

NW Seaport Alliance Puget Sound
Zero-Emission Truck Collaborative

NW Seaport Alliance Puget Sound Zero-Emission Truck Collaborative

January 30, 2024



Meeting Objectives

- Review and affirm initial draft recommendations on secondary markets and ZEV business models (from December meetings)
- Understand ZEV transition funding needs and near-term state funding opportunities; discuss strategies for unlocking future investments
- Identify key issues and needs for utility infrastructure planning and investments for drayage charging

Roadmap Outline: Today's Focus on Funding and Utility Infrastructure



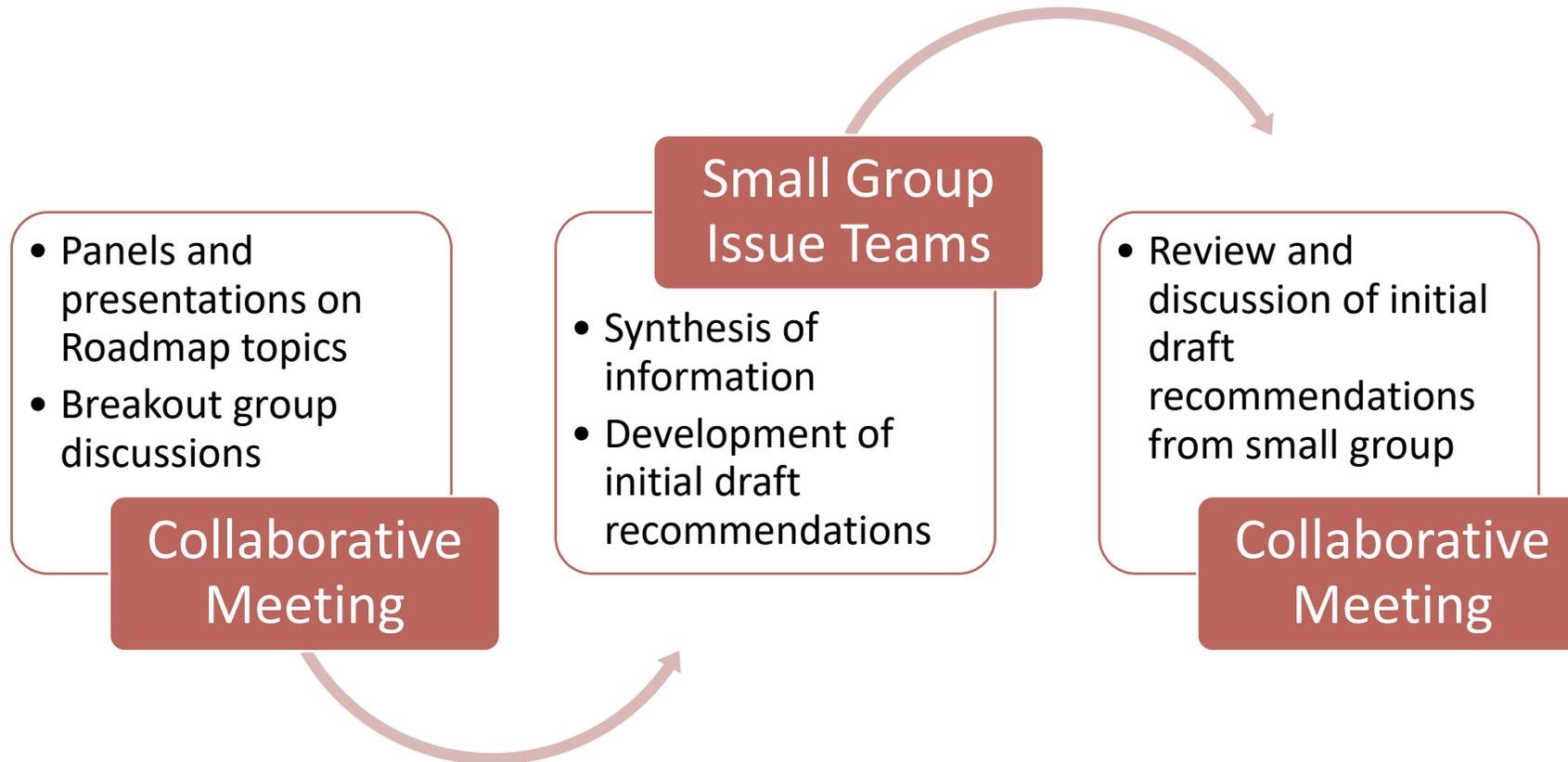
- 1. Introduction
- 2. Vision
- 3. Drayage Sector Context
- 4. Forecasted Transition
- 5. **Issues & Actionable Recommendations**
- 6. **Funding and Enabling Policy Needs**
- 7. Roles and Responsibilities
- 8. Ongoing Collaboration and Coordination
- 9. Conclusion

- a. Equity and Opportunity
- b. Vehicles
- c. **Infrastructure**

- a. **Estimated cost of transition, broken out by component**
- b. **Current sources of funding**
- c. **Funding gaps, needs, and priorities**
- d. Current enabling policies
- e. Policy gaps, needs, and priorities
- f. Role of supply chain/shippers
- g. Port preferences for ZEVs

- i. Ensure appropriate mix of charging types (behind-the-fence, trucking-as-a-service, public charging) and composition
- ii. Create appropriate role for hydrogen vehicles and fueling
- iii. Appropriately locate infrastructure to provide adequate opportunity and minimize disruption to drayage patterns
- iv. Site infrastructure in ways appropriate to the sector and community
- v. **Ensure adequate funding/financing for infrastructure costs**
- vi. Ensure high level of infrastructure reliability
- vii. **Ensure adequate power supply and infrastructure from utilities**

Development of Draft Recommendations



Small Group Session on Funding and Infrastructure: Monday, February 5, 3:00-4:30 PM

Meeting Agenda



- | | |
|---------------------|---|
| 9:00 – 9:10 AM | Welcome and Meeting Overview |
| 9:10 – 9:25 AM | Quick Funding and Policy Updates |
| 9:25 – 9:45 AM | Draft Recommendation Review from Previous Meeting:
Secondary Markets and ZEV Business Models |
| 9:45 – 11:15 AM | ZEV Drayage Transition Cost and Recommendations for
Near-Term Funding |
| 11:15 – 11:30 AM | <i>Break</i> |
| 11:30 AM – 12:45 PM | Utility Infrastructure Investments and Planning for HDV
Charging for Drayage: Panel |
| 12:45 – 12:55 PM | Public Comment |
| 12:55 – 1:00 PM | Wrap up and Adjourn |

Participating Effectively via Zoom

- Collaborative members please show your video
- If you're using your telephone for audio, remember to enter your participant ID
- If needed, update your name and affiliation
- To reduce background noise, please mute yourself when you are not speaking
- During discussions, please let us know you'd like to jump in by "raising your hand"



Public Participation

- Those observing the meeting will be muted, off video, and off chat until the public comment time
- There will be an opportunity for 2-minute public comments at the end of the meeting. At that time, members of the public who would like to comment should raise their hands if they would like time to speak

Project Website

URL:

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

PUGET SOUND

Zero-Emission Truck Collaborative

Meeting Schedule & Materials

About the Collaborative

The transition to zero-emission drayage vehicles serving ports in the Pacific Northwest is a key step to meet zero emission trucking targets adopted in the Northwest Ports Clean Air Strategy while also contributing to city and state decarbonization goals. The multi-stakeholder Puget Sound Zero-Emission Truck Collaborative to develop a roadmap for transitioning to zero-emission drayage services at the Puget Sound region marine cargo terminals no later than 2050. The Collaborative will meet approximately every other month for half-day meetings between June 2023 and December 2024. Most of these meetings will be virtual but some may be in-person meetings that will include site visits and/or listening sessions. This website will be updated with relevant materials for each of these meetings.

Meeting Schedule and Materials

Meeting 1: June 30, 2023

The purpose of this first meeting is to introduce members of the Collaborative and create a shared understanding of project context, background, and objectives and proposed process for the Collaborative. Members will discuss and affirm Roadmap principles and Collaborative purpose, as well as the Collaborative charter and operating guidelines.

[Meeting Agenda](#) [Draft Charter](#) [Collaborative Members](#) [Collaborative and Roadmap Scoping Document](#)

Meeting dates and materials will be posted for future meetings as available.

Engagement Updates



North and South Harbor communities:

- Invitations sent to 7 Tacoma-area CBOs.
- Invitations will be sent to North Harbor community groups in the next few weeks.

Driver group listening sessions:

- South Harbor session – Sat., Feb. 3, 10-12p – Fabulich Center, Port of Tacoma
 - RSVP count: 10
- North Harbor session – Mon., Feb. 12, 5:30-7:30p – Terminal 46, Port of Seattle
 - RSVP count: 2
- Registration link is in the chat! Please also see your email and share the opportunity.

Next update:

- Share engagement summary in March

Quick Funding and Policy Updates



Review of Draft Recommendations: Secondary Markets for Used Zero-Emission Trucks Emerging Business Models



Secondary Markets: Draft Recommendations for Roadmap



- Encourage the development of a secondary market for used vehicles for drayage in the Puget Sound region through:
 - Puget Sound region **demonstration project(s)** between fleets purchasing new vehicles and drayage purchasers of used vehicles
 - Design of state, local, and federal **stackable financial incentives** for 1) primary purchasers that commit to vehicle resale (in a predictable timeframe and for vehicles that meet certain specifications) and/or 2) used vehicle purchases for drayage market
 - Encourage US EPA to allow for used vehicle incentives in its funding programs
 - Organize the Puget Sound drayage market into a "**drayage pool**" or other arrangement that can guarantee purchases
 - Establish **enabling programs**, such as QA/QC for used vehicles
- Encourage development of secondary markets in California and access to used vehicles from California by drayage drivers/companies in the Puget Sound gateway
 - May require state regulatory collaboration to overcome barriers from CA grant conditions, etc.
 - Recognize that Puget Sound gateway may have requirements (e.g., for GVW) that make CA vehicles less suitable

Secondary Markets: Draft Recommendations for Roadmap, continued



- Keep incentive programs and market transactions as simple as possible
 - Minimize need for granting agency involvement in transactions
 - For example, don't complicate with “triangular trade” or 3-way scrappage arrangements
 - Simply having a funding program that will provide incentives for used zero emission trucks would provide a very strong market pull for primary owners of these trucks to send them to the PS market for sale to a secondary buyer
- Accelerate the availability and use of renewable diesel in diesel vehicles as the transition to ZEVs occurs
 - Recognize that the Puget Sound gateway drayage fleets will soon be mostly “clean diesel” vehicles newer than 2007—encouraged by replacement/scrappage programs—but that there are few incentives to use renewable diesel in these newer vehicles and that renewable diesel has GHG and air quality benefits.

Emerging Business Models: Draft Recommendations for Roadmap

- Encourage deployment of a variety of business models (TAAS, leasing, sponsorship) that make ZEV trucks available in the Puget Sound through:
 - Puget Sound region **demonstration projects** of trucking-as-a-service, leasing, and/or sponsorship
 - State, local, and federal **stackable financial incentives** for companies providing these services, for example:
 - CFS capacity credits for private depot charging
 - Adoption of CA's "fast charger pathway" to guarantee against downside risk of HDV charging investments
 - **Planning resources**, such as:
 - Utility power capacity mapping to identify charging sites
 - City/county/port analysis of their properties suitable for charging (and/or private property in their jurisdictions)
- Encourage shippers with operations in the Puget Sound region to sponsor alternative business models that make ZEV trucks available to drivers or otherwise provide financial incentives for drivers/companies that use ZEV trucks for drayage
 - Explore opportunities for pre-competitive business collaboration committing to ZEV drayage, drawing on models like Cargo Owners for Zero Emission Vessels (COZEV) and the Zero Emission Maritime Buyers Alliance (ZEMBA)
- Explore other models that involve driver ownership (e.g., co-op model)

ZEV Drayage Transition Cost and Recommendations for Near-Term Funding





Driving a More Sustainable Future

Estimating Total Costs of Transition to ZE Drayage

January 30, 2024

Question: What are the likely magnitudes of costs of a transition to zero-emission drayage in the PNW gateway?

Considerations:

- Estimate costs for a ~4,500 truck fleet
- Look for data specific to drayage and, ideally, the PNW
- Consider where these costs/benefits might be borne

Total Cost of Ownership

TCO Cost Element	Diesel	EV
Purchase Price	Lower	Higher
Residual Value	Understood	Uncertain
Infrastructure Cost	Low	High
Infrastructure Monitoring	Low	Higher
Fuel Cost	Higher	Lower to Higher
Maintenance	Higher	Lower
Insurance	Lower	Higher
Purchase Incentives	None	Often Significant
Carbon Credits	None	Significant
Operational Impacts	Baseline	Few to Significant

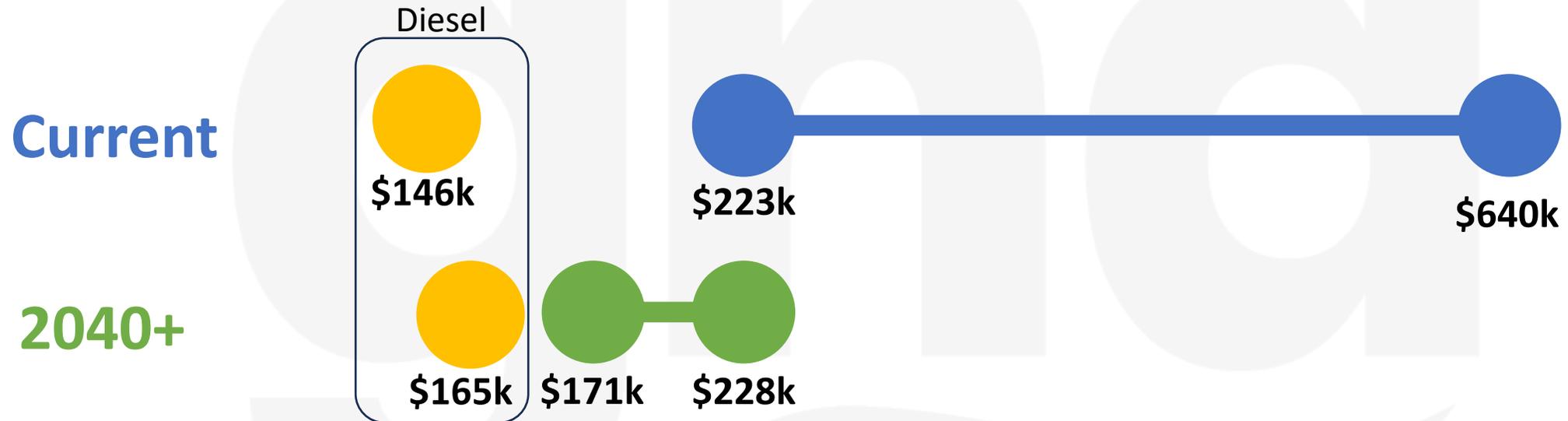
Research

- **“Meta study” of published studies**

- Washington Transportation Electrification Strategy (Commerce)
- California Transportation Commission Report for AB671
- NREL - Spatial and Temporal Analysis of the Total Cost of Ownership for Class 8 Tractors and Class 4 Parcel Delivery Trucks
- NREL – Port of New York and New Jersey Drayage Electrification Analysis
- San Pedro Bay Ports – 2021 Feasibility Assessment for Drayage Trucks
- California Energy Commission – EV Charging Infrastructure Assessment for AB2127
- Truck and Engine Manufacturers Association - Feasibility study of EPA NPRM Phase 3 GHG standards for Medium Heavy-Duty Vehicles
- UC Davis - Spatial Scenarios for Market Penetration of Plug-In Battery Electric Trucks in the U.S.



EV Purchase Cost



- Wide range of forecasts
- Long term expectation that cost will decline relative to range/performance

Infrastructure Need

Three approaches:

- **Simplified average power** 180 kW, 4.4 trucks/charger (TPC)
 - **Mixed Low + High Power** 50 kW, 1.3 TPC + 350 kW, 11.2 TPC
 - **High Power** 350 kW, 6.7 TPC
- Detailed modeling of drayage needs is generally not available (NW Gateway or otherwise).
 - Recognition that EVSE technology will evolve.

Infrastructure Costs

Charger Class	DC50	DC150	DC350	MCS
Equipment (\$/kW)	\$586	\$623	\$416	\$602
Installation (\$/kW)	\$972	\$387	\$278	\$219
Subtotal (\$/kW)	\$1,558	\$1,010	\$694	\$820
Grid (\$/kW)	\$606 - \$2,121			
Total (\$/kW)	\$2,164 to \$3,679	\$1,616 to \$3,131	\$1,300 to \$2,815	\$1,426 to \$2,941

- Grid-side costs are very difficult to estimate and often not included in TCO analyses.
- But grid-side costs are significant and not always covered by customer credit toward construction.

Other Costs

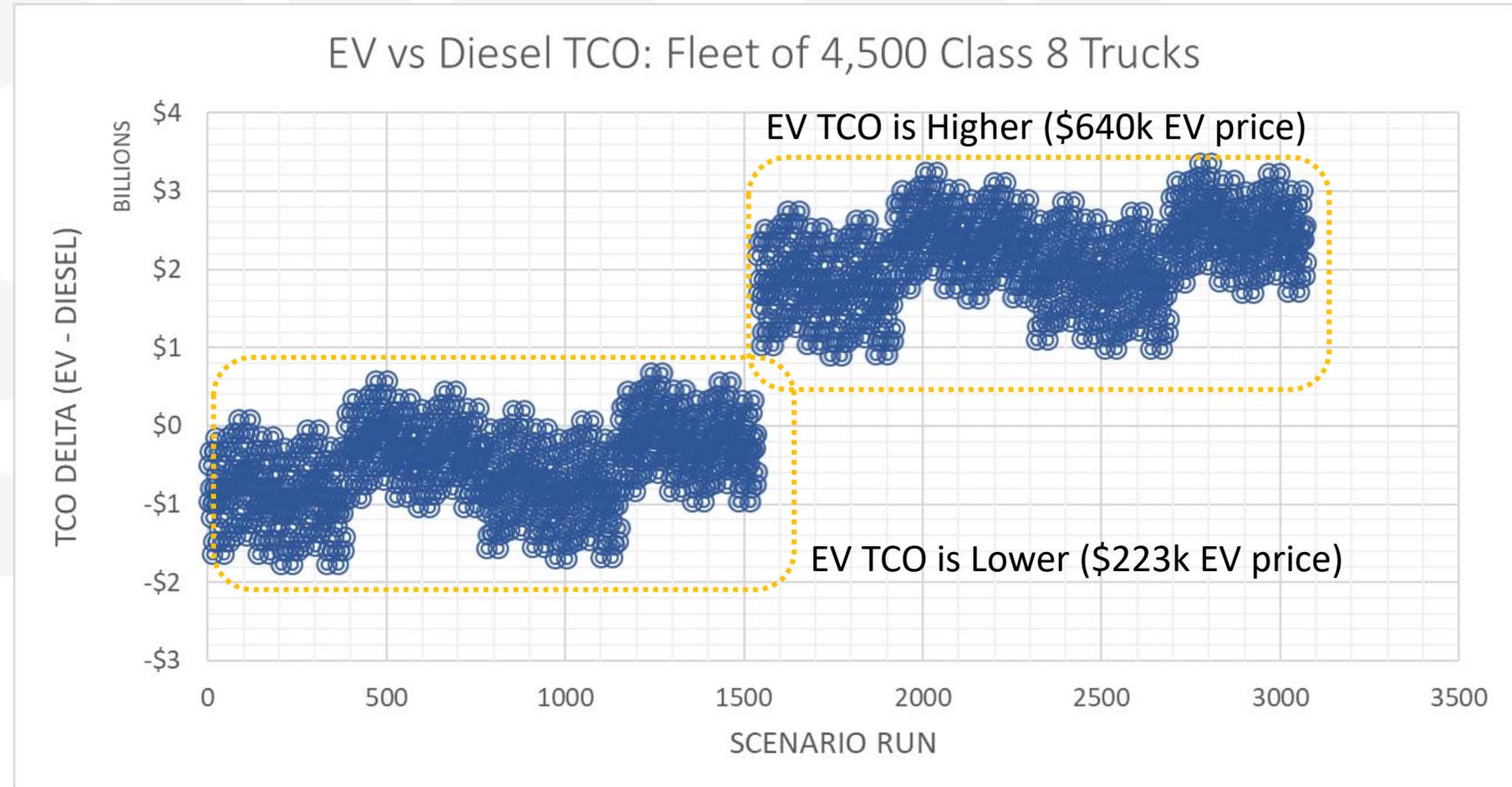
Cost	Units	Low	High	Source
Electricity Cost	\$/kWh	\$0.09	\$0.13	EIA Retail for WA and SCL with 20% EVSE utilization
Diesel Cost	\$/gal	\$3.50	\$5.20	EIA – 3 year range
EV Maintenance	\$/mi	\$0.06	\$0.14	NREL
Diesel Maintenance	\$/mi	\$0.08	\$0.30	NREL
CFS Revenues	\$/kWh	\$0.09	\$0.10	Program data

Analysis does not consider:

- battery replacements
- extended operating life of Evs
- driver/technician training costs
- land acquisition costs
- public charging fees/profits
- weight/operational impacts
- replacement ratios > 1:1

Results

- Wide range of results: EV TCO is - \$1.8B to +\$3.4B vs diesel.
- Difference is dominated by assumed EV purchase price.
- Grid-side costs are an additional \$90-\$550M



Where might costs be borne?

- TCO reflects costs to truck operators
- Absent incentives, costs to fleets could range from \$1.8B less than diesel to \$3.4B more than diesel over the first replacement of the fleet.
- Most costs would eventually be passed through to consumers in the form of higher shipping costs.
- Grid costs of \$90-\$550M would be borne by rate payers (possibly partially rate-based)
- Sales tax revenues would increase (\$20-\$190M)
- Federal tax payments would increase (\$30-\$260M)
- Federal tax credits could return \$180M (\$40k per truck via IRA)
- Clean Fuel Standard credits could return \$425M to operators, funded by fossil fuel producers/importers

Questions & Discussion





Let's work together to **drive a more sustainable future.**

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WA State Infrastructure & Incentive Program Design for MHD ZEVs

Presentation to Puget Sound ZE Truck Collaborative

January 30, 2024

Report Structure

I. Introduction

Research & Stakeholder Engagement

II. Understanding the MHDV Landscape

III. Review of Existing Zero-Emission MHDV Incentive Programs

VI. Review of Existing Zero-Emission MHDV Programs in WA

V. Stakeholder and Industry Engagement

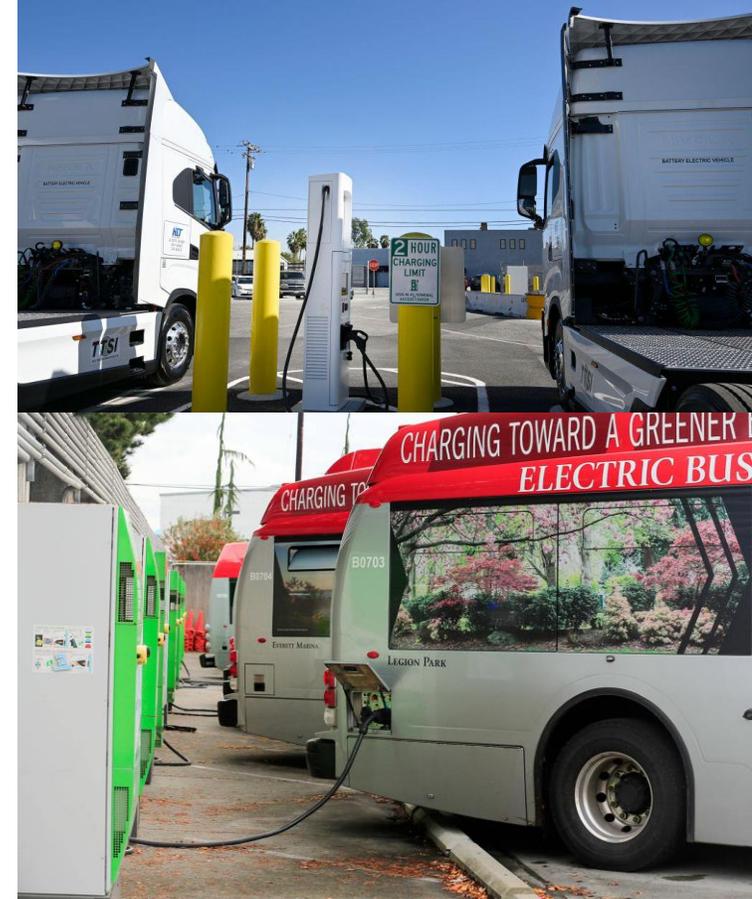
User Guide for Implementing Agency

VI. Key Attributes of an Incentive Program for Washington State

VII. Implementation Plan

Policy Recommendations

VIII. Policy Gaps, Recommendations, and Future Considerations



I. Introduction

- Purpose of Study
- **2023 – 2025 Fiscal Biennium, Climate Commitment Act Funding**
 - \$120,000,000 of the carbon emissions reduction account—state appropriation is provided solely for implementation of **zero-emission commercial vehicle infrastructure and incentive programs** and for the replacement of school buses powered by fossil fuels with zero-emission school buses, including the purchase and installation of zero-emission school bus refueling infrastructure.
 - (a) Of this amount, \$20,000,000 is for the department to administer an early action grant program to provide expedited funding to zero-emission commercial vehicle infrastructure demonstration projects. The department must contract with a third-party administrator to implement the early action grant program.
 - (b) The office of financial management shall place the remaining **\$100,000,000 in unallotted status until the joint transportation committee completes the medium and heavy-duty vehicle infrastructure and incentive strategy** required under section 204 of this act. The director of the office of financial management or the director's designee shall consult with the chairs and ranking members of the transportation committees of the legislature prior to making a decision to allot these funds.

II. Understanding the MHDV Landscape

- Background
- Purpose of Study
- Medium- and Heavy-Duty Vehicles
- State of MHD ZEV Technology in 2023
 - Battery Electric and Hydrogen Fuel Cell Technology
 - Infrastructure Needs
- Market Overview of MHDVs in Washington State
 - Impact of MHDVs on Emissions in Washington State
- Role of Incentive Program
- Goals of Study

III. Review of Existing MHD ZEV Incentives

- Tools to Incentivize ZEV Adoption
 - Grants
 - Point of Sale Voucher
 - Tax Credits
 - Third Party Financing
- Policies and Regulations
 - Federal
 - California (ACT & ACF)
- Incentives & Grants
 - California; Colorado; Hawaii; Massachusetts; New Jersey; New York, New York City; Quebec; British Columbia; Canadian Federal
- Key Takeaways from Evaluating Existing Programs

IV. Review of Existing ZEV Programs in Washington State

- State-Level Policies and Initiatives
- State Grant Programs & Incentives
- Evaluation of Clean Fuel Passenger Vehicle Tax Exemption
- Local Programs & Incentives
- Key Takeaways from Evaluating WA Programs

V. Stakeholder & Industry Engagement

Consultation with Legislators
Coordination with Staff Work Group
Industry Engagement & Outreach
Case Studies

Key Takeaways from Stakeholder Engagement

Stakeholder Engagement

22 Focus Groups

- 10/17: School buses
- 10/23: Off-road equipment - ports/airports
- 10/30: Utilities - Puget Sound Energy
- 11/03: Utilities - Public Utility Districts
- 11/07: Long-Haul Trucking
- 11/08: City of Seattle Drayage Driver Advisory Council
- 11/09: Public Agency
- 11/09: Staff work group
- 11/13: Dealership and finance meeting 2
- 11/15: Transit - buses
- 11/15: Small/mid-sized business operating MHD vehicles
- 11/17: Agriculture and farming equipment
- 11/27: Minority owned businesses operating MHD vehicles
- 11/30: Zero-emission refueling
- 12/07: Off road equipment - railroad | 1 - 2:30 p.m.
- 12/13: Agriculture and farming equipment | 1 - 2:30 p.m.

18 One-on-One Industry Interviews

- 9/27: Volvo North America
- 10/6: PACCAR
- 10/12: Earth Finance
- 10/23: Daimler
- 11/10: Peninsula Trucking
- 11/10: Ryder
- 11/10: Lynden Transport
- 11/13: Mercer Logistics
- 11/13: Hogland Trucking
- 11/14: AAA Washington
- 11/14: Stryder Motorfreight
- 11/16: Rivian
- 11/20: Oak Harbor Freight
- 11/20: Fastway Freight
- 11/21: DKS Associates
- 12/14: ConMet

Plus:

- Staff Work Group meetings
- Legislator meetings
- Partnerships with regional organizations



Stakeholder Feedback

- **Barriers to Purchasing MHD ZEVs**

- Vehicle cost
- Infrastructure
- Weight of BEV technology
- Range
- Insurance
- Existing technology does not match current needs, duty cycles

- **Point-of-Sale Voucher Programs (Voucher Incentive Program (VIP)) Work**

- Proven, effective tool for getting more MHD ZEVs on the road
- Existing VIP programs put too much financial risk on vendors, makes vendors responsible for implementing state-level policies
- Third Party Administrator is best option for implementation
- “Plus Ups” on base voucher amount encourage equity in program outcomes

- **Program should be easy to use**

- Future users want centralized place to get information, apply to program
- Users want stackability between state, local, and federal programs
- OEMs and vendors want coordination between WA and CA programs (ex. vehicle eligibility)

Stakeholder Feedback Continued

- **General lack of information or understanding about what this transition will look like**
 - Legislators want a roadmap to ZE technology adoption
 - Fleet advisory programs are key to helping all fleets transition
 - Targeted, sector-based outreach leveraging trusted, established partners is needed to share information
 - Future users want place to send, review, and process data related to MHD ZEV deployment
- **Equity should be centered in transition**
 - Ensuring benefits of emissions reductions benefit most burdened communities
 - Enable both small and large fleets to access incentives and make the transition
- **Secondary Market Incentives for ZEVs are needed**



VI. Key Attributes of an Incentive Program

Key Elements of Incentive Program



- Third-party administered point-of-sale voucher program for zero-emission MHDV fleets and the infrastructure to support their operation
 - An analysis of voucher programs across U.S. demonstrates as best practice
- Voucher amount plus-ups, or modifiers, for select fleet types, vehicles, or environmental impacts, such as:
- Vehicles domiciled in disadvantaged communities; small, minority-owned businesses and fleets
 - A reduced incentive for secondary market vehicles
- Allow for vouchers to be stackable with other federal, state, or local incentives

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

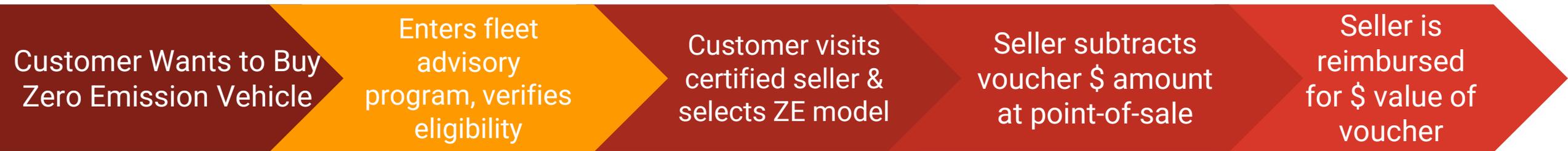
- Develop integrated technical assistance for fleets
- Streamline proactive coordination with utilities
- Develop a single program online portal for fleet applicants that includes on-road and non-road
- Develop a front-end pre-approval process and paperwork verification
- Create an education and outreach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

Point of Sale Voucher



Point of Sale Voucher - Advisory Track

- Fleets seeking technical assistance will complete checklist to prepare for decarbonization
- Process mitigates risk of a fleet being unprepared to transition to zero-emission technology



Fleet Consultation

- Use-case fit
- Financing & leasing options
- Total cost of ownership
- Insurance options

Eligibility, Verification & Compliance

- DOT verification
- WSDOT verification
- Motor carrier permit
- Program eligibility (plus-ups/modifiers)

Utility Considerations

- Site assessment
- Preliminary site plans
- Confirmation of request for service



VII. Implementation Plan to Establish a MHD ZEV Incentive Program

Vehicle Voucher Amounts

Vehicle voucher amounts consistent with HVIP funding levels

GVWR (lbs.)	Vehicle Class	Incentive Amount	Modifier Type	Amount Above Base
8,501-10,000	Class 2b	\$7,500		
10,001-14,000	Class 3	\$45,000	Class 8 Drayage	+ 25%
14,001-16,000	Class 4	\$60,000	More Impacted Environmental Risk	+ 15%
16,001-19,500	Class 5	\$60,000	Small or minority-owned fleet	+ 25%
19,501-26,000	Class 6	\$85,000	In-Use Converted/Remanufactured	- 50%
26,001-33,000	Class 7	\$85,000	Used Vehicle	- 50%
33,001+	Class 8	\$120,000	EV Charging and Infrastructure	+ 50%

Implementing a MHD ZEV Incentive Program

Goal: Grow MHD ZEV market in Washington State

Objective:

- Spend incentive money before end of biennium
- Demonstrate value of incentive program to accelerating MHD ZEV deployment

Phase 1 - Establish Incentive Program to Kick Start MHD ZEV Market in WA

Year 1: move quickly → launch with success

Year 2-3: refine program, add additional elements

Phase 2 - Explore Novel Market Acceleration Tactics

Phase 3 - Evaluate, Assess, Revise

VIII. Policy Gaps & Future Considerations

- MHD ZEV Insurance
- Supply Chain Issues
- Secondary Market Development
- Incentive Funding as Local Match
- Stackable Scrappage Incentives
- Additional Recommendations on School & Transit Fleets
- Infrastructure Considerations
- Next Steps



Next Steps

And Major Takeaways for the Collaborative

Next Steps

- ✓ **Formal Report Submitted:** Final text version of report submitted to OFM
- ❑ **Continued Coordination with WSDOT:** Finalizing pieces of implementation plan for quick deployment of program
 - ❑ WSDOT will be looking to hire approx. 2 FTE to help manage this program
- ❑ **Budget Proviso:** Rep. Fey is putting together a budget proviso to release the incentive program funding from OFM
- ❑ **Report Publicly Released:** Graphics finalized and all content formatted for publication in early February 2024
- ❑ **End of JTC Contract:** JTC contract with CALSTART and PNWER will conclude spring 2024
- ❑ **WSDOT RFP Drafted & Released**
- ❑ **WSDOT Internal Rulemaking on Program Guidelines**

Impact to Puget Sound ZE Truck Collaborative

- Once the program is available, drayage drivers should be able to layer the state incentive program with local programs, including the NWSA pilot projects.
- Report can be a resource and reference for the 2050 ZE Roadmap.
- Legislators highly invested in drayage elements of this study.
- Final report will include a drayage engagement and outreach plan that can help inform future efforts for the state and NWSA programs.
- Our recommendation to the JTC and WSDOT is to work closely with established partners (like NWSA and other members of the Collaborative), who will be powerful partners in sharing information and providing feedback about what is and isn't working about the program.

Key Takeaways from Drayage Outreach, Engagement, & Assistance Strategy

- Drayage drivers will need targeted outreach and hands-on assistance to help make this transition to ZE technology successfully. This may include:
 - Creation of culturally sensitive and tailored outreach material in a variety of languages.
 - Adequate resources for one-on-one assistance in several languages.
 - Distribution of information through trusted sources, including CBOs with established relationships within the community.
 - Providing information, education, and training to CBO staff to ensure they can effectively answer questions about these complex technologies.
- Provide a mix of online and in-person workshops, training, and informational sessions
- Regular updates through newsletters to keep drivers up-to-date.
- Establish a clear feedback mechanism for drivers
- Incentivize participation in informational sessions, workshops, and sustainability initiatives through recognition, awards, financial support, etc.



Thank you!

Please send feedback & further comments to betz.mayer@pnwer.org!

Discussion

- What will it take to unlock private and public investment at the scale needed for the transition to ZEV drayage?



Break [return at 11:35]



Utility Infrastructure Investments and Planning for HDV Charging for Drayage



Moderated Panel

- Moderator: Dennis McLerran
- Panelists:
 - Aaron August, Puget Sound Energy
 - David Logsdon, Seattle City Light
 - Jeremy Stewart, Tacoma Public Utilities

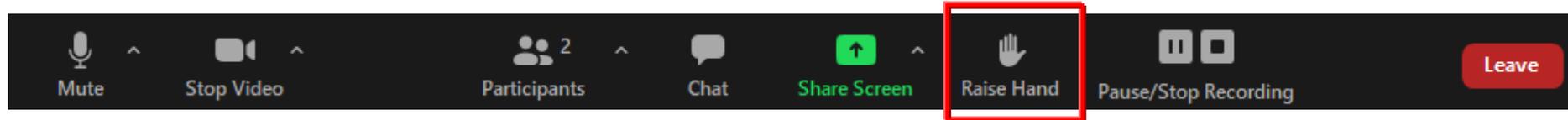


Public Comment



Instructions for Public Comment

- Members of the public that are interested in making 2-minute statements are invited to do so
- Please introduce yourself
- To the extent possible, please frame remarks as comments rather than questions
- For virtual participants, please use Zoom to raise your hand if you would like to make a statement, and you will be unmuted



Next Steps

- Meeting summary, slides and materials on website
- Issue team discussion of draft recommendations: February 5, 3:30-5:00 PM
- Next full Collaborative meeting: March 27, 1:00 – 5:00 PM
 - Drayage characterization study
 - Insights from driver and community outreach sessions

Additional Slides



Secondary Markets: Key Points



- Without a secondary market for used trucks, the residual value is effectively \$0; a secondary market could reduce the total cost of ownership of new vehicles and provide used vehicles on the market at approximately 30% of their new truck price (~\$160k)
- Appropriately structured financial incentives could spur a secondary market by 1) reducing costs to new purchasers who guarantee resale to the drayage market and 2) reducing costs for drayage drivers to purchase these used vehicles
 - Drayage operators will have greater access to ZEVs at a lower cost, and ongoing costs for things like insurance will also be lower
 - With a secondary market, smaller purchase incentives are required, reducing the overall price tag of incentives
 - The amount of incentives for used vehicles will be important to create uptake; the used vehicle incentive should be scaled to the current cost of new trucks (\$450-\$500,000) and estimated cost of used trucks (~\$160k); used vehicle incentives may initially be as high as \$100,000 to create parity with the cost of used diesel vehicles; incentive amounts should be re-evaluated over time as pricing changes.
- Other factors that will spur a secondary market include: QA/QC of used vehicle quality, a guaranteed pool of drayage purchasers, available infrastructure
- Lower-priced used ZEVs are likely attractive to independent owner-operators with less access to capital
- For TAAS companies, purchasing and providing used vehicles at lower cost is an attractive option, helping guarantee a secondary market
- Used vehicles are likely to come available 3-5 years after purchase of new vehicles
- Used vehicle value is highest for vehicles that meet certain specifications (e.g., color, wheelbase, etc.)

Secondary Markets: Potential Concerns and Unintended Consequences

- Without adequate policy/program design, used vehicles may not end up in the drayage sector
- Used vehicles may not become available for 3-5 years, and the timing may be longer because it is uncertain how long original purchasers would keep the vehicles
 - Existing ZE trucks in the California market, and elsewhere, should also be considered for the secondary use in the NWSA drayage sector as these vehicles will be more immediately available in the next 1-3 years
- Without adequate incentive program design, used vehicles may not end up with independent owner-operators with limited access to capital
 - Alternatively, if most used vehicles end up with IOO's they bear the risks of new technologies/markets
- Long-term maintenance and repair costs are uncertain (may increase or diminish value of used vehicles)
- Rapid technology innovation could accelerate the obsolescence and diminish value of used ZEV trucks
- Uncertain interactions between secondary markets and other models (e.g., driver co-ops)

Business Models: Key Points



- Trucking-as-a-service, leasing, and related business models may be appealing alternatives for certain segments of the drayage market
 - The sector writ large is seeing trends toward leasing, etc. as alternatives to ownership
- TAAS/leasing can be deployed rapidly, helping kick-start the market
- Incentives/policies that make markets attractive for TAAS/leasing providers are those that help advance the market generally: point of sale vouchers, make-ready infrastructure, charging station rebates, grants, regulations (e.g., ACT/ACF)
- Infrastructure requirements (charging and utility service) and challenges for trucking-as-a-service facilities are similar to those for large depot or public charging sites (e.g., real estate availability, distribution infrastructure, traffic, etc.).
 - In the near-term it may be more feasible for utilities to work with these larger facilities where utilization is more certain.

Business Models: Potential Concerns and Unintended Consequences

- Dependence of drivers/companies on one or a few trucking-as-a service companies may reduce competition, locking drivers/companies into financial arrangements
- Independent owner-operators often value vehicle ownership and may be resistant to non-ownership models; however, trucking-as-a-service can be an entry point for new drivers
- Drivers/companies with low credit may not be eligible (although TAAS/leasing/sponsorship may have underwriting flexibility to tailor for lower credit customers)
 - Business model presenters on Collaborative panel indicated they had been able to underwrite more drivers/companies interested in their services
- Licensed motor carriers (LMCs) cannot contract with TAAS companies and provide the trucks to independent owner-operators (IOOs) as this will result in the IOO being classified as an employee; IOOs must therefore contract directly with the TAAS company
- TAAS companies may choose to locate charging facilities in areas with affordable land and utility access, but that near-port communities oppose