EV COUNCIL

Washington Transportation Electrification Strategy

Developed by the Interagency Electric Vehicle Coordinating Council

FULL REPORT | FEBRUARY 2024

Letter of Introduction

Dear Families and communities of Washington state:

Washington's Interagency Electric Vehicle Coordinating Council (EV Council) is pleased to deliver to you the **Transportation Electrification Strategy** (TES) for Washington adopted at a public meeting on Nov. 30, 2023.

The TES, its appendices and the attachments to this letter meet the requirements in **RCW 43.392.040** to:

- Develop a statewide transportation electrification strategy to ensure market and infrastructure readiness for all new vehicle sales.
- Develop a robust public and private outreach plan that includes engaging with community organizers and the environmental justice council to develop community-driven programs to address zero-emissions transportation needs and priorities in overburdened communities (see attached Engagement Plan and Education Plan).
- Provide an annual report to the appropriate committees of the Legislature summarizing electric vehicle implementation progress, gaps and resource needs (see attached Annual Report).

Further, per **RCW 43.392.020,** the TES adopted by the EV Council provides a scoping plan for achieving the 2030 target that all publicly owned and privately owned passenger and light-duty vehicles of model year 2030 or later that are sold, purchased or registered in Washington be electric vehicles.

Developing the statewide TES and implementing recommendations to equitably accelerate the transition to electric vehicles required early and meaningful input from a wide variety of stakeholders, especially in overburdened communities. The EV Council, co-chaired by the Departments of Commerce and Transportation, sought input over the past year from the Washington Environmental Justice Council and many other organizations listed in the TES. The EV Council also consulted with its 25-member Advisory Committee — required in **RCW 43.392.040(1)(e)** — throughout the TES development process.

The EV Council developed the TES from the initial work in the **2021 State Energy Strategy,** working closely with the many agencies involved in aspects of electrification of transportation, and used the Joint Transportation Committee's June 2023 Report **"Encouraging High-Consumption Fuel Users to Use Electric Vehicles"** to inform options considered in the TES. The EV Council ensured that the TES aligns with and references several other related reports developed by WSDOT and Commerce, including:

- **Washington State Transportation Carbon Reduction Strategy** (2023).
- **Green Electrolytic Hydrogen and Renewable Fuels: Recommendations for Deployment in Washington** (2024).
- **Vehicle Miles Traveled (VMT) Targets – Final Report** (2023).

The TES recommends adaptive management, encouraging the incorporation of new information during implementation. Specific reports still in development on Nov. 30, 2023, that will be incorporated include the

Joint Transportation Committee's expected report on medium- and heavy-duty vehicle incentive strategies and the EV battery management report that the Department of Ecology will prepare by June of 2024.

The EV Council greatly appreciates the opportunity to assess and advance Washington's progress on transportation electrification. The TES provides a clear path forward, aligned with our climate and environmental justice laws, to make our electric vehicle transition as fast and as equitable as possible. We look forward to working with policymakers across state government to implement this comprehensive strategy.

Respectfully,

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Managing Director of Clean Transportation
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Acknowledgments

EV Council agency representatives thank Governor Jay Inslee and the Washington State Legislature for their vision and leadership.

The development of the Transportation Electrification Strategy would not have been possible without the contributions of countless individuals within the executive branch.

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Additional thanks to the members of the 2023 EV Council Advisory Committee, who contributed their time and expertise to informing and improving the Transportation Electrification Strategy; to the hundreds of stakeholders who participated in meetings and task forces and who commented on the report; and to the consulting team for their support of this process.

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Table of Contents

How to Read the Transportation Electrification Strategy

- **Glossary:** This report relies on a number of acronyms and technical terms to communicate nuance in analytical findings and policy recommendations. Please refer to the glossary in Appendix A on pages **151–157** for support.

- **With 10 minutes or less to read the Transportation Electrification Strategy:** Review the key takeaways on pages **11–13**.

- **With 30 minutes or less to read the Transportation Electrification Strategy:** Review the TES summary and action plan on pages **9–37**.

- **Legislative and agency actions:** The Transportation Electrification Strategy implementation plan on pages **138–148** provides a sequenced roadmap for maximizing electric vehicle adoption in an equitable way. This is a shorter read for policymakers and the public who have limited time to review recommended priority actions.

- **Policy recommendations:** A full list of policy recommendations can be found on pages **96-137** for those who have more time — or who are looking for more context on implementation plan actions — to review recommended strategies.

- **Equity in transportation electrification:** People interested in information about how the state intends to address transportation inequities should read Chapter 2. The implementation plan on pages **138–148** also marks policy recommendations specifically focused on ensuring an equitable transition.

- **Modeling and data analysis:** Those wanting an overview of modeling results should read pages **66–88**. This will provide helpful context for both policy recommendations and the implementation plan, especially for readers interested in actions essential for emissions reduction. A more in-depth explanation of the modeling inputs and outputs can be found in the technical appendix on pages **181–212**.

- **Development process:** Readers interested in context on how the Transportation Electrification Strategy was developed should read pages **38–41**.

Overview

A Chevrolet Bolt electric vehicle charges outside the Washington Department of Ecology's Eastern Region Office.

Washington has adopted impressive and scientifically necessary requirements for reducing greenhouse gases (GHGs) over the coming years, including limiting emissions to 45% below 1990 levels by 2030 and achieving net-zero emissions by 2050.[1] Representing 39% of Washington's economy-wide emissions, the transportation sector must play a critical role in the state's decarbonization efforts.[2] Electrifying on-road transportation, which represents 24% of the state's emissions, and for which electric vehicle (EV) technology is most advanced, is a critical opportunity for the state to reduce GHG emissions.[3]

As a national leader on climate action, Washington is already taking actionable steps toward achieving these goals. For example, the Washington State Legislature (Legislature) adopted, and the Department of Ecology is implementing, California's motor vehicle emissions standards rather than the federal government's standards.

- For new light-duty (i.e., passenger) vehicles (LDVs), the **Advanced Clean Cars I and II (ACC I and ACC II)** regulations, which require a progressively stringent zero-emissions vehicle (ZEV) sales share, culminate in a 100% sales requirement by 2035.

- For medium- and heavy-duty vehicles (MHDVs), the **Advanced Clean Trucks (ACT)** regulation requires increasing new sales shares for larger vehicles, with 40%–75% ZEV sales required by 2035 depending on weight class. These regulations are the driving force behind the recent acceleration in EV adoption across the country and in Washington.

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1 State of Washington Department of Ecology, **"The Climate Commitment Act: Washington's Path to Carbon Neutrality by 2050,"** (n.d.).

2 State of Washington Department of Ecology, **"Washington's greenhouse gas inventory,"** (n.d.).

3 State of Washington Department of Ecology, **"Washington's greenhouse gas inventory,"** (n.d.).

The Legislature passed **Move Ahead Washington (Chapter 182, Laws of 2022)**[4] in March 2022. This monumental 16-year transportation package is known for its historic investments in transit, active transportation, ferries, alternative fuels and rail, all intended to support mode shift, electrification of these modes and reductions in vehicle miles traveled (VMT) along with their associated emissions. It also established the Interagency Electric Vehicle Coordinating Council (EV Council) and a nonbinding statewide target of reaching 100% new electric passenger vehicle sales by 2030 (2030 EV target) — five years earlier than the 100% new ZEV sales requirement under ACC II.

The EV Council was tasked with aligning existing transportation electrification efforts across 10 state agencies and offices and developing an equitable and inclusive statewide Transportation Electrification Strategy (TES) pegged to the nonbinding 2030 EV target and aligned with the state's 2030 emissions limit. An annual report summarizing the transportation electrification–related activities and accomplishments of the 10 agencies that make up the EV Council from July 1, 2022, through June 30, 2023, is available on the **TES website**.

The TES addresses three critical questions:

- First, how can Washington meet the 2030 EV target established in Move Ahead Washington?
- Second, how can Washington ensure market and infrastructure readiness for all new LDV sales being electric?
- And third, how can Washington decarbonize the majority of the transportation system, covering all on-road vehicles (cars, trucks and buses) and non-road vehicles (planes, boats, trains and off-road mobile equipment), while directly and equitably benefiting vulnerable populations and overburdened communities?

4 **Chapter 182, Laws of 2022**.

Key Takeaways

Washington Department of Commerce staff and community members open an EV charging station in White Pass in 2023.

Emissions Reductions

The **2021 State Energy Strategy (SES)** is aligned with the state's emissions limits and shows transportation producing only 20 million metric tons (MMT) carbon dioxide equivalent (CO_2e) in 2030. Although Washington's on-road vehicles accounted for roughly 58% of state transportation sector GHG emissions in 2019, they are likely to contribute a smaller percentage of GHG emissions over time within the transportation sector — roughly half by 2030 — because EV technology is more advanced in on-road transportation modes than in non-road modes. Therefore, to meet the state's 2030 limit, GHG emissions from on-road vehicles likely need to decrease to fewer than 10 MMT CO_2e annually. The TES is the state's implementation roadmap for how to get there in 2030 by maximizing transportation electrification in a way that supports other clean transportation strategies, setting Washington up for the most equitable and cost-effective zero-emissions future possible.

1. Washington's recent transportation electrification policies will cut the state's on-road emissions by more than 70% in 11 years, from 23.5 MMT in 2019 to 14.1 MMT in 2030, if successfully implemented. State policymakers in both the executive and legislative branches should now focus efforts on supporting implementation of existing policies (e.g., ACC II, ACT) by (1) lowering up-front EV costs, (2) making charging easy and accessible and (3) increasing consumer and fleet manager education and awareness.

2. The Advanced Clean Fleets (ACF) regulation, which has not been adopted in Washington, is the most powerful tool available for accelerating medium- and heavy-duty (MHD) truck electrification, and achieving its required adoption rates would further reduce on-road 2030 emissions to 13.9 MMT. Analysis shows ACF adoption rates would increase the number of zero-emissions MHD trucks on Washington's roads in 2035 by approximately 14,000 vehicles (36%), creating significant demand for the vehicle supply produced under ACT and covering approximately 40% of total MHD trucks in Washington today.

3. Reaching the 2030 EV target would further reduce 2030 on-road emissions to 13.6 MMT, but will be incredibly challenging and should not be counted on to get under the 2030 emissions limit. The state's recent adoption of ACC II is a critical component of transitioning to an EV future. Without ACC II, sales of new electric passenger vehicles in Washington might account for only 59% of total new passenger vehicle sales annually by 2030, compared with the 68% the state now expects to see with ACC II. Both broad-based and additional targeted incentives are already necessary to achieve ACC II. Therefore, to further reach 100% new electric LDV sales, the state would need to bring down EV costs substantially for all residents, likely at the expense of more effective short-term emissions reduction strategies.

4. In addition to being essential — though insufficient — for short-term emissions reduction, electrification remains the most effective long-term strategy for transportation decarbonization. The climate benefits of electrification will accelerate in significance through 2050 as more gasoline and diesel vehicles are retired and replaced by EVs powered by non-emitting electricity (due to the **Clean Energy Transformation Act [CETA]**).

5. The state must also urgently pursue non-electrification policies to close the remaining gap in expected 2030 on-road emissions. Such actions include (1) a strategic VMT-reduction policy (especially more compact land use), (2) energy efficiency standards, (3) stronger clean fuels development and deployment and (4) early retirement of the dirtiest MHDVs. Significant progress on each of these strategies will likely be necessary to get under 10 MMT in on-road emissions by 2030.

Equity and Environmental Justice

Pursuant to the Move Ahead Washington legislation, the TES must ensure that "activities associated with advancing transportation electrification benefit vulnerable populations and overburdened communities."[5] Public engagement work and consumer research during TES development confirmed that without state action, significant inequities in the existing transportation system could continue, and in some cases worsen, during electrification of the transportation system.

1. Survey research conducted as part of the TES shows clear adoption disparities by income and home ownership for passenger EVs. The state must continue to measure adoption by socioeconomic factors to ensure equitable access and awareness. The EV Council proposes the development of a Transportation Equity Baseline across a variety of metrics, including equitable investments consistent with the **Healthy Environment for All Act of 2021 (HEAL Act)**. Refer to the **Washington Transportation Electrification Strategy EV Education Plan (Education Plan)** for more information on the survey findings and Chapter 2 of the TES for details on equity definitions and metrics.

2. Targeted incentives are more effective than broad-based incentives, because they provide EV adoption opportunities to vulnerable populations and consumers, organizations and businesses operating in overburdened communities. Although broad-based LDV incentives will be important in 2024–27 for growing new EV sales before ACC II requirements ramp up, EV supply in Washington will soon be constrained by limitations on "pooling" compliance credits among states. In other words, automakers will need to prioritize sales in other ACC II states that trail Washington's progress. This means incentives starting in the late 2020s will have more of an effect on *who* has access to new EVs than on growing the number of new EVs sold and increasing overall adoption.

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5 Chapter 182, Laws of 2022.

Since new battery electric trucks are increasingly economical on a total cost of ownership (TCO) basis due to current generous federal incentives, vehicle availability and charging are the more significant adoption obstacles. To address these obstacles, incentives should be directed toward agencies, organizations and businesses operating MHDVs in overburdened communities or toward those without the financial capital to take on higher up-front cost to access the post-sale fuel savings.

3. The new car market was inaccessible for the vast majority of drivers before EV adoption started to accelerate. The state cannot change that reality through consumer subsidies alone, and must pursue additional policies and programs to reduce prices through greater availability in the used vehicle market. Between January 2022 and June 2023, about 80% of light- and medium-duty vehicle sales were for used cars and trucks. That dynamic is flipped for battery electric vehicles (BEVs) due to the small number of used EVs available. Without structural reforms to regulations outside Washington's authority (e.g., ACC II and federal motor vehicle emissions standards), new cars will remain out of reach for most, regardless of fuel type. The state must prioritize strategies to grow the number of used BEVs on the market, in turn driving down prices, or the transition to EVs will remain inequitable.

4. Maximizing access to charging for residents of multifamily and low-income single-family homes — especially renters — will be essential to eliminating disparities already developing in the EV transition. Charging at home is by far the most affordable and convenient way to power an EV, but is predominantly available only to single-family homeowners. The state must grow its charging investments and carefully target programs toward maximizing residential charging for those who face financial or legal barriers. This will also reduce overall system costs, which are disproportionally borne by lower-income taxpayers and ratepayers, because residential charging installation is much more affordable than public chargers.

An air quality monitoring station

5. Strong transportation electrification actions, if successfully implemented, will cut current-day air pollution caused by on-road vehicles by more than half in 2035, leading to health benefits in overburdened communities. The decline in air pollution from MHDVs, which disproportionally operate in overburdened communities near airports, marine ports and highways, is especially important. The state should increase its air quality monitoring along transportation corridors and hubs, especially in neighborhoods most at risk of cumulative adverse effects, and direct additional electrification resources to areas near ports and highways until air quality and health benefits are equitable.

In light of these findings, the EV Council developed 86 policy recommendations to enable the regulatory and market environment needed for the strongest possible EV adoption through 2035. A companion implementation roadmap lays out those suggested policies by priority year of action, as well as delineating between those for legislative consideration and those for administrative action. The TES also highlights additional strategies beyond the transportation electrification recommendations to achieve the 2030 emissions limit. The state must continue its clean transportation leadership and act urgently on all fronts to build a cleaner, safer and more affordable transportation system for all Washington residents and businesses.

TES Implementation — 2024 Priorities

Washington has made tremendous strides in recent years to advance its climate leadership position. It passed a landmark 100% clean electricity law, the nation's first clean buildings standard and the nation's second cap-and-invest program. It also joined California, Oregon and British Columbia in the West Coast clean fuel standard market and adopted California's motor vehicle emissions standards. All of these policies were built on a foundation of environmental justice through the HEAL Act and with strong labor standards. And yet, as the TES modeling has made clear, Washington must do even more.
Given the high stakes and short time frame for closing the gap between current policy and the strongest feasible electrification pathway, Washington must be highly focused on and organized in establishing priorities. With this in mind, the following 2024 prioritization plan lays out a clear roadmap for 2024 legislative session recommendations and how agencies can work toward policy and program development for the longer 2025 legislative session. Each policy includes a clearly identified agency lead and notes expected transportation equity benefits and expected improvement in air quality in overburdened communities.

The 2024 priorities are presented in Tables 1 and 2.

Table 1 lists new actions and emissions reductions, broken out by electrification and non-electrification strategies, needed to close the 2030 on-road emissions gap left by current electrification and travel efficiency policies. The table also shows estimated incremental GHG emissions reduction by strategy and expected equity outcomes.

Achieving the additional 2030 emissions reductions in Table 1 is dependent on existing policies achieving their full expected effect. The state should not take this for granted without further action. The EV Council is prioritizing the recommendations in Table 1 for 2024 because urgent progress is essential to keep Washington on pace to achieve existing policies.

Table 2 lists new and continued actions needed to successfully and equitably implement existing transportation electrification policies, namely ACC I, ACC II and ACT.

It is challenging to isolate the effect on emissions of individual enabling actions that support existing regulatory policies. Each of the priorities in Table 2 will be essential to achieving the modeled 9.4 MMT CO_2e reduction in 2030 on-road emissions from 2019 levels.

Readers can review **Appendix D** for an explanation of the emissions and equity determinations in Table 1 and Table 2.

Table 1 2024 Priorities: New Actions and Emissions Reductions Needed to Close 2030 Emissions Gap

Recommendations*	Legislative actions	Agency actions	Lead Agency	GHG**	Equity***
Transportation Electrification					
Requirements and incentives for zero-emissions MHDVs: 4.1 Pursue ACF adoption rates. 4.4 Fund and implement an MHDV incentive and infrastructure program.	Fund staffing needed to pursue ACF adoptions rates through stakeholder engagement and possible rulemaking. Release appropriated funding to the Washington State Department of Transportation (WSDOT) to implement Joint Transportation Committee–recommended program design.	Work with stakeholders to consider rulemaking and other policy development needed to achieve ACF adoption rates. Implement MHDV incentives and programs.	Ecology and WSDOT	230,000	Significant air quality improvement Lower costs Increased EV access
Grow broad consumer demand for passenger BEVs: 3.8 Increase consumer awareness of incentives. 3.7 Extend and expand the state sales and use tax exemptions for BEVs.	Fund public information campaign to increase awareness of incentives and charging options. Pass legislation to extend and expand sales tax exemption for all BEVs.	Implement public information campaign.	Commerce	20,000	Air quality improvement Lower costs Increased EV access
4.5 Accelerate and fund school bus electrification to meet needed adoption rates.	Pass legislation and budget provisions developed with stakeholders.	Develop practical implementation timelines and needed funding.	Ecology (with support from the office of Superintendent of Public Instruction [OSPI])	10,000	Air quality improvement Lower costs Increased EV access

* Numbered items in the recommendations column correspond to the policy items detailed in Chapter 5, How Washington Can Get There, in Part I and Part II.

** The GHG column reflects estimated incremental GHG emissions reduction in 2030 (metric tons CO_2e).

*** The equity column reflects equity benefits, including air quality improvements in overburdened communities, and lower costs, increased EV access and more non-driving options for vulnerable populations.

Table 1 2024 Priorities: New Actions and Emissions Reductions Needed to Close 2030 Emissions Gap, continued

Recommendations*	Legislative actions	Agency actions	Lead Agency	GHG**	Equity***
Clean Fuels, Vehicle Efficiency and Voluntary Early Retirement					
Reduce carbon intensity of gasoline and diesel with clean drop-in fuels: C.1.1 Add flexibility to the Clean Fuel Standard's carbon intensity schedule. C.1.2 Increase stringency of Clean Fuel Standard program.	None anticipated for 2024	Assess needed program changes to increase emissions reductions and consider agency-requested legislation for 2025.	Ecology	Expected to be substantial, but more analysis is needed.	Air quality improvement
Diesel vehicle efficiency standards C.3 Enforce diesel vehicle compliance. C.4 Explore an anti-idling law for ICE MHDVs.	None anticipated for 2024	Develop diesel vehicle enforcement and anti-idling policy and consider introducing agency-requested legislation.	Ecology	≈300,000–700,000****	Significant air quality improvement Lower costs
C.2 Improve vehicle efficiency with lower-resistance replacement tires.	Pass legislation to provide Commerce rulemaking authority.	Begin rulemaking.	Commerce	≈600,000–700,000****	Air quality improvement Lower costs
C.5 Focus on high-consumption gasoline and diesel users.	None anticipated for 2024	Pursue state and federal funding opportunities.	Ecology	≈110,000–130,000****	Significant air quality improvement

* Numbered items in the recommendations column correspond to the policy items detailed in Chapter 5, How Washington Can Get There, in Part I and Part II.

** The GHG column reflects estimated incremental GHG emissions reduction in 2030 (metric tons CO_2e).

*** The equity column reflects equity benefits, including air quality improvements in overburdened communities, and lower costs, increased EV access and more non-driving options for vulnerable populations.

**** The emissions level or reduction is a preliminary estimate, not a model output, and requires additional analysis.

Table 2 2024 Priorities: Actions Needed to Successfully and Equitably Implement Current EV Policies

Recommendations*	Legislative actions	Agency actions	Lead Agency	Equity**
Continue funding WSDOT zero-emission vehicle and infrastructure programs: 2.24 Continue funding WSDOT's ZEVIP grant program to provide support for charging along state routes. 3.6 Continue funding WSDOT's Zero-emissions Access Program (ZAP). 4.8 Continue funding the WSDOT Green Transportation Capital grant program. 5.1 Support and expand the e-bike rebate and lending library programs. D.3 Continue to invest in early-stage development of electric and hydrogen planes. E.1.1 Vessel decarbonization (ferry vessel and terminal electrification). E.1 Port decarbonization (electrification).	None in 2024	Assess programs and develop funding request for 2025-27 biennium.	WSDOT	Significant air quality improvement Lower costs Increased EV access More non-driving options
Expand and accelerate funding Commerce community charging and EV incentive programs for low-to-moderate income (LMI) consumers: 2.9 Expand community charging programs through formula funding. 3.4 Expedite funding for Commerce's EV incentive program. 3.2 Create a state-supported low-cost leasing program with an EV equity objective.	None in 2024	Assess programs and develop funding request for 2025-27 biennium.	Commerce	Air quality improvement Lower costs Increased EV access
1.6 Provide block grants to increase CBO staff capacity.	Fund program to help CBOs design transportation electrification projects.	Implement program.	Commerce	Significant air quality improvement Lower costs Increased EV access More non-driving options

* Numbered items in the recommendations column correspond to the policy items detailed in Chapter 5, How Washington Can Get There, in Part I and Part II.

** The equity column reflects equity benefits, including air quality improvements in overburdened communities, and lower costs, increased EV access and more non-driving options for vulnerable populations.

Table 2 2024 Priorities: Actions Needed to Successfully and Equitably Implement Current EV Policies, continued

Recommendations*	Legislative actions	Agency actions	Lead Agency	Equity**
2.5 Support planning and building necessary utility-side charging infrastructure.	None in 2024	Finish cost assessment and develop program as funding request or legislation.	Utilities and Transportation Commission (UTC) and Commerce	No effect
3.14 Fund and support state agency efforts to implement EO 21-04.	Fund state agency fleets to successfully implement EO 21-04.	Implement EO 21-04.	All state cabinet agency fleets	No effect
Make charging access more equitable and speed up project timelines: Section 2: Charging and Utility Infrastructure	None in 2024	Develop suite of policy proposals to improve consumer experience and equitable access, and speed up implementation timelines.	Commerce (with support from UTC)	Air quality improvement Lower costs Increased EV access
1.7 Monitor equity indicators and measure outcomes.	None in 2024	Examine air-monitoring needs near highways, estimate health benefits of the TES and implement a transportation equity assessment.	Ecology, Health and WSDOT	Significant air quality improvement Lower costs Increased EV access More non-driving options

* Numbered items in the recommendations column correspond to the policy items detailed in Chapter 5, How Washington Can Get There, in Part I and Part II.

** The equity column reflects equity benefits, including air quality improvements in overburdened communities, and lower costs, increased EV access and more non-driving options for vulnerable populations.

Priorities for 2025 and Onward

The EV Council will implement the TES by immediately prioritizing the 14 sets of recommendations in Table 2 above. Based on progress made, it will determine 2025 priorities in fall 2024. The EV Council will then repeat the same annual prioritization process by identifying key actions for the year ahead. TES recommendations not included in the 2024 list are important to the transition and will be considered for prioritization in the EV Council's work in 2025 and the years following.

TES Development Process

The EV Council oversaw development of the TES. The EV Council is an interagency effort co-led by the Department of Commerce and the Washington State Department of Transportation (WSDOT), with representation from the State Efficiency and Environmental Performance (SEEP) Office, the Office of Financial Management, the Office of Superintendent of Public Instruction (OSPI), the Utilities and Transportation Commission (UTC) and the Departments of Agriculture, Ecology, Enterprise Services and Health.

Through an open and competitive proposal process in the fall of 2022, the EV Council hired a consulting team led by RMI and supported by Cascadia Consulting Group, NW Energy Coalition, Front and Centered and Strategic Research Associates.

The EV Council drafted the TES with significant stakeholder engagement and recommendations, including:

- The EV Infrastructure and EV Adoption Working Group, an informal committee made up of state agency staff with experience implementing transportation electrification policies and programs.
- The Advisory Committee,[6] a formal stakeholder group with 25 members representing a diversity of perspectives, in-state geographies and industries, and informed by issue-specific subcommittees.
- Wide-reaching and diverse stakeholder engagement in the form of 40 one-on-one interviews, eight focus groups and a survey of 3,026 residents across the state, statistically representative by gender, age and region, to explore opinions and perspectives on EVs. The survey consisted of 30 questions, including quota and demographic questions, and aimed to understand Washington residents' desires for their personal vehicles and how they think about EVs, including information gaps and myths, perceived barriers, trusted information sources and readiness to purchase an EV.
- In-depth modeling and analysis of different policy and economic scenarios influencing the potential rate of transportation electrification in Washington.
- Eight targeted policy workshops and three equity-focused workshops.
- The application of an equity lens to all elements of the TES, developed in partnership with community-based organizations (CBOs) representing low-income and Black, Indigenous and People of Color (BIPOC) communities across Washington.

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6 Washington State Department of Commerce, **"Engrossed Substitute Senate Bill 5974," Pub. L. No. Laws of 2022, 182** Chapter (n.d.).

Spokane City Line battery electric bus

Addressing Transportation Electrification Inequities

The TES fits within a broader statewide commitment to reduce carbon emissions and ensure equitable benefits flow to vulnerable populations and overburdened communities, as established through the **Climate Commitment Act (CCA)**, HEAL Act and other legislation. Historically, the harmful effects of transportation and energy policies have been concentrated on lower-income communities and communities of color.[7,8] Washington's low-income and BIPOC communities, which have contributed the least to climate change, experience the effects first and worst. These effects are compounded by a transportation system that disproportionately exposes low-income and BIPOC communities to pollution, vehicle crashes and the physical barriers created by roads, train tracks and airports.[9]

Although addressing these effects will require efforts beyond transportation electrification alone, a forward-looking TES can be a significant step toward redressing the effects of these past and current inequities by advancing meaningful security, safety and sustainability within the electrified transportation system for overburdened communities and vulnerable populations. This system should unite communities rather than divide them; provide individuals the tools to own, govern and benefit from the energy and transportation assets in their community; and aim to deliver jobs, community wealth and public health to overburdened communities throughout Washington.

The relationship between transportation electrification and overburdened communities is complex. At the surface, transportation electrification will reduce adverse health effects caused by vehicle exhaust in these communities. However, without state action, it is possible that overburdened communities and vulnerable populations could be further marginalized by the siting of infrastructure and requirements

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7 Thomas W. Sanchez, Rich Stolz and Jacinta Ma, **"Inequitable Effects of Transportation Policies on Minorities,"** *Transportation Research Record: Journal of the Transportation Research Board* 1885, no. 1 (January 2004).

8 Thomas W. Sanchez, **"Poverty, Policy, and Public Transportation,"** *Transportation Research Part A: Policy and Practice* 42, no. 5 (June 2008): 833–41.

9 Peter Huether et al., **"2023 Transportation Electrification Scorecard,"** ACEEE, (June 28, 2023).

for technologies that do not directly benefit them. Additionally, BIPOC communities have traditionally experienced higher energy burdens. Transportation electrification could risk worsening these inequities through loss of financial equity from devalued gasoline-fueled vehicles and the higher cost of charging EVs at public chargers versus at home.

The state bears an important responsibility to ensure that the imperative of achieving equitable outcomes does not fall through the cracks. The TES's recommendations include ways in which the state should use its policy and regulatory authority to shape the market and put structures in place to ensure benefits for overburdened communities and vulnerable populations. This means:

- Directly addressing the effects of higher costs of public charging on lower-income households that lack access to EV charging at home. Options could include providing subsidies for lower-income EV owners, extending rate protections to consumers at privately owned chargers and creating a system of public or community-owned chargers.

- Codifying and enforcing consumer protections related to prices and price transparency, information and signage, language access and alternative ways to pay (other than credit cards) to ensure that EV charging is available to everyone. Ensuring that an equitable share of EV charging infrastructure and its benefits is sited in overburdened communities. Options could include creating a system of public or community-owned chargers or subsidies for companies to locate charging infrastructure in these neighborhoods. Communities must be a part of this development to ensure solutions meet local needs.

- Requiring that chargers are regularly maintained and repaired in a timely manner, irrespective of location, and that the siting of high-speed chargers takes into consideration the cascading effects of lack of transportation on lower-income families and workers whose livelihoods depend on being able to get to work on time.

- Designing and implementing robust community-based capacity building, education and outreach to ensure equitable EV adoption.

- Prioritizing electrification of MHDVs that operate in overburdened communities, so that agencies target the benefits of reduced air pollution from EVs to areas most at risk from current tailpipe emissions.

The TES also includes recommendations for (1) a transportation equity baseline, (2) an equitable distribution process and (3) a clear model for adaptive management to help reach these goals.

Where Washington Is Today

Washington's transportation system — composed of roads, ports, railways, sidewalks, bike lanes, transit lines, vehicles small and large, and the people who operate and maintain the vehicles and infrastructure — supports the movements of more than 7.7 million people and a $725 billion economy.[10] Washington's transportation system is also the largest source of climate pollution in the state at 39% of total emissions, according to Washington's most recent official GHG inventory. Washington's leadership in decarbonizing transportation through electrification is critical for reducing overall emissions and driving market demand and innovation.

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10 Clifford Woodruff and Matthew von Kerczek, **"Gross Domestic Product by State and Personal Income by State, 1st Quarter 2023,"** *Bureau of Economic Analysis, U.S. Department of Commerce*, (June 30, 2023).

In addition to GHGs, gasoline- and diesel-fueled transportation produces air pollution that can worsen people's health, including nitrogen oxides (NOx), particle pollution and other hazardous air pollutants (HAPs). Air pollution can affect everyone, though some groups are especially sensitive, including children, older adults, pregnant people and people with health conditions.[11] Other groups, including people with low income, people of color and tribal populations, have historically encountered increased and prolonged exposures to air pollution. Traditional internal combustion engine (ICE) vehicles also create noise pollution, which, although invisible, can cause increases in cardiovascular disease and mortality.[12] Although EVs are required by law to make a minimum amount of sound under certain speeds for pedestrian safety reasons, they still result in a net reduction in noise pollution (especially at the MHD scale).

Table 3 Washington's Current Clean Transportation Requirements and Targets

Year	Goal(s)
By 2030	2030 EV Target — 100% of new passenger vehicles sales are electric, per Revised Code of Washington (RCW) 43.392.020* (non-binding target). Emissions Limit — Economy-wide GHG emissions down to 50 MMT/year, 45% below 1990 levels, per RCW 70A.45.020.** 30% to 50% of new MHDVs must be zero emissions depending on vehicle class, per ACT rule. Carbon-neutral electricity, with a maximum of 20% offsets, per RCW 19.405.040.***
By 2034	20% reduction in carbon intensity of on-road transportation fuels over 2017 levels, per Chapter 173-424 Washington Administrative Code (WAC).****
By 2035	100% of new passenger vehicles must be electric, per ACC II rule.
By 2040	Economy-wide GHG emissions down to 27 MMT/year, 70% below 1990 levels, per RCW 70A.45.020.
By 2045	Zero emissions electricity, per RCW 19.405.040.
By 2050	Economy-wide GHG emissions down to 5 MMT/year, 95% below 1990 levels, per RCW 70A.45.020.

* **RCW 43.392.020 – Interagency Electric Vehicle Coordinating Council – Target Established – Scoping Plan.**

** **RCW 70A.45.020 – Limiting Greenhouse Gas Emissions – Greenhouse gas emissions reductions – Reporting Requirement.**

*** **RCW 19.405.040 – Washington Clean Energy Transformation Act – Greenhouse gas neutrality – Responsibilities for electric utilities – Energy transformation project criteria – Penalties.**

**** **Chapter 173-424 WAC – Clean Fuels Program Rule.**

11 U.S. Environmental Protection Agency, **"Research on Health Effects from Air Pollution,"** (n.d.).

12 Thomas Münzel, Mette Sørensen and Andreas Daiber, **"Transportation Noise Pollution and Cardiovascular Disease,"** *Nature Reviews Cardiology* 18 (March 31, 2021): 619–36.

Governor Jay Inslee attends the opening of new fast chargers.

Modeling for the TES suggests that the state's current transportation policies and programs (Table 3) — ambitious and critical as they are — will need additional scaling and an increased implementation pace to meet the state's electrification, climate, health and equity targets under today's political and market conditions. To understand how Washington's transportation system will change, it helps to contextualize what vehicle adoption, driving habits and on-road GHG emissions look like today.

By the Numbers

LDVs — cars, crossovers, vans, SUVs and pickup trucks — make up the vast majority of the more than 6.5 million on-road vehicles in Washington today. Notably, although gasoline-fueled vehicles are the vast majority of vehicles in Washington, according to the U.S. Energy Information Administration (EIA), in 2021, 27% of on-road fuel consumption in Washington was by diesel vehicles, indicating proportionally greater fuel consumption per vehicle among MHDVs.[13]

Passenger EV adoption is on the rise. Gasoline-fueled vehicles accounted for roughly 88% of new LDV sales in Washington in 2022, but sales data from the first five months of 2023 suggest that approximately 16% of new LDVs sold in Washington were either BEVs or plug-in hybrid electric vehicles (PHEVs).[14] However, negligible numbers of electric MHDVs were sold (not including buses). Approximately 1% and 3% of motorcycle and bus sales were electric, respectively. According to the U.S. Department of Energy's Alternative Fuel Data Center, Washington has 910 direct current fast chargers (DCFCs) at 240 locations, and 3,493 publicly accessible Level 2 (L2) EV chargers at 1,605 locations.[15]

Washington's VMT has grown along with the state's population, although at a much slower pace. Between 1996 and 2021, Washington's VMT per capita has declined more than that of any other U.S. state.[16] As

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13 U.S. Energy Information Administration, **"Washington State Profile and Energy Estimates,"** (n.d.).

14 John Ryan, **"Electric Vehicle Sales Accelerate in Washington State,"** KUOW — NPR Network, (July 28, 2023).

15 U.S. Department of Energy — Energy Efficiency & Renewable Energy, **"Electric Vehicle Charging Station Locations,"** (n.d.).

16 Elizabeth Ridlington, **"Less Driving Is Possible,"** *Frontier Group*, (May 19, 2023).

incredible as this progress has been, even larger reductions in per capita VMT, in alignment with WSDOT's 2023 report recommending policy options at the state level and funding guidance for local jurisdictions, will support Washington's climate limits.[17]

The 2021 SES found that emissions from Washington's transportation sector must decline from an estimated 38 MMT CO_2e in 2022 to 20 MMT CO_2e or lower by 2030. On-road GHG emissions make up approximately 58% of the state's transportation sector emissions, suggesting that this subsector would contribute 11.6 MMT CO_2e in 2030 if this percentage stays the same. However, it is highly likely that annual on-road emissions in 2030 must be less than 10 MMT CO_2e to make up for harder-to-decarbonize transportation subsectors, such as aviation and marine.

Washington Residents' Perceptions about Transportation Electrification

For Washington to successfully meet its goals, it is essential to understand not only the current transportation sector but also the barriers state residents face (or perceive they face) in the transition to an electric transportation system. As part of the TES public engagement process, the consulting team collected testimonials from a diverse group of Washingtonians on the kinds of barriers that exist for transportation electrification, with a focus on overburdened communities and vulnerable populations. Such discussions covered topics including:

- Public charger availability and accessibility
- The cost to purchase and charge EVs
- Supporting policies and funding at the local, state and national level
- Public understanding and excitement about EVs
- Demand on the power grid
- Inequities for overburdened communities in the electrification transition

Discussions with these diverse groups, covering the topics noted above and other aspects of transportation electrification, have directly influenced policy development and implementation plan creation.

Where Washington Needs to Go

RMI conducted extensive modeling to explore how on-road EV adoption and charging needs in Washington may progress over time. The analysis to support the TES included two stages: (1) an EV adoption model, which estimates EV sales and overall vehicle population from 2023 through 2035 using a combination of bottom-up economic analysis and top-down policy requirements such as the ACC II and ACT regulations and (2) an assessment of anticipated EV charging needs, using the number of EVs estimated through the adoption model combined with local trip data.

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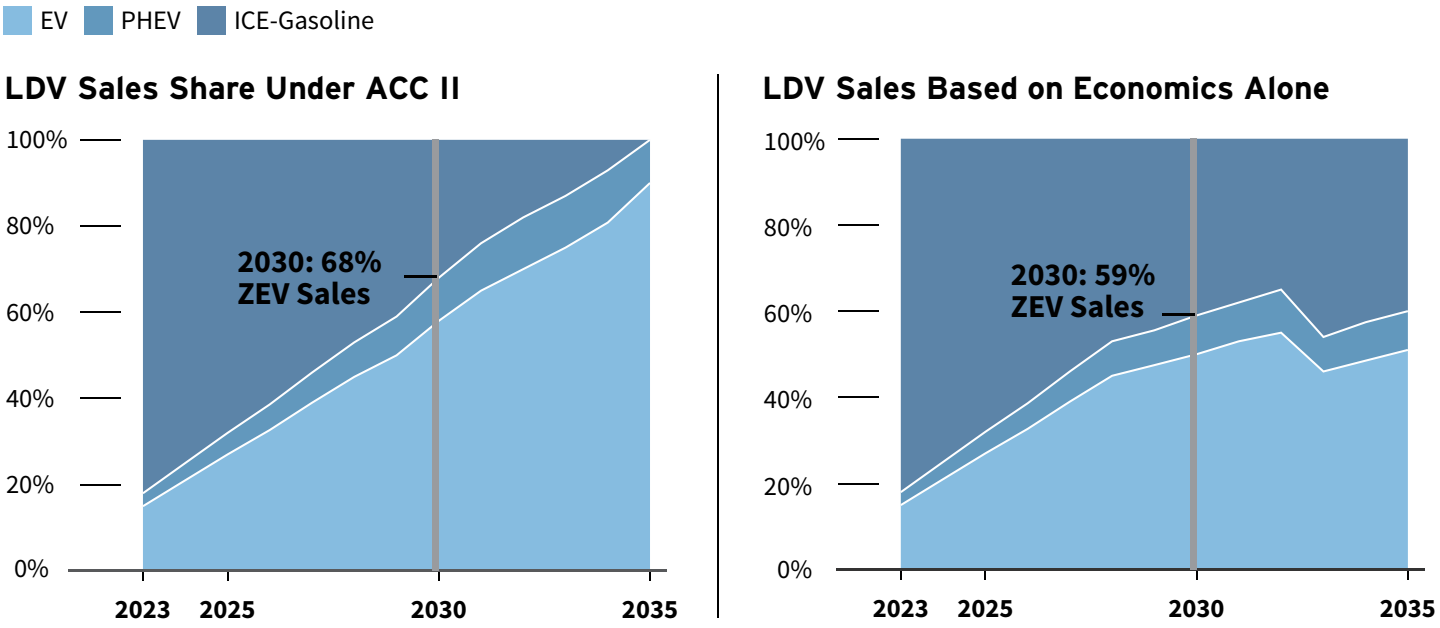
17 Roger Millar and Norene Pen, **"Vehicle Miles Traveled (VMT) Targets - Final Report,"** Washington State Department of Transportation, (June 2023).

The modeling demonstrates the wide variety of potential outcomes that might be expected based on different assumptions about future economic, policy and customer preferences. Several clear themes emerged, ordered below by priority and potential impact:

1. The state's adoption of **ACC II is a critical component of transitioning to an EV future**. However, achieving the regulation's sales requirements will happen only with additional actions to undergird the policy, such as infrastructure build-out, consumer education and reduced purchase price. ACC II requires light-duty ZEV sales in the state to account for 68% of new LDV sales in 2030 and 100% of new LDV sales by 2035, while the separate 2030 EV target sets an accelerated goal of reaching 100% by 2030. Without ACC II, the state would otherwise expect sales of electric and plug-in hybrid electric LDVs to represent only approximately 59% of new LDV sales in 2030 — far short of the 68% requirement and 100% goal (Figure 1). This finding underscores the need for supplementary investments to ensure ACC II is successfully and equitably implemented.

Figure 1 Estimated Light-duty Vehicle Sales, ACC II and Economics Alone

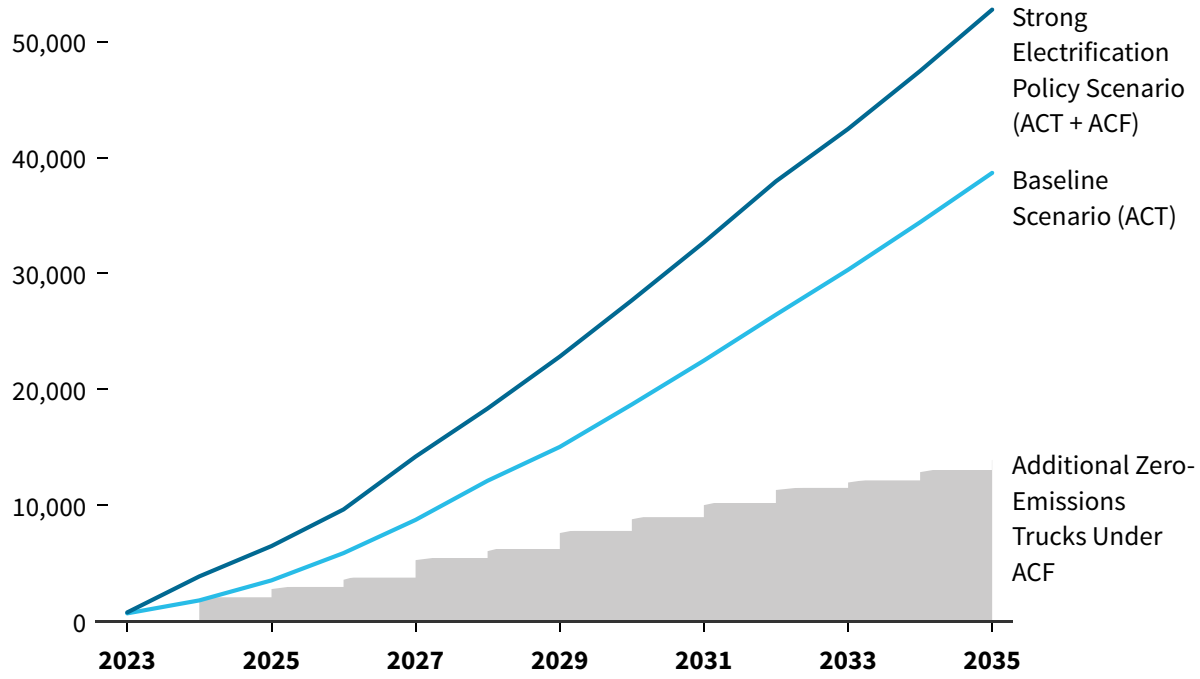


Note: The dip in EV sales share in the right-hand chart beginning in 2033 is due to anticipated expiration of federal tax credits extended and modified by the Inflation Reduction Act.

2. The **ACF regulation is one of the most powerful levers available to the state for accelerating MHD truck electrification** (Figure 2). By limiting usable lifetimes and setting purchase requirements for specific market segments, ACF ensures that high-impact, electrifiable fleets replace their vehicles. This purchase requirement creates significant demand for the vehicle supply produced under ACT. Further, given that drayage trucks, state and local vehicles, and high-priority fleets — targeted under ACF — comprise a significant number of vehicles (estimated at approximately 40% of total MHD trucks in Washington in 2023), this regulation is uniquely positioned to encourage MHD electrification broadly if adopted.

Figure 2

Zero-Emissions Medium- and Heavy-Duty Truck Population Under ACT and ACF



Note: The S3 Strong Electrification Policy scenario (upper sales share line in chart) includes incentives for MHD truck electrification in addition to those in the ACF regulation.

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3. **Ensuring EV purchase prices are affordable is a key strategy** for getting closer to sales and emissions goals, especially for lower-income residents. Focusing on reducing costs in the near term drives higher adoption before the 2035 ACC II requirements and 2030 EV target have clear effects. This supports faster electrification and thereby larger retirements of polluting gasoline-fueled vehicles.

4. **Supporting transportation options for people with lower incomes will be essential for attaining state goals for electrification, climate and equity.** The state will need to ensure that sufficient incentives, charging infrastructure, education and outreach are provided to those least able to afford to lease or purchase an EV and help make desirable EV adoption levels a reality.

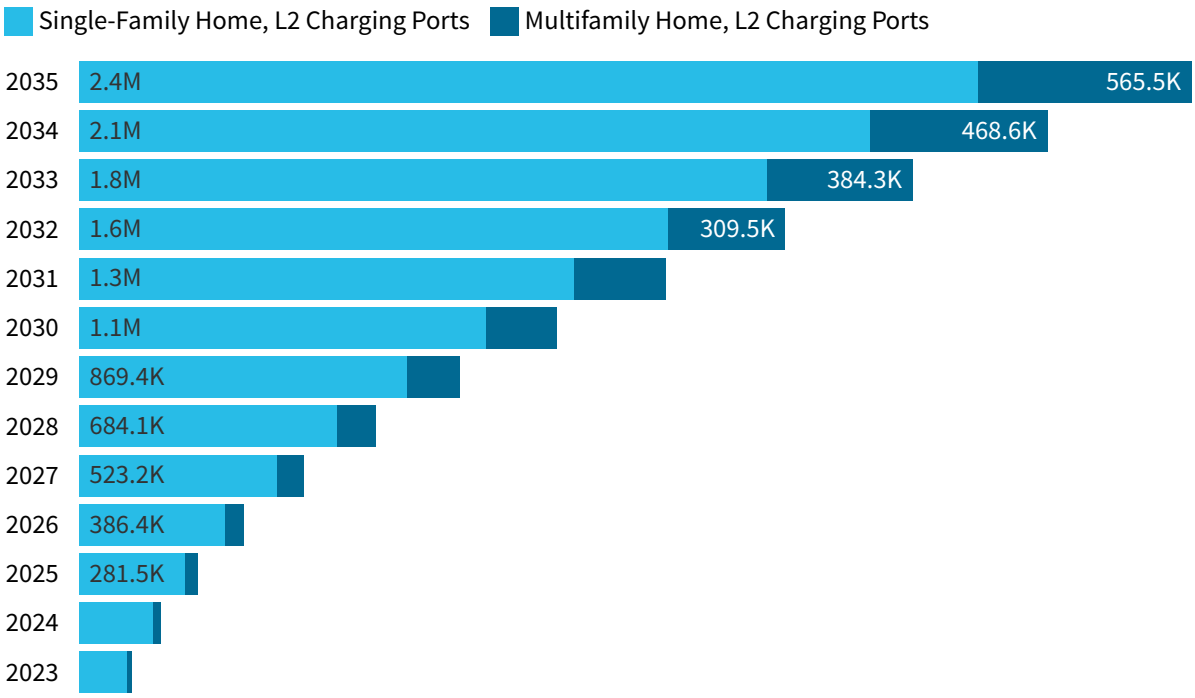
5. **Truck electrification is increasingly economical on a TCO basis,** due in large part to the incentives provided through the federal **Inflation Reduction Act (IRA)**. Although up-front costs can still represent a barrier, lifetime cost savings present opportunities to scale up electrification of these vehicles, beyond the levels required in the ACT regulation. To ensure truck electrification can drive maximum impact and scale up rapidly, Washington should focus on vehicles with strong potential to reduce local air pollution, removing bottlenecks such as vehicle availability constraints and delays in deploying EV supply equipment (EVSE – generally, charging stations) and providing education and technical assistance to fleet managers.

6. **The pace of installing charging infrastructure for LDVs and MHDVs needs to accelerate significantly, indicating a clear role for supportive policies.** In 2035 Washington will require more than 20 times more EV charging plugs than the TES model suggests is needed today.

7. **Ensuring availability of home (or neighborhood) charging for multifamily homes meaningfully reduces total public charging network requirements, providing both cost savings and equity benefits.** Figure 3 depicts the estimated number of residential charging ports for both single-family and multifamily dwellings required to support LDVs in the Strong Electrification Policy scenario, totaling more than 2.9 million by 2035. Supplementing direct on-site charging with neighborhood charging options in close proximity to multifamily homes will be an important strategy for providing this level of access for residents of multiunit dwellings.

Figure 3

Cumulative Residential Charging Ports Required, Strong Electrification Policy Scenario



8. **Reducing VMT and total vehicle stock, while shifting new sales to lighter-weight vehicles, has significant potential for reducing GHG and local air pollutant emissions,** as well as total costs.

9. **Bus electrification, especially school bus electrification, requires continued policy support to increase market share.** This support is needed from the state and local level, as well as through flexible federal funding and continued dedicated federal funding such as the Low or No Emissions grant and the Clean School Bus program.

10. **Hydrogen fuel cell electric vehicles (FCEVs)** are likely to eventually play a role in heavy-duty (HD) truck and transit bus electrification. The market share these vehicles will obtain remains unclear, but at present battery electric alternatives appear likely to be the primary technology for many applications and duty cycles — especially for LDVs — based on TCO analysis. As both the state's hydrogen economy and FCEV technology mature through 2035, the role played by these vehicles will become increasingly clear. The state should continue to monitor and track the development of

FCEV technology and costs, and over time consider how these vehicles can contribute to meeting transportation sector emissions reduction targets. Per **RCW 43.330.570**,[18] the Department of Commerce's Office of Hydrogen and Renewable Fuels delivered a Hydrogen and Renewable Fuels 2023 Legislative Report to the Legislature in December 2023, which should inform this assessment. Additional analysis on FCEV cost outlooks is included in Appendix D.

11. **Washington will need to take other actions for non-road vehicles,** such as planes, boats and trains, which represent approximately 42% of the state's transportation-related emissions. Accelerating electrification and emissions reduction policy measures addressing non-road vehicles will be vital for meeting emissions targets.

A ferry crosses the Puget Sound. WSDOT aims to fully electrify the state's ferry system by 2040.

Recommendation: Focus Efforts on Achieving the Strong Electrification Policy Scenario

The state will need to focus on the levers it most readily has available to promote transportation electrification, equity and alignment with climate goals. Accordingly, focusing on the Strong Electrification Policy scenario (also referred to as Scenario 3 or S3, which is described in further detail in Chapter 4) is likely to provide the best combination of attainable policy options and feasible programs to implement.

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18 RCW 43.330.570 – Office of renewable fuels – Duties.

For the state to align EV sales trajectories with the Strong Electrification Policy scenario, several key actions will be required.

1. **Providing enhanced state incentives for ZEVs and EV charging infrastructure.** Examples include extending and simplifying the EV sales tax exemption; providing a larger incentive value (e.g., $5,000) in the Alternative Fuel Vehicle Incentive administered by the Department of Commerce, with a particular focus on overburdened communities and vulnerable populations; increasing the charging and clean fuels subsidies provided through the Department of Ecology's Clean Fuel Standard through 2035; and working with electric utilities to provide higher EVSE incentives for residential and commercial customers (e.g., $800/residential EVSE through 2035 versus $400 through 2028 in the baseline scenario).

2. **Ensuring that federal incentives are used to the greatest extent possible**. Examples include promoting the availability of the Clean Vehicle Credit and Qualified Commercial Clean Vehicle Credit so that more EV sales in the state are subsidized primarily by the federal government, and promoting adherence to the requirements for full rather than partial compliance with the Alternative Fuel Refueling Property Credit, such as meeting prevailing wage requirements. The state should continue to monitor and track applicable federal programs and share information with local government, industry and residents to support effective utilization of federal incentives.

3. **Achieving ACF adoption rates to complement the existing ACT regulation.** Having adopted California's motor vehicle emissions standards under Section 177 of the Clean Air Act, Washington may have the ability to adopt and implement the ACF rule or a policy that creates ACF-like adoption rates, in addition to ACT. The Department of Ecology is currently monitoring California's actions to finalize ACF given its existing mandate from the Legislature. The accelerated purchase requirements for MHD vehicles in ACF have a meaningful effect on electric and FCEV truck adoption in the state because these requirements are applicable to an estimated 40% of the state's MHD vehicles. The EV Council anticipates ACF to provide commensurate levels of incremental GHG and local air pollutant emissions reductions, beyond those associated with ACT.

4. **Conducting education and awareness campaigns** to promote the benefits of EVs, available EV programs and increasing affordability of EVs. The Strong Electrification Policy scenario assumes stronger consumer interest in EVs as a proxy for effective messaging and education about the benefits of these vehicles. To make this assumption a reality, the state can invest in meaningful education and engagement activities, beginning with the Education Plan and the **Washington State Transportation Electrification Engagement Plan (Engagement Plan)** developed for the TES.

In addition to these key policies, the state should consider the strategies embedded within several of the "exploratory" scenarios modeled, which rely heavily on VMT reduction and vehicle stock change assumptions to achieve lower emissions rates than will be attainable through vehicle electrification alone.

How Washington Can Get There

In recognition of the challenge to meeting state goals identified within the modeling, the TES outlines critical technological, financial and institutional barriers that the state will need to address to meet its transportation electrification targets, briefly summarized in Table 4.

Table 4 Technological, Financial and Institutional Barriers

Technological	Financial	Institutional
Product supply chain limitations have led to both EV production challenges and reduced availability of fast-charging infrastructure. This has led to a mismatch between available EV stock and consumer preferences (e.g., affordable models like the Chevrolet Bolt, all-electric three-row SUVs, trucks, and vans) and a lack of available material for fast-charging hardware, lithium, and other components (particularly switchgear and transformers) critical to EVs and EVSE. **Current charging infrastructure is generally decentralized, can be unreliable, lacks interoperability and, due to slow speeds, can result in queues for open chargers.** **Grid infrastructure is insufficient to meet anticipated charging needs in later years in many locations, and likely in the near term for areas with concentrations of MHDVs which will require higher-power charging.** Additionally, Washington will need to increase investments in energy efficiency and demand management, and generate or import sufficient renewable energy to ensure transportation electrification is powered by zero-carbon electricity. **Trip range can be limited by negative weather impacts on battery capacity and can be worsened by lack of EVSE infrastructure.** Specific vehicle types, such as electric buses, fleet vehicles and used EVs are likely to face higher barriers.	**Lack of cost parity between EVs and ICE vehicles can make it difficult or impossible for some consumers to transition.** This barrier is worsened by the existence of a limited market for used EVs. Additionally, not all EV models qualify for federal tax credits, and historically, incentives have been provided in the form of tax credits rather than "on the hood" point-of-sale rebates. **Installation of EVSE can have high up-front capital costs, including costs to upgrade grid infrastructure, and challenging business models.** Furthermore, many individuals find it challenging to access federal, state, private and utility funding to defray the costs of charging infrastructure. **Operating costs for public EV charging lack transparency, and significant price variability between at-home and public charging disproportionately affects renters and residents of multifamily homes.** Additionally, fleet operators and businesses are unaccustomed to negotiating charging agreements and see it as complex and full of risk. Absent effective regulation, managed charging and other strategies to better use grid capacity, **energy burdens could increase for low-income households if utility rates increase to support charging infrastructure.** **On average, existing passenger cars often stay on the road for approximately 15 years,** given the cost of replacing vehicles and because older cars often move into the used car market rather than being taken off the road.	**Charging infrastructure development can face delays due to challenges caused by local permitting processes, timelines, regulatory procedures for grid-side utility upgrades and supply chain constraints for electrical equipment, among other institutional barriers.** **Lack of clear and consistent EV signage creates difficulty locating and subsequently using chargers.** **There is a lack of community support and buy-in due to perceived or real safety concerns; insufficient data for personal and business decision-making; questions about range, weather and towing capacity; and real or perceived concerns regarding the ethical and environmental impacts of material extraction and recycling.** These are worsened by a confusing policy and incentive landscape and information gaps for consumers shopping for a new vehicle. **A limited workforce means a lack of technicians to service EVs, and of engineers, electricians and technicians to install and maintain EVSE and related grid infrastructure.** Additionally, increasing this limited workforce needs to be balanced with job security for the existing workforce, including those who currently work with ICE vehicles. **Charging infrastructure, especially for MHDVs, will require significantly more real estate than diesel fueling.** **Slow turnover of existing vehicle stock can limit implementation timelines.** Many cities limit the number of electric buses they can procure based on their current stock of buses that are still in operation.

To overcome these barriers, to enable a regulatory and market environment to facilitate EV adoption rates at the pace envisioned in the Strong Electrification Policy scenario and to achieve Washington's climate and equity goals, the state will need to enact a collection of supplemental policies across six categories: consumer education and capacity building, charging and utility infrastructure, LDVs, MHDVs, electrified micromobility and workforce. This approach not only accounts for the need to transition vehicles, but importantly, continues to develop the ecosystem needed to effectively and equitably transition to an electrified transportation system.

A total of 86 policies are included across these six categories. Detailed descriptions can be found in Chapter 5, Part I – Achieving the Strong Electrification Scenario.

Additionally, to achieve the state's 2030 GHG emissions limit, it is likely that on-road emissions must be less than 10 MMT CO_2e to make up for harder-to-decarbonize sectors and subsectors, including non-road transportation.

RMI modeling shows that maximum feasible EV adoption still leaves an approximate 4 MMT CO_2e gap in emissions reductions in 2030 relative to the 10 MMT CO_2e threshold. Given the state's commitment to reaching its 2030 emissions limit, it must consider significant new investments beyond the transportation electrification recommendations laid out in this strategy (Table 5). Although EVs are part of a holistic transportation landscape, they cannot be separated from land use, safety, transit, active transportation, fuel economy and clean fuels. For this reason, the EV Council lays out additional policies in Chapter 5, Part II – Closing the 2030 Transportation Greenhouse Gas Emissions Gap, because the state will need to consider developing and implementing strategies to achieve the following objectives:

- Speed up retirement of the highest-emitting ICE vehicles
- Increase vehicle energy efficiency
- Decarbonize non-road vehicles (e.g., aviation, maritime)
- Reduce VMT by supplementing existing state efforts

Table 5

Strategies to Achieve 10 MMT CO_2e in 2030 On-Road Emissions

Strategy	2030 emissions	Incremental reduction
Successfully implement current EV and VMT policies	14.1 MMT	9.4 MMT (from 2019 levels)
Take stronger electrification actions	13.9 MMT	0.2 MMT
Reduce VMT per capita by 17% instead of 6%	≈13.2 MMT*	≈0.7 MMT*
Require vehicle efficiencies and fund early ICE vehicle retirement	≈12.0 MMT*	≈1.2 MMT*
Reduce carbon intensity of gasoline and diesel	≈10.0 MMT*	≈2.0 MMT*

* The emissions level or reduction is a preliminary estimate, not a model output, and requires additional analysis.

2030 EV Target Is an Aspirational Stretch Goal, but Likely Infeasible

Revised Code of Washington (RCW) 43.392.020[19] requires the EV Council complete a scoping plan for achieving the 2030 EV target. The EV Council decided to complete this analysis within the TES, and it is embedded throughout this report. The actions needed to achieve 100% new light-duty EV sales by 2030 are also needed to achieve the 68% sales share projected by 2030 in the Strong Electrification Policy scenario (S3). Therefore, the policy recommendations in Chapter 4 should be considered key elements of the required scoping plan.

This divide raises the question: How could the state go from reaching 68% to 100% EV market share in 2030? The TES model uses a sensitivity analysis to assess the difference between these versions of the future. For the preferred Strong Electrification Policy scenario (S3), that sensitivity analysis is labeled S3b throughout the TES.

In addition to the recommended Strong Electrification Policy approach detailed throughout the rest of this report, such a scenario (S3b) would require:

- Rebates amounting to $9,000 per sedan and $11,000 per light truck or SUV or more in 2030 *above* the incentives required to reach the ACC II's 2030 sales goal
- Approximately 185,000 additional charging ports by 2030 at an additional expense ranging from $200 million to $520 million
- Voluntary discontinuation of non-electric LDV production and sales by all automakers and dealers

Because S3b would likely be infeasibly expensive, would depend on factors largely outside the state's control (e.g., fossil fuel prices, automaker and dealership voluntary decision-making) and would result in a relatively modest 0.3 MMT decline in 2030 emissions compared with Scenario 3, the EV Council selected the more feasible and still very strong electrification pathway in Scenario 3 as the preferred scenario to use as the TES foundation.

Recognizing the importance of bold targets to drive urgency in climate action, the EV Council and its member agencies will continue to pursue the 2030 EV target set by the Legislature as an aspirational stretch goal. It will also urge state policymakers to consider the cost per metric ton CO_2e avoided when evaluating different program investments to stay under the 2030 emissions limit.

Monitoring, Evaluation and Continuous Improvement

Successful implementation of Washington's transition to an electric transportation system will be measured in EVs on the road, EV chargers installed, air quality improvements and real and direct equitable outcomes for overburdened communities and vulnerable populations. To that end, the state will publicly track the key performance indicators listed below and publish an annual report.

In addition, the EV Council is committed to an adaptive management process to ensure that policies and programs are having their intended effects and that policies and programs remain flexible and iterative

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19 RCW 43.392.020 – Interagency Electric Vehicle Coordinating Council – Target Established – Scoping Plan.

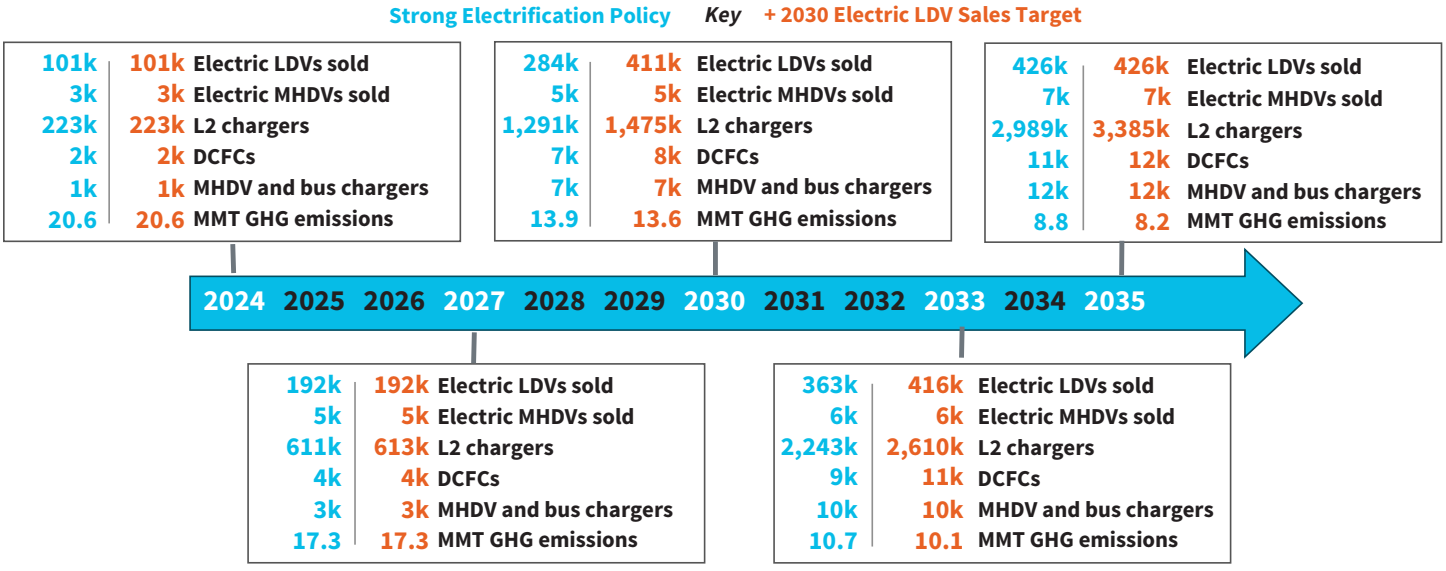
in the face of a changing market and policy landscape. The annual report will assess progress, identify roadblocks and recommend course corrections as necessary to achieve desired outcomes. Metrics will include several indicators to assess changes to charging infrastructure, LDV and MHDV adoption, EV miles traveled, GHG emissions and air pollutants, and equity and environmental justice indicators.
As a first step in successfully tracking relevant metrics, the EV Council, through the lead of each designated agency, must:

- Establish methods of data collection and tracking for any new key performance indicators and set baselines for any new information.
- Develop thresholds or goals by date for each indicator, if possible and if not already established.
- If too much uncertainty exists to establish a reliable threshold or goal, establish directional indicators (positive, negative) for guidance.

As a reference, the Strong Electrification Policy scenario (S3) establishes guiding metrics that the state can use to benchmark its progress (Figure 4). These metrics, as well as those from all modeled outcomes of different scenarios and sensitivities tested as part of developing the TES, can be explored on the Washington TES User-Interactive Dashboard, found on the **TES website**.[20]

Importantly, the metrics from the modeling should be considered directional and indicative, rather than precise. State staff and interested stakeholders can use the metrics as general guidance when considering Washington's success in reaching state goals.

Figure 4 Washington EV Adoption and Infrastructure Milestones



20 Washington TES User-Interactive Dashboard, found on the **TES website**.

Building Awareness and Capacity

Although the state has existing programs and policies to bring down EV costs and build out charging infrastructure, it has not yet taken action to provide good-quality public information so both consumers and fleet managers can navigate a new, complex and quickly changing EV industry. If up-front cost and charging are the first two legs of the EV transition stool, education and awareness is the third. Declining prices and expanded charging infrastructure only drive adoption as far as people know about them. Recognizing this gap, the EV Council hired Cascadia Consulting to develop an EV Education Plan to increase awareness and a TES Engagement Plan to improve state-level decision-making with on-the-ground information and input.

EV Education Plan

A crucial element for Washington's success in meeting its goals is to ensure that Washington residents have information and awareness regarding EVs. The EV Education Plan's goal is to accelerate the adoption of personal EVs in Washington. To that end, the EV Education Plan aims to serve as an evidence-based guide for a short-term (one- to two-year) marketing campaign to provide Washingtonians with the information they need to buy or lease EVs. This involves raising awareness of EVs, providing information and pointing consumers to places where they can determine which EV is best for them and their lifestyle. The EV Education Plan is a guide to overcoming Washingtonians' barriers to and concerns about switching to EVs to facilitate EV purchasing and leasing.

The plan draws from a literature review of existing EV Education Plans, a statewide EV market research survey administered in the spring of 2023 and one-on-one interviews and focus groups conducted as part of the TES's formative engagement.

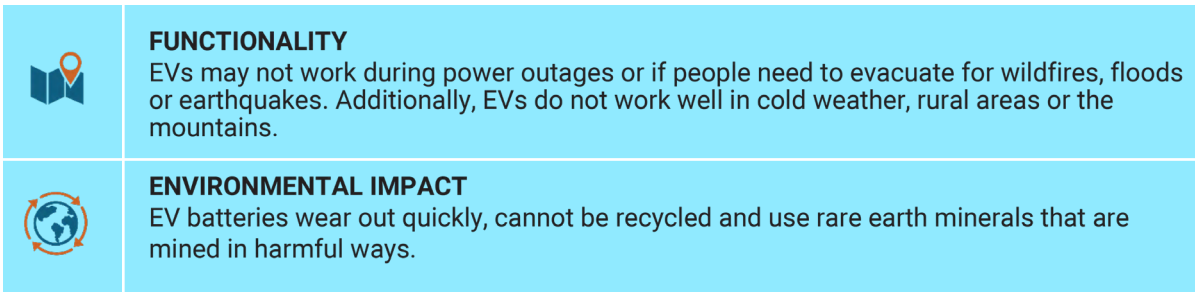
According to the market research survey, the top three barriers to EV adoption — whether perceived or real — are universal across target audiences (Figure 5).

Figure 5 **Top Three Barriers to EV Adoption**

	**COST** The up-front cost of buying an EV
	**RANGE AND CHARGING** EVs do not have enough range and there are not enough charging stations
	**TECHNOLOGY WILL BECOME OUTDATED** Concern about EV technology changing fast and not wanting a vehicle that will be outdated

The statements in Figure 6 are perceptions (again, accurate or misconceptions) that survey respondents reported with the most frequency as making them less enthusiastic about EVs. Although not explicitly barriers, these statements can factor into individual decisions not to purchase or lease EVs or to delay doing so, and therefore should be addressed through educational messaging and strategies.

Figure 6 Survey Respondents' Perceptions



The EV Education Plan includes messaging opportunities, trusted information channels, equity considerations, strategies and monitoring and evaluation criteria.

TES Engagement Plan

The TES Engagement Plan's goal is to provide a roadmap for engaging key audiences and Washington communities on policies and programs that will be implemented under the umbrella of the TES. It is complementary to the TES implementation plan and focuses on providing guidance regarding which audiences need to be engaged on specific policy recommendations in the TES, and how to inform them, seek their input, involve them in planning and implementation, and collaborate with them.

This engagement plan incorporates Washington audiences' and community members' input, priorities and recommendations, and builds on extensive community feedback from several months of engagement and a literature review.

The plan is divided into three parts (Table 6).

Table 6 TES Engagement Plan

Part One	Part Two	Part Three
Engagement Principles and Methods This section notes the guiding principles for engagement, including stages of engagement and equity considerations.	**TES Engagement Strategies, Actions and Activities** This section outlines the recommended ongoing engagement strategies, actions and associated activities. It also offers recommendations on messaging to audiences whose input is sought.	**A Guide to TES Implementation Engagement** This section lists key audiences identified in formative engagement, provides specific guidance on which audiences and communities to engage, and offers a matrix of engagement and activities for each policy.

The TES Engagement Plan identifies four key strategies for ongoing statewide engagement for the implementation of TES programs and policies. These strategies are supported by actions, specific activities and key performance indicators, and are as follows:

- Strategy 1: Cultivate an audience network
- Strategy 2: Establish an audience engagement framework
- Strategy 3: Engage key audiences and Washington communities
- Strategy 4: Conduct monitoring and evaluation

This document also serves as a guide to TES implementation engagement and serves as a complement to other TES documents. The TES Engagement Plan identifies lead agencies and programs for specific policies and programs in the TES, recommends integration into existing state infrastructure and funding streams, and provides next steps for implementing those programs and policies. The TES Engagement Plan outlines the ingredients for facilitating partnerships and engaging audiences that will support the advancement of TES programs and policies.

Call to Action

An electric vehicle charges along the West Coast Electric Highway.

Washington's TES builds on years of state leadership and recent historic federal investment in transportation decarbonization. Against this backdrop, the state's focus is to ensure that the transition to an electrified transportation system is as efficient, equitable and effective as possible. Due to the slow nature of vehicle stock turnover, analysis and modeling from this report highlights that the next five years, and even the next two years, are critical for the state to meet its important climate requirements.

The EV Council designed the policy recommendations and implementation plan in this report to meet Washington's emissions limits through setting up the supportive infrastructure necessary for rapid scaling, intentionally and proactively directing benefits to overburdened communities and vulnerable populations, and ensuring that the electrification transition supports the state's wider decarbonization targets in 2030, 2040 and beyond.

Washington is among the first states to develop a truly holistic plan for equitably transitioning to a predominantly electric transportation system. With this report, Washington commits to following up its nation-leading policy obligations with actionable plans and impactful programs to achieve its climate and equity goals.

1. Introduction: Historical Context and Objectives

Climate Imperative

People feel the effects of climate change across Washington. More extreme weather events, longer droughts, increased wildfire risk and intensity and decreased snowpack are a result of climate change and are impacting human health and the environment. Continuous action from Washington state government is critical to protect the health and well-being of residents, and to eliminate the historical and cumulative effects borne by overburdened communities and vulnerable populations. Mitigating the effects of climate change is a paramount statewide priority. Washington has adopted aggressive requirements to limit GHG emissions to 45% below 1990 levels by 2030, 70% below 1990 levels by 2040 and 95% below 1990 levels by 2050, and to achieve net-zero GHG emissions by 2050.

Achieving these GHG emissions reductions will require Washington to focus on the transportation sector, which represents the state's largest source of emissions at 39%. Electricity as a transportation fuel offers one of the lowest carbon pathways to reduce transportation sector emissions, since Washington has some of the cleanest electricity in the nation and is on a path to 100% clean electricity by 2045 as mandated by **CETA**.[21] CETA, coupled with Washington's suite of clean transportation policies — including the Clean Fuel Standard (CFS) and Clean Vehicles programs — as well as historic levels of federal support for reducing emissions and fossil fuels through the **IRA**, positions Washington to rapidly decarbonize the transportation sector.

Legislative Directive

In March 2022, the Legislature passed **Move Ahead Washington (Chapter 182, Laws of 2022)**, a 16-year transportation package. Included in Move Ahead Washington were several key elements to further accelerate the transition to an electrified transportation system. Principally, Move Ahead Washington established the EV Council to align existing transportation electrification efforts across state agencies. As one of its first orders of business, the EV Council was directed to develop an equitable and inclusive TES.[22]

To complement this new interagency effort, Move Ahead Washington established a nonbinding target that all publicly and privately owned passenger vehicles and light-duty vehicles of model year 2030 or later that were sold, purchased or registered in Washington must be electric. Consistent with Move Ahead Washington's directives, the TES explores pathways to meet this 2030 EV target.

These directives have created a first-of-its-kind effort in Washington to strategically chart a holistic path forward to a cleaner and more equitable transportation system.

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21 Washington State Department of Commerce, **"Clean Energy Transformation Act,"** (n.d.).

22 A full report of the EV Council's activities and accomplishments in 2022 and 2023 can be found in the Annual Report on the **TES website**.

RapidRide station in Downtown Seattle. Photo courtesy of Seattle Department of Transportation

Equity and Environmental Justice

The TES fits within a broader statewide commitment to reduce carbon emissions and ensure equitable benefits flow to vulnerable populations and overburdened communities, as established through the **CCA**, **HEAL Act**[23] and other legislation. Historically, the harmful effects of transportation and energy policies have been concentrated on lower-income communities and communities of color.[24,25] Washington's low-income and BIPOC communities, which have contributed the least to climate change, experience the effects first and worst. These effects are compounded by a transportation system that disproportionately exposes low-income and BIPOC communities to air and noise pollution, vehicle accidents and the physical barriers created by roads, train tracks and airports.[26]

The TES presents an extraordinary opportunity to redress the effects of these past and current inequities by advancing meaningful security, safety and sustainability within the electrified transportation system for overburdened communities and vulnerable populations. This system should unite communities rather than divide them; provide individuals the tools to own, govern and benefit from the energy and transportation assets in their community; and aim to deliver jobs, community wealth and public health to overburdened communities throughout Washington.

In response to this opportunity and with significant input from representatives of overburdened communities from across the state, the TES includes recommendations for (1) a transportation equity baseline, (2) an equitable distribution process and (3) a clear model for adaptive management to help reach these goals, among other policy proposals.

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23 Washington Department of Ecology, **"Healthy Environment for All,"** (2023).

24 Sanchez, Stolz and Ma, "Inequitable Effects of Transportation Policies on Minorities."

25 Sanchez, "Poverty, Policy, and Public Transportation."

26 Huether et al., "2023 Transportation Electrification Scorecard."

Scope, Objectives, Goals

Maximizing the opportunity of electrifying the transportation system requires Washington to address the inherent challenges in this transition. To achieve this, the TES seeks to address three key questions:

1. How can Washington meet the 2030 EV target established in Move Ahead Washington?
2. How can Washington ensure market and infrastructure readiness for all new LDV sales being electric?
3. How can Washington decarbonize the majority of the transportation system, covering all on-road vehicles (cars, trucks and buses) and non-road vehicles (planes, boats, trains and off-road mobile equipment), while directly and equitably benefiting vulnerable populations and overburdened communities?

The EV Council developed seven TES objectives to help answer these questions:

1. Complete a statewide TES that can be delivered by the EV Council to the Legislature by January 2024.
2. Ensure the TES represents the preferences of and information from communities across Washington, including perspectives gained from close coordination with the EV Council Advisory Committee.
3. Ensure the TES benefits vulnerable populations and overburdened communities.
4. Identify grant funding for EV infrastructure available to persons living in Washington, including existing and future state, federal and other opportunities.
5. Create a detailed implementation roadmap through 2035 within the TES, including a scoping plan benchmarked to the state's 2030 EV target.
6. Create an engagement plan for effective public engagement through 2035 consistent with the HEAL Act.
7. Create an education plan detailing needed actions by the state to provide clear information and education about EVs to ensure adoption in rapidly changing EV markets.

The five remaining chapters of the TES tie these objectives together:

- Chapter 2, **Strategy to Address Transportation Inequities**, describes transportation equity expansively, anticipates how overburdened communities and vulnerable populations may be impacted positively or negatively by electrification, and outlines key actions to support equitable outcomes.
- Chapter 3, **Where Washington Is Today**, outlines the current state of transportation electrification in Washington, including policies, programs, vehicle stock trends and residents' perspectives.
- Chapter 4, **Where Washington Needs to Go**, includes modeling and analysis of different scenarios influencing the rate of transportation electrification for on-road vehicles and evaluates other factors, including shifting and reducing VMT and HD mobility options.
- Chapter 5, **How Washington Can Get There**, outlines a detailed policy roadmap to meet Washington's transportation electrification targets and reduce transportation sector emissions consistent with the statewide GHG limits.

For the purposes of the TES, EVs exclude fossil fuel hybrids. The scenarios analyzed in Chapter 4 include only on-road vehicles (light-, medium- and heavy-duty vehicles), and the recommendations in Part I of Chapter 5 focus on supporting the electrification of these modes of travel, with the addition of e-micromobility. The policies in Part II of Chapter 5 expand on the on-road recommendations to include opportunities for non-road vehicle electrification and other strategies to reduce GHG emissions from the transportation sector, consistent with the 2030 emissions limit.

TES Development Process

The EV Council spearheaded development of the TES. The EV Council is an interagency effort co-led by the Department of Commerce and WSDOT and joined by the SEEP Office, the Office of Financial Management, OSPI, UTC, and the Departments of Agriculture, Ecology, Enterprise Services and Health.

Meeting the objectives identified for the TES requires significant and meaningful stakeholder engagement. Consequently, the TES is informed by recommendations from:

- The EV Infrastructure and Adoption Working Group, an informal committee made up of state agency staff with experience implementing transportation electrification policies and programs.
- The EV Council Advisory Committee, a formal stakeholder group with 25 members representing a diversity of perspectives, in-state geographies and industries, and informed by issue-specific subcommittees.
- Wide-reaching and diverse stakeholder engagement in the form of 40 one-on-one interviews, eight focus groups and a survey of 3,026 residents across the state, statistically representative by gender, age and region, to explore opinions and perspectives on EVs.
- In-depth modeling and analysis of different policy and economic scenarios influencing the potential rate of transportation electrification in Washington.
- Targeted policy and equity-focused workshops.
- The application of an equity lens to all elements of the TES, developed in partnership with CBOs representing low-income and BIPOC communities across Washington.

Under the leadership of the EV Council, development of the TES was supported by a consulting team, led by RMI and assisted by Cascadia Consulting Group, NW Energy Coalition, Front and Centered and Strategic Research Associates.

Summary

The TES is the culmination of clear legislative leadership, critical oversight from the EV Council and robust stakeholder input, and is designed to ease the path to an electrified transportation system that drives meaningful reductions in GHG emissions and air pollutants. Equitable outcomes are prioritized throughout and will be essential for the successful implementation of this strategy, as well as for the future health and well-being of Washington's residents.

2. Strategy to Address Transportation Inequities

Equity Chapter Overview

The TES fits within a broader statewide commitment to reduce carbon emissions and ensure equitable benefits flow to vulnerable populations and overburdened communities. In addition to a reduction in carbon emissions, the TES will be judged on its ability to deliver benefits to these residents.

Historically, the harmful effects of transportation and energy policies have been concentrated on lower-income communities and communities of color.[27,28] The transition to an electrified system will be the largest transportation and energy evolution in our lifetimes. The TES is a pivotal step in imagining and planning for that future in a way that leaves behind the inequities of the current system.[29] This can be realized through the adoption of (1) an equitable distribution process, (2) a transportation equity baseline and (3) a clear model for adaptive management to help reach these goals, among other proposals.

The TES development process involved significant input from representatives of overburdened communities from across the state. They included members of the Front and Centered Advisory Panel, which was convened for the purpose of integrating equity principles in the TES and contributing recommendations for this report.

Background and Statutory Guidance

The TES presents an extraordinary opportunity to set right the effects of past inequities by building on federal and state policies. The Justice40 Initiative[30] and CCA[31] set targets for investing in communities that have faced environmental injustice. CETA requires that equity become an explicit part of electric utility planning. Move Ahead Washington and the HEAL Act establish specific environmental justice requirements.

RCW 43.392.010[32] says "the legislature further finds that in order to meet the statewide greenhouse gas emissions limits in the transportation sector of the economy, more resources must be directed toward achieving zero emissions transportation and transit, while continuing to relieve energy burdens that exist in overburdened communities." **RCW 43.392.040(1)(f)**[33] says the EV Council must "ensur[e] the statewide transportation electrification strategy, grant distribution, programs, and activities associated with advancing transportation electrification benefit vulnerable and overburdened communities."

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27 Sanchez, Stolz and Ma, "Inequitable Effects of Transportation Policies on Minorities."

28 Sanchez, "Poverty, Policy, and Public Transportation."

29 Huether et al., "2023 Transportation Electrification Scorecard."

30 The White House, **"Justice40,"** (n.d.).

31 Washington Department of Ecology, **"Climate Commitment Act,"** (n.d.).

32 **RCW 43.392.010 – Interagency Electric Vehicle Coordinating Council: Findings – Intent.**

33 **RCW 43.392.040 – Interagency Electric Vehicle Coordinating Council: Council responsibilities – Annual Report.**

Equity and Transportation Electrification

Over the life span of the TES, transportation electrification will deliver substantial economic and health benefits to Washington residents, perhaps most clearly through reducing air pollution from vehicle exhaust in all communities. But without careful policy design, these benefits may be provided predominantly to the same neighborhoods and populations that have seen advantages from past policy and funding decisions. Such an outcome would leave in place institutional racism, an economy stacked against those with less generational wealth and obstacles to mobility for those without good credit or personal vehicles. The federal and state governments are investing in a new age of clean transportation infrastructure and have the opportunity to level the playing field for people all over the state and especially those facing cumulative environmental, health-based, discriminatory and financial harms layered brick by brick by our existing reliance on fossil fuels.

The EV Council is committed to building a new clean transportation system in an equitable way, which the previous system never did. Transportation policy and practice have far-reaching implications for many aspects of people's lives, including their health, wealth, safety and fundamental dignity. BIPOC and low-income communities, people with disabilities or language barriers and frontline transportation workers at ports and on highways bear greater exposure to the harmful effects of the transportation system, such as air and noise pollution and traffic collisions, and suffer from the division of their neighborhoods by highways, train tracks and airports.[34,35] Furthermore, they have limited access to essential resources, such as public transit, sidewalks and safe bike paths, resulting in longer and more challenging commutes.[36] Community members asked that the TES recognize these disparities and actively work to ensure the harms and inequities of the current transportation system do not carry over into the new, electrified system.[37,38]

Simultaneously, BIPOC communities have consistently struggled to improve equity in the electricity system. Energy burden and insecurity tend to be highest among Washington's BIPOC and elderly communities. People with larger energy burdens have long sought stronger consumer protections, improved community engagement with respect to price transparency and accountability for how energy is sourced and where facilities are sited. The intent of these efforts has been to enact policies that limit the catastrophic impact of electricity disconnections and voltage disruptions on low-income communities, including BIPOC communities. The TES recognizes these efforts as part of the system within which it must operate.

Transportation electrification, which intertwines the transportation and electricity systems, risks continuing to entrench financial and mobility inequities in Washington if done without actively counteracting these preexisting dynamics. For example, a recent survey from Front and Centered and the NW Energy Coalition found that public EV charging rates in Washington were three to four times higher than residential EV charging rates. Without purposeful policy intervention, this price differential means that in the switch from gasoline and diesel fuel to electric charging systems, those who have access to charging at a residential rate (primarily more affluent single-family home dwellers) will benefit from the savings of

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34 American Lung Association, "Urban Air Pollution and Health Inequities: A Workshop Report," *Environmental Health Perspective* 109, no. Suppl 3 (June 2001): 357–74.

35 Caitlin Cottrill and Piyushimita Thakuriah, "Evaluating Pedestrian Crashes in Areas with High Low-Income or Minority Populations," *Accident Analysis & Prevention* 42, no. 6 (November 2010): 1718–28.

36 Alexandra K. Murphy, Karina McDonald-Lopez and Alix Gould-Werth, **"Transportation Insecurity in the United States: A Descriptive Portrait,"** *Socius* 8 (September 14, 2022).

37 TES Public Engagement feedback.

38 Front and Centered, **"Just Movement Listening Sessions and Survey Findings,"** (n.d.).

low-cost charging, whereas those who rely on public charging (including people who live in multifamily housing, renters and high-mileage drivers) will see less in savings. What is more, those who cannot make the switch in the first half of the transition — by 2035 — may face higher fuel costs and lower ICE vehicle resale values as gasoline and diesel distributors see less demand and dirty vehicles become less desirable. Equitable public investment will be required to ensure that all Washington residents can participate in the transition, access its benefits and have upward mobility.

The TES should advance and support these efforts toward security, safety and sustainability in the electrified transportation system. It should unite communities rather than divide them; provide individuals the tools to own, govern and benefit from the energy and transportation assets in their community; and aim to deliver jobs, community wealth and public health to overburdened communities throughout Washington.[39]

To do so concretely, the following framework was developed.

Framework for Equity in Transportation Electrification

The EV Council identified a framework composed of three elements needed to equitably implement the TES:

- Define an equitable distribution process to guide the allocation of electrification funding and resources to overburdened communities and vulnerable populations.
- Establish a statewide transportation equity baseline upon which the effects of electrification and other transportation initiatives can be measured and outcomes tracked.
- Create an adaptive management process that Commerce and other state actors can use to "learn and adapt," to ensure the TES implementation improves equity outcomes.

Equitable Distribution Process

The TES prioritizes investments the market will not make on its own, targeting strategies and funding for those who most need them and to whom they would be most beneficial. The federal government and Washington have set a goal of distributing at least 40% of investments for transportation electrification to overburdened communities and vulnerable populations. Agencies investing in transportation electrification should consider the 40% goal as the minimum percentage of investment that will go to these communities and populations, not the maximum.

The EV Council created a special equity task force — composed of representatives from the Departments of Commerce, Ecology, Health (DOH), WSDOT and members of the Front and Centered Advisory Panel — to identify the criteria that will be used for allocating funding to overburdened communities, listed below. Note that this approach was developed to distribute funding in the short term. The state intends to continue its work, in alignment with the Environmental Justice Council and HEAL Act agencies, to best identify overburdened communities. Updated definitions should be developed with community input and enable the incorporation of qualitative measures.[40]

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39 Greenlining, **"Achieving Electrification Equitably: Principles for Building EV Charging Infrastructure For Everyone,"** *The Greenlining Institute*, (October 20, 2022).

40 For an example of how qualitative feedback might be included, see Colorado Energy Office, **Colorado EV Equity Study,** (2022).

In the interim, the state will prioritize transportation electrification funding to census tracts that are:

- Ranked 9 and 10 on the DOH's Environmental Health Disparities Map
- Tribal lands
- In the 80th percentile and above for race and income in the U.S. Environmental Protection Agency's (EPA) EJScreen tool[41]

In addition, the state should consider vulnerable populations for prioritization as required by **RCW 70A.02.010**,[42] including those who are low income, are linguistically isolated, are BIPOC, have disabilities, work on the frontlines of transportation pollution (including highway workers, commercial drivers and those who work at refineries and marine and aviation ports) and have been disadvantaged by historical or institutional racism.

Part of equitable distribution is strategically investing dollars in programs, strategies and sectors that can address long-standing inequity affecting overburdened and vulnerable communities. This includes:

- Making strategic electrification investments to convert light-, medium- and heavy-duty fleets that disproportionally operate in or pollute overburdened communities.
- Ensuring electric charging infrastructure is established and maintained in overburdened communities, especially where there are currently high ratios of people to EV chargers.
- Developing financing approaches that avoid debt traps and predatory lending.
- Electrifying school buses, public transit buses, owner-operated trucks and other vehicles for those who drive for a living.
- Enabling community economic development through publicly owned charging and support for community-controlled EV charging and revenue generation, investments in transitions for locally owned gas stations, public or community-based EV sharing and leasing programs and alternative career pathways for engine mechanics and other workers/community businesses in the gasoline and diesel fuel and vehicle industry.

Transportation Equity Baseline

If Washington does not know where inequities exist in the current system, it will be impossible to measure progress toward relieving them. To assess the impacts of transportation electrification, the state must develop a baseline index and track its progress across variables on a regular basis.

Based on a literature review and discussions with the equity task force, the following metrics were put forward as a starting point for the EV Council to gather and centralize ideas. Each EV and EVSE funding program should evaluate which metrics are relevant for its program for tracking and annual reporting, supplementing with additional data as appropriate.

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41 U.S. Environmental Protection Agency, **"EJScreen: Environmental Justice Screening and Mapping Tool,"** (n.d.).

42 **RCW 70A.02.010 – Environmental Justice – Definitions.**

- **EV adoption disparities (percent compared with population) broken down by the list of vulnerable communities included in the above definitions:** Over time, the EV adoption disparity between the general population and vulnerable populations should be reduced as outlined in the HEAL Act. If the rate of EV adoption remains static or grows larger, then investment allocations, targets and outreach efforts should be adjusted to ensure the desired equitable outcomes are achieved.

- **State dollar allocation (dollars) in overburdened and vulnerable communities as a percentage of overall funding for transportation electrification:** Measure the dollars spent/invested in overburdened communities to ensure that, at a minimum, the 40% threshold is being reached. If that target is not being reached, adjust program investments. Also measure the dollars spent/invested in the vulnerable populations listed above and in those further identified by the EV Council, to the extent data is available.

- **Air quality, fine inhalable particulate matter with a diameter less than 2.5 micrometers ($PM_{2.5}$ [microgram/m^3]), sulfur oxides (SO_x), NO_x and other applicable criteria and non-criteria pollutants caused by transportation in overburdened communities:** Measure air quality in these communities to track that the investments being made are having the desired effect of reducing air pollutants. If air quality is not improving, the state should investigate ways to identify specific vehicles that travel through these communities and prioritize their electrification.

- **Transportation energy burden (percent of income):** Commerce tracks the percent of energy-burdened households (defined as a household that spends more than 6% of its income on energy[43]), as required by CETA.[44] The EV Council should build on this work to track transportation energy burden, especially for overburdened communities, which should decrease or stay static as a result of the TES.

- **Crash-related injuries (number) by vehicle weight and severity tracked in overburdened communities and by vulnerable populations:** EVs tend to be heavier and quieter, and have faster acceleration than their ICE equivalents. As the number of EVs increases, it will be important to assess their effect on the safety of all road users, including pedestrians and cyclists. If crash-related injuries increase as more EVs are driven on Washington's roads, the state will need to address the issue by exploring and enacting different measures. WSDOT should share crash-related data with the EV Council to monitor this situation.[45]

- **Impact of electrification on transit accessibility:** WSDOT's public transit division data, which is used to populate the Washington State Transit Access Map,[46] can be used to inform the state's electrification process. If transit access is worsening in the defined communities, the state will need to ensure that transit service is not being negatively affected by electrification, and potentially revisit investments in terms of actual outcomes.

- **Transportation security:** A biennial statewide Transportation Security Index[47] survey is included in the TES policy recommendations **(monitor equity indicators and measure outcomes)**. Modeled on the Food Security Index and hosted by the University of Michigan, the Transportation Security Index

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43 Washington Utilities and Transportation Commission, **"Issue Brief 3: Energy and Equity in Washington State,"** (n.d.).

44 Kendrick Stewart, **Low-Income Energy Assistance 2023 Legislative Report**, Washington State Department of Commerce, (March 6, 2023).

45 Washington State Department of Transportation, **"Crash Data,"** (n.d.).

46 Front and Centered, and Center for Neighborhood Technology, **"Washington Transit Access Map,"** (n.d).

47 University of Michigan, Poverty Solutions, **"The Transportation Security Index,"** (n.d.).

is a 16-question survey (which can be abbreviated to six questions if necessary) that asks respondents about how their transportation situation affects their daily life. Survey results would help the EV Council determine if the measures taken are improving people's overall mobility situation or worsening it.

Adaptive Management Process

The following elements will be critical to the design and implementation of an adaptive management process that advances equity:

- **A structure and process for adjusting transportation electrification strategies to respond to data trends affecting equity:** It will be important for the state to have an iterative and adaptive approach to the investments and initiatives outlined in the TES. To do this, the state should assess overburdened communities across the metrics detailed above to establish baselines and measure their change over time. If the relevant indicators are not moving in the right direction, the EV Council and EV Council Advisory Committee should revisit each intervention and objective to assess how it can be adapted. Review of these indicators for each covered program should be a regular part of EV Council or relevant departmental meetings, and the EV Council should release an annual report with a summary of this effort.

- **A community engagement structure to assist the state in understanding data trends, including how they play out in particular communities:** Due to the magnitude of this transition and the myriad effects it could have, it will be essential to hear directly from community members and use their feedback to further evaluate the success of the state's approach. This is especially important in overburdened communities where quantitative data may be harder to gather. Qualitative feedback can be equally important to understanding whether the TES is benefiting those communities, and tracking the overall perception these communities have toward transportation electrification.

The concrete commitment from the EV Council to an equitable distribution strategy, coupled with the transportation equity baseline and an effective adaptive management process, are critical to ensuring that the TES outlines a path that meets the state's decarbonization targets while also achieving its legislative mandate of benefiting vulnerable populations and overburdened communities. This framework orients toward a cleaner, more just transportation and energy future.

A hybrid electric bus sits ready to roll.

Transportation Electrification Justice: In Our Own Voices

Members of the Front and Centered Advisory Panel provided the following quotes and calls to action. Their contributions helped shape the TES's recommendations.

Chiyo Crawford, Executive Director, Environmental Coalition of South Seattle (ECOSS):

"The state TES needs to be able to address policy that ensures cost of living will not be impacted by any changes to building infrastructure, public infrastructure, modes of transportation and utility rates. Public transit users are often unwilling to support or acknowledge public transportation electrification because of beliefs that the cost of riding will increase, and routes/services will lessen in their neighborhoods, meaning it will take more time and money to travel."

Paul Tabayoyon, Executive Director, Asian Pacific Islander Coalition of Yakima:

"Electrification of transportation comes with many inequities in the rural areas of eastern Washington. With limited access to property for placement of charging stations in public access spaces and easement and zoning issues, community members are finding that many new EV chargers are being placed on private property with limited or no public access.

"Many local governments, city and county, do not have additional staffing to properly analyze where zoning needs to be changed, or are heavily resistant and continue to permit gas stations, as is the case with Yakima County. This has the potential to end in abandoned chargers, investors who take money but do not use it appropriately and the waste of placement of chargers in areas that do not have a need.

"Examination of grant funding needs to be done quickly to ensure that all charging stations installed using public funds are placed where the general public will have access without worry of ticketing, towing or additional costs placed upon the consumer by higher charge rates. Without uniformity, EV charging rates will be different and exceptionally difficult to manage by consumers, creating a negative impact that prevents EV purchasers."

Krystal Monteros, Member, Empower Movement Washington:

"People with disabilities face numerous issues when it comes to electric vehicles. One example, for wheelchair users and possibly those with low vision, is the cords at every charging station. They are taking up the sidewalk space that was initially meant for people with disabilities to have independence, accessibility and safety when in public.

"As of now, electric vehicles are silent. This is of major concern for people who are blind and low vision. The fact that they only make noise when going below 18 miles per hour can put many lives in danger who have learned to rely fully on sound for independence and safety. Aside from the sound concern, braille needs to be on every charging station to comply with ADA regulations.

"Many people with disabilities fall in the category of low income. If they are able to afford an electric vehicle, chances are they will rely on cash only. From the equity and accessibility perspective, it is best to accept both cash and credit at each charging station."

3. Where Washington Is Today

Washington's Current Transportation System

Washington's transportation system – composed of roads, ports, railways, sidewalks, bike lanes, transit lines, vehicles small and large, and the people who operate and maintain the vehicles and infrastructure – supports the movements of over 7.7 million people and a $725 billion economy.[48] Washington's transportation system is also the largest source of climate pollution in the state at 39% of total emissions, according to Washington's most recent official GHG inventory (2019). Washington has long been a climate leader, and recent progress in curbing GHG emissions places it among a small subset of front-running U.S. states.[49] Washington's leadership in decarbonizing transportation through electrification is critical for reducing overall emissions and driving market demand and innovation.

Table 7

Washington's Current Clean Transportation Requirements and Targets

Year	Goal(s)
By 2030	2030 EV Target — 100% of new passenger vehicles sales are electric, per Revised Code of Washington (RCW) 43.392.020* (non-binding target). Emissions Limit — Economy-wide GHG emissions down to 50 MMT/year, 45% below 1990 levels, per RCW 70A.45.020.** 30% to 50% of new MHDVs must be zero emissions depending on vehicle class, per ACT rule. Carbon-neutral electricity, with a maximum of 20% offsets, per RCW 19.405.040.***
By 2034	20% reduction in carbon intensity of on-road transportation fuels over 2017 levels, per Chapter 173-424 Washington Administrative Code (WAC).****
By 2035	100% of new passenger vehicles must be electric, per ACC II rule.
By 2040	Economy-wide GHG emissions down to 27 MMT/year, 70% below 1990 levels, per RCW 70A.45.020.
By 2045	Zero emissions electricity, per RCW 19.405.040.
By 2050	Economy-wide GHG emissions down to 5 MMT/year, 95% below 1990 levels, per RCW 70A.45.020.

* **RCW 43.392.020 – Interagency Electric Vehicle Coordinating Council – Target Established – Scoping Plan.**

** **RCW 70A.45.020 – Limiting Greenhouse Gas Emissions – Greenhouse gas emissions reductions – Reporting Requirement.**

*** **RCW 19.405.040 – Washington Clean Energy Transformation Act – Greenhouse gas neutrality – Responsibilities for electric utilities – Energy transformation project criteria – Penalties.**

**** **Chapter 173-424 WAC – Clean Fuels Program Rule.**

48 Woodruff and von Kerczek, "Gross Domestic Product by State and Personal Income by State, 1st Quarter 2023."

49 RMI, **"Washington State Scorecard,"** (n.d.).

An EV driver uses the control panel to adjust settings.

Washington's clean transportation requirements and targets (Table 7), along with the state's existing equity goals, are intertwined. The pace of progress and degree of success in meeting one goal will affect others. For example, early and robust decarbonization of the transportation system will make the state's economy-wide GHG emissions targets much easier to achieve. And urban design improvements to reduce VMT will make the electrification transition easier by requiring less infrastructure build-out while providing a better quality of life for overburdened communities.

Washington has already implemented some of the policies needed to meet these goals and is recognized as a national leader in the work to electrify transportation. Some examples include:

- In addition to standing up the EV Council and authorizing the TES, the Move Ahead Washington transportation package makes historic investments in public transportation, state ferry fleet electrification, active transportation infrastructure and high-speed rail.
- As directed by the Legislature, the Department of Ecology has adopted multiple standards — ACC I and II and **ACT** — from the California Air Resources Board (CARB), instead of less clean federal standards, to drive future emissions reductions.
- Washington has reduced per capita VMT more than any other state since 1990.[50]
- In the 2021 state building code, new single-family residences are required to have the electrical infrastructure needed to support EV chargers, known as EV readiness.
- All three investor-owned utilities (IOUs) and at least seven consumer-owned electric utilities are currently implementing plans for accelerating transportation electrification.

50 Ridlington, "Less Driving Is Possible."

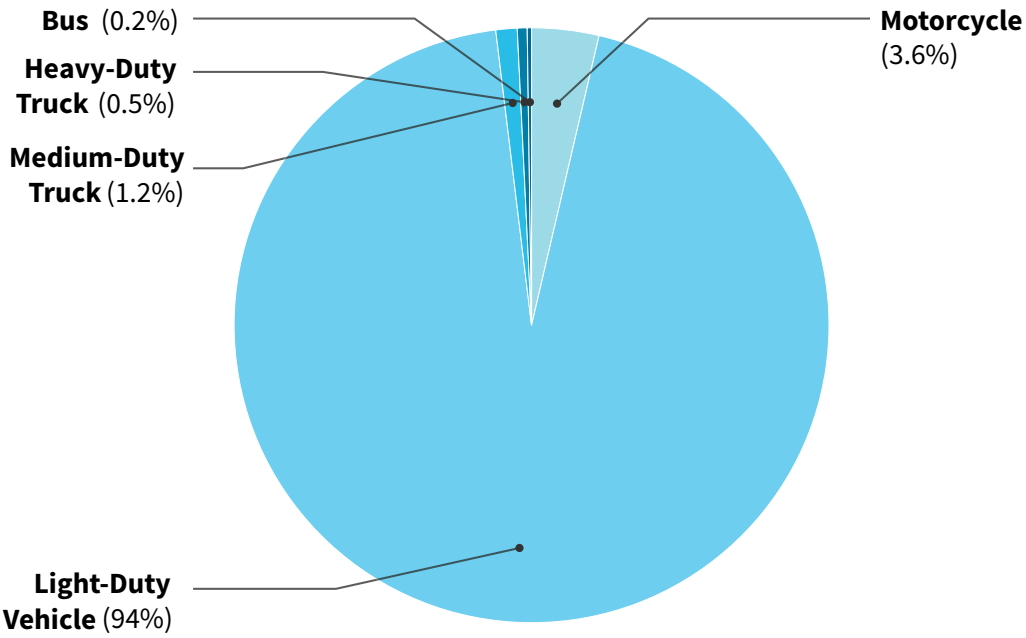
Modeling for the TES suggests the state's current transportation policies and programs — ambitious and critical as they are — will need additional scaling and an increased implementation pace to meet the state's electrification, climate, health and equity targets under today's political and market conditions. To understand how far the state will have to go to meet its goals, this chapter examines Washington's current vehicle stock, vehicle sales, VMT, transportation emissions and EV charging infrastructure.

2022 Total Vehicle Stock

LDVs — cars, crossovers, vans, SUVs and pickup trucks — make up the vast majority of the more than 6.5 million on-road vehicles in Washington today (Figure 7). Although gasoline-fueled LDVs are the vast majority of vehicles in Washington, according to the EIA, in 2021, 27% of on-road fuel consumption in Washington was by diesel vehicles, indicating proportionally greater fuel consumption per vehicle among MHDVs.[51]

Figure 7

2022 Vehicle Stock by Type



Sources: Washington State Department of Licensing (DOL), Office of Superintendent for Public Instruction (OSPI), Transit Agencies

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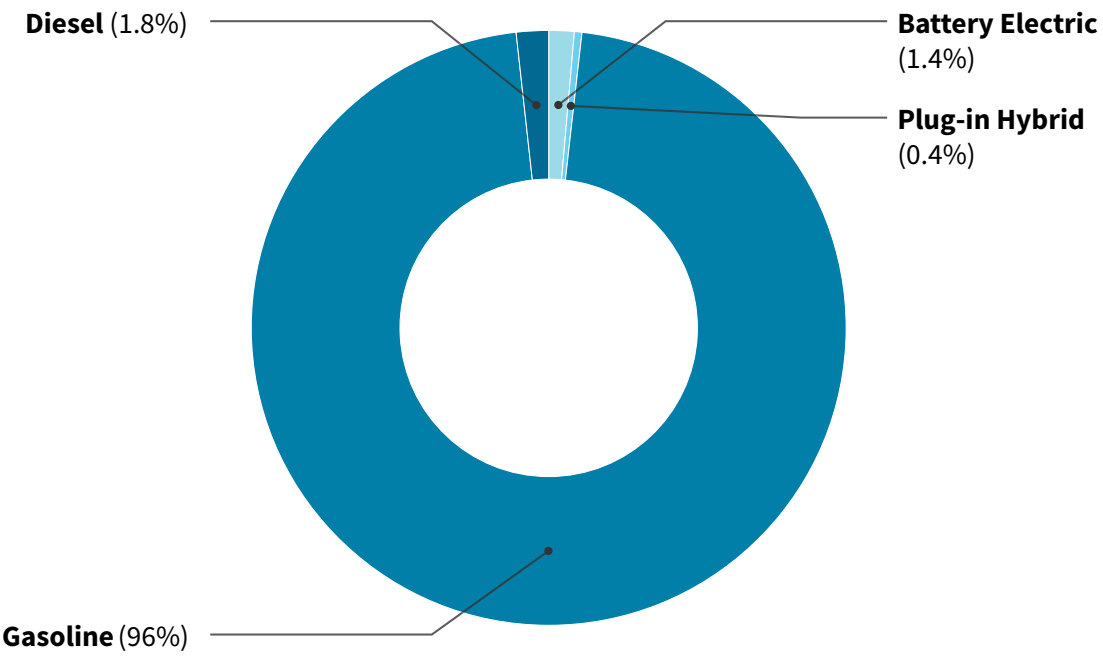
51 U.S. Energy Information Administration, "Washington State Profile and Energy Estimates."

Figure 8 2022 Light-Duty Vehicle Stock by Powertrain

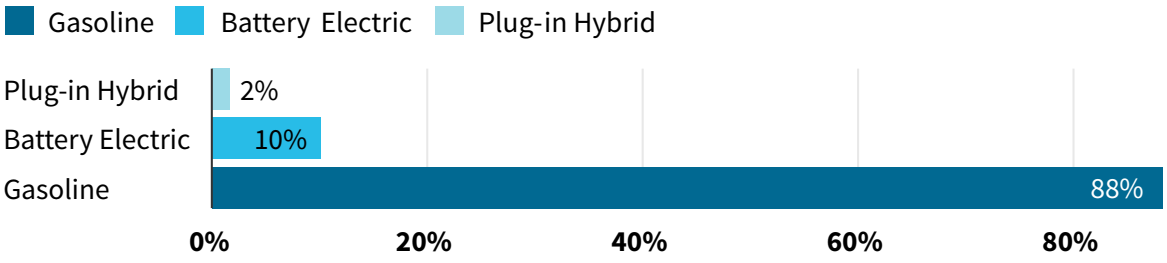


Source: DOL

2022 New Vehicle Sales

The vast majority of new vehicles sold in Washington in 2022 were powered by gasoline, making up roughly 88% of new LDV sales in the state (Figure 9). Sales data from the first five months of 2023 suggests that approximately 16% of new LDVs sold in Washington were either BEVs or PHEVs.[52] Although this is excellent progress, Figure 8 shows that BEVs account for only 1.4% of the entire vehicle stock. Compared with the history of new technology adoption, light-duty EV adoption in Washington is still in the innovation stage, meaning far more intervention is required to reach the state's goals.[53]

Figure 9 2022 New Light-Duty Vehicle Sales by Powertrain



Source: DOL

52 Ryan, "Electric Vehicle Sales Accelerate in Washington State."

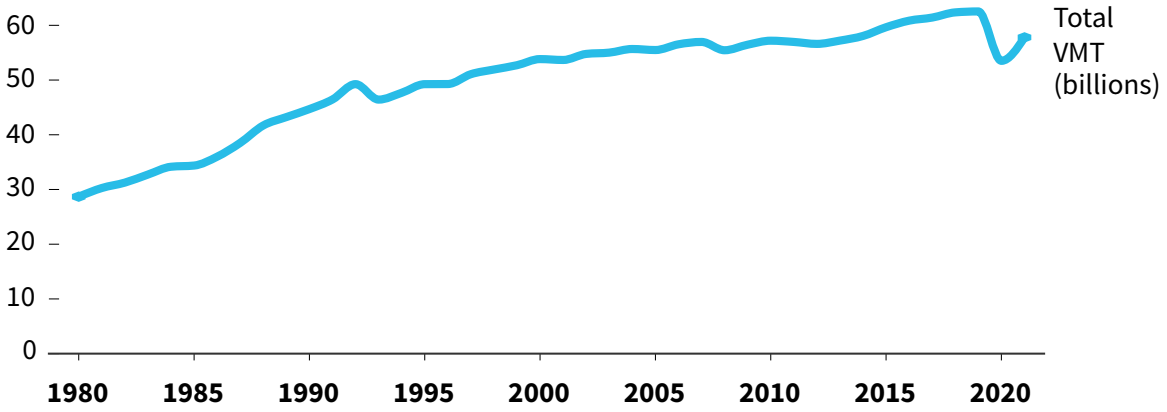
53 Guru Mirthinti, **"Technology Adoption Curve: 5 Stages of Adoption,"** *Whatfix* (blog), (March 16, 2023).

In 2022, negligible numbers of new electric MHDVs were sold (not including buses). Approximately 1% and 3% of new motorcycle and bus sales, respectively, were electric.

Vehicle Miles Traveled

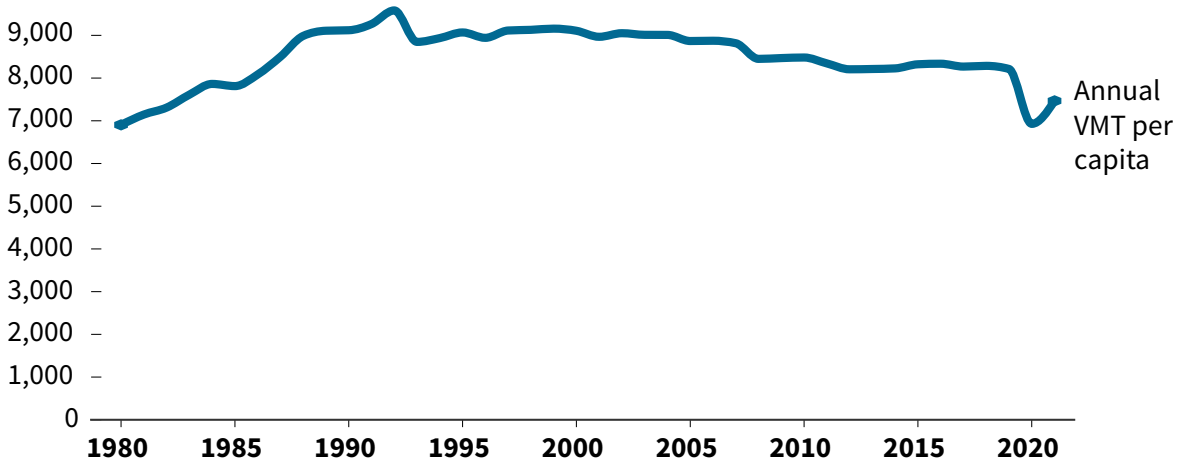
Washington's VMT has grown along with the state's population, but not to the same degree (Figure 10). In fact, over the past 25 years, Washington's VMT per capita has declined more than that of any other U.S. state (Figure 11), likely due to Washington's long-standing policies on commuting and working from home, investments in transit and improvements to walking and biking infrastructure.[54] WSDOT released a report in the summer of 2023 that outlines a process for establishing local VMT targets and recommends policy and funding options for local jurisdictions to employ in meeting the targets.[55] The majority of VMT driven in the state comes from LDVs (Figure 12).

Figure 10 **Washington Total Vehicle Miles Traveled, 1980-2021**



Source: WSDOT

Figure 11 **Vehicle Miles Traveled per Capita, 1980-2021**

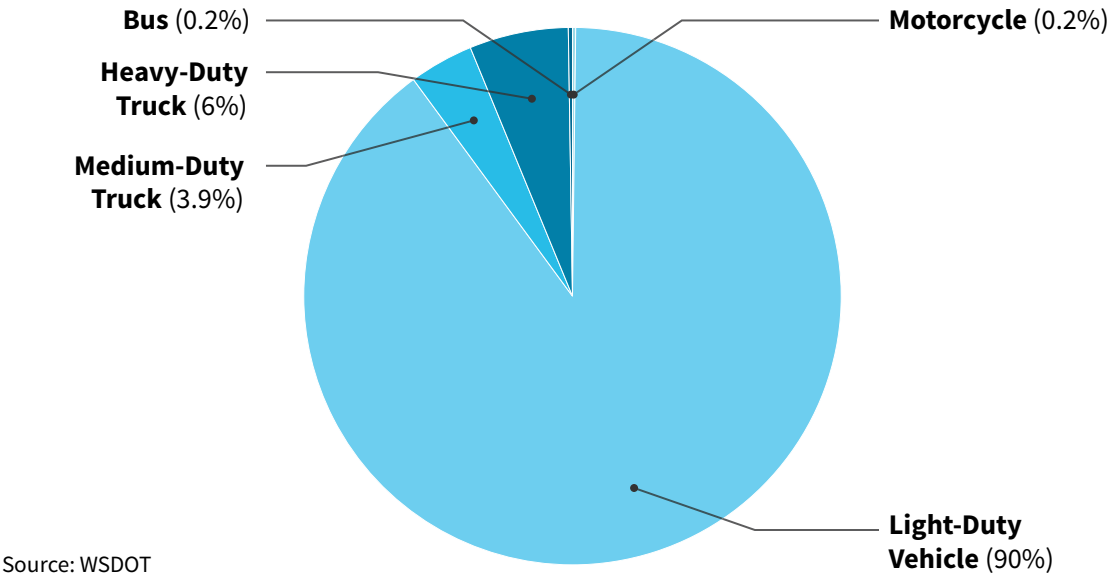


Source: WSDOT

54 Ridlington, "Less Driving Is Possible."

55 Millar and Pen, "Vehicle Miles Traveled (VMT) Targets — Final Report."

Figure 12 2022 Vehicle Miles Traveled by Vehicle Class



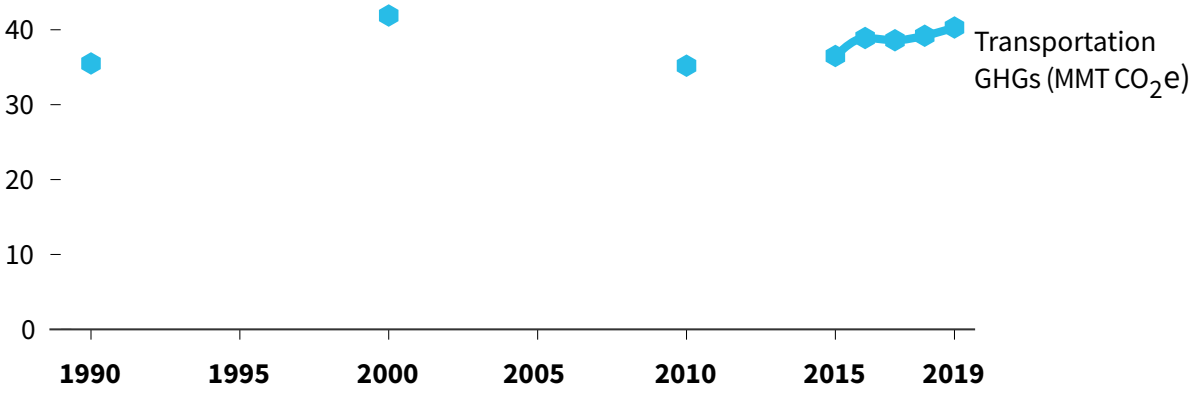
Source: WSDOT

Transportation Emissions, All Vehicles

In 2020, Washington updated its GHG emissions limits and set a binding target for itself to reduce economy-wide emissions to 50 MMT CO_2e by 2030. As the state's largest emitting sector (39% in 2019), the transportation sector will need to play a central role in the state's meeting its 2030 emissions target, and subsequently its 2040 and 2050 emissions targets.

The **2021 SES** found that Washington's transportation sector must decline from roughly 38 MMT CO_2e in 2022 (Figure 13) to 20 MMT CO_2e or lower by 2030 to support the state's economy-wide climate goals. Based on the latest inventory, on-road GHG emissions make up approximately 58% of the state's transportation sector emissions, suggesting this subsector would contribute 11.6 MMT CO_2e in 2030 if this percentage stays the same. However, it is highly likely that annual on-road emissions in 2030 must be less than 10 MMT CO_2e to make up for harder-to-decarbonize sectors and subsectors, including non-road transportation, industrial processes and commercial and industrial buildings.

Figure 13 Washington Transportation GHG Emissions, 1990-2022

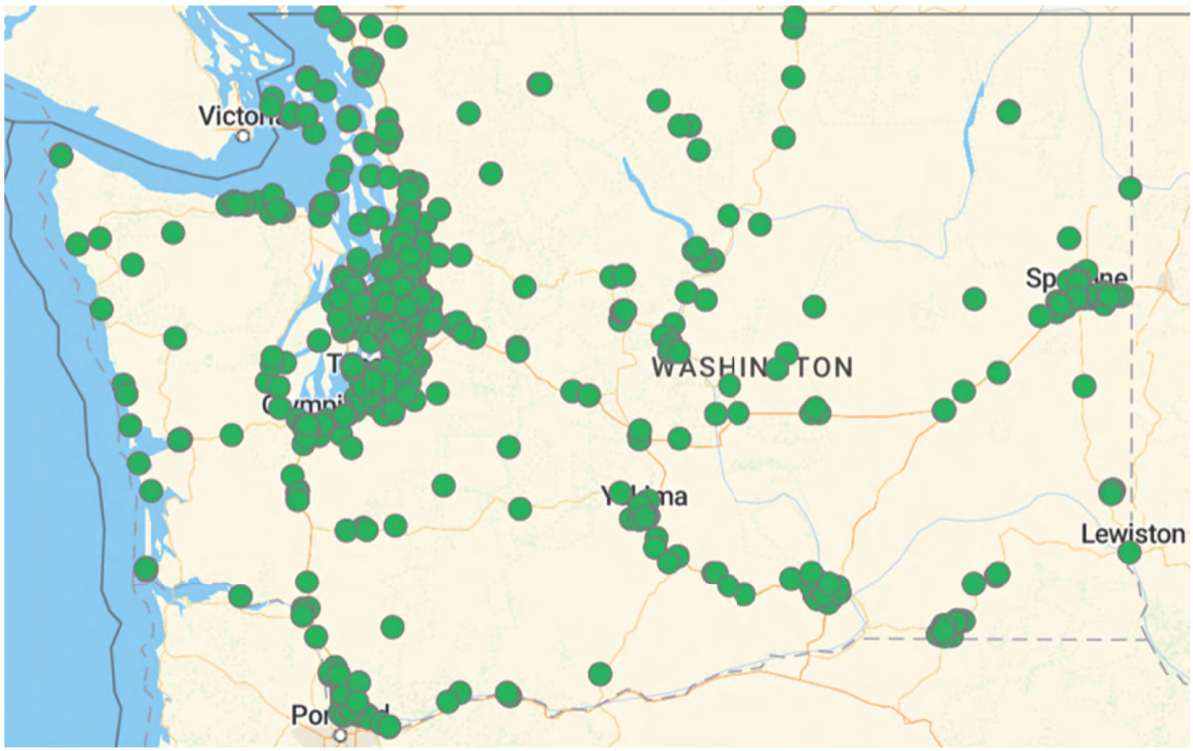


Source: Ecology

EV Charging Infrastructure

According to the U.S. Department of Energy's Alternative Fuel Data Center, Washington has 1,064 DCFCs at 280 locations, and 4,275 publicly accessible L2 EV chargers at 1,832 locations (Figure 14).[56] Although EVs can be charged using common 120 volt outlets, the slow speed of charging at those outlets can make it an impractical option for certain situations and use cases. Faster charging using higher voltages requires specialized infrastructure. As more EVs are deployed, more specialized charging infrastructure will have to be built, as will supporting grid infrastructure such as demand-side management technologies; new generation, transmission and distribution; and upgraded building panels.

Figure 14 **Map of EV Charging Stations in Washington**



Source: U.S. Department of Energy Alternative Fuel Data Center

Washington Residents' Perceptions about Transportation Electrification

For Washington to successfully meet its goals, it is essential to understand not only the transportation sector but also the barriers state residents face (or perceive they face) in the transition to electric transportation systems. As part of the TES public engagement process, the consulting team interviewed a diverse group of Washingtonians on the kinds of barriers that exist for transportation electrification, with a focus on overburdened communities and vulnerable populations. The sample sentiments in Table 8 broadly reflect interview findings. The full list of organizations and individuals interviewed can be found in Appendix B.

56 U.S. Department of Energy — Energy Efficiency & Renewable Energy, "Electric Vehicle Charging Station Locations," accessed December 18, 2023.

Table 8 Sample Barriers to Transportation Electrification from Interviews

Barrier	Samples from Public Outreach Interviews
Public Charger Availability and Accessibility	There is a lack of publicly available charging infrastructure and charging infrastructure for multifamily housing. It is expensive to install charging infrastructure. The current lack of regulations or standards for charging infrastructure makes charging stations difficult to use, unreliable and unpredictable. Charging stations vary in cost, access and charging speed.
Cost to Purchase EVs	The high up-front cost for EVs — including e-bikes, personal cars and MHDVs — is a large barrier for many, particularly low-income communities and small businesses.
Supportive Policies and Funding at Local, State and National Levels	Incentives and grants for EVs are fragmented, are incompatible with each other, and have regulatory limits. Applications can be difficult to navigate, and existing incentives are not sufficient to make EVs affordable, especially for MHDVs.
Public Understanding and Excitement	There is a current lack of awareness about electrification. The state needs to educate, inform and solicit feedback from community members, understanding that many communities have other pressing priorities.
Demand on Power Grid and Increasing Renewable Generation	The state's electrical grid needs to be updated to support the widespread and rapid deployment of EV infrastructure. EVs will increase overall electricity demand, which requires new generation, transmission and distribution resources to be quickly built. Coordination among utilities and EVSE/charging companies needs to be dramatically improved. Without coordination, interconnection times may increase, significantly delaying EVSE installations.
Inequities for Overburdened Communities in the Electrification Transition	Communities of color and low-income communities often live closest to transportation corridors and industrial facilities and are overburdened by the health impacts of noise pollution and poor air quality. But people living in overburdened communities do not feel included in decision-making and policy prioritization within the electrification conversation.

Change Is Possible, but More Support Is Needed

Understanding the current state of Washington's transportation system through data and interviews allows for the state to chart a course for meeting its ambitious goals. Although the transportation electrification transition has begun, reaching Washington's near-term and long-term goals will require new policies and programs to support electrification, drive market demand and inspire change.

4. Where Washington Needs to Go

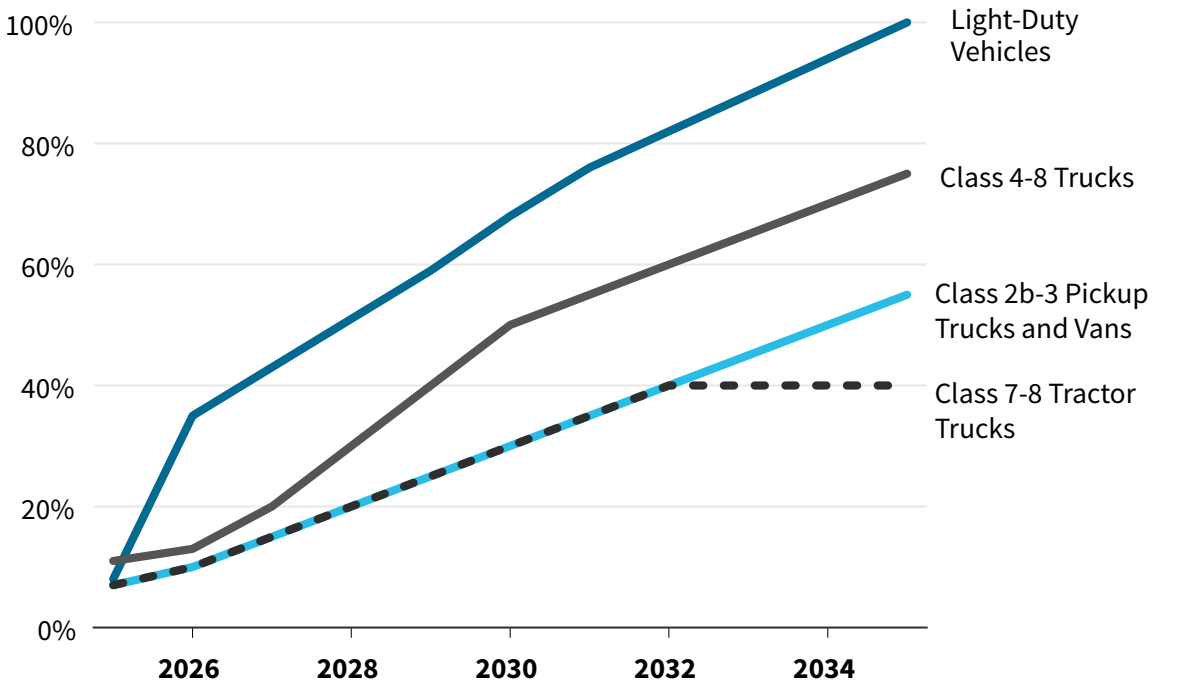
Policy Context and Key Analytical Findings

Policy Context

In recent years, Washington has adopted strong policies that support on-road vehicle electrification. Paired with revamped federal incentives that help reduce EV costs, these policies form the TES's backdrop.

For new LDVs, the **ACC I and ACC II** regulation puts in place progressively stringent ZEV sales share requirements, culminating in a 100% sales requirement by 2035. For new MHDVs, the ACT regulation also requires increasing sales shares, albeit at considerably lower levels (40%–75% ZEV sales share required by 2035, depending on vehicle weight class) (Figure 15). At the federal level, the IRA provides significant incentives that help reduce the up-front cost of ZEVs and supporting infrastructure through restructured, expanded and extended tax credits.[57]

Figure 15 **Sales Requirements for New Zero-Emissions Vehicles by Model Year**



57 For example, the Clean Vehicle Credit, Commercial Clean Vehicle Credit and Alternative Fuel Vehicle Refueling Property Credit.

This policy baseline — and especially the ACC II rule — plays a critical role in setting Washington on a path toward increasing sales of new EVs. If the state had not adopted ACC II, light-duty EV adoption based on economics alone would be unlikely to result in the state realizing adoption rates needed to meet either the 2035 or the accelerated 2030 EV target of 100% electric LDV sales. This indicates a clear need for additional policy support to ensure these targets can be attained — and attained equitably. For MHDVs, ACT plays a role in spurring vehicle electrification, although its considerably less stringent sales share requirements lessen its impact compared with the influence of ACC II on LDV sales.

The **ACF** regulation — a companion policy adopted in California that imposes purchase requirements on certain fleets of MHD trucks — has significant potential to bolster ACT and spur considerable truck electrification, should the state adopt it or a similar regulation.

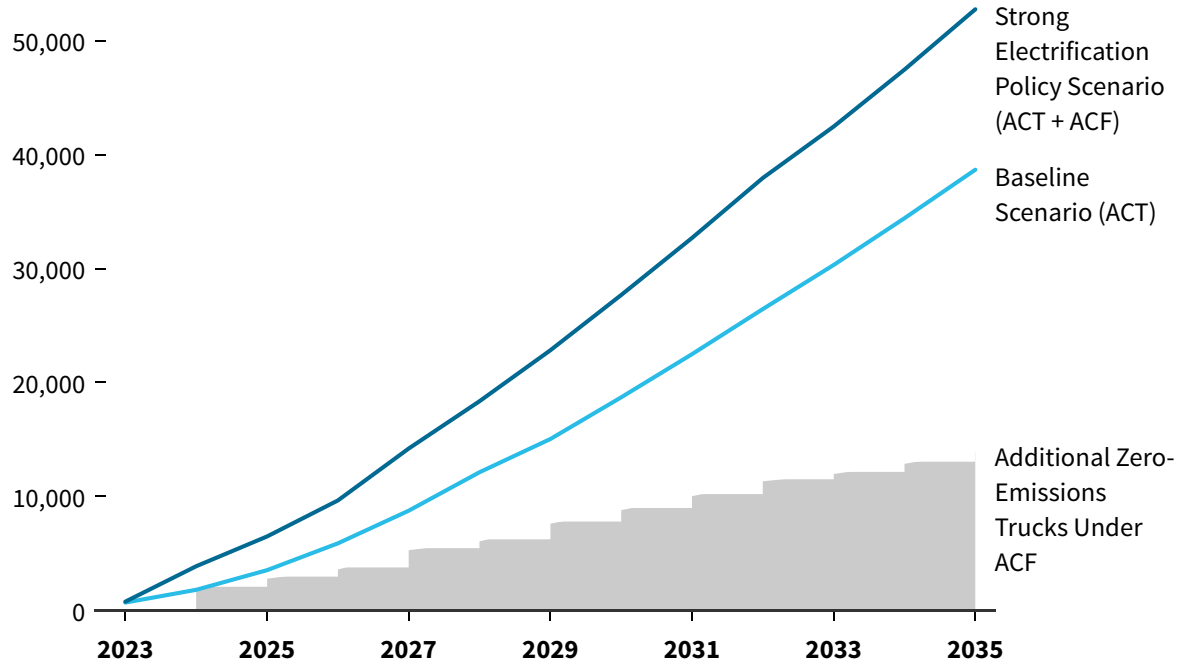
Key Analytical Findings

The modeling conducted for the TES demonstrates the wide variety of potential outcomes that might be expected based on different assumptions about future economic, policy and consumer preferences. Several clear themes emerge from this modeling, which help inform the policy recommendations and implementation guidance detailed in subsequent sections of this strategy.

1. The state's adoption of **ACC II is a critical component of transitioning to an EV future**. The strong and essential effect of ACC II is clear in all but the most optimistic exploratory scenarios. However, achieving the regulation's sales requirements will necessitate additional policies and incentives to undergird the policy's top-line requirements, such as infrastructure build-out, consumer education and reduced purchase price. Absent further intervention and policy support, economics-based adoption of EVs is unlikely to enable the state to attain the ACC II's requirement that light-duty ZEV sales account for 100% of new LDV sales by 2035, nor the accelerated goal of reaching this milestone by 2030. Based on anticipated economics alone, the state can expect sales of electric and plug-in hybrid electric LDVs to represent only approximately 59% of new LDV sales in 2030 — far short of the 68% required under ACC II and the 100% required under the 2030 EV target.

2. The **ACF regulation is one of the most powerful levers available to the state for accelerating MHD truck electrification** (Figure 16). By limiting usable lifetimes and setting purchase requirements for specific market segments, ACF ensures that high-impact, electrifiable fleets replace their vehicles. This purchase requirement creates significant demand for the vehicle supply produced under ACT. Further, given that drayage trucks, state and local vehicles, and high-priority fleets — targeted under ACF — comprise a significant number of vehicles (estimated at approximately 40% of total MHD trucks in Washington in 2023), this regulation is uniquely positioned to encourage MHD electrification broadly if adopted.

Figure 16 Zero-Emissions Medium- and Heavy-Duty Truck Population Under ACT and ACF



Note: The S3 Strong Electrification Policy scenario (upper sales share line in chart) includes incentives for MHD truck electrification in addition to those in the ACF regulation.

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3. **Ensuring EV purchase prices are affordable is a key strategy** for getting closer to sales and emissions goals, especially for lower-income residents. Focusing on reducing costs in the near term drives higher adoption rates before the ACC II sales requirements begin to take effect in model year 2026. This supports faster electrification and thereby larger retirements of polluting ICE vehicles. Electric sedans and crossovers have sufficiently strong economics in most years to meet ACC II sales requirements. Pickups and SUVs, in contrast, are likely to require more significant support beginning in 2026 as ACC II requirements ramp up. However, providing higher levels of incentives directly to all potential buyers of larger LDVs is neither feasible nor advisable. This reiterates the importance of ensuring that incentives are targeted to have maximum effect for minimum public cost, as well as capturing the financial and climate benefits of prioritizing and promoting sales of smaller vehicles to the extent possible.

4. **Supporting transportation options for people with lower incomes will be essential for attaining state goals for electrification, climate and equity**. The TES modeling did not explore the influence of socioeconomic or demographic factors on EV adoption. Accordingly, the assessment of how technology costs and policy incentives influence an individual's vehicle purchase or lease decisions does not distinguish between residents who are more or less able to afford EVs. The state will need to ensure that sufficient incentives, charging infrastructure, education and outreach are provided to those least able to help make the necessary EV adoption levels from the modeling a reality.

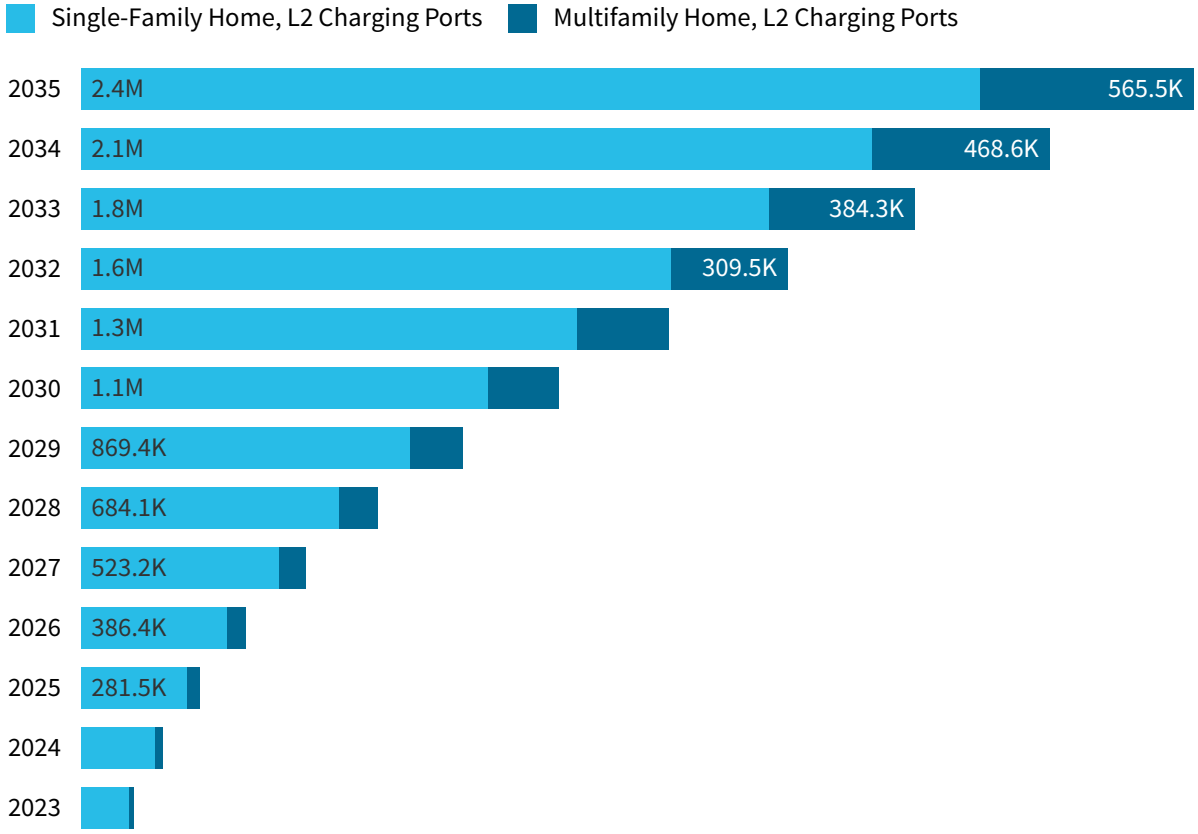
5. **Truck electrification is increasingly economical on a TCO basis**, due in large part to the incentives provided through the federal IRA. Although up-front costs can still represent a barrier, lifetime cost savings present opportunities to scale up electrification of these vehicles, beyond the levels required in the ACT regulation. To ensure truck electrification can drive maximum impact and scale up rapidly, Washington should focus on vehicles with strong potential to reduce local air pollution, removing bottlenecks such as vehicle availability constraints and delays in deploying EVSE and providing education and technical assistance to fleet managers.

6. **The pace of installing charging infrastructure for LDVs and MHDVs needs to accelerate significantly**, indicating a clear role for supportive policies. In 2035 Washington will require more than 20 times more EV charging plugs than the TES model suggests is needed today.

7. **Ensuring availability of home (or neighborhood) charging for multifamily homes meaningfully reduces total public charging network requirements**, providing both cost savings and equity benefits. Figure 17 depicts the estimated number of residential charging ports for both single-family and multifamily dwellings required to support electric LDVs in the S3 Strong Electrification Policy scenario, totaling more than 2.9 million by 2035. Supplementing direct on-site charging with neighborhood charging options in close proximity to multifamily homes will be an important strategy for providing this level of access for residents of multiunit dwellings.

Figure 17

Cumulative Residential Charging Ports Required, S3 Strong Electrification Policy Scenario



8. **Reducing VMT and total vehicle stock, while shifting new sales to lighter-weight vehicles, has significant potential for reducing GHG and local air pollutant emissions**, as well as total costs. However, the deep societal and behavioral changes required to realize the optimistic level of these efficiency changes included in two of the three exploratory scenarios (S4 Strong VMT Policy and S6 Best Case Climate Aligned, but not the S5 Worst Case scenario) indicate that, although these strategies would be helpful for meeting state goals, they should be considered *supplementary to* rather than replacements for meaningful focus on transportation electrification because they are unlikely to occur. These exploratory scenarios assume the state achieves 5,700 LDV VMT per capita in 2035, whereas the core scenarios (S1 Baseline, S2 Strong Electrification Technology, S3 Strong Electrification Policy) assume 6,400 LDV VMT per capita in that year.

9. **Bus electrification requires continued policy support to increase market share.** This support is needed from the state and local level, as well as through flexible federal funding and continued dedicated federal funding such as the Low or No Emissions grant and the Clean School Bus program. The S3 Strong Electrification Policy scenario estimates approximately 8,800 battery electric school buses and 3,500 battery or fuel cell electric transit buses on Washington's roads by 2035, respectively representing 66% and 56% of the state's projected total school and transit bus fleet in that year. This represents a significant increase in electrification over today's estimated 1% and 14% electric school and transit bus fleets in Washington.

10. **Hydrogen FCEVs** are likely to eventually play a role in HD truck and transit bus electrification. The market share these vehicles will obtain remains unclear, but at present battery electric alternatives appear likely to be the primary technology for many applications and duty cycles — especially for LDVs — based on TCO analysis. As both the state's hydrogen economy and FCEV technology mature through 2035, the role played by these vehicles will become increasingly clear. The state should continue to monitor and track the development of FCEV technology and costs, and over time consider how these vehicles can contribute to meeting transportation sector emissions reduction targets. Per RCW 43.330.570,[58] the Department of Commerce's Office of Hydrogen and Renewable Fuels delivered a Hydrogen and Renewable Fuels 2023 Legislative Report to the Legislature in December 2023, which should inform this assessment. Additional analysis on FCEV cost outlooks is included in Appendix D.

11. **Washington will need to take other actions for non-road vehicles**, such as aircraft, watercraft and locomotives, to accelerate their electrification and emissions reduction. Although not a part of this modeling effort, planning and policy measures for addressing non-road vehicles, which represent approximately 42% of the state's transportation emissions, will be vital for meeting emissions targets.

Recommendation: Focus Efforts on Achieving the S3 Strong Electrification Policy Scenario

The state will need to focus on the levers it most readily has available to promote transportation electrification, equity and alignment with climate goals. Accordingly, focusing on the S3 Strong Electrification Policy scenario described in further detail throughout this chapter, while striving for the S3b sensitivity that explores attaining the 2030 EV target of 100% electric LDV sales, is likely to provide the best combination of attainable policy options and feasible programs to implement. The state has the most control over the factors that shape that scenario given its emphasis on policy, whereas it does not have

58 RCW 43.330.570 – Office of renewable fuels – Duties.

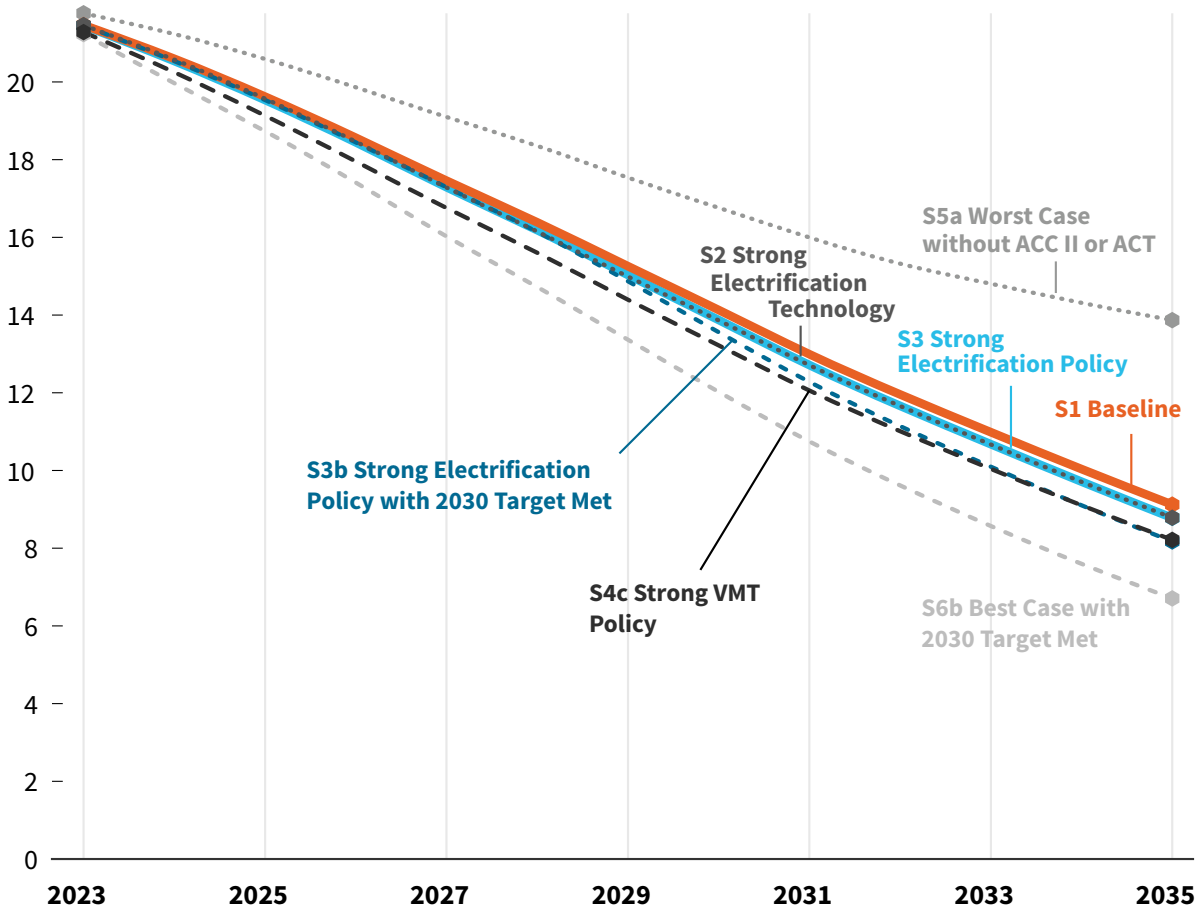
direct control over some other factors modeled in other scenarios, such as the pace of improvements in EV technology (S2 Strong Electrification Technology) or global fossil fuel prices (sensitivities d and e).

As shown in Figure 18, the S3 Strong Electrification Policy scenario projects on-road transportation emissions in Washington to decrease to approximately 13.9 MMT CO_2e by 2030, and to 8.8 MMT CO_2e by 2035, due in large part to supporting successful implementation of existing state and federal policies, including the ACC II and ACT regulations. Achieving the 2030 EV target provides a further 300,000 metric ton reduction in 2030 emissions. These S3 emissions figures represent a large improvement over the S5a Worst Case scenario where ACC II and ACT are not met (16.8 and 13.9 MMT in 2030 and 2035, respectively).

However, a significant gap remains between anticipated 2030 emissions under the S3 Strong Electrification Policy scenario and the approximate threshold of 10 MMT CO_2e the EV Council uses in this report for achieving the state's 2030 emissions limit for on-road transportation. Accordingly, targeting some of the strategies embedded within the exploratory S4 Strong VMT Policy and S6 Best Case Climate Aligned scenarios can help further close this gap, even if reaching the full levels of complementary VMT reduction and vehicle stock changes included in those modeling runs is limited in feasibility (for example, land use policies would have to be enacted and implemented fast enough to affect 2030 emissions) or are largely outside the state's control (for example, requiring lighter vehicles to be sold).

Figure 18

On-Road Transportation Sector GHG Emissions, Select Scenarios (MMT CO_2e)



Key Components of the S3 Strong Electrification Policy Scenario

Relative to the S1 Baseline scenario, the S3 Strong Electrification Policy scenario includes larger state and federal incentives for ZEVs and charging infrastructure, assumes stronger consumer interest in ZEVs, and assumes the ACF rule or a similar policy is adopted, requiring considerably faster adoption of zero-emissions trucks by fleets subject to this regulation (drayage trucks as well as "high-priority" and public fleets).[59] Sensitivity S3b — in which the 2030 LDV sales goal is met — does not include specific additional policies or incentives beyond the core S3 Strong Electrification Policy scenario, but rather assumes that the ACC II LDV sales trajectory increases substantially from 2027 through 2030 to reach the accelerated goal.

For the state to align EV sales trajectories with the S3 Strong Electrification Policy scenario or the S3b sensitivity (where the 2030 LDV sales target is met), several key actions will be required.[60]

1. **Providing enhanced state incentives for ZEVs and EV charging infrastructure**. Examples include extending and simplifying the EV sales tax credit through 2035, rather than through 2025 (baseline expiration year); providing a larger incentive value (e.g., $5,000) in the Alternative Fuel Vehicle Incentive administered by the Department of Commerce, with a particular focus on overburdened communities and vulnerable populations;[61] increasing hydrogen subsidies provided through the Department of Ecology's CFS through 2035; and working with electric utilities to provide higher EVSE incentives for residential and commercial customers (e.g., $800 per residential EVSE through 2035 versus $400 through 2028 in the baseline). The following section provides additional context on what levels of funding may be required for different vehicle segments.

2. **Ensuring that federal incentives are used to the greatest extent possible**. One example is promoting the availability of the Clean Vehicle Credit and Commercial Clean Vehicle Credit so that more EV sales in the state are subsidized primarily by the federal government (e.g., S3 Strong Electrification Policy assumes an average credit of 75% of the maximum $7,500 for LDVs, whereas the S1 Baseline scenario assumes an average credit of 50%). Another example is promoting adherence to the requirements for full rather than partial compliance with the Alternative Fuel Refueling Property Credit, such as meeting prevailing wage requirements. The state should continue to monitor applicable federal programs and share information widely to support effective utilization of federal incentives.

3. **Achieving ACF adoption rates to complement the existing ACT regulation**. Having adopted California's motor vehicle emissions standards under Section 177 of the Clean Air Act, Washington may have the ability to adopt and implement the ACF rule or a policy that creates ACF-like adoption rates, in addition to ACT. The Department of Ecology is currently monitoring California's actions to finalize ACF given its existing mandate from the Legislature. As highlighted earlier in this section, the accelerated purchase requirements for MHD vehicles in ACF have a meaningful impact on electric and FCEV truck adoption in the state because these requirements are applicable to an estimated 40% of the state's MHD vehicles. The EV Council anticipates ACF to provide commensurate levels of incremental GHG and local air pollutant emissions reductions, beyond those associated with ACT.

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59 The ACF regulation defines high-priority fleets as fleets with more than 50 trucks or belonging to private companies that make more than $50 million in annual revenue.

60 Please see Appendix D for additional details on scenario assumptions, including policy and incentive differences between Scenarios 1 and 3.

61 The S3 Strong Electrification Policy scenario assumes this incentive provides an additional $2,000 per vehicle, relative to the S1 Baseline scenario.

4. **Conducting education and awareness campaigns to promote the benefits of EVs, available EV programs and increasing affordability of EVs**. The S3 Strong Electrification Policy scenario and the S3b sensitivity, which meets the 2030 electric LDV sales goal, assume stronger consumer interest in EVs as a proxy for effective messaging and education about the benefits of these vehicles.[62] To make this assumption a reality, the state can invest in meaningful education and engagement activities, beginning with the **Education Plan** and **Engagement Plan** developed for the TES.

To achieve the 100% electric LDV sales goal, the state will need to invest significantly in the policy areas highlighted above, going beyond the support levels assumed in the core S3 Strong Electrification Policy scenario to enable the accelerated sales trajectory from 2027 to 2030. The state would also likely have to consider additional policies that discourage the sale of new ICE LDVs in the late 2020s to complement additional support for EVs. Realistically, achieving the 100% electric LDV sales goal will also involve favorable conditions outside of the state's control, such as the price of EV technology, federal policy, automaker decision-making, supply chains and rapid and deep shifts in consumer preferences across the population.

In addition to these key policies, the state should consider the strategies embedded within exploratory scenarios S4 Strong VMT Policy and S6 Best Case Climate Aligned, which rely heavily on VMT reduction and vehicle stock change assumptions to achieve lower emissions rates. Both the policy categories described above for the S3 Strong Electrification Policy scenario and the VMT reduction levers within the exploratory scenarios are discussed in further detail in Chapter 5.

2030 EV Target Scoping Plan – Scenario 3b

RCW 43.392.020[63] requires the EV Council to complete a scoping plan for achieving the 2030 EV target. The EV Council decided to complete this analysis within the TES, and it is embedded throughout this report. As one might imagine, the actions needed to achieve 100% new light-duty EV sales by 2030 are also needed to achieve the 68% sales share projected by 2030 in the S3 Strong Electrification Policy scenario. Therefore, the policy recommendations in Chapter 5 should be considered key elements of the required scoping plan.

This divide raises the question: How could the state go from reaching 68% to 100% EV market share in 2030? The TES model uses a sensitivity analysis to assess the difference between these versions of the future. For the preferred S3 Strong Electrification Policy scenario, that sensitivity analysis is labeled S3b throughout the TES.

In addition to the recommended S3 Strong Electrification Policy approach detailed throughout the rest of this report, S3b would require:

- Rebates in 2030 amounting to at least $9,000 per sedan and $11,000 per light truck or SUV *above* the incentives required to reach the ACC II's sales goal.[64]

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62 Stronger consumer interest is embedded by adjusting the parameters that determine the shape of the adoption S-curve, effectively making modeled consumers and businesses more responsive to TCO.

63 **RCW 43.392.020 – Interagency Electric Vehicle Coordinating Council – Target established – Scoping plan.**

64 These estimated incentive levels are based on reaching approximately 95% electric LDV sales share in 2030, beyond which modeled incentive values become exceedingly large. This is due to the S-curve modeling framework, which assumes that achieving the final percentage sales (e.g., the last 5%) require exponentially increasing monetary incentives as a way of conveying that the "last few" consumers put a very high value on buying an ICE vehicle.

- Approximately 185,000 additional charging ports by 2030 at an additional expense ranging from $200 million to $520 million.[65]

- Voluntary discontinuation of non-electric LDV production and sales by all automakers and dealers.

The TES model uses an S-curve to represent the projected shape of EV adoption. Sales start slowly at first before overall cost parity is reached, with only early adopters purchasing EVs. Then, as cost parity is reached and exceeded, adoption accelerates rapidly. However, an S-curve is symmetrical. When it comes to getting the last 5% or so of adoption, the pace slows down significantly, and incremental sales require increasingly higher consumer benefits to reach near 100% adoption. The required incentive value therefore increases exponentially as EV sales get closer to 100%, which reflects the reality that for the small tail of last adopters, there really is no price that would make them want to adopt an EV if a gasoline or diesel alternative still exists.

A worker digs a trench for EV charging infrastructure at a Jefferson Transit Authority station in Jefferson County.

The model therefore finds that the rebate amount needed to reach 100% new light-duty EV sales would be more than the price of the vehicle itself — clearly an unsustainable level of public funding. This highlights the importance of targeting incentives to influence incremental sales most cost-effectively. Providing exceedingly large incentives for each and every vehicle — including to individuals who do not require that level of monetary support — would be well beyond cost prohibitive for the state.

Because S3b would require an exponential cost for each additional EV sale, would depend on factors largely outside the state's control (e.g., fossil fuel prices, automaker and dealership voluntary decision-making) and would result in a relatively modest 0.3 MMT decline in 2030 emissions compared with S3, the EV Council selected the more feasible and still very strong electrification pathway in S3 as the preferred scenario to use as the TES foundation.

Recognizing the importance of bold targets to drive urgency in climate action, the EV Council and its member agencies will continue to pursue the 2030 EV target set by the Legislature as an aspirational stretch goal, and also urge state policymakers to consider the cost per metric ton CO_2e avoided when weighing different program investments to stay under the 2030 emissions limit.

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65 Cost range due to low and high EVSE and installation unit cost estimates, from the National Renewable Energy Laboratory, 2023.

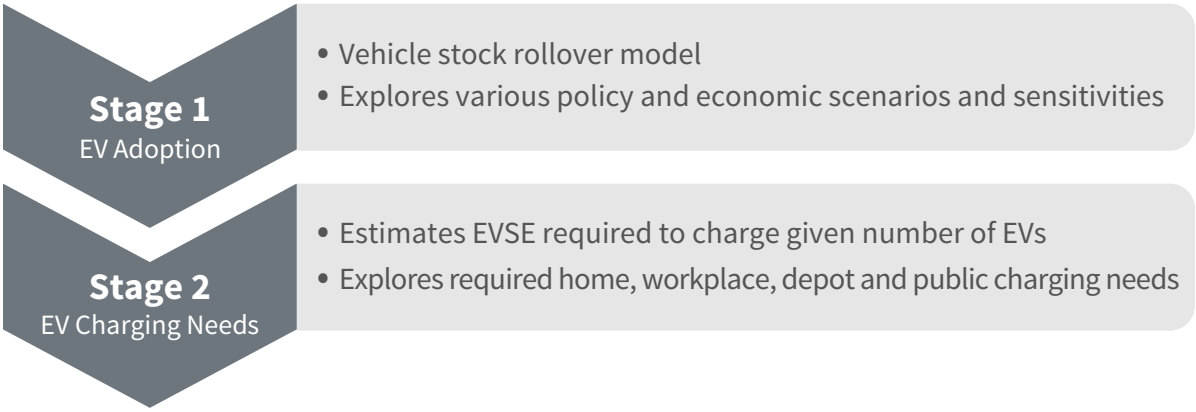
Analysis Conducted to Support the TES

Modeling Overview

To explore how on-road EV adoption and charging needs in Washington may progress over time, RMI developed a two-stage modeling approach (Figure 19). The first stage uses a vehicle stock rollover model, which assesses potential EV adoption from 2023 through 2035, by vehicle segment and by county, using a combination of bottom-up economic analysis based on estimated TCO for different powertrains, and top-down policy requirements such as the ACC II and ACT regulations. The second stage of the modeling assesses anticipated EV charging needs, using the number of EVs estimated through the stock rollover model combined with local trip data or average daily VMT.

Figure 19

Two-Stage Modeling Approach



The Future Is Uncertain – Different Scenarios Explore Potential Outcomes

EV adoption and associated charging needs in Washington will depend on a variety of factors, including market dynamics, such as the cost of EVs and charging infrastructure relative to conventional vehicles; public policy choices, including EV incentives and requirements, support for deployment of EV charging stations and the prioritization of public transit; and consumer preferences, among other influences.

To explore a wide range of potential EV adoption outcomes, RMI considered six scenarios with varied assumptions about market and economic factors, policy support and consumer preferences, as well as several sensitivities applied to one or more of the modeled scenarios. Table 9 provides an overview of the modeled scenarios. Three are core scenarios of interest (S1, S2 and S3), whereas three are exploratory scenarios (S4, S5 and S6) that are less probable, but nevertheless helpful for understanding the potential range of outcomes should certain dynamics (e.g., VMT reduction) occur more or less rapidly than anticipated.

Table 9 Scenarios Modeled

Type	#	Scenario	Characteristics (Relative to Baseline)	Key Questions Explored
Core	1	Baseline	N/A	What might EV adoption look like under current policy and middle-of-the-road outlooks on cost trajectories?
Core	2	Strong Electrification Technology	External technological shifts work in Washington's favor, including lower ZEV, EVSE, electricity and hydrogen costs.	How much greater electrification and lower costs would Washington get if technology develops faster than expected?
Core	3	Strong Electrification Policy	Washington enacts additional policy to support eletrification such as higher incentives for ZEVs and EVSE, inclusion of the ACF rule's adoption rates and education and outreach to encourage strong consumer interest in ZEVs.	How much greater electrification and lower costs would Washington get with more supportive policies?
Exploratory	4	Strong VMT Policy	Washington enacts policy to reduce per capita VMT more than is currently legislated. Policies also encourage less car ownership and a shift to more efficient, lighter vehicles (e.g., more sedans).	How much greater adoption, lower costs and additional social benefits would Washington get with successful VMT-limiting policies and actions?
Exploratory	5	Worst Case	Combination of factors that would together constitute the worst case, such as higher ZEV costs, lack of electrification policy and lack of VMT policy (i.e., inverse inputs from those used for Scenarios 2, 3 and 4).	What is the worst case for electrification and costs if the technology and policy environments are unfavorable?
Exploratory	6	Best Case Climate Aligned	Achieves the most on-road emissions reduction through an optimistic combination of external factors (from Scenario 2) and policy implementation (from Scenarios 3 and 4).	What is the best case for electrification and costs if all input variables support greater EV adoption and VMT reduction?

Exploring key sensitivities helps identify the effect of different policy and economic factors embedded in the scenarios described above. Table 10 provides an overview of the five different sensitivities tested, two of which ("major") were applied to all six of the scenarios and three of which ("minor") were applied to a subset of scenarios.

Table 10

Sensitivities Tested

Type	#	Sensitivity	Scenarios Applied To	Key Questions Explored
Major	a	Remove Effects of Policy Requirements	1–6	How much do ACC II and ACT influence outcomes? What might EV adoption look like without the top-down influence of those policies, and what does that suggest about additional policies that may be required to support these regulations?
Major	b	2030 LDV Sales Target Met	1–6	How close does each modeled scenario get to the 2030 target? What supportive policies may be required to enable this goal?
Minor	c	VMT Reduction without Stock or Freight Change	4	What benefits are achieved by reducing VMT but not reducing vehicle size and fleet size?
Minor	d	High Fossil Fuel Prices	1, 2	How do relatively high petroleum prices affect outcomes?
Minor	e	Low Fossil Fuel Prices	1, 2	How do relatively low petroleum prices affect outcomes?

Comparing across and between these scenarios and sensitivities allows for an estimation of how Washington's transportation sector may evolve over time under different combinations of economic and policy influences. Sensitivities further enable isolation of the effect that different factors may have on EV adoption over time.

These scenarios and sensitivities suggest which levers the state (and other stakeholders) might prioritize to ensure equitable and efficient attainment of transportation electrification goals. Some aspects of the scenarios and their sensitivities, such as EV technology progress, fossil fuel prices and ACC II or ACT being struck down in federal court, are beyond the state's control. Yet other aspects of the scenarios and their sensitivities, such as electrification policy and approaches to VMT reduction, are within Washington's control.

Scenario Output Comparison

Combining the scenarios and sensitivities results in 23 distinct sets of outputs, including EV and PHEV adoption by vehicle segment, EVSE needs by vehicle segment and location type, and GHG emissions and local air pollutants.

The remainder of this chapter provides an overview of how these outputs vary across scenarios and sensitivities, as well as a discussion of the primary drivers of this variation and the implications for the policy recommendations and implementation guidance detailed in subsequent chapters of the TES, including considerations related to state control (or lack thereof) over certain dynamics explored in the modeling.

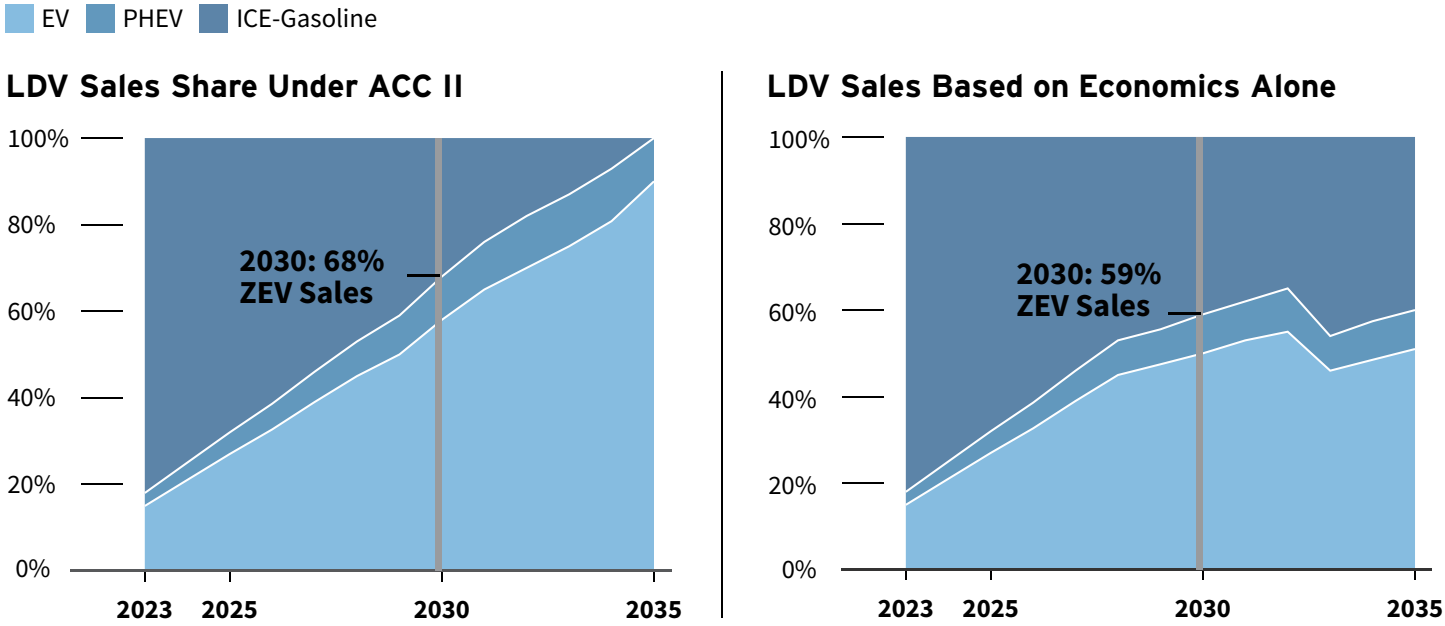
Outputs from all modeled scenarios and sensitivities are available in more detail (e.g., by vehicle subsegment) on the Washington TES User-Interactive Dashboard.[66]

Light-Duty Vehicle Outputs

Light-Duty Vehicle Sales

No modeled scenario reaches 100% electric LDV sales by 2030 or 2035 based on economics alone, highlighting the key role of policy support in attaining this level of EV uptake. Figure 20 shows anticipated LDV sales share by powertrain for the S1 Baseline scenario with and without the influence of the ACC II regulation, indicating both that the 2030 goal is unlikely to be met without substantial additional support and that ACC II bolsters the ZEV sales share significantly more than expected based on economics alone.[67]

Figure 20 Estimated Light-duty Vehicle Sales, ACC II and Economics Alone



Note: The dip in EV sales share in the right-hand chart beginning in 2033 is due to anticipated expiration of federal tax credits extended and modified by the Inflation Reduction Act.

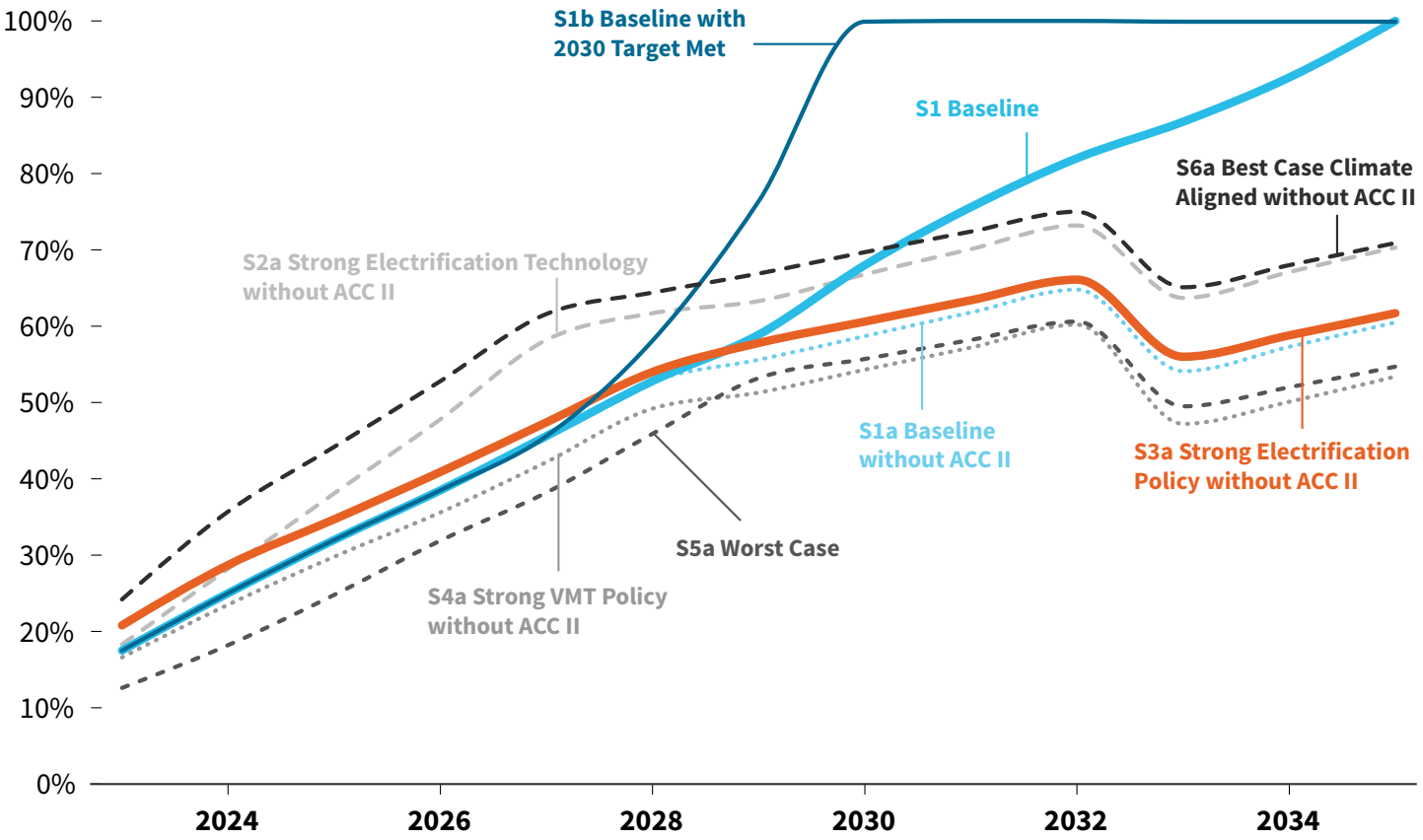
Other scenarios help close the gap between the economics-based adoption in the S1 Baseline scenario and the 2030 target and 2035 requirement of 100% electric LDV sales. When viewed without the influence of ACC II to isolate scenario impacts (Figure 21), the most impactful scenarios include S2a Strong Electrification Technology and S6a Best Case Climate Aligned, which increase economics-based EV sales share in 2030 by

66 Washington TES User-Interactive Dashboard, found on the **TES website**.

67 RMI initially included FCEVs as an option in the LDV analysis. However, the consistently and significantly higher costs of these vehicles on a TCO basis resulted in insignificant levels of light-duty FCEVs across all scenarios modeled. To simplify the LDV analysis, FCEVs were therefore removed; they remain present in the HD vehicle results described in the following section. TCO comparisons between battery electric, plug-in hybrid electric, fuel cell electric, and conventional ICE vehicles are shown in Appendix D.

8 and 11 percentage points, respectively, relative to the S1a Baseline scenario (59% sales share), and by 10 percentage points in 2035. The S3a Strong Electrification Policy also increases sales shares relative to the baseline, albeit to a smaller extent (2 and 1 percentage points in 2030 and 2035, respectively), indicating that the level of incentives embedded in that scenario have a smaller impact on reducing EV TCO than the cost declines embedded in S2a Strong Electrification Technology. However, increasing the magnitude of incentives included in S3a to levels commensurate with the assumed cost declines in S2a would equalize the effect of these two scenarios.

Figure 21 Light-Duty Vehicle Sales Share, BEV + PHEV (Baseline, 2030 Target Met and Economics-Based Adoption)



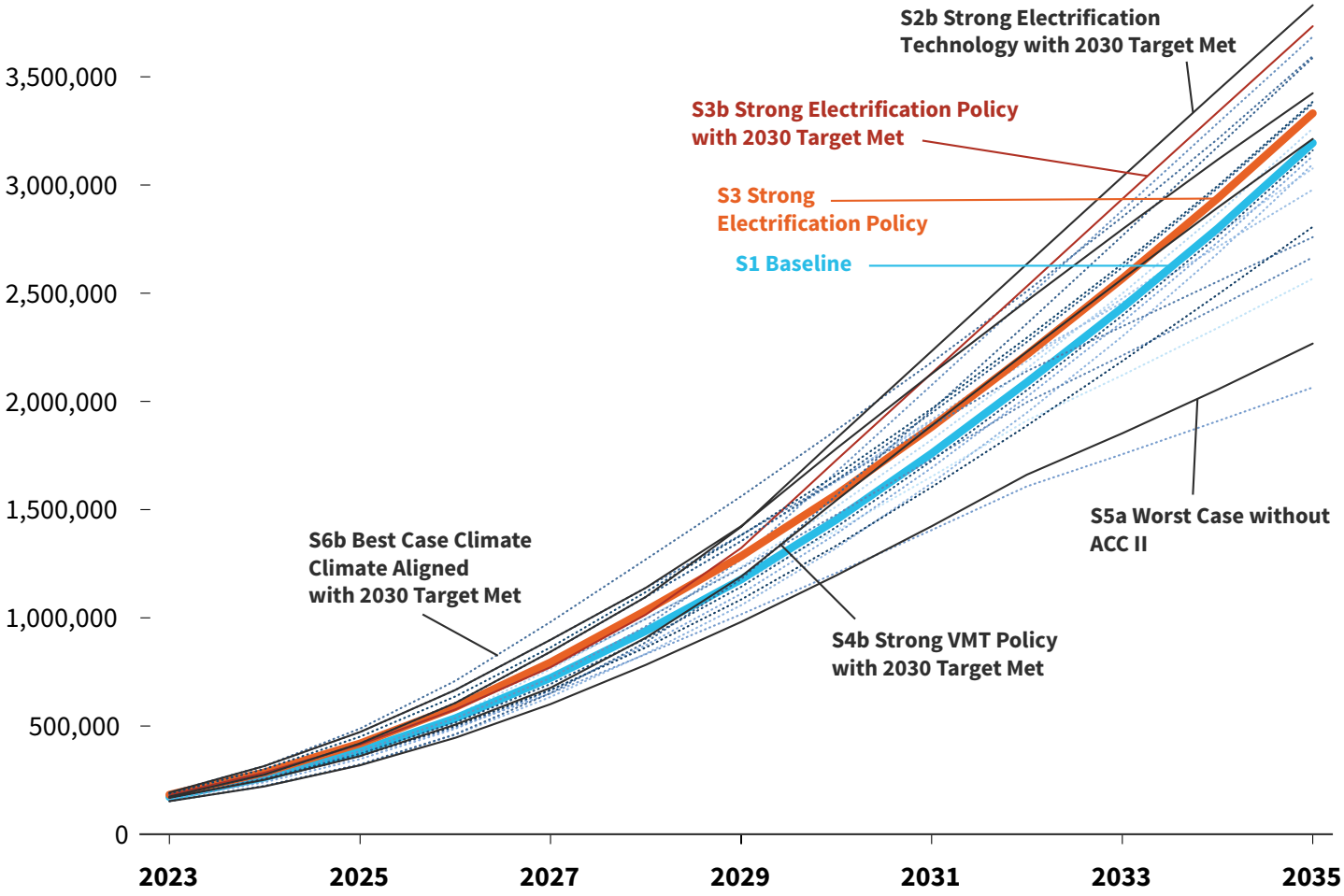
Light-Duty Electric Vehicle Stock Growth

The total population of EVs, including BEVs and PHEVs, in Washington by 2035 varies significantly across scenarios, as shown in Figure 22. The scenarios that result in the largest number of EVs by 2035 are S2b Strong Electrification Technology with the 2030 LDV target met, and S3b Strong Electrification Policy with the 2030 LDV target met (with ~3.8 million and ~3.7 million EVs, respectively). Both scenarios build on the ACC II regulation by assuming EV sales must increase to 100% by 2030, which drives a greater number of EVs into the vehicle stock by 2035.

It is worth noting that the exploratory S4 Strong VMT Policy and S6 Best Case Climate Aligned scenarios result in lower total numbers of light-duty EVs primarily because they assume an overall reduced vehicle stock.

Of the scenarios that do not assume vehicle stock reductions, S5a Worst Case without the Effect of ACC II results in the lowest number of light-duty EVs in Washington by 2035 (~2.3 million EVs). This result highlights both the important effect ACC II has on supporting EV sales and therefore stock, and the significant decrease in economics-based adoption that might be expected if EV technology costs are relatively high while policy support is relatively low (the dominant input variables to that scenario).

Figure 22 Statewide EV Population Variation



Differences in EV population across the scenarios are lessened by the requirement to reach ACC II annual sales shares, which, as noted in the beginning of this chapter, plays an outsized role in driving EV sales beyond what economics-based adoption alone might produce. Removing the effect of ACC II to explore how various scenarios compare shows larger variation. The sensitivity versions of S6 Best Case (S6a), S2 Strong Electrification Technology (S2a) and S3 Strong Electrification Policy (S3a), which remove the effect of ACC II, have the largest EV share in the baseline population, indicating they produce the most favorable economics for EVs.

Notably, achieving the 2030 100% electric LDV sales target results in relatively modest effects on the overall share of EVs in the vehicle stock by 2035. This is due to the relatively long time frame over which changes in new sales have meaningful effects on the total vehicle stock (i.e., vehicles are fairly long-lived assets).

Light-Duty EV Charging Needs

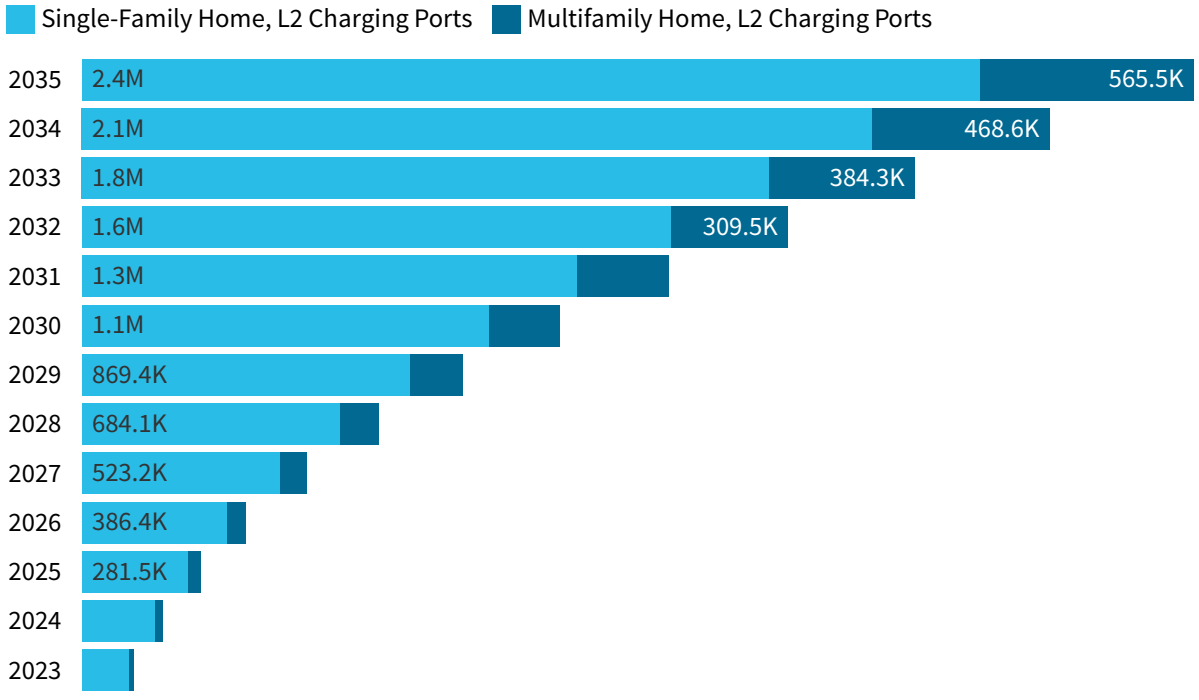
EV charging needs for LDVs vary across scenarios and sensitivities in proportion to the total number of EVs and PHEVs estimated by the stock rollover model. In the S3 Strong Electrification Policy scenario, the number of needed L2 residential charging ports grows from a 2025 estimate of 280,000 at single-family homes and 32,000 at multifamily homes to a 2035 estimate of 2.38 million and 570,000, respectively (Figure 23).[68]

The growing share of residential chargers at multifamily homes is based on the assumption that charging access at these residences will grow over time (from 20% of multifamily homes having access in 2022 to 60% in 2035). However, it is important to note that this growth in charging access — which would support both lower infrastructure costs and a more equitable transition to EVs[69] — is far from guaranteed. To ensure these monetary and equity benefits are realized, Washington will need to focus on enabling charging access for residents of multifamily homes, whether directly on-site or nearby at neighborhood charging sites, to closely replicate the convenience home charging offers to residents of single-family homes.

Level 1 (L1) charging at residences was not modeled given limited infrastructure development needs to support this form of charging. Additionally, L1 charging's slow recharging speeds limit its viability for residents who regularly drive moderate distances (e.g., relatively longer daily commutes without workplace charging access). However, the state is very supportive of leveraging L1 charging as a useful option for EV drivers whose travel patterns *do* accommodate these slower charging speeds, to reduce costs and expand access to charging options.

Figure 23

Cumulative Residential Charging Ports Required, S3 Strong Electrification Policy Scenario



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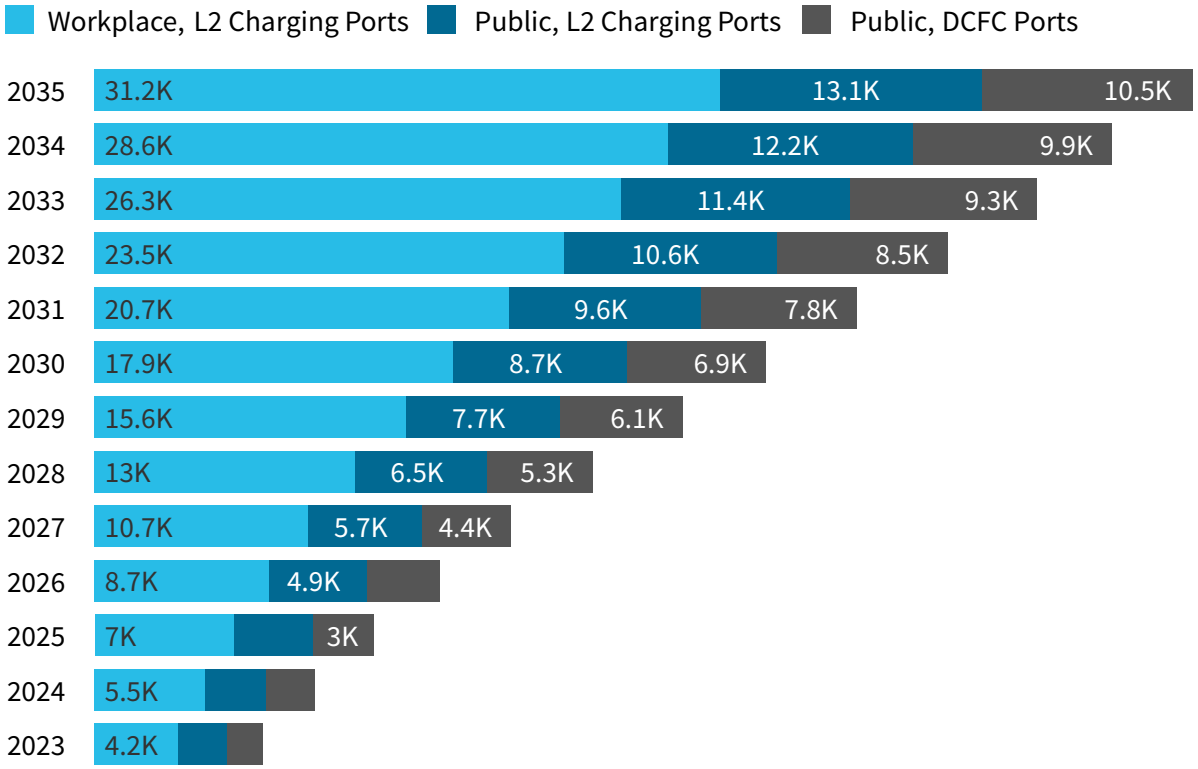
68 Residential L2 chargers are assumed to have a capacity of 7.2 kW.

69 Logan Pierce and Peter Slowik, **"Home Charging Access and the Implications for Charging Infrastructure Costs in the United States,"** The International Council on Clean Transportation, (March 9, 2023).

In addition to the growing number of residential charging ports required, a significant increase in L2 chargers at workplaces and public destinations will be required, as will public DCFCs (also known as Level 3 chargers).[70] Figure 24 depicts the anticipated number of each type of charging port required over time in the S3 Strong Electrification Policy scenario, increasing from approximately 7,000 workplace L2, 3,900 public L2 and 3,000 public DCFCs in 2025 to approximately 31,000, 13,000 and 10,500 ports by 2035, respectively.

Figure 24

Cumulative Nonresidential Charging Ports Required, S3 Strong Electrification Policy Scenario



These estimated nonresidential charging port requirements are lower than some other analyses of required EVSE, relative to the number of light-duty EVs anticipated based on the stock rollover modeling. This result is driven by several factors: the relatively high levels of residential charging assumed to be available, as noted above; an assumption that public L2 chargers are 19 kilowatts (kW) (faster and more powerful than is often the case today, because it is assumed that is what drivers will demand as the charging network matures); and an assumption that the utilization rate of nonresidential chargers will increase over time (e.g., public DCFC growing from 6% in 2023 to 15% by 2035, on average).[71]

70 Workplace L2 chargers are assumed to have a capacity of 7.2 kW, whereas public L2 and public DCFCs are assumed to have a capacity of 19 kW and 150 kW, respectively.

71 The relatively low utilization rate (especially in the early years of the modeling period) is also intended to reflect the reality that EVSE does not typically provide 100% of its nameplate capacity. An analogous treatment would be to assume that each port's nameplate capacity (e.g., 150 kW DC) is in reality only delivering a lower average power output, such as 120 kW. Higher utilization rates and lower delivered power rates would result in a similar number of total required ports.

Governor Inslee inspects a Kenworth electric truck in Pierce County.

If the nonresidential charging network developed in the state is not used as efficiently as the modeling assumptions suggest, a larger number of nonresidential charging ports would be required, increasing total infrastructure costs. Accordingly, focusing efforts on deploying nonresidential EVSE at locations that can both meet the needs of EV drivers and support relatively high levels of asset utilization will be an important component of developing a charging network that is both useful for drivers and cost-effective.

EVSE needs estimates for all modeled scenarios, by location type and by county or census block group, can be found on the Washington TES User-Interactive Dashboard.[72]

Medium- and Heavy-Duty Vehicle Outputs

Several types of MHD vehicles were considered in the TES analysis, including medium-duty (MD) trucks, HD trucks, school buses and transit buses.

Medium- and Heavy-Duty Vehicle Sales and Stock

Medium- and Heavy-Duty Trucks

Figure 25 depicts MHD truck sales and total vehicle population, by powertrain, for the S3 Strong Electrification Policy scenario.[73] In this scenario, electric MD truck sales share reaches approximately 65% in 2030, and grows to 90% by 2035, and their share of total MD truck stock nearly doubles from 25% in 2030 to 48% by 2035. Electric HD truck sales share reaches 77% in 2030, and grows to 81% by 2035, and their share of total HD stock reaches 23% by 2030 before growing to 41% by 2035. In addition to these battery electric trucks, a small but growing number of FCEV HD trucks are adopted beginning in the early 2030s.

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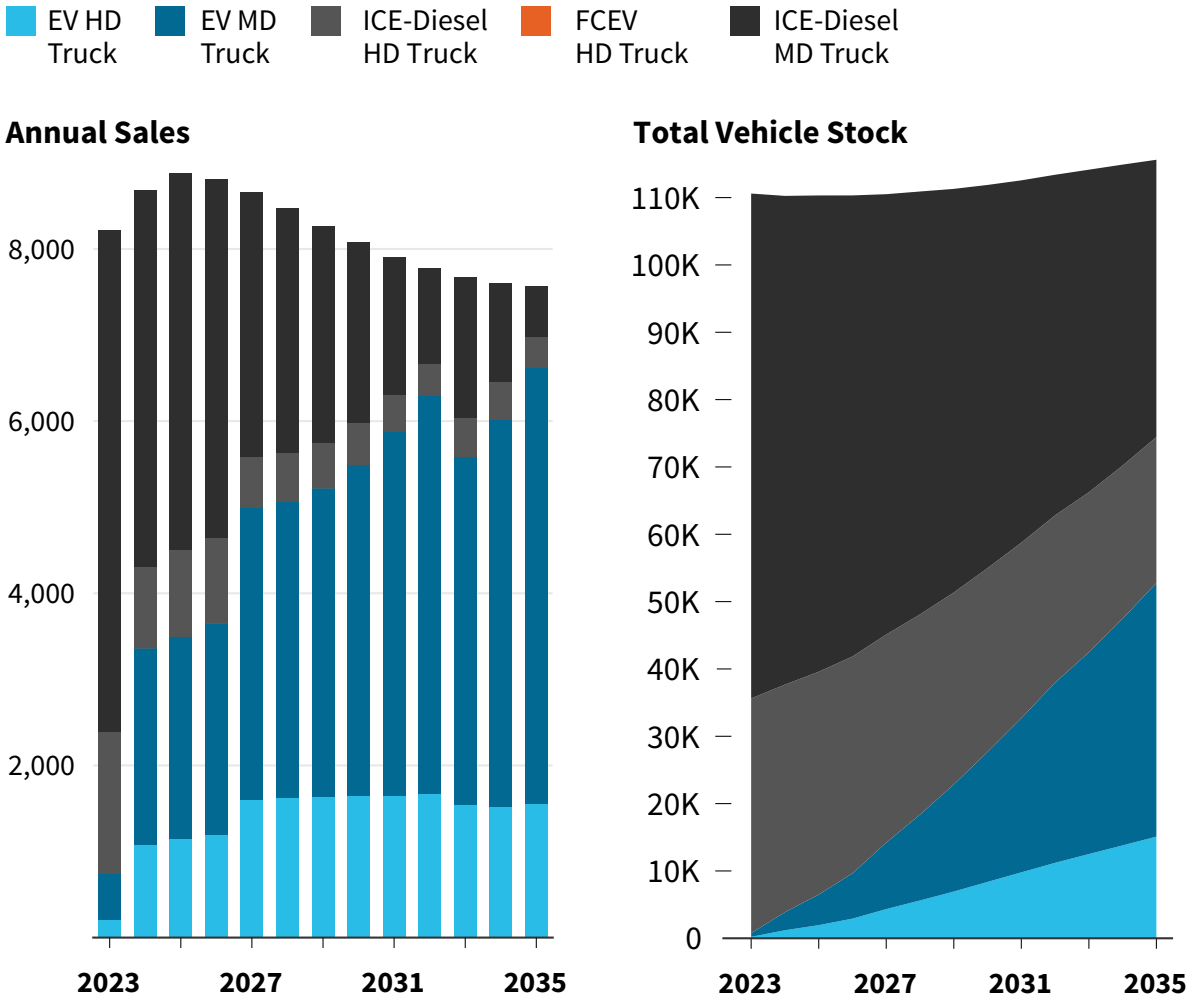
72 Washington TES User-Interactive Dashboard, found on the **TES website**.

73 For this analysis, Class 2b vehicles were included in the LDV pickup/SUV category, whereas Class 3 vehicles were included in the MD truck category.

Figure 25

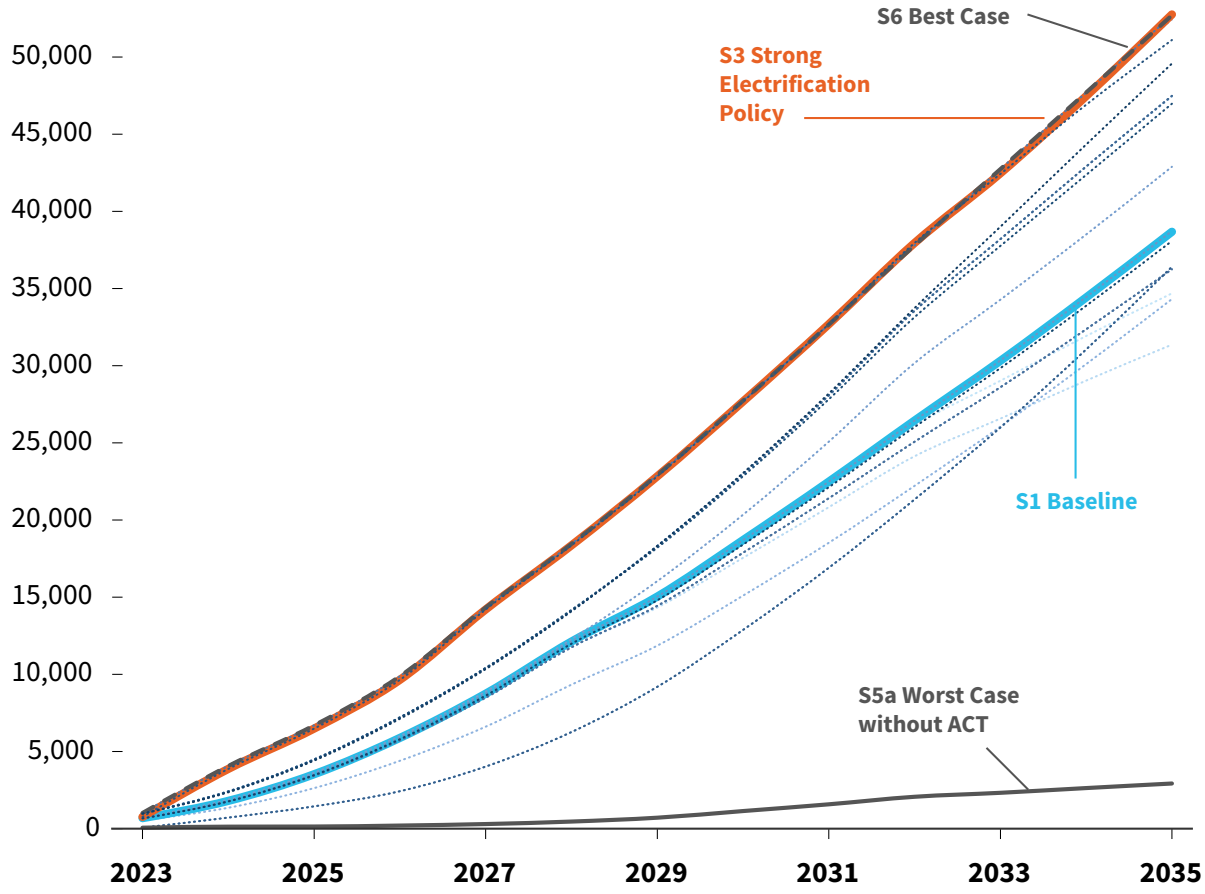
Medium- and Heavy-Duty Truck Sales and Total Vehicle Population by Powertrain, S3 Strong Electrification Policy Scenario



As with the LDVs described above, the total population of electric MHD trucks in Washington varies considerably across scenarios. Figure 26 provides this range over time, highlighting that the S3 Strong Electrification Policy and S6 Best Case Climate Aligned scenarios result in the largest number of electric trucks by 2035. A large component of this result is the inclusion of the ACF's adoption rates in these scenarios. ACF, which is currently being considered for adoption in Washington, is a more stringent companion policy to the existing ACT rule. RMI estimates that ACF would apply to approximately 40% of MHD trucks in Washington.

Unlike the analogous comparison of electric LDV stock over time, the scenario with the lowest number of electric trucks — S5a Worst Case without ACT — is a clear outlier, demonstrating that under other scenarios exposed to the sensitivity of removing the ACT requirement, truck electrification remains relatively strong. This is due to the combination of significant federal tax credits and the more responsive nature of commercial players to TCO advantages (compared with individual consumers), indicating there is significant opportunity for cost-effective electrification among the state's MHD trucks.

Figure 26 Statewide Medium- and Heavy-Duty EV and FCEV Truck Population Variation



In contrast to the LDV results, which are dominated by the effect of ACC II, for MHD trucks S2 Strong Electrification Technology, S3 Strong Electrification Policy and S6 Best Case Climate Aligned all show fairly large increases over the S1 Baseline in terms of 2035 EV population. S2 Strong Electrification Technology promotes higher adoption through lower vehicle and operating costs, S3 Strong Electrification Policy through both larger incentives and the purchase requirements from the ACF rule and S6 Best Case through a combination of S2 and S3.

Notably, these three scenarios show similar incremental levels of truck electrification over the S1 Baseline even in the absence of the ACT regulation (sensitivities S2a, S3a and S6a). This indicates that decreasing the cost of electric trucks relative to ICE trucks enables electrification beyond the minimum levels required by top-down policy — a distinct finding compared with the analogous analysis of electric LDV stock with and without the ACC II regulation.

The sensitivities that explore higher and lower fossil fuel costs show larger effects on MHD trucks than the application of these sensitivities to the LDV scenarios, due to both the higher responsiveness of commercial truck operators to TCO, and the larger share of total costs that operating expenses make up for trucks relative to cars (making truck operators more sensitive to fuel price changes, all else being equal).

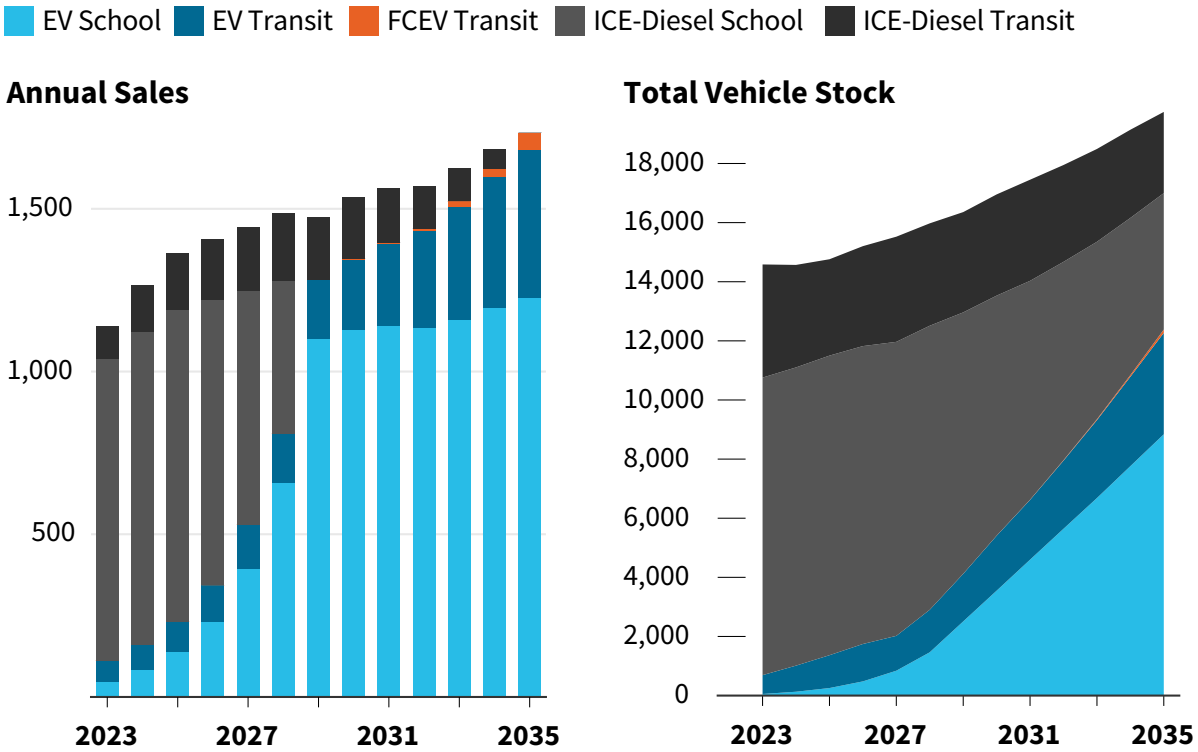
School and Transit Buses

Unlike LDVs and MHD trucks, bus electrification was modeled based primarily on assumptions about grant funding availability and forecasted price parity rather than TCO analysis due to the historic reliance of these vehicle types on public funding, including for electrification.

Three electric sales trajectory projections were created for both school and transit buses: a baseline, a high-adoption scenario and a low-adoption scenario. For transit buses, the sales trend was influenced by the availability of federal funds such as the low- or no-emissions grant offered by the Federal Highway Administration (FHWA), which covers up to 90% of the purchase price of electric transit buses. For school buses, the sales trajectories were differentiated based on anticipated years that price parity is achieved between ICE and battery electric school buses, according to the World Resources Institute (WRI).[74]

Figure 27 depicts school and transit bus sales and total vehicle population, by powertrain, for the S3 Strong Electrification Policy scenario. In this scenario, electric school bus sales increase exponentially to 100% by 2029. Electric transit buses reach an approximately 54% sales share by 2030, increasing to 80% by 2035. Additionally, FCEV transit buses start to gain a small portion of market share in 2029, reaching approximately 10% of statewide sales by 2035.

Figure 27 School and Transit Bus Sales and Total Vehicle Population, by Powertrain, S3 Strong Electrification Policy Scenario



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74 According to WRI **("Which Electric School Bus Business Model Is Right for Your District?")**, electric school buses are projected to reach lifetime TCO parity with diesel buses by 2029, and upfront price parity by 2033.

Alternate bus electrification scenarios assume more or less funding is available for these vehicles, with commensurate increases or decreases, respectively, for sales and stock share. Table 11 provides the sales and stock share for battery electric school and transit buses and for FCEV transit buses for the three bus electrification scenarios modeled.

Table 11

Bus Electrification Sales and Stock Share by Year

	Sales Share		Stock Share	
	2030	2035	2030	2035
BEV School Buses (Base)	38%	100%	11%	45%
High	100%	100%	30%	66%
Low	14%	37%	5%	16%
BEV Transit Buses (Base)	50%	68%	32%	47%
High	53%	90%	35%	55%
Low	22%	18%	25%	23%
FCEV Transit Buses (Base)	<1%	8%	<1%	1.50%
High	<1%	10%	<1%	2%
Low	<1%	2%	<1%	<1%

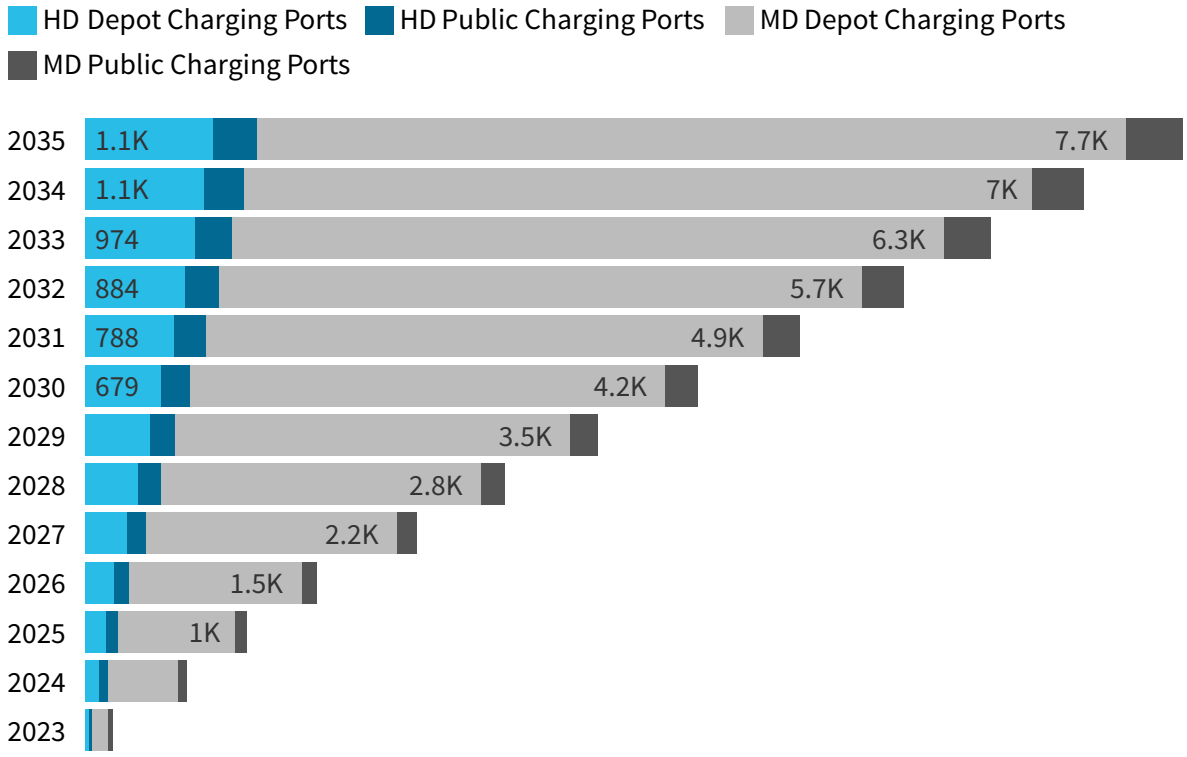
Medium- and Heavy-Duty EV Charging Needs

As with the LDVs, charging requirements for electric trucks and buses grow quickly, as depicted for the S3 Strong Electrification Policy scenario in Figures 28 and 29. As shown in Figure 28, charging for both MD and HD trucks is anticipated to come primarily from depots, especially in the near term as the routes that can best accommodate reliance solely on depot charging are electrified. Areas with significant trucking activity such as ports and warehouse districts are likely to be key locations within which to develop charging infrastructure. The concentration of the relatively large power needs of MHD trucks in such areas will require thoughtful advance planning to accommodate the electric grid upgrades necessary to accommodate charging of these vehicles. As additional trucking routes are electrified over time, an increasing share of charging is expected to come from on-road public DCFCs.[75] However, in these projections, even though the total amount of charging from public DCFCs grows, the share of public charging ports decreases compared with depot charging ports as utilization rates of the public charging network increase.[76]

75 Depot chargers for MD trucks are assumed to have a capacity of 50 kW DC, whereas depot chargers for HD trucks are assumed to be 350 kW DC. Public DCFCs for medium- and heavy-duty trucks are assumed to be 150 kW DC and 350 kW DC, respectively.

76 As with LDVs, utilization rates for MHDVs are intended to both encompass the proportion of time the charging ports are used in a given day and serve as a proxy for the difference between nameplate capacity of the EVSE and the average delivered power. Actual port count requirements, especially for MHDV public charging ports in the later years of the modeling period (where the utilization rate is assumed to be relatively high), may be larger than these estimates suggest due to both average power delivered versus nameplate capacity differences and relatively strong assumptions about the efficiency of charger utilization.

Figure 28. Cumulative Charging Ports Required to Support Electric Medium- and Heavy-Duty Trucks, S3 Strong Electrification Policy Scenario



The stock rollover model used to determine the number of electric trucks in Washington over time and the associated EVSE needs is based on vehicle registration data from the Department of Licensing (DOL). Although that data provides a good approximation of the LDVs operating in the state, a larger share of MD and especially HD trucks that operate on Washington's roads and highways are registered out of state. As these out-of-state trucks electrify, they will also require charging infrastructure when they are driven within Washington.

Data from the FHWA indicates that, on average, approximately 30% of MHD truck miles in the United States are driven outside of a truck's home state.[77] Separately, RMI analysis of FHWA data suggests that in Washington, the percentage of total state highway miles driven by vehicles registered outside the state is approximately 18% for MD trucks and potentially as high as 50% for HD trucks. Table 12 applies these shares (18% to 30% for MD trucks, and 30% to 50% for HD trucks) to the EVSE needs estimated for the S3 Strong Electrification Policy scenario to estimate the range of potential incremental charging required by out-of-state trucks (assuming for simplicity that those trucks are electrified on a similar trajectory as those within Washington). These out-of-state electric trucks would likely skew toward public rather than depot charging, although some would also charge at depots within the state.

77 U.S. Department of Transportation – Federal Highway Administration, **"Freight Facts and Figures 2010,"** (n.d.).

Table 12

Estimated Additional EVSE Required to Support Out-of-State MHD Trucks

Charger Type	MD Depot*	MD Public*	HD Depot**	HD Public**
2025	188 – 314	18 – 29	56 – 93	31 – 51
2030	759 – 1,264	51 – 85	204 – 340	77 – 129
2035	1,389 – 2,315	90 – 150	342 - 570	115 - 192

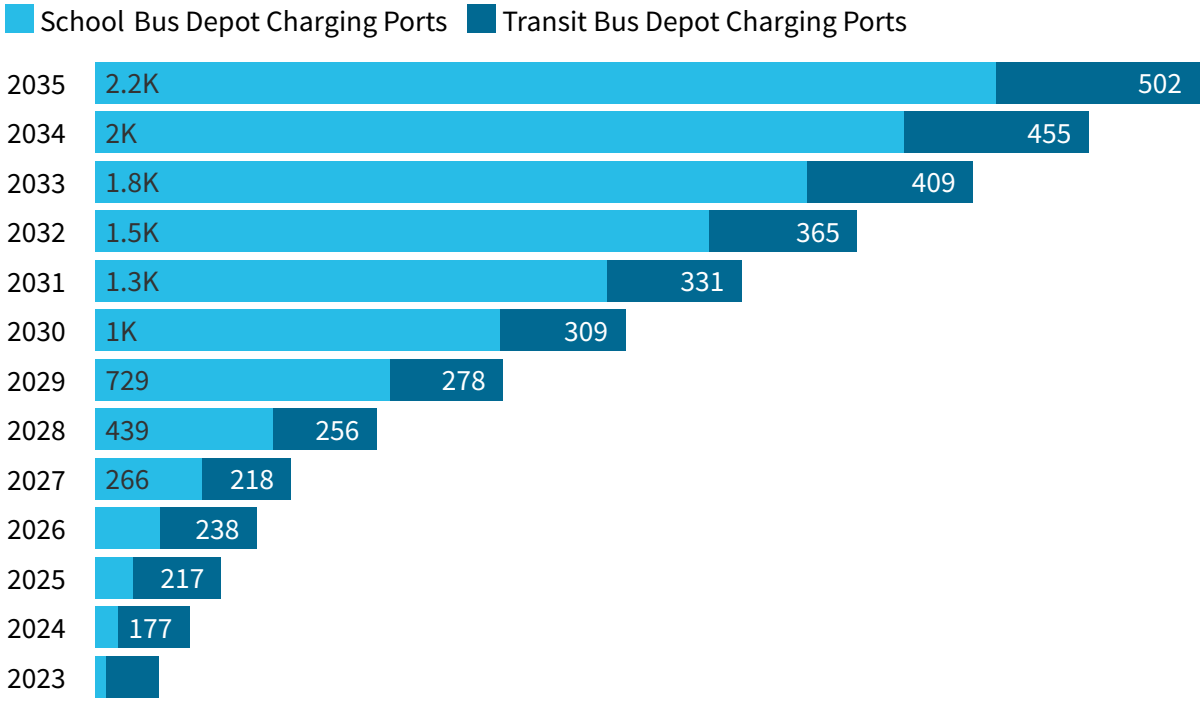
*Note: MD ranges represent number of chargers needed for an out-of-state share of MD trucks between 18% and 30%

** Note: HD ranges represent number of chargers needed for an out-of-state share of HD trucks between 30% and 50%

In this analysis, electric buses are assumed to exclusively use depot charging, as shown in Figure 29.[78] In the S3 Strong Electrification Policy scenario, school bus depot chargers begin with a relatively small number in the first few years as bus electrification ramps up, reaching approximately 2,200 19 kW L2 chargers statewide by 2035. A larger number of higher-power transit bus depot chargers (350 kW direct current [DC]) are required sooner as these vehicles electrify, whereas the growth of chargers needed over time is anticipated to be more moderate based on a somewhat slower pace of bus electrification, combined with an assumed increase in the efficiency of charger utilization as transit agencies learn how to optimize larger electric fleet operations.

Figure 29

Cumulative Charging Ports Required to Support Electric School and Transit Buses, S3 Strong Electrification Policy Scenario

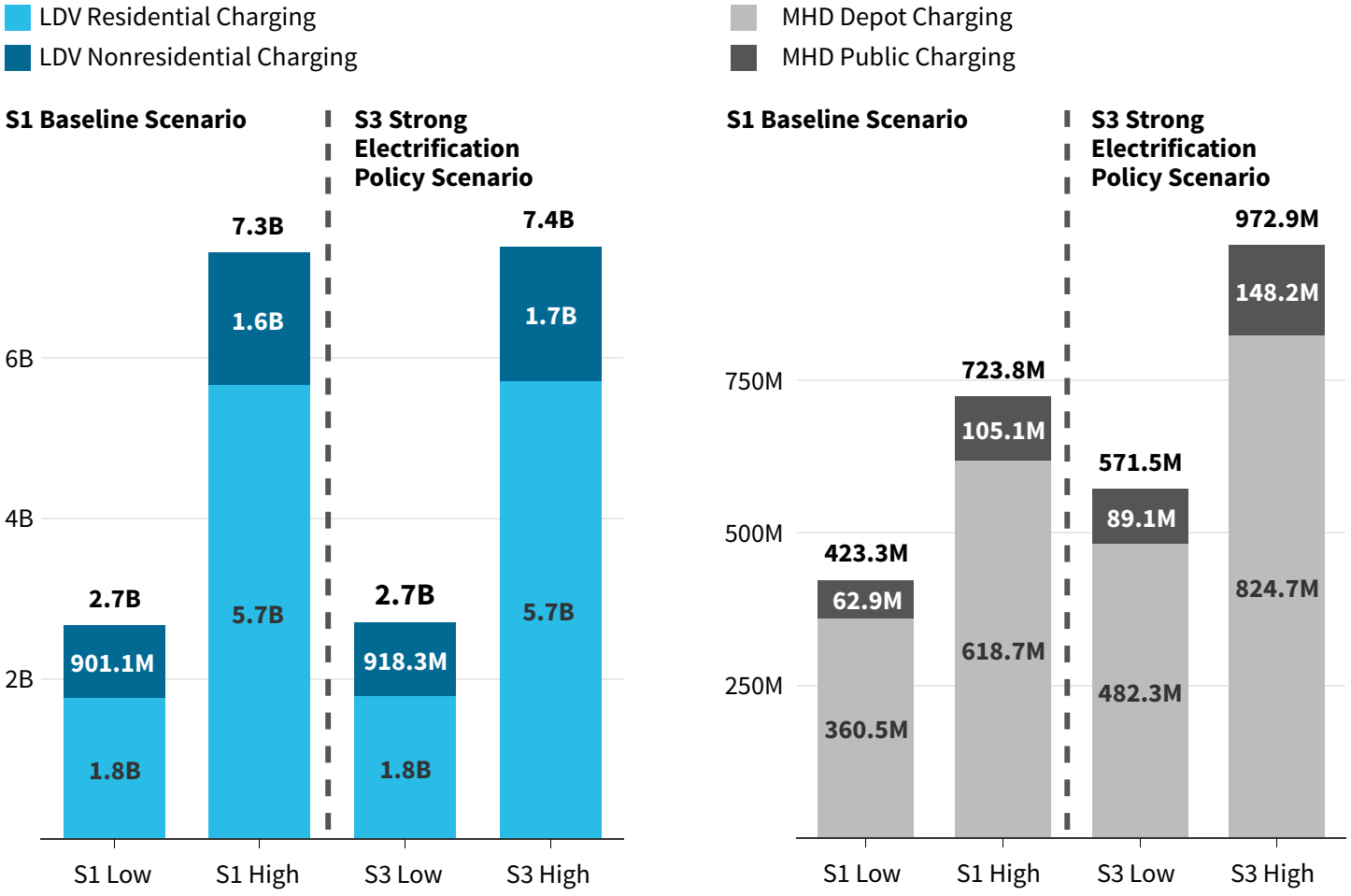


78 School bus depot chargers are assumed to be 19 kW AC given the relatively long dwell times these buses have during the school day and overnight, whereas transit bus depot chargers are assumed to be 350 kW DC to accommodate their duty cycles.

Anticipated EV Charging Costs

Based on the EVSE needs analysis described above, Washington can expect to require significant public and private funding to develop sufficient charging infrastructure to support the anticipated number of EVs. Figure 30 depicts cumulative estimated EVSE costs — including equipment and installation but not utility-side grid upgrades — by 2035 for both the S1 Baseline and S3 Strong Electrification Policy scenarios.[79] Note the different axis scales between the LDV (left) and MHDV (right) charts.

Figure 30 2035 Cumulative EVSE Equipment and Installation Cost Estimates, Scenarios S1 and S3 ($2023, billions)



Note: For the S3 Strong Electrification Policy scenario, additional costs to support out-of-state MHD trucks are estimated at between $157 million and $263 million cumulatively by 2035. This assumes the average of the scaling factors outlined earlier in this section, by vehicle segment, to determine incremental miles from out-of-state trucks, i.e., 24% and 40% for MD and HD trucks, respectively.

79 Estimates do not include the value of tax credits available through the IRA.

Table 13 provides estimates of annual EV charging costs for EVSE and installation, broken into four categories.

Table 13

Estimated Annual Cost of EV Charging Equipment and Installation, S3 Strong Electrification Policy Scenario ($2023, millions)

	LDV Residential	LDV Nonresidential	MHD Depot	MHD Public	Total
2023	149–446	202–367	27–47	9–15	**387–875**
2024	61–198	64–116	43–74	11–18	**180–406**
2025	75–242	64–117	33–57	6–10	**179–425**
2026	87–281	59–108	35–59	7–12	**188–460**
2027	109–351	70–127	40–67	8–14	**227–559**
2028	123–396	71–130	41–70	7–12	**242–608**
2029	136–438	69–125	40–69	6–10	**251–642**
2030	147–475	62–113	40–69	7–11	**256–668**
2031	164–530	63–115	40–69	6–10	**273–723**
2032	173–559	56–103	40–68	6–10	**275–739**
2033	180–579	55–101	34–58	5–9	**274–747**
2034	186–598	43–80	34–59	5–8	**268–745**
2035	193–622	40–74	35–59	6–10	**274–766**

Across all scenarios, the cost of EVSE for LDVs at residences is the primary driver of total costs, followed by nonresidential charging for LDVs (including workplace and public charging). Residential charging costs will be borne largely by private citizens, although ensuring EVSE costs are not a deterrent to EV adoption will be critical, especially for lower-income households (e.g., through state or utility incentive programs). Nonresidential light-duty EVSE costs will be borne by a combination of players, including developers of public charging stations (both L2 and DCFC) and employers developing EVSE for their employees.

Public funding for these nonresidential charging options will also be important to ensure they are deployed equitably, with access provided to all drivers in Washington. The state should prioritize L2 installation locations based on their connection to non-driving modes and their ability to maximize utilization to improve consumer experience, limit disruption to traffic patterns and bring significant savings to the state. Examples of locations that were requested during the public engagement period include park-and-rides, libraries, airports, parks and municipal buildings.

MHD charging costs will be borne largely by fleet operators developing private charging stations for their vehicles at depot locations. Public funding will, however, be important for ensuring that fleet electrification progresses quickly, in line with state goals, by providing incentives to reduce the up-front costs associated with deploying EVSE. Additionally, as trucks that cannot easily rely solely on depot charging electrify over time, public funding to support high-powered public DCFC suitable for MHD vehicles will be essential for ensuring larger portions of these vehicles are able to transition to electric options.

The cost estimates described above do not include utility electric grid upgrades that will be required to accommodate EV charging. Although those costs will be an important component of the total expense necessary to electrify the transportation sector, conducting estimates of utility-side costs was not part of the scope of this analysis. However, the Department of Commerce is conducting a study of utility-side costs in 2024 to better understand the total expense that will be required to prepare the state's electric grid for transportation electrification, the results of which should prove informative for additional planning efforts.

Electric Sector Impacts from Transportation Electrification

The total amount of electricity required to support transportation electrification will grow significantly this decade and beyond. In the S1 Baseline scenario, light-, medium- and heavy-duty EVs are estimated to require 1.4 terawatt-hours (TWh) of electricity by 2025, increasing tenfold to 14 TWh by 2035. This represents 1.6% and 16%, respectively, of the state's current annual electricity consumption of approximately 88 TWh.[80] The S3 Strong Electrification Policy scenario estimates that EV charging would require 1.7 TWh by 2025 and 15 TWh by 2035 (1.9% and 17% of the state's current consumption, respectively).

In terms of power demand, the growing number of EVs has the potential to materially increase peak loads, but also presents an opportunity to flatten out existing load profiles, thereby increasing the overall utilization of grid infrastructure and reducing average costs for all consumers. The modeling conducted for the TES did not explore the potential for managed charging, on-site generation or other peak demand reduction opportunities. Nonetheless, the magnitude of the opportunity presented by load shifting and distributed generation and storage resources is clear from the anticipated scale of load growth.

As transportation electrification progresses in Washington, it will be imperative to manage as much of this new load as possible, shifting charging to off-peak times that maximize utilization of both grid assets and renewable electricity generation. Figure 31 presents a statewide load shape for the S1 Baseline and S3 Strong Electrification Policy scenarios on a typical weekday in 2035, not including managed charging. Accordingly, the sizable evening peak — 3.2 gigawatts (GW) and 3.4 GW, respectively — can be considered a worst case outcome should the state, electric utilities and other stakeholders fail to take advantage of load shifting and demand mitigation through on-site resources such as renewable generation and stationary battery storage.[81]

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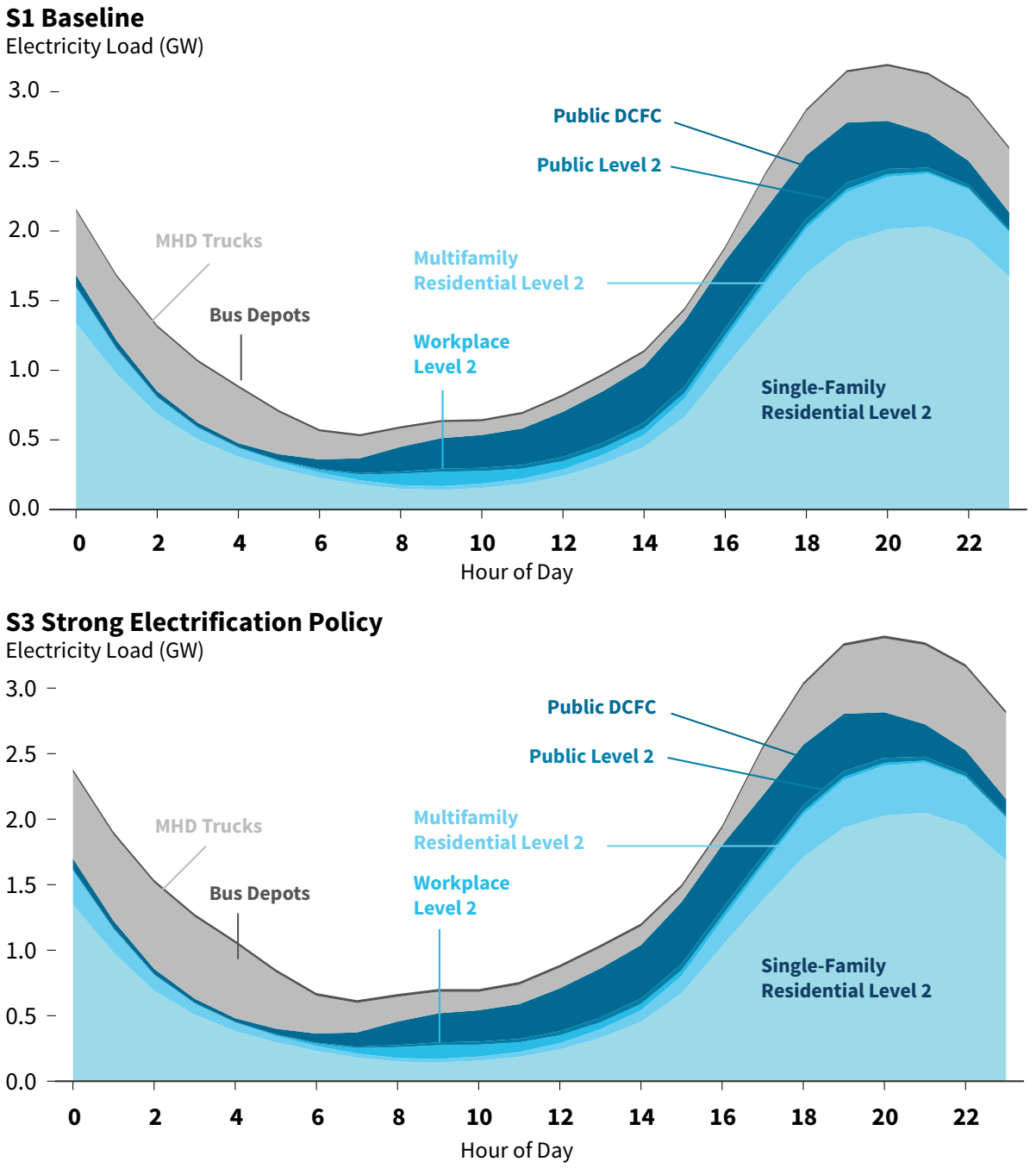
80 U.S. Energy Information Administration, **"Washington Electricity Profile 2021,"** (November 10, 2022).

81 Including estimates of MHD truck charging load from out-of-state vehicles operating in Washington, total unmanaged peak load in 2035 could increase by approximately an additional 120 MW or 170 MW for Scenario S1 and Scenario S3, respectively, representing an incremental 4%–5% of total peak demand across all vehicle segments.

Figure 31

Statewide Time-of-Day EV Load Without Demand Management, 2035 S1 Baseline and S3 Strong Electrification Policy Scenarios



Emissions Reduction Potential from Transportation Electrification

A primary benefit of transportation electrification is the reduction of both GHG and local air pollutant emissions. The following section briefly discusses modeled GHG and air pollutant outcomes; further details can be found on the Washington TES User-Interactive Dashboard, found on the TES website.[82]

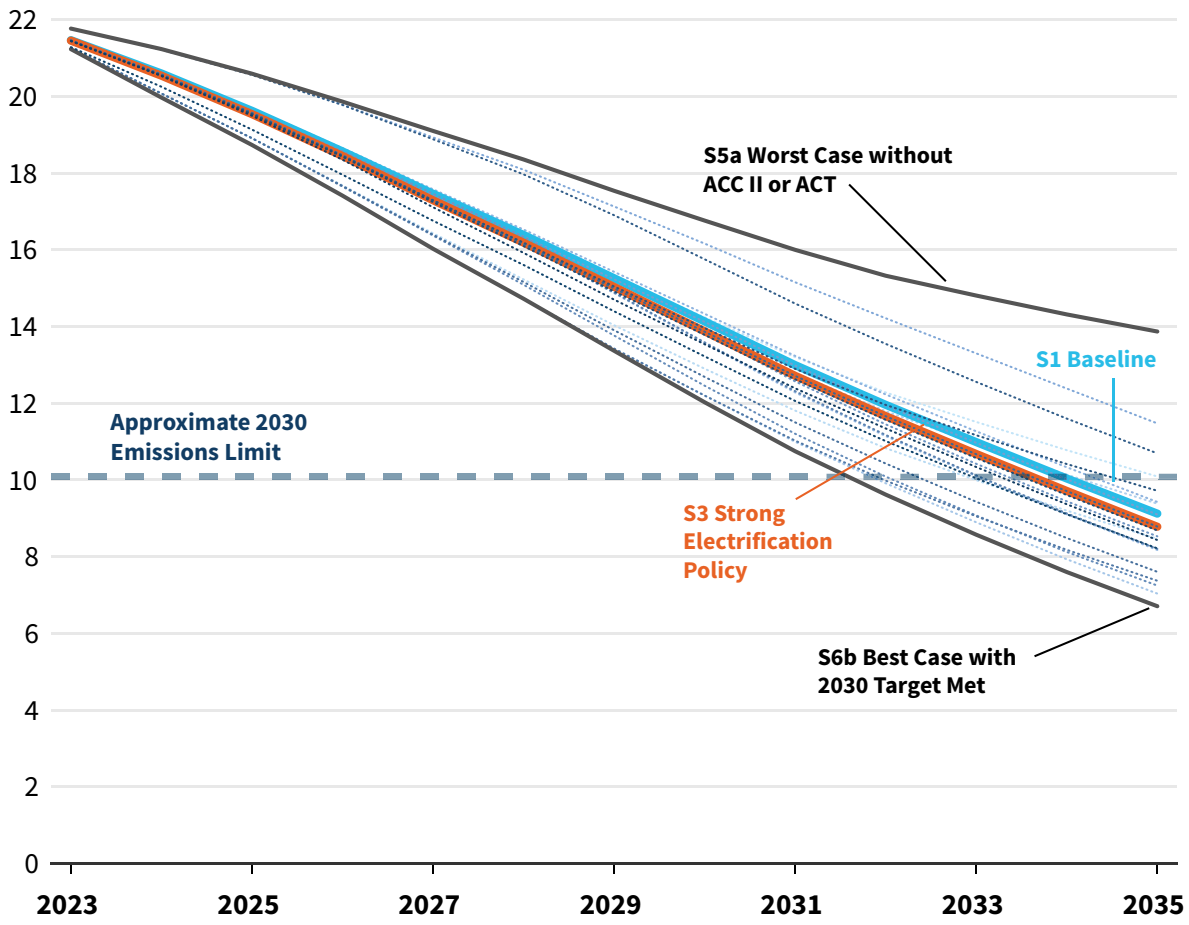
82 For a scenario comparison of GHG and local air pollutants from both ICE tailpipes and electric power generation for EV charging — including $PM_{2.5}$, PM_{10}, NO_X, N_2O, CO, SO_X and VOCs — please see the Washington TES User-Interactive Dashboard, found on the **TES website**.

Greenhouse Gas Emissions

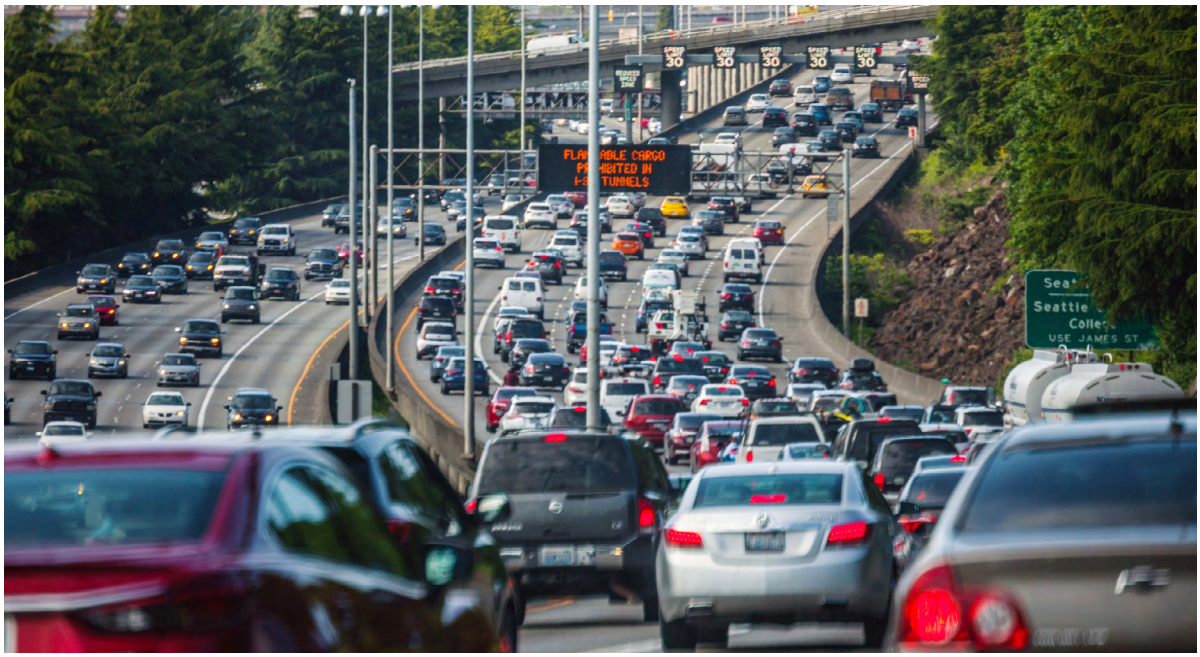
Modeling conducted for the TES suggests that current GHG emissions from the on-road transportation sector — approximately 22 MMT — may fall to between a worst case level of 16.8 MMT and a best case level of 12.0 MMT by 2030, and between 13.9 MMT and 6.7 MMT by 2035 (Figure 32).

Figure 32

Estimated Range of Statewide GHG Emissions from On-Road Transportation, By Scenario (MMT CO_2e)



Compared with the analogous figures shown for light-duty and MHD EV population variation across scenarios (Figure 22 and Figure 26, respectively), the range of emissions reduction outputs is somewhat narrower due to the continued effect of the remaining ICE vehicles (which keep emitting from tailpipes). The largest factors driving this range of outcomes include different assumptions about VMT reductions and vehicle stock changes (exploratory scenarios S4 Strong VMT Policy and S6 Best Case Climate Aligned, and the sensitivities applied to them), as well as the presence or absence of existing regulations (ACC II, ACT) and the 2030 EV target in the modeling. It is important to note that although the largest emissions reductions are desirable from a climate and public health perspective, they are based on aggressive VMT reductions and vehicle stock changes, which may not be feasible to fully attain in the short term (i.e., by 2030) because of their reliance on challenging structural changes such as land use reform.



Rush hour traffic in Seattle

The 2021 SES[83] found that Washington's transportation sector must reach 20 MMT CO_2e or lower by 2030 to support the state's economy-wide climate goals. On-road GHG emissions (those modeled directly for the TES) made up approximately 58% of the state's transportation sector emissions based on the latest inventory, suggesting that the approximate 2030 GHG emissions this subsector could contribute would be 11.6 MMT. However, electrification technology and commercialization status suggest that the on-road subsector is better positioned than non-road vehicles (e.g., marine, aviation, construction, agricultural) to achieve near-term decarbonization progress, indicating that a lower on-road target such as 10 MMT is better calibrated to the emissions reductions that will be required from these vehicles to support state goals.

Unfortunately, none of the modeled scenarios meet this 2030 emissions limit. Additionally, the emissions reductions estimated in the scenarios that achieve the largest emissions reductions (exploratory scenarios S4 Strong VMT Policy and S6 Best Case Climate Aligned, and the sensitivities applied to them) are likely to be fully unattainable because of the combination of external factors they include (e.g., high fossil fuel prices, low EV costs) and the challenges inherent in achieving the steep VMT and vehicle stock change reductions embedded in them. Nonetheless, these exploratory scenarios indicate the significant range of potential emissions reductions beyond those spurred by electrification alone. Accordingly, the state should focus on achieving the transportation electrification targets and goals it has established (ACC II, ACT, 2030 100% electric LDV sales) while also attempting to at least partially close the gap between expected and desired 2030 on-road vehicle GHG emissions.

Local Air Pollutants

Gasoline- and diesel-powered transportation produces air pollution that can affect people's health, in addition to emitting GHGs that contribute to climate change. These mobile sources of air pollution emit NO_x, particle pollution and other HAPs. NO_x is a respiratory irritant associated with asthma attacks,

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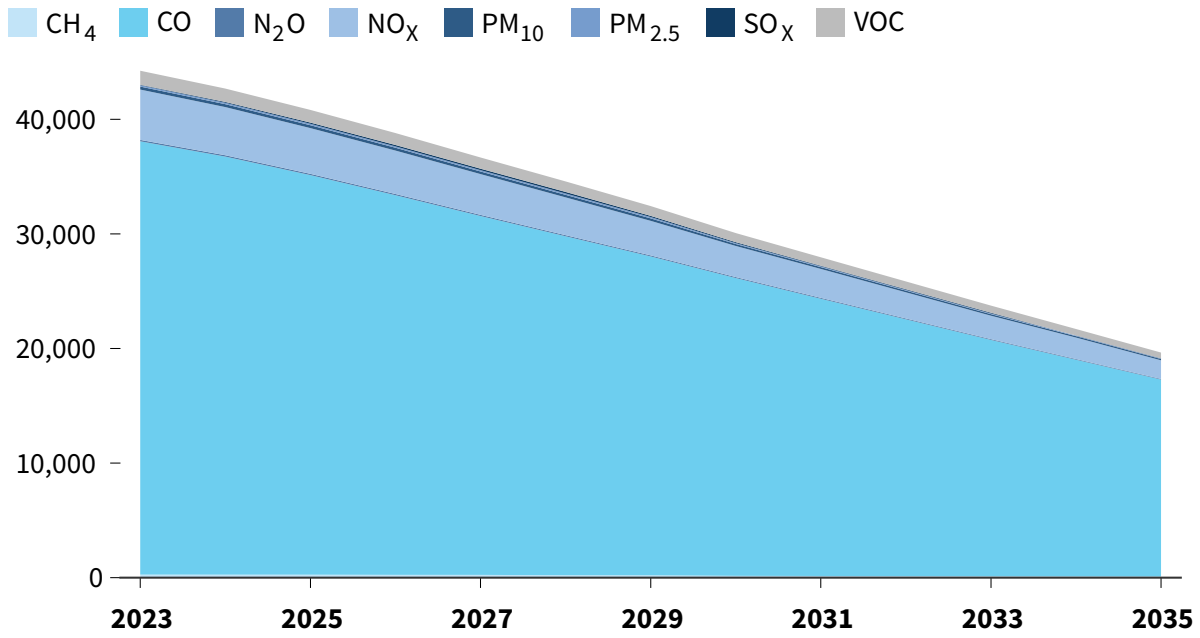
83 Lisa Brown et al., **"Washington State Energy Strategy, 2021,"** Washington Department of Commerce, (December 2022).

symptoms such as coughing and increased hospital visits for respiratory conditions. NO_x also reacts with sunlight to create ground-level ozone, another pollutant, which can cause wheezing, shortness of breath and chest pain; aggravate existing lung conditions; and increase the risk of respiratory infections. Particle pollution can cause eye, nose and throat irritation and coughing or asthma attacks, or aggravate existing lung and heart conditions. HAPs include a wide variety of toxins, including benzene, and are known or suspected to cause cancer or other serious health conditions such as reproductive issues and birth defects. Air pollution can affect everyone, though some groups are especially sensitive or at risk, including people 18 and younger and older than 65, pregnant people, people with health conditions, people with low income, people of color, and tribal and Indigenous populations. People who live near busy roads, truck routes or goods movement centers are also at increased risk of adverse health effects from air pollution.

Reductions in local air pollutant emissions are a significant benefit of transportation electrification, often felt more tangibly in communities than reductions in GHG emissions. Recognizing this opportunity, the American Lung Association released a series of reports in recent years documenting the meaningful health benefits expected from vehicle electrification and the associated reduction in tailpipe emissions.[84]

Figure 33 depicts estimated local air pollutants from both ICE vehicles and EVs in the S3 Strong Electrification Policy scenario. Table 14 shows the percentage change in each pollutant relative to estimated 2023 levels. As an increasing proportion of the state's vehicles are electrified, significant decreases in local air pollution will be attained, leading to improved public health outcomes such as reductions in asthma, respiratory-related hospitalizations and premature deaths.

Figure 33 Local Air Pollutants, S3 Strong Electrification Policy Scenario (Metric Tons)



84 American Lung Association, **"Electric Vehicle Reports,"** (n.d.).

Table 14

Change in Local Air Pollutants Relative to 2023 Levels, S3 Strong Electrification Policy Scenario

	CH_4	CO	N_2O	NO_x	PM_{10}	$PM_{2.5}$	SO_x	VOC
2024	−2%	−4%	−6%	−4%	−3%	3%	86%	−5%
2025	−3%	−8%	−10%	−9%	−4%	6%	175%	−10%
2026	−8%	−12%	−14%	−14%	−5%	−3%	224%	−15%
2027	−9%	−17%	−19%	−19%	−13%	−3%	237%	−20%
2028	−20%	−22%	−23%	−25%	−16%	−2%	260%	−25%
2029	−23%	−26%	−27%	−31%	−18%	−1%	166%	−30%
2030	−40%	−31%	−32%	−38%	−35%	−33%	114%	−35%
2031	−45%	−36%	−36%	−43%	−40%	−38%	26%	−40%
2032	−49%	−41%	−41%	−48%	−44%	−43%	46%	−45%
2033	−54%	−45%	−45%	−53%	−48%	−47%	66%	−49%
2034	−58%	−50%	−49%	−57%	−53%	−52%	−100%	−54%
2035	−62%	−55%	−54%	−63%	−57%	−56%	−100%	−58%

Note: Definitions for the abbreviations at the top of the table can be found in the glossary. Sulfur emissions from ICE vehicles are not included in the MOVES3 database from which emissions factors were sourced, because they are a relatively minor and nonuniform source of tailpipe pollution. They are, however, included in electric power sector emissions, driving the increase shown in this table. However, as the table shows, these are a relatively small source of local air pollution compared with other pollutants such as carbon monoxide (CO), nitrogen oxides (NO_x) and volatile organic compounds (VOCs).

Chapter 5 includes high-level recommendations for how to reduce both GHG and local air pollutant emissions from VMT reductions, vehicle stock changes, vehicle energy efficiency, clean non-electricity fuels, early retirement of gasoline and diesel vehicles, and reducing emissions from non-road transportation. The chapter also includes core policy recommendations and implementation guidance for achieving transportation electrification targets.

5. How Washington Can Get There

Anticipated Barriers to Scaling EV Adoption

Note: Barriers are applicable to all transportation electrification strategies (personal vehicle, micromobility, fleets, public transportation) unless otherwise specified.

Washington has taken a wide variety of critical actions to support transportation electrification, which has helped improve air quality and reduce GHG emissions. These actions include adopting ACC II and ACT, which analysis in the previous chapter shows will drive overall uptake of EVs by ensuring a growing percentage of vehicles sold in the state are electric. However, supporting the state's residents, companies and industries to adapt to EVs smoothly, equitably and affordably will require additional state action and capacity in the form of supporting technological, financial and institutional infrastructure.

The transition from predominately fossil fuel–based modes of transportation to a predominantly electric transportation system is likely to face barriers. This chapter begins by reviewing those barriers and then discusses how the policy recommendations and implementation plan are designed to address them.

Technological Barriers

Product supply chain limitations have led to both EV production challenges and limited availability of fast-charging infrastructure. The availability of EVs and charging equipment is a key component in ensuring people and companies have access to and are comfortable with the transition to EVs. Feedback from fleet operators noted that it is difficult to access electric vans, trucks and other EVs at a rate needed to achieve their EV procurement goals and requirements. Availability constraints are driven by demand outpacing available product, likely due to market factors such as rapidly declining capital costs or TCO and increasing gas prices. It could also be due to customer experience, such as improved driving experience or consumer preference. Similarly, government regulations or incentives at the federal or state level may also increase demand faster than supply.

Paradoxically, both real and perceived limitations in vehicle options, especially affordable models (e.g., Chevy Bolt) and other model types (e.g., electric three-row SUVs, trucks and vans) may limit consumer interest as auto manufacturers rush to adapt to evolving consumer preferences. As an example, in 2023 there were about 29 fully electric consumer vehicle models in North America (of which 18 were eligible for federal tax credits),[85] compared with over 400 models of fossil fuel–based models. Similarly, electrified versions of niche MHDVs, such as refrigerated trucks or long-haul capacity vehicles, are not yet available at scale.

Finally, pandemic-related delays in the supply chain for vehicle computer chips was a huge factor in the doubling of raw material costs for EVs since 2020.[86] Production capacity for fast-charging hardware,

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85 Scooter Doll, **"Here's Every Electric Vehicle That Currently Qualifies for the US Federal Tax Credit,"** Electrek, (August 8, 2023).

86 AlixPartners, **"Auto Industry Needs to Adopt the 'Ruthless Prioritization' Demonstrated by Chinese Automakers to Avoid a Repeat of China's Domestic Electric-Vehicle Dominance Globally,"** (June 26, 2023).

A Chevrolet Bolt electric vehicle charges outside the Washington Department of Ecology's Eastern Region Office.

semiconductors, switch gears, transformers, lithium and other components could similarly affect production and availability of EVs and EVSE.

Charging infrastructure is generally decentralized, can be unreliable, lacks interoperability and can result in queues for open chargers due to slow speeds. Charging an EV is inherently different than filling up a gas tank and will require both a different infrastructure model and a different user mindset. Currently, charging speeds, even for DCFC, are slower than filling up a gas tank, and there is a risk of long queues if drivers need to wait for an open charger. This risk is compounded by reliability challenges among existing chargers, which may be broken or vandalized.

Charger accessibility will also be a determining factor in easing the transition to EVs. For those who can charge at home, charging an EV will be far more convenient than filling up an ICE vehicle at a gas station. Although 72% of Washingtonians have parking within 20 feet of an electrical outlet,[87] those who cannot upgrade the outlet to 240 volts, lack access to personal off-street parking, or cannot charge sufficiently at work will need additional support from the state to gain reliable and affordable residential or neighborhood charging access.

Even with the vast majority of charging expected to happen at home, the public charging experience must be drastically improved, especially for those without residential charging access. As charging infrastructure is built out, the lack of a centralized platform to locate and compare nearby charging locations may frustrate would-be users. Similarly, challenges in interoperability among charging companies — for example, different apps and payment options, the need for credit cards and even varying charging connector ports — will complicate the ability to charge without standardization. Washington is funding both Combined Charging Systems (CCS) and North American Charging Systems (NACS) through charging investment programs and is waiting for federal action to move forward with one standard. NACS is still going through the SAE International (SAE) certification process and Commerce is working with the National Association of State Energy Officials to urge action at the federal level.

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87 Office of Energy Efficiency & Renewable Energy, **"FOTW #1308, September 18, 2023: Sixty-Seven Percent of All Housing Units in the United States Have Vehicle Parking Within 20 Feet of an Electrical Outlet,"** (September 18, 2023).

Two people admire an electric vehicle charging in a parking garage.

Of specific note, those using electric cars that rely on CHAdeMO chargers (including Washington's 13,000 Nissan Leaf drivers) will face unique challenges finding charging access. Washington agencies must prioritize more common connectors like NACS and CCS to make most effective use of limited resources and should urge Nissan to address this issue, caused by the company's decision to limit consumer interoperability.

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, which require higher-power charging. To support LDV adoption, fleet charging and MHDV charging in line with Washington's goals requires investments in and deployment of sufficient grid infrastructure to meet the charging demand. Nationally, transmission infrastructure needs to grow at least 2% per year (twice the annual national average growth rate) just to keep up with the electrification demand from the IRA's renewables and electrification incentives.[88] Utilities will need to deploy additional resources and enable electricity resource management to smooth and shape the demand of additional load throughout each day, such as through use of distributed energy resources (DERs), demand management and possibly vehicle-to-grid (V2G) capability.

Washington's electricity sector is already considerably low carbon and will become more so as utilities meet CETA's carbon neutrality requirement by 2030 and 100% clean energy requirement by 2045. However, as charging demand grows, Washington will need to increase investments in energy efficiency and demand management, and generate or import sufficient renewable energy to ensure transportation electrification is powered by zero-carbon electricity.

Trip range can be limited by negative weather impacts on battery capacity and can be worsened by lack of EVSE infrastructure. Range anxiety among drivers has and will continue to diminish as vehicle performance improves and the public charging network is built out. At the start of 2023, the average range

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88 Jesse D. Jenkins et al., **"Electricity Transmission Is Key to Unlock the Full Potential of the Inflation Reduction Act,"** REPEAT Project, Princeton, (September 22, 2022).

for a new electric LDV on a single charge was 216 miles (348 kilometers),[89] and the average car owner nationally drives 37 miles per day, according to the FHWA. In Washington, only about 10% of commuters have one-way travel times exceeding one hour, and even these commutes should not affect those with access to home charging. Used EVs, however, are often sold with smaller, older batteries that have a more limited range. This compounds equity implications for low-income drivers who are more likely to own used EVs and be impacted by these challenges.

Battery range is a more prominent issue among fleets and MHDVs, especially with respect to electric bus performance, which under the best circumstances may need to incorporate midday charging requirements, especially on hilly routes or in cold weather. Range limitations that constrain electric fleet vehicles to specific routes and schedules reduce their operational flexibility.[90,91] 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 made, sometimes with minimal planning. Drivers whose trip length dictates their income, such as couriers and transportation network company (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.

Financial Barriers

The lack of cost parity between EVs and ICE vehicles can make it difficult or impossible for some consumers to transition. Although a variety of EV models have begun to enter the market, new electric LDVs on average are still considerably more expensive than their ICE counterparts.[92] This also remains the case for MHDVs. Additionally, Washington's used EV market is still limited. Current federal and state incentives for purchasing new and used EVs have been a deciding factor for the majority of consumers. Analysis from RMI suggests light-duty EVs will eventually reach TCO superiority and purchase price parity with ICE vehicles, but not until 2030–32.[93] This is dependent on current projection for states' ACC II adoption. This suggests up-front incentives still have a strong role to play in decisions to purchase an EV over an ICE vehicle for the next few years, especially for LMI consumers.

Up-front vehicle costs impact LMI consumer options disproportionately compared with higher income consumers, even given the long-term operational savings EVs offer. Fortunately, the federal EV incentive is changing from a tax credit, wherein purchasers did not see the benefit until after they provided the up-front capital, to a point-of-sale rebate, requiring no tax liability for the consumer. The Washington sales tax exemption is also functionally an "on the hood" benefit, though it would be more impactful for consumers if it were aligned with the federal incentive.

Installation of EVSE can have high up-front capital costs, including costs to upgrade grid infrastructure, and challenging business models. Despite many federal, utility, private and other funding options to deliver charging infrastructure, EVSE equipment is still a substantial expenditure. Hardware,

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89 Electric Vehicle Database, **"Range of Full Electric Vehicles,"** (n.d.).

90 Ryan Sclar et al., **"Barriers to Adopting Electric Busses,"** World Resources Institute, (May 21, 2019).

91 Due to limited data on routes, the TES modeling assumed all transit and school bus charging takes place at depots. As these buses electrify, however, the state should work with transit agencies and school districts and OSPI to determine where on-route charging may be required, and incorporate these planning considerations into broader EVSE deployment strategies.

92 IEA, **"Global EV Outlook 2022,"** (May 2022).

93 Drew Veysey and Marie McNamara, **"Advanced Clean Cars II: Cutting Pollution While Strengthening Local Economies,"** RMI, (April 5, 2023).

An electric vehicle charging along the West Coast Electric Highway.

installation, site preparation, permits and inspections bring the up-front cost of an average DCFC EV charging station to more than $100,000.[94] The window to apply for a rebate or other incentive can fluctuate, and consumers are not always aware they qualify. Charging installations can trigger both building electrical upgrades and grid infrastructure upgrades. Moreover, because the EVSE market is still relatively new, modeling the return on investment of an EVSE installation varies widely across Washington.

Operating costs for public EV charging lacks transparency, and significant variability in costs between at-home and public charging disproportionately affects renters and residents of multifamily homes. For drivers without access to home charging, the cost of operating an EV can be a significant deterrent to adoption. At the start of 2023, EV owners paid on average $4 more for every 100 miles to charge at commercial charging stations compared with those who charged at home.[95] In some cases, the cost of charging at publicly accessible chargers is set by EVSE providers or property owners. These extra costs add up and are experienced disproportionately by renters and residents of multifamily homes, who tend to be low-income households.

Additionally, fleet operators and businesses are unaccustomed to negotiating charging agreements with their utility provider and see negotiations as complex and full of risk. Fleet operators, which typically have a strong sense of fuel costs when operating ICE vehicles, can feel that they have less control of prices when charging EVs and that there is overall less predictability.[96]

Absent effective regulation, managed charging and other strategies to better use grid capacity, energy burdens could increase for low-income households if utility rates increase to support charging infrastructure.

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94 Chris Nelder and Emily Rogers, **"Reducing EV Charging Infrastructure Costs,"** RMI, (2019).

95 Institute for Energy Research, **"Operating Costs of Electric Vehicles Are Catching Up, and in Some Cases Overtaking Gas-Powered Autos,"** (February 7, 2023).

96 **"Challenges and Solutions in EV Fleet Electrification,"** TruckingDive, (March 27, 2023).

On average, existing passenger cars often stay on the road for approximately 15 years, given the cost of replacing vehicles. The vehicle stock turnover rate is even longer for MHDVs. This will ultimately limit the rate at which vehicles in Washington more widely transition to EVs.

One concern heard during public engagement was from EV drivers who pay a $225 fee to cover what they would otherwise pay in gasoline tax, which helps fund roadway maintenance. The TES's TCO and S-curve model indicate that annual registration fees have little impact on consumer behavior. Based on this finding, the TES recommends other more effective strategies for lowering EV purchase prices without worsening roadway preservation. That being said, EV Council agencies will continue to support the administration's efforts to evaluate road usage charge proposals by ensuring fair fees for EV drivers.

Institutional Barriers

Charging infrastructure development can face delays due to challenges caused by local permitting processes, timelines, supply chain constraints for electrical equipment and regulatory procedures for grid-side utility upgrades, among other institutional barriers. Significant coordinated institutional efforts are needed to reduce barriers to developing accessible charging infrastructure. State and local efforts to develop EVSE need to be complementary and not duplicative, ensuring transparency and coordinated planning efforts. Securing permits to build chargers, construct sites and connect to the grid can require months (sometimes years) of planning, making it difficult to execute projects in a timely manner. Additionally, protocols for fleet electrification are lacking, specifically policies regarding take-home vehicles, charging on the clock, right-to-charge and a hierarchy of charging rights, which can cause confusion for employees.

Lack of clear and consistent EV signage creates difficulty locating and subsequently using chargers. Real or perceived lack of cost transparency to charge, in comparison to high-visibility gas station signage, also deters widespread EV adoption, as do perceptions that electricity costs on average exceed gas prices (though these assumptions are inaccurate in Washington[97]).

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 the ethical and environmental impacts of material and extraction recycling. Tackling the "FUD" principle (fear, uncertainty, doubt) when it comes to EVs means assuaging safety concerns, articulating the benefits of EVs and addressing both real and perceived biases. Some pedestrians and bicyclists have safety concerns regarding sharing roadways with EVs, which can be heavier than their ICE counterparts due to the large batteries. Maintenance workers will need to learn to work with new technology, and fire response personnel will need to learn how to safely deal with EV fires. Previous hasty, uncoordinated rollouts by technology companies of e-bikes and e-scooters have led to persistent negative perceptions of e-micromobility sharing programs and battery safety.[98]

Lack of data also contributes to the FUD principle for decision-making for both consumers and businesses. As mentioned in other barriers listed in this section, there is concern regarding battery range during different weather conditions and under various towing capacities. Data gaps regarding charging access and costs can also make it difficult for consumers and businesses to support the transition to EVs.

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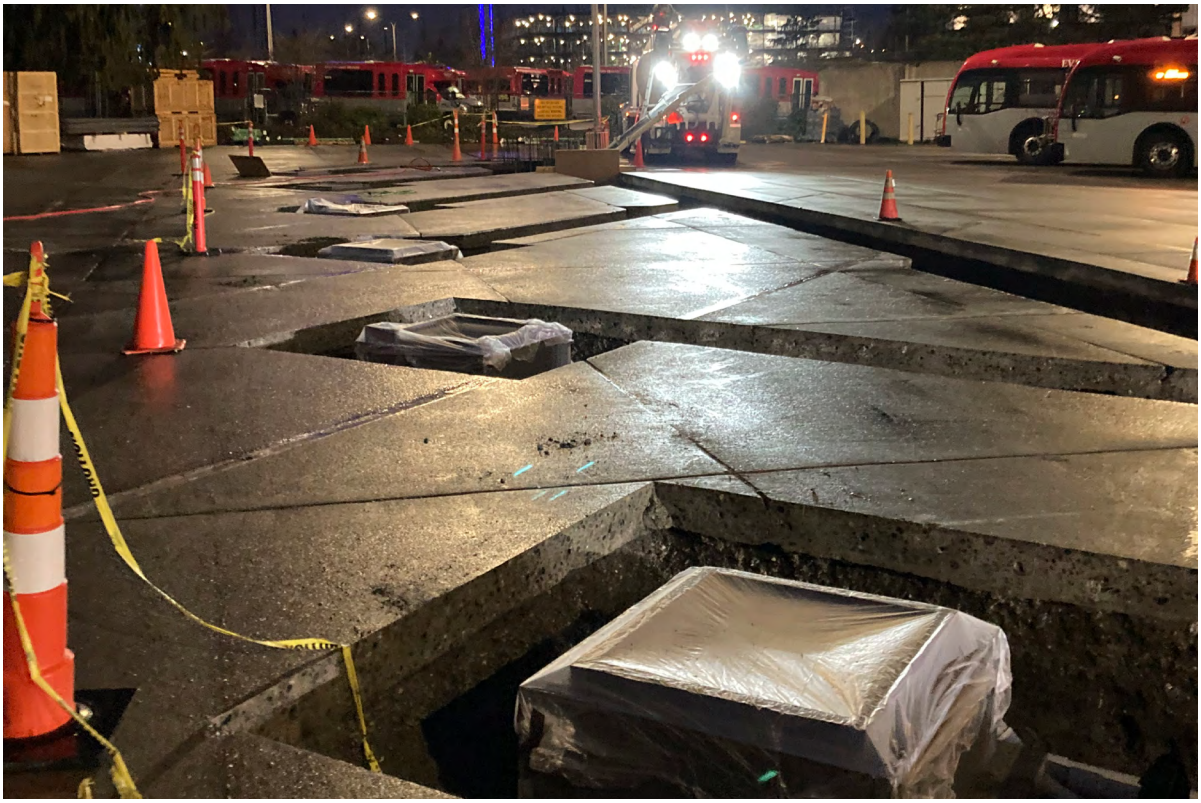
97 Michael J. Coren, **"Is It Cheaper to Refuel Your EV Battery or Gas Tank? We Did the Math in All 50 States,"** Washington Post, (August 14, 2023).

98 Nikolaus Lang et al., **"Putting Micromobility at the Center of Urban Mobility,"** *Boston Consulting Group*, (May 20, 2022).



Infrastructure is installed in a transit bus depot in preparation for high-powered electric bus chargers.

Additionally, consumers have both real and perceived concerns regarding ethical and environmental impacts of material extraction necessary for the manufacturing of EVs.[99] The need to establish infrastructure to support battery recycling could create additional challenges.

This overarching dynamic is worsened by a confusing policy and incentive landscape, and significant information gaps at the primary point of sale (dealerships).

A limited workforce means a lack of technicians to service EVs, and of engineers, electricians and technicians to install and maintain EVSE and related grid infrastructure. The EV and EVSE workforce, although growing in Washington, does not meet the number of technicians in demand for EV maintenance, EVSE installation and maintenance, and grid infrastructure upgrades. As fleets electrify, the skills needed to service EVs will likely require new training for existing maintenance staff, additional staff generally, and external contracting.[100] Ensuring an inclusive and just transition for Washington's ICE mechanics and wider workforce is also critical.

Charging infrastructure, especially for MHDVs, will require significantly more real estate than diesel fueling. Chargers, especially MHDV chargers, take up a significant amount of real estate, and their needs must be balanced with competing state interests such as habitat preservation and housing. Charger sizes typically increase with the size of the vehicles they power. Electric buses, for example, demand considerably larger charging equipment and more space, and can require depot expansion by as much as 40%.[101]

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99 Alessandra Carreon, **"The EV Battery Supply Chain Explained,"** RMI, (May 5, 2023).

100 Sclar et al., "Barriers to Adopting Electric Busses."

101 Sclar et al., "Barriers to Adopting Electric Busses."

Priority Policies

In 2022, the Legislature directed the EV Council to determine how Washington could meet its 2030 EV target, ensure market and infrastructure readiness for an electric transportation system, and ensure the TES benefits vulnerable populations and overburdened communities. The Annual Report contains an annual report that shows the progress state agencies have made since the Legislature created the EV Council. The report shows that Washington has already adopted some critical policy levers, such as ACC II and ACT, that will benefit from supporting policies to ease the path to EV adoption. Other policies need to be established or modified to ensure equitable distribution of benefits.

The EV Council must additionally consider its role in advancing strategies to reduce the transportation sector's GHG emissions. Washington will need to take a number of actions to reach its ambitious goals of reducing transportation sector GHG emissions from 40.3 MMT CO_2e annually in 2019 to roughly 20 MMT CO_2e or below annually by 2030, in keeping with the state's 2030 emissions limit. Electrifying on-road vehicles, which today account for 58% of Washington's transportation sector emissions, is a key opportunity that can be pursued swiftly and equitably and will further benefit from Washington's low-carbon electric grid. This is especially true for LDVs, which were responsible for 40% of transportation sector emissions in 2019 and are further ahead in EV technological advancement than heavier on-road vehicles.

Notably, **reaching Washington's mandate of 100% electric LDV adoption by 2035 is critical but insufficient to reduce enough GHG emissions attributed to the transportation sector by 2030**, and the state would benefit from considering opportunities beyond on-road vehicle electrification. Policy recommendations are therefore divided into two sections.

Cars drive through downtown Seattle at dusk.

Policies in Part I, Achieving the Strong Electrification Scenario, are designed to enable the assumptions built into the S3 Strong Electrification Policy scenario described in Chapter 4, which assumes the state adopts a suite of supporting policies to encourage adoption of on-road EVs, and additionally includes policies to ensure this scenario can be met equitably. The policy recommendations span six areas:

- **Consumer Education and Capacity Building** 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 CBOs, have the resources to support their constituents.

- **Charging and Utility Infrastructure** considers how to scale deployment of EVSE 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.

- **Light-Duty Passenger Vehicles** reviews opportunities to accelerate electric passenger vehicle adoption through financial support, state leadership and other strategies.

- **Medium- and Heavy-Duty Vehicles** examines strategies to accelerate electric MHDV adoption through targeted policies that ease financial barriers to getting more EVs on the road.

- **Electrifying Micromobility** considers how to expand affordable access to e-bikes and integrate them with electrified public transit.

- **Workforce Development** details actions the state can take to ensure Washington's workforce develops the skills and training necessary to support work on EVs, 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.

Policies in **Part II, Closing the 2030 Transportation Greenhouse Gas Emissions Gap,** detail additional strategies the state should consider beyond on-road vehicle electrification to reduce GHG emissions from the transportation sector in alignment with the state's 2030 emissions limit. Such opportunities include:

- Reducing VMT and vehicle weight.

- Additional on-road vehicle strategies, targeted specifically to reducing GHG emissions.

- Non-road transportation strategies, including aviation, marine and ports.

- Focusing state planning and implementation efforts on meeting the 2030 emissions limit.

Collectively, Washington can take action on several fronts to ensure its residents, businesses and workforce are supported in swiftly adopting EVs and deploying charging infrastructure at scale. The state can also pursue additional strategies to steepen the curve of GHG emissions reductions.

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 the S3 Strong Electrification Policy scenario, a comprehensive education and engagement strategy is essential to ensure the general public is aware of the transportation electrification resources and opportunities available and takes action. This should build on the Education Plan and the Engagement Plan[102] and integrate existing local resources, such as the Municipal Research and Services Center and the Washington State University (WSU) Green Transportation program.

    - **(1.1) Develop a Transportation Electrification Education and Resource Center:** In coordination with relevant agencies, Commerce should develop and manage the Resource Center, starting with a centralized Transportation Electrification website to provide clear information on incentives, grants and programs offered by the federal, state and local governments; electric utilities; and community organizations. This one-stop shop of incentives, including consolidated program requirements and application processes, will increase ease of access and support enhanced understanding of opportunities for Washington drivers, fleet managers and state funding applicants and recipients. The website should also provide educational materials, resources and best practices for consumers, dealers, auto and other original equipment manufacturers (OEMs), fleet managers and local implementers. This could include guidance for consumers regarding at-home charging and one-on-one technical assistance for local implementers. This could also include something similar to CARB's Cal Fleet Advisor program, which provides funding assistance, resources, planning and other support for fleet operators that are working to purchase ZEVs.[103] Commerce is currently considering developing a website to help users navigate available energy rebates for the clean buildings programs, and could consider expanding the website to also include information on transportation rebates, thereby establishing a clean energy clearinghouse website. The Resource Center should be developed by leveraging existing resources such as WSU Energy Office, where possible.

      Once a central website is built, the Resource Center should have staff or consultants in relevant funding programs, electric utility planning and operations, or transportation planning organizations assigned to each region in the state. This is a similar structure to ReCharge Colorado within Colorado's Energy Office.[104] Commerce should request preliminary funding to establish the Resource Center, and more funding will be needed from the Legislature to staff and maintain the Resource Center in the future. Resources should be available in the languages spoken in those regions.

    - **(1.2) Promote public information campaigns about financial incentives for and the benefits of getting an EV:** Federal funding for IRA tax credits[105] is unlimited, meaning a state can access consumer- and commercial-facing incentives to the extent it can get its residents and businesses to use them. Accessing incentives will become easier starting in 2024 when dealers will begin providing the Clean Vehicle tax credit at the point of sale, regardless of a consumer's tax liability. Commerce

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102 Additional education and engagement strategies are to be further developed in the **Education Plan** and the **Engagement Plan**.

103 California Air Resources Board, **"Medium- and Heavy-Duty Fleet Zero-Emission Vehicle Purchasing Support (SB 372),"** (n.d.).

104 Colorado Energy Office, **ReCharge Colorado**, (n.d.).

105 IRS, **"Credits and Deductions Under the Inflation Reduction Act of 2022,"** (n.d.).

Prospective EV drivers inspect an electric vehicle at a "ride and drive" event.

should invest in a robust marketing campaign directed at consumers and dealers in order to increase Washington's share of federal dollars and make EVs more affordable. Public information campaigns should include facts about the efficiency of available EVs and should rely on hyperlocal messaging and messengers to the maximum extent possible.

In addition, the Legislature should pass a bill authorizing the DOL, as an extension of its oversight of dealerships, to create and enforce rules requiring dealers to display tax credit and incentive information and to provide it to potential buyers.

- **(1.3) Support ride-and-drive events:** The previously described Resource Center within Commerce should support ride-and-drive events that anyone can attend and test drive an EV to facilitate an increase in business and consumer awareness and understanding of EV technology. These events are an important tool for providing people hands-on opportunities to experience EVs. This support can take the form of leveraging efforts from private entities already hosting such events in order to reduce public costs, along with partnering with CBOs to host events in the communities they serve.

- **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 EVs, EVSE 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 EV adoption, build out associated supporting physical and operational infrastructure, and measure success.

  - **(1.4) Standardize and streamline government EV and EVSE program applications:** Commerce staff assigned to EV Council responsibilities should work together with other agencies to simplify access to government funding in support of EV and EVSE adoption by standardizing and streamlining program applications and program design administered by different agencies as

applicable. For applications, this would ideally take the form of a universal application in which applicants could upload supporting material once for all relevant state programs. In lieu of proof of qualification at the point of sale, Commerce should consider self-attestation of LMI eligibility with sample audits, following the lead of other state agencies and electric utilities.

To streamline reporting and data collection requirements for EVSE, the EV Council should coordinate across agencies, municipalities, private entities and stakeholders with respect to technical-, industry- and consumer-facing requirements for EVSE (refer to the *Charging and Utility Infrastructure* section). It should also coordinate and streamline data collection, reporting and standardization.

- **(1.5) Fully fund agency staffing needs to implement the TES:** The Legislature should direct full appropriate funding to agencies for staffing to carry out the responsibilities identified in the TES. Agencies should work with urgency to recruit and fill positions as funding allows.

- **(1.6) Provide block grants to increase CBO staff capacity:** Commerce should provide new funding specifically to support low-income service provider and CBO staff capacity for transportation electrification project planning and site design, potentially as part of a broader neighborhood-led decarbonization program. This funding is essential to (1) create better access to increasingly large climate funding programs for overburdened communities and vulnerable populations, and (2) establish an information feedback loop between community leaders and state agencies to better inform large program design decision-making. The feedback loop will also provide agencies a channel to inform communities about funding opportunities, and for communities to inform agencies about clean energy siting priorities. Consider designing the grants similarly to the EPA's Climate Pollution Reduction Grants, such as providing guaranteed funding for planning and assessment and competitive grants for implementing specific programs.

- **(1.7) Monitor equity indicators and measure outcomes:** WSDOT should be funded to implement a transportation equity measurement tool, starting with a baseline assessment. The tool should include a Transportation Security Index (similar to the Food Security Index, which identifies food deserts) to assess how people's access to and utilization of transportation modes changes over time as the state begins to implement the TES.

  The Legislature should fund the DOH to estimate and model health benefits for inclusion in TES metrics. Estimates should be based on TES modeled air pollutants reductions.

  In Seattle and Tacoma, two existing air-monitoring locations adjacent to I-5 use EPA-approved air monitors and establish a benchmark for high-quality air monitoring near highways. The information from these locations can be used to accurately characterize air quality improvements that result from fleet electrification.

  As noted both during TES engagement efforts and through current work at Ecology to expand the existing air quality monitoring network in overburdened communities highly impacted by air pollution, there is a desire for a greater understanding of air quality in such neighborhoods. Ecology should evaluate how to best obtain information on traffic-related air pollutants along additional high-traffic road segments, particularly those in overburdened communities highly impacted by air pollution. Ecology should consider community input in this evaluation and any potential expansion of its existing air-monitoring network. These outcomes may be achieved through Ecology's existing efforts to conduct outreach and engagement and to characterize air quality in overburdened

A family crosses the street in Seattle Department of Transportation gear.

communities highly impacted by air pollution. Ecology should bring a budget proposal to the Governor's Office if funding needs are demonstrated by the review, including for expanded engagement with overburdened communities.

Commerce's staff should coordinate with the other EV Council agencies to track these and other equitable electrification-related metrics, such as EV adoption rates by race, income and geography, to assess the effects of transportation electrification–related projects, programs and opportunities on overburdened communities and on equity outcomes moving forward.

2. Charging and Utility Infrastructure

- **Prepare the grid to handle the increase in EV charging demand.**
  - **(2.1) Require utilities to develop public-facing electric capacity maps:** The state should pass legislation requiring consumer-owned electric utilities — and the UTC should require IOUs — to post public-facing grid "hosting" capacity maps on their websites and provide the underlying data layers to WSDOT, Commerce and UTC so they can be added to existing tools (such as WSDOT's ZEV Mapping and Forecasting Tool) without compromising data security. Although this action is important for helping project planners identify sites for EV charging, maps should also show capacity for other DERs. Commerce may need to adopt rules to implement this legislation.

    Maps should show electrical capacity to power EV charging at the distribution feeder level. This initiative could be a challenge for under-resourced consumer-owned utilities and will likely require state funding in order to be implemented. The Legislature should include funding for public power associations or a similar entity to do this work on behalf of their member utilities or utility customers below a certain size threshold. Maps must be updated at least once a year and include clear contact information and responsive technical assistance to allow EVSE implementers to verify accuracy. Commerce and the UTC should work with the Attorney General's Office Public Counsel Unit and other ratepayer advocates to ensure mapping requirements are as cost-effective as

possible so planning benefits outweigh costs to ratepayers. Complementary policies should be evaluated to ensure available capacity benefits all users, not just early adopters.

- **(2.2) Replace the statutory rate impact cap with ratepayer benefits and affordability protections:** Repeal the annual rate impact cap under RCW 35.92.450,[106] RCW 54.16.430[107] and RCW 80.28.360[108] that limits how much electric utilities can spend on transportation electrification programs using ratepayer dollars. The cap was originally intended to protect ratepayers from broadly covering programs that only benefited early adopters. However, with EVs now making up close to 20% of all new vehicle sales, the cap is too restrictive to allow utilities to meet the needs of their customers. Instead of a broad cap, the Legislature should:

  - Require utilities to designate a minimum percentage of their transportation electrification portfolio to provide direct benefits to low-income customers.

  - Replace the incentive rate of return for IOUs with performance incentives currently under development in Docket U-210590 to support equitable outcomes.

  - Consider additional measures, as necessary, to promote affordability. This is consistent with concerns expressed by stakeholders regarding rising electricity prices, especially for overburdened communities and vulnerable populations.

  - Provide the additional funding necessary for agencies to implement changes to RCW 35.92.450,[109] RCW 54.16.430[110] and RCW 80.28.360.[111]

- **(2.3) Identify areas for increased grid investment:** The Energy Resilience and Emergency Management Office (EREMO) within Commerce should cross-reference utility outages of significant duration in overburdened communities and incorporate the energy risk and vulnerability information from the state energy security plan. This analysis should also determine the unique grid upgrades needed for rural communities to transition to electrified transportation. This assessment can also support digitalization via smart grid investments, time-variant charging (i.e., reducing charging prices at certain times of day), managed charging and other load management strategies. Both of these investments should enhance the utility system's resilience as EV adoption reaches critical mass in future years.

  This analysis should actively involve consumers and provide fair compensation to them for supporting grid management needs. The UTC has led on requiring such work with several IOUs incorporating analysis into their clean energy implementation plans (CEIPs) and settlement agreements. This initial progress should be scaled up for all utilities through integrated resource plans (IRPs) and CEIPs.

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106 RCW 35.92.450 – Municipal Utilities – Electrification of transportation plan – Considerations – Incentive programs

107 RCW 54.16.430 – Powers – Electrification of transportation plan – Considerations – Incentive programs.

108 RCW 80.28.360 – Gas, Electrical, and Water Companies – Electric vehicle supply equipment – Capital expenditures – Incentive rate of return on investment.

109 RCW 35.92.450 – Municipal Utilities – Electrification of transportation plan – Considerations – Incentive programs.

110 RCW 54.16.430 – Powers – Electrification of transportation plan – Considerations – Incentive programs.

111 RCW 80.28.360 – Gas, Electrical, and Water Companies – Electric vehicle supply equipment – Capital expenditures – Incentive rate of return on investment.

- **(2.4) Evaluate time-variant electricity pricing and EV charging management:** IOUs and a few consumer-owned utilities have started using time-variant electricity pricing for EV charging and voluntary managed charging programs. The Legislature should require that all consumer-owned electric utilities with more than a specified number of customers develop and offer managed charging programs. The UTC should continue to require IOUs to do the same. Managed charging programs should be technology and hardware agnostic to offer flexibility to develop the best solution for affected communities. As part of these efforts, the state should monitor developments in both V2G and battery storage technology and opportunities and consider if they could be leveraged as an extension of managed charging strategies, for example, through the use of virtual power plants (VPPs), which aggregate multiple DERs to provide energy, capacity and other grid services. Commerce should compile best practices from initial programs to inform a statewide requirement for managed charging programs and time-variant pricing. These programs may be included in demand response targets in utility CEIPs for compliance with the CETA. Reducing impacts on the power system is complementary to the state's commitments to restoring salmon populations and improving salmon migration.

- **Offer and explore additional tools for rapid EVSE deployment.**

  - **(2.5) Support planning and building necessary utility-side charging infrastructure:** UTC and Commerce should enable utilities to develop "make-ready" infrastructure programs, which cover partial or full costs of electrical infrastructure, assessments and equipment to accommodate EV charging. UTC and Commerce should also enable utilities to own and operate EVSE in circumstances where the private EV service provider (EVSP) market is unlikely to meet customer needs. This may include incorporating on-site DERs in appropriate locations. Make-ready investments for customers need to ensure that customers benefit from the investment, and that there is no cross subsidization between residential and commercial customers.

    This should include passing legislation requiring and ensuring equitable funding for proactive grid planning to help utilities scale transportation electrification. Industry leaders believe one of the greatest risks to the EV transition will be utility-side infrastructure bottlenecks. Consumer and fleet

Workers prepare to install EV charging infrastructure in a parking lot.

demand for EVs is increasing, OEMs are working on increasing supply, and EVSPs and other EVSE implementers are anticipating where charging demand will be. To meet this new demand, distribution and transmission upgrades will be necessary in certain locations, as indicated by modeling results. This need for upgrades is an especially large concern for MHD charging sites, such as fleet depots and along freight corridors. Because Washington's drayage truck industry is predominantly owned by small enterprises, cost-effective charging infrastructure that meets their needs should 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 (S1 Baseline scenario), demand for MHD charging is forecasted to grow exponentially from 2023 to 2035, from fewer than 250 ports to over 7,500. MHD deployment to meet the ACT rule (and possibly ACF) levels will simply not occur without adequate new charging infrastructure.

Building on Commerce's current utility-side EVSE cost assessment, which is due in November 2024, the state should give clear authority to utilities for planning and building infrastructure in accordance with anticipated EV charging demand. To the extent possible, Ecology could share nonproprietary fleet data to best equip the utilities to plan accordingly. Guidance should be developed to allow proactive infrastructure investments to support transportation electrification in areas where EV adoption and EVSE analyses highlight impending needs. Alternative financing mechanisms to offset costs to customers should be considered, such as leveraging the U.S. Department of Energy's Loan Programs Office programs. In tandem, WSDOT and Ecology should develop a process for updating the list of eligible expenditures by utilities with CFS revenue.

- **(2.6) Explore expanding public utility line extension allowances for public EVSE charging:** IOUs may provide allowances to commercial customers that require line extensions to serve EVSE. However, consumer-owned utilities do not currently offer line extension allowances, making it harder for commercial customers to afford the up-front capital costs for projects. Commerce should convene consumer-owned utilities to discuss opportunities to better enable their customers to implement EVSE projects, and subsequently work with the Legislature to clarify or authorize, as appropriate, such measures to support EVSE build-out.

- **(2.7) Explore the development of a publicly backed financing entity to provide innovative financing mechanisms:** Green banks in other parts of the country support a variety of different initiatives and projects, including providing financing mechanisms for EV charging infrastructure. A regional financing entity established through the IRA's Greenhouse Gas Reduction Fund that serves Washington businesses and organizations could, for example, provide support for a zero-emissions trucker co-op, including low- or no-interest loans for electric trucks and associated EVSE. As an example, Canada's Infrastructure Bank recently made a CAD 220 million commitment to finance more than 2,000 public fast-charging ports across Canada by 2027.[112] A green bank or similar publicly backed financing entity can assist in mitigating uncertainty in the rate of EV adoption and subsequent charger utilization.

- **(2.8) Amend Clean Fuel Standard rules to allow capacity credits for private fleet depots:** In order to be eligible under this change from Ecology, projects would need to demonstrate a public benefit (for example, improving air quality in overburdened communities) and serve two or more fleets.

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112 **"Canada Infrastructure Bank Marks Its First EV Charging Investment with a $220 Million Commitment to FLO,"** FLO, (April 26, 2023).

A row of electric vehicle chargers ready for use.

- **Ensure benefits and costs of charging infrastructure are passed on equitably.**

  - **(2.9) Expand community charging programs through formula funding:** Commerce is using the first $69 million in community charging grants to fund chargers at multifamily buildings, in rural and tribal communities, in underserved urban and suburban areas, at workplaces and for depot charging. These have been identified as priority areas that require funding to add chargers. The funding is being allocated through a competitive process that will take at least six months from application development to contract negotiation. RMI analysis shows that in the preferred S3 Strong Electrification Policy scenario, the state will need to build approximately 1.3 million charging ports by 2030, increasing to 3 million by 2035. If the state intends to distribute the funding required to support the amount of EVSE installations indicated by RMI's modeling, the state will need to expedite its process for awarding funding.

    Furthermore, Commerce currently receives funding through operating appropriations, which require new appropriations when spanning biennia — an inevitable need for fast-charging projects that take more than one year to complete. Formula grants would allow Commerce the flexibility needed to award funding annually. Instead, Commerce should develop an equitable funding formula that delivers the state's share of funding based on (1) likely local public and private investments, determined through factors such as area median income or county median household income, current and projected EV adoption by county and existing EVSE; and (2) the approximate range of funding needed as estimated in the preferred S3 Strong Electrification Policy scenario.

    Feedback collected during the public engagement period noted that EVSE locations should be prioritized based on their connection to non-driving modes and their ability to maximize utilization to improve consumer experience (especially for TNC and rideshare drivers), limit disruption to traffic patterns and bring significant savings to the state. Example locations include park-and-rides, airports, transportation hubs, parks, libraries, hospitals and municipal buildings. This could also include installing infrastructure to support a bring-your-own-cable structure, as appropriate.[113] It is essential that charging infrastructure meets the unique needs of the local community (i.e., different solutions for rural populations) and that the level of charging meets the charging location's anticipated timing and demand.

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113 EVBox, **"5 Biggest Differences of EV Driving in the US,"** (February 22, 2018).

The formula funding structure and program design should be evaluated on a regular basis to ensure it is having the intended effects and is not unintentionally skewing funding to areas with minimal need. Applications for multifamily charging should specifically be assessed to ensure residents benefit from lower-cost at-home charging (as opposed to being used to create paid charging at the same rates as public charging or EV parking spots for high monthly fees). The EV Council will discuss whether to expand this and other EVSE incentive programs to include private entity applicants. Included in this discussion will be an analysis of how eligibility for different incentive programs might differ based on their funding sources, and the state's need to balance public interest with ease of implementation.

- **(2.10) Ensure community partnerships are in place for charging infrastructure in overburdened communities:** Community benefit agreements[114] with ongoing project assessments should be required for publicly funded charging infrastructure above a specified size installed in overburdened communities, as defined within the TES. Community benefit agreements should be developed between the grantee (for example, an EVSP) and the local community and submitted to the state as a stipulation for receiving funding. Community benefit agreements should be used to ensure EV charging is holistically serving overburdened communities and vulnerable populations, consistent with community input.

- **(2.11) Develop charging consumer protections and price transparency:** Typically, residential charging rates are lower than public charging prices, which could worsen inequities between those who can charge at home and those who cannot. As a result, Washington residents are at risk of experiencing price disparities that would predominantly impact overburdened and vulnerable communities absent policy solutions. To better understand the extent of this issue and begin to ensure equitable charging access, a suite of policy development actions are recommended.

  - The UTC should review and consider the application of **RCW 80.28.320**[115] to require IOUs to include caps for reasonable public charging rates in utility contracts with EVSPs while also ensuring the economic viability of public charging projects.

  - Commerce and UTC, in consultation with the Attorney General's Office, should periodically assess prices for electricity as a transportation fuel for all residents, and, as necessary, pursue actions to protect customers and eliminate financial disparities. Policies should, at a minimum, seek to mitigate cost disparities between those who do not have access to home charging (residential rates) and those who rely on public charging.

  - Commerce should explore the viability of alternative EV charging ownership models that maximize economic benefits for overburdened communities and vulnerable populations. Alternative ownership models should consider regional and utility partnerships that promote administrative efficiencies and equitable outcomes.

- **(2.12) Relieve demand charges through alternative rates for EV charging:** Commerce and UTC, working with COUs and IOUs respectively, should develop model rate structures and conduct outreach to support widespread adoption of EV charging rates across Washington. A demand

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114 Community benefit agreements are contracts between community groups and private entities that require, in the case of EVSE, that a certain percent of the proceeds generated from charging are funneled back into the local community or neighborhood.

115 **RCW 80.28.320 – Gas, Electrical, and Water Companies – Regulation of battery charging facilities.**

A ribbon-cutting ceremony for a new EV charger, attended by WSDOT representatives.

charge is a charge paid by electricity customers on the basis of metered demand (i.e., required electric power), typically for the highest hour or 15-minute interval during a billing period. Because EV charging, particularly DCFC, can have low utilization but intervals of high demand, demand charges can make it difficult to cost-effectively operate EV charging. Time-variant electricity rates provide an alternative to demand charges that help shift charging to off-peak periods while ensuring utilities can recover costs through rates without disincentivizing EV charging and also adhering to the principles of cost causation. Alternatively, the state could explore rate design relief models that scale with utilization, such as those in place in New York and Massachusetts.

- **(2.13) Carefully consider electricity rates:** The Legislature, UTC and Commerce should carefully consider how to sequence the implementation recommendations in this section of the TES to avoid spikes to electricity rates. Complementary programs may be useful to reduce system costs, and partnerships between Commerce, UTC, Bonneville Power Administration, Northwest Power and Conservation Council, and utilities should be explored to evaluate energy efficiency opportunities.

- **Ensure the EVSE build-out process is informed by communities, streamlined and consistent.**

  - **(2.14) Community-informed EVSE siting:** In coordination with HEAL Act staff, agencies with charging funding programs should co-develop guidance for community-centered siting for EVSE infrastructure and require that utilities and EVSPs use the guidance through contract language. The guidance should include best practices for collaboration and co-development between utilities/EVSPs and community entities, including through information loops developed by CBO block grants recommended in *Consumer Education and Capacity Building*. Agencies should work together with utilities and EVSPs when making community-level requests for input to avoid burdensome and duplicative requests.

- **(2.15) Develop model site designs:** Commerce should pull together industry and accessibility experts and local planners to develop statewide model site designs for different types of EVSE deployments that can be used by local implementers. The use of model site designs does not need to be a requirement but could aid in speeding up site design and permitting processes.

- **(2.16) Analyze and reduce grid interconnection timelines for EVSE:** In anticipation of a significant uptick in EVSE development, Commerce and UTC should conduct a study of how long it takes on average for EVSE installations to complete the utility service and local government permitting process, as well as the steps necessary to obtain project approval. The study should also consider interconnection timelines for bidirectional charging (or V2G). This study will help streamline the project approval process and identify bottlenecks so the state can work to address them accordingly. With this insight, the state can set required turnaround times for utility service and local government permit approvals. Utility service approvals should consider existing service approval requirements and practices such as for rooftop solar and residential service. Turnaround times should account for technical requirements for service at the site for the utility to approve service in a specified number of days. There may be additional factors (e.g., grid capacity, environmental justice) to consider in developing an extension request process. Recent work on these topics published by the Sustainable Energy Action Committee, the Interstate Renewable Energy Council and RMI can serve as best practices.

  As part of this analysis, Commerce and the UTC should learn from implementation of California's recently passed **SB 410**,[116] which requires by September 30, 2024, that the California Public Utilities Commission set reasonable average and maximum target times for connecting new customers to the grid and has corresponding reporting requirements. Findings from California should inform whether Washington adopts similar policies.

- **(2.17) Develop recommendations for building codes and corresponding parking and charging requirements:** Commerce, in coordination with the Department of Enterprise Services (DES), the Labor & Industries Department (LNI), WSDOT and other agencies, should review current building code EV charging requirements and develop a 2024 building code cycle proposal for EV charging requirements for all relevant codes, including technical requirements in alignment with the National Electrical Code. The proposal should cover new buildings and renovations, include requirements for MHDV charging at appropriate locations, allow flexibility for the type of charging required at large parking areas, and align with TES modeling. The agencies should assess possible improvements to requirements for **Americans with Disabilities Act** (ADA)–compliant EV charging and include requirements for secure parking with adequate access to charging outlets for a variety of e-bike models.

- **(2.18) Increase ability to install EV chargers in public rights-of-way:** Where possible, electric utilities and local jurisdictions should identify barriers to and encourage the installation of EV chargers in public rights-of-way, including the dual use of light poles, utility poles and other existing electrified infrastructure. Careful consideration will be needed to ensure charging at light poles does not contribute to or create ADA accessibility issues for pedestrians or individuals accessing chargers, or create visual obstacles at street corners. Commerce's local government division should support the development of model ordinances to support this initiative.

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116 SB 410 – Powering Up Californians Act.

- **Ensure EVSE are reliable and resilient.**

  - **(2.19) Establish standards for EVSE reliability:** It is essential that EVSE are reliable and resilient and composed of quality chargers. To achieve this, Commerce, in partnership with WSDOT, should adopt statewide publicly accessible EVSE reliability standards, including uptime standards and charging power rates, that help improve the customer experience, which could include requiring preventive maintenance and field monitoring. Commerce should evaluate existing reporting requirements and modify as necessary to ensure data is being tracked by the appropriate state agencies for all publicly accessible charging ports. When feasible, reporting requirements, such as tracking uptime, should be aligned with federal minimum standards, state agency standards adopted by DES and SEEP, and other programs that have similar requirements to measure and report these metrics. EVSE operators should implement effective systems for consumers to report problems with chargers, and individual chargers should have a unique identifier number or code so problems can be reported more effectively and tracked over time. Commerce should also set a standard (including a time frame) for how quickly chargers will be repaired. Reliability standards should measure incidents of vandalism and other physical damage to inform best-practice EVSE security measures.

  - **(2.20) Establish ongoing maintenance agreements for publicly funded projects:** Commerce, WSDOT and other applicable agencies should require all new projects that use public funds, including any projects in which state or local agencies or public utilities play an administrative role in funding deployment, have either ongoing maintenance agreements or retainer contracts with a local or regional contractor to meet the maintenance demand. Possible accountability structures include (1) partial clawback of public funds used to finance the charger, (2) disqualification from future public EVSE funding, (3) financial penalty written into the contract and (4) an incentive retainage awarded annually based on achievement of minimum uptime standards. WSDOT, in partnership with Commerce, may also consider reserving a pool of funds to bring down costs of multiyear maintenance contracts, and the establishment of a list of qualified maintenance providers.

Electric vehicles are displayed at an EV charger.

- **(2.21) Plan for EVSE disaster readiness:** Commerce's EREMO, in partnership with other key stakeholders, should develop an emergency response action plan for the prioritization of EV charging during an energy supply disruption, in line with current planning for fuel supply disruptions at gas stations.

- **(2.22) Co-locate renewable energy and battery storage with charging:** Agencies with EVSE funding programs and regulatory authority should encourage the deployment of renewable infrastructure and batteries together with EV chargers when connection to the electric grid is either infeasible or less cost-effective, or when charging from battery storage is essential for load management. Although co-location should not be required for all charging infrastructure, the state should list renewables and batteries as an allowable expense under all grant funding opportunities. Charging locations where load shifting or managed charging are less feasible may be better for the co-location of renewables and battery storage, given their ability to help offset peak demand. Renewable energy system co-ops and localized governance and ownership models should be encouraged where feasible, especially in overburdened communities.

- **(2.23) Evaluate cybersecurity threats to drivers and their EVs:** EREMO should evaluate threats that could disrupt transportation operations or compromise personally identifiable information, including threats related to EVs, charging infrastructure, network companies and utilities.

- **Continue to fund and implement highway fast charging.**

  - **(2.24) Continue funding WSDOT's ZEVIP grant program to provide support for charging along state routes:** This program provides funds to nonprofit organizations, tribes and other governmental organizations in cooperation with private-sector partners for EVSE along state routes in Washington. In the 2023–25 biennium, ZEVIP awarded 14 grants for 32 EVSE sites, totaling $30.2 million. The program received applications for $49.1 million, leaving almost $20 million in viable projects unfunded.

  - **(2.25) Use the National Electric Vehicle Infrastructure (NEVI) Formula Program to fund EVSE along interstates and highways:** FHWA has approved Washington's Electric Vehicle Infrastructure Deployment Plan and its first annual update. The EV Council oversees development of this program. WSDOT will administer approximately $71 million in federal NEVI funding over five years. NEVI funds must meet federal requirements, including:

    - Minimum of four 150 kW combo charging system DCFCs per site
    - Site power capability no less than 600 kW
    - 50 miles between sites along designated alternative fuel corridors within one mile of the highway

- **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 EVSE investment decisions:** WSDOT is developing the ZEV Mapping and Forecasting Tool in close coordination with Ecology, Commerce and the Office of Equity. The tool will be available in 2024. Census tract–level data will include EV registration numbers by vehicle class, EVSE stations, road networks, and traffic levels, and population, employment, health, environmental and socioeconomic data. The tool will use, and if needed build on, TES modeling to forecast vehicle populations and derive associated charging infrastructure and electricity needs.

- **(2.27) Develop and implement reporting requirements to assess charging installation progress and provide better information to drivers:** The Legislature should provide rulemaking authority to Commerce to, in coordination with California and other states, require owners, operators and infrastructure developers of public charging and electric utilities that develop private charging to report information needed for the state to assess progress on charging build-out and to support WSDOT's ZEV Mapping and Forecasting Tool.

- This authority should also include the ability to require EVSPs to share real-time data free of charge with each other and with third-party application developers so the public can conveniently access availability information in mobile navigation apps. Requirements for shared real-time data should be limited to information drivers need to find and use chargers (for example, number of charging plugs available, power level, price and parking restrictions).

- **(2.28) Standardize EVSE signage:** The Legislature, based on recommendations from WSDOT and Commerce, should modify **RCW 46.08.185**[117] to increase EVSE visibility and require installation of consistent signage. Consistent FHWA signage should be installed on Washington state roads and rights-of-way. Road users should be able to locate major charging hubs along highways by using consistent wayfinding signage and not need to use an app, although the state should work with mobile navigation apps to ensure drivers can easily use them to find charging.

- **(2.29) Electrify truck parking at ports:** Commerce, Ecology and WSDOT should work with ports to locate truck parking in industrial areas away from residential zones to minimize the effects of trucking activities on neighboring communities. Allocating parking will require coordination with local jurisdictions. These locations should provide overnight truck parking that is secure and access

The Port of Seattle is shown from an aerial view.

117 RCW 46.08.185 – General Provisions – Electric vehicle charging stations—Signage—Penalty.

to L2 and DCFC charging stations for different charging needs. Electrifying truck parking at ports will be expensive, and because parking is already limited, it is likely that additional parking will need to be added at ports to achieve electrification. The state should conduct additional assessments to ensure that charging infrastructure is designated and designed to meet port needs effectively.

- **(2.30) Develop increased public charging for MHDVs:** The state should fund increased public charging for MHDVs through NEVI, ZEVIP and other programs to increase the potential range for MHDVs and decrease range anxiety. Depot charging will be funded in conjunction with incentives for MHDVs.

- **Ensure that all Washington residents can access charging equitably.**

  - **(2.31) Make EVSE accessible:** Agencies with EVSE funding programs and regulatory authority should evaluate EVSE standards under **WAC 16-662-200**,[118] **16-662-210**,[119] **16-662-215**[120] and **16-662-220**,[121] and amend as necessary to expand financial services, increase access to affordable charging and increase physical access to charging.

    State agencies should evaluate complementary efforts to expand financial services and increase access to affordable charging. For example, Commerce should work with the Washington Department of Social and Health Services to explore opportunities to use Electronic Benefits Transfer (EBT) cards that support EV charging at discounted rates and work with utilities to extend bill discount rates to EV charging rates. The Department of Agriculture has an open rulemaking on payment methods for EVSE, and the EV Council will ensure the outcome of that rulemaking is incorporated into future policies and programs.

    Additionally, the state should adopt statewide accessibility standards for new publicly accessible EV charging to improve physical access to EVSE. Such standards could include establishing an adjoining access aisle of 5 feet between spaces, ensuring charging infrastructure is not obstructed by a curb and that the surrounding ground is clear and prohibiting unsecured cables on sidewalks (which could pose a hazard for wheelchair users, pedestrians, people using walkers and so on). Design recommendations from the U.S. Access Board[122] and final Department of Justice accessibility requirements can be used to inform standards for accessible EV charging.

  - **(2.32) Encourage deployment of EV charging in multifamily housing:** Commerce should identify and recommend, and the Legislature should codify, consumer protections associated with communal EV charging access at multifamily residences (e.g., price transparency, accessible payment methods and language access) and establish enforcement mechanisms for charging station operators, as contracted by the building owner and management. Commerce should ensure EV infrastructure requirements do not mandate more parking than would otherwise be required for the site. Commerce should also identify funding mechanisms that can be stacked to help offset the cost of EV infrastructure built and maintained at affordable housing developments. Commerce and

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118 **WAC 16-662-200 – Agriculture marking and fair practices – Electric vehicle supply equipment compliance dates.**

119 **WAC 16-662-210 – Agriculture marketing and fair practices – Electric vehicle supply equipment payment method and fee disclosure requirements.**

120 **WAC 16-662-215 – Agriculture marketing and fair practices – Electric vehicle supply equipment language requirements.**

121 **WAC 16-662-220 – Agriculture marketing and fair practices – Interoperability requirements related to electric vehicle supply equipment.**

122 **"Design Recommendations for Accessible Electric Vehicle Charging Stations,"** U.S. Access Board, (July 17, 2023).

Electric vehicles charge under a canopy of solar panels.

UTC should engage utilities to prioritize their EVSE incentives for multifamily units in overburdened and vulnerable communities.

- **(2.33) Develop renter protections regarding EV charging:** The Legislature should pass right-to-charge legislation to ensure that renters have a means of gaining access to charging infrastructure at their residence or can add charging infrastructure at their residence, without the threat of penalty or eviction. Right-to-charge legislation from other states[123] and Washington's HB 1793 (2022)[124] should be evaluated to inform policy design. Affordability agreements should be considered when allocating public funding to install EVSE at rental housing. As shown in TES analysis, ensuring that an increasing share of multifamily homes — many of which are rental units — have access to home charging has significant benefits in terms of both equitable outcomes and cost savings, by reducing the size of the public charging network required.

- **(2.34) Enforce EVSE standards:** To enforce all standards and program requirements, including consumer protections, the Department of Agriculture should establish additional fees, using existing statutory authority, in order to fund field visits and analyze data reported as part of funding programs. Field visits and data collection will be essential to ensure EVSE meets standards and reliability thresholds, and is accessible for Washington residents.

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123 States that have right-to-charge legislation include California, Colorado, Florida, Hawaii, Maryland, New Jersey, New York, Oregon and Virginia.

124 HB 1793 (2022) – Concerning EV charging stations in common interest communities.

3. Light-Duty Passenger Vehicles

- **Provide financial support for passenger vehicle drivers who are currently priced out of EVs.** Providing incentives and rebates for the transition to EVs will ease the burden of those who would otherwise face challenges affording an EV while increasing the number of both new and used EVs in the state, further driving down purchase prices.

    - **(3.1) Launch Commerce's targeted, up-front point-of-sale EV rebate program:** Up-front rebates have proven more effective than tax incentives for influencing EV purchases, and RMI's modeling shows that incentives are required to achieve necessary rates of passenger EV adoption. Up-front rebates are necessary to ensure access for customers who do not have the capital to cover the purchase cost of an EV and then wait for rebates through their tax return. Commerce is in the process of developing a new, targeted point-of-sale rebate program with the intent to ensure rebates are reaching people in communities that need them the most.

      LMI residents should be specifically supported by point-of-sale light-duty EV rebates. In lieu of proof of qualification at the point of sale, Commerce should consider self-attestation of LMI eligibility with sample audits, following the lead of other state agencies and electric utilities.

      Furthermore, the state should consider allowing low-income service providers to access this rebate to subsidize EVs they use to serve the LMI community. Low-income service providers could be defined as organizations that provide health, dental, social, transportation, financial, energy conservation or other assistive services to LMI households, and the state could consider using an existing program to verify eligibility, such as the Washington State Community Action Partnership.

      Commerce should engage with TNCs and rideshare drivers to discern how to best support drivers to transition to EVs through incentives and other support systems, if they do not qualify for incentives under the parameters described above.

      The state should also consider including additional restrictions, parameters, down payment assistance and bonus incentives in the creation of this rebate. This could include, for example, additional financial support for LMI drivers and qualifying high-mileage drivers to purchase wheelchair-accessible vans and for small businesses in rural communities. The state could also include caps on rebates for qualifying vehicles tied to cost or weight limits, in alignment with the federal Clean Vehicle Credit. Additionally, Commerce should explore implementing a loan loss reserve fund to make it possible for consumers without access to credit to participate. Similar programs in California and other states have found very limited instances of defaults.

      Finally, Commerce should consider offering comprehensive solutions that stack— rather than just one of these possible design options — to increase affordability and reduce burdens for LMI residents.

    - **(3.2) Create a state-supported low-cost leasing program with an EV equity objective:** To provide additional support for LMI communities — which make up a disproportionate 75% of Washington drivers who buy used vehicles — Commerce is considering a social leasing program, wherein individuals below an income threshold can lease EVs at an affordable monthly rate. Although low-cost leases may be included as part of the point-of-sale rebate program, Commerce should explore an expanded program if new vehicle leases prove effective at driving down used EV prices.

An electric vehicle drives with a mascot on board.

- **(3.3) Establish financing and charging incentives supporting affordability:** Commerce is considering offering corresponding rebates to LMI residents for residential or discounted public EV charging, and offering state-backed, low-interest-rate financing for the purchase or lease of both the EV and charger. This could be paired with financial counseling and case management provided by nonprofits.

- **(3.4) Expedite funding for Commerce's EV incentive program:** In the 2025–27 biennium, the next governor should propose, and the Legislature should appropriate, the remaining funding in the Electric Vehicle Incentive Account for Commerce's EV incentive program. Commerce should obtain an independent evaluation of the program to inform recommendations for continued funding for equity-focused EV incentives beyond the 2025–27 biennium.

- **(3.5) Facilitate a used EV work group:** Commerce should work with automakers and dealerships to identify strategies that make the state the highest per capita net importer of used EVs and make recommendations to the governor and Legislature for additional incentives beyond the existing program.

- **(3.6) Continue funding WSDOT's Zero-emissions Access Program (ZAP):** WSDOT's ZAP grants provide funding for zero-emissions car-share pilot programs in underserved and LMI communities that have limited access to public transportation. By making vehicles available to people who may not be able to afford one, this program provides another way for people to access the places, goods and services they need. Ensuring that car-sharing vehicles are electric means the communities using these vehicles receive the benefits of electrified transportation. In addition, this program introduces drivers to EVs. The pilot program is funded through 2023–25. The Legislature should work with WSDOT on extending, refining and expanding ZAP from a pilot to a funded program.

- **Leverage the unlimited federal Clean Vehicle Credit with a broad-based expanded sales tax exemption to signal consumer demand to automakers, incentivizing increased new vehicle supply in Washington and further driving down prices.**

  - **(3.7) Extend and expand the state sales and use tax exemptions for BEVs**: To maximize EV adoption, the state needs to attract vehicle adopters across all incomes, geographies and use cases. Sales and use tax exemptions are administratively more efficient than rebates, serve as a helpful incentive for all EV adopters, and can be used in combination with IRA incentives to substantially reduce up-front capital costs of vehicles. The Legislature should extend the exemptions' effective date, narrow eligibility to BEVs, and align its purchase price requirements with federal limits. Additionally, DOL should work with dealerships to ensure they are providing information about EV incentives to consumers.

  - **(3.8) Increase consumer awareness of incentives:** Commerce should make broad-based incentives, especially the federal rebate, one of the key messages of the public information campaign recommended in *Consumer Education and Capacity Building.* Every dollar spent on increased awareness will be matched by significantly more in federal dollars and consumer cost savings. A number of audiences should receive specific outreach, including LMI residents, small businesses, rural communities and MHDV fleet owners.

- **Pursue additional policy strategies to accelerate LDV adoption rates.**

  - **(3.9) Update ACC II to make EVs more affordable while also accelerating adoption rates.** Ecology, with consultation from Commerce, should work with CARB and other ACC II states to change the ACC II credit structure to incentivize automakers to sell more affordable vehicles without lowering overall ZEV sales percentages. For example, instead of an EV sale being worth one credit, the EV sale itself would be worth 0.75 in isolation, with the vehicle's specific price or efficiency determining the rest of the credit. Alternately, the state could consider a standards-based credit system where vehicle price standards are set and EVs that are more affordable than the standards get additional credits and those that are less affordable get fewer. Additional topics for discussion should include requirements for vehicles to have the technical ability to initiate a managed charging session or send signals to incentivize managed charging, lower credit values for hydrogen FCEVs to reflect their increased risk of power sector natural gas emissions because they need three to four times more electricity than BEVs, and lower credit values for eligible PHEVs to reflect their higher associated emissions.

  - **(3.10) Work with CARB to explore further actions that can be taken to support equitable and lower-cost access to EVs.** California and states that have adopted California's motor vehicle emissions standards have considerable automobile market power. The state should discuss regional approaches with CARB and Section 177 states to support equitable and lower-cost access to EVs for LMI households and retain used EVs in California and Section 177 states.

  - **(3.11) Develop a Clean Miles Standard for large employers:** WSDOT, in consultation with Ecology and Commerce, should work with the Commute Trip Reduction Board to examine strengthening **RCW 70A.15.4060**[125] and associated WSDOT rules to create a Clean Miles Standard for large employers that reduces gasoline consumed by their employees for commutes.

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125 RCW 70A.15.4060 – Washington Clean Air Act – Transportation demand management – Commute trip reduction board.

A group of people share a ride.

Additionally, using California's Clean Miles Standard as a model, Ecology should convene TNC companies, taxicab companies, rideshare drivers and cab drivers to develop a recommended policy for reducing emissions from those companies. Facilitating electrification of rideshare vehicles is both an equity and an emissions reduction priority for the state. The Clean Miles Standard should have specific targets for companies, such as GHG emissions reduction targets, and financial support for high-mileage drivers so they can meet these parameters without undue financial burden, especially because many of the drivers for these companies are from LMI and other overburdened communities. It is essential that charging infrastructure is developed to effectively support drivers impacted by the Clean Miles Standard, by installing sufficient charging at park-and-rides, airports, transportation hubs, parks, libraries, hospitals and municipal buildings. In addition, it is crucial that the charging level meets the charging location's anticipated timing and demand.

Ecology's GHG inventory team, in consultation with Commerce, should set targets for on-road gasoline and diesel usage aligned with the state's climate goals, 2021 SES and the TES by driver segment and by vehicle segment to track progress on prioritizing high-fuel-consumption users.

- **(3.12) Allow automakers to sell direct to consumers for all ZEVs:** The Legislature should pass legislation allowing consumers to purchase any ZEV (LDV or MHDV) directly from automakers without having to purchase through a dealership. Currently, Tesla is the only OEM allowed to sell directly to consumers in Washington. Based on research by Atlas Public Policy[126] and public engagement findings by the RMI consulting team, the EV Council has determined this market inconsistency creates an unnecessary barrier to EV adoption. The TES modeling shows the state can no longer leave any policy option untapped to increase EV adoption, let alone one that comes with only relatively minor administrative cost to implement.

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126 **"Estimating the Impacts of Direct-to-Consumer Electric Vehicle Sales,"** Atlas Public Policy, (September 2022).

The EV Council recognizes that franchise dealerships oppose this change and agency representatives listened carefully to their perspectives throughout the engagement process. Dealerships are important members of their communities and essential partners in the EV transition. Ultimately, this recommendation comes down to empowering consumer choice and creating fair competition in the automaker market.

- **Provide state agencies with the commitment and resources they need to lead by example and implement Executive Order (EO) 21-04, which calls for the electrification of state executive and small-cabinet agency fleets. Reform state standards for local public fleet electrification and use state procurement to make the transition more affordable.**

  - **(3.13) The next governor should reaffirm commitment to EO 21-04:**[127] Some specialty vehicles without electric alternatives may require separate timelines, though gaps are rapidly being filled by new models.

  - **(3.14) Fund and support state agency efforts to implement EO 21-04:** The Legislature should ensure Washington is able to lead by example through codifying EO 21-04 and allocating funding for ongoing staffing at state agencies to plan and implement strategies needed to achieve EO 21-04 targets. Additionally, the Legislature should provide funding for staff training on fleet electrification, model availability and use of TCO models. The Breaking Barriers Collaborative[128] cohort model can be used as a reference for a program in a new state Electric Vehicle Resource Center within Commerce.

    DES and fleet managers should also continue to prioritize purchasing vehicles that qualify for 100% of the federal Commercial Clean Vehicle Tax Credit when cost-effective and feasible from a vehicle availability and deliverability standpoint.

  - **(3.15) Provide charging for state fleets:** Provide EV charging for the state's fleet, state staff's personal vehicles and visitor vehicles at state properties. Leverage the recently completed DES study[129] on EVSE needs for cabinet-level state agency fleet electrification. The Legislature should provide adequate funding for DES, SEEP and state agencies to complete this work and meet requirements set in EO 21-04.

  - **(3.16) Convene a local public fleet work group:** The work group, led by the WSU Energy Office in collaboration with Ecology, Commerce, DES and SEEP, should assess amending **RCW 43.19.648**[130] to align the statute with Ecology's motor vehicle emissions standards (ACC II, ACT and, if adopted, ACF or a similar policy). The statute should also support bulk purchasing of BEVs by the state on behalf of local public fleets, similar to how WSDOT procures transit buses on behalf of transit agencies. The state should continue to consider bulk purchasing for both state and local fleets to increase vehicle model availability and affordability for specific duty cycles when appropriate.

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127 **EO 21-04 – Zero Emission Vehicles.**

128 **"Breaking Barriers Collaborative,"** (n.d.).

129 Washington State Department of Enterprise Services, **"Washington State Cabinet Agency Vehicle Fleet Electrification Forecast,"** (n.d.).

130 **RCW 43.19.648 – Department of Enterprise Services – Publicly owned vehicles, vessels, and construction equipment – Fuel usage – Advisory committee – Tires.**

High-powered electric bus chargers shown at a bus depot.

4. Medium- and Heavy-Duty Vehicles

- **Adopt California's motor vehicle emissions standards under the Clean Vehicles Program (ACC I, ACC II and ACT)**. The Department of Ecology is required to do this through RCW 70A.30.010,[131] 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:** Modeling for the TES shows a significant difference in electric MHDV deployment and emissions impacts when ACF-required adoption rates are included, making ACF the single largest emissions reduction electrification policy the state has yet to adopt. Ecology is monitoring California's actions to finalize ACF and will continue to update Washington's motor vehicle emissions standards as required by RCW 70A.30.010. Design and production of electric fleet vehicles across all categories are still developing. Although fleet electrification is rapidly expanding, some use cases may not yet have an electrified version on the market. Ecology should maintain a list of vehicle use cases where electrification is not yet available to facilitate exemption processes as needed.

    - **(4.2) Advocate for and support development of a successor policy to ACT:** TES modeling indicates the need for a policy more robust than ACT to help bridge the gap between ACT and ACF automaker sales mandates, which increase significantly between model year 2035 and 2036. Therefore, Ecology should advocate for, support and provide input on any potential CARB development of a successor policy to ACT, as well as updates to ACT. Supporting both will further accelerate electrification in the MHDV sector.

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131 RCW 70A.30.010 – Motor Vehicle Emission Standards – Department of ecology to adopt rules to implement California motor vehicle emission standards.

- **(4.3) Consider adopting other MHDV emissions policies and updating existing standards:** California has adopted, is working on developing, or is updating the following standards: ACT, Innovative Clean Transit, ACC I and its amendments (ACC II), Zero Emissions Forklifts policy, In-Use Off-Road Diesel-Fueled Fleets Regulation, Ocean-Going Vessels At Berth policy, Commercial Harbor Craft policy, In Use Locomotive Regulation, Zero Emission Airport Shuttle policy and Zero Emission Motorcycles. Ecology should continue to assess the impact of adopting additional MHDV emissions policies and act accordingly.

- **Incentivize electrification of privately owned MHDVs.**

  - **(4.4) Fund and implement a MHDV incentive and infrastructure program:** The Legislature should allocate necessary funding to support zero-emissions MHDV adoption beyond the initial $130 million–plus in the 2023–25 biennium. The EV Council recommends one large voucher 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 carve outs at least for public fleets. 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 for businesses that cannot afford the up-front cost of these vehicles. However, the base level incentive should otherwise be applicable statewide and have no minimum number of vehicles requirement. Additionally, this voucher program should also include strong incentives for corresponding EVSE infrastructure, such as depot charging, to serve the funded vehicles. Private-sector investment companies should be engaged to finance further electrification of the commercial fleet sector and achieve economies of scale. Finally, the voucher program should consider design options that promote the secondary market for MHDVs in the state, as many users (e.g., drayage) have historically purchased used MHDVs.

  - **(4.5) Accelerate and fund school bus electrification to meet needed adoption rates:** To transition Washington's school bus fleet as quickly as the state's GHG targets demand and to significantly improve health outcomes for students and bus drivers, easy-to-access funding must be provided for school districts and for student transportation service contractors to purchase electric school buses on an urgent timeline. Utilizing its 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 that 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 (e.g., WRI[132]).

    - Calculate the amount of funding necessary for school districts to cover higher 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 that ensures a seamless transition from Ecology's Clean Diesel school bus program.

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132 Lydia Freehafer, Leah Lazer and Brian Zepka, **"The State of Electric School Bus Adoption in the US,"** World Resources Institute, (September 21, 2023).

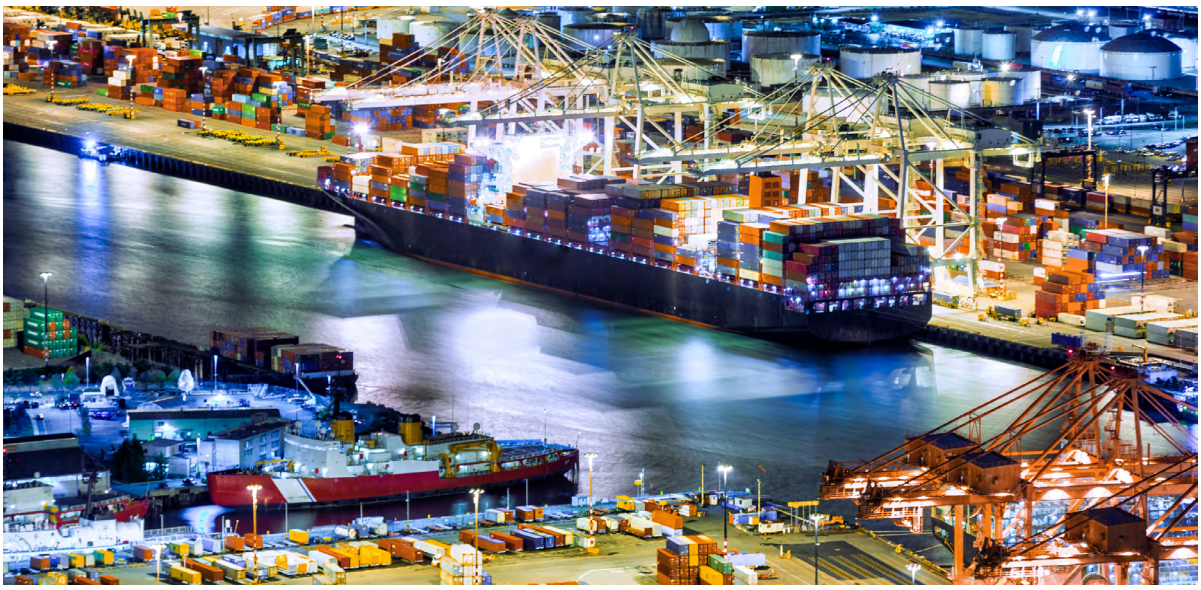
- Develop an exemptions request and approval process that can be made for FCEVs or other ZEVs, if a district can demonstrate they are required by the route.

- Coordinate with school districts via regional transportation coordinators on the above decision points.

- **(4.6) Expand the Clean Diesel program's focus and funding:** Currently, Ecology's Clean Diesel program is entirely focused on diesel-powered vehicles. The state should expand the program to address all fossil fuel–powered equipment transitioning to zero-emissions technology. The Legislature should also provide funding via the Clean Diesel program for innovative projects in sectors that need more support or are showing a promising innovative approach. As an example, this could include funding for comprehensive demonstration projects for more complex sectors that have environmental justice benefits, such as electrifying the refrigerated food delivery trucks of local food banks.

- **(4.7) Establish port priority access for EVs:** State ports should develop opportunities to prioritize access for EVs, without creating undue burdens on small fleets or owner-operated vehicles or creating new traffic congestion, which would worsen air quality impacts. This could take the form of creating priority lanes, priority hours or a fee structure that could be aimed at large fleets and initially waived for small operators. Because of the complex operations and competing demands that take place on port property, implementation of this recommendation must be completed in close alignment with ports and other stakeholders to avoid unintended consequences and operate within the federal and international legal constraints.

- **(4.8) Continue funding the WSDOT Green Transportation Capital grant program:** This program provides funding to transit agencies for zero-emissions 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 2023–25 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.



A cargo ship awaits unloading in port.

- **Leverage federal funding for the electrification of MHDVs.**

  - **(4.9) Apply for a Clean Heavy-Duty Vehicles grant from the IRA:** Washington can use IRA funding to electrify its own fleet vehicles, and establish a grant to support localities, tribal nations and school districts to do the same. SEEP should take the lead on pursuing federal funding for the state fleet, and WSDOT and Ecology should work together on supporting other applications. Washington should explore the potential to contribute local matching funds.

  - **(4.10) Explore bulk purchase financing through the U.S. Department of Energy Loan Programs Office:** Commerce, Ecology and WSDOT should work together to explore financing bulk purchases of electric trucks and buses, and charging infrastructure, through the U.S. Department of Energy Loan Programs Office's IRA funding.

5. Electrifying Micromobility

- **Expand affordable access to e-bikes and integrate it with electrified public transit.**

  - **(5.1) Support and expand the e-bike rebate and lending library programs:** The Legislature should establish the new programs in statute, expand future funding to meet LMI resident needs, and provide flexibility to modify the programs based on lessons learned through the early implementation phases. Based on strong demand for such programs in other states, the Legislature should fund programs in line with emissions reduction and transportation equity objectives.

    - **Provide rebates for e-bikes and e-trikes:** The rebates should include electric cargo bikes and family bikes, adaptive e-bikes and e-trikes for use by people with disabilities, as well as related equipment, including equipment designed for transporting children such as child bike seats and trailers. The state should reserve at least 75%–80% of the rebate for LMI residents.

    - **Fund the scaling or introduction of affordable e-bikes and e-scooters that connect to other forms of public transportation:** Providing access to and increasing first- and last-mile transportation options in locations where transit services are not available is essential for non-drivers. Explore opportunities to create "one card" access across these shared mobility platforms and transit services.

- **Adequately fund bike infrastructure, including charging access for e-bikes.**

  - **(5.2) Implement the Active Transportation Plan's remaining recommendations:** The Legislature and other state decision-makers should implement any remaining recommendations not yet acted on in WSDOT's **award-winning Active Transportation Plan** related to e-micromobility, including providing safe bicycling paths. Similar to WSDOT's highway corridor charging programs for passenger vehicles, the Legislature should create an e-bike charging program administered by WSDOT to ensure sufficient recharging access to make commutes and other longer trips possible.

  - **(5.3) Expand public access to secure bike parking, including access to charging outlets for e-bikes:** WSDOT's Active Transportation Division, in consultation with Commerce's Local Government Division, should enable e-bike parking to count toward parking requirements, provided minimum requirements are in place to encourage conversion of traditional parking spots into secure storage for different types and sizes of electric and non-electric bikes. Where feasible, e-bike

A pair of electric bikes await riders on their daily commute.

parking should integrate with solar-powered facilities. WSDOT and Commerce staff supporting local governments should prioritize these parking and charging stations at transit centers, state government buildings including colleges and universities, libraries, schools, local government buildings, community centers, public gathering places such as parks and providers of essential goods and services such as health care and groceries.

- **(5.4) As communities develop their curb management strategies, ensure that electrification and micromobility safety is considered:** Support communities in establishing a curb management strategy that balances priority access to the curb for pedestrians, cyclists and shared transit users with short-term pick-up and drop-off access and charging infrastructure for electric modes of transportation, particularly e-micromobility. Commerce's Growth Management Services team should work with local governments to work this strategy into its comprehensive plans to ensure significant build-out of protected bike lanes and infrastructure. The strategy should include guidance on:

  - Accommodating standard cargo and e-cargo bikes (e.g., lane widths, loading zones and on-street charging zones).

  - Utilizing space at intersections to provide parking for e-bikes and other e-micromobility devices, potentially with charging and/or docking stations, while also providing improved line of sight for drivers so they can see pedestrians crossing streets and other movements.

  - Ensuring capital improvements to the curb include preparing for or implementing EVSE for e-micromobility and for some electric LDVs and MDVs.

  - Ensuring curbside EV charging does not deter conversions of or plans to convert on-street parking to public space for recreational and commercial use.

  - Ensuring access for people with disabilities.

6. Workforce Development

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

    - **(6.1) Invest in targeted workforce training:** Fund workforce training programs across Washington, in rural, suburban and urban areas, that provide education about the mechanics, operation, safety and maintenance of ZEVs, EV charging, hydrogen fueling stations, and tools involved in the implementation of alternative fuel technologies. This should include funding to create accessible career pathways, including registered pre-apprenticeship and apprenticeship programs with a focus on joint labor-contractor programs and labor-led workforce development. Certification programs should be scaled and delivered in partnership with technical colleges and CBOs. Additionally, this should include training for incumbent manufacturing employees and ICE vehicle mechanics on new technologies to minimize worker displacement — using federal funding where available. This should be specifically designed to ease barriers to entry for BIPOC, women, tribal citizens, low-income residents and veterans. Additionally, this should include wraparound services for individuals in these communities.

      Agency staff involved in the EV Council's work should get on the Clean Energy Technology Workforce Advisory Committee's agenda early in its formation to present the TES findings and the feedback received from workforce stakeholders in the TES development process, and to urge the committee to prioritize transportation electrification jobs in their recommendations.

- **Ensure 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 EV charger installations:** Require Electric Vehicle Infrastructure Training Program (EVITP) or similar accredited program certification for the installation of the electrical system of EV chargers to ensure safety and effectiveness, and to address inconsistencies in labor standards. This requirement should be rolled out in phases, starting in 2025 as a requirement for publicly funded projects, and later for privately funded projects. EVITP certification should only apply to electricians required to work on-site on solely electrical components and should not apply to other construction workers necessary for the installation of EV charging infrastructure (including but not limited to charging stations, parking spots and bus and other fleet depots) and all other processes involving EVSE installation. EVITP certification typically requires 20 hours of instruction and costs $275 for the online course (and typically less for in-person apprenticeship continuing education programs). The state should set up a fund to offset the cost of certification for Minority or Women's Business Enterprises entities. LNI should review the EVITP curriculum to ensure it stays current with changing EV charger technology. As this policy recommendation is implemented, additional consideration should be given to the findings from the Clean Energy Technology Workforce Advisory Committee (HB 1176). [133]

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133 Clean Energy Workforce Advisory Committee **(HB 1176) – An act relating to developing opportunities for service and workforce programs to support climate-ready communities.**

A maintenance technician works on an EV charger.

- **(6.3) Explore training and certification requirements for EV charging maintenance technicians:** Support maintenance providers in receiving appropriate instruction for maintenance and repair of EVSE, including manufacturer-approved training. For example, SAE International has a specifically developed Electric Vehicle Supply Equipment (EVSE) Technician Certification.[134]

- **(6.4) Require EV technician training for fleets:** Agencies with ZEV funding programs should work with LNI, transit agencies and labor unions to ensure training and proper equipment for technicians working on EVs, including electrical safety best practices. 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.

- **(6.5) Require training and certification for EV technicians:** Ensure a lead mechanic is present when an OEM gives instructions on servicing their vehicle models and require annual re-trainings to keep technicians up to date on new technologies.

- **(6.6) Create a training grant program for first responders addressing EV battery fires:** Although EV battery fires are significantly less frequent than gasoline vehicle fires, they burn differently and require new vehicle firefighting methods. Washington State Patrol, in their authority on fire safety training, should develop guidance on responding to EV battery fires and request funding for a grant program to support local training for first responders.

- **Enact strong labor standards and agreements for the existing and growing electrification workforce.**

  - **(6.7) Set standards for government-funded EVSE projects:** Ensure all EVSE projects funded in whole or in part with state or federal funds, including projects supported with grants, loans and tax incentives, pay the prevailing wage and adhere to Apprentice Utilization Requirements. Apply the

134 SAE International, **"SAE International Electric Vehicle Supply Equipment (EVSE) Technician Certification,"** (n.d.).

labor standards attached to federal funding to projects funded in whole or in part by the state through project installation. Require high-road labor standards for manufacturing assembly, and operations and maintenance jobs at facilities funded in part by public funds (including tax incentives).

- **(6.8) Develop labor and workforce standards and require labor agreements for large public installation projects:** Develop labor and workforce standards for transportation electrification projects and require project labor agreements or community workforce agreements (for laborers, operators and electricians) for all public installation projects larger than 25 DCFCs, 100 L2 chargers and/or $1 million in total cost. Require project labor agreements or community workforce agreements for the construction of new or retrofitting of existing manufacturing plants.

- **(6.9) Establish clear objectives for participation by overburdened communities and vulnerable populations in the electrification workforce:** Building on experience with priority hiring programs in Washington, establish clear goals for the recruitment, participation, hiring and retention of women, BIPOC community members and individuals from overburdened communities and vulnerable populations in pre-apprenticeship programs, apprenticeship programs and employment. Require data collection and submission to the LNI so that trends can be monitored and corrective actions can be taken if necessary to reach these goals. Contractors and training organizations that successfully meet goals should receive additional points in future contracting and procurement opportunities with the state.

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

  - **(6.10) Build EV manufacturing in Washington:** Commerce's Office of Economic Development and Competitiveness should identify manufacturing sites statewide and support site development for EV components and assembly. It should either prioritize areas where workforce and training centers are currently located or support the creation of new workforce development centers in identified areas. Leverage all available federal funds (namely the 48C Advanced Manufacturing Tax Credit and the Domestic Manufacturing Conversion Grants Program) to expand in-state manufacturing of EV components and EV assembly. As an example, in 2023 it was announced that a factory is being built to manufacture and deliver silicon battery technology in Moses Lake, Washington, and production lines are projected to be online by 2024.[135]

  - **(6.11) Support local markets for battery reuse and recycling:** There is a focus on developing a circular economy for battery recycling in the United States to reduce reliance on minerals sourced overseas. As directed by **Chapter 434, Laws of 2023**, Ecology is currently studying EV battery management in Washington and will be making recommendations to the Legislature via a legislative report in spring 2024. Part of that study is examining reuse markets. The Legislature should take action to financially support the development of a program to reuse or retire EV batteries. In addition, Commerce's Office of Economic Development and Competitiveness should apply for federal funding (namely the 45X Advanced Manufacturing Production Tax Credit) for the creation of a battery recycling plant using direct disassembly or hydrometallurgy. In consultation with Commerce, Ecology should examine what obstacles prevent the siting of a battery recycling facility in Washington and identify what steps can be taken to address them. Any recycling plants need to meet workforce standards for both construction and operations.

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135 PR Newswire, **"Group14 Technologies Begins Construction of the World's Largest Commercial Factory for Advanced Silicon Battery Materials,"** (April 4, 2023).

Part II – Closing the 2030 Transportation Greenhouse Gas Emissions Gap

TES modeling shows that even the most ambitious, yet still feasible EV adoption rates reflected in the S3 Strong Electrification Policy scenario leave an approximate 3.9 MMT CO_2e gap in emissions in 2030. As explained in Chapter 4, even if insufficient, maximizing transportation electrification is necessary to stay under the 2030 emissions limit, and it is essential to staying under 2040 and 2050 limits.

Meeting the state's 2030 emissions limit will require actions beyond the transportation electrification recommendations in this strategy. The Legislature cited the 2030 emissions limit in its language creating the EV Council, embedding it in this report's purpose. This legislative intent was mirrored by stakeholders and community leaders who requested recommendations beyond EVs be included in this strategy.

For these reasons, staff representing the agencies on the EV Council will support efforts by colleagues, local and regional public agencies, private-sector and nonprofit partners, and communities to make progress on additional clean transportation strategies.

On-Road Vehicle Strategies

A. Reducing Vehicle Miles Traveled

The 2021 SES identified two prongs to address transportation GHGs: switching to EVs and clean fuels, and moving people and goods more efficiently and equitably. The TES focuses on transportation electrification. However, because electrification will leave a significant emissions gap in 2030, additional strategies are needed. Investments that move people and goods more efficiently will reduce per capita VMT and bring the state closer to meeting GHG limits.

Drivers commute home through the dusky Seattle night.

In addition to directly lowering vehicle energy use and associated emissions, improved travel efficiency reduces the amount of energy infrastructure needed, which also supports transportation electrification efforts. Requiring less electricity for travel will make the transition to EVs easier and less costly, because it will require less additional generation, transmission and charging infrastructure.

As described in Chapter 4, VMT-related scenarios identify the additional emissions reductions from transportation efficiency strategies. Modeling included several exploratory scenarios to evaluate how maximizing reductions in VMT would affect 2030 emissions. Analysis compared a 17% per capita reduction by 2035 with the 6% reduction expected under current policies and showed that a high level of VMT reduction could narrow but not fully close the remaining 2030 emissions gap. Although meeting the underlying assumptions in these illustrative scenarios will be very challenging — due to long timelines for infrastructure build-out and housing density changes — they must be pursued in tandem with electrification and clean fuels strategies.

In November 2023, WSDOT submitted the **Transportation Carbon Reduction Strategy** (TCRS).[136] The TCRS uses the SES's two-pronged approach to describe the transportation carbon reduction policies and strategies currently in place across the state. In the section on moving people and goods more efficiently, the TCRS identifies a number of current policies and strategies, including land use strategies, active transportation investments, transit and rideshare incentives and strategies (including intercity transit), using the internet to reduce travel needs, operating the system efficiently, and improvements in user fees, fleet operations management and vehicle efficiency.

- **(A.1) WSDOT – 2023 VMT Report**

  In 2021, the Legislature directed WSDOT, in partnership with Commerce, to complete a report on VMT reduction targets. WSDOT's **Vehicle Miles Traveled (VMT) Targets – Final Report**[137] provides recommendations on legislative and rules changes that would improve travel efficiency and reduce the need to drive alone, setting sub-state per capita VMT targets and identifying the need for future equity analysis and community-led planning and engagement.

  The report chapter "What Works – A Menu of VMT Strategies" highlights the effectiveness of various VMT reduction strategies, as shown in Table 15, and notes the importance of land use changes and pricing:

  - "Reducing per capita VMT requires smart transportation investments aligned with strong land use planning. A study by Smart Growth America and the State Smart Transportation Initiative in 2021 for Washington State identified the potential VMT impact of land use and transportation strategies.

  - "Land use patterns are clearly one of the most effective changes a jurisdiction can make, but the resulting development (and therefore VMT reduction benefits) will take time. It is crucial to address land use changes as soon as possible to accelerate the realization of future benefits. Land use provides the foundation, then active transportation and transit facilities and services enable people to enjoy the benefits of shorter travel distances. Pricing is also effective as witnessed by behavior changes related to gas prices; however, it can be politically challenging to implement. For these reasons, a combination of all these strategies should be implemented in communities across the state."

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136 WSDOT, **"Transportation Carbon Reduction Strategy."**

137 Millar and Pen, "Vehicle Miles Traveled (VMT) Targets - Final Report."

Table 15

VMT Reduction-Management Strategies and Their Potential Average Effect

Strategy	Potential Effect on VMT
Land use	●●●●●●●●●●●●○○○○○○○○
Constrained highway spending	●○○○○○○○○○○○○○○○○○○○
Transit enhancements	●●○○○○○○○○○○○○○○○○○○
Bike and pedestrian enhancements	●○○○○○○○○○○○○○○○○○○○
Consumer benefits	●●○○○○○○○○○○○○○○○○○○
Parking policy	●●●●○○○○○○○○○○○○○○○○
Road pricing	●●●●●○○○○○○○○○○○○○○○
Broadband and remote access	●○○○○○○○○○○○○○○○○○○○

Note: Each dot represents a 5% average reduction in VMT.

Source: WSDOT *"Vehicle Miles Traveled (VMT) Targets – Final report."*

- **(A.2) Commerce – Local Land Use Support**

  The state is supporting the land use VMT strategy by providing early guidance for local governments on improving transportation efficiency (among other climate planning issues)[138] developed by Commerce's Growth Management Services team, working in close coordination with WSDOT.

  In the 2023 legislative session, **Chapter 228, Laws of 2023** added a climate element to comprehensive planning requirements for counties and cities with more than 6,000 people.[139] For the state's 11 largest counties and the cities within those counties, a required sub-element must include goals and policies to reduce emissions and VMT. To support this planning, Commerce is awarding $30 million in grants statewide for the 2023–25 biennium.

Historic Investments in Transit and Active Transportation

Efforts to create denser communities are supported by significant new investments in public transit and active transportation. These two transportation options will receive 80% of CCA carbon emissions reduction account funding per **RCW 46.68.490**[140] and **RCW 46.68.500**.[141]

B. Reducing Vehicle Weight

Reducing vehicle weight can have significant effects on fuel economy and energy consumption, therefore reducing emissions. The national trend toward larger passenger vehicles[142] such as pickup trucks and SUVs

138 Washington State Department of Commerce — Growth Management Services, **"Climate Element Planning Guidance,"** (June 2023).

139 Washington State Department of Commerce, **"Climate Program,"** (n.d.).

140 **RCW 46.68.490 – Climate active transportation account.**

141 **RCW 46.68.500 – Climate transit programs account.**

142 Andrew Van Dam, **"The Real Reason Trucks Have Taken over U.S. Roadways,"** *Washington Post*, (April 7, 2023).

makes emissions reduction more difficult, transportation fuel costs more expensive and traffic collisions more likely to be fatal or to cause serious injury. However, achieving vehicle weight reductions at the state level is difficult, as automaker marketing has an outsized effect on consumer preferences.

Although options are limited, the Legislature and state agencies should consider a variety of possible actions to make progress on reducing average passenger vehicle weight:

- **(B.1) Explore increasing registration fees for noncommercial vehicles that weigh more than 4,000 pounds.** RCW 46.17.355[143] sets increased registration fees for vehicles starting at 4,000 pounds to reflect increased wear on roads, ranging from $53 for 4,000 pounds to $93 for 10,000 pounds. The state could assess the impact these fees have on consumer decision-making and consider increasing fees or shifting to a more visible point-of-purchase sales tax surcharge. California's Legislature is considering a bill to conduct a similar analysis.[144]

- **(B.2) Support federal efforts to apply consistent emissions standards for larger vehicles.** The state should comment on relevant rulemakings related to the EPA's emissions standards, the National Highway Transportation Safety Administration's Corporate Average Fuel Economy (CAFE) standards, and the U.S. Department of Energy's fuel efficiency standards to encourage the consistent application of emissions standards to larger passenger and commuter vehicles. Historically, these standards have incentivized automakers to produce vehicles with larger physical footprints, which have relatively higher traffic safety concerns and emissions but are required to have less costly emissions controls systems. The state should also work with Washington's federal congressional delegation to support changes that incentivize smaller new passenger and commuter vehicles.

C. Strategies to Reduce Gasoline and Diesel in Existing Vehicles

The modeled electrification strategies leave a 2030 emissions gap largely because they primarily address new vehicle sales and not the gasoline or diesel vehicles already on Washington roads. The state can close this gap by pursuing the following strategies:

- **(C.1) Increase use of clean drop-in fuels through the Clean Fuel Standard:** The 2021 SES was tied to the state's emissions reduction limits and modeled scenarios that stay under the 2030 emissions limit by assuming a dramatic increase in clean drop-in fuels, including biofuels, renewable diesel and electrofuels (carbon-neutral fuels created by combining green electrolytic or renewable hydrogen and CO_2 or carbon monoxide), which reduce the carbon intensity of gasoline and diesel when blended with fossil fuels. The state's primary policy instrument to increase the use of these drop-in fuels is the Clean Fuel Standard (CFS), which is currently set to decrease carbon intensity by 20% by 2034 through a credit-deficit market system. Ecology should coordinate with Commerce's Office of Renewable Fuels to assess whether the CFS is driving enough drop-in fuel deployment to meet the SES and other relevant modeling and pursue two actions:

    - **(C.1.1) Add flexibility to the Clean Fuel Standard's carbon intensity schedule:** The Legislature currently retains authority, through RCW 70A.535.025,[145] to set carbon intensity reduction

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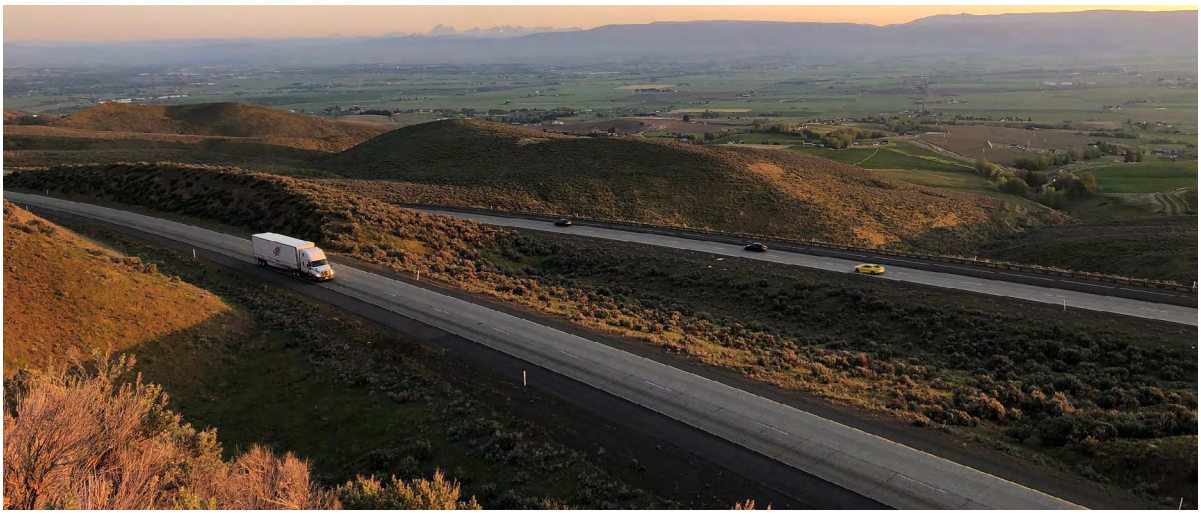
143 RCW 46.17.355 – Vehicle Fees – License fees by weight.

144 AB-251 California Transportation Commission: vehicle weight safety study, (2023–24).

145 RCW 70A.535.025 – Carbon intensity in transportation fuels – Standards to reduce carbon intensity – Adoption of rules – Monthly Calculation.



A lone 18-wheel truck traverses a Washington highway.

schedules for Washington's CFS. The Legislature should transfer that authority to Ecology so Ecology can adjust schedules via rulemaking. This effects the program's flexibility to respond to changes in the transportation sector and the Washington CFS market, the state's emissions reduction needs and price stability in the market for CFS credits. This would align with two other states' low-carbon fuel standards, as the CARB and the Oregon Department of Environmental Quality both control their respective state's carbon intensity schedules.

- **(C.1.2) Increase the stringency of the Clean Fuel Standard program:** Where appropriate, the state should consider for inclusion in Washington's CFS both the suite of proposed updates to California's Low Carbon Fuel Standard[146] and updates implemented by Oregon's CFS since the passage of Washington's CFS statute. This includes increasing the stringency of the carbon intensity reduction schedule by 2030 and extending the carbon intensity targets into later years. Further reductions in fuel carbon intensity are not included in the TES modeling results and will be an important part of bridging the emissions gap identified above for 2030. This includes increasing the stringency of the carbon intensity reduction schedule by 2030 and extending the carbon intensity targets into later years. Further reductions in fuel carbon intensity are not included in the TES modeling results and will be an important part of bridging the emissions gap identified above for 2030.

- **(C.2) Improve vehicle efficiency with lower-resistance replacement tires:** According to the U.S. Department of Energy, "20% to 30% of a vehicle's fuel consumption and 24% of road vehicle CO_2 emissions are tire-related."[147] In fact, only 12% to 30% of gasoline used in an ICE vehicle goes to propelling motion. More than 70% of energy is lost in engine operations and wheel resistance. Commerce's Energy Policy Office estimates that efficiency standards for replacement tires and associated consumer awareness and labeling efforts could save about 618 million gallons of gasoline, 1,396 gigawatt-hours of electricity, and 5.4 MMT CO_2e between 2026 and 2035. They further find that Washington drivers would save an average of $714 per set of four replacement tires over the life of the tires through increased efficiency savings. States can adopt efficiency standards because the federal

146 State of California Air Resources Board, **"Low Carbon Fuel Standard 2023 Amendments,"** (September 8, 2023).

147 U.S. Department of Energy, **"Tires and Fuel Economy,"** (n.d.).

government has not acted and therefore no preemption exists. Commerce plans to pursue such standards, which are similar to other energy efficiency standards enacted through Commerce rules.[148]

- **(C.3) Enforce diesel vehicle compliance:** Many diesel engines are out of compliance. Due to EPA inaction on this issue, a diesel anti-tampering law is needed to stop the sale of aftermarket defective devices, which should include a scrap-and-swap element for electrification. Additionally, the Legislature should authorize Ecology to develop penalties for shops that illegally retrofit or bypass emissions systems. This effort could be combined with the proposed anti-idling legislation below.

- **(C.4) Explore an anti-idling law for ICE MHDVs:** Ecology should consider developing an anti-idling agency request bill for MHD ICE vehicles, specifically targeting long idling times, thus incentivizing a shift to EVs while reducing pollution in overburdened communities. The legislation or resulting implementation could provide incentives for drivers to invest in technologies that reduce idling, including electrifying internal cabin operations to ease the transition to anti-idling. HD truck idle reduction technologies exist, which enable truck drivers to maintain climate control and power.[149] In places like New York City, a Citizens Air Complaint Program enables citizens to file a complaint when vehicles are idling for more than one to three minutes and potentially receive payment.[150]

- **(C.5) Focus on high-consumption gasoline and diesel users:** Building on findings from the Joint Transportation Committee's June 2023 report the state should focus electrification efforts on "superusers" to maximize emissions reductions through electrification investments. Strategies include:[151]

  - Developing a Clean Miles Standard
  - Specifically identifying LMI residents who drive long distances for work as vulnerable populations within incentive program prioritization
  - Targeting high-consumption fuel users in the Education Plan's outreach
  - Creating a scrap-and-replace incentive program for high-emissions MHDVs with viable battery electric alternatives

  This scrap-and-replace program should aim to accelerate the adoption of electric MHDVs by providing incentives to purchase new electric MHDVs in exchange for scrapping inefficient ICE trucks and construction equipment. This program would not be structured as a requirement, but instead as an incentive, and would be stackable with other incentive programs. This incentive should be designed specifically to support small fleets and owner-operators through a Disadvantaged Business Enterprise program. Funding amounts would need to be significant — hundreds of millions of dollars annually — to make a sizeable contribution to emissions reduction considering the sheer number of existing ICE vehicles and high administrative cost for scrappage verification.

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148 Chapter 19.260 RCW – Energy Efficiency.

149 U.S. Department of Energy – Energy Efficiency & Renewable Energy, "Heavy-Duty Truck Idle Reduction Technologies," (n.d.).

150 NYC Environmental Protection, "Citizens Air Complain Program," (n.d.).

151 Washington State Joint Transportation Committee, "Encouraging High-Consumption Fuel Users To Use Electric Vehicles," June 2023.

- **(C.6) Continue to assess fossil-fuel-to-electric conversions:** Conversions that change existing ICE vehicles to battery or plug-in hybrid electric have long been a potential way to achieve faster emissions reductions, but despite decades of research and development they have not reached scale. The state must focus on scaling up proven technology to meet its emissions limits, but will monitor conversion technology developments and reassess prioritization during TES implementation.

Non-Road Vehicle Strategies

Electrification of non-road vehicles is explored below, although it was not designed to be a significant focus of the TES. As the state continues to explore non-road vehicle strategies, it will further engage and involve non-road transportation stakeholders.

SeaTac airport is shown from above.

D. Aviation

At 6.3 MMT, aviation emissions — primarily from jet fuel — made up 16% of the state's transportation emissions in 2019 and 6% of economy-wide emissions. For perspective, that is more than the emissions created from burning natural gas to generate electricity. In recent years, aviation emissions have been as high as 9% of all emissions — more than natural gas used to heat residential and commercial buildings combined.

Pollution from jet fuel and aviation gasoline, especially nitrogen dioxide (NO_2), has negative effects on health outcomes for residents living near airports and downwind of flight paths, and for workers at airports. In a 2019 University of Washington School of Public Health study funded by the Legislature, researchers found "communities under the flight paths near the airport are exposed to higher proportions of smaller-sized, 'ultra-ultrafine' pollution particles and over a larger area compared to pollution particles associated with roadways."[152] Smaller pollution particles are more dangerous to health because they are more easily inhaled, as noted in a 2019 DOH literature review on ultrafine particles.[153]

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152 **"Communities around Sea-Tac Airport Exposed to a Unique Mix of Air Pollution Associated with Aircraft,"** *UW News*, (December 3, 2019).

153 Elmer Diaz et al., **"Summary of Health Research on Ultrafine Particles,"** Washington State Department of Health, (November 2019).

Zip codes containing SeaTac Airport (10), Paine Field (9), Boeing Field (10) and Grant County International Airport (9) all have either a 9 or 10 on DOH's Environmental Health Disparities Map, identifying them as overburdened communities. Spokane International Airport is ranked as an 8 overall, though it is ranked as a 10 for the ozone concentration factor (which is correlated to NO_2). In order to reduce GHG emissions and pollution associated with the aviation sector, the state should consider the following actions:

- **(D.1) Encourage increased uptake of sustainable aviation fuel (SAF) and establish interim targets through 2030:** Building on the agreements negotiated by the Port of Seattle, Commerce's Office of Renewable Fuels should push for ambitious targets and corresponding policy recommendations with the WSU Alternative Jet Fuels Work Group continued by **Chapter 232, Laws of 2023**. The IRA includes sustainable aviation tax credits, which are $1.25–$1.75 per gallon of SAF in a mixture through 2027. Incentives from Chapter 232, Laws of 2023 will augment the IRA incentives, including the creation of a tax credit of $1–$2 per gallon for SAF produced in Washington and allowing more favorable carbon accounting to make SAF be included in the Washington CFS.

- **(D.2) Implement market mechanisms to speed up the use of SAF:** Revise the CFS via **WAC 173-424-130** to include jet fuel as an obligated fuel for intrastate flights. This will help improve the economics of SAF while also putting jet fuel on an even playing field with other transportation fuels used in Washington. A commercial facility to produce SAF using electricity recently broke ground in Moses Lake, Washington.[154]

- **(D.3) Continue to invest in early-stage development of electric and hydrogen planes**: Washington has continued to build on its longtime position as a global aviation leader by investing in research development and deployment of early-stage electric and hydrogen plane technology.[155] Commerce should continue to fund private-sector technologies, while WSDOT continues to make investments in airport infrastructure needed to test emerging electric and hydrogen planes for shorter regional flights.[156]

E. Marine and Ports

Marine vessels were responsible for even more GHG emissions than aviation in the 2019 inventory, making up 18% of the transportation sector's climate pollution — the same share as HD on-road vehicles. Many of those emissions are connected to the state's many marine ports, which serve as vital engines of Washington's economy. A number of options are available for the state to reduce emissions within the marine sector.

- **(E.1) Port decarbonization (electrification):** The Legislature should allocate funding to Commerce to create a holistic maritime electrification strategy, informed by the **2019 Blue Economy Strategy**.[157] The maritime electrification strategy should be developed with ports, industry, longshoremen, frontline communities residing near ports, freight and drayage drivers, utilities and other stakeholders. The strategy should include vessel decarbonization, port decarbonization (specifically shore power) and the creation of green corridors.

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154 Washington Governor Jay Inslee, **"Twelve Announces Plans to Scale Production of Sustainable Aviation Fuel Made from CO2 in Washington State,"** (June 19, 2023).

155 Washington State Department of Commerce, **"ZeroAvia Announces Expansion of Electric Propulsion R&D Facility at Paine Field,"** (June 19, 2023).

156 Washington State Department of Transportation – Aviation Division, **"Washington Electric Aircraft Feasibility Study,"** (November 2020).

157 Washington Maritime Blue, **"Washington State's Strategy for the Blue Economy,"** (January 2019).

A group of cars await loading onto one of Washington's ferries in Seattle. WSDOT aims to fully electrify the state's ferry system by 2040.

- **(E.1.1) Vessel decarbonization (ferry vessel and terminal electrification):** Effective vessel decarbonization will require a variety of alternative fuel technologies to address a variety of use cases. More research, demonstration projects and policy guidance are needed to increase information availability, decrease investment risk, and ultimately lead to fuel switching.

  Electric and hybrid electric propulsion systems are replacing traditional fueling systems in limited use cases, such as intracoastal ferry routes. The Washington State Ferry System is working on three key elements to transition to a hybrid electric fleet: building new vessels, converting vessels and electrifying the terminals. The first hybrid electric conversion is planned to be complete in the fall of 2024. Work is also under way on terminal electrification and contracting for new electric hybrid vessels. Challenges to these types of projects can include the cost and complexity of designing and building new vessels (or rebuilding them in the case of conversions), the cost and complexity of installing charging infrastructure, and limitations in vessel operations (e.g., limited routes) due to vessel charging requirements.

  Clean alternative fuels such as green electrolytic hydrogen, electrofuels (e.g., e-methane, e-ammonia, e-diesel), renewable diesel and biofuels (e.g., bio-methane, bio-methanol, bio-oils) hold promise, particularly for transoceanic use cases. When coupled with renewable electricity for production, the life-cycle GHG emissions of these fuels can be significantly lower compared with those of traditional marine fuels. From a regional perspective, Washington's relatively low-cost and low-carbon electricity presents an economic opportunity to support the local production of emerging clean maritime fuels. Tacoma Power created the nation's first pilot electricity rate to support the production of electrofuels in 2021.[158]

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158 Tacoma Public Utilities, **"Tacoma Power Announces the Nation's First Electrofuel Tariff,"** (March 4, 2021).

- **(E.1.2) To create better certainty, Washington should support development and partnerships for clean maritime fuels.** Modeling in Commerce's green hydrogen legislative report indicates Washington will see demand for sustainable maritime fuels, including hydrogen-derived Fischer-Tropsch liquid fuels and ammonia, beginning to take off by 2025–30. Entities including Washington Maritime Blue are conducting research regarding the most appropriate sustainable maritime fuels, vessel types and corridors. The state should use these findings to support rapid deployment of these fuels in maritime operations. This should include establishing strong targets and new market incentives for maritime fuels, as well as support for multi-stakeholder efforts that will elevate this policy area in similar ways to the Alternative Jet Fuels Work Group.

- **(E.1.3) Port decarbonization:** A wide variety of infrastructure upgrades will be necessary to sustain ongoing port operations with reduced carbon intensity. These activities include refueling vessels, providing shore power to sustain vessel operations at berth (e.g., cold ironing), cargo handling and drayage. The state now has shore power active in the Port of Seattle, and the Legislature recently invested nearly $50 million for the 2023–25 biennium. Many of the technologies will be electrically powered and will significantly increase demand on the electrical grid, requiring close coordination with electric utilities. Replacing traditional port and ship technologies could require additional job training and adjustments to the long-standing operational status quo, which must be accounted for in transition planning. The state could look to the Port of Los Angeles's Technology Advancement Program,[159] Zero Emission Freight Advanced Infrastructure Demonstration (AID) Program, and Zero Emission Tech Demonstration Projects[160] as examples. In addition to infrastructure upgrades, the state should explore adopting California's 2020 Ocean-Going Vessels At Berth regulation to ensure that shipping companies utilize the shore power being added to the ports.

- **(E.1.4) Green corridors:** Washington ports have recently gained notoriety for the announcement of two green corridors, currently under development. They include a green cargo shipping corridor between the Northwest Seaport Alliance and the Republic of Korea[161] and a green cruise corridor from the Pacific Northwest to Alaska.[162] These corridors are designed to overcome technology adoption barriers by ensuring vessels will have access to required fuels and infrastructure at each port, and to demonstrate feasibility in support of future expanded routes.

F. Rail

The EV Council also recognizes that rail emissions make up 300,000 metric tons CO_2e in the 2019 emissions inventory, but they are not addressed in the TES. Ecology's latest Volkswagen Settlement program included zero-emissions freight switcher locomotives. The current transportation budget also includes $5 million for a Tacoma rail facility to add zero-emissions battery electric switchers. Representatives of member agencies will explore the EV Council's role in supporting rail electrification during implementation of the TES, including reviewing other zero-emissions projects in the country.

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159 Clean Air Action Plan, **"Ports Technology Advancement Program,"** (n.d.).

160 Port of Los Angeles, **"Zero-Emissions Technologies,"** (n.d.).

161 Northwest Seaport Alliance, Seattle + Tacoma, **"The Northwest Seaport Alliance Announces Partnership with Busan Port Authority to Further Decarbonization of Ports at United Nations Climate Conference,"** (November 7, 2022).

162 Port of Seattle, **"Exploring the World's First Green Corridor for Cruise,"** (n.d.).

G. Focus Planning and Implementation Efforts on Meeting the 2030 Emissions Limit

The TES provides the clearest indicator yet that Washington needs increased focus on the 2030 emissions limit if state leaders hope to stay under the scientifically necessary threshold. As part of the Pacific Coast Collaborative and U.S. Climate Alliance, Washington is a key partner in a group of states and provinces in the United States and Canada that can show the rest of the world how to decarbonize equitably while creating good jobs and affordable electricity, transportation and heating and cooling.

The state has several planning efforts that can bring even more focus to Washington's short-term emissions limit, identify key strategies to actualize existing policies, and move forward on new actions to meet the 2030 emissions limit.

- **(G.1) Carbon Pollution Reduction Grants:** Through the IRA, Congress provided several funding opportunities for states to pursue GHG pollution reductions, including the Climate Pollution Reduction Grants program administered by the EPA. The Climate Pollution Reduction Grants program has two phases. Phase 1 is the planning phase, and the IRA has appropriated $250 million for planning grants that the EPA will award noncompetitively to states, metropolitan statistical areas, tribes and territories. Phase 2 will issue implementation grants, and the IRA has appropriated $4.6 billion under this phase to carry out the plans that are developed under Phase 1 of the program.
    - Commerce and Ecology are leading development of Phase 1 for the state and plan to include TES recommendations as part of the Priority Climate Action Plan, which is due March 1, 2024. This is essential, because climate mitigation measures must be included in the Priority Climate Action Plan to be eligible for funding in Phase 2.
    - EV Council agencies should work through the (to-be-designated) lead agency for the Climate Pollution Reduction Grants program to prioritize TES recommendations in the state's competitive application in Phase 2. The lead agency should identify gaps in progress on the TES implementation plan to determine the most urgent funding requests.
    - Commerce and Ecology should also support Seattle-Tacoma-Bellevue metro area and tribal planning and competitive applications by sharing TES modeling outputs and policy guidance.
- **(G.2) Move up the next SES:** During the 2025 session, the next governor should include a budget proviso funding Commerce's Energy Division to move up its next SES to be completed in mid-2026 with a special focus on immediate actions within the power, transportation, buildings and industrial sectors needed to hit the 2030 emissions limit. The 2026 SES should be delivered to the governor's office for inclusion in the 2027 session budget and legislative proposals.
    - For the transportation sector, the 2026 SES should update TES modeling to assess implementation progress and focus on the trade-offs of more aggressive emissions reduction options, such as early ICE vehicle retirement through a robust scrap-and-replace program.
    - The 2026 SES should establish clear sector and subsector targets that must be achieved to stay under the 2030 emissions limit, while recommending the governor and Legislature take immediate action in the 2027 legislative session on 2026 SES proposed strategies.

6. Implementation Roadmap

Washington has made tremendous strides in recent years to achieve its climate leadership position. It passed a landmark 100% clean electricity law, the nation's first clean buildings standard and the nation's second economy-wide cap-and-invest program. It also joined California, Oregon and British Columbia in the West Coast clean fuel standard market and adopted California's motor vehicle emissions standards. All of these policies were on a foundation of environmental justice through the HEAL Act and strong labor standards. And yet, as the TES modeling has made clear, Washington must do even more.

Given the high stakes and short time frame for closing the gap between current policy and the S3 Strong Electrification Policy scenario, Washington must be highly focused on and organized in establishing priorities. With this in mind, the following 2024 prioritization plan lays out a clear roadmap for 2024 legislative session recommendations and how agencies can work toward policy and program development for the longer 2025 legislative session. Each policy includes a clearly identified agency lead and notes expected transportation equity benefits and expected improvement in air quality in overburdened communities.

The 2024 priorities are presented in Tables 16 and 17.

Table 16 lists new actions and emissions reductions, broken out by electrification and non-electrification strategies, needed to close the 2030 on-road emissions gap left by current electrification and travel efficiency policies. The table also shows estimated incremental GHG emissions reduction by strategy and expected equity outcomes.

Achieving the additional 2030 emissions reductions in Table 16 is dependent on existing policies achieving their full expected effect. The state should not take this for granted without further action. The EV Council is prioritizing the recommendations in Table 16 for 2024 because urgent progress is essential to keep Washington on pace to achieve existing policies.

Table 17 lists new and continued actions needed to successfully and equitably implement existing transportation electrification policies, namely ACC I, ACC II and ACT.

It is challenging to isolate the effect on emissions of individual enabling actions that support existing regulatory policies. Each of the priorities in Table 17 will be essential to achieving the modeled 9.4 MMT CO_2e reduction in 2030 on-road emissions from 2019 levels.

Readers can review Table 38 in Appendix D for an explanation of the emissions and equity determinations in Table 16 and Table 17.

Table 16 2024 Priorities: New Actions and Emissions Reductions Needed to Close 2030 Emissions Gap

Recommendations*	Legislative actions	Agency actions	Lead Agency	GHG**	Equity***
Transportation Electrification					
Requirements and incentives for zero-emissions MHDVs: 4.1 Pursue ACF adoption rates. 4.4 Fund and implement an MHDV incentive and infrastructure program.	Fund staffing needed to pursue ACF adoptions rates through stakeholder engagement and possible rulemaking. Release appropriated funding to the Washington State Department of Transportation (WSDOT) to implement Joint Transportation Committee–recommended program design.	Work with stakeholders to consider rulemaking and other policy development needed to achieve ACF adoption rates. Implement MHDV incentives and programs.	Ecology and WSDOT	230,000	Significant air quality improvement Lower costs Increased EV access
Grow broad consumer demand for passenger BEVs: 3.8 Increase consumer awareness of incentives. 3.7 Extend and expand the state sales and use tax exemptions for BEVs.	Fund public information campaign to increase awareness of incentives and charging options. Pass legislation to extend and expand sales tax exemption for all BEVs.	Implement public information campaign.	Commerce	20,000	Air quality improvement Lower costs Increased EV access
4.5 Accelerate and fund school bus electrification to meet needed adoption rates.	Pass legislation and budget provisions developed with stakeholders.	Develop practical implementation timelines and needed funding.	Ecology (with support from the office of Superintendent of Public Instruction [OSPI])	10,000	Air quality improvement Lower costs Increased EV access

* Numbered items in the recommendations column correspond to the policy items detailed in Chapter 5, How Washington Can Get There, in Part I and Part II.

** The GHG column reflects estimated incremental GHG emissions reduction in 2030 (metric tons CO_2e).

*** The equity column reflects equity benefits, including air quality improvements in overburdened communities, and lower costs, increased EV access and more non-driving options for vulnerable populations.

Table 16 2024 Priorities: New Actions and Emissions Reductions Needed to Close 2030 Emissions Gap, continued

Recommendations*	Legislative actions	Agency actions	Lead Agency	GHG**	Equity***
Clean Fuels, Vehicle Efficiency and Voluntary Early Retirement					
Reduce carbon intensity of gasoline and diesel with clean drop-in fuels: C.1.1 Add flexibility to the Clean Fuel Standard's carbon intensity schedule. C.1.2 Increase stringency of Clean Fuel Standard program.	None anticipated for 2024	Assess needed program changes to increase emissions reductions and consider agency-requested legislation for 2025.	Ecology	Expected to be substantial, but more analysis is needed.	Air quality improvement
Diesel vehicle efficiency standards C.3 Enforce diesel vehicle compliance. C.4 Explore an anti-idling law for ICE MHDVs.	None anticipated for 2024	Develop diesel vehicle enforcement and anti-idling policy and consider introducing agency-requested legislation.	Ecology	≈300,000–700,000****	Significant air quality improvement Lower costs
C.2 Improve vehicle efficiency with lower-resistance replacement tires.	Pass legislation to provide Commerce rulemaking authority.	Begin rulemaking.	Commerce	≈600,000–700,000****	Air quality improvement Lower costs
C.5 Focus on high-consumption gasoline and diesel users.	None anticipated for 2024	Pursue state and federal funding opportunities.	Ecology	≈110,000–130,000****	Significant air quality improvement

* Numbered items in the recommendations column correspond to the policy items detailed in Chapter 5, How Washington Can Get There, in Part I and Part II.

** The GHG column reflects estimated incremental GHG emissions reduction in 2030 (metric tons CO_2e).

*** The equity column reflects equity benefits, including air quality improvements in overburdened communities, and lower costs, increased EV access and more non-driving options for vulnerable populations.

**** The emissions level or reduction is a preliminary estimate, not a model output, and requires additional analysis.

Table 17 2024 Priorities: Actions Needed to Successfully and Equitably Implement Current EV Policies

Recommendations*	Legislative actions	Agency actions	Lead Agency	Equity**
Continue funding WSDOT zero-emission vehicle and infrastructure programs: 2.24 Continue funding WSDOT's ZEVIP grant program to provide support for charging along state routes. 3.6 Continue funding WSDOT's Zero-emissions Access Program (ZAP). 4.8 Continue funding the WSDOT Green Transportation Capital grant program. 5.1 Support and expand the e-bike rebate and lending library programs. D.3 Continue to invest in early-stage development of electric and hydrogen planes. E.1.1 Vessel decarbonization (ferry vessel and terminal electrification). E.1 Port decarbonization (electrification).	None in 2024	Assess programs and develop funding request for 2025-27 biennium.	WSDOT	Significant air quality improvement Lower costs Increased EV access More non-driving options
Expand and accelerate funding Commerce community charging and EV incentive programs for low-to-moderate income (LMI) consumers: 2.9 Expand community charging programs through formula funding. 3.4 Expedite funding for Commerce's EV incentive program. 3.2 Create a state-supported low-cost leasing program with an EV equity objective.	None in 2024	Assess programs and develop funding request for 2025-27 biennium.	Commerce	Air quality improvement Lower costs Increased EV access
1.6 Provide block grants to increase CBO staff capacity.	Fund program to help CBOs design transportation electrification projects.	Implement program.	Commerce	Significant air quality improvement Lower costs Increased EV access More non-driving options

* Numbered items in the recommendations column correspond to the policy items detailed in Chapter 5, How Washington Can Get There, in Part I and Part II.

** The equity column reflects equity benefits, including air quality improvements in overburdened communities, and lower costs, increased EV access and more non-driving options for vulnerable populations.

Table 17 2024 Priorities: Actions Needed to Successfully and Equitably Implement Current EV Policies, continued

Recommendations*	Legislative actions	Agency actions	Lead Agency	Equity**
2.5 Support planning and building necessary utility-side charging infrastructure.	None in 2024	Finish cost assessment and develop program as funding request or legislation.	Utilities and Transportation Commission (UTC) and Commerce	No effect
3.14 Fund and support state agency efforts to implement EO 21-04.	Fund state agency fleets to successfully implement EO 21-04.	Implement EO 21-04.	All state cabinet agency fleets	No effect
Make charging access more equitable and speed up project timelines: Section 2: Charging and Utility Infrastructure	None in 2024	Develop suite of policy proposals to improve consumer experience and equitable access, and speed up implementation timelines.	Commerce (with support from UTC)	Air quality improvement Lower costs Increased EV access
1.7 Monitor equity indicators and measure outcomes.	None in 2024	Examine air-monitoring needs near highways, estimate health benefits of the TES and implement a transportation equity assessment.	Ecology, Health and WSDOT	Significant air quality improvement Lower costs Increased EV access More non-driving options

* Numbered items in the recommendations column correspond to the policy items detailed in Chapter 5, How Washington Can Get There, in Part I and Part II.

** The equity column reflects equity benefits, including air quality improvements in overburdened communities, and lower costs, increased EV access and more non-driving options for vulnerable populations.

An Amtrak Cascades train zips toward its destination.

Priorities for 2025 and Onward

The EV Council will implement the TES by immediately prioritizing these 14 sets of recommendations. Based on progress made, it will determine 2025 priorities in fall 2024. The EV Council will then repeat the same annual prioritization process by identifying key action for the year ahead. TES recommendations not included in the 2024 list are important to the transition and will be considered for prioritization in the EV Council's work in 2025 and the years following.

Monitoring, Evaluation and Continuous Improvement

Successful implementation of Washington's transition to an electric transportation system will be measured in EVs on the road, EV chargers installed, air quality improvements, and real and direct equitable outcomes for overburdened communities and vulnerable populations. To that end, the state will publicly track the key performance indicators listed below and publish an annual report.

In addition, the EV Council is committed to an adaptive management process to ensure that policies and programs are having their intended effects and that policies and programs remain flexible and iterative in the face of a changing market and policy landscape. Given Washington's position as a first mover in pursuing an electric future, the historic amount of federal support for clean energy and technology and a growing embrace of transportation electrification nationwide, significant uncertainty exists in the near- and long-term implementation of the TES. Metrics should be monitored and evaluated annually. The EV Council should publish an annual report that assesses progress, identifies roadblocks, and recommends course corrections as necessary to achieve desired outcomes.

Table 18 details key performance indicators that the EV Council should monitor and evaluate annually, across the following categories: GHG emission reduced, equity and environmental justice, light-duty EV adoption, medium- and heavy-duty EV adoption, VMT reduced and charging infrastructure.

Table 18 Metrics and Key Performance Indicators for Tracking Transportation Electrification Progress

Impact	Metric	Description	Lead Agency
GHG EMISSIONS REDUCED			
Avoided fossil fuels	Gallons	Estimated gasoline and diesel avoided by (1) changes in gasoline consumption and (2) number of EV miles driven	Ecology
GHG reduction, overall	Metric tons CO_2e	Estimated GHG emissions reduction attributable to EV adoption and reduced VMT	Ecology
GHG reduction, by sector	Metric tons CO_2e	Estimated GHG emissions reduction, attributed to electrification of on-road travel, non-road travel and reduction in VMT	Ecology
Cost-effectiveness	Metric tons CO_2e /$	Estimated reduction in GHG emissions per dollar spent by the state	Ecology
EQUITY AND ENVIRONMENTAL JUSTICE			
EV adoption disparities	%	For each vulnerable population (as defined in the HEAL Act), compare % EV drivers with % state population	Commerce, DOL
State allocation	$, %	Total state dollars invested in overburdened communities as a percentage of overall funding for transportation electrification (must be 40%+)	All agencies with programs
Air quality	$\mu g/m^3$	$PM_{2.5}$, SO_x, NO_x and other applicable criteria and non-criteria pollutants caused by transportation in overburdened communities	Ecology
Transportation energy burden	%	Measure of percent of a household's income spent on transportation energy. Evaluate across all vulnerable populations	Commerce
Correlation of crash-related injuries with vehicle weight over time	R-squared coefficient	Tracked statewide and in overburdened communities, and evaluated across all vulnerable populations	WSDOT
Impact of electrification on transit accessibility	#	Number of high-frequency routes (under 15-minute headways) within overburdened communities (via Washington Transit Access Map)	WSDOT
Charger reliability in overburdened communities	%	Frequency and duration of uptime for EV charging in overburdened communities	Commerce
Charger availability in overburdened communities	%	Percentage of EV chargers in overburdened communities, broken out by use case	Commerce

Table 18 Metrics and Key Performance Indicators for Tracking Transportation Electrification Progress, continued

Impact	Metric	Description	Lead Agency
LIGHT-DUTY EV ADOPTION			
Electric miles driven	Miles	Miles driven by light-duty EVs	WSDOT
EV registrations	#	Total light-duty EV registrations in Washington, by type (BEV, PHEV)	Commerce, DOL
New vs. used EVs	#	Light-duty EV registrations in Washington, by year first registered	Commerce, DOL
Year-over-year EV growth	%	Annual growth in light-duty EV registrations in Washington, by type	Commerce, DOL
EV share of fleet	%	Percent of state cabinet agency light-duty fleets made up by EVs	State cabinet agency fleets
MEDIUM- AND HEAVY-DUTY EV ADOPTION			
Electric miles driven	Miles	Miles driven by MHD EVs	WSDOT
ZEV MHD truck registrations	#	Total MHD EV registrations in Washington, by type (BEV, FCEV)	Commerce, DOL
ZEB registrations	#	Total number of electric and FCEV bus (school and transit) registrations in Washington, by type (BEV, PHEV, FCEV)	DOL, OSPI
New vs. used EVs	#	MHD EV registrations in Washington, by year first registered	Commerce, DOL
Year-over-year EV growth	%	Annual growth in MHD EV registrations in Washington, by type	Commerce, DOL
EV share of fleet	%	Percent of state cabinet agency MHD fleets made up by EVs	State cabinet agency fleets
VMT REDUCED			
Miles driven	Miles	Year-over-year change in total miles driven (gas/diesel or EV)	WSDOT
Vehicle registrations	#	Year-over-year change in number of vehicle registrations (gas/diesel, EV, total)	Commerce, DOL

Table 18 Metrics and Key Performance Indicators for Tracking Transportation Electrification Progress, continued

Impact	Metric	Description	Lead Agency
CHARGING INFRASTRUCTURE			
Residential EVSE	# and # per capita by geography	Number of L2 home ports (Single Family Homes and Multifamily Homes) deployed in Washington, assessed in total and per capita by geography	Commerce
Nonresidential L2 EVSE	# and # per capita by geography	Number of workplace and public L2 ports deployed in Washington, assessed in total and per capita by geography	Commerce
Public DCFC	# and # per capita by geography	Number of public DCFCs deployed in Washington, assessed in total, per capita and per capita by geography	WSDOT, Commerce
MHD EVSE	# and # per capita by geography	Number of depot and non-depot EVSE deployed to support MHD trucks and buses, assessed in total and per capita by geography	Commerce
Average costs	$/station, $/port	Average capital investment and operating support, by station and by port	Commerce
Average utilization rate	%	Percent of time a charger is providing electricity to a vehicle	Commerce
Charger reliability	%	Percentage uptime of individual EVSE and stations	Commerce
Customer satisfaction	Survey responses	Customer satisfaction surveys issued to understand consumer experience and any areas for improvement and issue resolution	Commerce
Total charging events	#	Discrete charging events	Commerce
Unique visitors	#	Unique visitors (drivers)	Commerce
Public engagement events	#	Events held to solicit input for station siting, promote the program, or other engagement purposes	Commerce
State fleet EVSE	#	Number of EV charging ports installed with primary purpose of charging state cabinet agency fleet vehicles	State cabinet agency fleets

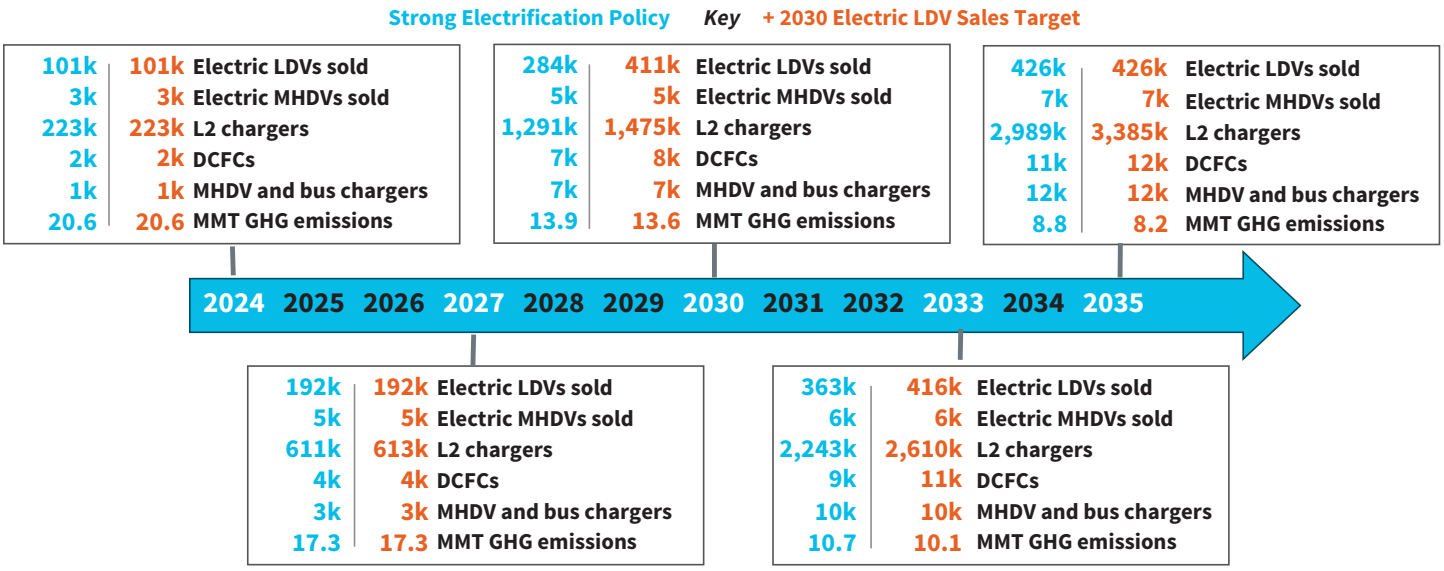
As a first step in successfully tracking relevant metrics, the EV Council, through the lead of each designated agency, must:

- Establish methods of data collection and tracking for any new key performance indicators and set baselines for any new information.
- Develop thresholds or goals by date for each indicator, if possible and if not already established.
- If too much uncertainty exists to establish a reliable threshold or goal, establish directional indicators (positive, negative) for guidance.

As a reference, the S3 Strong Electrification Policy scenario, which assumes strong policy support to meet the ACC II mandate among other goals, and sensitivity S3b, which additionally assumes the 2030 goal of 100% electric LDVs is met, establishes guiding metrics the state can use to benchmark its progress and remain on track to achieve required outcomes (Figure 34).

These metrics are for electrification and efficiency because those are the ways to decarbonize transportation. They prevent transportation pollution by reducing the use of gasoline and diesel, which must be tracked and measured to ultimately understand progress on the state's climate objectives. Ecology, in coordination with other member agencies, will explore how to best track all transportation fuels during strategy implementation.

Figure 34 Washington EV Adoption and Infrastructure Milestones



State staff and interested stakeholders can explore these metrics, as well as those from all the modeled outcomes of different scenarios and sensitivities tested as part of developing the TES, on the Washington TES User-Interactive Dashboard.[163] These outputs include annual sales, sales share, total vehicle population, EV charging requirements, GHG emissions and local air pollutants. Most outputs are segmented by different dimensions across the different pages, including vehicle segment (e.g., LDVs, MD trucks), county, census block group and year (2023–35).

Importantly, the metrics from the modeling should be considered directional and indicative, rather than precise. State staff and interested stakeholders can use the metrics as general guidance when considering Washington's success in reaching state goals.

163 Washington TES User-Interactive Dashboard, found on the **TES website**.

7. Conclusion

An electric vehicle gets a charge with Washington's evergreens in the background.

Washington's TES builds on years of state leadership and recent historic federal investment in transportation decarbonization. Against this backdrop, the state's focus is to ensure the transition to an electrified transportation system is as efficient, equitable and effective as possible. The policy recommendations contained in this report are designed to meet these objectives, by setting up the supportive infrastructure necessary for rapid scaling, intentionally and proactively directing benefits to overburdened communities and vulnerable populations, and ensuring the electrification transition supports the state's wider decarbonization targets in 2030, 2040 and beyond. Because of the lagging nature of vehicle stock turnover, analysis from this report shows that the next five years, and even the next two years, are critical for the state to meet its ambitious climate goals. The implementation plan included in the TES outlines a strategic path for state policymakers and agencies to do just that.

Washington is among the first states to develop a truly holistic plan for equitably transitioning to a predominantly electric transportation system. With this report, Washington commits to following up its nation-leading policy obligations with actionable plans and impactful programs to achieve the state's ambitious climate and equity goals.

Appendices

A. Glossary

B. TES Engagement: Phase 1 and 2 Participants and Findings

C. Summary of Public Comment Feedback and Major Changes

D. Technical Appendix

Appendix A — Glossary

2021 State Energy Strategy (SES) – The Department of Commerce produced the 2021 State Energy Strategy to provide a roadmap for meeting the state's greenhouse gas emission limits.

Advanced Clean Cars II (ACC II) – A regulation originally established in California and implemented in Washington by the Department of Ecology, ACC II requires a progressively stringent zero-emissions vehicle sales share, culminating in a 100% sales requirement of zero-emissions LDVs by 2035.

Advanced Clean Fleets (ACF) – A California regulation requiring fleets to adopt an increasing percentage of ZEVs beginning in 2024 and culminating with a 100% ZEV sales requirement by model year 2036. ACF is designed to be complementary to ACT.

Advanced Clean Trucks (ACT) – Set in California and implemented in Washington by the Department of Ecology, this regulation establishes a manufacturer's ZEV sales requirement and includes a one-time reporting requirement for large entities and fleets.

Battery electric vehicles (BEV) – BEVs are vehicles that can be powered by an electric motor that draws electricity from a battery and is charged through an external source. These vehicles do not produce tailpipe emissions.

Black, Indigenous and People of Color (BIPOC) – A term used to refer to people of color, with specific emphasis on Black and Indigenous communities.

California Air Resources Board (CARB) – A California agency that protects public health from the harmful effects of air pollution, and develops programs to fight climate change.[164]

Carbon dioxide equivalent (CO_2e) – The number of metric tons of CO_2 emissions with the same global warming potential as one metric ton of another greenhouse gas.

Clean Energy Transformation Act (CETA) – Signed into law on May 7, 2019, by Governor Jay Inslee, CETA commits Washington to an electricity supply free of GHG emissions by 2045.[165]

Clean Fuel Standard (CFS) – Washington's Clean Fuel Standard law requires fuel suppliers to gradually reduce the carbon intensity of transportation fuels to 20% below 2017 levels by 2034. This could be through improving the efficiency of their fuel production processes, producing or blending low-carbon biofuels into the fuel and purchasing low-carbon fuel credits.[166]

Climate Commitment Act (CCA) – The CCA caps and reduces GHG emissions from Washington's largest emitting sources and industries, allowing businesses to find the most efficient path to lower carbon emissions. This powerful program works alongside other critical climate policies to help Washington achieve its commitment to reduce GHG emissions by 95% by 2050.[167]

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164 CARB.

165 "Clean Energy Transformation Act."

166 State of Washington Department of Ecology, **"Clean Fuel Standard,"** (n.d.).

167 "Climate Commitment Act."

Combined Charging Systems (CCS) – An open international standard for connectors used to rapid-charge electric vehicles.

Community-based organization (CBO) – An organization that is driven by community residents, and typically provides a bottom-up approach for participation in development efforts.

Cost parity – Total cost of ownership cost parity refers to equivalent lifetime costs for an EV and an ICE vehicle of similar types (e.g., sedans), when considering the all-in cost of not only purchasing the vehicle, but also the operating costs over its lifetime, including maintenance and fuel or charging costs. Purchase cost parity refers to equivalent purchase costs for an EV and an ICE vehicle of similar types, based solely on the up-front cost of the vehicle.

Department of Enterprise Services (DES) (Washington state) – DES provides centralized business services to state government agencies, to other public entities such as cities and counties, to tribal governments and to Washington residents.

Department of Health (DOH) (Washington state) – DOH works with others to protect and improve the health of all people in Washington.

Department of Licensing (DOL) (Washington state) – DOL provides driver's licenses, identification cards, license plates and vehicle and boat registrations. DOL also provides licenses for some professions.

Department of Revenue (Washington state) – DOR is Washington's primary tax agency, overseeing 60 categories of taxes, which provide funds for important state services.

Direct current fast charger (DCFC) – Rapid charging infrastructure designed to charge a BEV to 80% in 20 minutes to one hour. DCFC charging ranges from 400 to 1,000 volts direct current and provides a typical power output of 50 to 350 kW, providing an estimated 180 to 240 miles of electric range per hour of charging.[168] DCFCs are also referred to as L3 chargers.

Distributed energy resources (DERs) – Small, modular energy-generation resources that sometimes also include storage technologies, DERs can either be connected to the local electric grid or be a stand-alone system.[169]

Electric vehicle (EV) – An EV is a vehicle that can be powered by an electric motor that draws electricity from a battery and is charged through an external source. These vehicles do not produce tailpipe emissions.

Electric Vehicle Infrastructure Training Program (EVITP) – EVITP is a program that certifies electricians in the United States and Canada. Some places require at least one electrician working on an EV charging installation project to be EVITP certified.

Electric vehicle service provider (EVSP) – The EVSP delivers end-to-end EV charging and is responsible for managing, controlling and optimizing the EV charging station operations and experience.

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168 U.S. Department of Transportation, **"Charger Types and Speeds,"** (n.d.).

169 National Renewable Energy Lab, **"Using Distributed Energy Resources,"** (n.d.).

Electric vehicle supply equipment (EVSE) – A more complete term used for EV charging infrastructure and its component parts, EVSE includes both hardware and software, such as charging chords, charging stands or enclosures, plugs and software.

Energy Resilience and Emergency Management Office (EREMO) – Housed in the Energy Division of the Department of Commerce, EREMO is focused on energy assurance planning.

Environmental Health Disparities Map – An interactive mapping tool that compares communities across the state for environmental health disparities. It shows pollution measures such as diesel emissions, ozone and proximity to hazardous waste sites, and other metrics such as poverty and cardiovascular disease rates.

Environmental justice (EJ) – EJ is the meaningful involvement and fair treatment of all people regardless of race, color, national origin or income, with respect to the development, implementation and enforcement of environmental laws, regulations and policies. This should lead to the same degree of protection from environmental and health hazards, and equal access to the decision-making process to have a healthy environment.[170]

Federal Highway Administration (FHWA) – The Federal Highway Administration (FHWA) is an agency within the U.S. Department of Transportation that supports State and local governments in the design, construction and maintenance of the Nation's highway system.

Fuel cell electric vehicle (FCEV) – A FCEV is a vehicle that is powered by a hydrogen fuel cell. Hydrogen is converted to electricity by the fuel cell, which is used to power the vehicle. FCEVs do not produce harmful tailpipe emissions, only water vapor and warm air.

Greenhouse gas (GHG) – GHGs are gases that trap heat in the atmosphere, including carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and fluorinated gases. As GHGs build up in the atmosphere, they trap the sun's heat and alter the earth's climate.

Hazardous air pollutants (HAPs) – Hazardous air pollutants, also known as toxic air pollutants or air toxics, are pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects.

Healthy Environment for All Act of 2021 (HEAL Act) – The HEAL Act works toward eliminating environmental and health disparities among communities of color and low-income households. The HEAL Act covers seven Washington state agencies: Health, Agriculture, Commerce, Ecology, Natural Resources, Transportation and Puget Sound Partnership. The HEAL Act builds on recommendations from the Environmental Justice Task Force, including incorporating environmental justice into agency work, promoting the equitable sharing of environmental benefits, investing in communities that have experience significant environmental and health burdens and supporting evaluation tools and processes.[171]

Heavy-duty (HD) vehicle – Vehicles that have a gross vehicle weight rating greater than 26,000 pounds. This includes weight classes 7 and 8.[172]

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170 EPA, **"Environmental Justice,"** (n.d.).

171 DOH, **"Environmental Justice,"** (Washington State Department of Health), n.d.

172 FHWA, **"Traffic Monitoring Guide — Appendix C. Vehicle Types,"** (n.d.).

Inflation Reduction Act (IRA) – Signed on August 16, 2022, the IRA is a significant piece of federal legislation designed to help the United States meet its climate goals, strengthen energy security, create good-paying jobs and reduce energy and health care costs. It includes, for example, tax incentives for EVs and has spurred investment in the EV supply chain.[173]

Interagency Electric Vehicle Coordinating Council (EV Council) – Move Ahead Washington established the EV Council to align existing transportation electrification efforts across state agencies.

Internal combustion engine (ICE) – A vehicle that uses gasoline, diesel or alternative fuels such as natural gas, propane, biodiesel or ethanol to power its engine. ICE vehicles directly produce harmful tailpipe emissions.

Investor-owned utilities (IOUs) – IOUs are private, monopoly utilities that generate and distribute power to electric customers within their defined service territory.

Joint Transportation Committee – The JTC is a bipartisan, bicameral legislative agency that conducts transportation-related studies and other related activities to inform state and local government policymakers and legislators.[174]

Justice40 – A goal set by the federal government that 40% of the overall benefits of certain federal investments need to flow to disadvantaged communities that are marginalized, underserved and overburdened by pollution.

Kilowatt-hour (kWh) – A measure of electricity, measured as 1,000 watts of power expended over one hour.

Labor & Industries Department (LNI) (Washington state) – A state agency that focuses on the safety, health and security of Washington's workers. The agency helps employers meet health and safety standards and inspects workplaces when informed of hazards.

Level 1 EV charger (L1) – L1 chargers provide charging through a common residential 120-volt alternating current (AC) outlet. It can take 40 to 50-plus hours to charge a BEV to 80% on an L1 charger. The typical power output of an L1 charger is about 1 kW, which can provide 2 to 5 miles of electric range per hour of charging.[175]

Level 2 EV charger (L2) – L2 chargers provide higher-rate alternate current (AC) charging through 240- or 208-volt residential or commercial electrical service. It can take 4 to 10 hours to charge an EV from empty to 80% on an L2 charger. The typical power output of an L2 charger is 7 to 19 kW, which can provide 10 to 20 miles of electric range per hour of charging.[176]

Level 3 EV charger (L3) – Refer to the definition of DCFC.

Light-duty vehicle (LDV) – Vehicles that have a gross vehicle weight rating less than 10,000 pounds. This includes weight classes 1 and 2.[177] LDVs are generally considered passenger vehicles.

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173 The White House, **"FACT SHEET: One Year In, President Biden's Inflation Reduction Act Is Driving Historic Climate Action and Investing in America to Create Good Paying Jobs and Reduce Costs,"** (n.d.).

174 Washington State Legislature, **"Joint Transportation Committee,"** (n.d.).

175 "Charger Types and Speeds."

176 "Charger Types and Speeds."

177 "Traffic Monitoring Guide — Appendix C. Vehicle Types."

Low-to-moderate income (LMI) – A low-income community is one with a median family income of less than 50% of the area median income. A moderate-income community means the median family income is between 50% and 80% of the area median income.

Medium- and heavy-duty vehicle (MHDV) – An umbrella term that refers to medium-duty and heavy-duty vehicles collectively.

Medium-duty (MD) vehicle – Vehicles that have a gross vehicle weight rating between 10,001 and 26,000 pounds. This includes weight classes 3, 4, 5 and 6.[178]

Minority and Women's Business Enterprises (M/WBE) – M/WBE businesses can be certified by Washington to enhance their procurement opportunities for certified businesses participating in state-funded projects or working with state agencies, local governments, school districts and public universities. To be M/WBE certified, a business must be for profit, be licensed in Washington, be able to fulfill a contract in the business's area of expertise, be a small business and have an eligible owner. An eligible owner meets the criteria of being a minority or a woman, owns at least 51% of the company, controls day-to-day operations and is economically disadvantaged.[179]

National Electric Vehicle Infrastructure (NEVI) Formula Program – This FHWA program provides funding to states to deploy strategic EV charging stations to develop an interconnected network. Funding is available for up to 80% of eligible project costs, including acquisition, installation, network connection, operations and maintenance of charging stations, and data sharing.[180]

National Highway Transportation Safety Administration Corporate Average Fuel Economy (CAFE) standards – Mandated by Congress since 1975, the CAFE standards regulate how far vehicles must travel on one gallon of fuel.[181]

Nitrogen oxides (NO_x) – A combination of the gases nitrogen and oxygen, NO_x are released in tailpipe emissions from ICE vehicles and more generally from the burning of coal, oil and natural gas.

North American Charging Systems (NACS) – The North American Charging Standard (NACS) is a charging connector interface standard for electric vehicles that Tesla Inc. developed and has made available for use by other charging network operators and automakers.

Office of Equity (Washington state) – The Office of Equity was created by the Legislature and signed into law April 2020, with the mission to promote access to equitable opportunities and resources that reduce disparities and improve outcomes statewide across government.

Office of Financial Management (OFM) (Washington state) – OFM provides information, fiscal services and policy support to the governor, Legislature and state agencies.

Office of Superintendent of Public Instruction (OSPI) (Washington state) – OSPI oversees public K–12 education in the state, including allocating funding and providing tools, resources and technical assistance. It is also responsible for the safe and efficient transport of students, including school bus procurement.

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178 "Traffic Monitoring Guide — Appendix C. Vehicle Types."

179 Washington State Office of Minority & Women's Business Enterprises, **"State Certification,"** (n.d.).

180 U.S. Department of Energy, Energy Efficiency & Renewable Energy, **"National Electric Vehicle Infrastructure (NEVI) Formula Program."**

181 U.S. Department of Transportation, **"Corporate Average Fuel Economy (CAFE),"** (n.d.).

Original equipment manufacturer (OEM) – An original producer of vehicle components.

Overburdened community – A geographic area where vulnerable populations face multiple environmental harms and health impacts or risks due to exposure to environmental pollutants or contaminants through multiple pathways, which may result in significant disparate adverse health outcomes or effects.

Plug-in hybrid electric vehicle (PHEV) – A PHEV is a vehicle that is powered by both an electric motor that draws electricity from a battery and by an ICE. The ICE element produces tailpipe emissions.

$PM_{2.5}$ – Fine inhalable particulate matter with a diameter less than 2.5 micrometers.

PM_{10} – Inhalable particulate matter with a diameter less than 10 micrometers.

State Efficiency and Environmental Performance (SEEP) (Washington state) – SEEP works with state agencies to achieve reductions in GHG emissions and eliminate toxic materials from state agency operations.

State Transportation Carbon Reduction Strategy (TCRS) – Building on the 2021 SES, the TCRS will identify and summarize the strategies for reducing transportation carbon emissions that are being developed and implemented by state agencies, tribes, freight, aviation, ports and regional and local jurisdiction partners. It was submitted to FHWA in November 2023.[182]

Sulfur oxides (SO_x) – SO_x are made from sulfur and oxygen and contribute to acid rain and particulate pollution. They can be created by burning coal, oil and gas.[183]

Sustainable aviation fuel (SAF) – A biofuel that has similar properties to conventional jet fuel, but with a smaller carbon footprint. SAF can be used to power aircraft and can be made with renewable biomass and waste resources.

Total cost of ownership (TCO) – The TCO of an asset is calculated by adding the up-front cost of purchase and the operating costs over the asset's lifetime, including maintenance and fuel or charging costs.

Transportation electrification – Transportation electrification is the process of developing the infrastructure, systems and policies needed to transition all forms of transportation — public, private, commercial, etc. — to be electrically powered.

Transportation Electrification Strategy (TES) – A strategy initiated by the EV Council to align existing transportation electrification efforts across 10 state agencies and offices and develop an equitable and inclusive statewide strategy pegged to the nonbinding 2030 EV target and aligned with the state's 2030 emissions limit.

Transportation network company (TNC) – Also known as ridesharing companies, TNCs provide prearranged transportation services for compensation, usually through an online-enabled application to connect drivers with passengers.[184]

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182 Washington State Department of Transportation, **"Washington State Transportation Carbon Reduction Strategy,"** (n.d.).

183 UCAR Center for Science Education, **"Sulfur Oxides,"** (n.d.).

184 California Public Utilities Commission, **"Transportation Network Companies,"** (n.d.)

Utilities and Transportation Commission (UTC) (Washington state) – A three-member commission appointed by the governor and confirmed by the state senate, designed to protect the people of Washington by ensuring that IOU and transportation services are safe, equitable, reliable and fairly priced.[185]

Vehicle miles traveled (VMT) – The measurement of the number of miles traveled by a vehicle.

Vehicle-to-grid (V2G) – V2G is when unused power is drawn from an EV battery to provide more energy to the grid, especially during peak electricity hours or extreme conditions.[186]

Virtual power plants (VPPs) – VPPs are an aggregation of small-scale DERs that together, in coordination with grid operations, can offer additional energy and capacity to the grid similar to traditional power plants, providing increased reliability. Components of a VPP can include EVs, home appliances, batteries and heat pumps.[187]

Volatile organic compounds (VOCs) – Compounds that have high vapor pressure and low water solubility, VOCs are often components of petroleum fuels, hydraulic fluids, paint thinners and dry-cleaning agents. They are common groundwater contaminants and can have short- and long-term health effects.[188]

Vulnerable populations – As defined in the HEAL Act, vulnerable populations include racial or ethnic minorities, low-income populations, populations disproportionately impacted by environmental harms and populations of workers experiencing environmental harms.

Washington State Department of Transportation (WSDOT) – WSDOT provides safe, reliable and cost-effective transportation options to improve communities and economic vitality for people and businesses.[189]

Washington State University (WSU) – WSU is a public research university dedicated to improving lives by serving the public good. The university has six campuses, 11 academic colleges, extension offices in all 39 Washington counties and four research and extension centers.[190]

Zero-emissions Access Program (ZAP) – A WSDOT program that offers grant funding for zero-emissions car-share pilot programs in underserved and LMI communities.[191]

Zero-emissions vehicle (ZEV) – The EPA categorizes all-electric vehicles as ZEVs because they do not generate direct exhaust or tailpipe emissions. ZEVs include fuel cell EVs.[192]

Zero-emission Vehicle Infrastructure Partnerships (ZEVIP) – A WSDOT program that offers grant funding for the installation of new EV charging equipment and hydrogen fueling infrastructure located on priority corridors.[193]

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185 Washington Utilities and Transportation Commission, **"About the Commission,"** (n.d.).

186 IEEE, **"Vehicle to Grid (V2G) Technology,"** (n.d.).

187 Liza Martin and Kevin Brehm, **"Clean Energy 101: Virtual Power Plants,"** (January 10, 2023).

188 EPA, **"What are Volatile Organic Compounds (VOCs)?"** (n.d.).

189 Washington State Department of Transportation, **"Strategic Plan,"** (n.d.).

190 Washington State University, **"About Washington State University,"** (n.d.).

191 WSDOT, **"Zero-Emissions Access Program Grant,"** (n.d.).

192 U.S. Department of Energy, Energy Efficiency & Renewable Energy, **"All Electric Vehicles,"** (n.d.).

193 WSDOT, **"Zero-emission Vehicle Infrastructure Partnerships Grant,"** (n.d.).

Appendix B — TES Engagement: Phase 1 and 2 Participants and Findings

Tables 19 to 22 summarize all participants from Phase 1 and 2 engagement. The tables list participants by group and organization. "Group" refers to categories into which the TES project team sorted participants based on the overarching audience or interest they represented. "Group" does not represent organizational affiliation. A summary of findings from each engagement effort can be found below the participant tables.

Table 19 Phase 1 – One-on-One Interview Participants

#	Group	Organization/Affiliation
1	Community leader	HomeSight
2	Community leader	Former Yakima City Council Member; Washington State Labor Council
3	Community leader	Transit Riders Union
4	Community leader	Washington Tenants Union
5	Community leader	Asian American Pacific Islander (AAPI) Senior; Community Leader
6	Labor	Drivers Union
7	Labor	Northwest Laborers'-Employers Cooperation & Education Team (LECET)
8	Labor	Teamsters Local 117
9	Local jurisdiction	Port of Seattle
10	Multimodal transit users	Cascade Bicycle Club
11	Multimodal transit users	Seattle Neighborhood Greenways
12	Organizations	Sierra Club
13	Organizations	Transportation Choices Coalition
14	Overburdened communities	African Chamber of Commerce
15	Overburdened communities	BIPOC Mobility Action Coalition
16	Overburdened communities	Environmental Coalition of South Seattle (ECOSS)
17	Overburdened communities	Gather Together, Grow Together
18	Overburdened communities	Puget Sound Advocates for Retirement Action (PSARA)
19	Overburdened communities	Puget Sound Sage
20	Overburdened communities	Spokane Neighborhood Action Partners (SNAP)
21	Overburdened communities	WA Build Back Black Alliance
22	Overburdened communities	Washington State Community Action Partnership
23	Overburdened communities	Yakima Pacific Islander Coalition
24	Overburdened communities	Asian Pacific Islander Coalition (APIC) Spokane
25	Overburdened communities	People's Economy Lab
26	Overburdened communities	WA African Community Leaders
27	Overburdened communities	Earth Ministry; Washington Interfaith Power and Light

Table 20 Phase 2 – One-on-One Interview Participants

#	Group	Organization/Affiliation
1	EVSE contractors	Puget Sound Solar, LLC
2	Organizations	Transit Riders Union
3	Local jurisdictions	City of Mount Vernon
4	Local jurisdictions	Association of Washington Cities
5	Manufacturing and distributing	Association of Western Pulp and Paper Workers (Commerce Manufacturing Council)
6	Multifamily housing property managers/owners	Washington Multifamily Housing Association
7	Organizations	Methow Valley Citizens Council
8	Organizations	America Walks
9	Overburdened communities	Tri-Cities Hispanic Chamber of Commerce
10	Overburdened communities	Firelands Workers Action
11	School	Walla Walla Public Schools
12	Towing fleet	Towing & Recovery Association of Washington
13	Towing fleet	Airport Towing
14	Tribes and sovereign government partners	Columbia River Inter-Tribal Fish Commission

Table 21 Phase 1 – Focus Group Participants

#	Group	Organization/Affiliation
1	EV Driver	Private Citizen
2	EV Driver	Private Citizen
3	EV Driver	Private Citizen
4	EV Driver	Coltura; Seattle Electric Vehicle Association
5	EV infrastructure manufacturers and distributors	Blink Charging
6	EV infrastructure manufacturers and distributors	ChargePoint
7	EV infrastructure manufacturers and distributors	Electrify America
8	EV infrastructure manufacturers and distributors	EV Support, Puget Sound Solar
9	EV infrastructure manufacturers and distributors	Tesla
10	EV infrastructure manufacturers and distributors	Mobility House
11	EV infrastructure manufacturers and distributors	Hubject
12	EV manufacturer/dealer	Alliance for Automotive Innovation
13	EV manufacturer/dealer	Daimler
14	EV manufacturer/dealer	GM
15	EV manufacturer/dealer	Tesla
16	EV manufacturer/dealer	Toyota Motor North America
17	EV manufacturer/dealer	Volvo Group North America
18	Organizations	Drive Electric WA
19	Organizations	Seattle Electric Vehicle Association
20	Organizations	AAA Washington
21	Organizations	Climate Solutions
22	Organizations	Coltura
23	Organizations	Union of Concerned Scientists
24	Organizations	Zero Emission Transportation Association (ZETA)
25	Utility	Clark Public Utilities
26	Utility	PacifiCorp
27	Utility	Seattle City Light
28	Utility	Snohomish PUD
29	Utility	WA Public Utilities Districts Association (WPUDA)

Table 22 **Phase 2 – Focus Groups Participants**

#	Group	Organization/Affiliation
1	Labor	The International Brotherhood of Electrical Workers (IBEW) 46
2	Labor	Washington State Building & Construction Trades Council, AFL-CIO
3	Labor	Amalgamated Transit Union (ATU)
4	Labor	Blue Green Alliance
5	Labor	ATU 843
6	Mobility Equity Cabinet	Nakani Native Program; Consultant/Facilitator/DEI Trainer
7	Mobility Equity Cabinet	Para los Ninos
8	Mobility Equity Cabinet	University of Washington
9	Mobility Equity Cabinet	Community Leader
10	Mobility Equity Cabinet	Community Leader
11	Mobility Equity Cabinet	White Center Community Development Association
12	Mobility Equity Cabinet	The National Association for the Advancement of Colored People (NAACP)
13	Mobility Equity Cabinet	Community Leader
14	Mobility Equity Cabinet	King County Metro
15	Mobility Equity Cabinet	King County Metro
16	Multifamily housing property managers/owners	Washington Multifamily Housing Association
17	Multifamily housing property managers/owners	Fourth Ave Capital
18	Multifamily housing property managers/owners	Equity Residential Properties
19	Multifamily housing property managers/owners	Greystar

Findings from Phase 1 Focus Groups and Interviews

This section summarizes findings from focus groups and one-on-one interviews. To analyze the feedback from participants, the project team coded all responses to each discussion question into key themes. The project team then synthesized those initial themes into higher-level themes, which are reported below.

The themes in this section are presented in the following categories:

- General Views of Electrification
- Community Understanding of Electrification
- Barriers to Adoption and Use of EVs
- Barriers to Installation of Charging Infrastructure
- Suggested State Actions to Increase Access to and Feasibility of EVs
- EV Infrastructure Needs in Washington
- Recommendations for Electrification Incentives
- Preferred Methods for Information Sharing
- Implementing an Equitable Electrification Transition

General Views of Electrification

The following themes represent how participants understand and think about transportation electrification in general.

General Perceptions of Electrification

- Electrification is necessary for Washington to reduce GHG emissions, address climate change and mitigate adverse impacts from transportation pollution in overburdened communities.
- Although necessary, electrification is not the only solution to the climate crisis. Washington must consider the entire transportation system and invest in transit, active transportation (biking, walking and rolling) and multimodal options.

Critical Needs

- To achieve a just transition, electrification must be implemented equitably and keep environmental and racial justice at the forefront.
- There is a current lack of education about electrification, and the state needs to educate, inform, and solicit feedback from community members, understanding that many communities have other pressing priorities.
- Industry stakeholders noted that the transition is already happening, but MHDV electrification will require significant state policy intervention to make the transition.

Concerns about Electrification

- There are economic challenges, namely high up-front costs for EVs and budget limits that restrict the ability of utilities and government agencies to implement this transition.
- There are concerns about workforce changes, the use of natural resources to produce batteries and increasing vehicle weight due to batteries.
- There are also concerns about limited reliable and accessible charging infrastructure, and technological and electrical grid limitations.
- Rural, suburban and agricultural communities, particularly in Central and Eastern Washington, need tailored solutions and assistance to make the transition.

Community Understanding of Electrification

The following themes synthesize participants' characterization of their community's understanding of electrification. These themes are from the interviews alone, not focus groups. Since interviewees were mainly community leaders, they were asked specific questions about the community they serve.

Inequitable Access to Electric Transportation

- Communities of color and low-income communities often live closest to transportation corridors and industrial facilities and are overburdened by the health impacts of pollution and poor air quality. These overburdened communities have been largely excluded from decision-making and policy prioritization within the electrification conversation.
- For many, electrification is not as immediate a priority as basic needs such as neighborhood safety, affordable transportation, employment, food and housing.
- There is a lack of accurate, accessible information about transportation electrification within Washington communities.
- EVs are still too expensive for many people to transition. This exacerbates existing inequities within the transition, such as the decreasing value of assets for those who cannot afford to buy EVs.

Electrification Beyond Personal Vehicles

- Overwhelmingly, interviewees discussed the need to electrify more than just personal cars and LDVs. Interviewees emphasized the importance of electrifying transit, MHDVs, bikes and scooters.

Challenges to Electrification

- Rural communities have different needs within the electrification transition than communities in cities and urban areas.
- There is limited availability of charging stations at homes (particularly apartments and multifamily housing) and workplaces.

- Community members are concerned about workforce transitions and job security during the transition.
- Transportation electrification could exacerbate issues related to accessing infrastructure and transportation options for people with disabilities, such as EV charging cables crossing sidewalks.

Barriers to Adoption and Use of EVs

The following themes summarize the barriers participants shared that hinder the adoption and use of EVs in their community or industry.

Cost and Incentives

- **High cost of EVs:** The high up-front cost for EVs — from e-bikes and personal cars to MHDVs — is a large barrier for many, particularly low-income communities and small businesses.
- **Fragmented, limited and confusing incentives and grants:** Incentives and grants for EVs are fragmented, incompatible with each other, and have regulatory limits. Applications can be difficult to navigate, and existing incentives are not sufficient to make EVs affordable, especially for MHDVs.

Charging

- **Insufficient charging infrastructure and lack of standardization:** There is a lack of publicly available charging infrastructure and charging infrastructure for multifamily housing. It is expensive to install charging infrastructure. Current lack of regulations and standards for charging infrastructure makes charging stations difficult to use, unreliable and unpredictable. Charging stations vary in cost, access and charging speed.
- **Grid supply and utility capacity:** The electrical grid needs to be updated to support the widespread and rapid deployment of EV infrastructure, such as charging. EVs will increase overall electricity demand, which requires that new generation, transmission and distribution resources be quickly built. Coordination among utilities and EVSE and charging companies needs to be dramatically improved. Without coordination, concerns that interconnection times will significantly delay EVSE installations may become a reality.

Public Awareness and Opinion

- **Misinformation and lack of education:** Communities have limited exposure to and education about EVs. Information can be inaccessible, particularly for non-English speakers and people with limited access to technology. Education and outreach are needed to combat misconceptions about EVs.
- **Cultural resistance:** People who do not currently own or drive a vehicle may remain resistant to the transition to EVs.
- **Mistrust of government:** Overburdened communities continue to be excluded from decision-making and need to be heard and engaged to ensure their priorities guide the electrification transition.

Vehicle Technology

- **Lagging MHDV technology:** Technology for electric MHDVs, particularly long-haul trucking, is not as comprehensive as technology for electric LDVs.
- **Limited vehicle range:** Both actual and perceived range limits keep many community members and industries from adopting EVs.

Procedure and Process

- **Long wait times for both EVSE and EVs:** Long permitting timelines delay infrastructure installation. Limited availability of EVs themselves, as well as infrastructure and equipment, cause long wait times.

Barriers to Installation of Charging Infrastructure

The following themes represent barriers to installing and energizing charging infrastructure, as identified by participants in the utilities and EVSP focus groups.

Equipment and Infrastructure

- Installation and charging equipment (particularly switch gears and transformers) are experiencing supply chain delays and limited availability.
- It is difficult to find contractors to install charging equipment.
- There is resistance from landlords and homeowner associations, especially for renters.

Procedure and Process

- **Insufficient supporting infrastructure and building codes:** Existing building and electrical infrastructure may not support EV infrastructure or electrical upgrades and may need retrofitting.
- **Insufficient building codes:** Building codes are insufficient to support infrastructure development and charging placement.

Utilities

- There is a lack of easements allowing utilities and EVSPs to access public light poles.

Suggested State Actions to Increase Access to and Feasibility of EVs

The following themes synthesize participant suggestions for actions Washington can take to make EVs more feasible for their community or industry.

Incentives and Benefits

- Provide funding for incentives, rebates and low-income loans to increase access to EVs, reduce total EV costs and achieve cost parity with ICE vehicles.

- Create targeted incentives for electrifying vehicles in overburdened communities. Additionally, create targeted incentives for MHDVs. Consider pairing regulations and incentives.
- Consider policies that pair electrification with the adoption of solar.

Infrastructure

- Increase and improve charging infrastructure, particularly publicly accessible and multifamily residential charging stations.
- Improve and design street infrastructure for multimodal transportation options. Streets need to have comprehensive bike facilities that are safe for e-bikes and should encourage transit and active transportation.

Education and Engagement

- Develop and implement consistent, clear educational campaigns about all aspects of EVs, including incentives, charging and regulations and requirements.
- Let community voices develop campaigns so they are authentic and resonant with their communities.
- Beyond education, reach out to, engage with, and hear feedback from community members.
- Support workforce development to ensure job and economic security for workers during the transition.
- Host EV car-share programs to increase exposure and awareness within communities.

State Fleets

- Lead by example and model EV adoption by electrifying Washington's fleets.

EV Infrastructure Needs in Washington

The following themes encapsulate how participants characterize infrastructure needs and their suggested infrastructure changes to facilitate the transition to EVs.

Charging Infrastructure

- Need for an easily accessible public charging network, with charging stations co-located at community hubs (like grocery and retail) and protected from vandalism or destruction.
- Need for secure charging stations and storage for EVs, including e-bikes.
- Charging infrastructure needs to support charging for MHDVs.
- Permitting and insurance timelines need to be shortened.

Street Infrastructure

- Create safer streets that facilitate multimodal transportation, including transit, biking, walking and rolling.

Electric Infrastructure

- Upgrade existing electric infrastructure, particularly utility lines, to enhance grid capacity, reliability and resilience.

Engagement and Training

- Engage and educate community members about EV charging and technology, so they can more easily access and use charging infrastructure.
- Support or provide job training for EV repair and encourage more EV service shops.
- Coordinate with fleet owners and local municipalities to implement fleet electrification or help electrify service vehicles.

Recommendations for Electrification Incentives

The following themes represent participants' recommendations for incentives and benefits that will help Washington achieve a faster transition to EVs.

Ease and Accessibility

- Incentives need to be simple, streamlined and understandable. Education and training should accompany incentive programs and incentives should be "stackable," so people can apply for multiple programs and incentives with one application.
- Participants emphasized the importance and ease of point-of-sale incentives. They generally preferred rebates over tax incentives, although a few participants preferred tax incentives. Participants also mentioned stipends, grants, trade-in programs, subsidies and lowered insurance rates.

Charging Benefits

- Charging-based incentives, including access to low-cost charging stations or workplace and public charging stations, are beneficial.

Equitable Incentives

- Incentives should support vulnerable and overburdened communities. Incentives should be designed to prevent predatory financing, such as high-interest loans.
- Infrastructure improvements should have an anti-displacement focus to ensure that upgraded or newly built infrastructure does not displace residents by increasing property costs.

Preferred Methods for Information Sharing

The following themes summarize effective methods for sharing information, educating people, and increasing awareness about electrification and EVs, as recommended by participants.

Hands-on Experience

- Provide hands-on educational opportunities, such as in-person ride-and-drive events.

Partnerships

- Partner with CBOs and trusted local community members to spread the word about electrification.
- Partner with rideshares, schools and driving schools to expand EV visibility and education in communities.
- Partner with trusted community media sources and influencers for advertising, earned media and social media campaigns.

Communication Channels

- Send large, widespread digital communications through traditional methods, such as email blasts and newsletters.
- Utilize conventional media sources for advertising and earned media.
- Meet people where they are, such as CBOs, churches, unions and other community gathering spaces.
- Share information through government-based sources (e.g., departments of transportation, OEMs, utilities).

Accessible Engagement

- Ensure materials are accessible and inclusive, including providing materials in multiple languages.
- Lean on digital media, such as podcasts and digital workshops and trainings.
- Use a multipronged approach that includes several methods of outreach and education to ensure reaching as many community members as possible.

Implementing an Equitable Electrification Transition

The following themes synthesize actions and priorities that participants recommend be included in the TES to ensure that electric transportation equitably serves Washington communities.

Holistic Transformation for Transportation

- Design a reliable and inclusive transportation system because many will not be able to afford a personal EV. This includes expanding and investing incentives and supportive infrastructure for other transportation modes, particularly transit and e-bikes.
- Prioritize electrifying HD trucks and buses where they cause disproportionate air quality impacts, especially on overburdened communities.
- Enhance safety investments to create walkable, bikeable neighborhoods.
- Create protections against rising electricity prices, especially for the energy insecure.

Increased Access to Electric Vehicles

- Provide equitable access to low-cost EVs and low-cost electricity for charging.
- Create reliable, fast-charging infrastructure that is equitably accessible to community members. This includes charging infrastructure specific to multifamily buildings and in other public gathering places and destinations.
- Create programs that benefit rural areas, small towns and suburban areas.
- Conduct research on funding and grant opportunities for community members.

Engagement and Education

- Engage and collect input from community members to create and implement equitable programs.
- Ensure equitable and accessible education for community members. This includes EV pilot programs and job training for workforce development.

Local Policy, Housing and Land Use

- Work with local jurisdictions to update codes and policies to ensure efficient implementation.
- Approach this topic more holistically, going beyond transportation to include affordable housing, housing displacement and land use. Decreasing emissions could be more efficient by tackling the climate crisis with a multipronged approach.

Findings from Phase 2 Focus Groups and Interviews

This section summarizes findings from focus groups and one-on-one interviews. To analyze the feedback from participants, the project team coded all responses to each discussion question into themes. The findings in this section are presented in the following categories:

- General Views of and Existing Reactions to Transportation Electrification
- Barriers to Adoption and Use of EVs
- Suggested State Actions to Increase Access to and Feasibility of EVs
- EV Infrastructure Needs in Washington
- Preferred Methods for Information Sharing
- Implementing an Equitable Electrification Transition
- Audience-Specific Findings

General Views of and Existing Reactions to Transportation Electrification

The following themes represent how participants understand and think about transportation electrification in general, as well as how the industries, communities and organizations they represent have responded to electrification thus far.

General Perceptions of Electrification

- **There are barriers to electrification:** Electrification implementation is starting (through adoption of EVs or through installing infrastructure), but communities are running into a variety of barriers.
- **It is important for the environment:** Electrification is important to reduce emissions and to achieve goals beyond climate.
- **It has infrastructure needs and costs:** Electrification will require infrastructure installation and increased grid capacity and infrastructure installation costs can be a barrier for the transition to EVs.
- **Markets will change:** Electrification will change the transportation and housing markets. Participants are interested in how these changes will be implemented.

Electrification Needs

- **Grid capacity:** Electrification transition needs higher power grid capacity and access to renewable products.
- **Electrification planning:** The transition to electrification needs better planning.
- **Barriers:** There is interest in electrification, but costs and barriers need to be reduced for EVs to be more widely adopted.
- **EV education:** Communities need more education and engagement about the transition to EVs.

Perceptions of Transit Electrification

- **Concerns about electrifying bus fleets**
  - Participants specifically mentioned concerns about overhead electric wiring.
  - There are concerns about the ethical production of batteries for the transition to EVs.
  - Electrification of buses in rural areas is not as feasible or a high priority due to the limits of public transit in those areas.
- **Support for more reliable transit before electrification:** Multimodal transit users are worried that efforts to electrify transportation will be prioritized over those to make transit service more reliable. Participants noted that transit reliability is a high priority, particularly in rural areas.

Barriers to Adoption and Use of EVs

The following themes summarize the barriers participants shared that hinder the adoption and use of EVs in their community or industry.

Cost

- **High cost of EVs:** Participants named the up-front cost of purchasing and the cost to maintain EVs as barriers to adopting EVs in their communities.
- **Insufficient access to funding:** Existing EV car subsidies and rebates are insufficient and qualifying for funding can be complicated. There are also few existing subsidies for e-bikes and scooters.
- **Inequitable access to funding:** The high cost to purchase EVs and limited access to funding leaves lower-income communities out of the transition.

Infrastructure

- **Safe routes for electric bikes and scooters are needed:** There is an overall need for EV infrastructure and facilities, particularly for electric bikes and scooters. This will lead to safety improvements for people walking, biking and rolling.
- **Infrastructure is expensive:** Participants identified that infrastructure needs for the transition to EVs are expensive.
- **Charging infrastructure is needed:** There is a lack of charging infrastructure for public use along transportation corridors.

Public Perception

- **Lower buy-in in rural/suburban areas:** In rural areas, community buy-in is a barrier to electrification; there are concerns around range anxiety, battery safety and cost.

- **Range anxiety:** EV range is too short for typical trips.
- **Skepticism around benefits:** There is community skepticism regarding the benefits of EVs.
- **Support for a shift away from cars:** We need to prioritize modal shift, moving away from cars and moving toward public transit, walking, biking and rolling.
- **Environmental safety:** Concerns exist about the environmental impacts of lithium batteries (mining) and grid capacity for EV charging stations.

Barriers for Rural/Suburban Communities

- **Lack of charging infrastructure:** There is a lack of charging infrastructure for public use along transportation corridors in rural areas. At the same time, there is also a concern about grid capacity for charging infrastructure for rural/suburban utilities.
- **Infrastructure cost:** The up-front cost of creating new charging infrastructure and retrofitting existing structures for public and at-home chargers is a barrier for rural/suburban communities.
- **Insufficient funding:** There is a lack of financial incentives to transition to EVs.
- **Range anxiety:** People are worried their EVs will not get them where they need to go since trips are typically longer than in urban areas.
- **Change public perception:** There is a need to change cultural perceptions regarding who benefits from electrification and who does not.
- **High cost of EVs:** The up-front cost of purchasing EVs and the cost to maintain them are barriers to adopting EVs in rural/suburban communities.

Suggested State Actions to Increase Access to and Feasibility of EVs

The following themes synthesize participant suggestions for actions Washington can take to make EVs more feasible for their community or industry.

Access to EVs and EV Infrastructure

- **Improve charging access:** Increase convenient public charging and charging along travel corridors and improve charging accessibility.
- **Prioritize reliability:** Build a reliable electrification system for community members where charging stations are maintained and easily accessible.

Funding for EVs

- **Incentives for up-front costs:** Create easily accessible incentive programs that make EVs easier to own and use than gas-powered vehicles. Reduce up-front costs for EVs (including school buses).

- **Charging infrastructure:** Incentivize charging infrastructure construction through grants.
- **Tax system reform:** Create a more progressive and equitable tax system to incentivize EV transportation.

Public Perception and Education

- **Education programs:** Create education and engagement programs that prioritize investments in BIPOC communities and people in need. Include programs on EV servicing and maintenance.
- **Financial education for EVs:** Educate the public about financial support.
- **Multimodal solutions:** Shift cultural perspectives and normalize transit-friendly, walkable and bikeable communities, rather than car-dependent communities. Communities should have housing close to jobs and increased micromobility options.

EV Infrastructure Needs in Washington

The following themes encapsulate participants' characterization of infrastructure needs and their suggested infrastructure changes to facilitate the transition to EVs.

Charging

- **Increase public charging availability:** Improve charging accessibility and reliability. Put charging stations at places people need to go or already park, such as grocery stores, coffee shops, libraries and banks.
- **Install fast chargers and L2 chargers:** Focus not only on DCFC but also L2 charging for e-bikes, scooters, etc.

Infrastructure Installation

- **Provide EV training:** Increase training and educational programs for EV technicians.
- **Add new building requirements:** Require and incentivize charging stations in new construction and apartment buildings.

Preferred Methods for Information Sharing

The following themes summarize effective methods for sharing information, educating people, and increasing awareness about electrification and EVs, as recommended by participants.

Communication Channels

- **Conventional media:** Utilize conventional media sources for advertising and earned media.
- **Multimedia and in-language approaches:** Utilize social media, WhatsApp, interviews with experts and commercials to engage with non-English-speaking communities.

- **Gathering places:** Conduct in-person outreach that meets people where they are (e.g., at CBOs and community gathering locations).
    - Partner with CBOs that have built long, trust-based relationships with communities.
    - Coordinate word-of-mouth efforts and conversations, such as talks at local organizations.
- **Word of mouth:** Word of mouth is most effective for non-English-speaking communities because the message is coming from trusted community members.

Community Messaging

- **Unified messaging:** Unify the state's message about EV and EV infrastructure to create a cohesive narrative. State agencies need to communicate to reinforce each other's communications efforts and make messaging consistent and clear.
- **Jurisdictional roundtables:** Develop recurrent roundtables with representation of cities across the state (not just those in the Puget Sound).
- **Account for government distrust:** There is distrust of government and politicians; think through this lens when developing messaging about EVs for communities.

Implementing an Equitable Electrification Transition

The following themes synthesize actions and priorities that participants recommend be included in the TES to ensure that electric transportation equitably serves Washington communities.

Engagement and Education

- **Equitable implementation:** Incorporate equity through every step of the process to ensure that communities are centered in the conversation about the transition to EVs.

Partnerships

- **Collaboration with EV partners:** Do not reinvent the wheel when it comes to transportation and electrification equity. Lean on the expertise of partners that have already done electrification work.
- **Existing transportation equity frameworks:** Lean on existing transportation equity frameworks (such as the King County Metro Mobility Framework).

Electrification system

- **Prioritize reliable transit:** Prioritize a cohesive statewide public transit system over electric bus fleets. The main priority is to ensure public transit is reliable.
- **Used EV affordability:** Create a more affordable used EV market.
- **Multimodal transition:** Focus on a greater shift in the transportation system, rather than just switching all ICE vehicles to EVs.

Audience-Specific Findings

The following themes each synthesize key findings that arose from particular audience groups.

Multifamily Housing

- **Transition is tenant dependent:** Electrification for multifamily housing properties will depend on the demand from tenants. If there is little demand, it does not make sense for property managers to invest in the cost of installing charging equipment. The state should focus on developing and encouraging demand from customers.
- **Barriers to installation:** Permitting can be a barrier for property managers of multifamily housing to install EV infrastructure.

Multimodal Transit Users (King County Mobility Equity Cabinet)

- **Community-centered systems:** Create community-centered transportation systems that are designed for people.
- **Engagement for a multimodal solution:** Engage community members in the design of a system that supports active transportation (walking, biking or rolling) and public transit, prioritizing community mobility.
- **Good transit service over electrification:** For transit agencies, it is more effective to provide good transit services that disincentivize using cars, rather than electrifying transit fleets, to meet climate goals.
- **Paratransit challenges:** Electrifying paratransit vehicles may be a challenge due to vehicle weight. Ensure the priority is to provide paratransit services to those in need over electrifying the paratransit fleet.

Labor

- **Training and apprenticeships:** Training and apprenticeship opportunities to account for the changing labor market are needed for workers. Ensure apprentices working on electrification have enough work.
- **Maintenance responsibility clarity:** Responsibility for maintenance seems unclear. Clarity is needed about what gets maintained and who does that maintenance.
- **Funding for fleet electrification:** Provide state funding for electrifying bigger fleets — transit agencies, local jurisdictions, etc. — to ensure the proper workforce is available for the transition.
- **Access for underrepresented groups:** Create support programs to provide access to apprenticeships for populations underrepresented in the workforce, including people of color, women, tribal citizens and low-income residents.

Towing and Recovery Fleets

- **Safety concerns about batteries:** There are major concerns about safety risk from battery and electrical fires. In parking lots, EVs require a wide radius to protect their surroundings from fire, which decreases area available to store cars.
- **Concerns about the cost of transitioning to EV fleets:** There are major concerns about the effects of both costs and new regulations on small towing businesses in the state. The biggest worry is that fleet transition and the associated costs will be mandated by the state.
- **Conflict between state and insurance requirements:** Towing companies feel the conflict between changing state requirements to move toward electrification and changing insurance requirements, which respond negatively to the risks of electrification, including fires.
- **Prioritize electrification of fixed-route services:** Fixed-route services should be electrified first because their vehicles have more reliable schedules and thus more predictable charging needs.

Manufacturing

- **Define the benefits:** The state needs to define the benefit of the transition to EVs beyond reducing carbon emissions.
- **Define and align standards:** There need to be equal standards and requirements for EV manufacturing across each industry.
- **Ensure the transition is widespread to maintain cost competitiveness:** If the transition to EVs happens in some places but not all, competitors that do not transition will have a cheaper product and consumers will be less likely to buy an EV. Manufacturers would like to electrify, but if this is not a complete transition, they will go out of business.

Appendix C — Summary of Public Comment Feedback and Major Changes

The EV Council posted the draft TES to its website for public comment on October 2, 2023. Organizations and individuals were able to submit their feedback through a form available through October 30, 2023. The public comment period was announced through the EV Council listserv, as well as Commerce and WSDOT social media channels. EV Council Advisory Committee members shared the link with their communities, and the comment form was also distributed to each person who was previously involved in the engagement process throughout the year.

In total, 283 suggested changes were made during the public comment window from:

- 86 sets of comments* through the public engagement form. Together, they represent a broad array of perspectives, from industry implementation partners to local governments and utilities to advocates and CBOs (Table 23).
- 19 verbal comments from the October 11 EV Council meeting, which was dedicated to hearing public feedback.
- 19 sets of comments* sent to the EV Council email inbox.

*The phrase "sets of comments" is used to include coalition letters, which are only counted as 1 in these numbers.

Table 23 Comments Received through Public Engagement

Organization/Company/Entity	Count
Unaffiliated	18
Other	16
CBOs/advocate groups	14
Private-sector interest	6
EV manufacturers	5
EVSE providers	5
EV consumer advocate	5
Rural Washington residents	5
Auto dealers	4
Public transit agency	4
State/local government	3
Public utility	1

Once the comment period closed, each suggestion was compiled in a spreadsheet, separated into individual recommendations and coded according to theme or topic (e.g., "charging infrastructure"). The consultant team reviewed each comment individually and synthesized the feedback, noting where organizations or individuals had made similar or conflicting comments. For each suggestion, the consultant team submitted a recommendation to the EV Council: whether to make a substantive change to the draft TES, add clarifying language but no change in substance to the draft TES or move forward with no changes. Each individual EV Council representative provided their preferred responses and then agency staff compiled decisions to be reflected in the final TES.

Out of the 283 suggested changes, the EV Council incorporated more than half. Out of the 146 changes made, 75 included substantive edits or wholesale changes. For example, comments suggested that the draft Implementation Plan included too many of the recommendations and did not clearly identify realistic priorities for immediate action by the Legislature and agencies. In response, the EV Council completely revamped the implementation approach.

Major changes suggested through the public feedback process had a high threshold for inclusion because significant additions or deletions would not have the same opportunity to go through the stakeholder review process as previous TES content. The EV Council has been committed throughout the development process to ensuring that the TES reflects information and preferences representative of communities across Washington. The TES draft that was reviewed during the formal public engagement period was the result of an eight-month multilayered engagement process. As a result, major changes were included only where it was possible to do so without losing the intent of previous input.

Major themes submitted during the public comment period are listed below, along with the EV Council's response. Minor clarifying edits and corrections made to the TES in response to the public comment period are not included below. In general, comments regarding granular details for specific policies were not included because they will be addressed during program design processes at specific agencies and are out of scope for the TES.

- **Hydrogen fuel cell vehicles:** The TES was updated to further clarify where and how this technology was considered throughout the TES development process, and to highlight that Washington will continue monitoring this technology, its costs and its potential role in reducing emissions from the state's transportation sector. New language was also included to acknowledge the new development of the Pacific Northwest receiving $1 billion for a hydrogen hub and analysis from a report on hydrogen uses developed by Commerce's Office of Renewable Fuels.

- **Incentives for other fuel and vehicle types:** The TES was updated to include a recommendation that the state continue to monitor the market for alternative vehicle types (e.g., gasoline-to-electric conversions and FCEVs). The TES continues to recommend that incentives focus on BEVs because they are currently more cost-effective.

- **Direct sales:** Language was added to the direct sales policy recommendation acknowledging concerns from franchise auto dealerships, but ultimately the recommendation was still included in order to empower consumer choice and create fair market competition.

- **Domestic critical minerals and battery component provisions:** The EV Council added more context about the intention to create a circular battery recycling-to-manufacturing economy to reduce dependence on overseas mining. This addition included an example of ongoing research and

development work in Moses Lake, Washington. However, the EV Council ultimately decided not to add "Buy America" requirements to the recommended incentive programs because the restrictions would likely limit the vehicle and charging supply chains needed to meet the state's ambitious climate targets without influencing the behavior of companies that largely operate on a national and international scale. Federal clean vehicle credits already come with an influential North America assembly requirement that is far more effective in creating American or Washington jobs.

- **Priority charging:** A number of specific locations were called out as priorities for public charging investment, especially for TNC and rideshare drivers, including park-and-rides, airports, transportation hubs, parks, libraries and municipal buildings. Ports were also highlighted as a critical location for truck charging. References were added throughout the report.

- **Purchase requirements and niche vehicle uses:** Language was added to acknowledge the existence of unique vehicle use cases that do not currently have an electrified version on the market and create exemptions as needed.

- **New recommendations added:**

  - Continue funding for WSDOT's ZEVIP.

  - Continue funding for WSDOT's ZAP.

  - Clarified guidance about the use of NEVI funds and an increase in public charging for MHDVs using NEVI and ZEVIP.

  - Update Clean Fuel Standard rules to allow capacity credits for private fleet depots.

  - Evaluate cybersecurity and physical security threats to drivers and their EVs.

  - Publish and maintain the ZEV Mapping and Forecasting tool.

  - Continue funding the WSDOT Green Transportation Capital grant program (replaces "Increase funding for electrification of transit buses").

  - Explore training and certification requirements for EV charging maintenance technicians.

- **Implementation plan priorities:** Narrowed the list of regulatory and legislative priorities for 2024 to further emphasize critical actions, with an acknowledgment that an annual prioritization process will need to take place each future year.

- **Policy Recommendations, Part II:** Clarified the role of additional clean transportation strategies (beyond electrification) in meeting the state's emissions targets.

- **Maritime:** Added details to the maritime section, including a recommendation that the state support the development of clean maritime fuels such as green hydrogen.

- **Rail:** Added a section acknowledging that the EV Council did not have capacity to address rail electrification in the TES, and agency representatives will explore possible strategies during implementation.

- **MHDV costs:** Clarified that MHDV electrification is economical on a TCO basis, but that up-front costs can remain an important barrier, especially for smaller fleets and independent owner-operators.

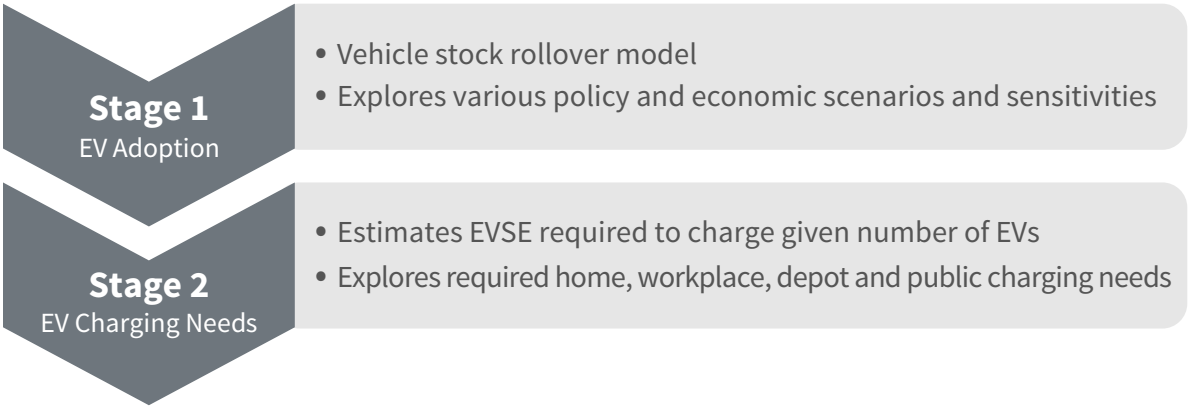
Appendix D — Technical Appendix

Transportation Electrification Strategy Modeling Overview

To explore how on-road EV adoption and charging needs in Washington may progress over time, RMI developed a two-stage modeling approach (Figure 35). The first stage uses a vehicle stock rollover model, which assesses potential EV adoption from 2023 through 2035, by vehicle segment and by county, using a combination of bottom-up economic analysis based on estimated TCO for different powertrains, and top-down policy requirements such as the ACC II and ACT regulations. The second stage of the modeling assesses anticipated EV charging needs, using the number of EVs estimated through the stock rollover model combined with local trip data or average daily VMT.

Figure 35

Two-Stage Modeling Approach



Stock Rollover Model

Overview

The Stock Rollover model was built in Python to estimate ZEV adoption in each of the 39 counties in Washington through 2035 for multiple categories of on-road vehicles, under both economic-based adoption and the state's sales mandate targets (ACC II, ACT). Figure 36 shows the general process, from inputs through two types of calculations to the resulting outputs.

Figure 36 Stock Rollover Model Flow

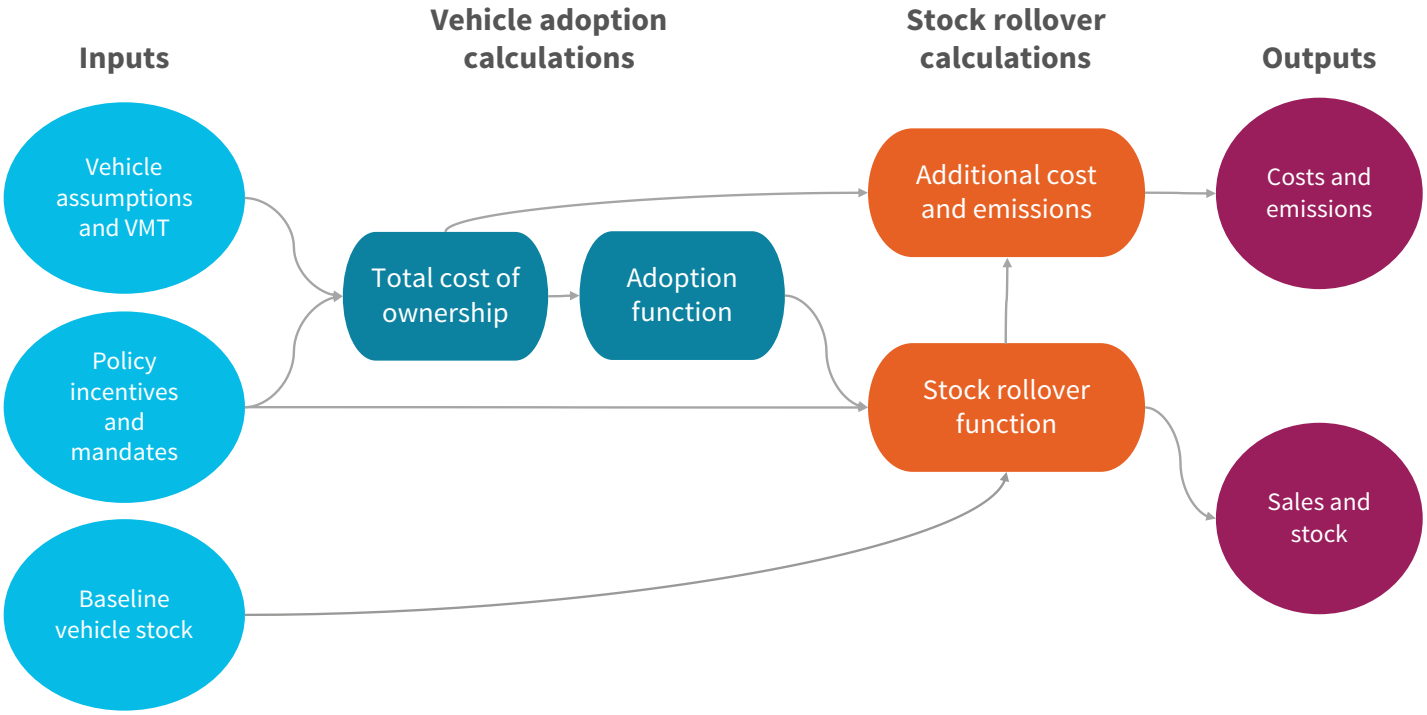


Table 24 describes the specific vehicle types considered in the stock rollover model. For LDVs other than motorcycles, several additional categories were modeled, including personal single-family home (SFH), personal multifamily home (MFH), commercial (fleet) SFH domiciled and commercial (fleet) MFH domiciled.

Table 24 Vehicle Segments Modeled

Vehicle Type	Powertrains
Passenger Vehicles	
Motorcycle	Gasoline ICE, EV
Light-Duty Sedan*	Gasoline ICE, EV, PHEV
Light-Duty Crossover*	Gasoline ICE, EV, PHEV
Light-Duty Pickup/SUV*	Gasoline ICE, EV, PHEV
Buses	
School Bus	Diesel ICE, EV, FCEV
Transit Bus	Diesel ICE, EV, FCEV
Commercial Trucks	
Medium-Duty Truck	Diesel ICE, EV, FCEV
Heavy-Duty Truck	Diesel ICE, EV, FCEV

*Note: These vehicle types have subsegments of personal SFH and MFH, and commercial (fleet) SFH and MFH.

The stock rollover model calculates the base year stock of vehicles and projected future demand using state data, and then models a retirement distribution of vehicles over time, to calculate the number of sales required for each vehicle segment by year. In each modeled year, for each vehicle segment and powertrain combination, the TCO is calculated over the average lifetime of that vehicle type. This calculation includes purchase costs, fuel, maintenance, refueling infrastructure costs (where relevant) and policy incentives.

The TCO for each powertrain within a vehicle segment is then compared in a logistic function, which uses an S-curve based on historic EV adoption for that segment to calculate the adoption probability for each powertrain in a given year. This probability is then translated into sales using the demand forecast and retirement calculation before constraints and sales mandates are applied to adjust total ZEV sales to meet state targets, where relevant. Vehicles are "aged" and "retired" over the modeling timeline in the stock rollover function. This then outputs the sales and vehicle stock for each segment, powertrain and county by year through 2035.

Stock Rollover and New Sales

Baseline Stock

The baseline stock in the model for 2022 was calculated from DOL vehicle registration data. This data indicated whether a car was a new registration or renewal, which county it was registered in, whether it was owned by a business and the specific vehicle model and category or weight class. These last three categories were used to define higher-level vehicle segments for the analysis, into which the registration data was then sorted. See the *Vehicle Stock* section later in this appendix for additional detail on baseline stock estimates by vehicle segment.

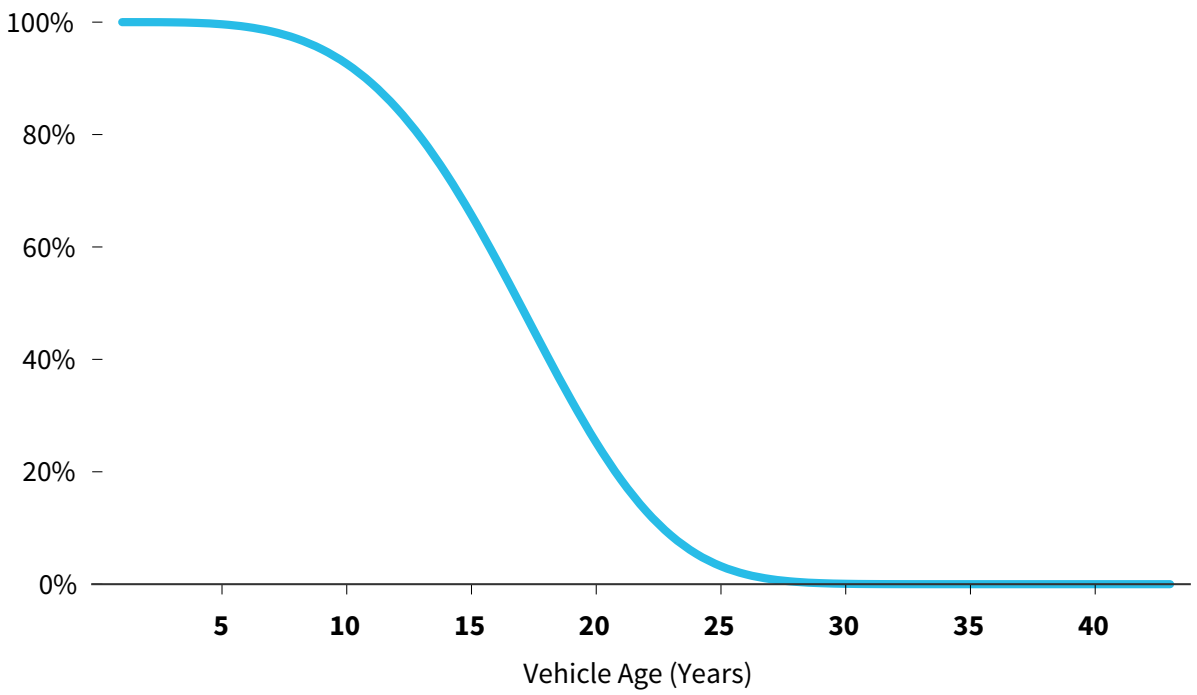
Stock Projection

The total stock forecast was determined from the DOL transportation revenue forecast from 2022. To match this forecasted data to baseline segment mapping, each segment in this data was converted to a percentage increase of the base year, which was then applied to the baseline. Additionally, because this data set only went to 2033, the trend was extrapolated to 2035.

Retirement Curve

Retirement of vehicles was modeled using a Weibull distribution. This is a mathematical function that takes the average retirement of a vehicle as an input, and then has retirement rates increasing as vehicle age increases and gets nearer to that average retirement age, before increasing even faster after the average age has been reached. This retirement distribution was tuned to a combination of national vehicle average lifetime data and the Washington state registration data, which skewed slightly older than the national average for some vehicle segments. For example, Figure 37 shows the "survival curve" output by this distribution for a personal sedan.

Figure 37 **Survival Curve for Personal Sedans**



Stock Rollover and Sales

At the end of each modeled year, each existing vehicle is aged by one year. The vehicle segment–specific survival curve value for this new age is then applied to determine the number of vehicles that should retire in that year, and the number of vehicles that will roll over to the next year. Total new sales in each subsequent year are then equal to the total stock projection for a year, less the vehicles that would survive the retirement curve at the end of the previous year (i.e., total population for a given year equals vehicles not retired in the previous year plus new sales).

Vehicle Adoption

To calculate the powertrain makeup of the sales for each vehicle segment each year, a bottom-up TCO approach is used, before applying any top-down policy mandates.

Total Cost of Ownership

Each TCO component is calculated in 2022 prices as a net present value (NPV) with a discount rate of 6.5%.

Vehicle cost, infrastructure and efficiency assumptions come from a variety of external sources, including the International Council on Clean Transportation (ICCT) and CARB, in addition to RMI analysis (see the *Key Inputs and Sources* section below).

VMT is calculated for each segment, for each county. This is determined using a combination of statewide FHWA data for total miles traveled by each vehicle type, and Replica, a commercially available source of travel demand data, for county splits. VMT is then used alongside efficiency inputs to calculate fuel usage for each vehicle and year, with operations and maintenance (O&M) scaling with VMT. Average VMT within a county was derived as detailed above given the scope of this analysis. Given that some vehicles will travel more (and some less) than this average VMT figure, the economic and technical feasibility of electrification will vary depending on specific use cases, driving patterns and driver needs. Accordingly, electrification may occur at different paces based on these driving patterns (among other factors, such as consumer preferences).

Charging infrastructure sizing, utilization and costs vary by vehicle type, and by whether a vehicle is located at a SFH or MFH, and whether it is a personal or commercial vehicle. Commercial vehicles and those located at MFHs are assumed to more heavily use public versus home charging.

Fuel costs come from the EIA's analysis of the Pacific U.S. region, with electricity prices varying between home charging and public charging.

Policy incentives are input into the model from federal, state and utility programs. These include purchase and charging/refueling infrastructure capital incentives and fuel tax credits.

All NPV components of the TCO are summed up, and then those outputs are sent to the adoption function.

Figures 38 through 42 provide examples of the TCO outputs. The first three plots compare TCO by powertrain for vehicles purchased in different years (2023–35) to demonstrate how the relative cost of different vehicles changes over time. The following two sets of plots show the TCO by component in two snapshot years — 2023 and 2030 — for two different example vehicles: a personal light-duty sedan and a HD truck.

As can be seen in these charts, current outlooks on ZEV costs — both in terms of purchase price and TCO — suggest that BEVs are anticipated to be considerably more cost-effective than FCEVs in the light-duty sector (Table 26 includes details on cost sources and assumptions). FCEV purchase costs and fuel costs would need to come down significantly to become cost-competitive with BEVs and PHEVs, and based on these TCO comparison findings, the primary LDV analysis focused on BEVs and PHEVs as the near-term light-duty ZEV options. Although several automakers have recently announced plans to explore or produce light-duty FCEVs, these plans appear focused on the back half of this decade, and therefore should be considered further if and when they materialize. In general, Washington will need to monitor developments in the FCEV market, and potentially further explore this powertrain option if and as it becomes more competitive.

Note that the temporary increase in TCO for all of the ZEVs (BEVs, PHEVs and FCEVs) after 2032 is due to the expectation that incentives provided for these vehicles through the IRA will no longer be available after that year.

Figure 38 TCO by Powertrain, Personal Light-Duty Sedans Domiciled at SFHs in Clark County ($2023)

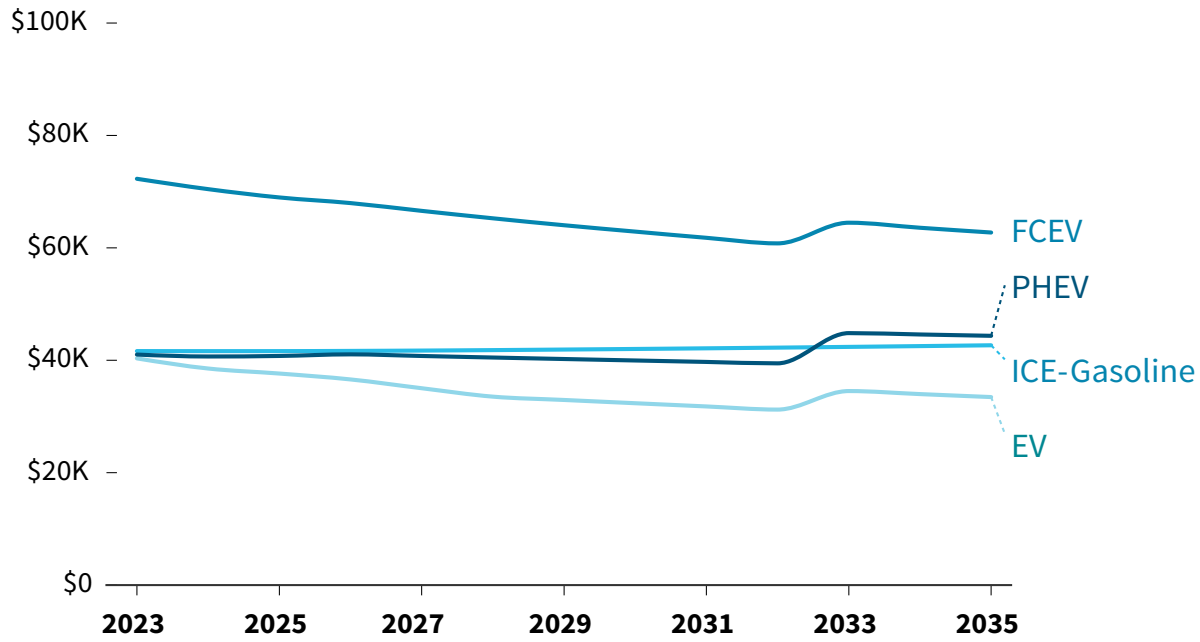
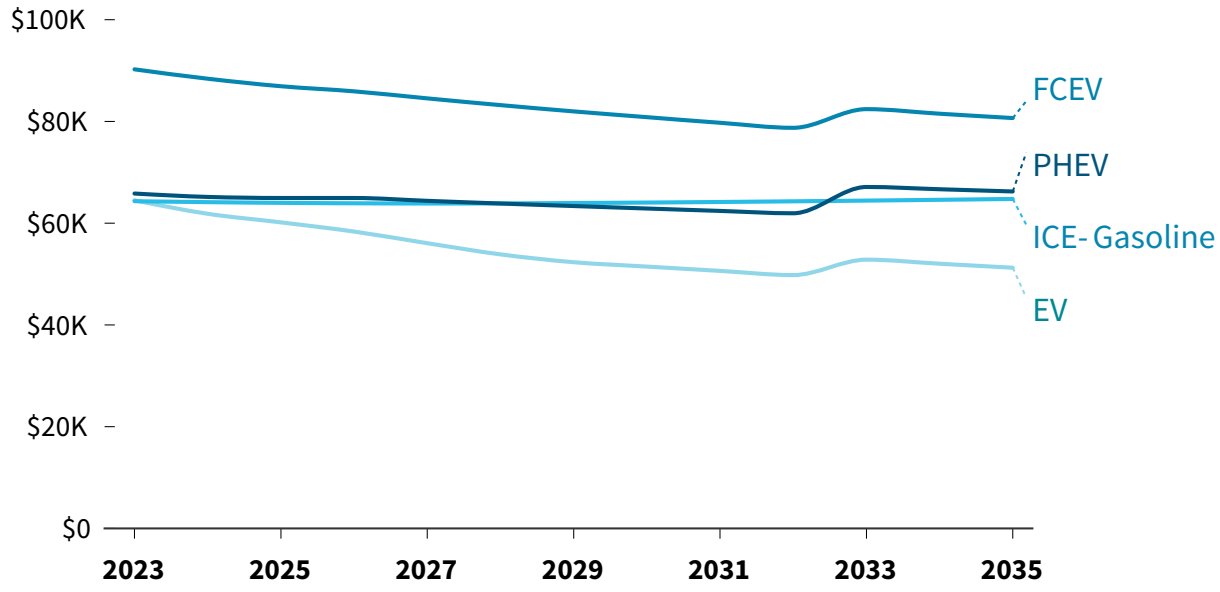
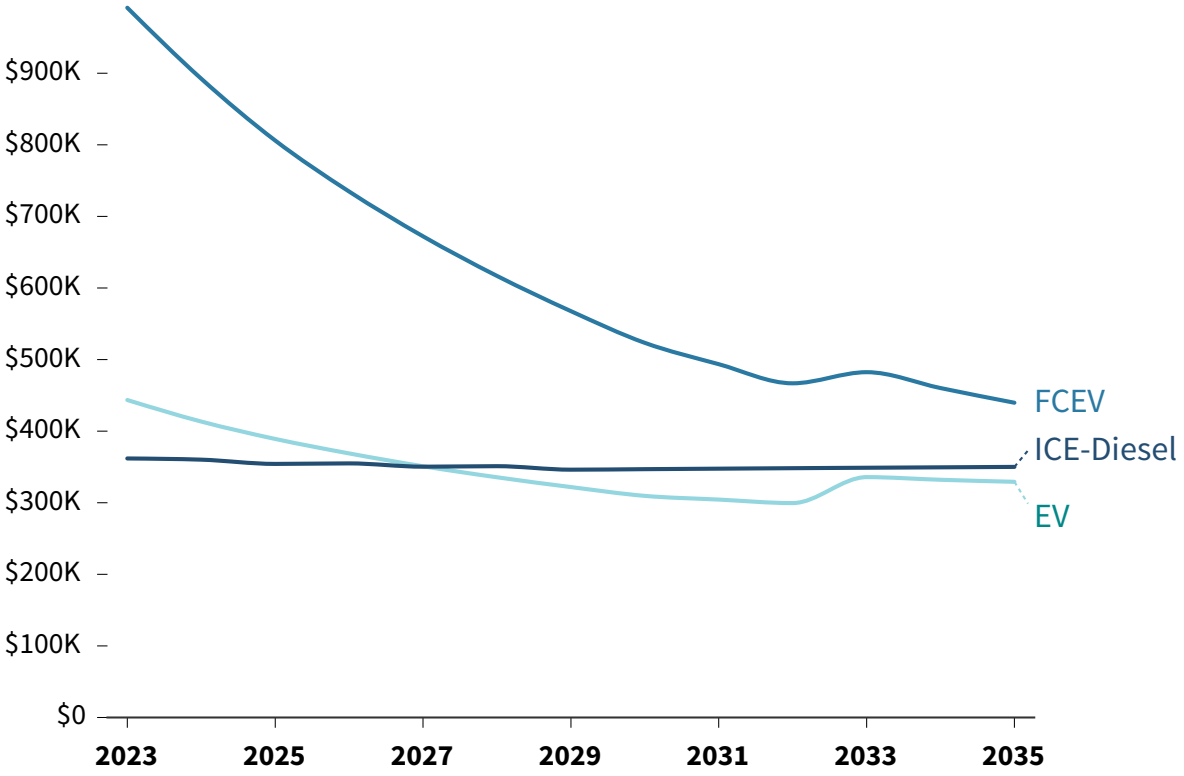


Figure 39 TCO by Powertrain, Personal Pickups/SUVs Domiciled at SFHs in Clark County ($2023)



Currently, FCEV cost outlooks for MHDVs are also considerably higher than those for both conventional diesel engines ("ICE-Diesel" in Figure 40) and battery electric options. However, the S-curve–based TES analysis does project small numbers of FCEV HD trucks being adopted in the early 2030s, when costs are expected to be somewhat more competitive with BEV and diesel options. Given uncertainty about how this technology and the associated costs develop (including uncertainty about hydrogen refueling infrastructure, which has yet to be developed at scale), Washington will continue to monitor FCEV options in the coming years, especially for MHDVs. Per **Chapter 292, Laws of 2022**,[194] the Department of Commerce's Office of Hydrogen and Renewable Fuels delivered a Hydrogen and Renewable Fuels 2023 Legislative Report to the Legislature on December 1, 2023, which should be used to inform this assessment.

Figure 40. **TCO by Powertrain for Heavy-Duty Trucks Domiciled in Kitsap County**



Note that in Figures 41 and 42, FCEV infrastructure is included as the "EVSE Cost" for the HD trucks. Infrastructure costs for light-duty FCEVs were not directly included in this assessment, and if included (as part of fueling costs) they would make FCEVs even less competitive for that vehicle segment.

194 SB 5910 – **Accelerating the availability and use of renewable hydrogen in Washington state**.

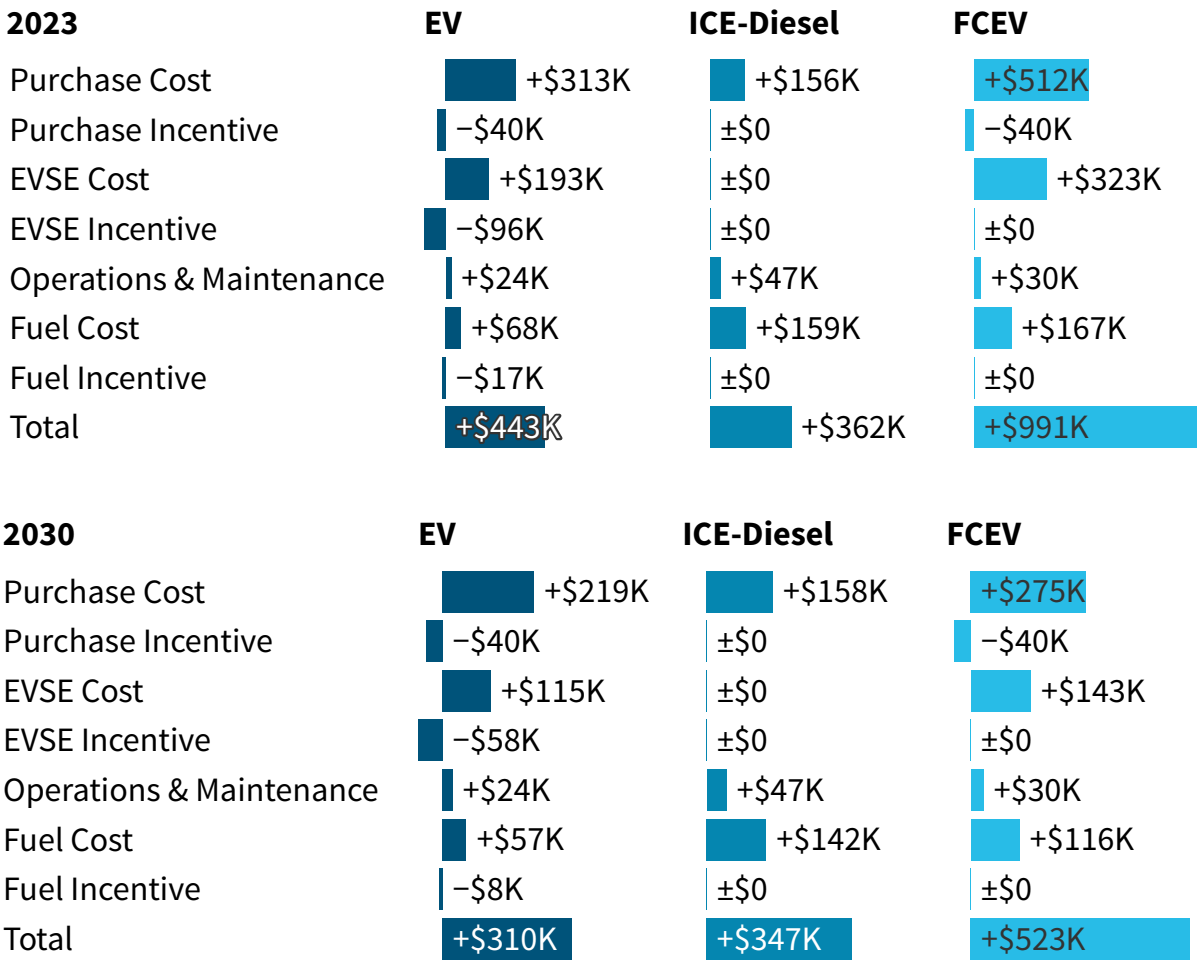
Figure 41 TCO by Powertrain and Component, Personal Light-duty Sedans in Clark County, 2023 and 2030

2023	EV	PHEV	ICE-Gasoline	FCEV
Purchase Cost	+$44K	+$43K	+$35K	+$76K
Purchase Incentive	−$7K	−$7K	±$0	−$7K
EVSE Cost	+$1K	+$596	±$0	±$0
EVSE Incentive	−$22	±$0	±$0	±$0
Operations & Maintenance	+$1K	+$1K	+$3K	±$0
Fuel Cost	+$1K	+$2K	+$4K	+$2K
Fuel Incentive	−$25	±$0	±$0	−$169
Total	+$40K	+$41K	+$42K	+$72K

2030	EV	PHEV	ICE-Gasoline	FCEV
Purchase Cost	+$35K	+$42K	+$36K	+$67K
Purchase Incentive	−$6K	−$6K	±$0	−$6K
EVSE Cost	+$1K	+$596	±$0	±$0
EVSE Incentive	−$22	±$0	±$0	±$0
Operations & Maintenance	+$1K	+$1K	+$3K	±$0
Fuel Cost	+$1K	+$2K	+$3K	+$2K
Fuel Incentive	−$14	±$0	±$0	−$96
Total	+$32K	+$40K	+$42K	+$63K

Figure 42

TCO by Powertrain and Component, Heavy-duty Trucks Domiciled in Kitsap County, 2023 and 2030



Adoption Function

The adoption function is based on the S-curve theory of innovation and growth. Adoption of a new technology occurs slowly at first, then exponentially, before slowing down as the last few percentage points of adoption are approached.

S-curve inputs were calibrated to historical EV sales figures as a proportion of total sales for each vehicle segment, in addition to past EV and ICE prices, to determine the link between TCO and S-curve position. Different future S-curve shapes (i.e., speed of adoption and sensitivity to economics) were used for the S1 Baseline scenario and other modeled scenarios that assume either more or less consumer and business interest in EVs and responsiveness to underlying economics. These different S-curve shapes are also intended to reflect other noneconomic factors, such as relatively more or less EV charging availability or the extent of education and outreach programs to promote vehicle electrification, and the associated effect these may have on EV uptake (these different S-curve treatments are reflected as "EV Adoption Demand Rate" in Table 33).

A logistic function (mathematical representation of the S-curve) is used to model the purchase decision-making process for an individual or fleet operator at each sale decision point. For each vehicle type, the TCO for each powertrain option is fed into a logistic function in a two-step process, with two decisions or comparisons made:

1. Will the adopted vehicle be an ICE or a ZEV?

2. If the vehicle will be a ZEV, which type of ZEV will it be?

At each step, the logistic function outputs a probability of adoption. Combined, this two-step process outputs the probability of what new sales of a particular vehicle type will be (i.e., ICE vehicles, EVs, PHEVs or FCEVs).

Final Sales

These probabilities are not yet final sales. For some segments, sales constraints are applied (based on RMI analysis of potential supply chain and manufacturing constraints, for both vehicle supply and electric grid capacity availability) to slow their growth in sales to a particular rate. Additionally, vehicle sales are compared against policy mandates (e.g., ACC II, ACT) to determine whether TCO-based sales shares meet the required level for a given year.

Policy Mandates

ACC II and ACT are both relatively straightforward regulations to implement in the stock rollover model, with both setting a minimum sales share trajectory implemented for their target vehicle segments. Where economic-based sales are below the target level, sales are increased proportionally across the state with a method that increases sales in counties where the economics are stronger first. For LDVs this is done across all segments combined rather than for each individual segment, and so certain segments with more favorable TCOs may reach higher EV shares first (e.g., personal sedans).

Advanced Clean Fleets

ACF-applicable MHDV populations are derived from a combination of bottom-up calculations and high-level estimates. ACF is a complex policy, with different phase-in dates for different types of MHDVs, including drayage trucks, high-priority fleets and state fleets. In addition, implementation of this policy in Washington may differ in some respects from what happens in California (which developed this regulation).

For state fleets, additional county-level data was provided by Washington. For drayage fleet port volumes, California's drayage inventory was scaled to the port volumes of Washington, and checked for soundness against some public Washington drayage registries because there is no single drayage truck inventory for Washington.

High-priority fleets are the most difficult to accurately determine without detailed data on the makeup and revenue of fleets operating in Washington. Accordingly, CARB estimates for California were scaled down to Washington's number of residents. To eliminate some double counting, approximately 50% of the drayage truck population from this high-priority fleets estimate was then subtracted for those counties in which drayage fleets operate.

With this total number of ACF-applicable fleets, a minimum sales mandate share for each county was calculated, inclusive of ACT as well as ACF, and used in the modeled scenarios that include ACF as an active policy (using the same method described above for ACT and ACC II).

Emissions and Air Quality

Emissions and air quality are calculated from the fuel usage determined during the TCO steps, and the overall stock by vehicle type and powertrain determined in the stock rollover step. Emissions and air quality factors for grid electricity used to charge EVs and tailpipe emissions for ICE vehicles were derived from Argonne National Laboratory's GREET model database. The modeling does not assume increased usage of alternative liquid fuels such as renewable diesel or biofuels in ICE vehicles over time.

This approach excludes some air quality emissions due to tire and brakes wear and tear.

Electric Vehicle Supply Equipment Model

The EVSE model calculates the charging infrastructure needed to satisfy the charging demand of the number of EVs determined by the stock rollover model. LDV, MHD truck and bus EVSE needs are simulated separately. The total number of required charging ports represents the final output of the model, whereas the intermediate steps produce insight into hourly load shape and (unmanaged) peak electricity demands.

Light-Duty Vehicle Modeling

The process for modeling LDV EVSE requirements begins with aggregating daily trips for a given geography from Replica, based on a combination of different data sources aggregated to create a robust data set. The Replica data set contains vehicle travel simulations for each day of the week for the entire population of the state. Trips can be aggregated at the census block group, county or state level. Each trip indicates start/stop location, start/stop time, vehicle type, travel purpose and demographic information about the driver. A unique driver identification is used to link all the stops and trips across the day made by the same person.

After all trips in the geography are collected, calculating total charging demand is the next step. All vehicles are assumed to start fully charged at the beginning of the day. The mileage of each trip is converted to electrical demand via unique efficiency scalars (kWh/mile) for each type of LDV (e.g., sedans operate at a different average efficiency than pickup trucks). Vehicles must recharge the load they have used by the end of the day.

The charging logic aspires to capture driver behavior by accounting for stop duration and charger availability. Stops over the course of a day are ranked by duration, and charging is assigned in order from longest to shortest duration stop until the total demand is satisfied. Load for a given geography (e.g., county) is distributed across five charger types: Single-Family Home L2, Multifamily Home L2, Workplace L2, Public L2 and Public DCFC.

If charging at home is available, demand is usually met there. All single-family home residents are assumed to have access to home L2 charging. A variable fraction of multifamily home residents (increasing with time) is assumed to have access to home L2 charging. Work charging access is assumed to increase over time in a similar fashion (Table 25). Public charging stops shorter than one hour are assumed to be met with DCFC and longer stops with L2.

Table 25 Assumed EVSE Access Rates

Access Rate	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
SFH L2	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
MFH L2	23%	26%	29%	32%	35%	38%	42%	45%	48%	51%	54%	57%	60%
Office Work	23%	26%	29%	32%	35%	38%	42%	45%	48%	51%	54%	57%	60%
Non-office Work	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%

Port counts of each charger type are then calculated based on the power level of the charger, the quantity of the load and a charger utilization rate that represents the total time in a day the unit is assumed to be providing power (Table 26). To derive estimated LDV charging ports at the census block group level, Replica data by trip purpose (e.g., return to home, commute) for each block group is used to allocate chargers from the county level to individual census block groups.

Table 26 Assumed EVSE Utilization Rates

Utilization Rate	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Work L2	4%	5%	6%	7%	8%	9%	9%	10%	11%	12%	13%	14%	15%
Public L2	4%	4%	5%	5%	6%	6%	7%	7%	8%	8%	9%	9%	10%
Public DCFC	6%	7%	7%	8%	9%	10%	10%	11%	12%	13%	14%	14%	15%
MHD Depot	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
MHD Highway	10%	13%	15%	18%	20%	23%	25%	28%	30%	33%	35%	38%	40%

Medium- and Heavy-Duty Vehicles

As with LDVs, the process for modeling MHDV EVSE requirements begins with collecting daily Replica trips for a given geography (county or statewide). Unlike with LDVs, truck trips are anonymized and cannot be linked to distinct drivers or vehicles. Trip attributes are limited to start/stop time, start/stop coordinates, distance and truck type.

Since individual vehicle driving patterns cannot be analyzed, charging load is allocated in the aggregate across the total active truck population of the region. Desired charging times are assumed to be inversely proportional to driving times. For example, if the population of trucks drives 25% more than average from 3:00 to 4:00 PM, the charging load delivered to the population in the same time frame will be 25% less than mean hourly charging. As with LDVs, trucks must satisfy all demand (refill their batteries) in each 24-hour period.

Once a curve of charging needs by hour in each county is obtained, the shape of this curve is used to scale average daily mileage data. Average vehicle efficiency (kWh/mile) is then used to calculate total daily load for the region. The number of ports needed to satisfy this load is then calculated in the same way as described above for LDVs, as a function of charger power level and charger utilization (access rate — a factor in the calculation of LDV EVSE ports — is not a factor for the analogous MHD truck calculation).

Buses

The Replica data set does not contain trip data on transit or school buses, so the bus EVSE modeling process is distinct. This alternative method takes the annual statewide school and transit bus VMT totals from WDOT and assumes the baseline scenario of the stock rollover model corresponds with the most recent WSDOT VMT data. Annual VMT from the baseline year is scaled by the annual growth projected in each stock rollover scenario, and vehicle driving efficiency (kWh/mile) is then used to convert mileage into bus electricity needs. The number of charging ports needed to satisfy daily loads is then calculated as a function of charger power levels and available charging hours. School buses are assumed to operate an average of 200 days per year, whereas transit buses are assumed to operate 280 days per year. School buses are assumed to have eight stationary hours per day available for charging and transit buses are assumed to have four.

Table 27 EVSE Power Levels

EVSE Type	SFH L2	MFH L2	Work L2	Public L2	Public DCFC	MD Depot	MD Highway	HD Depot	HD Highway	School Bus Depot	Transit Bus Depot
Power (kW)	7.2	7.2	7.2	19	150	50	150	350	350	19	350

Estimating TCO Surplus and Deficit Relative to Attainment of Desired EV Sales Shares

To reach state goals, the gap between estimated EV adoption levels based on economics alone and EV sales trajectories required for compliance with enacted (or contemplated) state regulations must be bridged. To provide a sense of the gap's magnitude, the TES model was used to estimate the associated gap in TCO between economics-based adoption and policy-mandated sales shares.

It is important to clarify that the TES stock rollover model was not developed to be a subsidy calculation tool, and instead is intended to estimate adoption levels based on average costs and expectations of technology uptake. Estimating potential TCO shortfalls using this tool can help assess whether and to what extent compliance with policy goals may be at risk due to insufficient economics for ZEV technology. However, the results shown in Figure 43 should be understood as directional estimates, rather than precise forecasts; there is sufficient uncertainty in this modeling to merit caution in interpreting these results. This is especially true given the importance of use cases (duty cycles) in determining the physical and economic feasibility of transportation electrification, perhaps most notably for MHDVs.

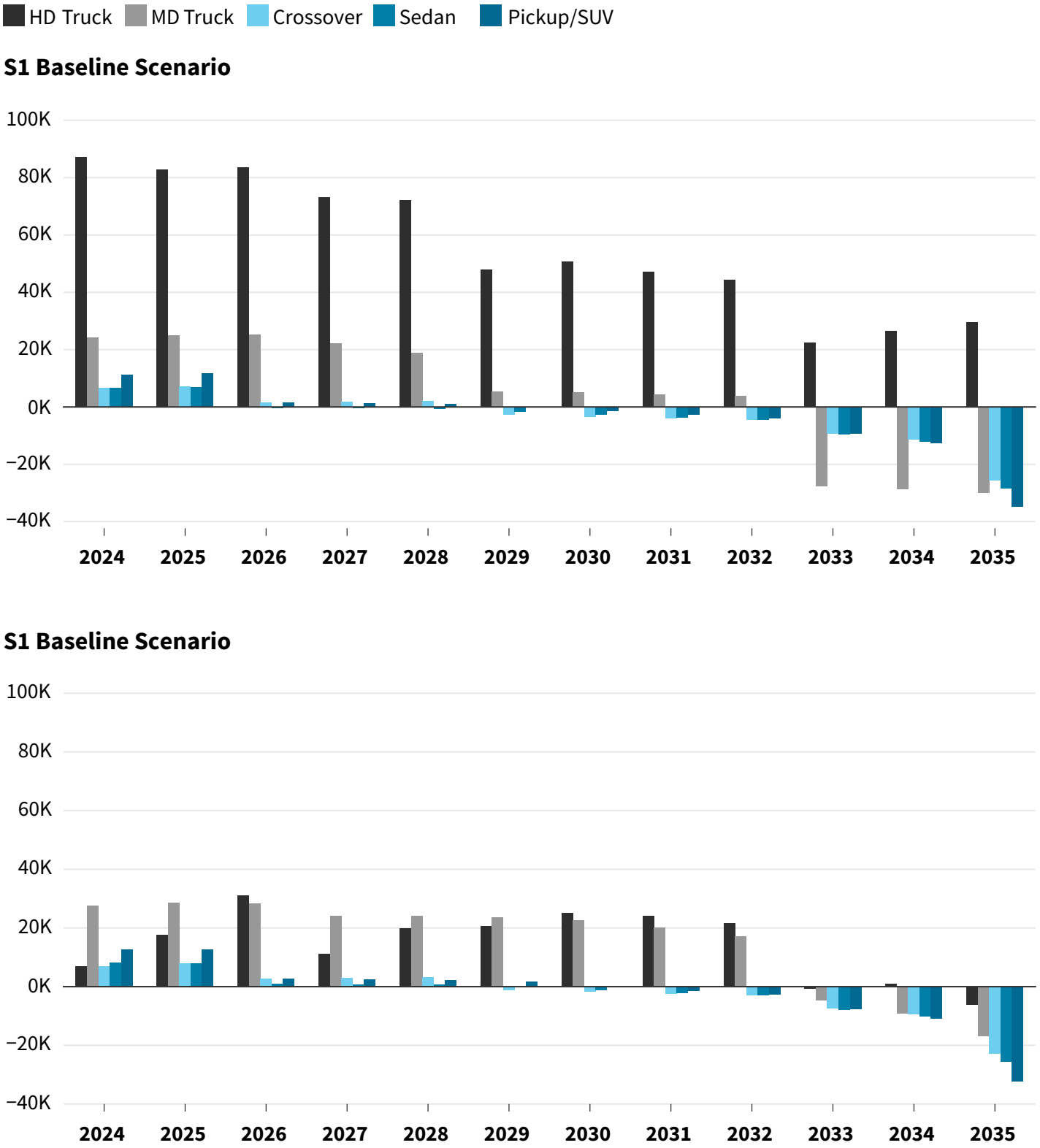
Figure 43 indicates the estimated average "missing money" — on a TCO basis — to produce sales shares in line with the regulations embedded in the S1 Baseline scenario (ACC II and ACT) and the S3 Strong Electrification Policy scenario (ACF). This is based on the S-curve methodology described earlier in this section, which assumes that as economics improve for a new technology, sales share also increases, with relatively slow adoption in the initial years, rapid adoption once economics are competitive with alternative options and then slower adoption as the market saturates. Importantly, this method produces a phased adoption of alternative technologies, rather than a binary adoption function where 100% of the less expensive vehicle would be adopted each year. Fundamentally, this assumes that as the TCO of different vehicle types (e.g., EV and ICE) gets closer, there will be adoption of *both* vehicle types, with the relative share based on the TCO comparison between the two.

Understanding the implications of Figure 43 requires considering the interaction of this S-curve methodology and the level of EV adoption required for compliance with state goals. In the early years, ZEV sales targets are relatively low (e.g., 7% for class 7 and 8 tractors in 2025). Although the TCO for electric class 7 and 8 vehicles is not estimated to be less expensive than comparable diesel tractors in that year, the values are sufficiently close that a small share of electric tractors are estimated to be adopted. Additionally, given that the compliance level is *also* relatively low for these vehicles in that year (7% ZEV sales share), these charts therefore tell us that based on estimated TCO and adoption, economics-based EV adoption (which includes significant federal incentives) should support sufficient compliance levels for those vehicles.

In Figure 43, positive values indicate that the TCO advantage of EVs is sufficiently strong in that year that, as modeled, economics-based adoption surpasses required sales targets. Negative values, in contrast, indicate the additional value required per vehicle — on a TCO basis — to produce EV adoption aligned with that year's sales share target for a given vehicle type (i.e., ACC II requirements for LDVs and ACT or ACF requirements for MHDVs). Note that the $0 axis in these plots does not indicate TCO *parity* between EV and ICE options, but rather indicates the level of EV TCO *advantage* estimated to be required to reach a given year's sales goals for the different vehicle segments. The significantly smaller surplus TCO values for MHDVs in the S3 Strong Electrification Policy chart are due to the inclusion of ACF in addition to ACT, which has higher ZEV sales share requirements, offsetting the higher incentive levels assumed in that scenario.

The positive values for the next several years indicate that TCO (inclusive of all available incentives) appears to be sufficient to enable compliance with state policy goals. In short, this analysis suggests that TCO should not be a barrier to accomplishing near-term policy goals. It is critical to reemphasize that these results assume vehicles take advantage of all available incentives, which are critical to producing TCO-based adoption in line with required targets. Additionally, duty cycles and specific operational needs, especially for MHDVs, will play a key role in determining both the economic and physical feasibility of electrification, suggesting the need for continued focus on enabling larger portions of the market to electrify. This analysis uses county-level average VMT to assess TCO, but VMT will vary by vehicle use case. The state should continue to monitor EV adoption rates, incentive program participation and consumer perspectives over the coming years to best calibrate the needed levels of support to produce desired EV sales penetrations.

Figure 43 Average TCO Surplus or Deficit Relative to EV Adoption Compliance Requirements



Key Inputs and Sources

Table 28 describes the sources and modifications used to develop the key inputs for the EV stock rollover and EVSE models. RMI can answer additional questions regarding inputs and sources.

Table 28 Key Inputs and Sources

Category	Input	Description	Modifications	Source
Commodity (Fuel) Costs	Electricity	Annual $/kWh energy prices for electricity used in transportation in the Pacific region	**End-use sectors:** residential, commercial and industrial **Forecast scenarios:** reference case, low uptake of IRA, low oil and gas supply, and low macro and low zero-carbon technology cost	Annual Energy Outlook 2023, U.S. EIA
Commodity (Fuel) Costs	Diesel and Gasoline	Annual $/gallon energy prices for motor gasoline and diesel used in transportation in the Pacific region	**Forecast scenarios:** reference case, low oil price, and high oil price	Annual Energy Outlook 2023, U.S. EIA
Commodity (Fuel) Costs	Hydrogen	Annual $/kg prices for hydrogen fuel	**Forecast scenarios:** high and average cost	Making Zero-Emissions Trucking Possible, MPP/RMI
Vehicle Upfront Costs	LDVs	Annual purchase price per vehicle	**Vehicle types:** sedan, crossover, SUV/pickup **Fuel types:** ICE, BEV, PHEV **Forecast scenarios:** baseline, conservative, and optimistic, created based on ICCT source and BloombergNEF EV Outlook 2023 trajectories	International Council on Clean Transportation (ICCT); EV Outlook 2023, BloombergNEF
Vehicle Upfront Costs	Buses	Annual purchase price per vehicle	**Vehicle types:** school bus, transit bus **Fuel types:** ICE, BEV, PHEV, FCEV. **Forecast scenarios:** baseline, conservative and optimistic	Market research
Vehicle Upfront Costs	MD and HD Trucks	Annual purchase price per vehicle	**Vehicle types:** MD trucks, HD trucks **Fuel types:** ICE, BEV, FCEV **Forecast scenarios:** baseline, conservative, and optimistic, created based on RMI and MPP analysis	Making Zero-Emissions Trucking Possible, MPP/RMI
Vehicle Upfront Costs	Motorcycles	Annual purchase price per vehicle	**Fuel types:** ICE, BEV Forecast scenarios: baseline, conservative and optimistic	Market research

Sources: Mission Impossible Partnership and RMI, "Making Zero-Emissions Trucking Possible"; International Council on Clean Transportation (ICCT), "Assessment of Light-Duty Electric Vehicle Costs and Consumer Benefits in the United States in the 2022-2035 Time Frame"; BloombergNEF, "Electric Vehicle Outlook 2023"; Consumer Reports, "Electric Vehicle Ownership Costs: Today's Electric Vehicles Offer Big Savings for Consumers"; NREL, "Foothill Transit Battery Electric Bus Evaluation: Final Report"; NREL, "Orange County Transportation Authority Fuel Cell Electric Bus Progress Report"; California Energy Commission, "GFO-17-607 Cost Effectiveness Model Battery Electric School Buses"; CARB, "Appendix G, Literature Review on Transit Bus Maintenance Cost"; J.D. Power, "Don't Get Ripped Off by Excessive Motorcycle Servicing Costs"; ConEdison, "Con Edison and Partners Go To School with Findings from E-School Bus Contract"; WSDOT, "Annual mileage and travel information"; EIA, "Annual Energy Outlook 2023"; NREL, "The 2030 National Charging Network: Estimating U.S. Light-Duty Demand for Electric Vehicle Charging Infrastructure."

Table 28 Key Inputs and Sources, continued

Category	Input	Description	Modifications	Source
Vehicle O&M Costs	LDVs	Annual $/mile maintenance cost.	**Powertrains:** ICE, EV, PHEV **Vehicle types:** sedan, crossover, SUV/pickup	Consumer Reports
Vehicle O&M Costs	Buses	Annual $/mile maintenance cost.	**Powertrains:** ICE, EV, FCEV **Vehicle types:** school bus, transit bus	Foothills Transit Study, NREL; Orange County FC Bus Report, NREL; California Energy Commission, CARB
Vehicle O&M Costs	MD and HD Trucks	Annual $/mile maintenance cost.	**Powertrains:** ICE, BEV, FCEV **Vehicle types:** MD trucks, HD trucks	Making Zero-Emissions Trucking Possible, MPP/RMI
Vehicle O&M Costs	Motorcycles	Annual $/mile maintenance cost.	**Powertrains:** ICE, BEV	J. D. Power
Vehicle Efficiencies	LDVs	Annual mpg and kwh/mile fuel efficiencies	**Powertrains:** ICE, EV, PHEV **Vehicle types:** sedan, crossover, SUV/pickup	Annual Energy Outlook 2023, U.S. EIA; EV Outlook 2023, BloombergNEF
Vehicle Efficiencies	Buses	Annual mpg, kwh/mile and kg/mile fuel efficiencies	**Powertrains:** ICE, EV, FCEV. **Vehicle types:** school bus, transit bus	Foothills Transit Study, NREL; Electric School Bus Report, Con Edison
Vehicle Efficiencies	MD and HD Trucks	Annual mpg, kwh/mile and kg/mile fuel efficiencies	**Powertrains:** ICE, BEV, FCEV **Vehicle types:** MD trucks, MD trucks	Making Zero-Emissions Trucking Possible, MPP/RMI
Vehicle Efficiencies	Motorcycles	Annual mpg, kwh/mile and kg/mile fuel efficiencies	**Powertrains:** ICE, BEV	Market research – CT Ridge Guide, Electrek
VMT	VMT	Annual Vehicle Miles Traveled (VMT)	VMT is calculated for each vehicle type from the total statewide VMT using the share of each vehicle type of the total statewide vehicle stock. **Scenarios:** base, low, high Scenarios are calculated according to modeled change in per capita VMT required to meet baseline growth from current state data, MOVE Ahead scenario and other recent work.	WSDOT
EVSE	EVSE Costs	Installation and equipment costs per port	**Charging types and levels:** single-family L2, multifamily L2, public L2, workplace L2, public DCFC	NREL

Sources: Mission Impossible Partnership and RMI, "Making Zero-Emissions Trucking Possible"; International Council on Clean Transportation (ICCT), "Assessment of Light-Duty Electric Vehicle Costs and Consumer Benefits in the United States in the 2022-2035 Time Frame"; BloombergNEF, "Electric Vehicle Outlook 2023"; Consumer Reports, "Electric Vehicle Ownership Costs: Today's Electric Vehicles Offer Big Savings for Consumers"; NREL, "Foothill Transit Battery Electric Bus Evaluation: Final Report"; NREL, "Orange County Transportation Authority Fuel Cell Electric Bus Progress Report"; California Energy Commission, "GFO-17-607 Cost Effectiveness Model Battery Electric School Buses"; CARB, "Appendix G, Literature Review on Transit Bus Maintenance Cost"; J.D. Power, "Don't Get Ripped Off by Excessive Motorcycle Servicing Costs"; ConEdison, "Con Edison and Partners Go To School with Findings from E-School Bus Contract"; WSDOT, "Annual mileage and travel information"; EIA, "Annual Energy Outlook 2023"; NREL, "The 2030 National Charging Network: Estimating U.S. Light-Duty Demand for Electric Vehicle Charging Infrastructure."

Economic Policy Inputs

Table 29 describes the policy inputs that directly influence the economics in the model, which determine TCO-based adoption.

Table 29 Economic Policy Inputs

Policy	Jurisdiction	Lead Agency	Modeling Detail	Vehicle Segments	Time Frame	Baseline Values	High/Low Scenario
Alternative Fuel Vehicle Incentives	State	Department of Commerce	Reduction in up-front cost for electric LDVs	Electric LDVs	2024–28	$5,000/ personal crossover	**High:** $7,000/ personal crossover **Low:** $3,000/personal personal crossover
EV Sales Tax Exemption	State	Department of Revenue	Removal of state sales tax from up-front cost for alternative fuel vehicles	All electric LDVs	2023–25	$1,000 off sales price	**High:** Extend through 2035 **Low:** Remove after 2025
Advanced Clean Cars II	State	Department of Ecology	Escalating minimum annual sales percentage (LDVs)	All LDV cars (motorcycles excluded)	2026–35	Annual sales requirements	N/A (removed in one sensitivity)
Advanced Clean Trucks	State	Department of Ecology	Escalating minimum annual sales percentage (MHDVs)	All MHDVs	2024–35	Annual sales requirements	N/A (removed in one sensitivity)
Clean Fuel Standard	State	Department of Ecology	Downward adjustment to $/kWh rates for public charging	All EVs, all segments	2023–33	Varies	**High:** Extend through 2035 **Low:** Remove after 2026
Clean Vehicle Credit	Federal	U.S. Treasury	Reduction in up-front cost for alternative fuel vehicles	Electric and PHEV LDVs	2023–32	$3,750 average credit (50% of $7,500)	**High:** $5,625 (75% of $7,500) **Low:** $1,875 (25% of $7,500)
Qualified Commercial Clean Vehicles	Federal	U.S. Treasury	Reduction in up-front cost for alternative fuel vehicles	All EVs, PHEVs and FCEVs	2023–32	**<14k lb:** $5,625 (75% of $7,500) **>14k lb:** $30,000 average credit (75% of $40,000)	**<14k lb:** High/Low 100% and 50% of $7,500, respectively. **>14k lb:** High: $40,000; Low: $20,000
Residential EVSE Incentive (utility)	Utility	Various	Reduction in up-front cost for electric LDVs (reducing EVSE cost)	All electric LDV cars (motorcycles excluded)	2023–28	$400	**High:** Increase to $800, extend through 2035 **Low:** Decrease to $0 beginning 2025
Commercial EVSE Incentive (utility)	Utility	Various	Reduction in up-front cost for EVs (reducing EVSE cost)	All EVs, all segments (motorcycles excluded)	2023–28	25% of EVSE costs	**High:** Increase to cover 50% of costs, extend through 2035 **Low:** Decrease to $0 beginning 2025
Alternative Fuel Refueling Property Credit	U.S.	U.S. Treasury	Reduction in up-front cost for EVSE	All EVs, all segments	2023–32	**Residential:** 30% max of $1,000 **Commercial:** 6% up to $100,000, only in eligible census tracts (using 10% for baseline, assuming an average of some projects that do use prevailing wages)	**High:** Residential: no change; commercial: increase to 25% average credit value **Low:** Residential: drop to $0; commercial: decrease to 0%
Clean School Bus Program	U.S.	Environmental Protection Agency	Reduction in up-front cost of electric school bus and charging infrastructure	Electric school buses	2023–26	$20,000 average credit (rounding to $18,750 for buses + $1,000 for EVSE)	**High:** $40,000 **Low:** $0

Source: Chapter 297, Laws of 2022; RCW 82.12.999 – Exemptions – Vehicles using clean alternative fuels and electric vehicles (Expires August 1, 2028); Advanced Clean Cars II; Advanced Clean Trucks; Clean Fuel Standard; Clean Vehicle Credit; Commercial Clean Vehicle Credit; Alternative Fuels Data Center; Clean School Bus Program Rebates.

Vehicle Stock

The vehicle stock input is a CSV file detailing the vehicle stock composition for the base year of the stock rollover model. Every subsequent year in the model is built in relation to this base stock input. The stock input file describes, for every county in Washington, the number of vehicles in each vehicle type category (personal/commercial sedan, crossover, or pickup/SUV; MD or HD trucks; school bus; transit bus; and motorcycle), powertrain (ICE or EV) and vintage (age of operation up to 30 years old).

Table 30 Vehicle Stock Estimation

Source	Information Gathered	Key Assumptions or Modification
Washington DOL, Registration Database*	Count, age and powertrain information for: • Personal/commercial sedans, crossovers or pickups/SUVs • MD and HD trucks • Motorcycles	Base year data based on 2022 registrations, the most recent complete year. Off-road and ATV vehicle types were excluded from the stock.
Washington OSPI, School Bus Database	Count, age and powertrain information for: • School buses	None
Federal Transit Administration, National Transit Database	Count and age for: • Transit buses	Transit agencies were assigned to counties based on operating territory. In case of cross-county operations, buses were assigned to the county with the majority of territory. Vehicles counted toward the bus type of interest, and excluded other vehicles in the National Transit Database, such as light rail and trams.
Respective Transit Development Plans for each Washington transit agency	Powertrain information for: • Transit buses	Most recent transit agency development plans were used, usually the 2021–26 plan. EV counts were determined from stock and investment information in plans.

*Note: Multiple Department of Licensing data fields used to create vehicle categories modeled for TES.

Scenarios and Sensitivities Modeled

Tables 31 and 32 describe the scenarios and sensitivities modeled. Table 33 describes the combination of inputs used to define each scenario.

Table 31 Scenarios Modeled

Type	#	Scenario	Characteristics (Relative to Baseline)	Key Questions Explored
Core	1	Baseline	N/A	What might EV adoption look like under current policy and middle-of-the-road outlooks on cost trajectories?
Core	2	Strong Electrification Technology	External technological shifts work in Washington's favor, including lower ZEV, EVSE, electricity and hydrogen costs.	How much greater electrification and lower costs would Washington get if technology develops faster than expected?
Core	3	Strong Electrification Policy	Washington enacts additional policy to support eletrification such as higher incentives for ZEVs and EVSE, inclusion of the ACF rule's adoption rates and education and outreach to encourage strong consumer interest in ZEVs.	How much greater electrification and lower costs would Washington get with more supportive policies?
Exploratory	4	Strong VMT Policy	Washington enacts policy to reduce per capita VMT more than is currently legislated. Policies also encourage less car ownership and a shift to more efficient, lighter vehicles (e.g., more sedans).	How much greater adoption, lower costs and additional social benefits would Washington get with successful VMT-limiting policies and actions?
Exploratory	5	Worst Case	Combination of factors that would together constitute the worst case, such as higher ZEV costs, lack of electrification policy and lack of VMT policy (i.e., inverse inputs from those used for Scenarios 2, 3 and 4).	What is the worst case for electrification and costs if the technology and policy environments are unfavorable?
Exploratory	6	Best Case Climate Aligned	Achieves the most on-road emissions reduction through an optimistic combination of external factors (from Scenario 2) and policy implementation (from Scenarios 3 and 4).	What is the best case for electrification and costs if all input variables support greater EV adoption and VMT reduction?

Table 32 Sensitivities Tested

Type	#	Sensitivity	Scenarios Applied To	Key Questions Explored
Major	a	Remove Effects of Policy Requirements	1–6	How much do ACC II and ACT influence outcomes? What might EV adoption look like without the top-down influence of those policies, and what does that suggest about additional policies that may be required to support these regulations?
Major	b	2030 LDV Sales Target Met	1–6	How close does each modeled scenario get to the 2030 target? What supportive policies may be required to enable this goal?
Minor	c	VMT Reduction without Stock or Freight Change	4	What benefits are achieved by reducing VMT but not reducing vehicle size and fleet size?
Minor	d	High Fossil Fuel Prices	1, 2	How do relatively high petroleum prices affect outcomes?
Minor	e	Low Fossil Fuel Prices	1, 2	How do relatively low petroleum prices affect outcomes?

Table 33 Scenario and Sensitivity Inputs

		Scenarios						Sensitivities			
		1	2	3	4	5	6	a (1–6)	b (1–6)	c (4)	d,e (1–2)
Category		Baseline	Strong Electrification Tecnology	Strong Electrification Policy	Strong VMT Policy	Worst Case	Best Case Climate Aligned	Remove Effect of Requirements	2030 Target Met	VMT Reduction without Stock, Freight Change	High/Low Fossil Costs
Vehicle	EV and PHEV Costs		Low			High	Low	Varied	Varied		
Vehicle	FCEV Costs		Low			High	Low	Varied	Varied		
Energy	Electricity		Low			High	Low	Varied	Varied		
Energy	Fossil Costs					Low	High	Varied	Varied		High/Low
Energy	Hydrogen Costs		Low			High	Low	Varied	Varied		
Infrastructure	EVSE Costs		Low			High	Low	Varied	Varied		
Infrastructure	Hydrogen Infrastructure Costs		Low			High	Low	Varied	Varied		
Infrastructure	EVSE Availability			High		Low	High	Varied	Varied		
Requirements and Targets	ACC II	Yes						No	Varied		
Requirements and Targets	ACT	Yes						No	Varied		
Requirements and Targets	ACF	No		Yes			Yes	No	Varied		
Requirements and Targets	2030 LDV Target	No						No	Yes		
Incentive Policies	Utility Incentives			High		Low	High	Varied	Varied		
Incentive Policies	State Incentives			High		Low	High	Varied	Varied		
Incentive Policies	Federal Incentives			High		Low	High	Varied	Varied		
VMT Portfolio	LDV VMT Reduction				High	Low	High	Varied	Varied	High	
VMT Portfolio	LDV Stock Reduction				High	Low	High	Varied	Varied		
	LDV Composition: Shift to Lighter Vehicles				High	Low	High	Varied	Varied		
VMT Portfolio	Increase in Bus VMT and/or Stock				High	Low	High	Varied	Varied	High	
VMT Portfolio	Reduction in Freight VMT and/or Stock				High	Low	High	Varied	Varied		
Cross-cutting	EV Adoption Demand Rate			High		Low	High	Varied	Varied		

VMT Scenario Assumptions

Table 34 provides VMT assumptions used in the different scenarios.

Table 34 VMT Scenario Assumptions

Scenario Input	Units (Reported for 2035)	Scenario	Value	Source/Assumption
LDV VMT Reduction	% per capita decrease relative to 2019	Baseline	6%	State forecast
LDV VMT Reduction	% per capita decrease relative to 2019	High	17%	State Smart Transportation Initiative-Smart Growth America Washington report
LDV VMT Reduction	% per capita decrease relative to 2019	Low	−10%	Reverse progress since 2005
LDV Stock Reduction	% reduction relative to baseline	High	17%	Proportional to VMT reduction
LDV Stock Reduction	% reduction relative to baseline	Low	−5%	50% of VMT increase
LDV Shift to Lighter Vehicles	% sedan share of LDV sales	Baseline	20%	Conservative trend extrapolation
LDV Shift to Lighter Vehicles	% sedan share of LDV sales	Low	5%	Worst case extrapolation
LDV Shift to Lighter Vehicles	% sedan share of LDV sales	High	50%	Return to 2000s share
Increase in Bus VMT and Stock	% increase relative to baseline	High	59%	Washington Energy Policy Simulator; Institute for Transportation and Development Policy
Increase in Bus VMT and Stock	% increase relative to baseline	Low	−10%	Partial post-COVID19 recovery
Freight VMT and Stock Reduction	% reduction relative to baseline	High	6%	State Energy Plan (~50% of LDV potential)
Freight VMT and Stock Reduction	% reduction relative to baseline	Low	−20%	Double LDV worst case

Bus Electrification Scenarios

The baseline scenario assumes that the growth in funding availability from 2020 to 2023 would continue through 2035. The "low" scenarios assume annual funding availability to stay constant from 2023 through 2035, with an increasing number of electric buses becoming eligible for purchase due to a decrease in bus purchase costs. The "high" scenarios follow the sales trajectory required to achieve 100% electric transit bus sales in the state by 2035.

For school buses, the sales trajectories are differentiated based on anticipated years that price parity is achieved between ICE and electric school buses, according to WRI. The baseline sales trajectory is projected to meet a target of 100% electric school bus sales by 2033, the year electric school buses are expected to reach up-front price parity with their ICE counterparts. Similarly, the "high" sales trajectory is projected to meet 100% sales in 2029, the year in which the electric school buses reach TCO parity with ICE buses, according to WRI. The "low" sales trajectory is aligned with a longer-term goal of 100% sales by 2040.

Additional Scenario Analysis Comparisons and Commentary

LDV Comparison Across Scenarios and Sensitivities: Plug-in EV Share of Total 2035 Light-Duty Vehicle Stock

Table 35 provides a comprehensive comparison of the different scenarios and sensitivities based on their resulting light-duty plug-in EV share of total stock in 2035 (shown as percentage point change in EV stock share, relative to the S1 Baseline scenario).

Table 35 Effect of Scenarios and Sensitivities on 2035 Light-duty Plug-in EV Share of Vehicle Stock

−14% 9%

Percentage Point Change Relative to S1 Baseline Scenario	No Sensitivities	a) Remove Effect of ACC II	b) 2030 LDV Target Met	c) VMT Reduction without Stock Change	d) High Fossil Fuel Prices	e) Low Fossil Fuel Prices
S1 Baseline		−9%	7%		3%	−1%
S2 Strong Electrification Technology	3%	−3%	9%		6%	1%
S3 Strong Electrification Policy	2%	−8%	8%			
S4 Strong VMT Policy	−2%	−14%	5%	−1%		
S5 Worst Case*	−1%	−13%	6%			
S6 Best Case Climate Aligned	2%	−3%	8%			

* S5b (6%) is a counterintuitive scenario with somewhat limited value for interpretation because it includes high EV technology costs and low levels of supportive policy incentives, while also adhering to the top-down 100% electric LDV sales by 2030 goal.

As shown in the No Sensitivities column, differences across scenarios are muted by the requirement to reach ACC II annual sales shares. S4 Strong VMT Policy has fewer EVs because it has many fewer LDVs overall, as well as lower VMT per vehicle (making EVs relatively less economic through minimized opportunity to save on operating costs). S6 Best Case Climate Aligned has a similar dynamic, although the EV economics in that scenario — based on a combination of technology cost declines and policy support — are strong enough that it counteracts the effect of lower VMT, resulting in a modest EV stock increase relative to the S1 Baseline scenario.

Removing the effect of ACC II to explore how various scenarios compare (third column) shows larger variation. S6 Best Case, S2 Strong Electrification Technology and S3 Strong Electrification Policy maintain the largest EV share of baseline population, indicating they produce the most favorable economics for EVs.

The fourth column shows relatively modest impacts on the overall share of EVs by 2035 from including a firm 2030 100% electric LDVs sales requirement. This is due to the relatively long time frame over which changes in new sales have meaningful impacts on the total vehicle stock (i.e., vehicles are fairly long-lived assets).

The fifth column highlights the scenario in which VMT reduction takes place without there also being a reduction in vehicle stock and a shift to lighter vehicles. Although reducing VMT will decrease the cost savings for EVs and would therefore decrease their sales and stock share, the inclusion of the ACC II requirement mutes this dynamic, producing minimal changes relative to the baseline. S4c does, however, have a much larger impact on GHG and local air pollutant emissions reduction. The final two columns show a similar effect, with relatively small changes to 2035 EV stock share due to the strong influence of ACC II on EV sales and ultimately stock.

MHD Truck Comparison Across Scenarios and Sensitivities: ZEV Share of Total 2035 MHD Truck Stock

Table 36 provides a comprehensive comparison of the different scenarios and sensitivities based on their resulting electric share of total truck stock in 2035 (shown as percentage point change in EV stock share, relative to the S1 Baseline scenario).

Table 36 Effect of Scenarios and Sensitivities on 2035 Zero-Emissions Share of MHD Truck Stock

−31% 14%

	Percentage Point Change relative to S1 Baseline Scenario	No Sensitivities	a) Remove Effect of ACT	b) 2030 LDV Target Met (N/A for MHD trucks)	c) VMT Reduction without Stock Change	d) High Fossil Fuel Prices	e) Low Fossil Fuel Prices
Core	S1 Baseline		−3%			7%	−4%
Core	S2 Strong Electrification Technology	8%	8%			9%	4%
Core	S3 Strong Electrification Policy*	12%	11%				
Exploratory	S4 Strong VMT Policy	−1%	−6%		−1%		
Exploratory	S5 Worst Case	−5%	−31%				
Exploratory	S6 Best Case Climate Aligned	14%	14%				

* S3a (11%) is a counterintuitive scenario with somewhat limited value for interpretation regarding MHDs because it removes the effect of the ACT regulation, yet includes the effect of the more stringent ACF regulation.

The No Sensitivities column shows fairly large increases over the S1 Baseline 2035 electric truck population for S2 Strong Electrification Technology (due to lower vehicle and operating costs), S3 Strong Electrification Policy (due to larger incentives) and S6 Best Case Climate Aligned (due to a combination of lower costs and higher incentives). The Remove Effect of ACT column shows similar deviations from baseline levels of electric truck adoption, even in the absence of the ACT regulation, for S2a, S3a and S6a. This indicates that decreasing the cost of electric trucks relative to ICE trucks enables electrification *beyond* the minimum levels required by top-down policy, a distinct finding from the analogous comparison of electric LDV stock with and without the ACC II regulation.

S4a Strong VMT Policy without the Effect of ACT hurts the economic case for electric trucks by reducing operating cost savings, thereby reducing electric truck adoption relative to the baseline. S5a Worst Case without the Effect of ACT significantly reduces the economics for electric trucks, resulting in far lower sales and stock when ACT is not serving as a backstop.

The VMT Reduction without Stock Change column shows a marginal change in 2035 electric truck population from reducing VMT while holding vehicle stock constant. The final two columns — which explore the sensitivity of higher and lower petroleum prices, relative to the baseline — show larger impacts than the application of these sensitivities to the LDV scenarios, due both to the higher responsiveness of commercial truck operators to TCO, and the larger share of total costs that operating expenses make up for trucks relative to cars (making truck operators more sensitive to fuel price changes, all else equal). Interestingly, S2e Strong Electrification Technology with Low Fossil Fuel Prices results in a larger number of electric trucks in 2035 than the S1 Baseline scenario, indicating that the economic advantage provided by lower electrification technology costs is sufficient to offset the disadvantage of lower diesel prices.

Table 37 provides a comprehensive comparison across scenarios and sensitivities of the estimated on-road GHG emissions in 2035, shown as percent change relative to the S1 Baseline scenario.

Table 37 Effect of Scenarios and Sensitivities on 2035 On-road Transportation GHG Emissions

−36% 34%

	No Sensitivities	a) Remove Effect of ACC II	b) 2030 LDV Target Met	c) VMT Reduction without Stock Change	d) High Fossil Fuel Prices	e) Low Fossil Fuel Prices
S1 Baseline		10%	−7%		−5%	3%
S2 Strong Electrification Technology	−4%	3%	−11%		−8%	0%
S3 Strong Electrification Policy*	−4%	6%	−12%			
S4 Strong VMT Policy	−20%	−8%	−26%	−11%		
S5 Worst Case	21%	34%	15%			
S6 Best Case Climate Aligned	−30%	−24%	−36%			

* S3a (6%) is a counterintuitive scenario with somewhat limited value for interpretation because it removes the effect of the ACT regulation, yet includes the effect of the more stringent ACF regulation.

For additional details on both GHG and local air pollutant emissions, by scenario, vehicle segment and powertrain, please see the online Washington TES User-Interactive Dashboard.[195]

Explanation of Emissions and Equity Determinations in Tables 1 and 2

Table 38 provides an explanation of how the EV Council determined estimates for potential emissions reduction and equity effects in identifying 2024 priorities.

195 Washington TES User-Interactive Dashboard, found on the TES website.

Table 38 Explanation of Emissions and Equity Determination in Prioritization Tables 1 and 2

Strategy	Emissions Reduced	Transportation Equity	Air Quality Equity
Requirements and incentives for zero-emissions MHDVs.	Achieving ACF adoption rates with support from incentives is one of the assumptions made in modeling S3 but not in S1. The determination of 230,000 MMT is found by taking the difference between GHG emissions in S3 and S1 for MD and HD vehicle segments in 2030 and rounding to the nearest 10,000.	Requiring and incentivizing the purchase of MD and HD ZEVs will increase access to EVs by accelerating the supply of ZEV trucks in Washington. The CARB found in a cost assessment of ACF that fleets save $48 billion through 2050 as a result of the policy.*	There is a strong overlap between overburdened communities and those most affected by diesel pollution. Therefore, reducing truck pollution through electrification will have a larger positive effect on air quality in the average overburdened community than the average Census tract.
Grow broad consumer demand for passenger BEVs.	Modeling for S3 assumes increased incentives and consumer awareness needed to achieve increased EV sales prior to model year 2026. The determination of 20,000 MMT is found by taking the difference between GHG emissions in S3 and S1 for LDV and motorcycle segments in 2030 and rounding to the nearest 10,000.	Growing consumer demand for EVs will result in automakers delivering more EVs to Washington, especially prior to model year 2026. Increased sales tax exemption and awareness of incentives and charging will have a larger positive impact for those who currently cannot afford the up-front purchase price differential of EVs to access the TCO savings. Recent consumer research shows that Black and Hispanic Americans are less likely to be aware of federal EV credits.**	There is an overlap between overburdened communities and those most impacted by heavy-traffic roadways. Therefore, reducing LDV pollution through electrification will have a larger positive effect on air quality in the average overburdened community than the average Census tract.

*CARB, **"Public Hearing to Consider the Advanced Clean Fleets Regulations - Final Statement of Reasons for Rulemaking, Including Summary of Comments and Agency Response,"** (April 27, 2023).
** Ben German, **"Exclusive: 40% of Americans Say They've Never Heard of Biden's EV Tax Credits,"** Axios, (October 30, 2023).
***Freehafer, Lazer and Zepka, "The State of Electric School Bus Adoption in the US."
**** EPA, **"Making School Buses Cleaner,"** (n.d.).
***** Washington Department of Ecology, **"Clean Fuel Standard Cost Benefit Analysis Report,"** (May 12, 2022).

Table 38 Explanation of Emissions and Equity Determination in Prioritization Tables 1 and 2, continued

Strategy	Emissions Reduced	Transportation Equity	Air Quality Equity
Accelerate and fund school bus electrification to meet needed adoption rates.	Modeling for S3 assumes 100% of school bus purchases are electric starting in 2029, four years earlier than in S1. The determination of 10,000 MMT is found by taking the difference between GHG emissions in S3 and S1 for the school bus segment (6,800) and rounding to the nearest 10,000. The modeling assumptions should not be considered a recommendation of the EV Council and were used to explore possible scenarios. Any purchase requirements should be developed with school districts and stakeholders. Refer to Recommendation 4.5 for suggested actions toward policy development.	According to the World Resources Institute, "Students from low-income families are particularly exposed to the dangers of diesel exhaust pollution: 60% ride the bus to school, compared to 45% of students from families with higher incomes. In addition, Black students and children with disabilities rely on school buses more than their peers, meaning they're more likely to be exposed to diesel exhaust."***	According to the EPA, "Children are more susceptible to air pollution than healthy adults because their respiratory systems are still developing and they have faster breathing rates."**** State funding will be needed by all districts, especially those with lower access to local funding, to transition to electric school buses.
Reduce carbon intensity of gasoline and diesel with clean drop-in fuels.	The TES modeling did not assume a reduction in carbon intensity for gasoline and diesel emissions, making it possible to isolate the program's impact separate from transportation electrification policies. Ecology staff will assess the isolated impacts of the current CFS and an acceleration in carbon intensity reduction schedule.	Reducing the carbon intensity of liquid fuels powering ICE vehicles does not increase access to EVs or non-driving transportation options. According to Ecology's cost-benefit analysis for the CFS, the current policy is estimated to affect gasoline prices between $0.00 and $0.19 per gallon and diesel prices between –$.02 and $0.17 per gallon, while driving down costs of all other major fuel types by much larger amounts.***** More analysis is needed to determine the impact of an accelerated carbon intensity reduction on transportation costs.	There is an overlap between overburdened communities and those most impacted by heavy-traffic roadways. Therefore, reducing vehicle pollution through reduced carbon intensity will have a larger positive effect on air quality in the average overburdened community than the average Census tract.

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** Ben German, "Exclusive: 40% of Americans Say They've Never Heard of Biden's EV Tax Credits," Axios, (October 30, 2023).
***Freehafer, Lazer and Zepka, "The State of Electric School Bus Adoption in the US."
**** EPA, "Making School Buses Cleaner," (n.d.).
***** Washington Department of Ecology, "Clean Fuel Standard Cost Benefit Analysis Report," (May 12, 2022).

Table 38 Explanation of Emissions and Equity Determination in Prioritization Tables 1 and 2, continued

Strategy	Emissions Reduced	Transportation Equity	Air Quality Equity
Pursue diesel vehicle efficiency standards.	Ecology staff have provided preliminary estimates of 300,000–700,000 metric tons of CO_2e reductions in 2030 from an anti-idling policy.	Anti-idling measures reduce costs for fleets by changing behavior that reduces fuel usage well beyond the amount of fines paid for violations. The measures do not have an effect on overall EV adoption, though may result in some electric anti-idling technologies. They also do not have an impact on mobility options.	There is a strong overlap between overburdened communities and those most impacted by diesel pollution. Therefore, reducing truck pollution through less idling and engine tampering will have a larger positive effect on air quality in the average overburdened community than the average Census tract.
Improve vehicle efficiency with lower-resistance replacement tires.	RMI estimated that if Commerce were to implement a replacement tire efficiency standard similar to a draft regulation published by the California Energy Commission, Washington LDV emissions would decline by an additional 360,000 metric tons in 2030.	Efficiency standards for replacement tires will save drivers hundreds of dollars in fuel costs for each set of tires, far more than the expected marginal increase in cost for more efficient tires. The standards will have no impact on EV or multimodal options.	There is an overlap between overburdened communities and those most impacted by heavy-traffic roadways. Therefore, reducing vehicle pollution through better fuel efficiency will have a larger positive effect on air quality in the average overburdened community than the average Census tract.
Focus on high-consumption gasoline and diesel users.	Ecology staff have provided preliminary estimates of 110,000–130,000 metric tons of CO_2e reductions in 2030 from early retirement of heavy diesel users.	A scrap-and-replace program for the heaviest medium- and heavy-duty vehicle fuel users may steer EV incentives toward independent owner-operators, but more analysis is needed. Scrappage can also have the negative effect of reducing the number of used diesel trucks available, which could increase used diesel truck prices. But the state could structure a scrap-and-replace program to mitigate these effects by, for example, requiring incentive recipients to trade their newer, more efficient diesel trucks at no or low cost to smaller fleets or owner-operators and require scrappage of the older, less efficient model. There is no expected impact on multimodal options.	There is a strong overlap between overburdened communities and those most impacted by diesel pollution. Therefore, reducing truck pollution through electrification will have a larger positive effect on air quality in the average overburdened community than the average Census tract.

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** Ben German, **"Exclusive: 40% of Americans Say They've Never Heard of Biden's EV Tax Credits,"** Axios, (October 30, 2023).
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**** EPA, **"Making School Buses Cleaner,"** (n.d.).
***** Washington Department of Ecology, **"Clean Fuel Standard Cost Benefit Analysis Report,"** (May 12, 2022).

Table 38 Explanation of Emissions and Equity Determination in Prioritization Tables 1 and 2, continued

Strategy	Emissions Reduced	Transportation Equity	Air Quality Equity
Continue funding WSDOT zero-emission vehicle and infrastructure programs.	Programs are considered essential to successful and equitable implementation of existing policies, but no emissions reduction is attributed to this specific strategy.	WSDOT's programs, especially those focused on zero-emissions transit, electric bikes and car shares, have an outsized positive impact on lowering costs and increasing EV and multimodal options for vulnerable populations.	WSDOT programs focused on airports, marine ports and buses have a strong positive effect on the air quality of overburdened communities and those most impacted by diesel pollution.
Expand and accelerate funding for Commerce community charging and EV incentive programs for low-to-moderate income (LMI) consumers.	Programs are considered essential to successful and equitable implementation of existing policies, but no emissions reduction is attributed to this specific strategy.	Commerce programs are specifically focused on improving equitable access to lower-cost EVs, multifamily residential charging and public charging. As a result, they will lower transportation fuel costs for low-income communities. They are not expected to have an impact on multimodal options, although public charging near transit access points and fleet depots may be funded.	There is an overlap between overburdened communities and those most impacted by heavy-traffic roadways. Therefore, reducing vehicle pollution through more equitable EV adoption will have a larger positive effect on air quality in the average overburdened community than the average Census tract.
Provide block grants to increase CBO staff capacity.	Program is considered essential to successful and equitable implementation of existing policies, but no emissions reduction is attributed to this specific strategy.	Grants to CBOs to plan and design projects will allow for more equitable participation in available programs, including the WSDOT and Commerce opportunities listed above. This will result in more electrified multimodal options at lower costs in overburdened communities.	Block grants to CBOs for projects that benefit their neighborhoods will improve air quality by increasing electrification that displaces polluting fuels.
Support planning and building necessary utility-side charging infrastructure.	Policy is considered essential to successful and equitable implementation of existing policies, but no emissions reduction is attributed to this specific strategy.	Although utility-side make-ready infrastructure is an essential component of the electrification transition, it does not on its own lower costs, increase EV options or increase multimodal options.	Similar to the emissions reduction and transportation benefits, this policy is a structural component of the transition but is not expected to have an outsized impact in overburdened communities.

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** Ben German, "Exclusive: 40% of Americans Say They've Never Heard of Biden's EV Tax Credits," Axios, (October 30, 2023).
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Table 38 Explanation of Emissions and Equity Determination in Prioritization Tables 1 and 2, continued

Strategy	Emissions Reduced	Transportation Equity	Air Quality Equity
Fund and support state agency efforts to implement EO 21-04.	Policy is considered essential to successful and equitable implementation of existing policies, but no emissions reduction is attributed to this specific strategy.	EO 21-04 applies to state cabinet agency fleets. Although it will have positive transportation benefits for state agencies, the transportation equity determinations are intended for the broader public and vulnerable communities.	EO 21-04 applies to state cabinet agency fleets. More analysis is needed to identify positive air quality impacts of agency electrification for overburdened communities compared to other Census tracts.
Make charging access more equitable and speed up project timelines.	Policies are considered essential to successful and equitable implementation of existing policies, but no emissions reduction is attributed to this specific strategy.	Policies are likely to result in improved price transparency, better access to charging information, improved reliability and quicker build out of the public charging network. These outcomes will lead to more equitable access to EVs and lower charging prices, especially for those without access to home charging.	There is an overlap between overburdened communities and those most impacted by heavy-traffic roadways. Therefore, reducing vehicle pollution through electrification will have a larger positive effect on air quality in the average overburdened community than the average Census tract.
Monitor equity indicators and measure outcomes.	Policy is considered essential to successful and equitable implementation of existing policies, but no emissions reduction is attributed to this specific strategy.	Assessing transportation equity outcomes will improve understanding of program impacts and drive more effective investments and policies.	Working with communities to put in place more air monitors near highways will improve understanding of program impacts and drive more effective investments and policies.

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** Ben German, "Exclusive: 40% of Americans Say They've Never Heard of Biden's EV Tax Credits," Axios, (October 30, 2023).
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