participant outreach sessions that capture participant attitudes toward the transition to zero-emission drayage trucks:

- The learning curve associated with adopting a new technology is daunting and spurs anxiety for many drivers.
- Providing the amount of money needed to supplement the difference between an electric drayage truck and a diesel truck is a large financial strain, even with a financial incentive in place.
- The lack of charging infrastructure and time required to charge an electric vehicle is less desirable than refueling at an often-accessible gas station. Charging a vehicle can take up to 45 minutes, which is a deterrent to busy drivers.
- The lack of comprehensive awareness about zero-emission trucks causes drivers to be wary of making ill-informed decisions regarding the adoption of a new electric vehicle.

Although participants noted challenges present in their potential adoption of zero-emission vehicles, the group responded generally positively to the concept of making the transition, noting that it would positively impact their wellbeing and the environmental health of the city and surrounding areas. The pilot program noted an alignment between an incentive program and the desire to embrace a new, cleaner technology, underscoring the importance of a state incentive program as a positive step toward decarbonized drayage operations.

Key Takeaways from Stakeholder Engagement

The collective insights garnered from more than 50 meetings with Washington's diverse range of local and regional industry stakeholders were invaluable in shaping a more comprehensive and effective statewide strategy. State and local initiatives have played a critical role in piloting and refining approaches, providing a foundation upon which broader strategies are being built. These efforts highlight the importance of understanding specific regional needs and the nuances of zero-emission vehicle adoption for Washington state fleets.

- **Infrastructure is the top perceived barrier** by fleets and manufacturers, especially in the long term.
 - There is opportunity to coordinate infrastructure and vehicle deployment timelines.
 - Some Washington utilities asked to help implement state incentives parallel with utility incentives.
- **Vehicle costs are the next highest priority barrier** and will impact uptake of zero-emission MHDVs in the short term. The incremental costs of zero-emission vehicles compared to gasoline and diesel counterparts are very high.
- **Current zero-emission MHDV technologies are not always a good use-case fit** for many current MHDV duty cycles. Weight and battery range are two of the largest concerns.
- **Legislators want a roadmap** to zero-emission technology adoption that emphasizes the importance of an equitable transition for the MHDV sector.
- **Dealerships and manufacturers like the point-of-sale voucher system.** They want a program that is clearer and more straightforward than California's.
 - Do not want the full burden of implementing state policy.
 - Want lower risk levels in the voucher process.
 - Where possible, want some elements (e.g., vehicle eligibility) to coordinate between California and Washington.
- **Insuring zero-emission trucks is difficult**, and Washington can proactively plan for this.
 - Currently exploring pooled risk options.
 - Also discussing a loan loss reserve program.
- **Fleet advisory programs are key** to help fleets transition and should be an element in Washington's plan.
 - There is a major information gap about use case, technology fit, etc. on the zero-emission market. This is true for both small, mid-sized, and large fleets.
- **Users want stackability** between state, local, and federal programs.

- **Data collection and data sharing are important**, and there needs to be a centralized place to send, review, and process data related to zero-emission MHDV deployments. Knowledge sharing will be key to a successful program.
- **Stakeholder engagement is key for ongoing evaluation of the program.** Stakeholders should be asked for input of future program changes and quickly informed of those changes.

The evident gap in targeted support for commercial zero-emission vehicles underscores the need for a multifaceted approach that encompasses not just incentives but also infrastructure readiness and technical support. The engagement and collaboration with major utilities in these programs have proven essential, enhancing the understanding of the specific requirements of zero-emission MHDVs and facilitating the necessary infrastructure developments. Moving forward, these key takeaways will serve as guiding principles, helping Washington state to develop a robust, efficient, and inclusive framework that supports the transition to zero-emission transportation, ultimately contributing to a cleaner, more sustainable future.



VI. Key Attributes of an Incentive Program for Washington State

Based on an analysis of existing incentive program best practices and extensive stakeholder engagement, it is recommended that Washington state adopt a point-of-sale voucher incentive program. The incentive program should be similar in structure to those that have been successfully demonstrated in California, New York, New Jersey, and other states. To promote the efficacy of Washington's program and adjust to the needs of future program users, there is a variety of best practices and innovative approaches that are recommended.

The following key attributes will create a successful program. A high-level overview is provided below, with additional detail following.

- Point-of-sale voucher incentives to direct funds at the biggest barrier to fleet adoption: the cost of purchasing vehicles and infrastructure.
 - Stakeholder feedback clearly identified a point-of-sale approach as key, as it reduces the cost at the time of adoption and helps justify the early business case.
- Third-party administered point-of-sale voucher program for zero-emission MHDV fleets and the infrastructure to support their operation.
 - Feedback from stakeholder engagement efforts and from an analysis of other MHDV voucher programs determined that Washington state's requirement of a third-party administrator is a best practice.
 - This approach reduces time to launch the program and augments the state by providing specialized sectoral knowledge and relationships.
 - Doing so will reduce the number of staff hours WSDOT would need to implement the program from approximately 530 hours a week to 60 hours a week.
- Voucher amount plus-ups, or modifiers, for select fleet types, vehicles, or environmental impacts, such as:
 - Vehicles domiciled in disadvantaged communities; small, minority-owned businesses; and fleets
 - A reduced incentive for secondary market vehicles
- Allow for vouchers to be stackable—meaning easily combined—with other federal, state, or local incentives.
- Eligibility should include on-road zero-emission Class 2b–8 vehicles and off-road equipment, with all zero-emission technologies eligible (i.e., battery-electric and hydrogen fuel cell electric).

- Transit buses should not be eligible due to their current eligibility for other Washington state funding.
- School buses will only be funded through the \$20 million early action CCA funding.

It is also recommended that the following innovative approaches be incorporated in the point-of-sale voucher incentive program to greatly enhance the offering by streamlining participation:

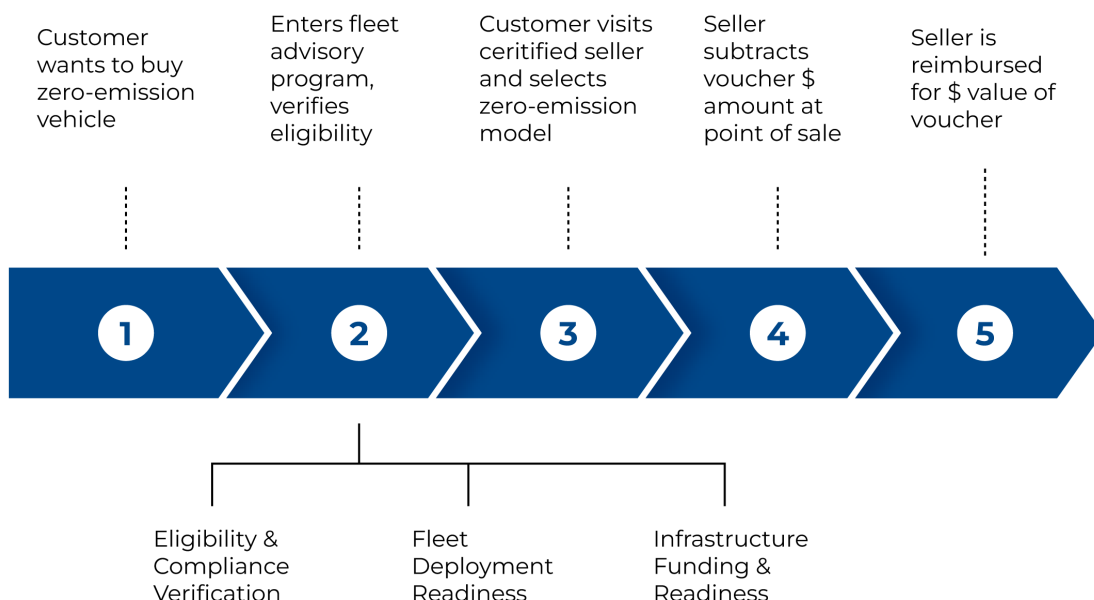
- Develop integrated technical assistance for fleets.
- Streamline proactive coordination with utilities.
- Develop a single program online portal for fleet applicants that includes on-road and non-road.
- Develop a front-end pre-approval process and paperwork verification.
- Create an education and outreach effort that targets fleets by sector with customized messaging that is important to each sector.

Point-of-Sale Voucher Program for Washington State

The proposed point-of-sale voucher program for Washington state includes a few additions to streamline the overall vehicle acquisition process and help prioritize successful delivery and deployment of zero-emission MHDVs. This program pairs eligibility, readiness, and compliance verification with elective technical assistance at the beginning of the process to ensure fleets are well prepared to effectively transition to zero-emission vehicle technology. Most other point-of-sale voucher programs verify fleet eligibility and readiness later in the voucher process.

The revised steps of the voucher application process are demonstrated in Figure 6.

Figure 6. Major Stages of Voucher Application and Process for Washington State



Point-of-Sale Voucher Program Primarily Designed for Zero-Emission MHDVs: The recommended program is designed to specifically address the key barriers for zero-emission MHDVs and equipment and infrastructure. The program targets private fleets needing to change their purchase plans. While the program can be used by public agencies as needed, the program is not designed with their longer acquisition cycles in mind. Additionally, this approach fills the policy gap seen in Washington state, where the owners and operators of the majority of MHDVs on Washington roads are not eligible for programs to substantially support their adoption of zero-emission technology.

Third-Party Administration: The state agency overseeing the program should contract with a third-party administrator to implement the voucher program. This aligns with the best practices as part of other state voucher programs due to the size of the technically skilled staff needed to successfully operate such a program. It allows the voucher program to take advantage of a third-party administrator's current book of business, existing administration teams, operational expertise, and scales of economy in voucher processing. For effective program administration, a combination of incremental WSDOT management and a third-party program administrator to handle the tactical day-to-day duties is advised. Based on the historical workload, this proposal adds approximately 60 hours per week to WSDOT and third-party administrator staff. This proposal represents the least amount of incremental bandwidth required from all potential voucher incentive program solutions.

Single Program and Online Portal for On- and Off-Road Vehicles: Many industries have both on- and off-road equipment in their operations. A single, streamlined program will ensure efficiency on the back end for the third-party administrator and make the user interface more navigable as organizations adopt zero-emission technology. The program will be set up to provide a one-stop shop for a prospective applicant to learn about and request incentives for zero-emission vehicles, zero-emission off-road equipment, and associated infrastructure.

Front-End Pre-Approval Process and Paperwork Verification: This unique approach builds on learnings from existing programs. Instead of waiting to verify program paperwork during the latter half of the voucher process, this front-end pre-approval process and paperwork verification approach helps avoid later cancellations and sets fleets up for successful zero-emission MHDV deployment. This approach helps the implementing agency, Legislature, and third-party administrator understand where users are in the process "pipeline" and plan more effectively for future funding needs. Additionally, this approach alleviates the risk and burden from vehicle vendors by ensuring that the vehicle vouchers they administer will be reimbursed and the vehicle successfully deployed. The pre-approval process will assess three main categories: eligibility and compliance verification; fleet deployment readiness; and infrastructure readiness.

- **Eligibility and Compliance Verification:** A robust yet streamlined online application review process should be established to address eligibility and compliance verification. The system should be designed to be thorough yet user-friendly, providing applicants with a clear checklist of required credentials and guiding them through the submission process. This proactive approach ensures all legal prerequisites are met before the operation of zero-emission vehicles, thereby promoting a responsible and lawful transition to cleaner transportation alternatives. The third-party administrator

will review all applicants and offer fleets to participate in an integrated technical fleet assistance program to help move them smoothly through the application and vehicle purchase process.

- **Fleet Deployment Readiness:** The third-party administrator plays a crucial role in ensuring that participating organizations are well prepared for the transition. They can provide a comprehensive evaluation as to whether the existing zero-emission technologies align effectively with the specific use-case requirements of the fleet. This assessment considers the operational demands, geographical considerations, and unique characteristics of the fleet to determine the suitability of available vehicles. The third-party administrator will connect the fleet to resources for financial solutions to cover the residual costs of the vehicle. This could involve navigating through various funding opportunities, grants, or financing options that could lessen the financial burden on the organization. They will also assist the fleet in facilitating discussions and providing guidance on securing insurance coverage for zero-emission MHDVs. This involves ensuring that the fleet owners understand any potential changes in insurance premiums and have access to the necessary resources to obtain adequate coverage.
- **Infrastructure Funding and Readiness:** The program will provide an integrated base incentive to support simplified infrastructure. Furthermore, for vehicles deployed in the service territory of an electric utility that has an infrastructure incentive or assistance program, the voucher incentive program administrator will coordinate with the fleet and utility to proactively help determine the steps needed to align infrastructure installation with vehicle delivery. Participation by the fleet in the third-party administered technical assistance program will help the fleets streamline these connections and right-size their infrastructure needs to their fleet needs. For electric vehicle charging sites, this may require a site assessment, preliminary site plans, and/or a confirmation of request for service from the utility. For hydrogen fuel cell vehicles, this may include verifying that the hydrogen producers understand the organization is a future customer.

Integrated Technical Fleet Assistance: As part of the pre-approval process, the implementing agency should ensure the third-party administrator integrates technical assistance into this process to provide information and support to fleets as they navigate the adoption of new technology. Each of the three pre-approval categories above may present challenges for fleets as they adopt zero-emission vehicles, and the integrated technical assistance services should ensure that these challenges do not become obstacles to adoption. This element is key to equitable deployment of zero-emission MHDVs by ensuring both large and small fleets understand how to effectively transition to zero-emission technologies.

Targeted Sectoral Engagement Efforts: In addition to technical assistance, the implementing agency and third-party administrator should work with trusted partners within various sectors and users of MHDVs and off-road equipment to share information, provide opportunities to test zero-emission technology, and communicate about the incentive program. The trusted partner will look different sector by sector. Industry organizations are often a good starting place to identify the right partners to conduct this outreach work. This element is key to equitable deployment of zero-emission MHDVs by ensuring both large and small fleets know about these programs and understand how they work.

Stackable Vehicle and Infrastructure Incentives: The Washington incentive program should allow stackable vehicle incentives so users can layer state, local, and federal funding opportunities to help purchase zero-emission MHDVs. Incentive amounts will be discussed below. The Washington incentive program should allow stackable infrastructure incentives so users can layer state, local, federal, and utility-level funding opportunities to assist with electric vehicle installation for MHDVs. As discussed above, it is not recommended that this program provide additional state-level incentives for hydrogen fuel cell refueling infrastructure due to the available federal funding source for this effort.

Voucher Amount Plus-Ups, or Modifiers, for Select Populations: The program should introduce “plus-ups” or modifiers for the voucher amounts, specifically targeting vehicles that operate in disadvantaged communities and those owned by small, minority-owned businesses. This focused approach aims to promote equity and inclusivity in the transition to zero-emission fleets.

Include Incentives for Secondary Market: A base-line incentive amount is recommended for vehicles across Washington state regardless of location, fleet size, or other factors. This ensures a smoother, easier-to-understand system. However, to help ensure the health benefits of zero-emission technologies benefit communities most impacted by transportation-related pollution, the program should further incentivize certain markets.

Future Funding Set-Asides for Vehicle Classes: In future years of the program, create funding set-asides for several categories of vehicles or equipment that may need extra time to develop or are a high priority for deployment. If funding is not fully requested after six to eight months, funding goes back into the general funding pot to be distributed to categories with waitlists. For Year 1, it would be more expedient to launch without set-asides.

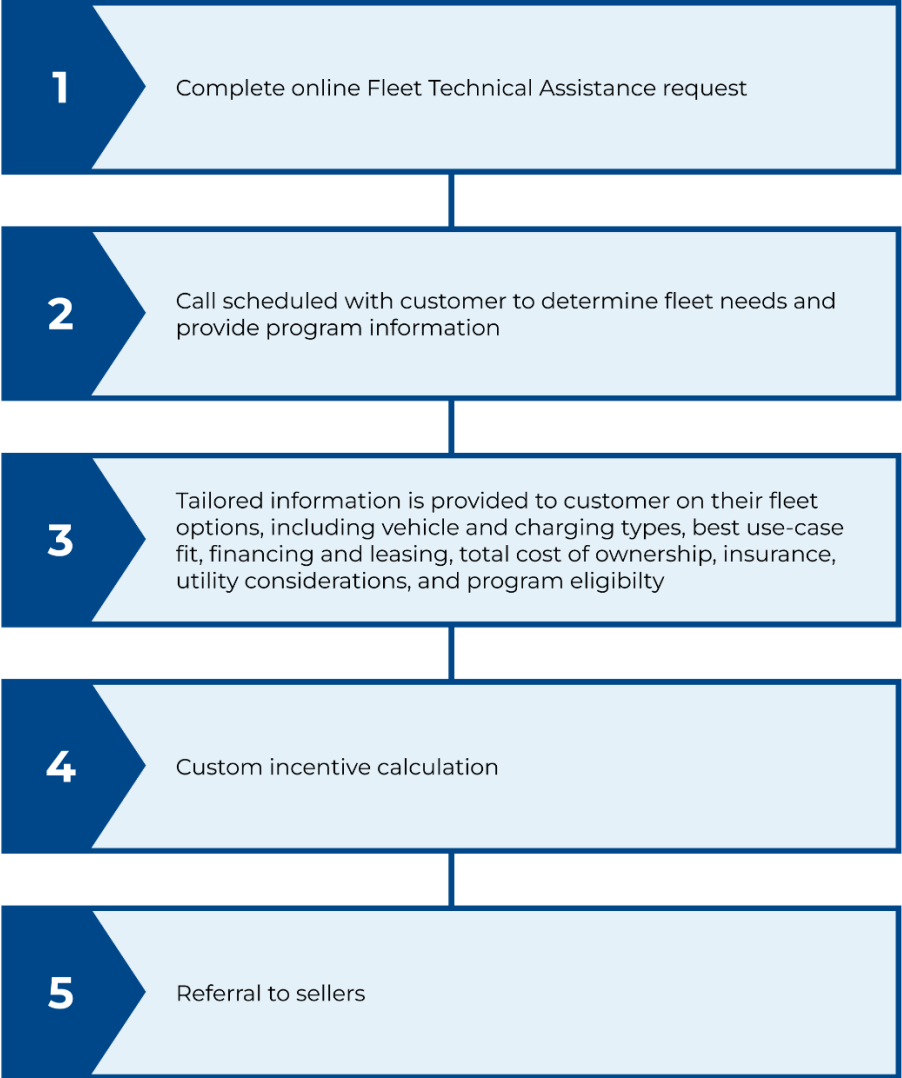
Fleet Technical Assistance Process

One of the most important findings in the review of other incentive projects around the country is the increasing importance of providing technical assistance to fleets starting their adoption of zero-emission vehicles. There are important considerations a fleet new to zero-emission vehicles needs to understand and digest. Early steps, such as communication with their local utility, can help level set the expected timeline to infrastructure completion. However, fleets may not understand the importance of coordinating these timelines with vehicle acquisition or who to talk with at their utility to begin these discussions.

An integrated fleet technical assistance program enables fleets at all levels of knowledge and understanding about the zero-emission transition to receive transition planning assistance to help align vehicle and infrastructure rollout. Fleets have the option to participate in seeking technical assistance but can bypass the service if they meet readiness standards established in coordination between the implementing agency and the third-party administrator.

Figure 7 describes the process a fleet would use to start their assistance request and support.

Figure 7. Fleet Technical Assistance Process



Goals and Considerations

The six goals with respective attributes for this incentive program design are described in Table 12. The goals are then used to inform the phases of the incentive program.

Table 12. Program Goals and Considerations

Goal	Best Practices	Tactics	Timeline	Resource Requirements
Accelerate Zero-Emission MHDV Market Adoption: Speed up the uptake of zero-emission vehicles within the commercial sector.	Public-private partnerships to leverage expertise and resources; incentive programs to reduce initial purchase costs; educational campaigns.	Develop partnerships with manufacturers and energy providers; establish a tiered incentive structure based on vehicle size and type; launch a statewide awareness campaign on zero-emission MHDV advantages.	At Launch: Launch awareness campaigns and partnership formations. Long-term: Fully establish the incentive structures. Ongoing: Maintain partnerships and adapt incentives as the market evolves.	Policy: Legislation to enable incentive programs. Funding: Budget allocation for incentives and campaigns. Industry: Collaboration with vehicle manufacturers and energy providers.
Achieve Equitable Access: Ensure all communities can access vehicle options.	Targeted outreach to underserved communities; inclusive policymaking to consider diverse needs; flexible financing options.	Conduct community workshops and forums; collaborate with community leaders for policy development; introduce sliding-scale subsidies based on economic need.	Prior to launch: Begin community engagement and policy discussions. Long-term: Implementation of community-specific programs. Ongoing: Evaluation and adaptation of access strategies.	Policy: Frameworks for equitable access. Funding: Allocated funds for fleet advisory services and education and outreach. Industry: Engagement for a broader reach of vehicle options.
Lower Financial Barriers: Reduce the economic hurdles preventing adoption by commercial fleets.	Tax credits and exemptions purchases; grants and low-interest loans for small businesses; cost-sharing programs for infrastructure development.	Advocate for state and federal tax incentives; develop grant programs; create partnerships for shared charging or fueling infrastructure.	Prior to launch: Establish financial support programs. Long-term: Scale up financial incentives to match market growth. Ongoing: Monitor and adjust financial support mechanisms.	Policy: Tax incentives and grant programs. Funding: Allocation for tax credits, grants, and loans. Industry: Involvement in cost-sharing initiatives.

Goal	Best Practices	Tactics	Timeline	Resource Requirements
<p>Include Infrastructure Support: Facilitate the development of necessary charging and fueling infrastructure for zero-emission vehicles.</p>	<p>Strategic placement of charging stations; partnerships with utilities for grid upgrades; standardization of charging and fueling equipment.</p>	<p>Map out critical locations for infrastructure development; engage with utility companies for grid planning; promote universal charging connectors and protocols.</p>	<p>Prior to launch: Initiate infrastructure planning and partnerships.</p> <p>Long-term: Complete major infrastructure projects.</p> <p>Ongoing: Continuous assessment and expansion of infrastructure.</p>	<p>Policy: Regulations to support infrastructure development.</p> <p>Funding: Investment in public charging and fueling networks.</p> <p>Industry: Collaboration with infrastructure providers.</p>
<p>Offer Fleet Advisory Services: Provide expertise and guidance to fleets transitioning to zero-emission vehicles.</p>	<p>Tailored consulting services for fleet needs; training programs for fleet managers and drivers; support networks for ongoing fleet management.</p>	<p>Develop a team of MHDV advisors and trainers; create educational materials and workshops; establish a support hotline for fleet operators.</p>	<p>Prior to launch: Set up advisory and training services.</p> <p>Long-term: Expand services to meet growing demand.</p> <p>Ongoing: Continual improvement of fleet technical assistance.</p>	<p>Policy: Endorsement of Fleet Technical Assistance.</p> <p>Funding: Resources to establish and maintain services.</p> <p>Industry: Expert contributions to service offerings.</p>
<p>Develop Pre-Approval Process: Streamline the zero-emission MHDV incentives application process to facilitate easier access for fleets.</p>	<p>Simplified application procedures; transparent criteria for qualification; quick turnaround times for application review.</p>	<p>Design an online portal for application submission; develop clear guidelines for applicants; implement an expedited review process.</p>	<p>At Launch: Launch the pre-approval process.</p> <p>Long-term: Refine the process based on feedback.</p> <p>Ongoing: Ensure the process adapts to changing regulations and market conditions.</p>	<p>Policy: Clear regulatory frameworks for pre-approval.</p> <p>Funding: Administrative support for managing the process.</p> <p>Industry: Feedback and cooperation in process design.</p>

Off-Road

Fleets with off-road vehicles and equipment will apply for the program the same way as those with on-road vehicles. Other programs throughout the United States have separated off-road and on-road vehicle voucher incentives into two different programs. An analysis of other states' voucher programs and discussions with stakeholders have determined it will streamline the process and ease participation by combining them. In doing so, Washington state stands poised to implement a transformative strategy aimed at fostering the widespread adoption of zero-emission off-road equipment and swift allocation of \$2.5 million for zero-emission cargo handling equipment (Sec. 215 (10)) and \$5 million for clean off-road equipment incentives (Sec. 215 (11)).

This streamlined application process will assist small businesses, vulnerable populations, and overburdened communities through a well-structured voucher program and setting stringent yet attainable eligibility criteria for the equipment. This ensures not only the accessibility of zero-emission options but also their operational and economic viability.

Dedicated Off-Road Fleet Engagement: Engage with equipment operators, port authorities, construction companies, agricultural businesses, and other stakeholders to understand their needs, concerns, and readiness for transition. Form a task force with off-road fleet representatives to guide the strategy development.

Financial Incentives: Develop a voucher program for the purchase of zero-emission equipment, with higher incentives for small businesses and equipment deployed in vulnerable populations and overburdened communities.

Voucher System Details: Applicants should apply for a voucher prior to the purchase of zero-emission equipment. The voucher amounts are predetermined based on specific criteria, encouraging transparency and ease of application.

Base Voucher Calculation Methods:

- Per Kilowatt-Hour (kWh) Capacity:
 - Vouchers could be issued on a dollar-per-kWh basis of the battery or hydrogen fuel cell capacity.
 - This method directly relates the incentive to the energy capacity of the equipment, encouraging the adoption of more efficient technologies.

Cost Differential Basis:

- Vouchers could be calculated based on the cost differential between the traditional diesel equipment and the zero-emission alternative.
- This approach ensures the voucher covers a significant portion of the additional cost incurred when opting for a zero-emission option.

- Vouchers should be enhanced for small businesses and equipment deployed in and benefiting vulnerable populations and overburdened communities.

Program for Small Businesses:

- An additional financial incentive up to 15 percent of the base voucher amount.
- Vouchers would be competitive, with priority given to businesses that demonstrate a commitment to serving or operating within vulnerable communities.

Monitoring and Reporting: Establish a system for monitoring the adoption of zero-emission equipment and its environmental benefits. Establish a system for collecting and reporting vehicle in-use telematics data that could incorporate:

- Programmatic success metrics
- Global positioning system (percent in vulnerable populations and overburdened communities)
- Battery state of charge before and after charge events
- Time of vehicle key on and off
- Service and repair events

Incentive Amounts

The recommended incentive program amounts correlate to vehicle class (Table 13).

Table 13. Recommended Base Vehicle Incentive Amounts

GVWR (lbs.)	Vehicle Class	Incentive Amount
8,501–10,000	Class 2b	\$7,500
10,001–14,000	Class 3	\$45,000
14,001–16,000	Class 4	\$60,000
16,001–19,500	Class 5	\$60,000
19,501–26,000	Class 6	\$85,000
26,001–33,000	Class 7	\$85,000
33,001+	Class 8	\$120,000

Washington state had 292,206 registered MHDVs (Class 3–8) in 2023. That number jumps by 505,969 vehicles to 798,175 when Class 2b vehicles (SUVs and large pickup trucks) are included. While a majority of these Class 2b vehicles are more likely owned by individuals than commercial businesses, there are many fleets that have large pickup trucks as part of their fleets, and therefore these vehicles should be included in the incentive program at a reduced incentive amount. Class 2b applicants should be required to

demonstrate they are a business, provide a business license or nonprofit registration, and sign an affidavit affirming they will use the vehicle for commercial purposes. Eligibility for Class 2b vehicles will be evaluated after two years.

The voucher incentive program design introduces “plus-ups” or modifiers for the voucher amounts, specifically targeting vehicles that operate in disadvantaged communities and those owned by small, minority-owned businesses (Table 14). Charging stations and infrastructure are included in these modifiers to better align the certainty of funding for the equipment needed to fuel the vehicles. This focused approach aims to promote equity and inclusivity in the transition to zero-emission fleets.

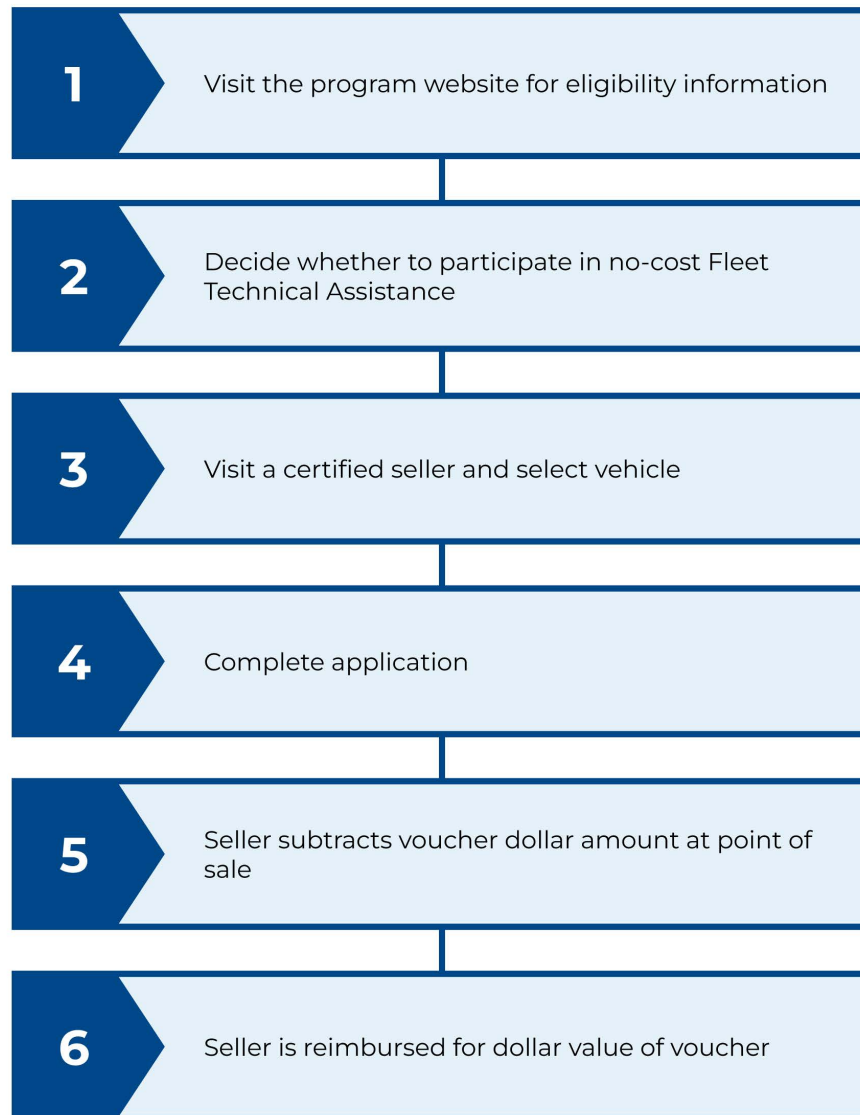
Table 14. Recommended Incentive Modification Type and Amount

Modifier Type	Amount Above Base
Class 8 Drayage	+ 25%
More Impacted Environmental Risk	+ 15%
Small or Minority-Owned Fleet	+ 25%
In-Use Converted/Remanufactured	- 50%
Used Vehicle	- 50%
Charging Stations and Infrastructure (Capped at \$30,000)	+ 50%

Enrollment Process for Fleets

Fleets start the process of entering the program by deciding if they need technical assistance and if they are ready to select a dealer and vehicle to purchase. The fleet enrollment process is described in Figure 8.

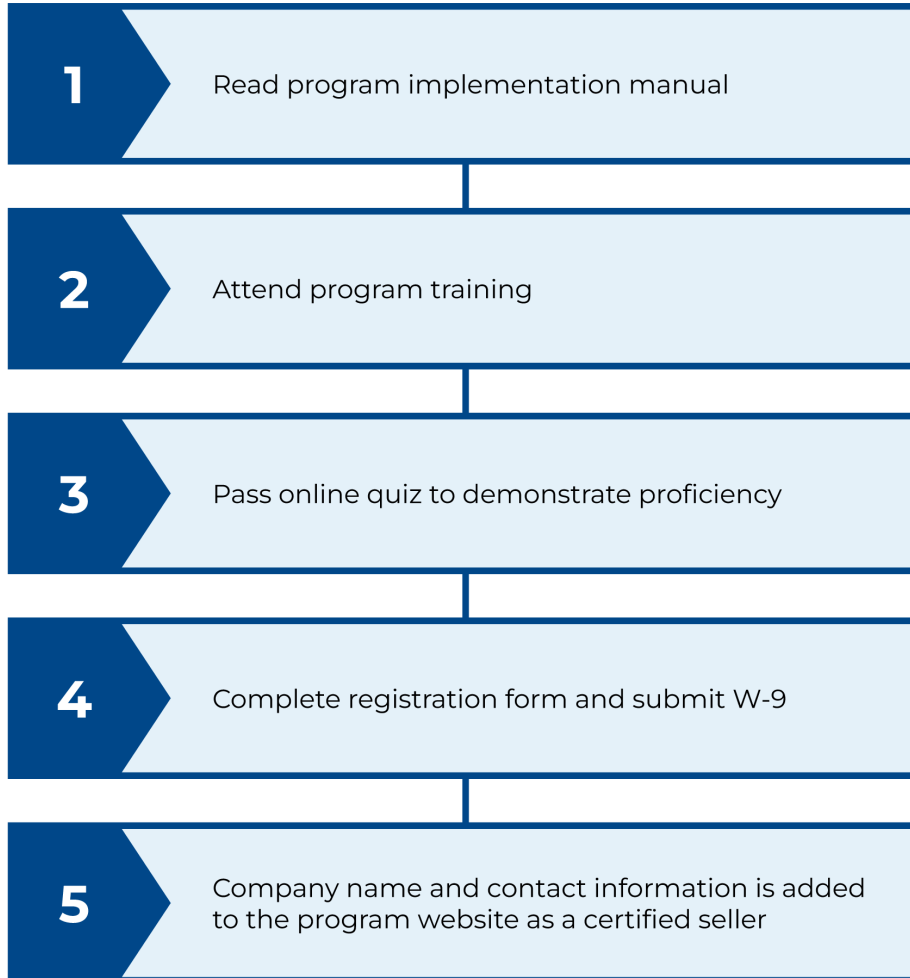
Figure 8. Enrollment Process for Fleets



Enrollment Process for Vehicle Seller Certification

Manufacturers who have eligible vehicles in the incentive program identify dealers (i.e., vehicle sellers) they would like to use to process incentive requests in the program. As described in Figure 9, the dealer would start a process of learning the incentive program, learning how to use the voucher processing center, and signing required participation documentation. That process is outlined below.

Figure 9. Enrollment Process for Vehicle Seller Certification



VII. Implementation Plan

The Implementation Plan is a comprehensive guide that puts into action the six goals and considerations in Table 12 that resulted from the work of this study as well as the stakeholder engagement work. It includes a three-phase approach that can be used as a planning tool to launch this incentive effort most efficiently to fleets throughout Washington state. Further coordination with WSDOT is needed to ensure the timely and efficient roll out of this program.

Phase 1

Phase 1a. Planning – Months 1–10 (10 months total)

1. WSDOT hires staff to oversee the incentive program's third-party administrator.
 - a. When using a third-party administrator, WSDOT's staff hours would be cut from approximately 520 hours to 60 hours a week.
2. Determine if there are new pieces of legislation that will impact the incentive program launch.
 - a. Understand the incentive program components that can be accomplished without legislation.
3. Issue third-party administrator request for proposal and hire the third-party administrator.
 - a. To speed up the program launch, include fleet technical assistance program administration as part of the incentive program third-party administrator request for proposal.
4. Develop a marketing, education, and outreach plan.
 - a. Ensure local participation in the plan's creation and implementation.
 - b. Develop a customer journey map to ensure each fleet customer touchpoint is streamlined as much as possible.
 - c. Develop a strong fleet customer segmentation component of the plan.
 - i. Understand which fleet customers are ready now to gain quick success upon the incentive program's launch.
 - ii. Target best use cases like local and regional day delivery and family-owned fleets.
 - d. Allocate funding to effectively communicate possible changes once launched, host informational fleet customer workshops, and host at least one MHDV test-drive event per year.

- e. Create a workforce development component of the plan to increase literacy of technical skills.
 - i. Develop a curriculum and list of skills needed.
 - ii. Develop a seller certification program based on industry best practices.
5. Allocate maximum funding amounts to off-road equipment and on-road vehicles as general categories. Further segmentation by vehicle type, class, etc. is recommended for future rounds of funding once the demand in Washington is better understood.
6. Develop an evaluation plan with metrics and milestones to inform staff of the incentive program's progress.
7. Develop processes and procedures for incentive processing that allow staff and the third-party administrator to be nimble if program changes to streamline the effort as needed.
8. Develop a plan to thoroughly test all online customer interface technology and implement the plan prior to launch.

Phase 1b. Launch – Months 11–18 (8 months total)

1. Launch all online customer interface technology.
2. Launch the marketing, education, and outreach plan with a call-to-action driving customers to sign up on the incentive program website.
3. Launch the Fleet Tech Program Time-Saver: While building the fleet technical assistance service function, a fleet that already understands zero-emission MHDV operation can opt out of fleet technical assistance and proceed directly to a voucher request. Fleets who do want or need support will get technical assistance at the launch of the fleet tech program.
4. Launch the evaluation plan (Month 16).
 - a. Retest all online customer interface technology.
 - b. Review the customer journey map to ensure processes and procedures are streamlined for each customer touchpoint; make improvements where needed.
 - c. Communicate incentive program changes to fleet customers if they will be impacted by the changes.
 - d. Understand any legislative changes impacting the incentive program.
 - e. Communicate results of metrics and milestones to staff and third-party administrator.
 - f. Determine how future funding should be allocated between vehicle categories and classes.

Phase 2

Explore Novel Market Acceleration Tactics – Months 24+

1. Consider the list of future considerations in this report (Section VIII).

Phase 3

Evaluate, Assess, and Revise – Annually

1. Review the evaluation plan for necessary changes.
2. Launch an evaluation of the plan each year.
 - a. The Legislature meets annually and can also evaluate the program's success at this time.
 - b. Additional stakeholder engagement efforts with fleet participants can help provide feedback to the Legislature, WSDOT, and third-party administrator for any potential program improvements.
3. If incentive program changes are needed, determine if additional funding is needed to communicate the changes to fleet customers.

VIII. Policy Gaps and Future Considerations

Zero-Emission MHDV Policy Gaps

New policies could lower barriers to entry for MHDV adoption in Washington state. Some future considerations listed below are included to create awareness around an issue. In other cases, blueprints for getting around the barrier are offered. Policy gaps and future considerations included herein impact insurance affordability, supply chain, MHDV funding through tax credits and stacking of funds and scrappage, and the MHDV secondary market. These can be considered during Phase 2 of the Implementation Plan.

Insurance Risk Pool

The development of a statewide insurance risk pool for zero-emission MHDVs can be a complex but essential initiative to increase their adoption. Today, only large fleets, or those able to self-insure, can access insurance coverage. For most fleets, like small and minority-owned fleets, the inability to get vehicle insurance means they would not be able to purchase or lease that vehicle.

It would require collaboration, careful planning, and ongoing commitment from all stakeholders. It can help address the current insurance challenges and pave the way for a more sustainable and accessible insurance market for these vehicles.

- **Assessment and Planning:** To create a foundation for planning the risk pool, conduct a comprehensive assessment of the current insurance landscape for electric MHDVs within the state. Identify the specific challenges and concerns that insurance companies have regarding these vehicles.
- **Regulatory Framework:** Collaborate with government agencies and regulatory bodies to establish a legal framework for the insurance risk pool. Include guidelines for participation, risk assessment, and financial obligations of insurance providers.
- **Stakeholder Engagement:** Involve stakeholders from the zero-emission MHDV industry, insurance companies, vehicle manufacturers, and fleet operators. The incentive program began this work by hosting public stakeholder engagement discussion sessions with these groups and learned of the industry needs. A deeper dive into this issue, along with input and support from these groups, will ensure the risk pool addresses their needs and concerns effectively.
- **Risk Assessment and Premium Calculation:** Develop a methodology for assessing the risks associated with MHDVs. Consider factors such as vehicle technology, safety features, driver training, and accident data. Premiums should be calculated based on the assessed risk.

- **Capitalization:** Determine the initial capital requirements for the insurance risk pool. Explore funding options, including contributions from participating insurance companies, government grants, and industry associations. Ensure that the pool has sufficient financial resources to cover potential claims.
- **Administration and Management:** Establish a dedicated entity responsible for administering and managing the insurance risk pool. This entity should have the expertise to evaluate claims, set premiums, and ensure compliance with regulatory requirements.
- **Education and Training:** Develop educational programs and training materials for insurance professionals to enhance their understanding of electric vehicle technology and associated risks. This will help bridge the knowledge gap within the insurance industry.
- **Risk Mitigation Measures:** Encourage the adoption of safety technologies and best practices among fleet operators to reduce the frequency and severity of accidents involving electric vehicles. This can lead to more favorable risk assessments and lower premiums.
- **Monitoring and Evaluation:** Continuously monitor the performance of the insurance risk pool. Evaluate the effectiveness of risk assessment methodologies and premium calculations. Make necessary adjustments to ensure the sustainability of the pool.
- **Promotion and Outreach:** Launch a campaign to promote the availability of insurance coverage for electric MHDVs. Highlight the benefits of participating in the risk pool, such as cost savings and improved access to coverage.
- **Review and Adaptation:** Periodically review and adapt the insurance risk pool's operations to reflect changes in technology, vehicle safety, and industry trends. Ensure that it remains responsive to the evolving needs of the electric vehicle sector.

Mitigate Supply-Chain Issues

Supply-chain constraints continue to impact MHDV charging infrastructure installation projects. Infrastructure projects that are relatively more capital-intensive—such as large-scale fast charging hubs—place the highest bids on components that are scarce. This can significantly constrain component availability and lengthen the installation timelines for relatively less capital-intensive projects, such as modest depot electrification that requires only a handful of chargers.

One option is to incorporate the use of a reverse auction for the installation of MHDV charging infrastructure. A reverse auction is a creative solution to overcome installation barriers for business owners burdened by the adoption of new technology, as the implementor of the incentive assumes the administrative work of installation to a degree. The reverse auction aims to reduce the cost of installation by covering a significant portion of costs and reducing costs by offering projects up for bid to contractors that can offer full installation and the lowest marginal cost.

Reverse Auction Program Design

A look at the different roles needed to implement a reverse auction can assist in understanding how it would function.

- **Role of the Implementor:** The implementor will take a different approach to the implementation of the incentive project; traditionally, the implementor will distribute rebates to awardees, while awardees are responsible for all aspects of application, installation, payment, and requests for reimbursements from the implementor. In this role, the implementor will be responsible for more administration by being the entity responsible for collecting a portfolio of project sites that are requested from stakeholders that have identified project sites that will have a large impact on their communities.

Once the implementor has finalized its portfolio of project sites, the implementor will ensure that each project site is shovel-ready, which means that the project site has all necessary issued permits and all necessary utility upgrades are accounted for. Once the project sites have been verified, the implementor will send the project or group of projects out for bid via a state portal where a contractor can bid. The implementor will review bids and assess the quality of the bid based on the contractor's business standing with the State, the value of the bid, and quality of the bidder's resume and work history. Once a bidder is selected, a notice to proceed can be issued, and a date for final payment will be set. Finally, the implementor will follow the traditional role of receiving payment requests, verifying invoices with backup documentation, and issuing a check to the contractor.

- **Role of the Site Host Applicant:** The role of the site host applicant will be to propose a project site and to conduct a site assessment to ensure that their site is viable to become shovel-ready and if utility upgrades need to be completed before the close of an application window. The applicant will also be responsible for pulling all permits with their authority having jurisdiction. If the applicant is selected, they will be issued a notice of award and will be responsible for allowing access to the property and selecting and ordering equipment for their site.
- **Role of the Contractor:** The contractor's role will be to submit a bid to the state portal ensuring quality and timely completion of the installation of the infrastructure that remains within budget. The selected contractor will be issued a notice to proceed and will coordinate with the site host to ensure equipment is ordered, complete the installation and submit for reimbursement by the agreed date.

The benefits of a reverse auction include removing the administrative burden from community stakeholders that struggle with these projects. It allows for more shovel-ready projects and more opportunity for outreach to contractors and ensure quality contractors are selected in the bidding process.

Some considerations for a reverse auction are that more administrative work is required for the implementor, leading to additional administrative costs. The implementor assumes more risk if a project does not get completed. In some cases, a reverse auction may favor site hosts with more financial resources that can become shovel ready in a shorter amount of time.

Secondary MHDV Market Development

Many less-resourced fleets and independent owner-operators rely on older diesel trucks that cost a fraction of the price for a new zero-emission truck. No state-level incentive program that simply provides a consumer-side incentive can afford to reach and help vulnerable populations in the MHDV market. The state must think through the cascading sales of trucks as it incentivizes the introduction of zero-emission vehicles.

The Washington State TES does not provide recommendations on secondary supply in the truck market, in part because it is so nascent. However, conversations in the TES stakeholder engagement process did point to the need to plan the secondary market from the start. JTC should consider whether equity-focused set-asides and minimum funding requirements aligned with the Healthy Environment for All Act and CCA can be met through incentives that benefit more than one fleet at once, with part of the voucher or incentive going to the first fleet who owns the truck for 3–5 years and then agrees to sell at a certain price to a less-resourced fleet, who then has time to plan out charging solutions.

The state could also identify a state entity to assess buying used zero-emission trucks from California to increase secondary supply in Washington. There may be an opportunity to lock in cheaper prices now while early adopters wait for secondary market prices to develop and opt for certainty at what ends up being a price discount. Section VIII of this report outlines a residual value framework for lessees of MHDVs, which will accelerate the secondary market development while still providing voucher savings to the vehicle user.

Program Funding as State Match

The Washington State Legislature could provide the incentive-program implementing agency the authority to use program funding as a state match for federal funding opportunities that bring additional resources to the program.

The implementing agency could explore financing bulk purchases of electric trucks and buses, and charging infrastructure, through the U.S. Department of Energy Loan Office's Inflation Reduction Act funding. They could also work with the State Efficiency and Environmental Performance office to apply for the Clean Heavy-Duty Vehicles grant within the Inflation Reduction Act. Washington can use Inflation Reduction Act funding to electrify its own fleet vehicles and establish a grant to support localities, Tribal nations, and school districts to do the same. Washington should explore the potential to contribute local matching for these funds.

Stackable Scrappage Incentive

Consider allowing the program to be stackable with an additional scrappage incentive. While there is some stakeholder objection to scrappage requirements (like the New York State Energy Research and Development Authority program and Washington's current Volkswagen program) as part of the incentive program, the TES modeling suggests that early retirement of diesel vehicles will likely need to be a core part of additional strategies to reach the 2030 emissions limit.

Scrappage programs can be criticized for being administratively burdensome and without clear benefits since they retire vehicles that may have been retired on their own soon after anyway. This is because they usually focus on the oldest and therefore dirtiest vehicles.

For this reason, a scrappage program could be beneficial as an additional incentive rather than an eligibility requirement. This additional incentive would be open only to the heaviest diesel users in recent years, as demonstrated by odometer readings or telematics data to ensure it is removing vehicles that otherwise would continue to contribute the most emissions and air pollution.

This program element would require significant increases in funding to program incentives and administration beyond the initial \$110 million. However, doing so would maximize GHG emissions and air pollutant reductions. The implementing agency will need to assess secondary market impacts and ensure zero-emission supply for less-resourced fleets and independent owner-operators is sufficient. Otherwise, this could lead to increased used diesel-truck prices, creating cost increases that cascade down the goods movement economy.

Alternatively, the state could assess how many diesel trucks are now not being used due to oversupply during the pandemic and offer to buy them back and retire them as a financial incentive to independent owner-operators who overextended when consumer demand peaked in 2021 to 2022.

This could be paired with priority access to the zero-emission MHDV incentive program if they decide to re-enter the industry within a certain number of years. Such a “scrap now, replace later” option would expedite the stock rollover and push more truck purchases into later years when prices will come down and zero-emission sales requirements will be higher.

Zero-Emission MHDV School Bus, Transit, and Public-Entity Funding

A school bus, transit, or public entity set-aside is not recommended as part of this program due to the availability of funding from other sources. However, additional funding is recommended for these important sectors. Public entities that are not transit agencies or purchasing school buses are eligible for the incentive program. However, the incentive amounts proposed will not adequately cover the cost disparity for public agencies purchasing zero-emission MHDVs. The design through this incentive program is not tailored for the needs of school districts or transit agencies. Transit agencies and school districts have direct relationships with their manufacturers and vehicle acquisition cycles that do not match those of the private sector. This program seeks to address a policy gap for commercial zero-emission MHDVs, so the process is streamlined to support the electrification of commercial MHDVs in the private sector.

Instead of adding these users into a system that was not designed for their acquisition processes, the following policy recommendations are proposed in the Washington State TES (Washington State Department of Commerce 2023):

“(4.5) Accelerate and fund school bus electrification to meet needed adoption rates:

Utilizing their expertise from the existing Clean Diesel school bus program, Ecology should work with OSPI and Commerce to:

- Identify target years for requiring that all new public school bus purchases be battery electric (or fuel cell if electric is not feasible) and all public-school buses in operation be battery electric (or fuel cell if electric is not feasible) considering the TES modeling and other cost analyses and bus availability projections.
- Calculate the amount of funding necessary for school districts to cover increased purchase prices prior to cost parity, bus route planning, facility upgrades, charging infrastructure, and training for technicians and drivers.
- Develop a funding process that does not require school districts to apply for state competitive grants separate from other direct funding streams and ensures a seamless transition from Ecology’s Clean Diesel school bus program.
- Develop an exemptions request and approval process that can be made for FCEV, or other non-emitting fuel sources, if a district can demonstrate it is required by the route; and
- Coordinate with school districts via regional transportation coordinators on the above decision points.”

“(4.8) Continue funding the WSDOT Green Transportation Capital grant program: This program provides funding to transit agencies for zero-emission buses and infrastructure capital projects that reduce the carbon intensity of the Washington transportation system. Nearly \$50.5 million was awarded to nine transit agencies for 11 projects for the 2023-2025 biennium, including both battery electric and hydrogen fuel cell technologies. The program is expected to receive \$39.4 million each of the next two biennia based on transportation budget funding projections.”

These recommendations are in the adopted TES and are consistent with the findings of this report.

Policy Suggestions:

Transit and other public agencies must go through different processes than private organizations when it comes to applying for and receiving grants. This incentive program is streamlined to support the electrification of commercial vehicles in the private sector. For this reason, the Washington State Legislature should invest additional funding into the transit zero-emission transition through other pre-existing or future funding sources.

- School districts and transit buses can access fleet technical assistance.
- Keep and improve funding in WSDOT’s Green Transportation Capital Program.

Impact of Vouchers for Lessees in MHDV Market

Small truck fleets are facing challenges in adopting zero-emission vehicle technology due to difficulties accessing limited supplies of new zero-emission MHDV inventory compared to bigger fleets with larger volumes of purchase orders and established fleet transition plans. Without addressing their specific barriers, the adoption of zero-emission vehicles is disproportionately challenging for smaller players. An additional pressing concern in the zero-emission MHDV marketplace is the lack of established expectations

regarding the residual values of used vehicles. Despite the operational lifespan of most zero-emission vehicles exceeding 6–10 years (or even longer if components are disassembled and repurposed), commercial fleet leases typically range from three to six years. Due to a lack of data on residual values, the lifetime value of the vehicle and its components are not currently recognized within the financing terms. The primary vehicle lessee must assume the entire cost of the vehicle within the initial three- to six-year lease period, which then drives up the monthly lease rate.

Crucially, smaller truck fleets often opt for lease financing rather than outright cash purchase of trucks. Leases subsidized through special incentives such as higher residual values and upfront discounts have played a pivotal role in shaping the financial landscape for similar, new leased technologies. To address the barriers hindering the lease financing for small zero-emission MHDV fleets, an innovative solution called a "residual value guarantee" is proposed. This incentive program design aims to encourage the secondary use of zero-emission vehicles beyond their primary lease term, providing certainty to the lessor and affordability to the lessee. CALSTART recommends the implementation of this incentive structure in the medium term (two to three years), recognizing the time required for careful design, administration, and development of methods to ascertain zero-emission vehicles' residual values. This approach not only supports sustainable transportation but also provides a practical pathway for small fleets to navigate zero-emission MHDV adoption and financing complexities.

Concept: Residual Value Guarantee for Leased Small Truck Fleets

The proposed concept, termed the "residual value guarantee," is a progressive incentive design that aims to incentivize both the uptake and reutilization of leased zero-emission trucks. Unlike conventional upfront vouchers, this model splits the voucher amount into two parts: an upfront installment (50 percent) and a second guaranteed amount held in reserve until the end of the lease term, or the "point of resale" (50 percent). Receiving the point-of-resale voucher is contingent upon the zero-emission MHDV being either re-leased or resold to a new user or repurposed for a second-life application, such as stationary energy storage or individual component resale. If the resale price achieved by the financier is lesser than the reserve amount, then the difference is taken out of the reserve and given to the financier in the form of a second voucher. Thus, the financier receives a guaranteed total incentive over the lease term and is therefore able to minimize lease payments charged to the lessee. But depending on the resale price, the funds taken out of reserve by Washington state could be much smaller.

This incentive structure achieves the dual objective of minimizing lease payments, akin to a purely upfront voucher, while ensuring an extended life and residual value for the zero-emission MHDV. Importantly, lessors play a key role in determining the value of the point-of-resale voucher and contributing to the establishment of a proxy estimate for the residual value of each zero-emission MHDV. Consideration must be given to how resale prices will be determined, as this not only affects the total voucher cost to Washington state but also the affordability of a used zero-emission MHDV. To further enhance this model, Washington state can actively engage secondary users of zero-emission vehicles, both in the transportation and energy storage sectors, soliciting their input to raise the minimum residual value estimate. By doing so, this concept not only incentivizes zero-emission MHDV adoption from small fleets, but also leverages

collaborative efforts to establish realistic residual value benchmarks for the evolving zero-emission MHDV market.

Example of Residual Value Guarantee

Below is an example of a voucher incentive transaction applied in four different scenarios toward the financing of a leased Class 8 battery-electric truck. In this example, the voucher is used to finance the lease of a Freightliner eCascadia battery-electric truck with 475 kWh of maximum battery capacity rating, priced at \$476,000 and leased for a term of 60 months. The lessor's cash flows are considered under four different scenarios:

1. No voucher
2. An upfront "point-of-sale" voucher applied at the start of the lease term
3. A "point-of-resale" voucher worth the same amount given after the lease term
4. A hybrid "point-of-sale" and "point-of-resale" guarantee totaling the same as in (2) and (3)

In Scenario 2, the present value of the point-of-sale voucher was set as \$120,000 based on the level of voucher incentive provided for this vehicle by California's HVIP.⁵⁰ In Scenario 3, the present value of the point-of-resale voucher was also set as \$120,000. After considering an inflation rate of 3.24 percent, the future value after the lease term is \$140,742.

In Scenario 4, the present value of the point-of-sale voucher is halved to \$60,000. The remaining \$60,000 is set aside in a reserve for the future. At the end of the lease term, the reserve has grown to \$70,371 from inflation. At this point, the financier is required to resell or release the vehicle to create a residual, and if the residual is below \$70,371, then the difference is taken out of the reserve in the form of a point-of-resale voucher. This way, the financier receives a guaranteed total incentive of \$120,000 over the lease term, but depending on the resale price, the total voucher amount provided by Washington state could be much smaller. The financier's cash flows under each of the four scenarios are shown in Figure 10.

⁵⁰ <https://californiahvip.org/>

Figure 10. Lease Financier Cash Flow Scenarios



Importantly, Scenarios 2, 3, and 4 all result in similar lease payments for the lessee, since the vouchers provided either upfront or at the end of the lease term (combined with the resale value) reduce the total cost that the financier needs to recoup through lease payments by the same amount.

Another important note is that Scenario 4 could result in significant cost savings for the State of Washington. For example, consider a scenario where the financier was able to resell just the battery back from the vehicle at the end of the lease term. Assuming a conservative annual degradation factor of 4 percent on the usable battery capacity, the capacity at the end of the lease term is approximately 350 kWh. At current lithium-ion prices of \$140 per kWh, the potential resale value of the battery at the end of the lease term is roughly \$45,000. This means that out of the end-of-term guarantee of \$70,000, only \$25,000 must be withdrawn from the reserve.

Infrastructure Considerations

As Washington state moves toward the electrification of the transportation infrastructure, there is an essential need for increased coordination and planning among utilities to ensure they can meet the energy demands of the large-scale and rapid infrastructure upgrades necessary to build out the zero-emission MHDV charging network. The development of a charging station network requires massive infrastructure development and significant capacity requirements, particularly for medium- and heavy-duty trucks, on a scale the industry is not currently ready for. Proactive, not reactive, planning is necessary to meet the demands of electrification.

Significant planning is required among individual utilities, and it is of vital importance that increased coordination be conducted now on a region-wide basis among utilities to ensure a smoother transition to an electrified transportation network and the decarbonization of the transportation sectors. Ensuring resource adequacy, or the ability of utilities to reliably balance load supply with electricity demands, is of particular importance as the energy mix of Washington's grid moves toward more dispatchable resources such as renewable wind and solar.

This coordination should be inclusive of all sectors, including utilities, charging station operators, ports, fleet operators, and others to understand the infrastructure upgrades required, impacts on demand, and subsequent resource and capacity needs to meet demand moving forward.

Appendix A: MHDV Definitions

Bus	Any other bus not defined below that is used to transport people
Cargo Van	One-piece vehicle: the cargo area can be conveniently accessed from inside the vehicle for loading and unloading of cargo
City Bus	Operates within the city (also big bus, commuter bus, transit bus, town bus, urban bus, stage bus, public bus, or simply bus) and is used on shorter-distance public transport bus services
Coach	Bus used for longer-distance service
Construction Truck	Heavy-duty vehicles used for heavy equipment or heavy machinery operations, including utility work, specially designed for executing construction/maintenance tasks (e.g., dump/cement truck)
Drayage	Transports goods over a short distance in the shipping and logistics industries; often part of a longer overall move, such as from a ship to a warehouse
Emergency Truck	A vehicle that is used by emergency services to respond to an incident (e.g., ambulance)
Fire Truck	Trucks that transport firefighters and their equipment (e.g., ladders, rescue gear, and power)
Heavy-Haul Truck	Long-distance heavy equipment transport tractor
Long-Haul Truck	Tractor freight for long-distance transport (i.e., transports materials and goods through the country)
Motor Home/Coach	A self-propelled recreational vehicle (RV) that offers living accommodations combined with a vehicle engine
Passenger Van	A one-piece vehicle like a cargo van but with seats to transport people

Pickup Truck	A light truck with an enclosed cab and an open cargo area with low sides and a tailgate
Refuse Truck	Specially designed to collect municipal solid waste and transport it to a solid waste treatment facility, such as a landfill
Regional Truck	Delivery truck, box truck, furniture truck, delivery truck, or beverage truck that runs in a specific area
School Bus	Bus that transports students to/from school
Shuttle Bus	A bus that travels regularly between two places (i.e., shuttles people from one main location, such as an airport, hotel, convention center, or sports stadium, to one or more satellite locations)
Step Van	Walk-in delivery van
SUV	All use a car-based unibody design; typically have off-roading capabilities

Appendix B: TES Alignment

A thorough review was provided of the Washington State TES to ensure recommendations for the voucher incentive program aligned. The following information addresses the components of TES that were relevant to MHDVs.

Anticipated Barriers to Scaling Electric Vehicle Adoption

Technological Barriers

- Product supply-chain limitations have led to both electric vehicle production challenges and limited availability of fast charging infrastructure.
 - Availability of electric vehicles and charging equipment were noted as key barriers to electrification within TES. This includes existing issues within the electric vehicle battery manufacturing space, including limited critical minerals and constrained manufacturing capacity.
 - There are even fewer models of zero-emission MHDVs on the market today relative to the light-duty vehicle sector, and MHDV sales are not as voluminous as light-duty vehicle sales overall. Consequently, the MHDV sector has a harder time competing for the same electric vehicle battery materials. An MHDV-focused electric battery manufacturing facility is planned using Inflation Reduction Act funding but will take a few years to come online.
- Charging infrastructure is generally decentralized, can be unreliable, lacks interoperability, and can result in queues for open chargers due to slow speeds.
 - Beyond overall charger availability, many of the planned electric vehicle public chargers are not designed to accommodate the power and space needs of zero-emission MHDVs. Large trucks and buses have a larger turning radius than light-duty vehicles and will require pull-through charging options. To accommodate private-sector MHDVs and consumer vehicles including recreational vehicles, public charging sites should consider the needs of MHDVs in the design process where possible.
- Grid infrastructure is insufficient to meet anticipated long-term charging needs in many locations, and likely in the near term, for areas with high concentrations of MHDVs that require higher-power charging.
 - This finding is highly consistent with this study's findings and feedback from stakeholders. State legislators should encourage cooperation between utilities, Department of Ecology,

Department of Commerce, WSDOT, and others to adequately plan for the power needs of electrification, specifically for MHDV power needs.

- Trip range can be limited by negative weather impacts on battery capacity and can be worsened by lack of charging infrastructure.

As noted in TES, this is an especially prominent issue among fleets and MHDVs, including electric buses and long-haul trucking. “Range limitations can reduce operational flexibility if electric fleet vehicles are limited to specific routes and schedules. Many school districts have their buses in operation the better part of the day with drivers’ downtime spent outside the depot. Cross-county trips for recreational games and field trips need to be served, sometimes with minimal planning. Drivers whose trip length dictates their income, such as couriers and TNC drivers like Uber and Lyft, many of whom share their vehicle with other drivers and lack downtime to charge, will also struggle to transition without additional support.”⁵¹

Financial Barriers

- Current lack of cost parity between electric vehicles and internal combustion engine vehicles can make it difficult or impossible for some consumers to transition.
 - While MHDV fleet owners and operators are generally more responsive to total cost of ownership benefits, the high upfront costs and amount of unknowns associated with new zero-emission technology perpetuates this in the MHDV market. Though the federal Commercial Clean Vehicle Tax Credit can help offset some of these costs, incentive programs are necessary to help bridge this funding gap.
- Installation of charging equipment can have high upfront capital costs, including costs to upgrade grid infrastructure, and challenging business models.
 - Given the large power needs of charging electric MHDVs, which will likely happen on a depot-based model, this is especially true for the MHDV sector.
- On average, existing passenger cars often stay on the road for approximately 15 years given the cost of replacing vehicles.
 - The MHDV market operates differently from the light-duty vehicle market with more specialized vehicles, and entire sectors rely heavily on the secondary MHDV market to obtain vehicles.

⁵¹ <https://www.commerce.wa.gov/growing-the-economy/energy/clean-transportation/ev-coordinating-council/transportation-electrification-strategy/>

Institutional Barriers

- Charging infrastructure development can face delays due to challenges caused by local permitting processes, timelines, supply-side constraints for electrical equipment, and/or regulatory procedures for grid-side utility upgrades, among other institutional barriers.
- Lack of clear and consistent electric vehicle signage creates difficulty locating and subsequently utilizing chargers.
 - Currently there is only one publicly available electric MHDV charging station on the West Coast at the Daimler Electric Island facility in Portland, Oregon. All other public electric vehicle charging is exclusively designed for passenger duty vehicles.
- There is a lack of community support and buy-in due to perceived or real safety concerns; insufficient data for personal, consumer, and business decision-making; questions about range, weather, and towing capacity; and real or perceived concerns regarding ethical and environmental impacts of material and extraction recycling.
 - Data and information gaps were identified as some of the major challenges to the zero-emission transition. Participants expressed wanting a centralized place to look for data and lessons learned from other companies and fleets that had adopted some zero-emission technologies. Specialized groups focused specifically on MHDV issues should be put together as part of other efforts to address this issue.
- A limited workforce means there are not sufficient technicians to service electric vehicles, and there are not enough engineers, electricians, and technicians to install and maintain charging infrastructure and related grid infrastructure.
 - The driver shortage for long-haul trucking will impact the transition to zero-emission MHDVs in addition to the workforce issues outlined in TES. Additionally, drivers will need training on ways to optimize regenerative braking technology to maximize battery life and brief refresher courses in how to operate this new set of machinery. Fleet managers will need to reconfigure how routes are created to suit the needs of zero-emission technologies.
- Charging infrastructure, especially for MHDVs, will require significantly more real estate than diesel fueling.
 - As mentioned, the size of MHDVs means a larger space requirement to turn, pull through, and move around refueling facilities. The higher power needs to recharge zero-emission MHDVs will also require more space to put in adequate chargers. This challenge presents an opportunity for the private sector to work with cities, counties, and the state to identify potential public-private partnership opportunities to find publicly owned land that could be utilized for public and private electric MHDV charging purposes.

Priority Policies

Of the six priority areas, four have direct connections to the broader goal of accelerating the adoption of zero-emission MHDVs and decarbonizing the MHDV sector in Washington state. The policies outlined in TES are geared toward achieving the 'Strong Electrification Scenario' to help Washington meet its goals of reducing transportation related GHG emissions from 40.3 MMT CO₂ annually in 2019 to approximately 20 MMT CO₂ or below annually by 2030.

Broadly speaking, the priority policies outlined in TES directly relate to the needs of zero-emission MHDV market development and zero-emission technology adoption. Specific recommendations for ways these policies can accommodate or better support owners and operators of MHDVs are outlined below. This list is not exhaustive, and the general perspective of this team is to support the general policy recommendations identified within TES unless otherwise noted.

The following priority policy areas are taken from TES approved in 2023 by the State EV Coordinating Council:

- **Capacity Building and Consumer Education** explores state actions to ensure residents and businesses have the information and resources they need to make this transition easily and confidently, and that local and state government, as well as community-based organizations, have the resources to support their constituents;
- **Charging and Utility Infrastructure** considers how to scale deployment of charging infrastructure and ensure people have the means to charge their vehicles when they need to at a convenient, safe, and accessible location; costs and benefits of charging are distributed equitably; charging is reliable and resilient; and the grid is prepared to handle the increased demand;
- **Medium- and Heavy-Duty Vehicles** examines strategies to accelerate electric medium- and heavy-duty vehicle adoption through targeted policies that ease financial barriers to getting more electric vehicles on the road; and
- **Workforce Development** details actions the state can take to ensure Washington's workforce develops the skills and training necessary to support work on electric vehicles, charging infrastructure, and the grid; requisite training includes strong labor standards; and that the transition to a low-carbon transportation sector fuels the growth of Washington's clean industrial economy.

The following priority policy areas are not relevant to the MHDV discussion but are a critical part of Washington reaching the emissions limits set for 2030.

- **Light-Duty Passenger Vehicles** reviews opportunities to accelerate electric passenger vehicle adoption through financial support, state leadership, and other strategies.
- **Electrifying Micromobility** considers how to expand affordable access to e-bikes and integrate them with electrified public transit.

Part I – Achieving the Strong Electrification Scenario

1. Consumer Education and Capacity Building

Educate and engage Washington residents and businesses about the opportunities and benefits of transportation electrification. As shown in the TES analysis, and specifically Scenario 3 Strong Electrification Policy, a comprehensive education and engagement strategy is essential to ensure that the general public is aware of the transportation electrification resources and opportunities available and acts on uptake. This should build upon the Education Plan and the Engagement Plan and integrate existing local resources, such as the Municipal Research and Services Center and the WSU Green Transportation program.

(1.1) Develop a Transportation Electrification Education and Resource Center:

Due to the complexity of transitioning a MHDV fleet from diesel to zero-emission technology, specialized third-party technical assistance integrated into the incentive application process is the preferred strategy for meeting this policy recommendation. However, the MHDV information and technical assistance should be well integrated into the broader Transportation Electrification Resource Center so they are coordinated and easy to cross-reference.

(1.2) Promote public information campaigns about financial incentives for and benefits of getting an electric vehicle:

A specific strategy and set of resources should be set aside to support public information campaigns to owners and operators of MHDVs.

(1.3) Support ride and drive events:

Ride and drive events are critical to increasing familiarity with existing technology, which is especially important for sectors like agriculture. Industry groups like the Washington Trucking Association, or agencies with an established relationship to the sector like the Department of Agriculture, will be key partners in having successful ride and drive events for the MHDV on- and off-road sectors.

The state should also support more pilot projects in the MHDV and off-road vehicle sectors. Increase government capacity to coordinate and streamline program design, assess equity outcomes and equity-oriented initiatives, and support municipal capacity for grant funding distribution for electric vehicles, electric vehicle supply equipment, and complementary programs. To ensure the equitable transition to transportation electrification and to support its residents, businesses, and municipalities, the state can provide additional guidance, resources, and internal capacity to simplify and encourage electric vehicle adoption and buildout of associated supporting physical and operational infrastructure and measure success.

(1.4) Standardize and streamline government electric vehicle and charging infrastructure program applications.

A standardized form for both light-duty and MHDV programs may not be the most effective approach given the additional information, background material, licenses, etc., that will be required for MHDV fleets

to acquire an incentive voucher. To the extent possible, there should be coordination between these two program applications, including potentially the use of a single customer-facing portal that leaves most of the complexity on the administrative backend.

Streamlined reporting and data collection requirements for charging infrastructure should include any specialized areas relevant to zero-emission MHDV infrastructure.

(1.5) Fully fund agency staffing needs to implement TES:

Fully funding the staffing needs of the implementing and supporting agencies for the incentive program will be a critical component of the program's success.

(1.6) Provide block grants to increase community-based organizations' staff capacity:

Community-based organizations, including industry organizations, will be a critical tool to reach MHDV owners and operators in Washington state to keep them updated and informed about the incentive program. Working with trusted, known partners within a sector is critical to growing and maintain trust and interest in the program.

(1.7) Monitor equity indicators and measure outcomes:

Data collection and reporting will be a major component of the incentive program's follow-up costs, and special attention will be paid to ensure the impacts of the incentives are equitably benefiting communities across Washington state. Additional state investment in data collection and air quality monitoring will enable better investments and more targeted approaches to the incentive program deployment over time.

The data collected through the incentive program should feed directly into this broader effort.

2. Charging and Utility Infrastructure

Prepare the grid to handle the increase in electric vehicle charging demand.

(2.1) Require utilities to develop public-facing electric capacity maps.

Supporting and funding this requirement will enable fleets to more quickly and effectively plan for zero-emission MHDV deployment by seeing which of their existing sites already have adequate power and allow them to better plan out their long-term zero-emission transition.

(2.2) Replace the statutory rate impact cap with ratepayer benefits and affordability protections.

This policy recommendation balances the need to allow utilities to begin planning and building out infrastructure to meet transportation electrification power needs while protecting individual rate payers. Keeping energy affordable for fleets will be a critical component of ensuring that the cost of refueling an electric truck or bus remains cost competitive against diesel.

(2.3) Identify areas for increased grid investment.

A stronger, more reliable grid across the state will support zero-emission MHDV deployment and ensure all regions can support the power demands of recharging buses, trucks, and delivery vans in addition to passenger vehicles.

(2.4) Evaluate time-variant electricity pricing and electric vehicle charging management.

Fleets will likely actively participate in managed charging strategies where possible, especially if competitive pricing is offered. There will be use cases and situations where MHDV charging cannot happen during off-peak hours, which will need to be considered as these programs are developed.

Offer and/or explore additional tools for rapid charging infrastructure deployment.

(2.5) Support planning and building necessary utility-side charging infrastructure.

As noted throughout this report, there is a timely need to begin planning and building out this power infrastructure to meet future electric vehicle charging demands. Funding for proactive planning can help offset the costs passed on to consumers.

TES notes that “because Washington’s drayage truck industry is predominantly owned by small enterprises, cost-effective charging infrastructure that meets the needs of this small owner operator model needs to be prioritized. The state should identify and recommend sites where publicly available charging should be developed and recommend proactive grid development to accommodate it. According to the baseline modeling for the TES, demand for MHDV charging is forecasted to grow exponentially from 2023 to 2035, from fewer than 250 ports to over 7,500. MHDV deployment to meet the Advanced Clean Trucks rule (ACT) (and possibly Advanced Clean Fleets) levels will simply not occur without adequate new charging infrastructure.”⁵²

(2.6) Explore expanding public utility line extension allowances for public charging infrastructure charging.

Many fleets in Washington state are served by consumer-owned utilities (COUs), which currently do not offer line extension allowances to serve charging infrastructure, which makes it harder for commercial customers to afford the upfront capital costs for charging infrastructure projects. This policy recommendation for the Department of Commerce to convene COUs and discuss opportunities to better enable COU customers to implement charging infrastructure projects is a critical component of helping fleets electrify depots.

(2.7) Explore the development of a publicly backed financing entity to provide innovative financing mechanisms.

The cost differential between internal combustion and zero-emission on- and off-road MHDVs is a major obstacle that cannot be solved by state incentives alone. Innovative financing mechanisms will be needed to effectively bridge this funding gap. A state infrastructure bank backed by the U.S. Department of Transportation’s TIFIA loan program, a regional financing entity established through the Inflation Reduction Act’s Greenhouse Gas Reduction Fund, or other proposal may help fill this need, but more

⁵² <https://www.commerce.wa.gov/growing-the-economy/energy/clean-transportation/ev-coordinating-council/transportation-electrification-strategy/>

research is needed to identify what the best course of action should be. State agencies should work with established partners with expertise in innovative financing for MHDVs in putting together this plan.

(2.8) Amend Clean Fuel Standard rules to allow capacity credits for private fleet depots.

Data collected from zero-emission MHDVs funded through the incentive program will demonstrate clear benefits to air quality in overburdened communities and support the amendment of this rule. Allowing private fleet depots that serve two or more fleets to access capacity credits will help make the financial calculations for switching to zero-emission MHDVs more attractive for fleets and investors.

(2.10) Ensure community partnerships are in place for charging infrastructure in overburdened communities.

Many truck depots are already located in overburdened communities, including those disproportionately impacted by transportation-related pollution. Working with these communities as charging infrastructure is installed will help ensure community buy-in to the process and help ensure the community is seeing the benefits of the transition.

(2.12) Demand charge relief through alternative rates for electric vehicle charging.

(2.13) Carefully consider electricity rates.

Ensure charging infrastructure build-out process is community-informed, streamlined, and consistent.

(2.14) Community-informed charging infrastructure siting.

(2.15) Develop model site designs.

In this process of developing model site designs, the Department of Commerce should ensure there are experts knowledgeable about the needs and requirements of zero-emission MHDVs so there are adequate resources for these sites as well. This will accelerate the deployment of zero-emission MHDV charging sites across the state, which supports broader electrification.

(2.16) Analyze and reduce grid interconnection timeline for charging infrastructure.

(2.17) Develop recommendations for building codes and corresponding parking and charging requirements.

Permitting and codes were flagged as major roadblocks for deploying electric MHDV charging infrastructure, and parking remains a major concern for the MHDV industry. Reviewing these codes and including requirements for electric MHDV charging at appropriate locations and allowing for flexibility for the type of charging required at large parking areas will help address this issue.

(2.18) Increase ability to install electric vehicle chargers in public right-of-way.

Ensure charging infrastructure are reliable and resilient.

(2.19) Establish standards for charging infrastructure reliability.

(2.22) Co-locate renewable energy and/or battery storage with charging.

MHDV chargers will require upwards of hundreds of megawatts worth of power to refuel zero-emission MHDVs. On-site energy generation and storage will help alleviate the stress this puts on the grid and lower costs for users of that site.

Continue to fund and implement highway fast charging.

(2.24) Continue funding WSDOT's Zero-emission Vehicle Infrastructure Partnership (ZEVIP) grant program to provide support for charging along state routes.

Continue this program and ensure applicants can apply for infrastructure grants that support MHDV charging infrastructure.

(2.25) Implement the National Electric Vehicle Infrastructure (NEVI) program to fund charging infrastructure along Interstates and U.S. highways.

Although considerations for MHDVs is not currently a requirement for NEVI-funded sites, Washington state can include elements in site design that make the stations more accessible for large trucks, buses, recreational vehicles, and other MHDVs. This will ensure the system being built today is usable by all road users and grow trust in the reliability and availability of the charging network for MHDVs.

Ensure that all Washington residents can access charging easily.

(2.26) Publish and maintain the ZEV Mapping and Forecasting tool to provide information to support utility and charging infrastructure investment decisions.

Ensure MHDV needs are taken into consideration as the mapping and forecasting tool is edited and improved.

(2.27) Develop and implement reporting requirements to assess charging installation progress and provide better information to drivers.

(2.29) Electrify truck parking at ports.

(2.30) Develop increased public charging for MHDVs.

This policy is a critical component of decreasing range anxiety and increasing range potential for MHDVs.

(2.33) Develop renter protections regarding electric vehicle charging.

Many companies rent their depot space, so right-to-charge legislation that enables renters at commercial and residential locations to add charging infrastructure is an important piece of helping MHDV fleets transition.

4. Medium- and Heavy-Duty Vehicles

Adopt California's motor vehicle emissions standards under the Clean Vehicles Program (Advanced Clean Cars, Advanced Clean Cars II, and ACT). Washington's Department of Ecology is required to do so through RCW 70A.30.010, and therefore should continue to update existing standards and adopt any additional regulations by reference considered by the agency to be motor vehicle emissions standards. These

standards should be used independently or in tandem with other existing state policies to accelerate the transportation electrification transition.

(4.1) Pursue ACF adoption rates.

ACF-required adoption rates of zero-emission MHDVs were noted as a significant policy lever for Washington state to help accelerate adoption of zero-emission MHDVs. ACF mandates the number or percentage of zero-emission vehicles within a fleet, increasing over time to encourage zero-emission MHDV adoption.

California has had nearly 10 years of HVIP and other incentive programs that have supported the development of a zero-emission MHDV market within the state. Washington is several years behind California, and the need to develop a zero-emission MHDV market should be considered when setting the fleet targets within ACF.

The Department of Ecology should work closely with zero-emission MHDV owners and operators to ensure the adoption rates set in Washington state are reasonable, achievable, and practical with existing market zero-emission technologies. As has been noted throughout this report, there are several use cases and vehicle types that have very limited or no practical zero-emission replacement technologies at this time. Technology improvements over the next 5–10 years are expected to address this gap.

(4.2) Successor policy to ACT.

“Ecology should advocate for, support, and provide input on any potential CARB development of a successor policy to Advanced Clean Trucks (ACT), as well as updates to ACT. Supporting both will further accelerate electrification in the medium- and heavy-duty sector.”⁵³

(4.3) Other MHDV motor vehicle emission policies and updating existing standards.

“Ecology should continue to assess the impact of adopting additional MHDV motor vehicle emission policies and act accordingly.”⁵⁴

(4.4) Fund and implement an MHDV incentive and infrastructure program.

The incentive program design proposed within this report outlines a program that aligns with the details within this policy recommendation with a few key caveats.

“The EV Council recommends one large program with set asides for all on-ground vehicle types except public school and transit buses (rather than many different programs spread across agencies and different program administrators), with carveouts for at least public fleets.”⁵⁵ In the first round of funding, there are no carveouts for public fleets, as the objective is to fund as many vehicles as possible. Future rounds of funding can and should explore this set-aside option.

⁵³ <https://www.commerce.wa.gov/growing-the-economy/energy/clean-transportation/ev-coordinating-council/transportation-electrification-strategy/>

⁵⁴ Ibid.

⁵⁵ <https://www.commerce.wa.gov/growing-the-economy/energy/clean-transportation/ev-coordinating-council/transportation-electrification-strategy/>

“The program should include a dedicated increased incentive and set-aside funding for MHDVs operating in overburdened communities historically exposed to higher levels of air pollution, as well as businesses that cannot afford the upfront cost of these vehicles. However, the base level incentive should otherwise be applicable statewide and have no minimum number of vehicles requirement.”⁵⁶ The proposed incentive program has plus-ups for vehicles domiciled in overburdened communities, which is generally seen as an easy way to capture vehicles that operate in overburdened communities. Otherwise, the baseline incentive amount is the same across the state and across fleet size.

“Additionally, this voucher program should also include strong incentives for corresponding charging infrastructure – such as depot charging – to serve the funded vehicles.”⁵⁷ Infrastructure incentives are part of the program design.

“Private sector capital investment companies should be engaged to finance further electrification of the commercial fleet sector and achieve economies of scale.”⁵⁸ Private-sector capital investment companies were part of the stakeholder engagement efforts. Cooperation with the private sector through public-private partnerships and feedback are important to ensure the program works well for companies.

“Finally, the voucher program should consider design options that promote the secondary market for MHDV in the state, as many users (e.g., drayage) have historically purchased used MHDV.”⁵⁹ The proposed incentive program for Washington is the first to propose an incentive value for secondary MHDVs. This proposal should give Washington a competitive edge in bringing used MHDVs to the state and growing this sector.

(4.5) Accelerate and fund school bus electrification to meet needed adoption rates.

Though the proposed incentive program does not include school buses, this is in large part because existing funding mechanisms are more efficient at meeting school bus electrification funding needs. These programs should be fully funded and supported to ensure adoption rates are met. School districts will be able to access the fleet advisory and other MHDV-focused technical assistance services.

(4.6) Expand Clean Diesel program focus and funding.

The Clean Diesel program focus and funding could be a good avenue for funding pilot or demonstration projects, as suggested in TES. If possible, eligibility for this program should be expanded to include private sector fleets.

(4.7) Establish port priority access for electric vehicles.

Port priority access for zero-emission vehicles should be explored with NWSA to ensure the program is equitable and does not disadvantage small fleets that cannot afford zero-emission vehicles.

(4.8) Continue funding the WSDOT Green Transportation Capital grant program.

⁵⁶ Ibid.

⁵⁷ Ibid.

⁵⁸ Ibid.

⁵⁹ Ibid.

Much like school buses, buses for transit agencies are not eligible under the proposed incentive program because of successful programs like WSDOT's Green Transportation Capital grant program. This and other existing funding mechanisms are effectively meeting transit agency decarbonization funding needs. Continued support and funding for these programs is essential to ensuring this continues and that transit agencies can reduce their emissions profiles.

Leverage federal funding for the electrification of MHDVs.

(4.9) Apply for Clean Heavy-Duty Vehicles grant within the Inflation Reduction Act.

(4.10) Explore bulk purchase financing through Department of Energy Loan Office.

Beyond bulk purchase financing, there are other potential innovative financing solutions that can help the private sector purchase zero-emission MHDVs. The cost differential between internal combustion and zero-emission on- and off-road MHDVs is a major obstacle that cannot be solved by state incentives alone. Innovative financing mechanisms will be needed to effectively bridge this funding gap. A state infrastructure bank backed by the U.S. Department of Transportation's TIFIA loan program, a regional financing entity established through the Inflation Reduction Act's Greenhouse Gas Reduction Fund, or other proposal may help fill this need, but more research is needed to identify what the best course of action should be. State agencies should work with established partners with expertise in innovative financing for MHDVs in putting together this plan.

6. Workforce

Support early career development, career transitioning, and underrepresented individuals to access the industry while meeting Washington's transportation electrification workforce demand.

(6.1) Invest in targeted workforce training.

Ensure that the Clean Energy Technology Workforce Advisory Committee includes representatives knowledgeable about the labor and workforce needs of the MHDV sector.

Ensure that the existing workforce has adequate access to the certifications necessary to participate in the shifting industry.

(6.2) Require certifications for the electrical components of electric vehicle charger installations.

(6.3) Explore training and certification requirements for electric vehicle charging maintenance technicians.

(6.4) Require electric vehicle technician training for fleets.

As noted within the details of this strategy, "legislators, agencies, and stakeholders should determine whether this is best implemented through legislative or regulatory workplace safety standards, guidance that must be adopted to receive ZEV funding, or collective bargaining contract language."⁶⁰

⁶⁰ <https://www.commerce.wa.gov/growing-the-economy/energy/clean-transportation/ev-coordinating-council/transportation-electrification-strategy/>

(6.5) Require training and certification for electric vehicle technicians.

(6.6) Create a training grant program for first responders addressing electric vehicle battery fires.

Identify opportunities created through the transportation electrification transition to grow Washington's clean industrial economy.

(6.10) Build up Washington state electric vehicle manufacturing.

Washington state is the current and future home of several MHD OEMs that are producing zero-emission models. Policies that encourage these and other manufacturers to produce zero-emission MHDVs and components in Washington will increase the stock of available zero-emission MHDVs, which is currently a major obstacle.

(6.11) Support local markets for battery reuse and recycling.

Appendix C: Stakeholder Engagement Participants

The following tables represent the participants involved in the study's stakeholder engagement and outreach efforts. The tables are categorized by focus-group topic and are broken down into "group" and "organization/affiliation." "Group" refers to participant industry, audience, or interest.

Legislator Outreach #1: October 2, 2023

Group	Organization/Affiliation
Washington Legislature	Senate Transportation Committee

Legislator Outreach #2: October 3, 2023

Group	Organization/Affiliation
Washington Legislature	Joint Transportation Committee
Washington Legislature	Joint Transportation Committee

Legislator Outreach #3: October 6, 2023

Group	Organization/Affiliation
Washington Legislature	Joint Transportation Committee

Legislator Outreach #4: October 9, 2023

Group	Organization/Affiliation
Washington Legislature	House Environment and Energy Committee

Legislator Outreach #5: November 8, 2023

Group	Organization/Affiliation
Washington Legislature	Innovation, Community & Economic Development and Veterans Committee

Washington State Department of Transportation: September 29, 2023

Group	Organization/Affiliation
Washington agency	Washington State Department of Transportation
Washington agency	Washington State Department of Transportation
Washington agency	Washington State Department of Transportation

Washington State Department of Ecology: October 5, 2023

Group	Organization/Affiliation
Washington agency	Washington State Department of Ecology
Washington agency	Washington State Department of Ecology
Washington agency	Washington State Department of Ecology
Washington agency	Washington State Department of Ecology

Group	Organization/Affiliation
Washington agency	Washington State Department of Ecology
Washington agency	Washington State Department of Ecology

Dealerships: October 11, 2023

Group	Organization/Affiliation
Truck dealership	Dobbs Truck Group
Truck and trailer dealership	TEC Equipment Washington State
Truck and trailer dealership	TEC Equipment Washington State
Truck manufacturing	Pape Kenworth
Truck manufacturing	Pape Kenworth
Truck dealership	Western Peterbilt LLC
Trucking association	Washington Truckers Association

Finance: October 12, 2023

Group	Organization/Affiliation
Transportation consulting	GNA
Transportation consulting	GNA
Truck and trailer dealership	Dobbs Peterbilt
Truck and trailer dealership	TEC Equipment Washington State
Financial services	Volvo Financial Services
Trucking association	Washington Trucking Association

School Buses: October 17, 2023

Group	Organization/Affiliation
Schools	Tacoma Public Schools
Schools	Tacoma Public Schools
Schools	Inchelium School District
Schools	Lake Washington School District
Schools	Kennewick School District
Education Law	G&L Gates
Schools	Colfax School District
Schools	Franklin Pierce School District
Schools	Deer Park School District
Schools	Riverview School District

Puget Sound Energy: October 30, 2023

Group	Organization/Affiliation
Utility provider	Puget Sound Energy
Utility provider	Puget Sound Energy

Public Utility Districts: November 3, 2023

Group	Organization/Affiliation
City jurisdiction	City of Tacoma
Utility association	Washington Public Utility District Association
Utility district	Snohomish PUD
Utility district	Seattle City Light

Long Haul Trucking: November 7, 2023

Group	Organization/Affiliation
Truck and trailer dealership	Peninsula Truck Lines, Inc
Logistics and transportation service provider	IEDS Logistics
Truck dealership	Nikola Corporation
Truck dealership	Einride
Truck and trailer dealership	Kenworth
Heavy-duty vehicle electrification	WattEV
Truck and trailer dealership	Peterbilt Motors Company
Truck dealership	Tesla

Private Fleets: November 8, 2023

Group	Organization/Affiliation
Trucking association	Washington Trucking Association
Trucking association	Washington Trucking Association
Heavy-duty vehicle electrification	WattEV
Charter transportation service	MTR Western
Washington agency	Washington State Dept. Of Commerce
Eco-friendly home improvements	Eco Infinity Nation
Clean fuel manufacturer	Pape Clean Fuels
Fruit processive cooperative	Treetop
Energy storage technology	StorEdgeAI

Public Agencies: November 9, 2023

Group	Organization/Affiliation
City jurisdiction	City of Everett
Utility district	Seattle City Light
Clean transportation coalition	Western Washington Clean Cities Coalitions

Staff Working Group: November 9, 2023

Group	Organization/Affiliation
Washington agency	Joint Transportation Committee
Washington agency	Joint Transportation Committee
Washington agency	Joint Transportation Committee
Washington agency	Washington State Department of Ecology
Washington agency	Office of Program Research

Group	Organization/Affiliation
Washington agency	Washington State Department of Transportation
Washington agency	Washington State Department of Transportation
Washington agency	Washington State Department of Commerce

AAA Washington: November 14, 2023

Group	Organization/Affiliation
Transportation service provider	AAA Washington
Transportation service provider	AAA Washington
Transportation service provider	AAA Washington
Transportation service provider	AAA Washington
Eco-friendly home improvements	Eco Infinity

Dealerships and Finance #2: November 15, 2023

Group	Organization/Affiliation
Zero-emission vehicle and charging distribution	Forum Mobility
Truck and trailer dealership	TEC Equipment
Truck and trailer dealership	TEC Equipment
Truck and trailer dealership	TEC Equipment
Truck and trailer dealership	TEC Equipment
Truck manufacturing	Kenworth
Truck manufacturing	Paccar
Truck manufacturing	Pape Kenworth
Electric automobile manufacturer	Rivian
Trucking association	Washington Trucking Association
Trucking dealership	Western Peterbilt LLC

Transit Agencies: November 15, 2023

Group	Organization/Affiliation
Transit union	ATU Legislative Council of Washington
Transit agency	Community Transit
Transit agency	Intercity Transit
Transit union	ATU 843
Transit agency	King County Metro
Transit agency	Everett Transit
Transit agency	Island Transit

Minority Owned Businesses: November 15 and 27, 2023

Group	Organization/Affiliation
Minority owned business	Sandwich shop
Minority owned business	Advertising company
Minority owned business	Party decoration company

Group	Organization/Affiliation
Chamber of commerce	Seattle Latino Metropolitan Chamber of Commerce
Minority owned business	Columbian Delights Bakery
Minority owned business	Sports radio personality
Minority owned business	Colombian grocery store
Minority owned business	Air conditioning company
Minority owned business	El 7 Dias Newspaper
Minority owned business	Moving company
Insurance	Insurance broker
Insurance	Insurance broker
Minority owned business	Paperepas food truck

Agriculture and Farming Equipment: November 17 and December 13, 2023

Group	Organization/Affiliation
Washington agency	Washington State Department of Agriculture
Washington agency	Washington State Department of Agriculture
Washington agency	Washington State Potatoes Commission
University research center	Washington State University Tree Fruit Research & Extension Center
Farming association	Tree Fruit Association
Clean transportation consulting	Clean Future
Washington agency	State Energy Office
Agriculture association	Washington State Dairy Federation
Tractor manufacturer	Monarch Tractor

Logistics: November 28, 2023

Group	Organization/Affiliation
Truck dealership	Tesla
Shipping and logistics	United Parcel Service
Heavy-duty vehicle electrification	WattEV
Trucking association	Washington Trucking Association
Washington agency	Washington State Department of Commerce
Clean fuels coalition	Columbia-Willamette and Western Washington Clean Cities Coalitions

Zero-Emission Refueling: November 30, 2023

Group	Organization/Affiliation
Electric vehicle charging	BP Pulse
Zero-emission vehicle and charging distribution	Forum Mobility
Electric vehicle charging	InCharge Energy
EV & energy solutions manufacturer	Nikola Corporation

Group	Organization/Affiliation
Clean fuel manufacturer	Pape Clean Fuels
Electric automobile manufacturer	Tesla
Heavy-duty vehicle electrification	Watt EV
Zero-emission commercial vehicle service	Zeem Solutions
Eco-friendly home improvements	Eco Infinity

Final Stakeholder Review: December 5, 2023

Group	Organization/Affiliation
Zero-emission vehicle and charging distribution	Forum Mobility
Automobile manufacturer	Volvo Group
Truck and trailer dealership	TEC Equipment
Truck and trailer dealership	TEC Equipment
Schools	Richland School District
Utility district	Tacoma Power
Utility district	Tacoma Power
Schools	Colfax School District
Schools	Richland School District
Schools	School Alliance
Technology manufacturing	Base Tech
Transportation service provider	AAA Washington
Transportation service provider	AAA Washington
Truck manufacturer	Pape Kenworth
Agriculture association	Washington Association of Wheat Growers
Port district	Port of Bremerton
Port alliance	Northwest SeaPort Alliance
Port alliance	Northwest SeaPort Alliance
Port alliance	Northwest SeaPort Alliance
Electric vehicle manufacturer	Einride
Truck association	Washington Trucking Association
Trucking & logistics	Lynden Incorporated
Tractor manufacturer	Monarch Tractor
Zero-emission transportation	ABB E-mobility
Commercial vehicle industry supplier	Consolidated Metco
Port association	Washington Public Ports Association
Truck manufacturer	Kenworth Truck Co.
Port district	Port of Benton
Union	Transit union
Port district	Port of Kalama
Sustainability consulting	8020 Vision
Engineering	MX
Zero-emission commercial vehicle service	Zeem Solutions

Group	Organization/Affiliation
Utility association	Washington Public Utility Districts Association
City jurisdiction	City of Liberty Lake
4 additional people attended but did not disclose organizations/affiliation	

Railroad and Off-Road: December 7, 2023

Group	Organization/Affiliation
Rail magazine	VTD Rail Publishing
Port district	Port of Vancouver
Port district	Port of Benton

Washington Public Ports Association: December 15, 2023

Group	Organization/Affiliation
Port district	Port of Bellingham
Port association	Washington Public Ports Association
Port association	Washington Public Ports Association
Port district	Port of Benton
Port district	Port of Port Angeles
Port district	Port of Port Angeles
Port alliance	Northwest Seaport Alliance
Port district	Port of Tacoma

Industry One-on-One Interviews

Group	Organization/Affiliation
Shipping	Lynden Trucking
Shipping	Peninsula Trucking
Shipping	Signature Transport
Shipping	Hogland Transfer
Shipping	Oak Harbor Freight
Shipping	Stryder Motor Freight
Shipping	Fastway Freight
Shipping & logistics	Ryder
Logistics	DKS
Logistics	Mercer Logistics

Appendix D: Stakeholder Engagement Interview Summaries

Companies representing the breadth of Washington state's trucking and logistics industry were interviewed for their opinions on the challenges and opportunities for de-carboning the heavy-duty trucking segment. Below is a summary of their comments, along with potential solutions suggested by industry leaders.

Operational Concerns with Electric Battery Technology:

- 1) **Reduction of payload due to extra weight of electric batteries (or fuel cells).** For heavy-duty trucks, current technology in electric batteries adds 3,000–6,000 lbs. of additional weight, substantially reducing the amount of freight a truck can haul based on current weight allowances. This reduction of payload will require trucking companies to purchase additional trucks simply to haul the same amount of freight as they do currently. For trucking companies, these additional trucks will also require additional drivers, additional space for parking, additional insurance, etc., substantially increasing operating costs. Additional trucks will also affect the state's transportation and logistics chain, with more containers needed to haul the same amount of freight, more trucks on the state highway system, more trucks entering the ports, etc.

Suggested solutions:

- o Increase weight allowances to adjust for the weight of the batteries.
- o Align state policy with neighboring states (Oregon, Idaho, Montana, Nevada) by permitting triple-trailers on certain freight routes (one triple-trailer removes one truck from the highway). This would reduce emissions by taking every third truck off the road and increase efficiency of the supply chain.

- 2) **The full cost of conversion to electric trucks is substantially more than the purchase of the truck.**

This includes cost of the electric truck + federal excise tax + state sales tax + cost of installing chargers + additional yard space needed for trucks while charging + down time of trucks during charging + additional drivers required (charging time cuts into service hours) + cost of battery replacement.

Suggested solutions:

- o Provide incentives for the full cost of ownership. Examples: exemptions from state sales tax; incentives for installation of chargers; discounts on additional battery purchases.
- o Long-term financing programs are needed (beyond the conventional five-year period), particularly for small- to medium-sized companies.

- 3) **Reliability and range.** Current battery technology has not yet advanced to meet the requirements of long-line hauls across Washington. Reduction of range in colder temperatures is a concern for trucking companies hauling freight from Eastern Washington.

Suggested solution:

- o Focus state incentives on developing the short-haul market first (e.g., Class 8 yard trucks, box trucks) until technology exists for long-line hauls.

- 4) **Lack of availability and cost of insurance for electric/fuel cell trucks.** Insurance products for electric trucks are not yet widely available; currently available insurance products are three times the cost of traditional insurance.

Suggested solution:

- o Provide incentives to the insurance market to provide electric/fuel cell battery at costs competitive to standard truck insurance rates.

Concerns about Electrification Infrastructure:

- 1) Cost of installing charging infrastructure on private facilities.
- 2) The “charging challenge”: Most of the facilities where charging is needed for the private sector are rented (not owned) by the vehicle/fleet owners, so there is no incentive for large, long capital investments in charging infrastructure. Trucking companies frequently move locations in pursuit of low rent prices, which disincentivizes landlords from making the investment in charging infrastructure.
- 3) Lack of adequate space in yards to install chargers (e.g., 10 electric chargers will displace parking spots for 50 trailers).
- 4) Significant lag time with utilities to install power. Trucking companies report that utilities 1) are requiring electric truck purchase orders before agreeing to install power, and 2) will not put chargers on private property without long-term (10-year+) leases, which are not standard for the industry, to recoup the investment.
- 5) Availability of power and charging infrastructure in smaller/rural communities and outside state lines.

Suggested solutions:

- o State investment in and buildout of infrastructure should be a top priority for the Legislature.
- o Create a streamlined permitting process for infrastructure development.
- o Include all utilities (public and private) statewide in evaluating power availability and charging installation.
- o Provide incentives for commercial landlords to install charging infrastructure for tenants.
- o Ensure financial incentives/grants are broadly available across the state, not just in low-income neighborhoods.

- Provide incentives for utilities to work with municipalities to plan and offer charging to the general public.
- Provide technical assistance to private companies to analyze the use case for commercial charging to optimize investments (e.g., analyze duty cycles).
- Work with adjacent states (especially Oregon and Idaho) on developing an interstate charging infrastructure.

Impact on Drivers:

1. **Time to charge trucks will reduce drivers' hours of service**; this is especially impactful on independent owner-operators and drivers paid by the mile.
2. The current driver shortage will be exacerbated by the need for additional drivers if the battery weight/payload reduction issue is not addressed and more trucks are required to haul the same amount of freight.

Potential solutions:

- Increase state funding for expanded CDL training at high schools and community/technical colleges.

Comments and Suggestions About Statewide Zero-Emission Adoption:

- The operational complexities for long-haul and heavy-haul trucking are immense. Start with transitioning short-haul fleets and provide a longer transition period for heavy/long-haul trucking as necessary statewide infrastructure and new technologies come online.
- Provide immediate incentives for alternative fuels such as renewable diesel or hydrogen gasoline and diesel, which provide immediate emissions reduction during the transition period.
- Provide a specific schedule for achieving zero emissions, so companies have time to adequately plan.
- Mandates should not occur unless/until electric charging is available.
- State investment should look at all zero-emission options (e.g., hydrogen, ethanol), not just electrification, and program design should be flexible in including hybrid options.
- It is unrealistic for companies to be able to transition their entire fleet quickly and efficiently without current proven, cost-effective solutions.

Appendix E: Federal Commercial Clean Vehicle Tax Credit

The following information is additional detail on the federal Commercial Clean Vehicle Tax Credit and how fleets can claim the credit.⁶¹

Options for Claiming the Commercial Clean Vehicle Tax Credit

The Commercial Clean Vehicle Credit allows businesses and tax-exempt organizations to qualify for up to \$40,000 determined by the lesser of 15 percent of the basis in vehicle price (or 30 percent in the case of electric/fuel-cell electric vehicles), or the incremental cost of the vehicle. Incremental cost is determined by the excess cost of the qualified vehicle over a comparable (nonqualified) vehicle. For example, if a qualified vehicle costs \$140,000 but a comparable (nonqualified) vehicle costs \$100,000, the incremental cost would be \$40,000.

Option 1 – Claim to reduce taxes payable: The Commercial Clean Vehicle Credit is a nonrefundable tax credit, meaning it may offset the taxpayer's tax but will not result in a check being dispersed to the taxpayer. While buyers of passenger vehicles under 14,000 lbs. may take their savings in the form of reduced vehicle pricing at a qualified dealer (pursuant to Internal Revenue Code 30D and 25E), IRS is currently finalizing a form for businesses and tax-exempt organizations to claim a Commercial Clean Vehicle Credit under Internal Revenue Code 45W.⁶²

Option 2 – Leases: The following guidance is provided in the IRS's "Frequently asked questions about Qualified Commercial Clean Vehicle Credit" pursuant to Leasing:⁶³

A taxpayer that leases clean vehicles may be able to claim the qualified Commercial Clean Vehicle Credit depending on the ownership status of the vehicle for federal income tax purposes. The owner of the vehicle is determined based on whether the lease is respected as a lease or recharacterized as a sale for federal income tax purposes. Longstanding tax principles are the determining factor as to whether a transaction constitutes a sale or a lease. Features of a vehicle lease agreement that would make it more likely to be recharacterized as a sale of the vehicle for tax purposes include but are not limited to:

- A lease term that covers more than 80 percent to 90 percent of the economic useful life of the vehicle.

⁶¹ <https://www.irs.gov/credits-deductions/commercial-clean-vehicle-credit>

⁶² <https://www.irs.gov/credits-deductions/clean-vehicle-credit-seller-or-dealer-requirements>

⁶³ <https://www.irs.gov/newsroom/topic-g-frequently-asked-questions-about-qualified-commercial-clean-vehicle-credit>

- A bargain purchase option at the end of the lease term (i.e., the ability to purchase the vehicle at less than its fair market value at the end of the term) or other terms/provisions in the lease that economically compel the lessee to acquire the vehicle at the end of the lease term.
- Terms that result in the lessor transferring ownership risk to the lessee (e.g., a terminal rental adjustment clause that requires the lessee to pay the difference between the actual and expected value of the vehicle at the end of the lease).
 - Note that special rules exist under § 7701(h) for qualified motor vehicle operating agreements that contains such a rental clause.

In the event the clean vehicle lease is recharacterized as a sale, the lessee would need to determine if they are eligible to claim either a clean vehicle credit or a qualified commercial vehicle credit. The lessor would not be eligible to claim either credit because they would have engaged in a resale of the vehicle.

Appendix F: Washington State Sales and Use Tax Exemption for Passenger Vehicles

The Washington State Medium- and Heavy-Duty Zero-Emission Vehicle and Infrastructure Incentive Program Design team was asked to evaluate the effectiveness of the state's current sales and use tax exemption for sales of passenger vehicles powered by a clean alternative fuel and certain plug-in hybrids.⁶⁴ This analysis is meant to act as a stand-alone document, separate from the report. The Washington State Transportation Electrification Strategy performs a similar analysis, and the conclusions for each are aligned.

Introduction

Transportation remains the single largest contributor to greenhouse gas (GHG) emissions in the United States, with light-duty vehicles responsible for over half of the sector's emissions. These emissions, largely generated by internal combustion engine (ICE) vehicles, have been linked to severe health consequences, including cancer, cardiovascular disease, and immune system damage.⁶⁵

Electric vehicles (EVs) offer a compelling solution to this challenge. However, their initial purchase price can be a barrier to wider adoption. To address this, many states, including Washington, have implemented financial incentives like tax credits, rebates, and registration fee reductions.

Washington has long been recognized for its strong commitment to environmental sustainability and its leadership in promoting clean transportation technologies. This commitment is evident in the state's ambitious climate goals, including a 45 percent reduction in GHG emissions by 2030, 70 percent by 2040, and 95 percent by 2050 (Executive Order 21-04). Washington's abundant supply of clean, low-cost electricity further strengthens the case for EV adoption. By transitioning to EVs, the state can significantly reduce transportation emissions, improve air quality, and enhance public health. Additionally, electrification benefits the economy by increasing energy efficiency, reducing reliance on fossil fuels, and spurring local innovation and business development.⁶⁶ In pursuit of these benefits, Washington's Clean Cars 2030 law, passed in 2022, requires all new passenger vehicles sold in the state to be zero-emission vehicles (ZEVs) by 2035. ZEVs include both EVs and hydrogen fuel cell electric vehicles (FCEVs).⁶⁷

Recognizing the cost barrier in adoption, Washington offers a valuable incentive to EV buyers: a sales tax exemption for qualified purchases. This document delves into the details of this incentive, evaluates its

⁶⁴ <chrome-extension://efaidnbnmnibpcjpcglclefindmkaj/https://www.dol.wa.gov/media/170/download?inline>

⁶⁵ <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions#:~:text=In%202021%2C%20greenhouse%20gas%20emissions,fuel%20combustion%20increased%20by%2019%25.>

⁶⁶ <https://www.commerce.wa.gov/growing-the-economy/energy/clean-transportation/ev-coordinating-council/transportation-electrification-strategy/>

⁶⁷ <https://ecology.wa.gov/air-climate/reducing-greenhouse-gas-emissions/zev#:~:text=Adopted%20in%20December%202022%2C%20the,heavy%2Dduty%20internal%20combustion%20engines>

impact on EV adoption in the state, and compares it to similar policies in other states. It assesses the effectiveness of Washington's sales tax exemption and explores potential opportunities to further incentivize EV adoption and accelerate the transition to a clean transportation future in the state.

Policy Background

In 2019, Washington state reinstated a pivotal initiative—the sales and use tax exemption—for vehicles running on clean alternative fuels and specific plug-in hybrids. This exemption alleviates buyers from paying sales tax on qualifying vehicles, up to a specified purchase price, significantly reducing the financial burden associated with these purchases.

The exemption applies to dealer and private sales of new, used, and leased vehicles sold on or after August 1, 2019.⁶⁸ To qualify, vehicles must either run exclusively on clean alternative fuels or be plug-in hybrids capable of traveling at least 30 miles solely on battery power. Notably, this exemption is set to remain in effect until July 1, 2025.

- New vehicle transactions must not exceed \$45,000 in purchase price or lease payments.
- Used vehicle transactions must not exceed \$30,000 in fair market value or lease payments.
- You cannot use a trade-in to lower the price of a vehicle to meet the exemption limits.

The goals of the above policy include:

- Encouraging EV Adoption: The primary aim of the sales tax exemption is to make EVs more financially accessible, thereby incentivizing increased adoption. This strategy aligns with the state's objective of mitigating GHG emissions and enhancing air quality.
- Supporting the Clean Energy Economy: Washington recognizes the burgeoning potential of the EV industry as a significant economic sector. The sales tax exemption serves as a catalyst, fostering the growth of this industry within the state.
- Job Creation: The EV industry is a source of new employment opportunities in Washington. The tax exemption aims to further stimulate job creation within this industry, contributing to the state's economic vitality.⁶⁹

While the sales tax exemption is one of the main policies that Washington state has implemented to encourage the adoption of EVs, other policies include:

1. The Washington Clean Vehicle Rebate: This program provides rebates of up to \$4,000 for the purchase of new EVs.

⁶⁸ <https://dor.wa.gov/about/news-releases/2019/new-sales-and-use-tax-exemptions-green-vehicles-begin-aug-1#:~:text=To%20qualify%20for%20the%20tax,miles%20on%20battery%20power%20alone>

⁶⁹ <https://www.commerce.wa.gov/growing-the-economy/energy/electric-vehicles/>

2. The Zero Emission Vehicle Infrastructure Investment Program: This program provides funding for the installation of EV charging stations throughout the state.
3. The Clean Fuel Standard: This program requires fuel providers to reduce the carbon intensity of their transportation fuels.

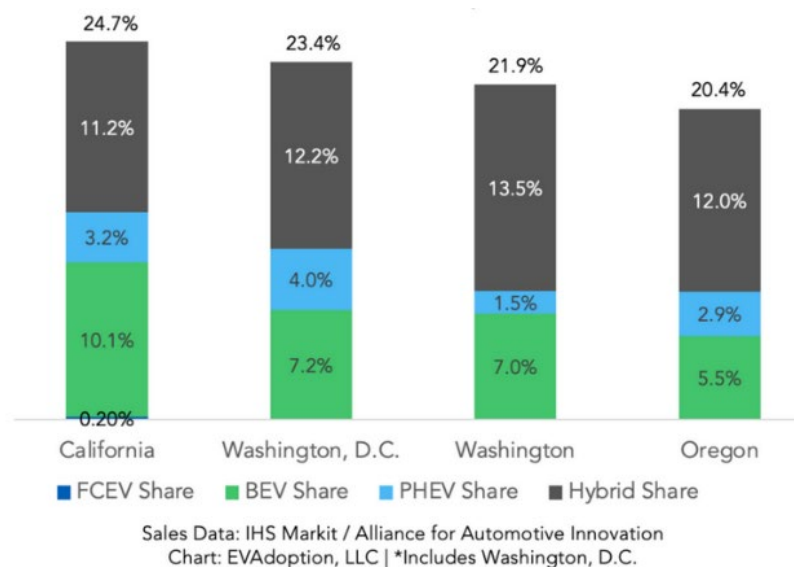
Washington state had a goal of registering 50,000 EVs by 2020. The timeline of Washington state's ZEV goals is as follows:

- 2019: Governor Jay Inslee signed an executive order requiring that 50 percent of all new state-owned and -leased passenger vehicles be electric by 2020.
- 2020: The state achieved its goal of having 50,000 ZEVs registered on the road.
- 2022: The Clean Cars 2030 law was passed, requiring 100 percent of new passenger vehicles sold in the state to be ZEVs by 2035.
- 2022: The state adopted a new rule requiring 100 percent of new ZEV sales for passenger cars, light-duty trucks, and medium-duty vehicles starting in 2035.

Electric Passenger Vehicle Sales in Washington State

Washington now ranks among the top states in the nation for EV market share, as shown in Figure F-1. In 2022, EVs accounted for nearly 10 percent of all new car sales in the state, compared to the national average of around 5 percent.⁷⁰

Figure F-1. 2021 Ranking of Top U.S. States for EV Market Share



Source: EVAdoption.⁷¹

⁷⁰ <https://evadoption.com/54-percent-of-states-2021-bev-sales-share-of-less-than-2-percent-2021-state-ev-sales-data-now-available/>
⁷¹ Ibid.

Washington state witnessed a notable evolution in its EV landscape from 2021 to 2023. In August 2021, there were 58,000 battery EVs and 22,000 plug-in hybrid EVs registered in the state. In August 2023, the EV landscape experienced a transformative shift, with the number of battery EVs escalating to 117,000, significantly exceeding the original 2020 goal of 50,000. That month, plug-in hybrid EVs more than doubled to 34,000.⁷²

Since the enactment of the sales and use tax exemption in August 2019, the state has seen an impressive surge in EV adoption.⁷³ The growth trajectory is staggering, with nearly a 300 percent increase in battery EVs and over 100 percent rise in plug-in hybrids. This extraordinary growth surpasses the expected natural progression in EV and plug-in hybrid EV purchases. While national averages indicate a steady increase in EV and plug-in hybrid EV sales over time, the reduction in costs facilitated by the sales and use tax exemption has played a pivotal role in propelling this remarkable surge observed in EVs and plug-in EVs within Washington state. This substantial growth underscores the influential role of financial incentives in accelerating the transition toward cleaner transportation options and highlights the significance of targeted policies in driving widespread adoption of EVs.

Table F-1. Comparison with Other States

States	Vehicle Sales and Use Tax Exemption	Tax Credits	Charging Infrastructure Support	High Occupancy Lane Exemption
Washington	<p>New Vehicles August 1, 2021, through July 31, 2023 Pay no sales tax on the first \$20,000 of qualified new EV purchase</p> <p>August 1, 2023, through July 31, 2025 Pay no sales tax on the first \$15,000 of qualified new EV purchase</p> <p>Used Vehicles August 1, 2019, through July 31, 2025 Pay no sales tax on the first \$16,000 of qualified new EV purchase</p>		Yes	No
California	The Clean Vehicle Rebate Project offers rebates for the purchase or lease of qualified vehicles. Qualified vehicles include light-duty EVs, FCEVs, and plug-in hybrid EVs that the California Air Resources Board has approved or certified. The rebate amounts are up to \$4,500 for FCEVs, \$2,000 for EVs, \$1,000 for plug-in hybrid EVs, and \$750 for zero-emission motorcycles.		Yes	Yes
Colorado		Yes, varying by year	Yes	No

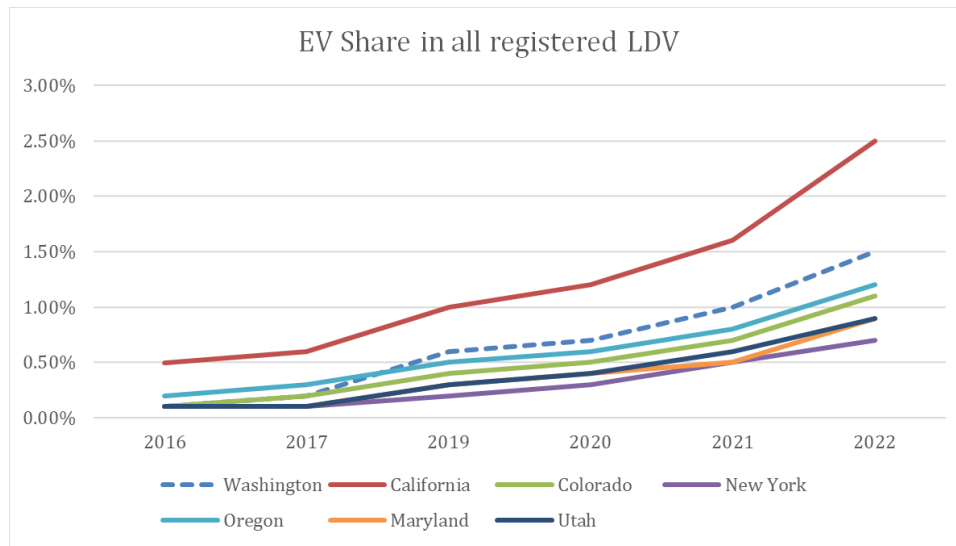
⁷² <https://data.wa.gov/Transportation/Electric-Vehicle-Population-Counts/qi6z-wzah>

⁷³ <https://wsdot.wa.gov/about/data/gray-notebook/gnbhome/environment/electricvehicles/electricvehicles.htm#info>

States	Vehicle Sales and Use Tax Exemption	Tax Credits	Charging Infrastructure Support	High Occupancy Lane Exemption
New York	The New York State Energy Research and Development Authority provides rebates of up to \$2,000 for the purchase or lease of a new eligible EV.		Yes	Yes
Oregon	The Charge Ahead Rebate Program offers low- and medium-income Oregon residents a rebate of up to \$5,000 for EVs purchased before May 1, 2023, including plug-in hybrid vehicles. Residents may combine this rebate with the Clean Vehicle Rebate to receive a maximum rebate of \$7,500. Qualifying residents are considered households with income levels that do not exceed 400% of the federal poverty line.		Yes	No
Maryland	EV and ZEV Rebates: The Massachusetts Offers Rebates for Electric Vehicles program provides residents with rebates of up to \$2,500 for the purchase or lease of eligible battery EVs and FCEVs and up to \$1,500 for the purchase or lease of eligible plug-in EVs purchase prices must be below \$50,000. Only vehicles purchased or leased on or after Jan. 1, 2020, are eligible.		Yes	No
Utah			Yes	Yes

Source: CALSTART research.

Figure F-2. Electric Vehicle Share in All Registered Light-Duty Vehicles



Data source: Alternative Fuels Data Center TransAtlas.⁷⁴

⁷⁴ <https://afdc.energy.gov/transatlas/#/>

Rationalization of Incentives

The environmental benefits for the state of Washington can be calculated by the methodology described in the Journal of Environmental Economics and Management report “Providing the Spark: Impact of Financial Incentives of Battery Electric Vehicle Adoption”⁷⁵ and the report “Are There Environmental Benefits from Driving Electric Vehicles? The Importance of Local Factors.”⁷⁶

Table F-2. Estimated Program Impacts by State

Table 8
Estimated program impacts by state.

State	ΔQ (No. BEVs)	Program cost (\$000)	Env. benefits (\$000)	ΔW (\$000)
CA	10,032	160,029	19,693	-56,858
IL	670	11,916	-1145	-7252
TX	301	5297	76	-2420
PA	224	4388	-459	-2519
HI*	133	2583	-	-
TN	116	1963	-199	-1130
MA	103	1851	-143	-1013
National	11,447	185,444	17,822	-71,192
Excl. CA	1415	25,415	-1871	-14,333

Notes: Holland et al. (Holland et al., 2016) do not calculate environmental benefits from vehicle use for the state of Hawaii. Environmental benefits assume a 10 year vehicle lifetime, 11,000 vehicle miles traveled per year. Welfare change assumes a marginal excess burden of 0.4.

Source: Are There Environmental Benefits from Driving Electric Vehicles? The Importance of Local Factors.⁷⁷

Barriers to EV Adoption in Washington State

While Washington state has made strides in promoting EV adoption through incentives and initiatives, several barriers persist, hindering the widespread transition to cleaner transportation alternatives.

- Supply Limitations and Regional Distribution:** The demand for EVs has faced challenges due to supply constraints, with many original equipment manufacturers channeling a significant portion of their EV production to high-demand markets like California. This dynamic has occasionally resulted in shortages of EVs available for purchase in Washington, affecting the availability and accessibility of these vehicles within the state.
- Issues with Public Charging Infrastructure:** The reliance on home charging for most EV owners underscores the criticality of a reliable public charging network. However, reports indicate that the public charging system in Washington faces significant challenges. Issues such as unreliability, inconvenience, and confusion plague EV drivers using public charging stations. Limited availability,

⁷⁵ <https://sci-hub.se/https://www.sciencedirect.com/science/article/abs/pii/S0095069618303115>

⁷⁶ <https://pubs.aeaweb.org/doi/pdfplus/10.1257/aer.20150897>

⁷⁷ <https://pubs.aeaweb.org/doi/pdfplus/10.1257/aer.20150897>

frequent out-of-service chargers, and a decentralized system managed by various private companies, utilities, and government entities contribute to these challenges.

- **Inadequate Public Charging Network and Reliability Concerns:** The disparity in the number of charging stations compared to other countries exacerbates the challenge. The United States lags behind China and Europe significantly in charging infrastructure, with only approximately 140,000 charging points nationwide. Comprehensive statistics are not available for the developing industry, but two reports suggest the uptime of existing public EV chargers falls short of the mark set by the National Electric Vehicle Infrastructure (NEVI) Formula Program's requirements. A field study in the greater San Francisco Bay Area concluded only 72.5 percent of chargers were functional despite claims of 95–98 percent uptime by the charging providers.⁷⁸ Similarly, JD Power's annual user-experience study of public EV charging noted that "electric vehicle owners are frustrated by charging station reliability."⁷⁹ The study reported that one out of every five respondents were unable to charge their EVs—mostly because of malfunctioning or out-of-service chargers.
- **Regulatory Hurdles and Fees:** Washington state imposes additional fees on EV owners, including a \$150 annual registration fee and a \$75 transportation electrification fee, in addition to standard operational costs. Discussions about restructuring these fees to align with usage, such as a per-kilowatt-hour (kWh) structure, have been deliberated but are yet to be implemented, potentially posing financial hurdles for prospective EV owners.
- **Addressing Challenges for Streamlined Adoption:** Addressing these barriers necessitates concerted efforts to streamline the public charging network, enhance reliability, and reevaluate regulatory frameworks to encourage widespread EV adoption. The transition to EVs requires a more coherent and accessible charging infrastructure, alongside regulatory adjustments that promote affordability and convenience for EV drivers.

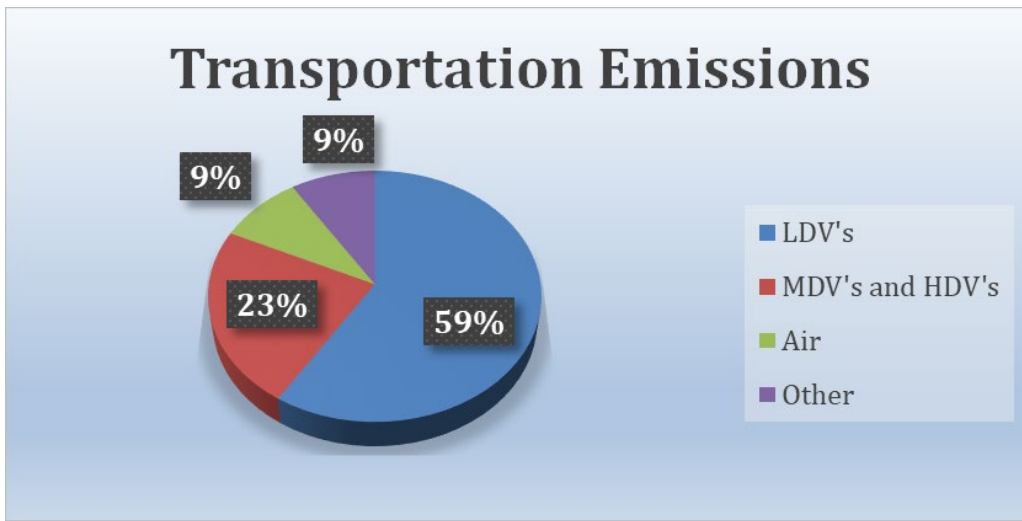
Inclusion of Heavy-Duty Vehicles in Electric Transition

Only focusing on light-duty vehicles cannot achieve the target of net zero. Medium- and heavy-duty vehicles (MHDVs) are about 10 percent of the vehicles on the road but disproportionately contribute to emissions: about 29 percent of transportation GHG emissions, 45 percent of on-road nitrogen oxide emissions, and 57 percent of direct PM_{2.5} (particulate matter \leq 2.5 microns in diameter) emissions.

⁷⁸ <https://www.publicpower.org/periodical/article/study-finds-electric-vehicle-owners-are-frustrated-charging-station-reliability>

⁷⁹ Ibid.

Figure F-3. Transportation Emissions



Source: EPA Fast Facts on Transportation Greenhouse Gas Emissions.⁸⁰

In addition, at the state level in Washington, heavy-duty diesel emissions are driving an increasing proportion of exhaust emissions—up from 13 percent in 2005 to 16 percent in 2019.⁸¹ As per the Department of Ecology, about 680,000 MHDVs are on the road in Washington today—one in five of the approximately 3.2 million total motor vehicles in service.

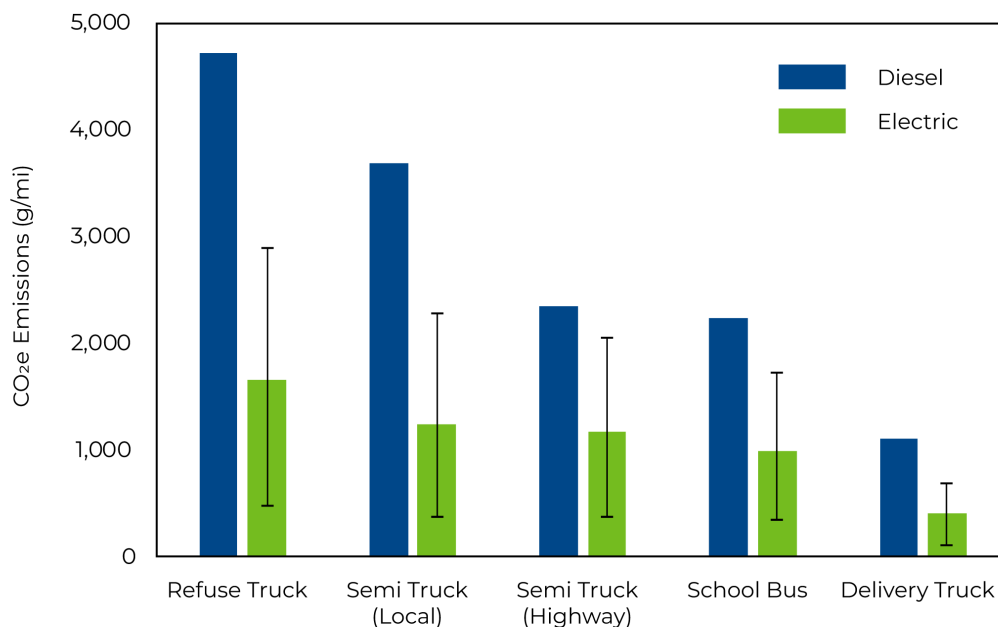
Electrification of heavy-duty vehicles serves as an important pathway to deal with the challenge of pollution as well as GHG emissions. Considering all the operating characteristics of the vehicle or electricity grid, battery-electric heavy-duty vehicles have lower global warming emissions than diesel vehicles. This advantage comes in addition to the public health benefits resulting from zero tailpipe emissions of harmful air pollutants such as particulate matter and nitrogen oxides.⁸²

⁸⁰ <https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions>

⁸¹ <https://ecology.wa.gov/blog/april-2023/electric-trucks-to-join-state-s-clean-transportation#:~:text=About%20680%2C000%20medium%2D%20and%20heavy,total%20motor%20vehicles%20in%20service>

⁸² <https://www.ucusa.org/sites/default/files/2019-12/ReadyforWorkFullReport.pdf>

Figure F-4. Life Cycle Global Warming Emissions for Different Heavy-Duty Electric Vehicles on the Average U.S. Grid (generation-weighted) in 2016



Source: Union of Concerned Scientists, Ready for Work.⁸³ Design modifications made by CALSTART.

The emissions reductions for a delivery truck operating in all grid regions across the United States ranges from 36 percent to 88 percent lower life-cycle global warming emissions than a diesel delivery truck. For Washington, this number is up to 77 percent.

Financially, battery-electric heavy-duty vehicles are a suitable alternative to diesel heavy-duty vehicles. The lower operating costs of battery-electric trucks translate to lower costs for the movement of goods, which will benefit the economy. From a societal cost perspective, over the life of a truck, these vehicles, compared to ICE trucks, already offer a lower total cost of ownership and thus a very low or negative cost of reductions to carbon dioxide (CO₂) emissions.⁸⁴

The lower operating costs of battery-electric trucks will ultimately mean a lower cost for the movement of goods, which will benefit the economy. From a societal cost perspective, over the life of a truck, these vehicles, compared to ICE trucks, already offer a lower total cost of ownership and thus a very low or negative cost of reductions to CO₂ emissions.⁸⁵

⁸³ <https://www.ucsusa.org/sites/default/files/2019-12/ReadyforWorkFullReport.pdf>

⁸⁴ <https://doi.org/10.1007/s40518-021-00187-3>

⁸⁵ Ibid.

Table F-3. Cost Comparisons Between Electric and Diesel Vehicles and Estimated Payback Times for Battery Electric Buses and Trucks of Various Classes and Applications in 2025 and 2030

Vehicle Type	Mileage (miles/year)	Cost Difference 2025			Cost Difference 2030		
		Purchase (\$)	Operating (\$/mile)	Payback Years	Purchase (\$)	Operating (\$/mile)	Payback Years
Class 3 Delivery Van	20,000	\$32,000	\$0.32	5.1	\$5,000	\$0.32	0.8
Class 4 Step Van	25,500	\$32,000	\$0.32	3.9	-\$2,000	\$0.33	0.0
Class 6 Box Truck	25,500	\$57,000	\$0.38	5.9	\$14,000	\$0.40	1.4
HD Pickup 150 mi	20,000	\$23,000	\$0.28	4.1	\$6,000	\$0.28	1.1
HD Pickup 250 mi	20,000	\$40,000	\$0.28	7.1	\$14,000	\$0.26	2.7
Mid-haul 300 mi	90,000	\$211,000	\$0.30	7.9	\$74,000	\$0.27	3.1
Long-haul 500 mi	120,000	\$372,000	\$0.30	10.5	\$148,000	\$0.27	4.7
Transit Bus	40,000	\$84,000	\$0.80	2.6	\$12,000	\$0.80	0.4

Source: Current Sustainable/Renewable Energy Reports.⁸⁶ Design modifications made by CALSTART.

By 2030, battery EV and FCEV purchase costs drop considerably and become competitive with diesel for several truck types. Recognizing these benefits of electrification of truck and bus fleets, Washington signed on to the Multi-State Medium- and Heavy-Duty Zero Emission Vehicle Action Plan, committing to strive for at least 30 percent of new zero-emission MHDV sales by 2030, and 100 percent of sales by 2050.⁸⁷

Washington state has also embraced the California Advanced Clean Trucks standards outlined in Title 13 of the California Code of Regulations 13. This mandates manufacturers to comply with California's ZEV production and sales guidelines. Commencing from the model year 2025, manufacturers must include zero-emission trucks as a growing proportion of their yearly sales for vehicles spanning from Class 2b–8 in Washington. ZEVs encompass both battery EVs and FCEVs.

⁸⁶ <https://doi.org/10.1007/s40518-021-00187-3>

⁸⁷ <https://www.truckinginfo.com/10177882/17-states-d-c-and-quebec-release-action-plan-to-accelerate-electric-truck-and-bu>

Table F-4. Policy Support and Targets in Other States

State	Policy and Targets
California	<ul style="list-style-type: none"> ▪ MHDVs make up only 6 percent of the vehicles registered with the California DMV; they account for over 20 percent of the GHG emissions and almost 50 percent of emissions from oxides of nitrogen. ▪ California is working toward achieving the Governor’s Executive Order N-79-20, which aims to reach a 100 percent zero-emission drayage truck and off-road equipment population by 2035 and 100 percent zero-emission MHDV population by 2045. ▪ Additional emissions reductions from all freight sources, including trucks, are also essential to meet air quality standards that will be put forth by the 2022 State Implementation Plan Strategy.
Colorado	<ul style="list-style-type: none"> ▪ Advanced Clean Trucks (passed April 2023) – This is a similar regulation to the Colorado Clean Cars rule but impacts MHDVs like delivery vans and other commercial vehicles. ▪ Colorado state electric vehicle tax credits – Colorado has adopted some of the most generous tax credits for EVs designed to complement federal credits. Currently the state offers a \$5,000 tax credit for EV models under \$80,000 MSRP and an additional \$2,500 starting in January 2024 for models under \$35,000 MSRP. ▪ Colorado Electric School Bus Grant Program (bill passed in June 2022; program opened March 2023) – The Colorado legislature funded \$65 million (the second largest public investment of its kind at the time) to provide funding to districts to offset the upfront costs associated with buying and charging new electric school buses. ▪ Clean Fleets Vehicle Technology and Grant Programs (opened March 2023, application process will reopen in March 2024) – This program provides incentives for businesses and governments to fund low- or zero-emission vehicles for fleets.
New York	<ul style="list-style-type: none"> ▪ New York State is following the 2019 passage of the Climate Leadership and Community Protection Act; the state is mobilizing to drive EV uptake by subsidizing vehicles and charging infrastructure. The legislature passed a complete phase-out of light-duty ICEs by 2035 and MHDVs by 2045. ▪ NYC DOT is pursuing additional strategies to incentivize the switch to clean trucks and smaller, sustainable delivery vehicles. These include priority loading zone access for electric or low-emission trucks, and a pilot program for electric cargo cycles. ▪ The MHDV make-ready pilot budget designed for commercial customers more than doubled to \$58 million, paired with increased flexibility for applicants regarding eligible costs and vehicles, targeting emissions reductions in disadvantaged communities.
Oregon	<ul style="list-style-type: none"> ▪ State will work toward the goal that 100 percent of all new MHDVs sales will be zero-emission by 2050. An interim target strives to achieve 30 percent of all new zero-emission MHDV sales by 2030.
Maryland	<ul style="list-style-type: none"> ▪ Beginning with model year 2027, manufacturers will be required to sell zero-emission trucks as an increasing percentage of their annual sales for Classes 2b-8 vehicles in Maryland. ▪ Beginning in fiscal year 2024, Maryland Energy Administration is authorized to administer a zero-emission MHDVs grant program. Grants must cover up to 20 percent of the cost to purchase the vehicles, along with charging stations, or non-road equipment. Eligible vehicles must have a gross vehicle weight rating above 8,500 pounds and be powered exclusively by electricity or hydrogen.
Utah	<ul style="list-style-type: none"> ▪ The Advanced Clean Trucks rule requires manufactures of Classes 2b-8 vehicles to meet certain in-state new sales targets. For example, if the rule went into effect in 2025 in Utah, 7-11 percent of all MHD vehicles sales must be electric. ▪ Several programs established by the Infrastructure Investment and Jobs Act of 2021 and Inflation Reduction Act could provide funding for medium- and heavy-duty incentives.

Source: CALSTART research.

Growth in the passenger EV market has influenced efforts to electrify MHDVs. Transit bus electrification is rapidly accelerating both across the United States and in Washington, where King County Metro alone has committed to purchasing 120 electric transit buses worth \$130 million.⁸⁸

⁸⁸ https://afdc.energy.gov/files/u/publication/Electrification_draftfinalreport.pdf?664d99e453