Resource Planning Advisory Group Info Session

2027 Integrated System Plan

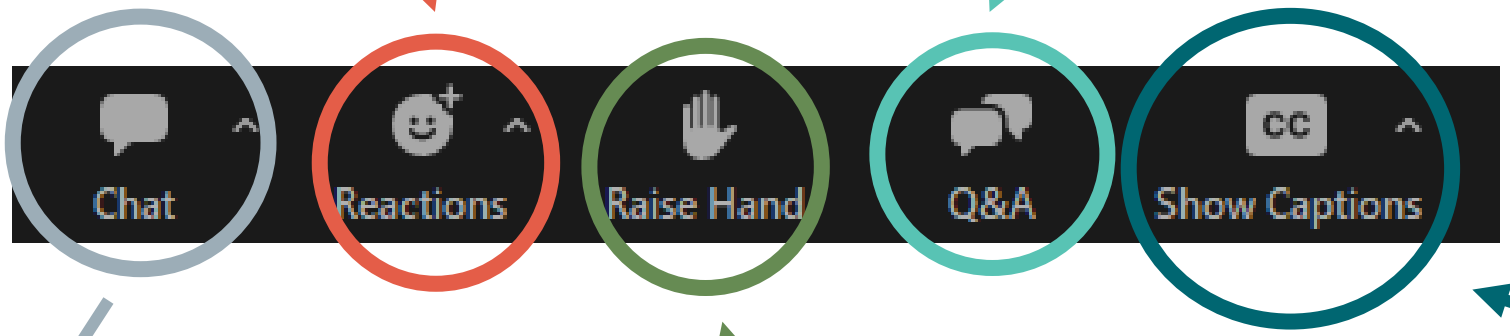
June 18, 2025

PUGET SOUND ENERGY

Welcome to the webinar!

Use the **Reactions** feature to respond to content with emojis

The **Q&A** tool will be turned off during the meeting



RPAG members and PSE staff are welcome to use the **Chat** feature

Use **Raise Hand** feature if you'd like to provide a comment or ask a question

Click **Show Captions** to see real-time closed captioning

Facilitator requests

- Engage constructively and courteously towards all participants
- Respect the role of the facilitator to guide the group process
- Avoid use of acronyms and explain technical questions
- Use the feedback form or email isp@pse.com for additional input to PSE
- Aim to focus on the webinar topic
- Public comments will occur after PSE's presentations

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Safety moment

Summer road trip safety

- **Inspect tires for wear and tear and pressure**
- **Plan your route and check traffic conditions ahead of time**
- **Allow extra time to get to your destination – account for traffic and don’t rush!**
- **Get enough rest prior to driving**
- **Keep you phone put away while driving**

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Today's speakers

Annie Kilburg Smith

Facilitator, Triangle Associates

Will Sierzchula

Guidehouse

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Agenda

Time	Agenda Item	Presenter / Facilitator
11:00 a.m. – 11:03 a.m.	Welcome and introductions	Annie Kilburg Smith, Triangle Associates
11:03 a.m. – 11:52 a.m.	PSE electric vehicle forecast	Will Sierzchula, Guidehouse
11:52 a.m. – 12:00 p.m.	Next steps and public comment opportunity	Annie Kilburg Smith, Triangle Associates
12:00 p.m.	Adjourn	All

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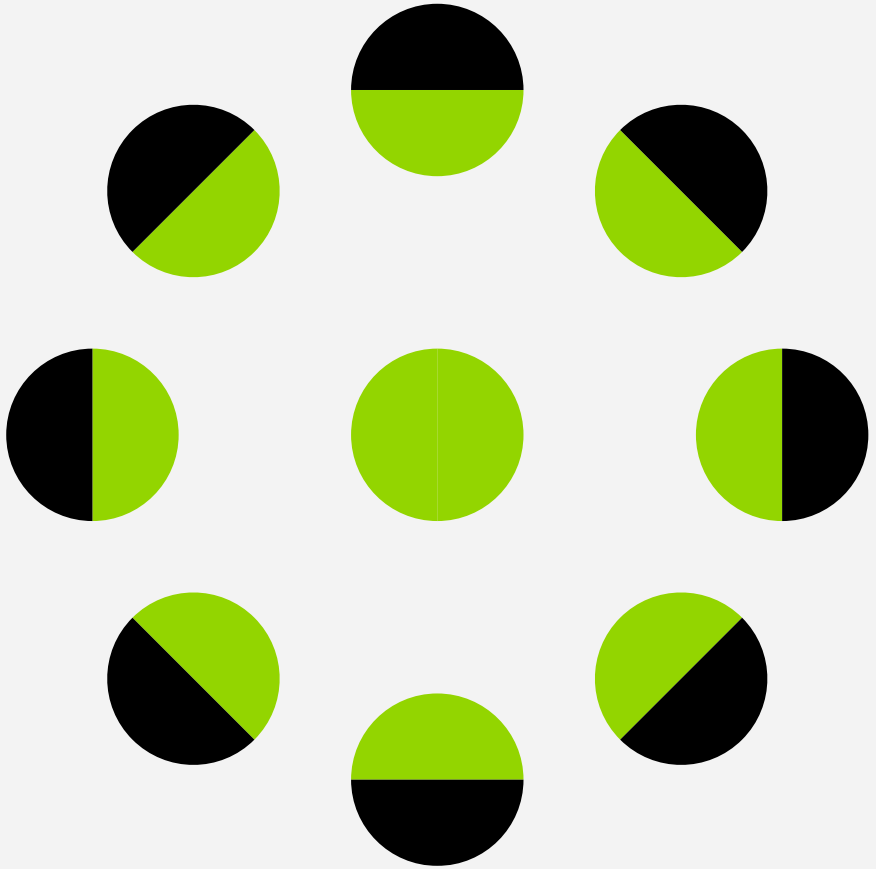
JUNE 2025

PSE FY25 EV Forecast

RPAG Presentation

outwit complexity™

Contents



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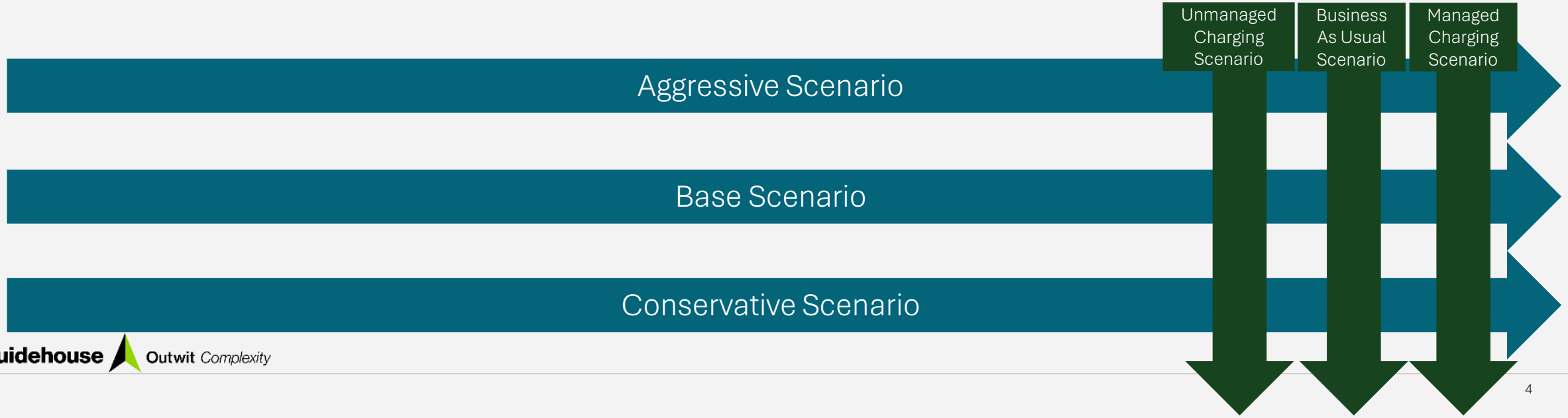
Executive Summary

PSE F25 EV Forecast Overview

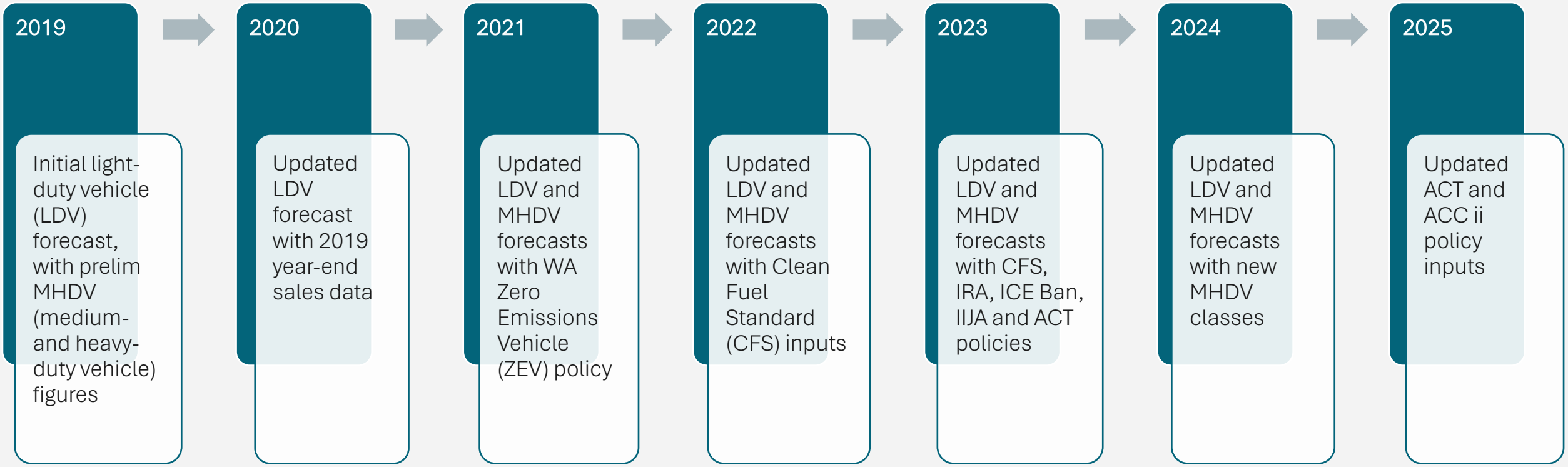
Guidehouse forecasted EV adoption, infrastructure, and load impacts within PSE's Service Area through 2050 across 3 adoption scenarios and 3 managed charging scenarios.

EV Adoption	Charging Needs	Load Impacts	Managed Charging
Forecasted battery-electric (BEV) and plug-in hybrid (PHEV) EV adoption for Light-, Medium- and Heavy-Duty Vehicles.	Forecasted charging infrastructure needs associated with EV adoption across charging use case and technology.	Forecasted monthly energy requirements to support EV adoption within PSE's service area.	Developed average daily weekday and weekend load shapes associated with different levels of managed charging uptake.



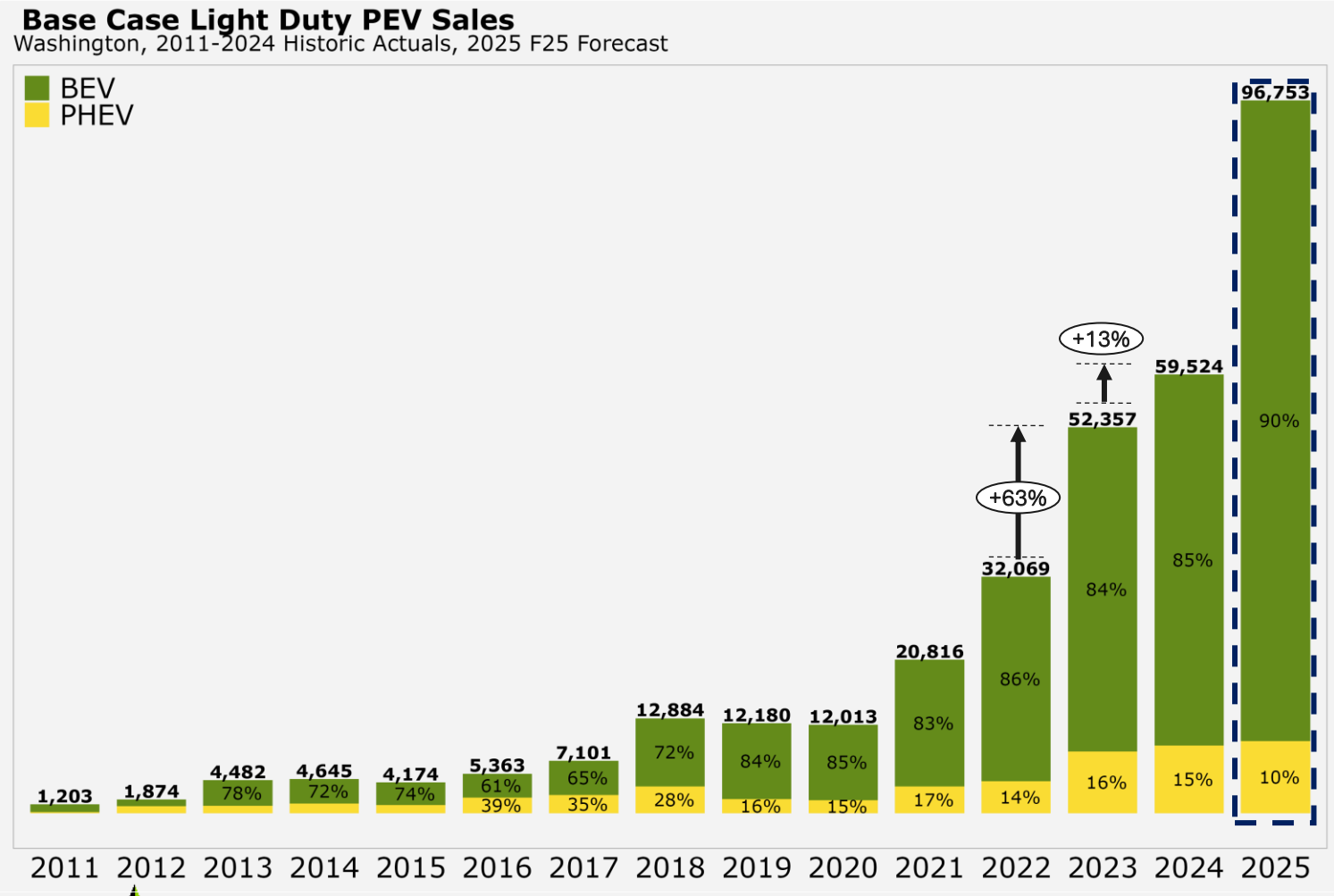
Background

Guidehouse has supported PSE in EV forecasting since 2019.



Base Case Light Duty Adoption

PSE forecast continues to assume the light duty segment will meet policy sales targets



Policy	Year	Penalty
ACC	2018-2025	$5,000
ACC II	2026-2035	$20,000

Forecast Comparison

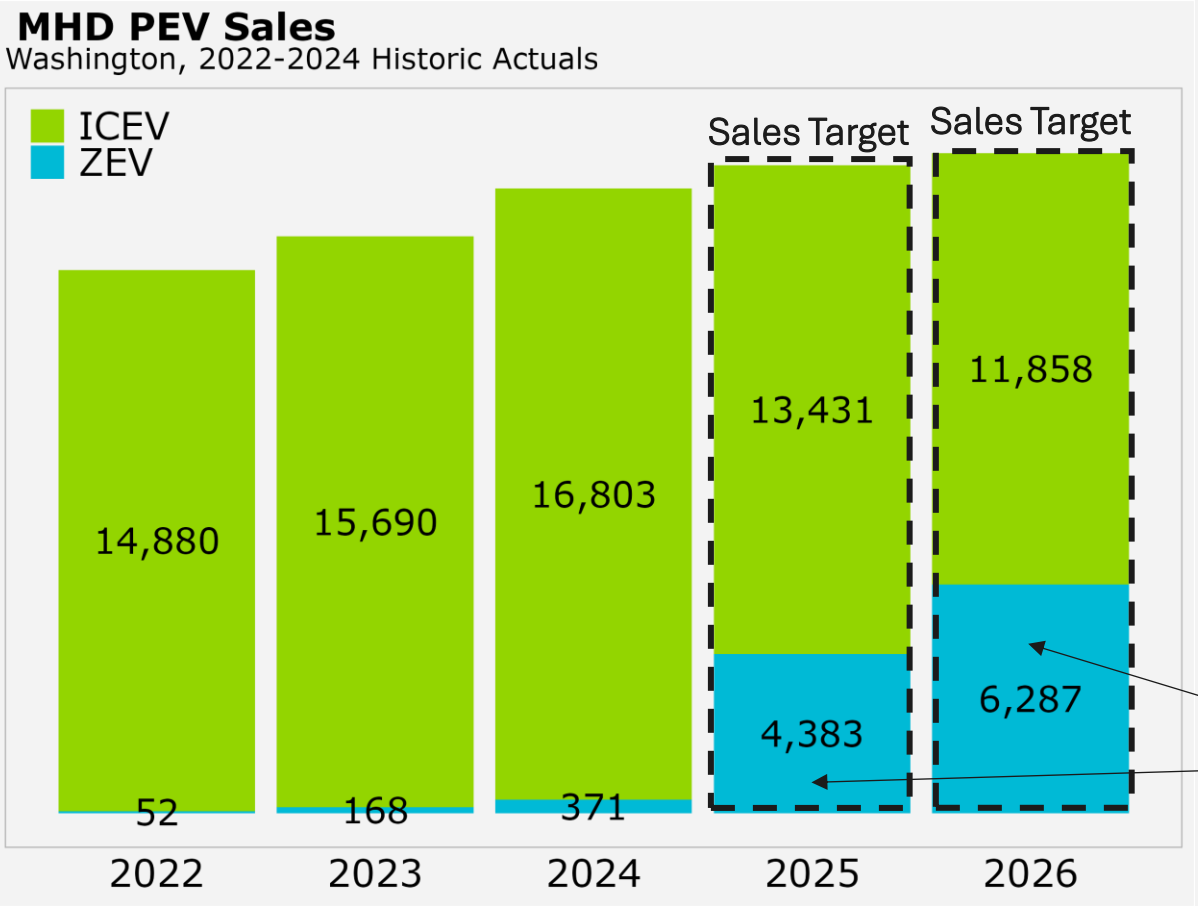
PSE F25 LD Forecast Aligns with other Projections

Forecast Source	Forecast Metric	Forecast Results	PSE F25 Forecast Results
NREL[1]	WA LD BEV + PHEV Population	352k in 2025 1,336k in 2030	332k in 2025 1,337k in 2030
WA Department of Ecology[2]	WA LD BEV + PHEV Sales under Base Scenario	69% in 2030 100% in 2035	76% in 2030 96% in 2035

[3]NREL - Data Files for "The 2030 National Charging Network: Estimating U.S. Light-Duty Demand for Electric Vehicle Charging Infrastructure" | NREL Data Catalog
[1]WA DoE - Washington Transportation Electrification Strategy | Tableau Public

Base Case Medium/Heavy Duty Adoption

PSE forecast no longer assumes that the MHD segment will meet policy sales targets



Forecast Source	Forecast Metric	Forecast Results	PSE F25 Forecast Results
WA Department of Ecology[1] - Washington	WA MHD BEV Sales under Base Scenario	**71% in 2030 89% in 2035**	**35% in 2030 41% in 2035**

[1]WA DoE - Washington Transportation Electrification Strategy | Tableau Public

Policy	Year	Penalty
ACT	2025-2035	$37,500

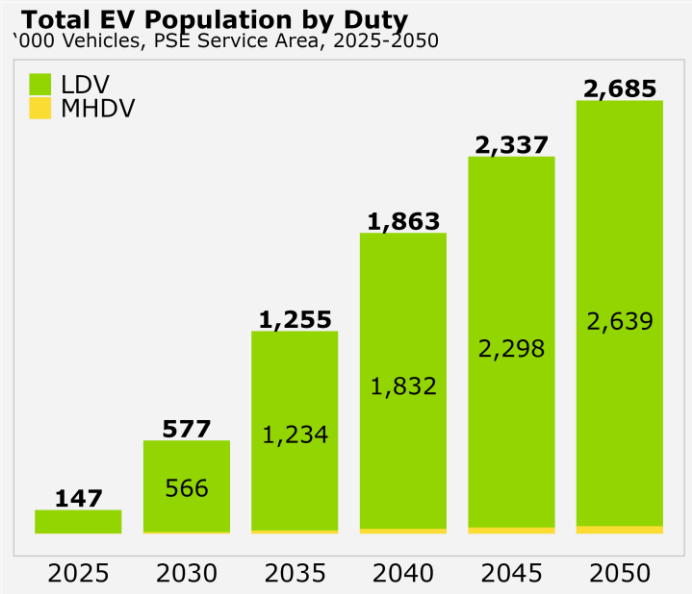
Year	F25 Forecast
2025	1,025
2026	1,555

Illustration of very aggressive sales necessary to meet MHD sales targets

Base Scenario EV Adoption & Load Impacts

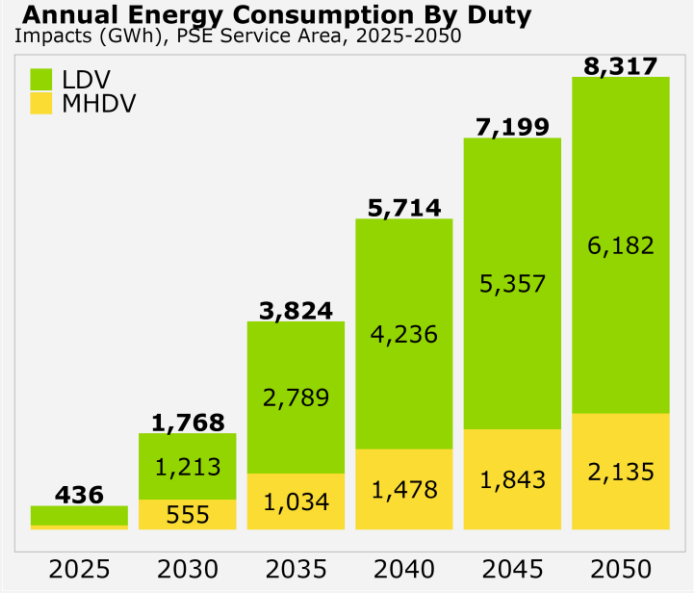
By 2050, 2.7 million EVs are forecasted in PSE's Service Area, requiring 8.3k GWh of energy with an annual EV peak before losses forecasted to hit 1,544 MWs.

EV Population



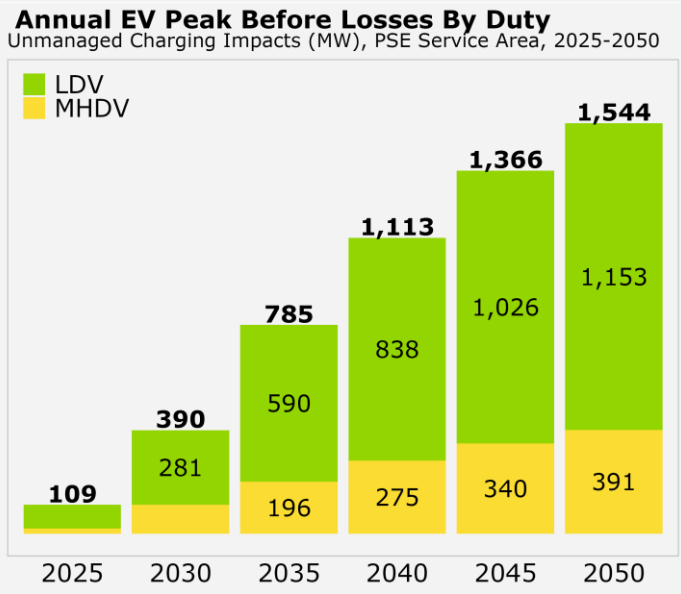
- By 2050, **Light-duty (LD) EVs represent 98%** of the total EV population
- EV forecasts are heavily affected by **Advanced Clean Cars II sales** targets

Energy Need



- MHDVs, while only **2%** of the total **EV population**, are forecasted to represent **26%** of the **required energy** due to their larger batteries, lower efficiency, and greater VMT

EV Peak Before Losses[1]

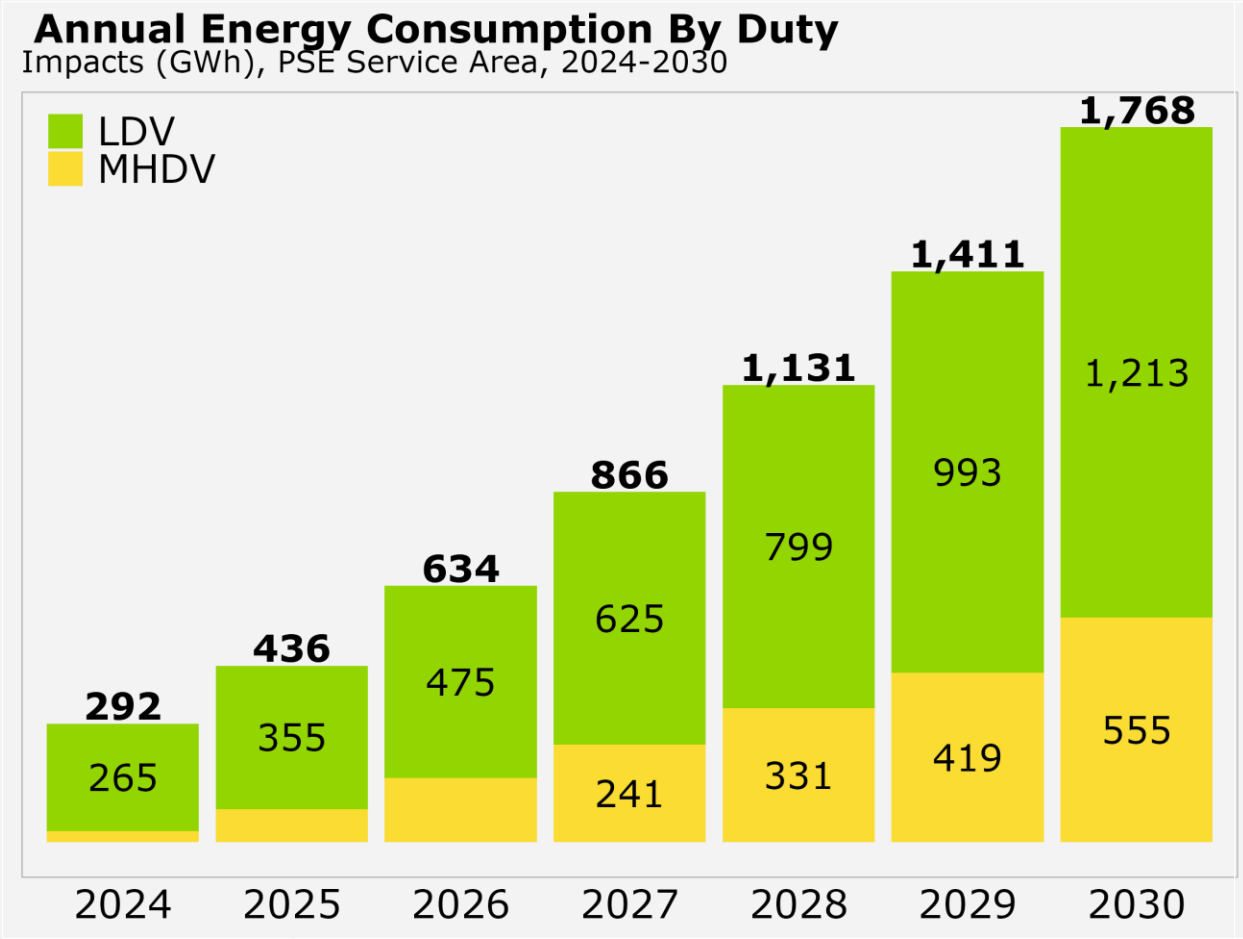


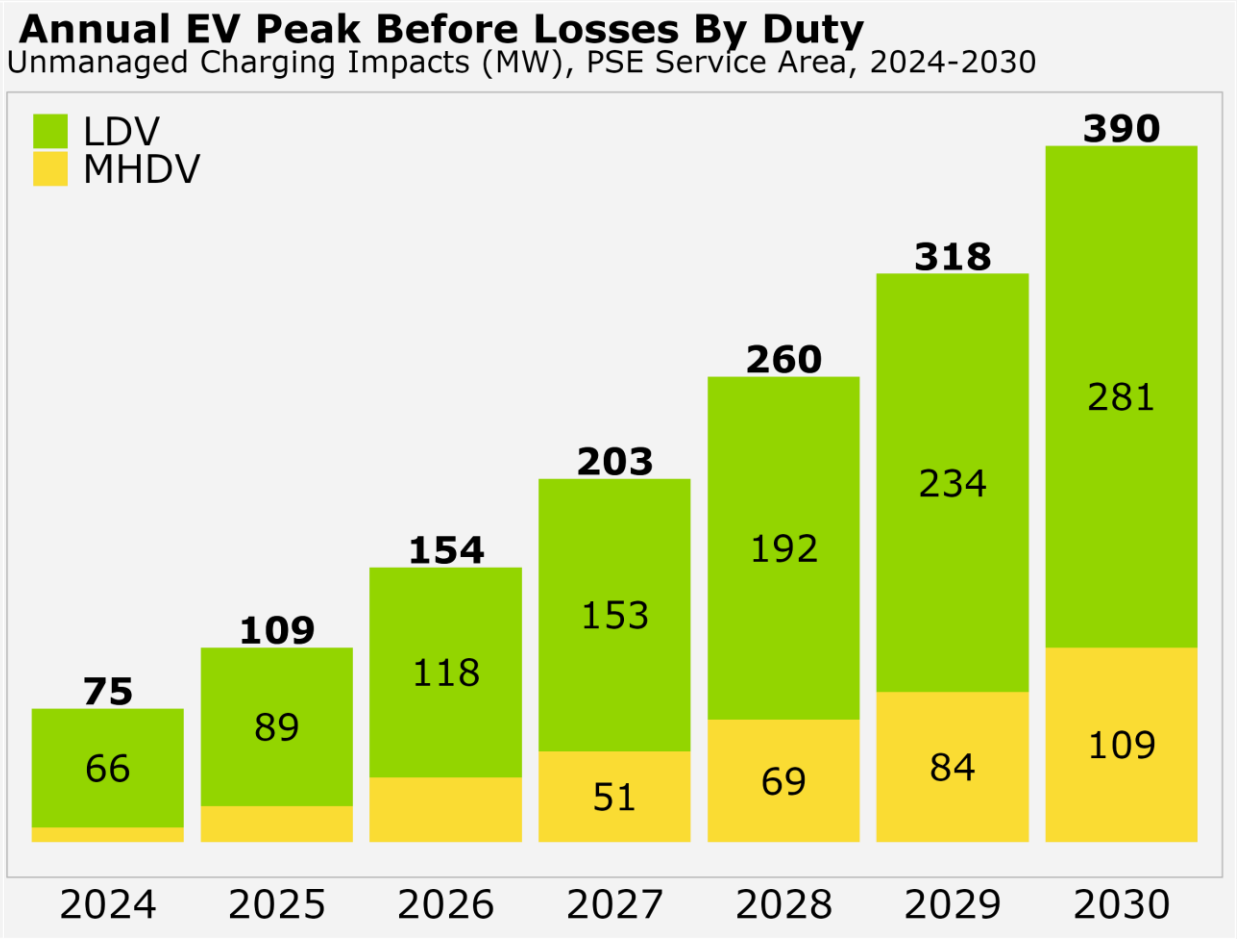
- The weekday **peak load** associated with EV charging occurs between **7:00 and 8:00 PM**
- The peak is driven by **residential charging for LDVs** and **depot charging for MHDVs**

[1]The Annual EV Peak Before Losses is not coincident with PSE's system peak and occurs at the customer's meter.

Near-Term energy impacts

PSE energy and peak demand impacts are forecasted to increase by 6x and 5x from 2024-2030





Guidehouse Outwit Complexity

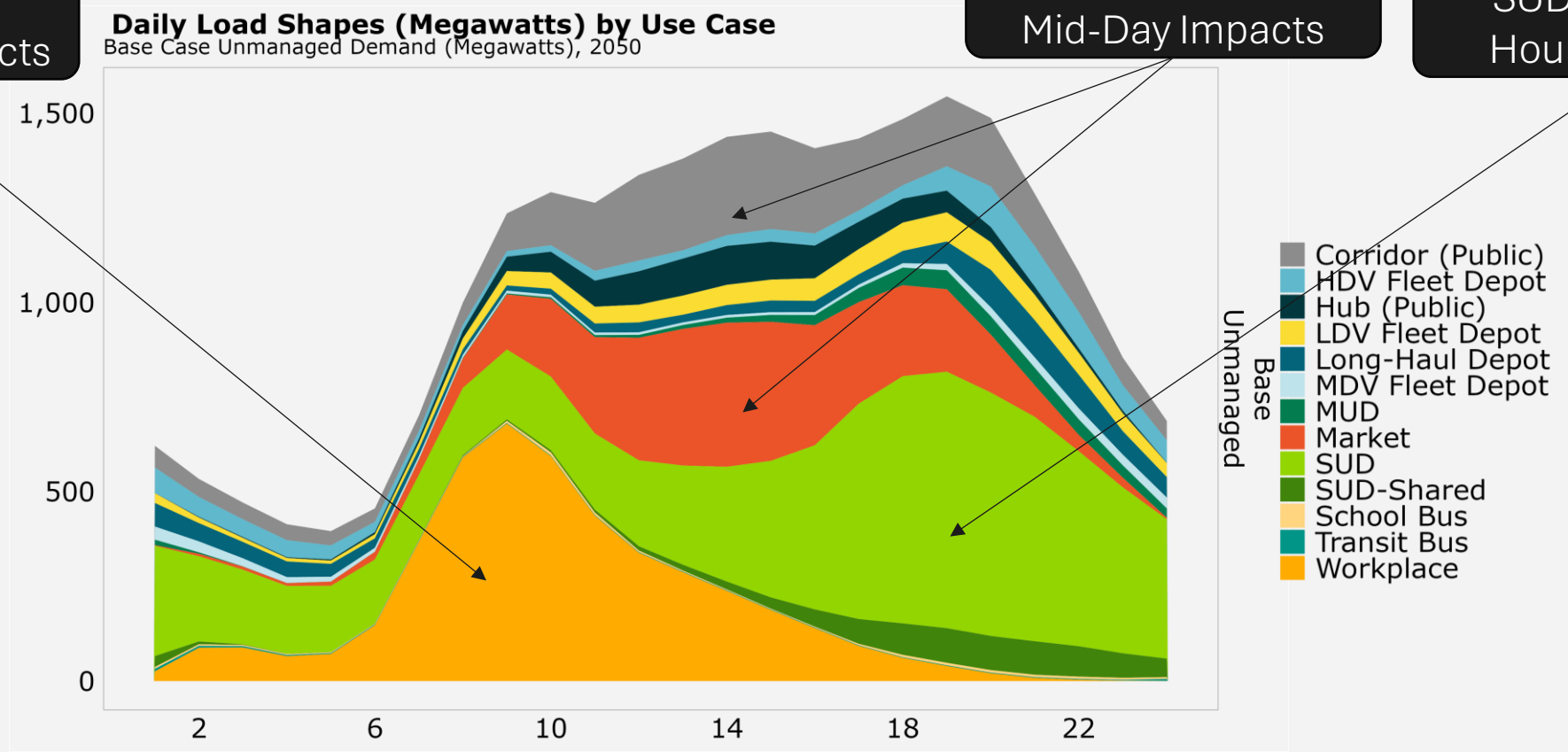
Charging Use Cases Vary by Hour of Day in 2050

Different use cases function to flatten out load by concentrating at different times of the day

Workplace – Early Hours Impacts

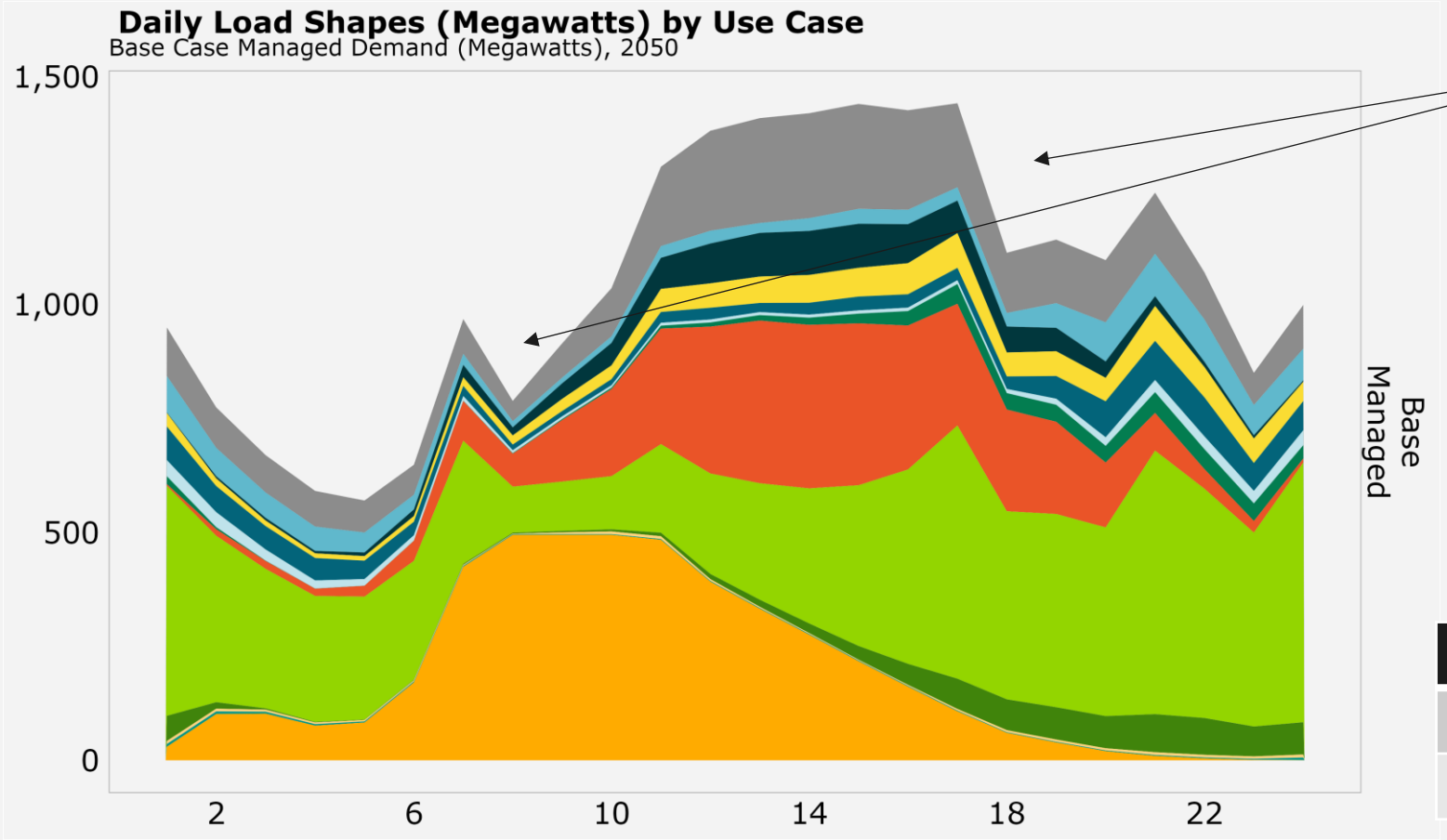
Corridor & Market – Mid-Day Impacts

SUD – Evening Hours Impacts



Impacts of Managed Charging on Load

Shifts load out of peak hours, creating spikier load shape



Winter TOU Peak	Hour Ending
Morning	8-10
Event	18-20

Market Trend: Leveling of sales in 2024 and uncertainty in 2025

Nationally, EV adoption from 2023 to 2024 was linear – not exponential like many analysts had expected. This could mean the next group of adopters will be slower to shift from ICEV to BEV.

Policy Uncertainty and Reversal

- The current political environment creates uncertainty regarding whether policies such as the IRA and CA emissions waiver will be repealed.
- Some ZEV states, such as CT, have reversed position on sales mandates.

OEM Delays in EV Transition

- Major OEMs including Toyota, Stellantis, Volkswagen, and Ford all reduced their EV production and sales targets.
- Automakers have shifted some focus from fully-electric to hybrid-electric vehicles.

A strong set of national and state policies still provides support for an expanding EV market share. OEMs have invested considerable resources and time in bringing EV models to market and driving down prices.

Favorable Federal and State Policies

- Infrastructure Investment and Jobs Act (IIJA)
- Inflation Reduction Act (IRA)
- EPA limits on tailpipe emissions
- WA Advanced Clean Cars II
- WA Advanced Clean Trucks
- WA Clean Fuel Standard

OEM EV Investment and Goals

- China is leading the world in EV adoption. S&P Global estimates EVs will make up almost 30% of market share in 2025.
- Investments in Extended-Range Electric Vehicle (EREV) by companies like Ford and Hyundai could increase future PHEV Adoption

Key Takeaways

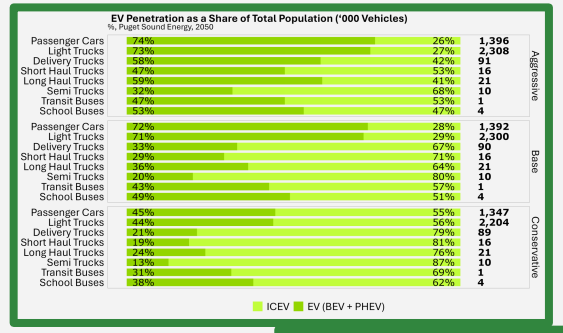
EV adoption and associated energy requirements in PSE's service area are expected to grow significantly: An average of **315 GWh per year** of load is estimated to be added to the PSE system (2025-2050) due to EV adoption.

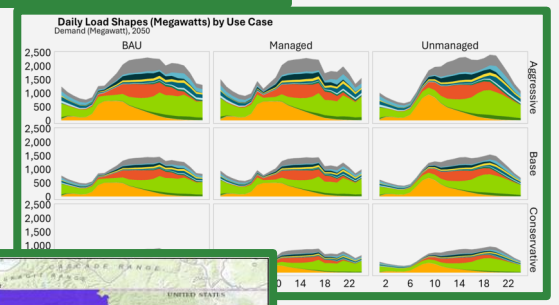
Policy-defined sales targets have greatest impact: The assumption that WA will meet sales targets established under the ACC II drives high EV adoption. However, it is not clear whether these sales targets will be met, or the policies revoked.

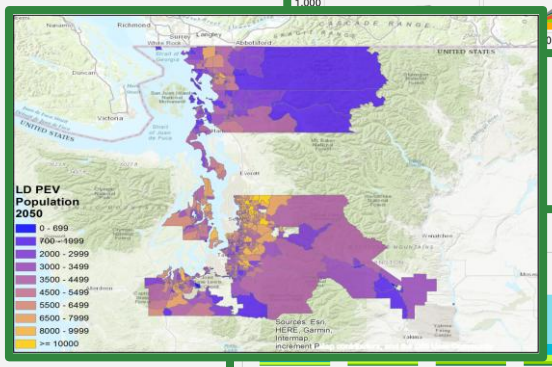
Significant down-side risks to short-term and long-term EV adoption: Market uncertainty should result in slower near-term EV sales while congress removing the CA emissions waiver or WA repealing the ACC II could lower the state's long-run EV adoption trajectory.

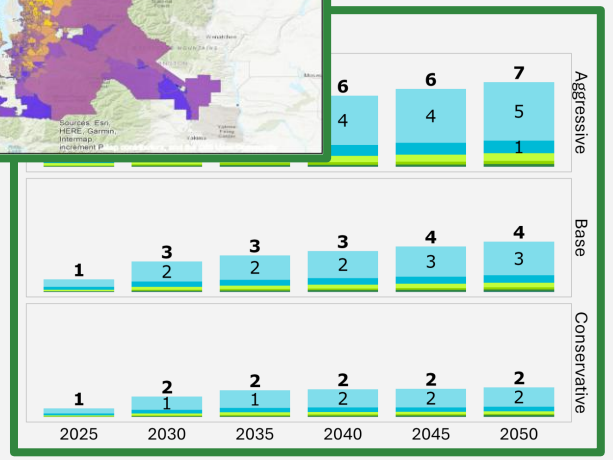
Uncertainty in LDV forecasts related to home charging: As more individuals without access to home charging adopt EVs, dependence on workplace and public market charging will likely grow, shifting load from night to evening or mid-day.

Uncertainty in MHDV forecasts related to unknown market behavior: As a nascent market, it is still unclear what the charging needs and behavior may be for large vehicles (e.g., Long-Haul trucks) as duty-cycle, battery efficiency, and use of in depot vs. in route charging are not yet well-established.









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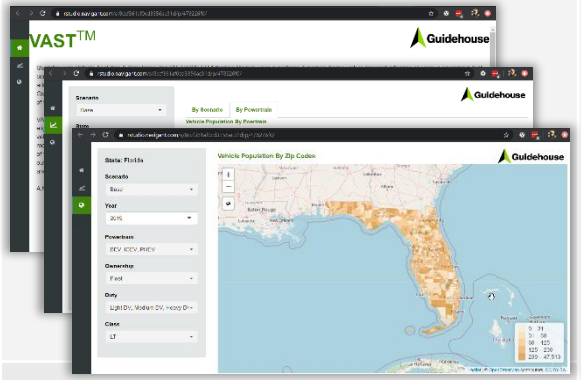
VAST Overview

VAST Suite Overview

Guidehouse's Vehicle Analytics & Simulation Tool (VAST) Suite uses in-house datasets and industry insights to provide market transparency as a single / repeatable source of truth for EV analysis needs.

EV Adoption



EV Market Assessment

How many vehicles are on the road by type and location?

EV Charging Needs

EV Charging Infrastructure Plan

What charging infrastructure is required to support these vehicles?

EV Load Impacts

EV Load Impacts

What are the energy impacts (kWh, kW) at the distribution system levels, including managed charging?

Key Business Use Cases for VAST Solution Outputs

- Clean Transportation Electrification Roadmap Development
- Integrated Resource Planning
- Distribution Planning

- Load Forecasting
- Charging Infrastructure Planning
- Infrastructure Siting Analysis
- Customer Program Design

- Benefit-Cost Analysis
- Regulatory Filing & Rate Design
- Stakeholder Engagement
- Economic Development Impacts

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Scenario Parameters

VEHICLE ELECTRIFICATION

F25 Scenario Definitions

Drivers	Description	Low Scenario	Base Scenario	High Scenario
Incentives	Dollar per EV tax incentive ($)	Any existing and planned **incentives discontinued**	**Currently existing and planned** incentive policies	**Additional "cash on the hood" incentive** per vehicle covering 50% of incremental cost of EV over ICEV[1]
Vehicle Cost	EV MSRP ($)	**Base EV MSRP** forecast - GHI	**Base EV MSRP** forecast - GHI	**15% lower EV MSRP** vs. base forecast (leading to decreased EV operating costs)
Fuel Prices	Gasoline and diesel prices ($ per gallon)	**AAA average base** assumption, adjusted for inflation	**AAA average base** assumption, adjusted for inflation	**75% higher gasoline and diesel prices** vs. base (leading to increased operating ICEV costs)
Consumer Awareness & Acceptance	Marketing & outreach impacting customer familiarity (i.e., awareness, acceptance)	**Lower consumer awareness and acceptance** vs base (leading to decreased EV adoption)	**Base assumption**, calibrated to Washington's historical consumer awareness metrics - GHI	**1/3 higher consumer awareness and acceptance** vs. base (leading to increased EV adoption)[1]
Regulations	Policies regulating ICEVs and EVs	ACT and ACC **policies overturned**	**ACT policy sales targets not met.** Financial penalty imposed on ICEVS for ZEV sales shortfall	**Adoption consistent with relevant regulatory rules**, including Advanced Clean Cars II and Advance Clean Trucks
Vehicle Miles Traveled	Annual VMT by vehicle class and powertrain	**Base assumption** from FHWA, EMFAC, EDF, and AFDC	**Base assumption** from FHWA, EMFAC, EDF, and AFDC	**30% higher VMT** vs. base (leading to increased energy requirement)

[1]Incentives and Consumer Awareness and Acceptance drivers will be adjusted to achieve regulatory targets per Regulations driver requirement.

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PSE Territory Load Impacts Forecast Results

VEHICLE ELECTRIFICATION

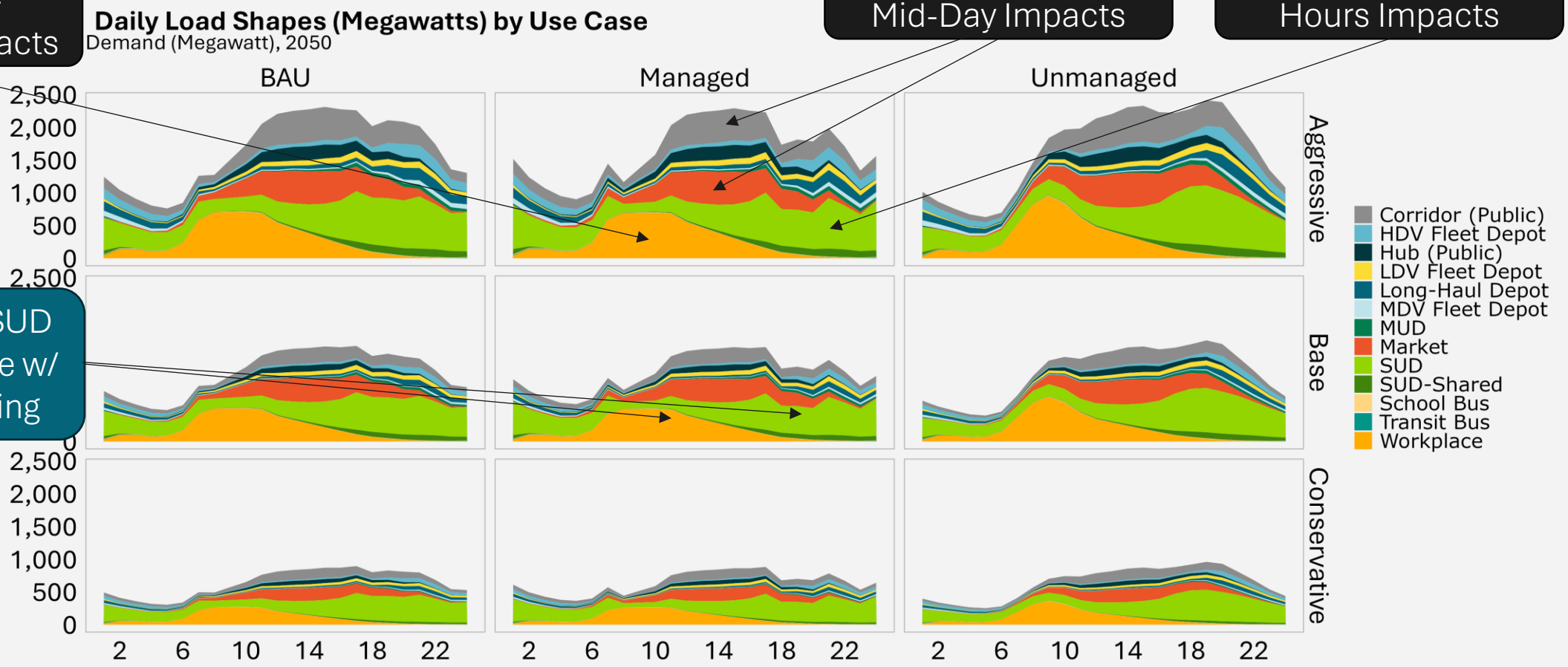
Unmanaged charging scenario has peak later in day

Workplace – Early Hours Impacts

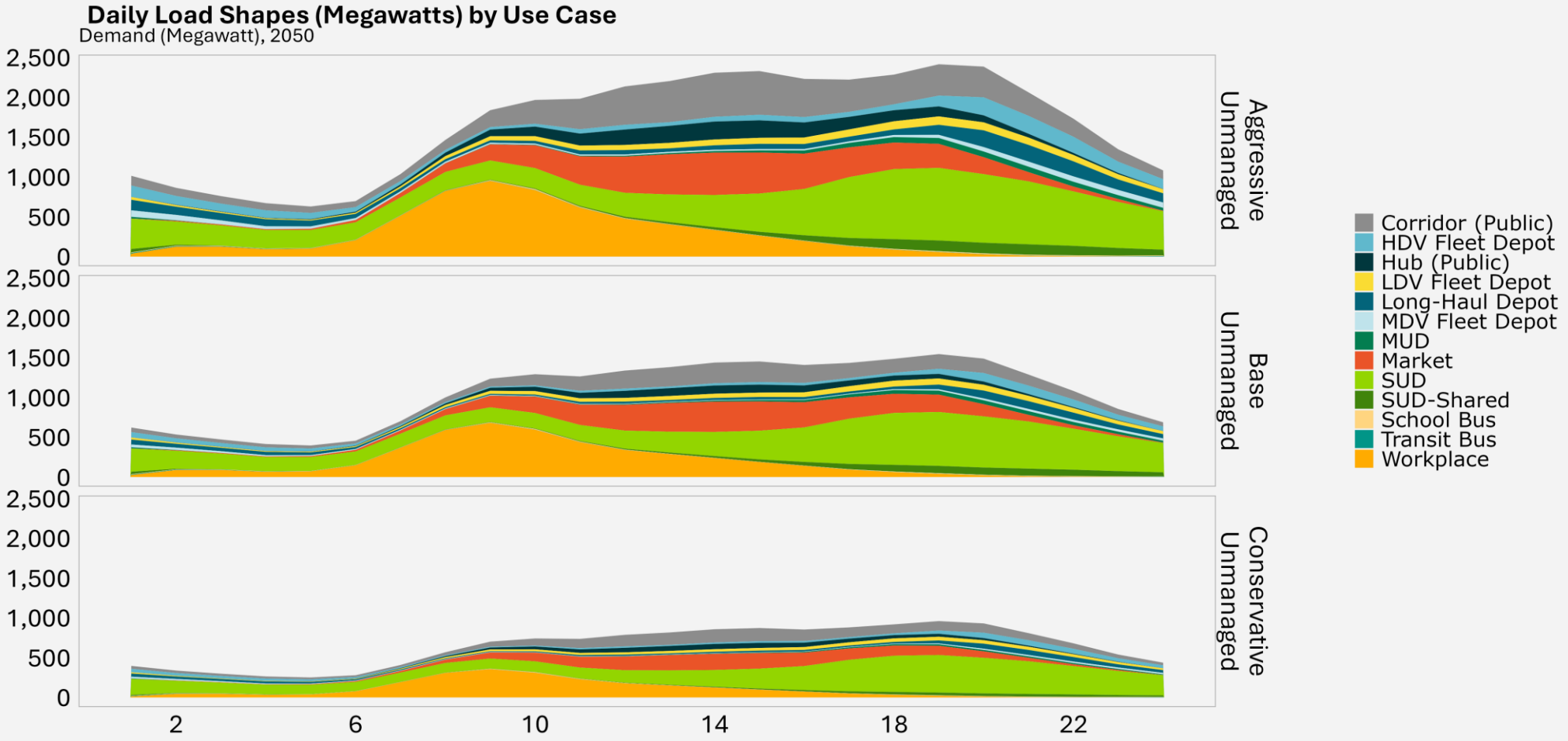
Corridor & Market – Mid-Day Impacts

SUD – Evening Hours Impacts

Workplace and SUD flatten load shape w/ managed charging

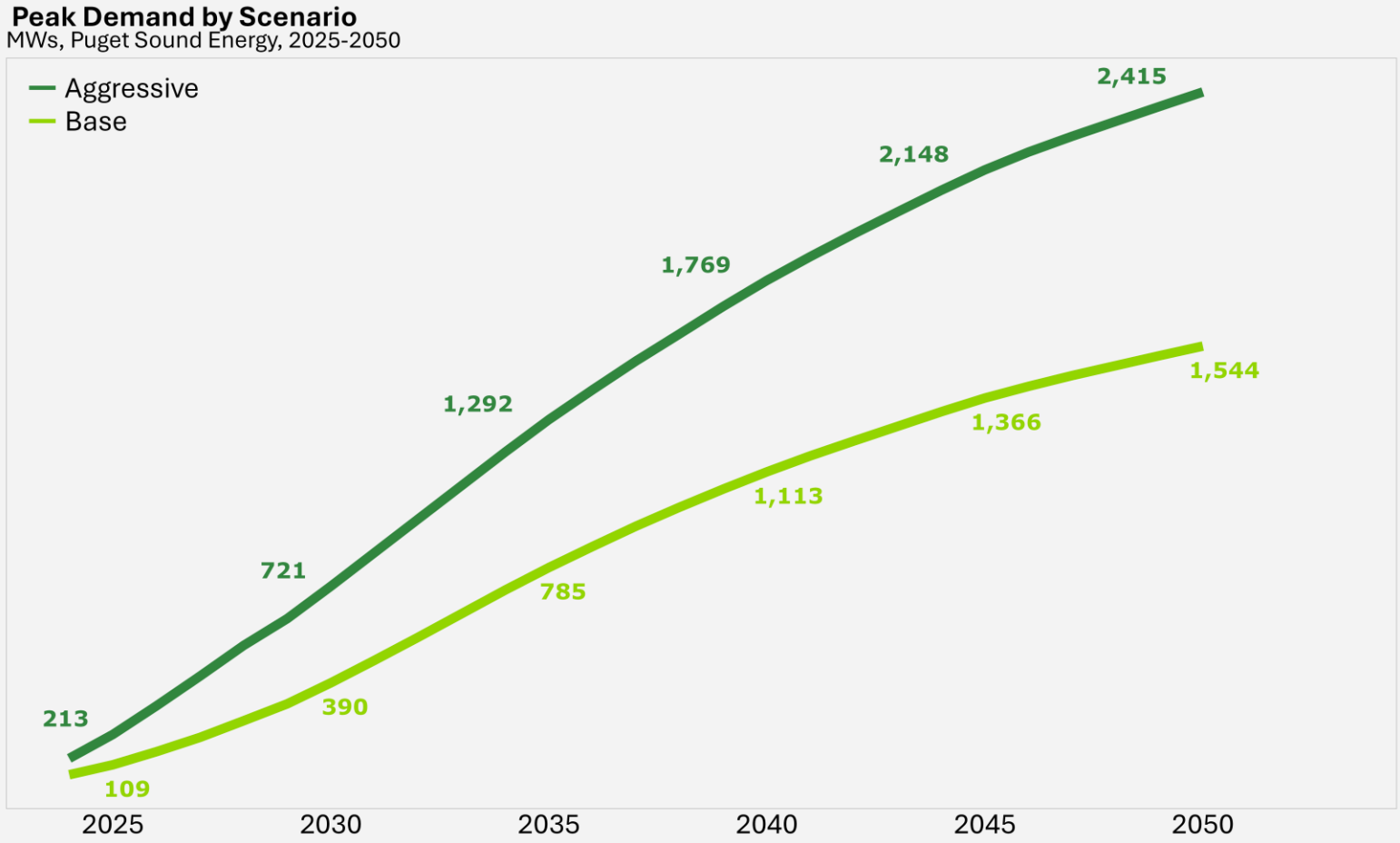


Use Cases Help to Flatten EV Load Shape

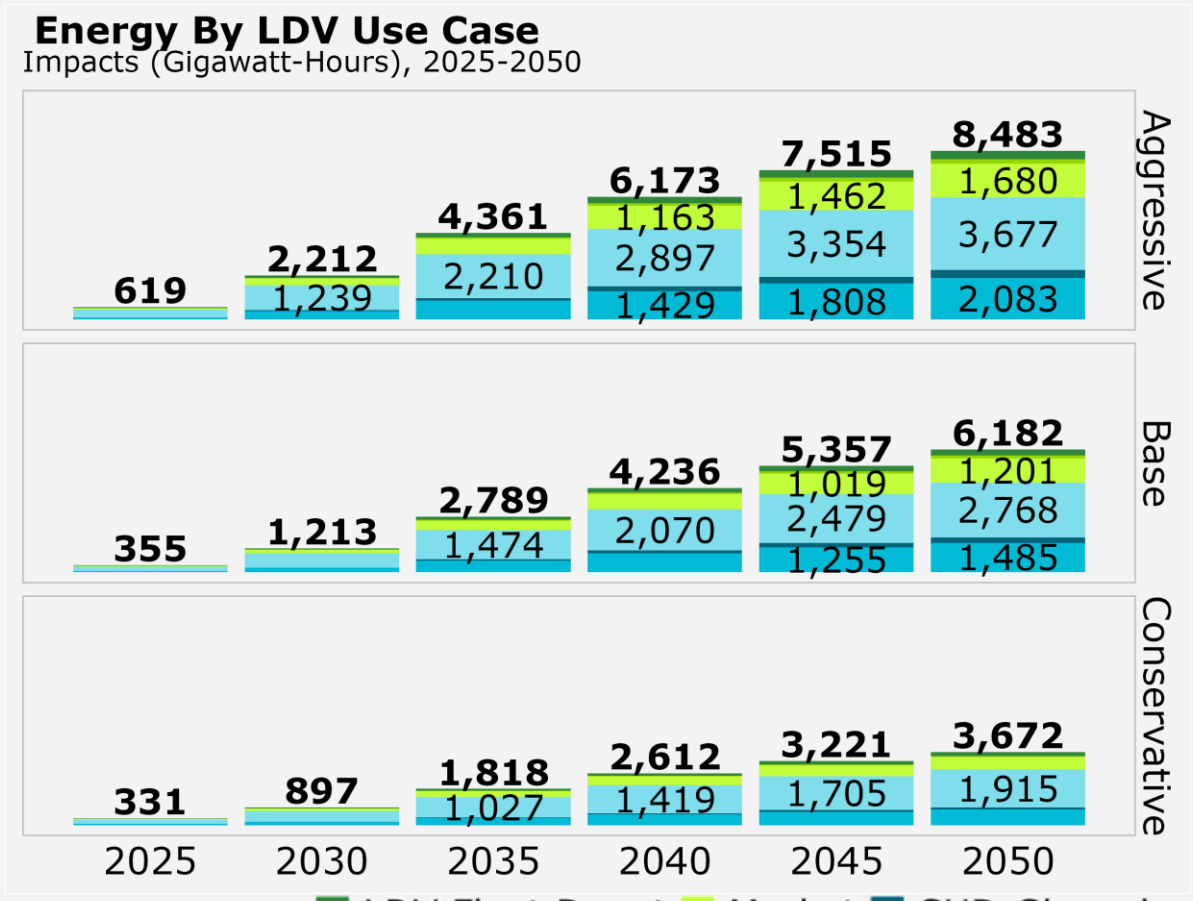


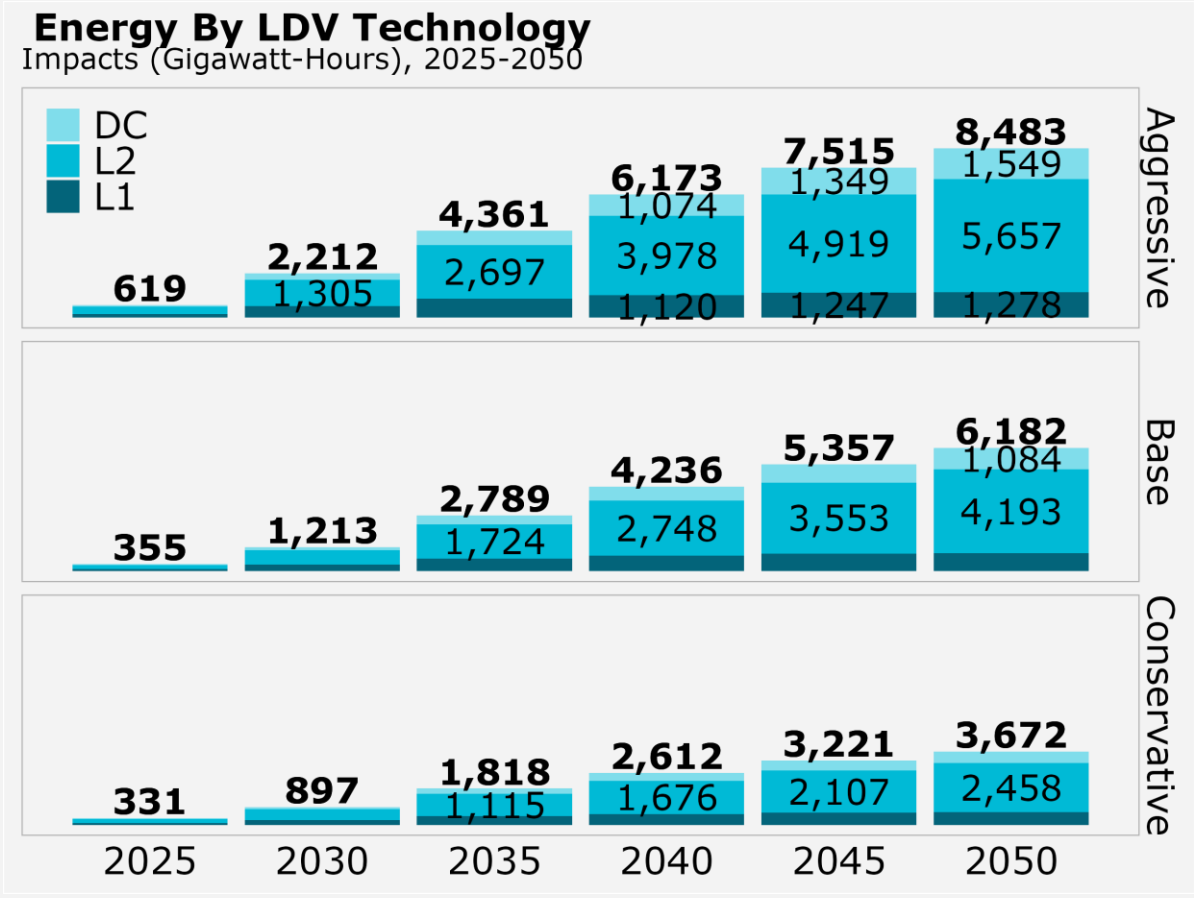
Peak Demand Comparison Between F25 Aggressive and Base Scenario

(Unmanaged Charging)



SUD, Market, & Workplace comprise Most LD impacts





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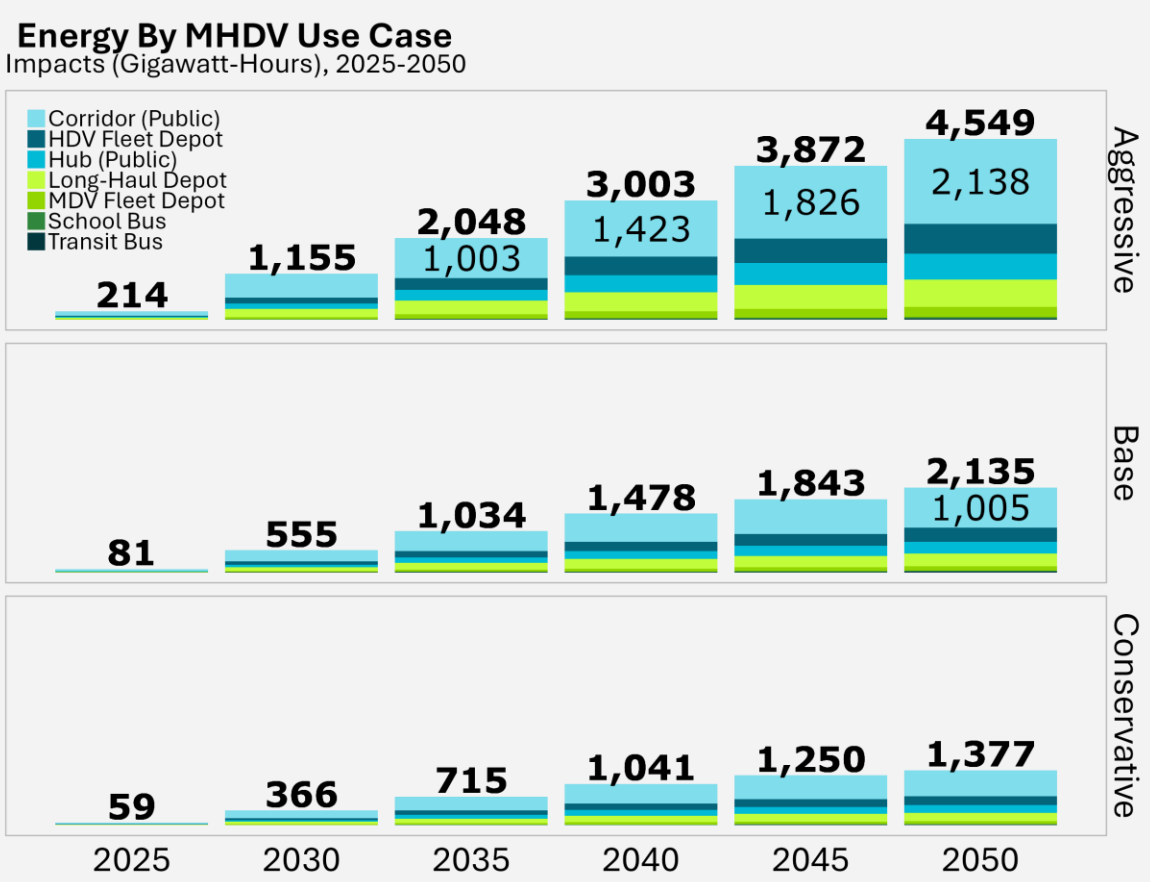
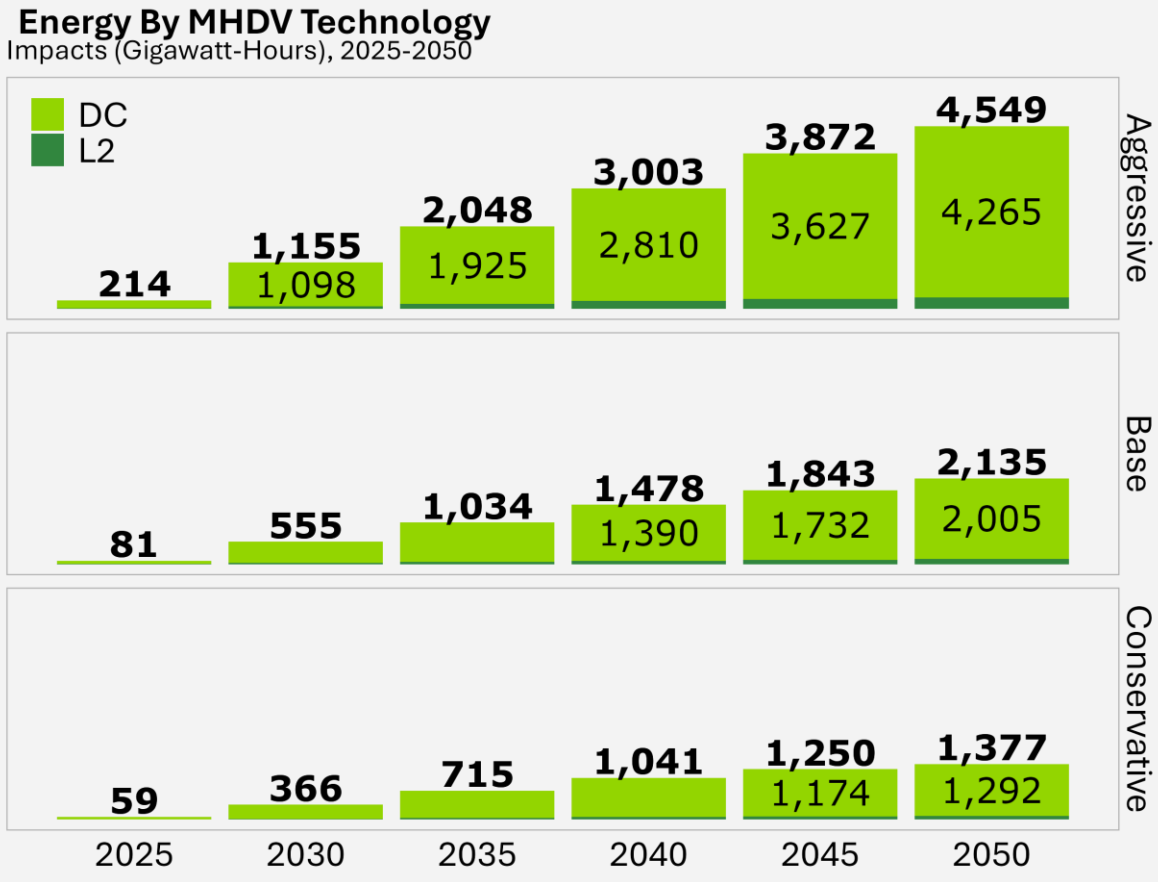
Public Charging > 50% of MHDV Impacts





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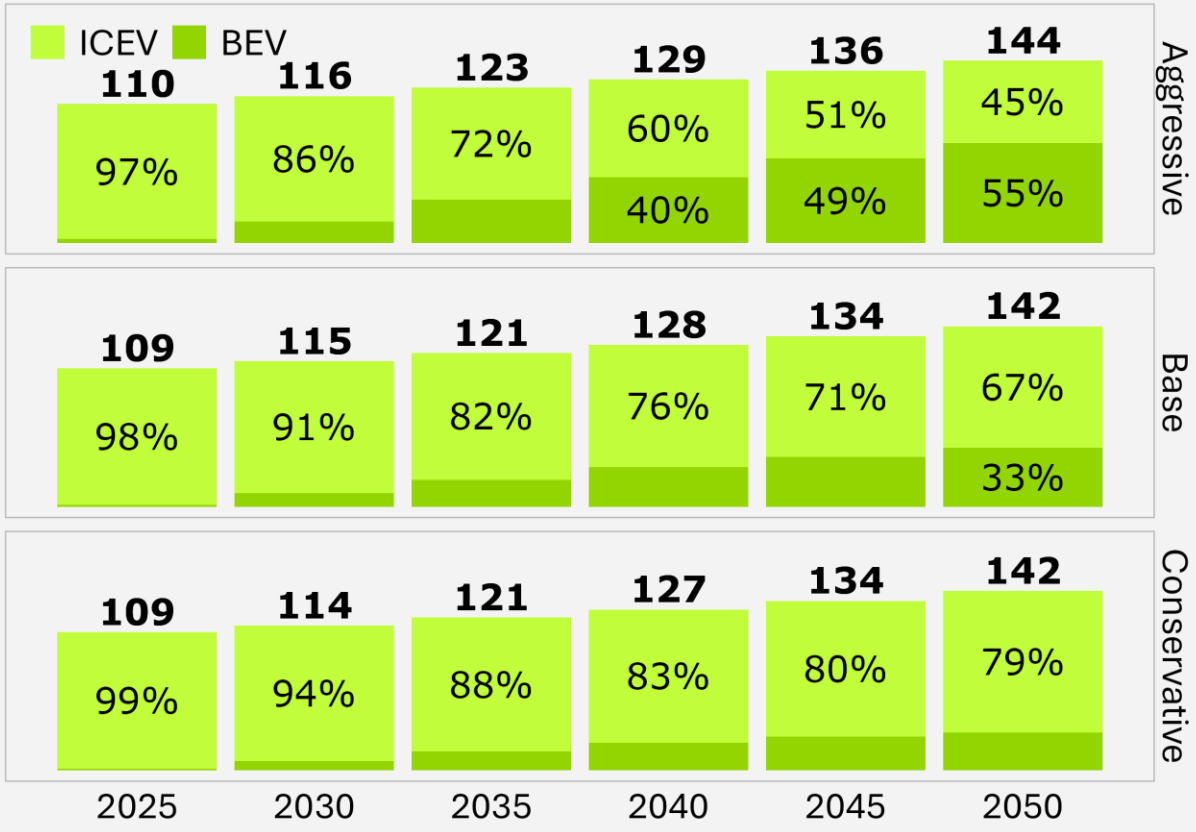
PSE Service Area EV Adoption Forecast Results

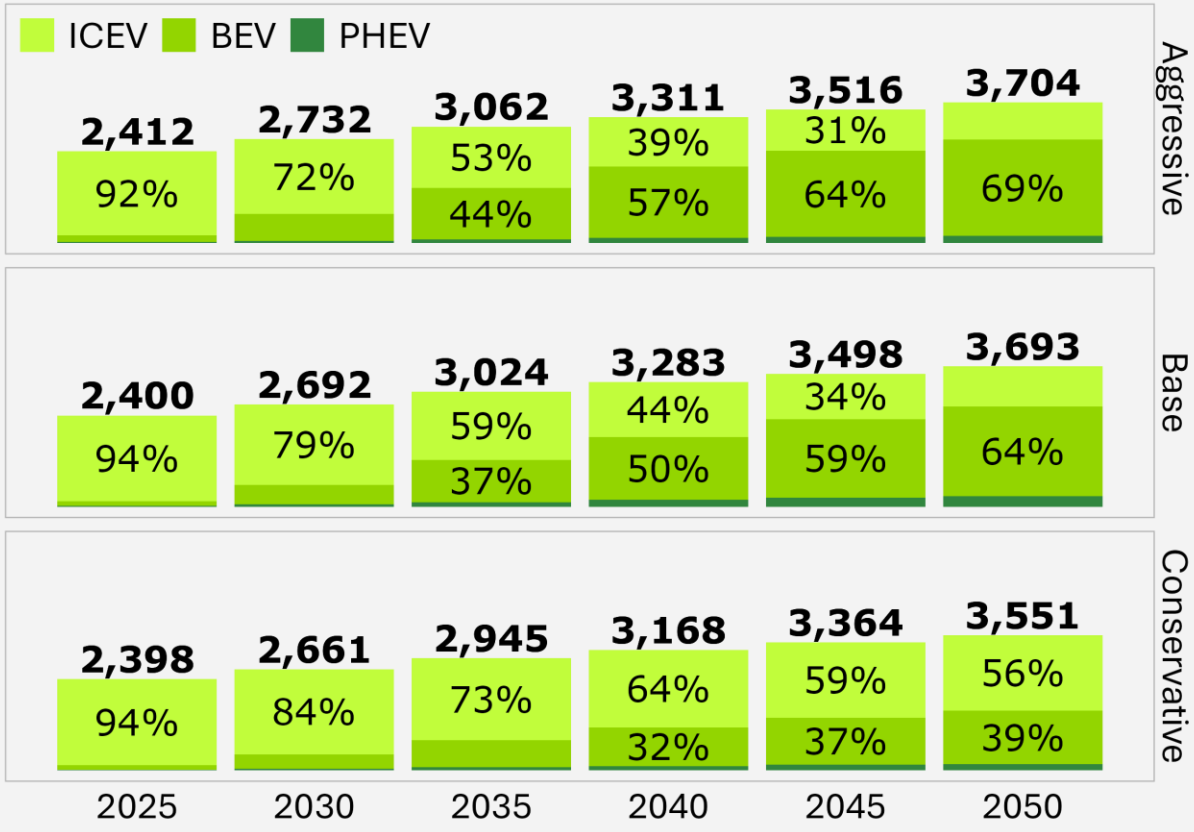
VEHICLE ELECTRIFICATION

PSE Territory Population by Powertrain

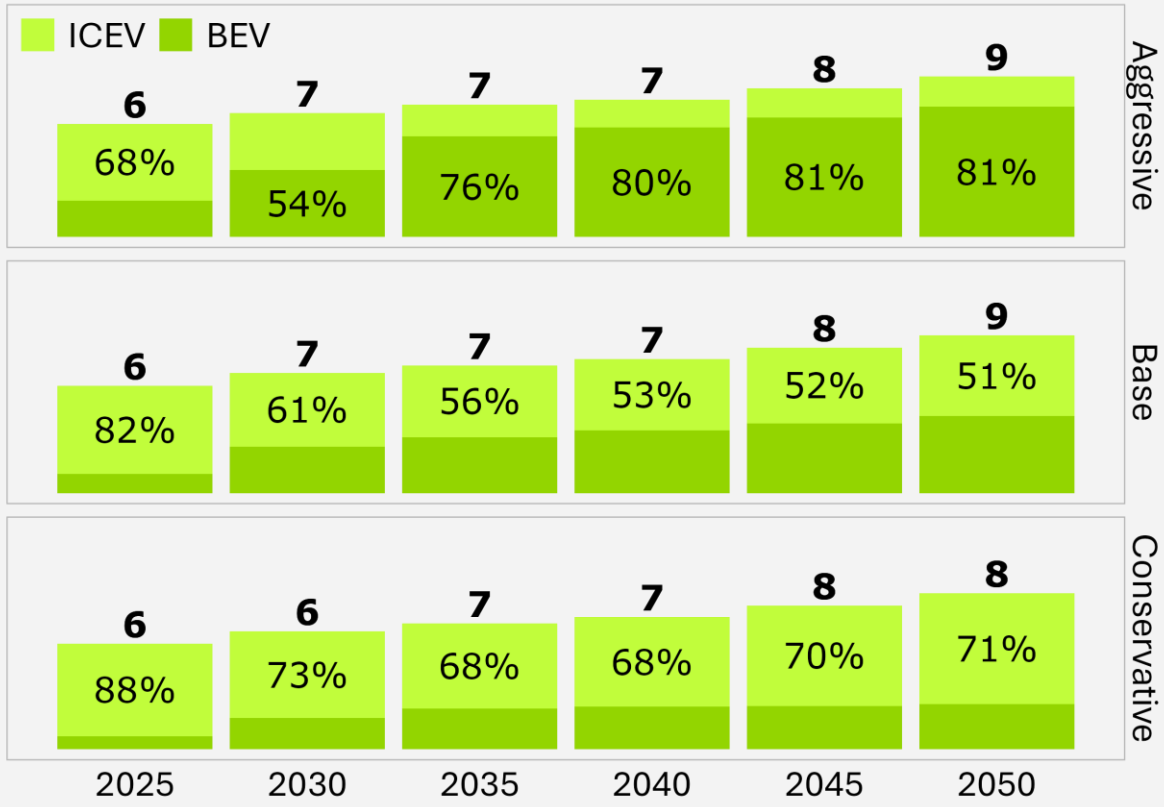
MHDV Population by Powertrain
'000 Vehicles, Puget Sound Energy, 2025-2050

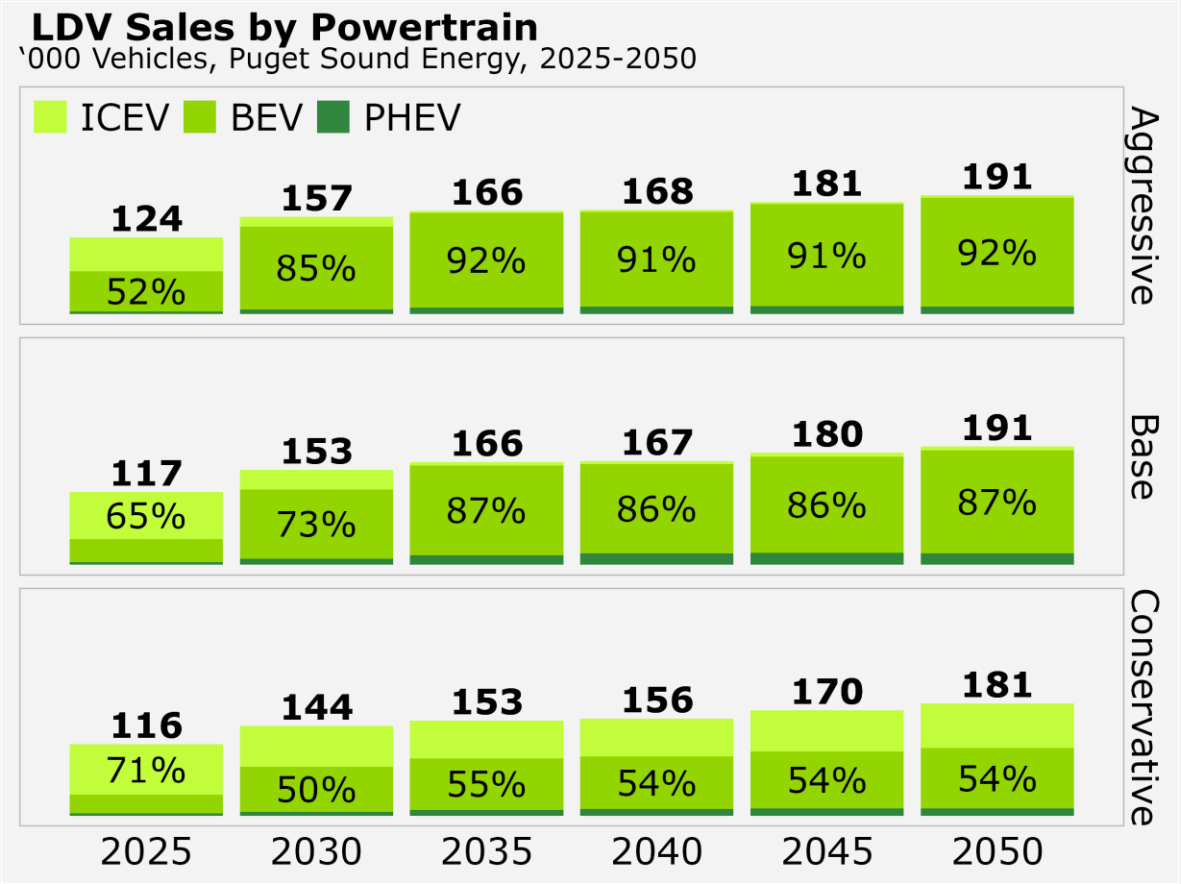


LDV Population by Powertrain
'000 Vehicles,Puget Sound Energy, 2025-2050

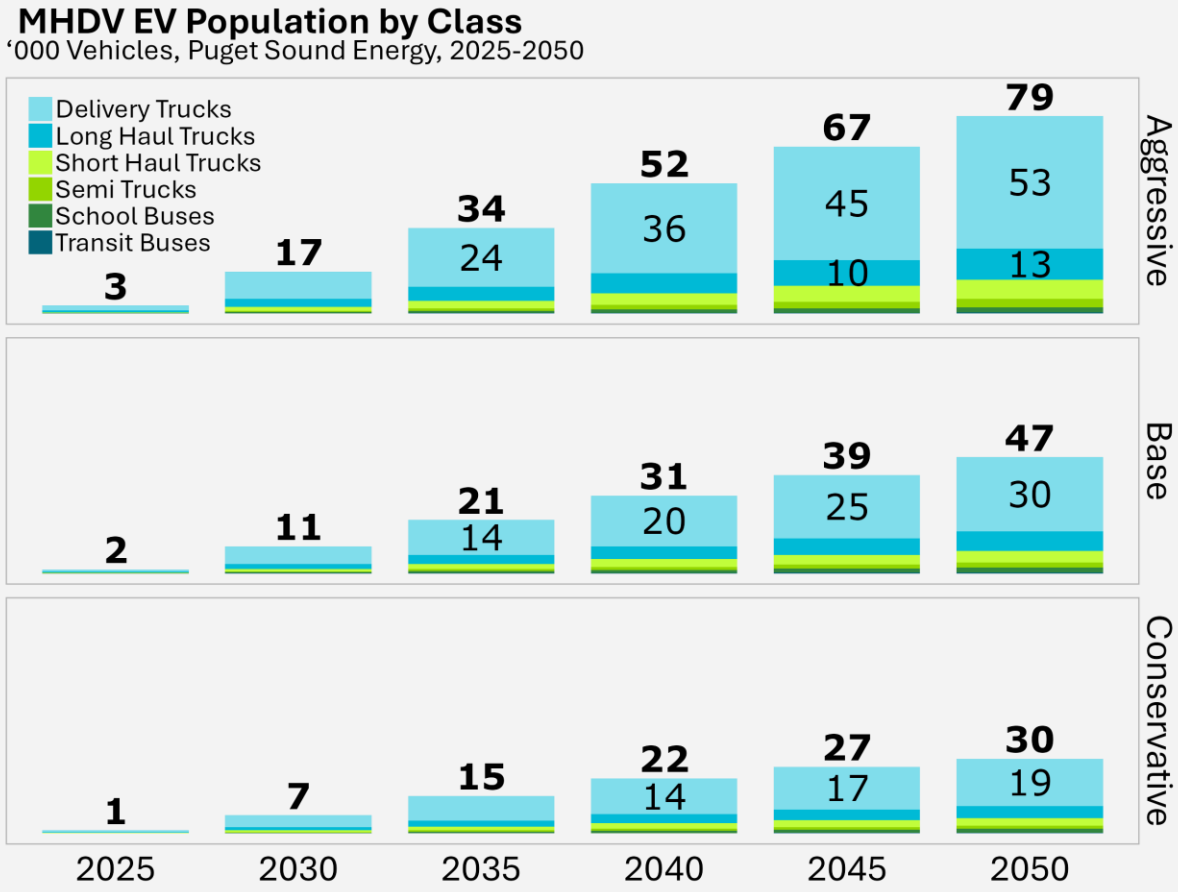


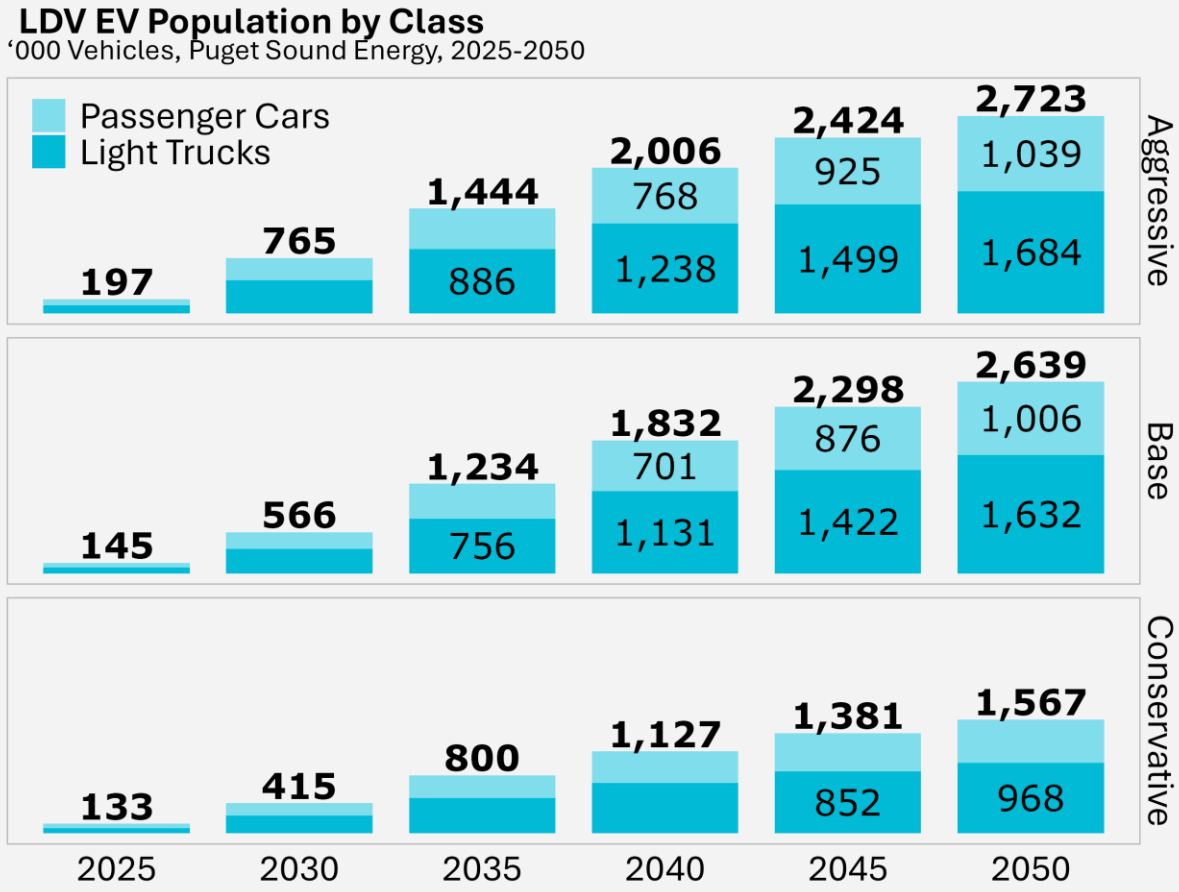
PSE Territory Sales by Powertrain





PSE Territory Population by Class

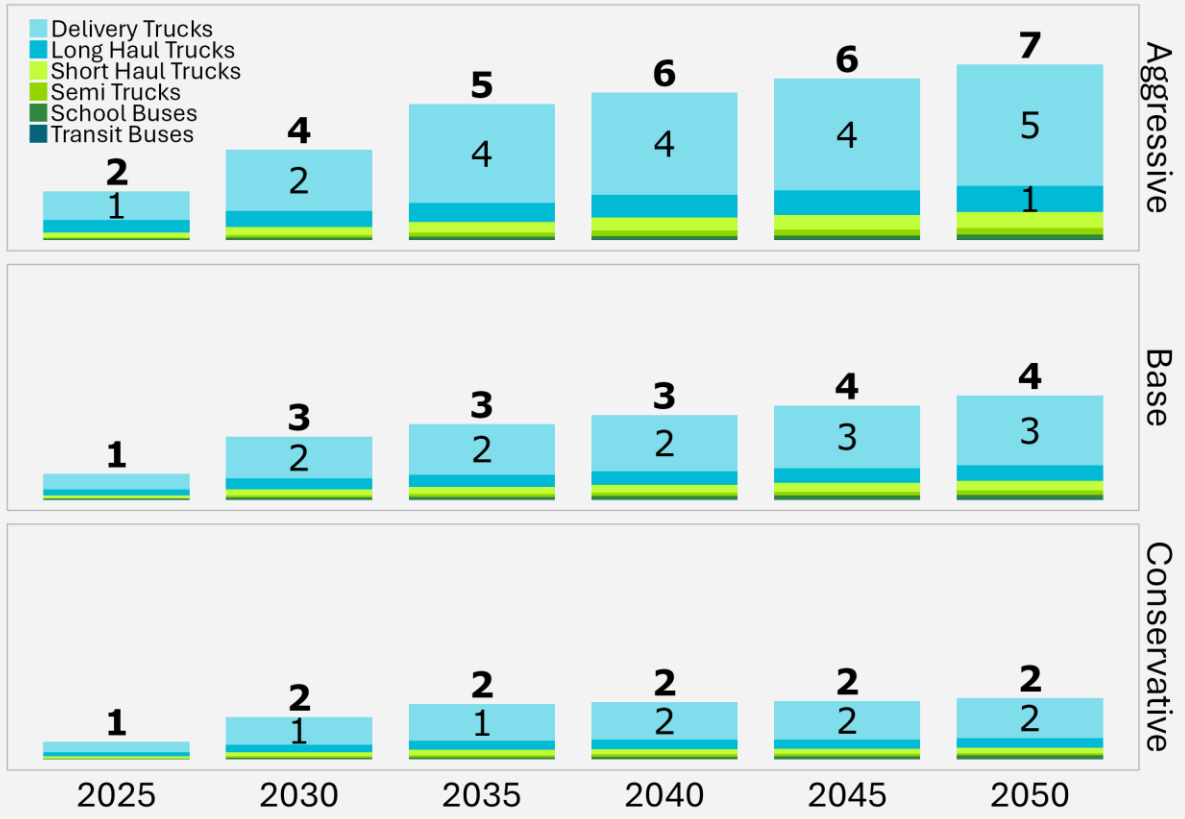




PSE Territory Sales by Class

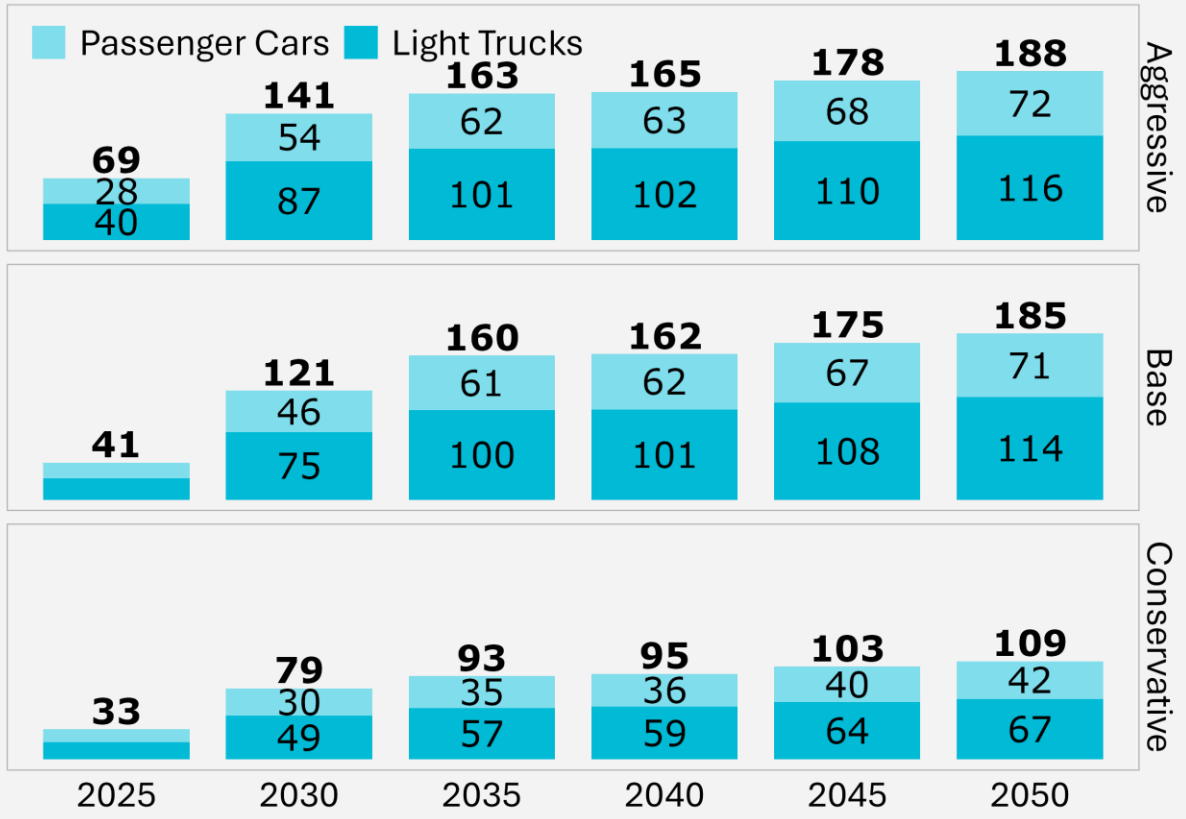
MHDV EV Sales by Class

'000 Vehicles, Puget Sound Energy, 2025-2050

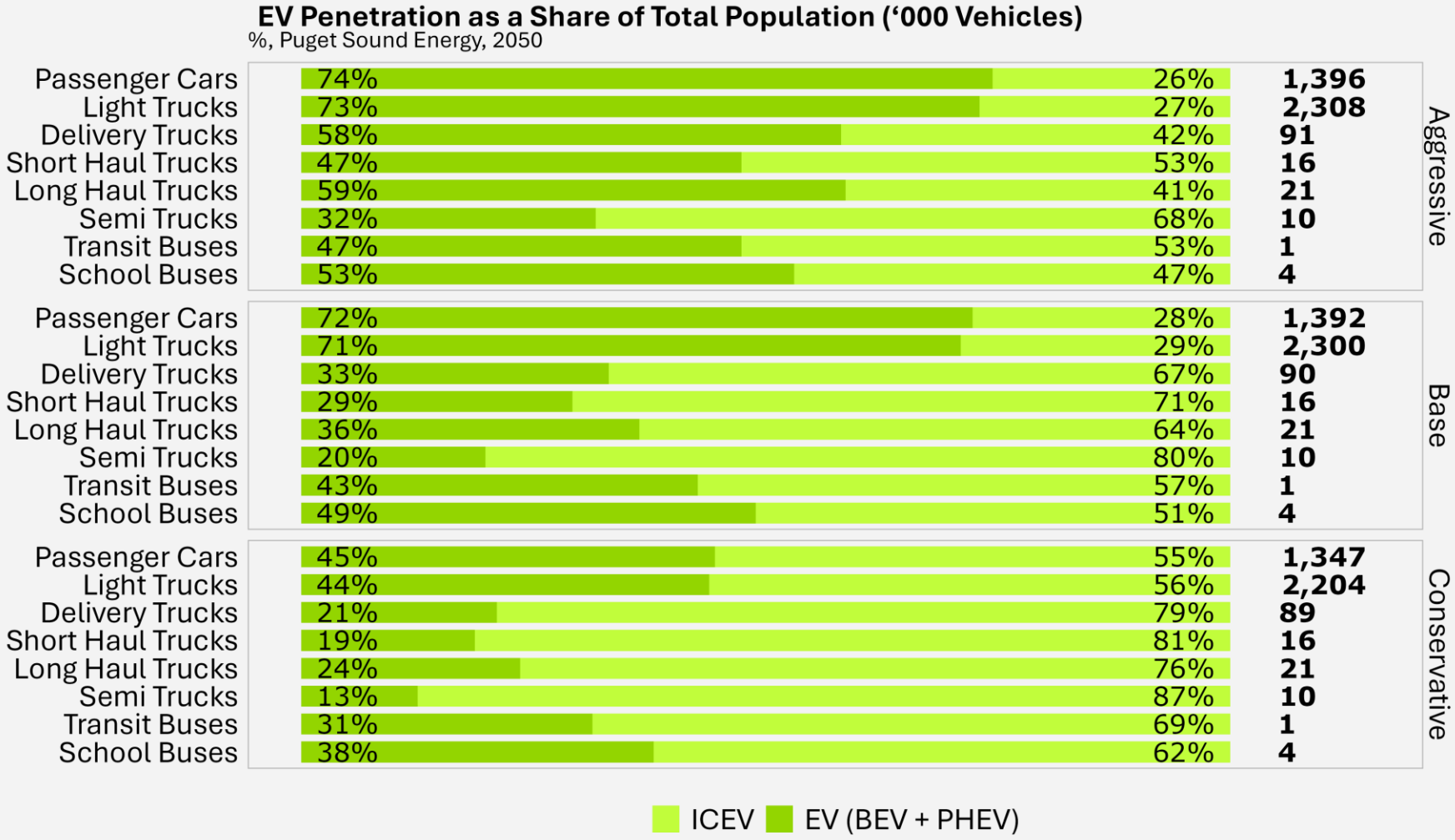


LDV EV Sales by Class

'000 Vehicles, Puget Sound Energy, 2025-2050

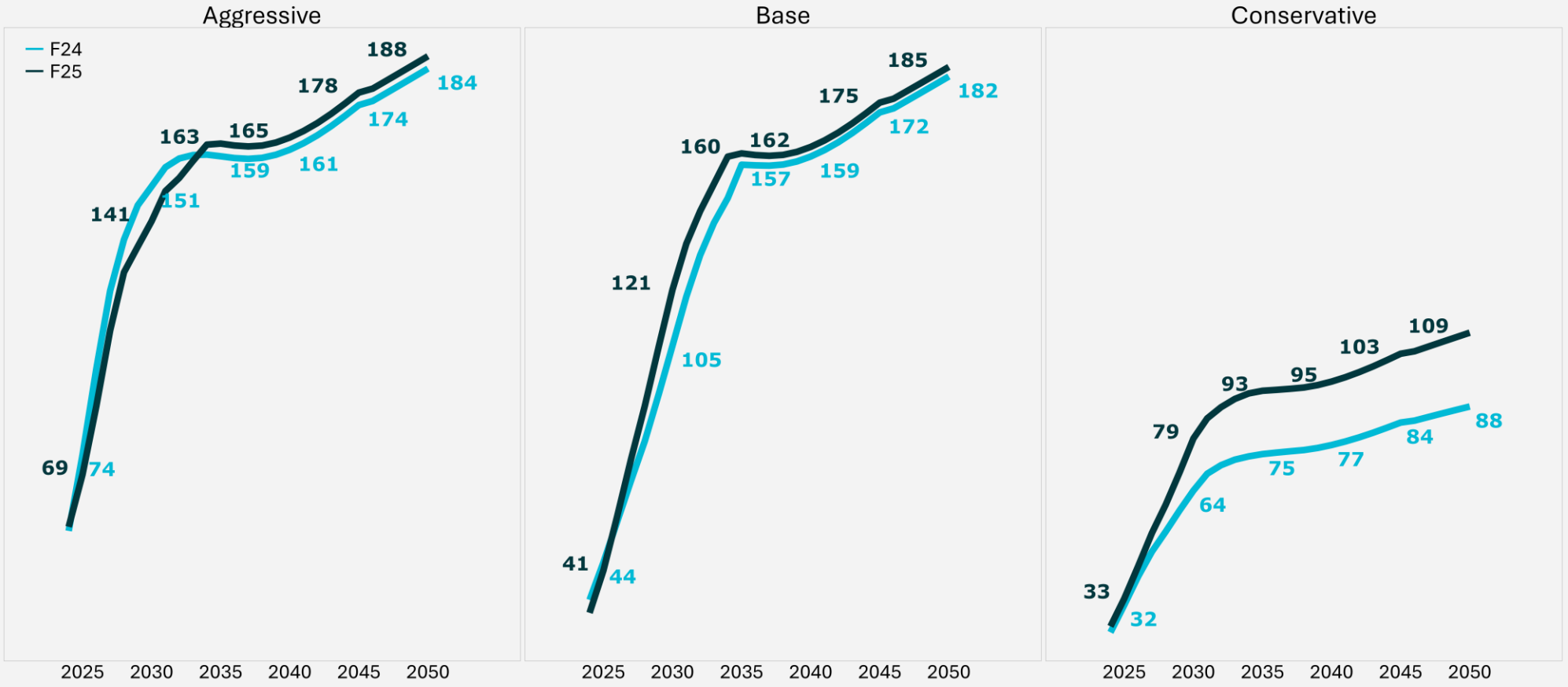


Policies strongly affect adoption by scenario



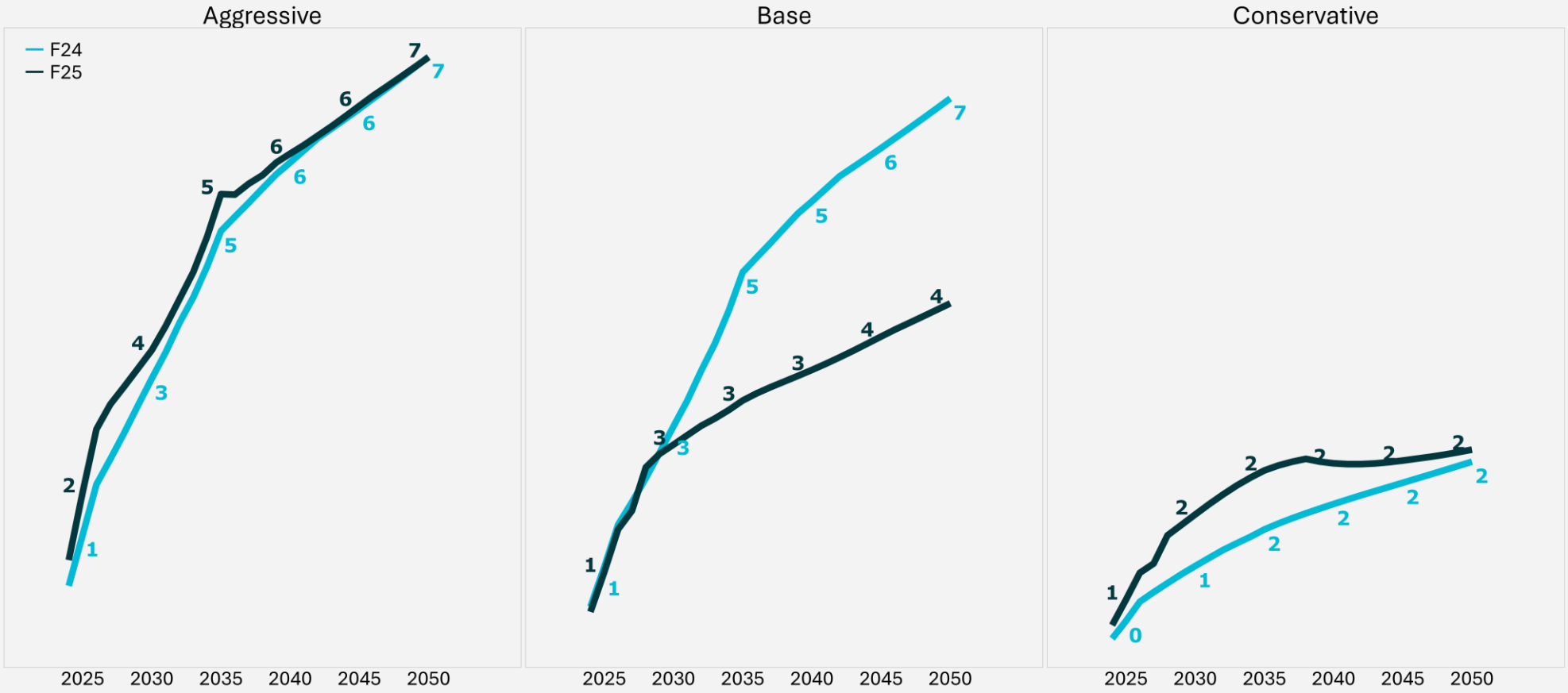
Consistent F25 and F24 base and aggressive sales

LDV PEV Sales by Study
'000 Vehicles, Puget Sound Energy, 2025-2050



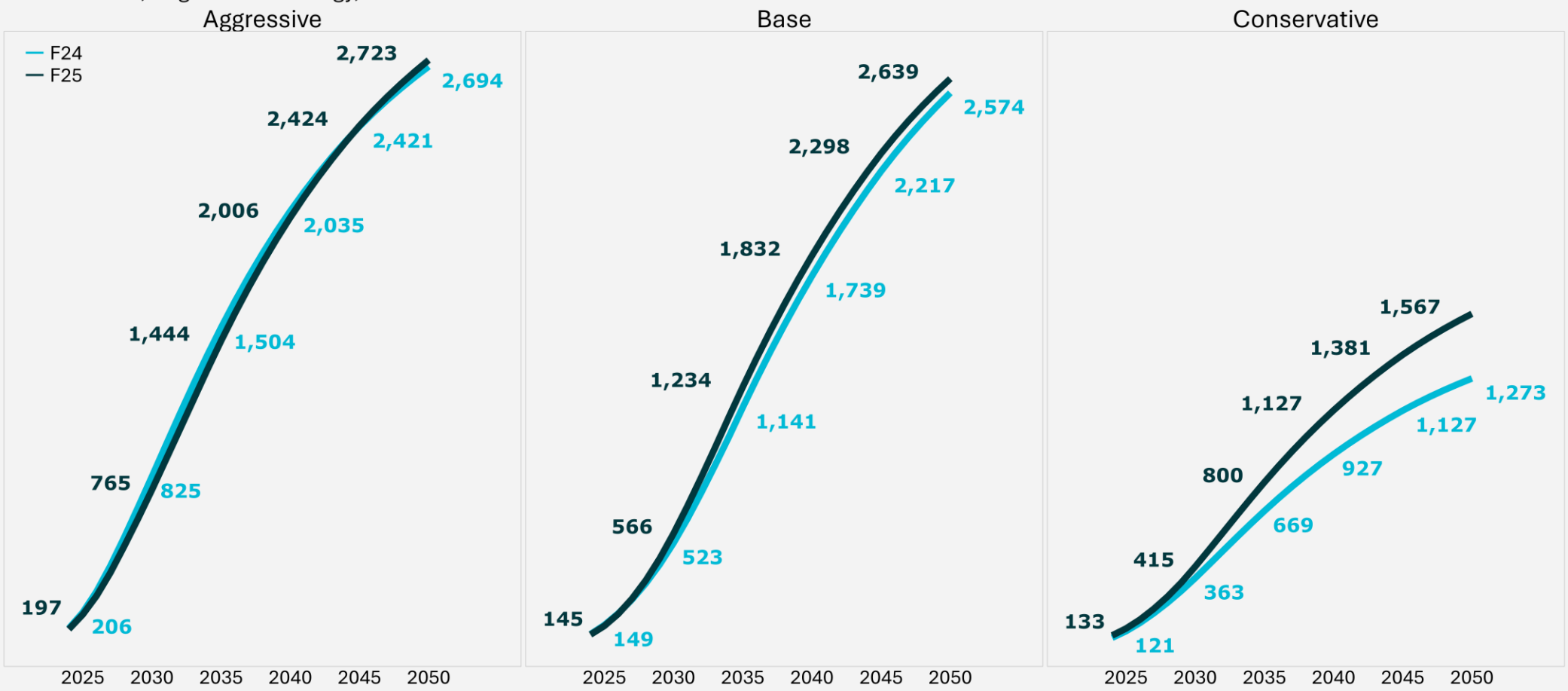
Policy parameters result in F25 and F24 differences

MHDV PEV Sales by Study
'000 Vehicles, Puget Sound Energy, 2025-2050



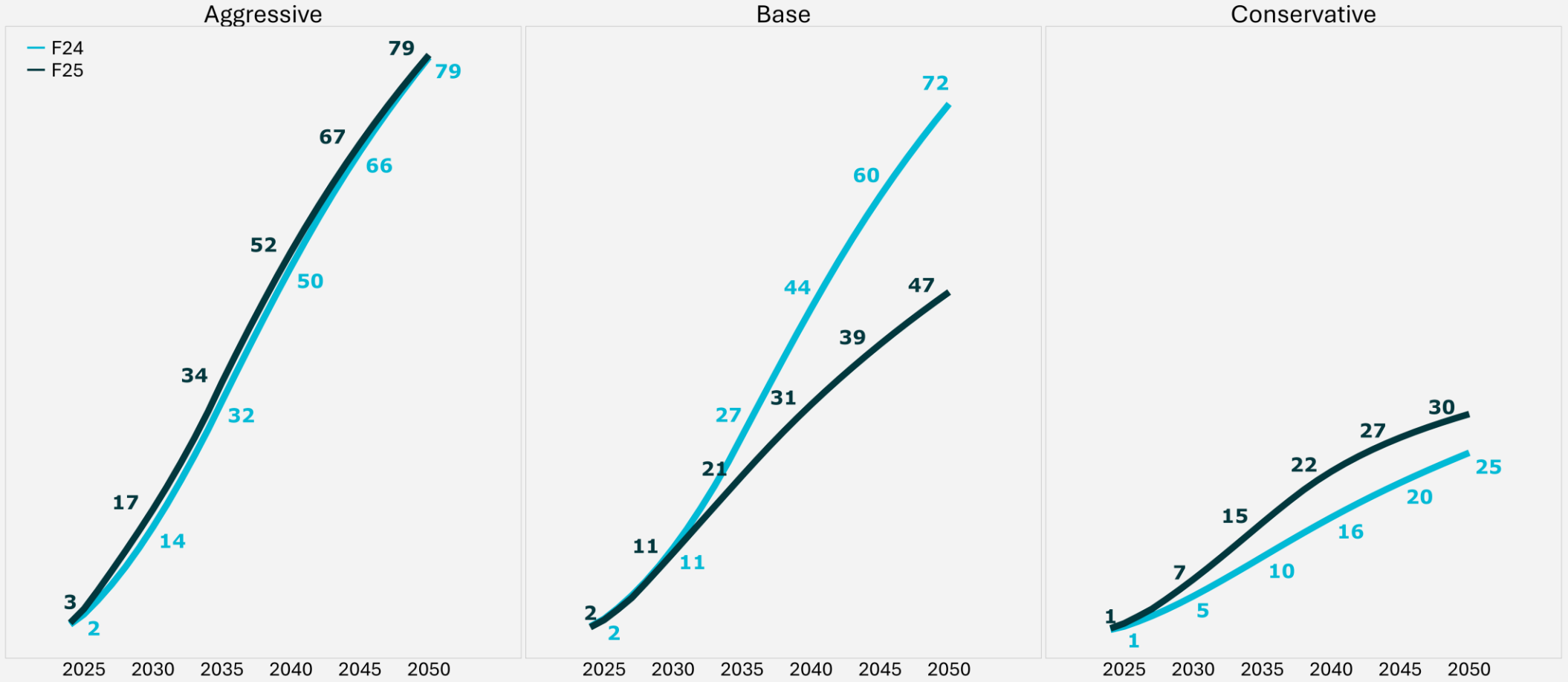
PSE service area shows similar LDV adoption as WA

LDV PEV Population by Study
'000 Vehicles, Puget Sound Energy, 2025-2050



PSE service area shows similar MHDV adoption as WA

MHDV PEV Population by Study
'000 Vehicles, Puget Sound Energy, 2025-2050



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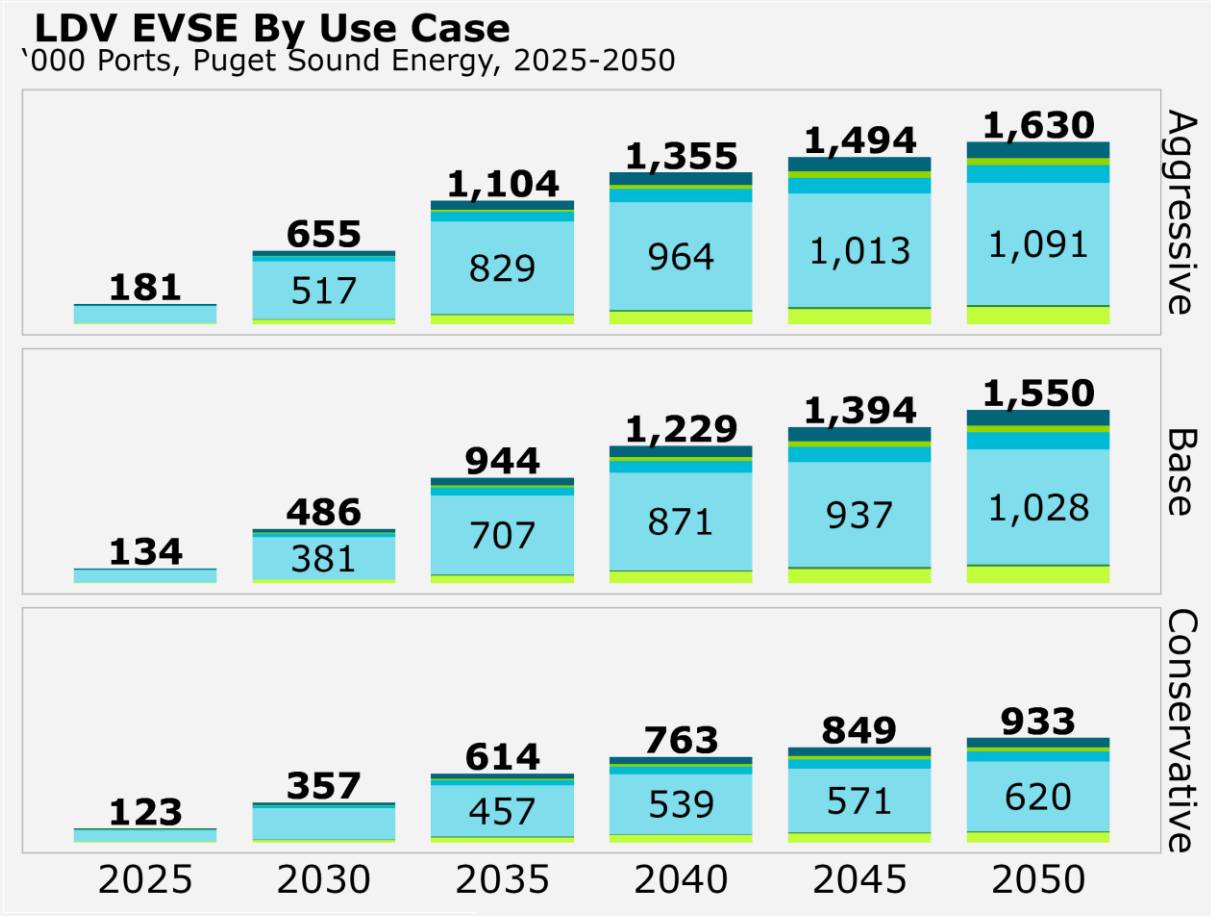
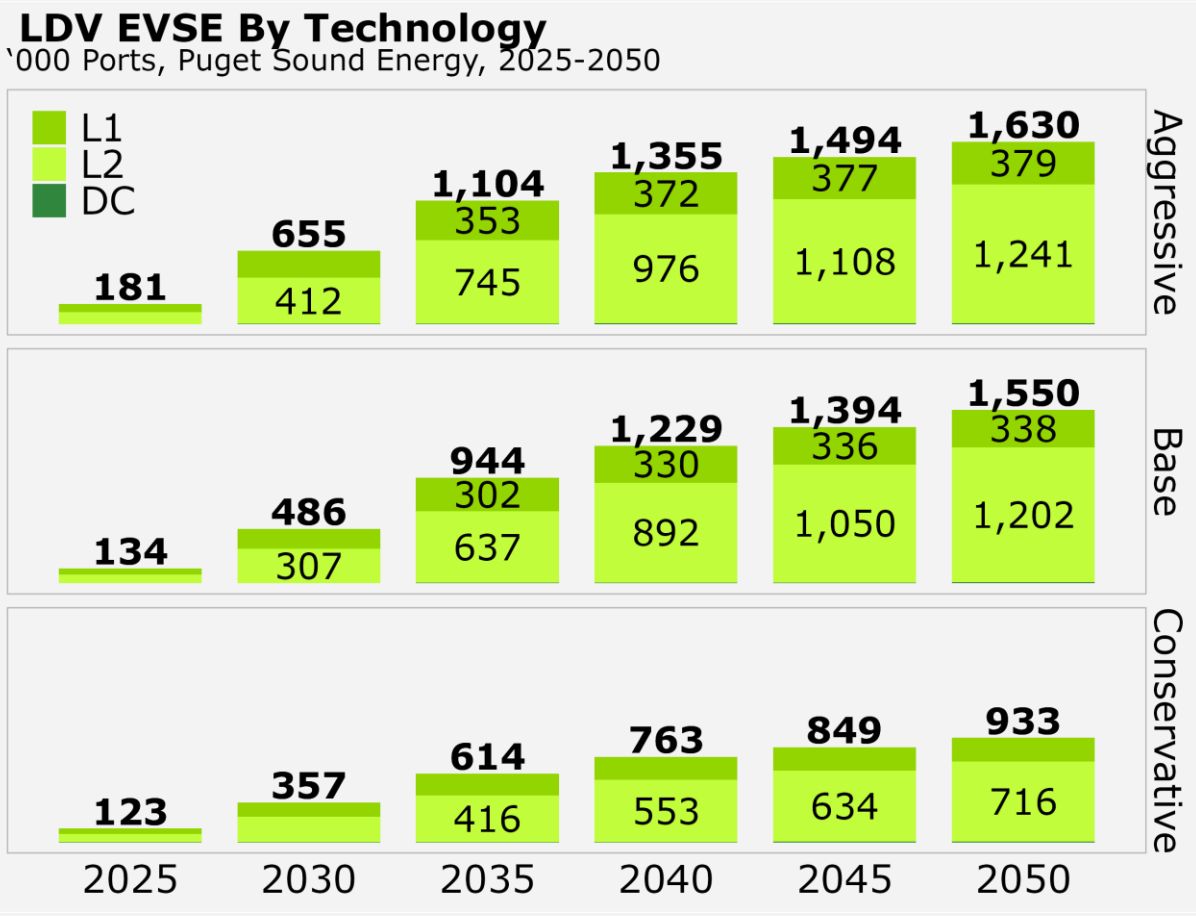
PSE Territory EVSE Needs Forecast Results

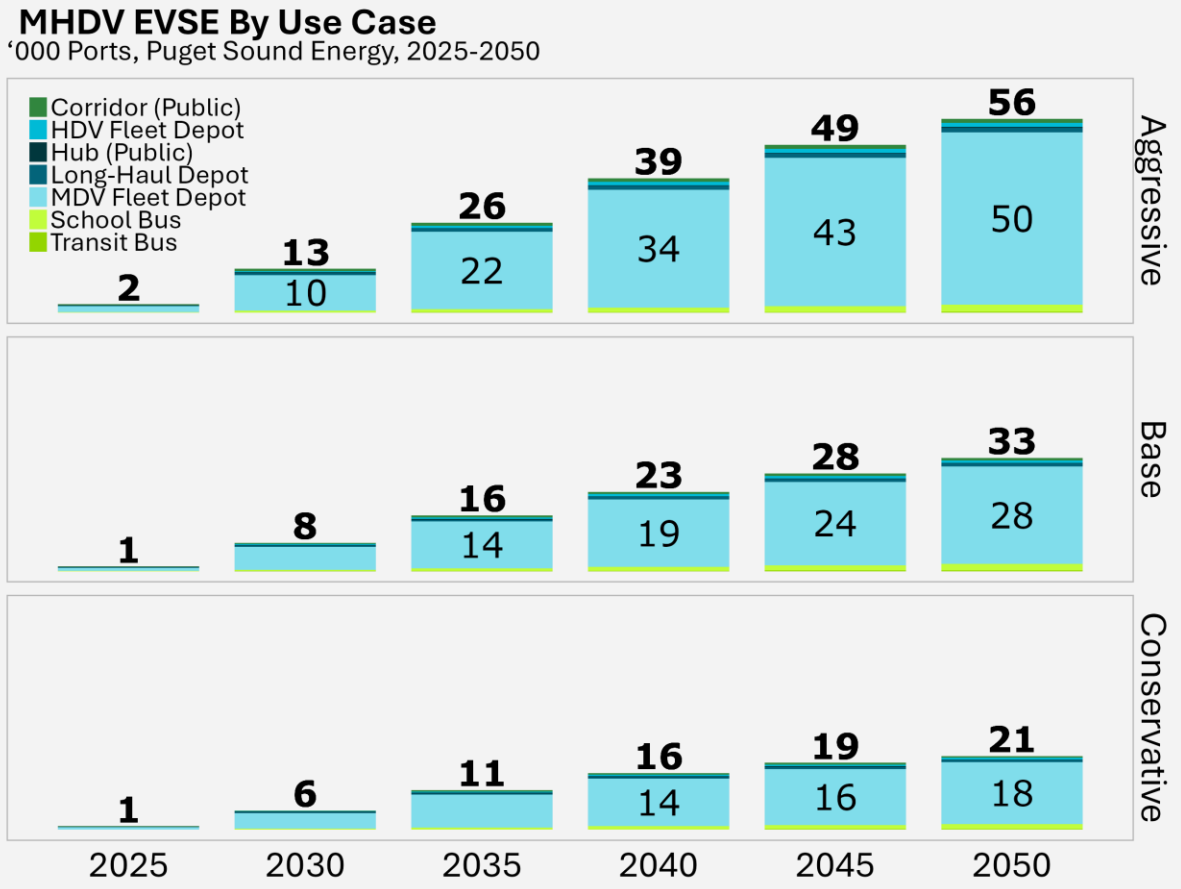
VEHICLE ELECTRIFICATION

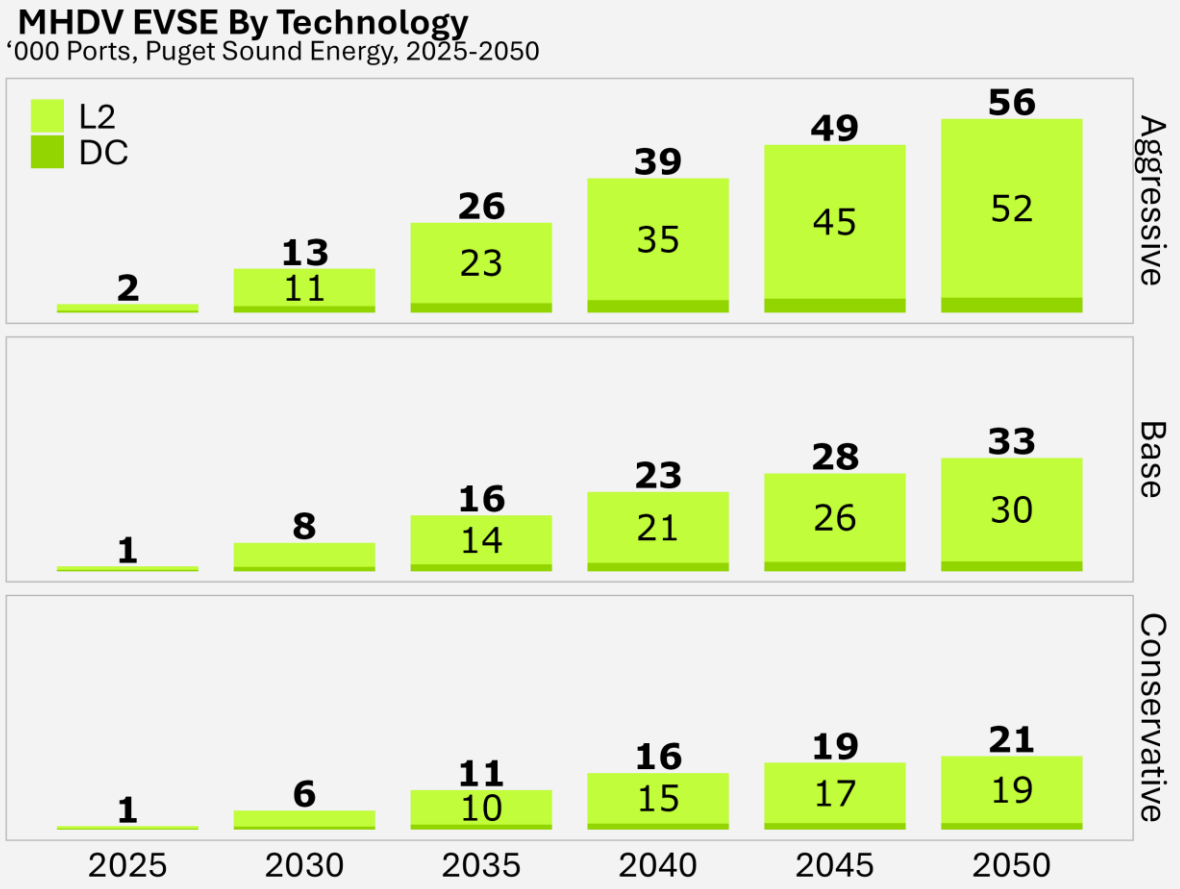
Most charging occurs at single-unit dwellings





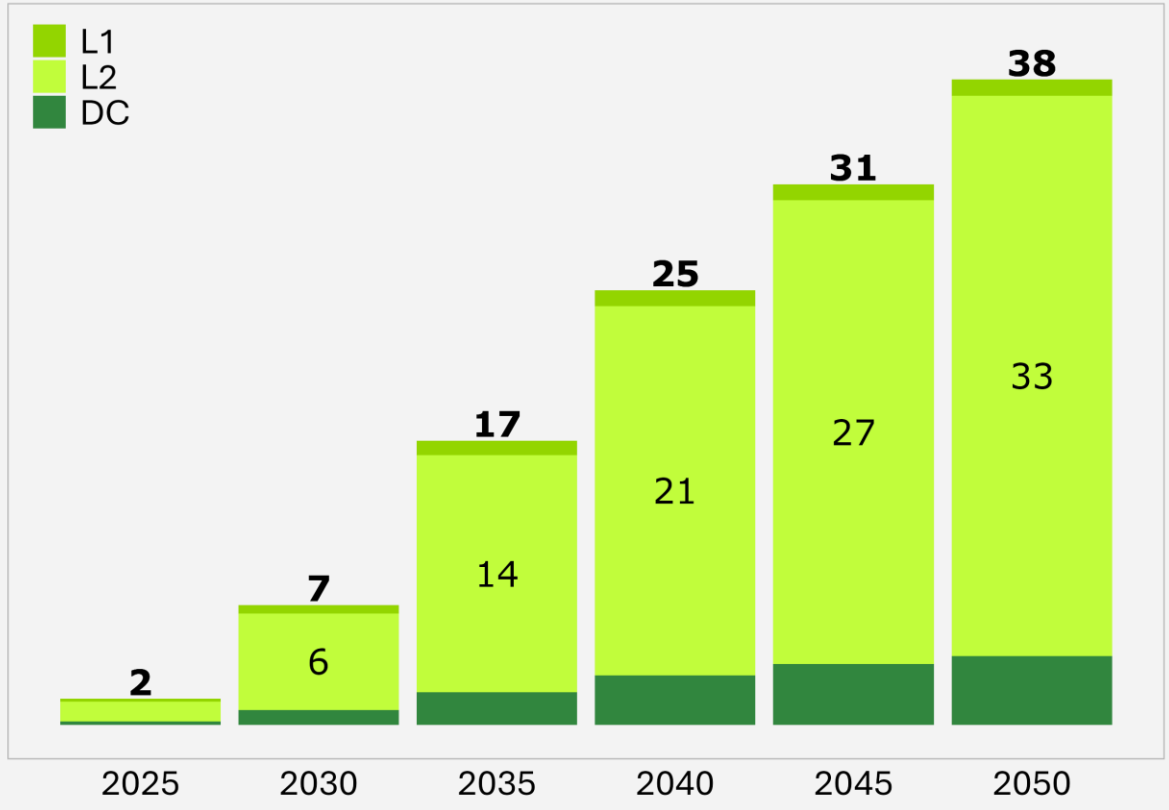
MDV L2 charging biggest component of MHDV EVSE



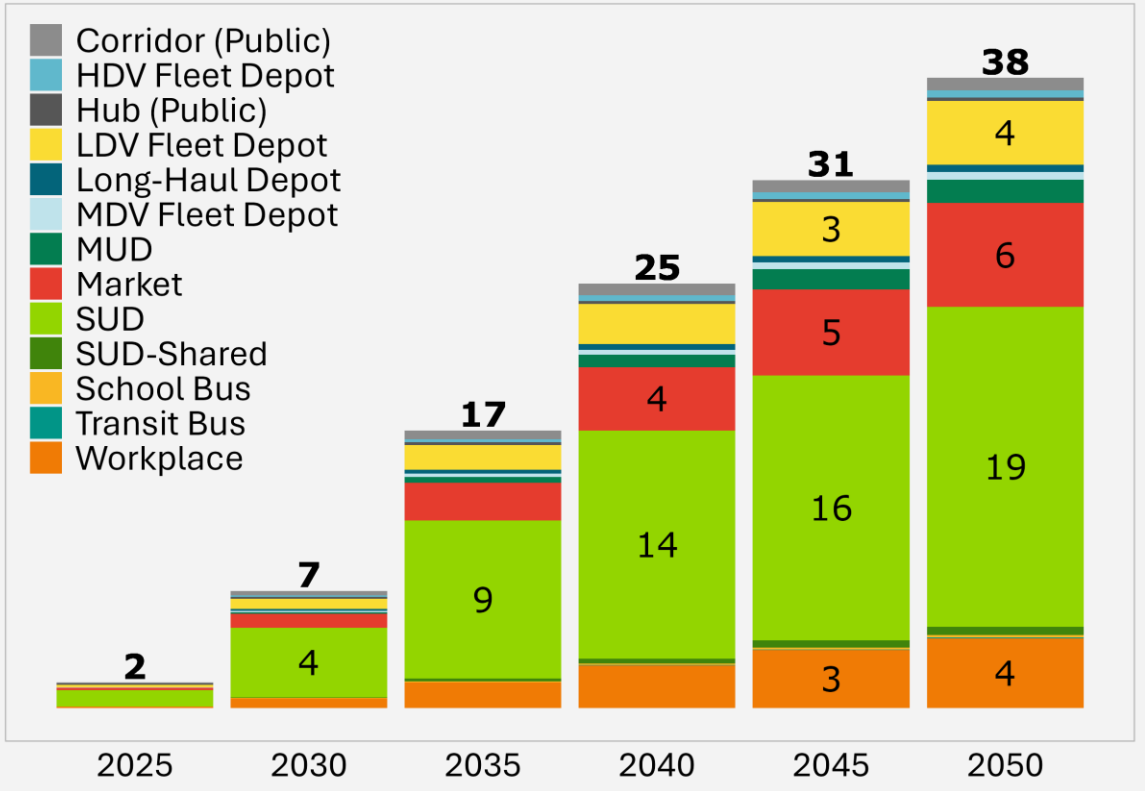


Most charging coming from L2 ports

Installed Capacity (Gigawatt) by Technology
Capacity (Gigawatt), 2025-2050

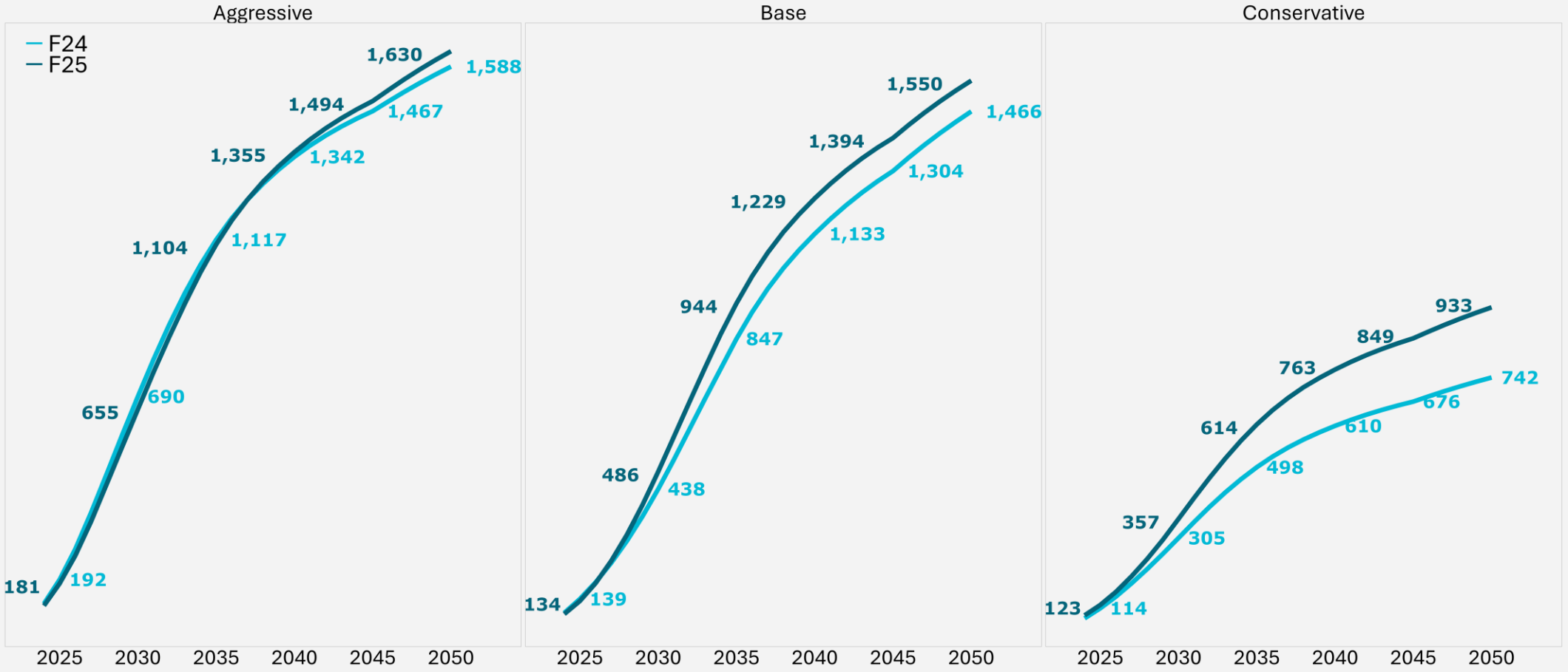


Installed Capacity (Gigawatt) by Use Case
Capacity (Gigawatt), 2025-2050



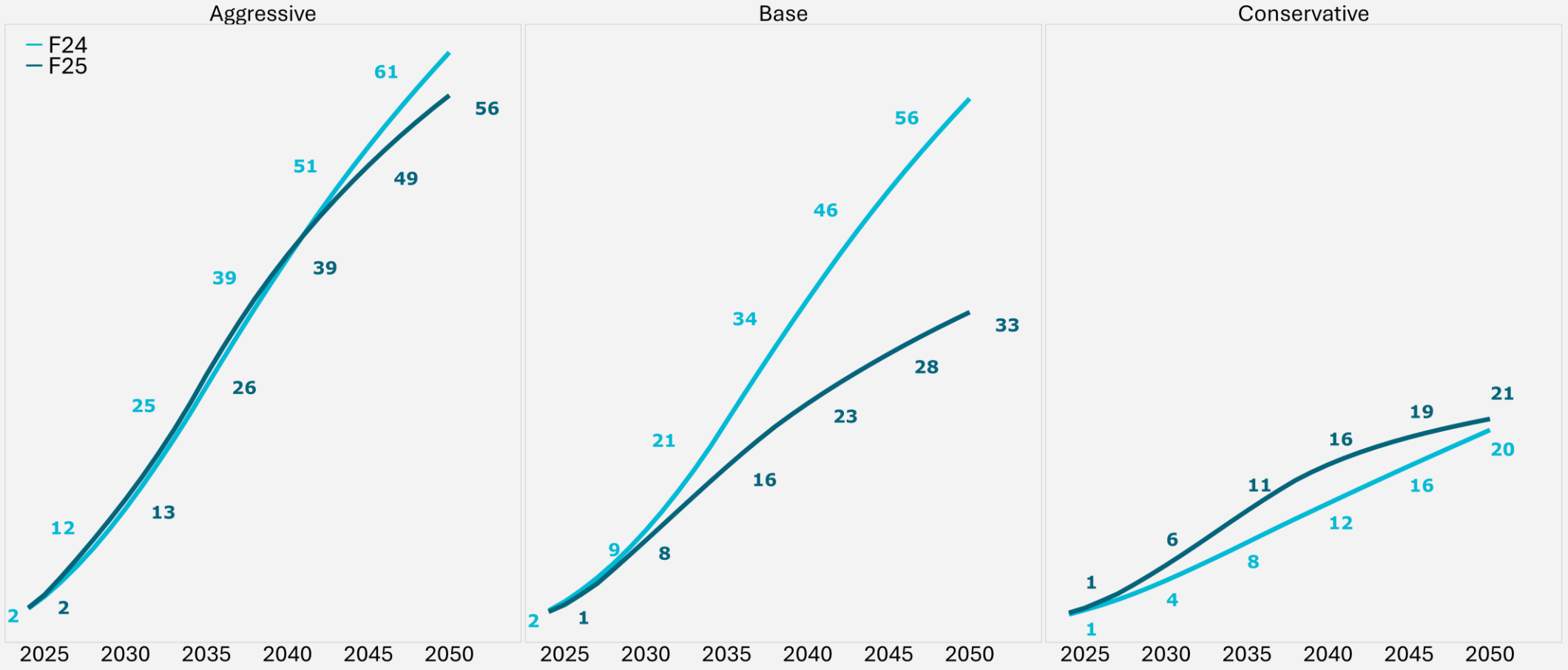
F25 LDV charging tracks F24 closely

LDV EVSE Ports by Study
'000 Ports, Puget Sound Energy, 2025-2050



F25 MDV Base ports lower due to greater utilization

MHDV EVSE Ports by Study
'000 Ports, Puget Sound Energy, 2025-2050



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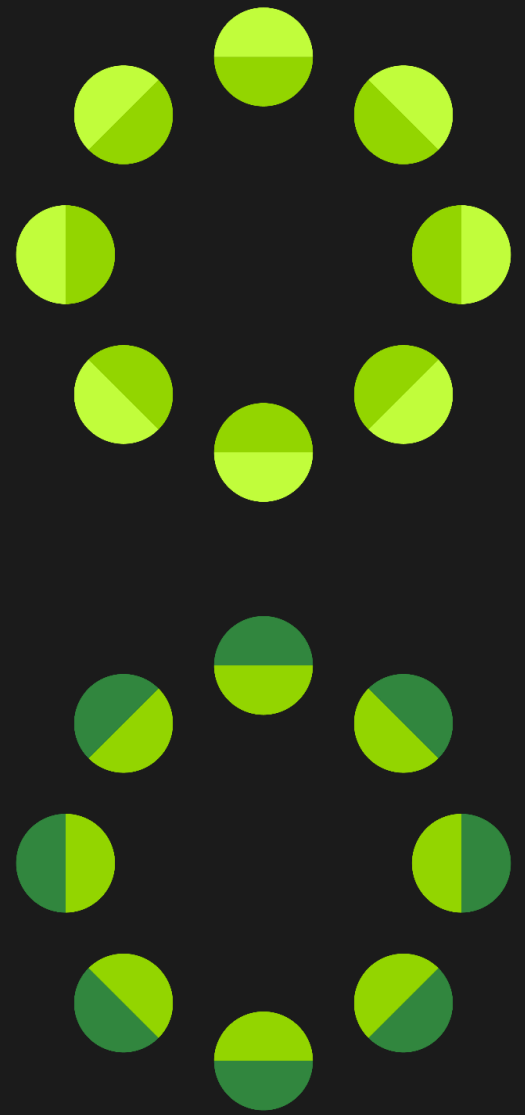

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Additional Results

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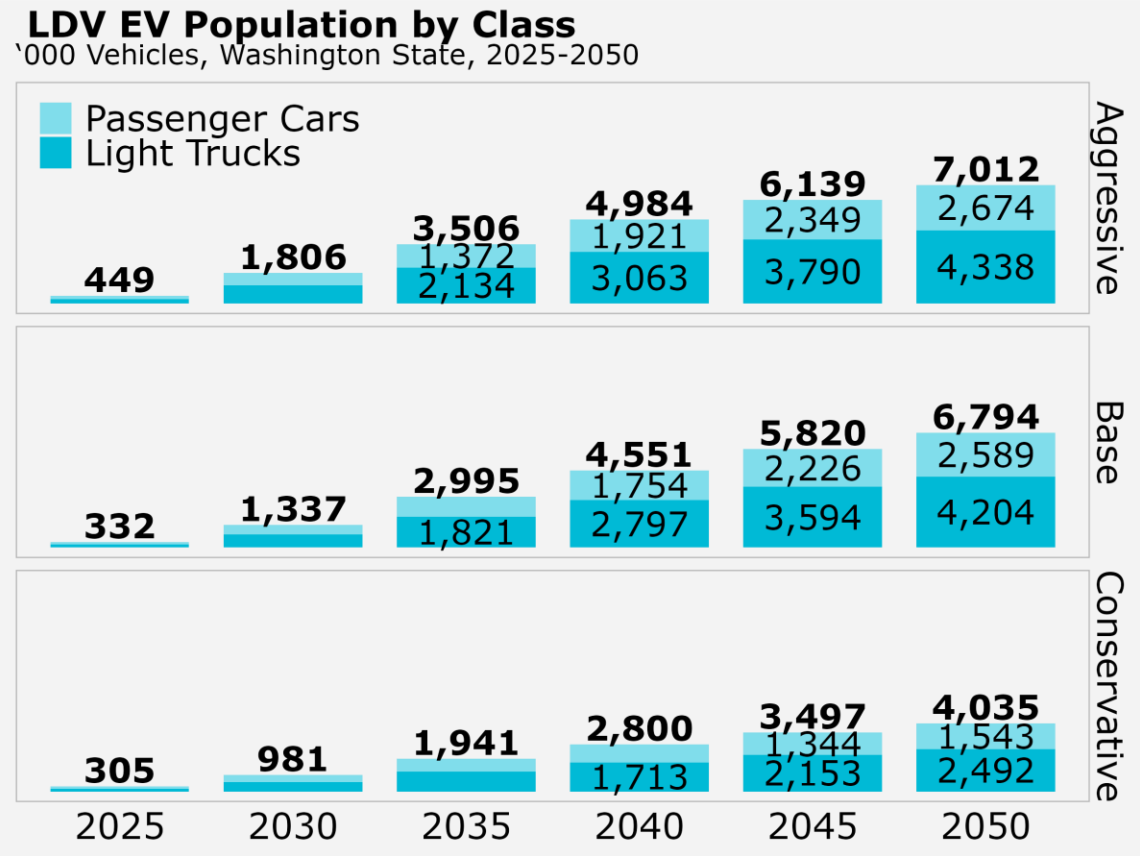
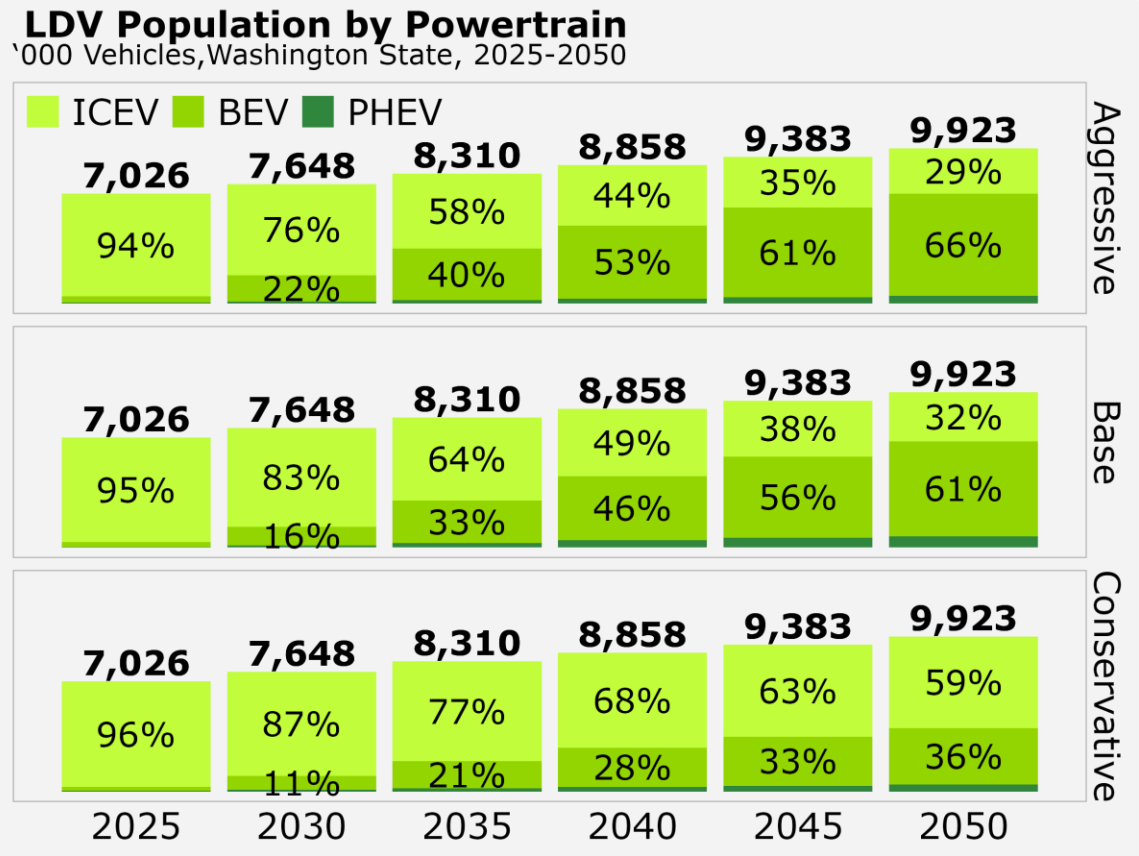
Washington State EV Adoption Forecast Results

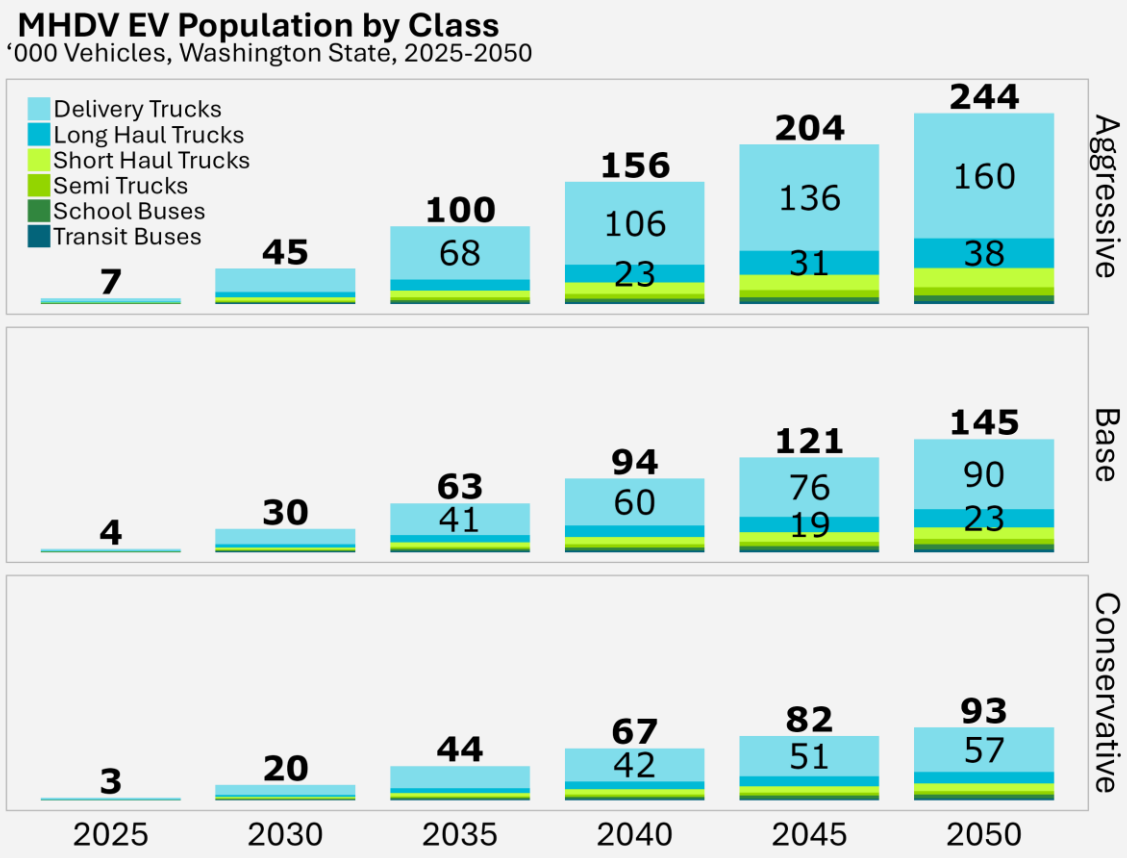
VEHICLE ELECTRIFICATION

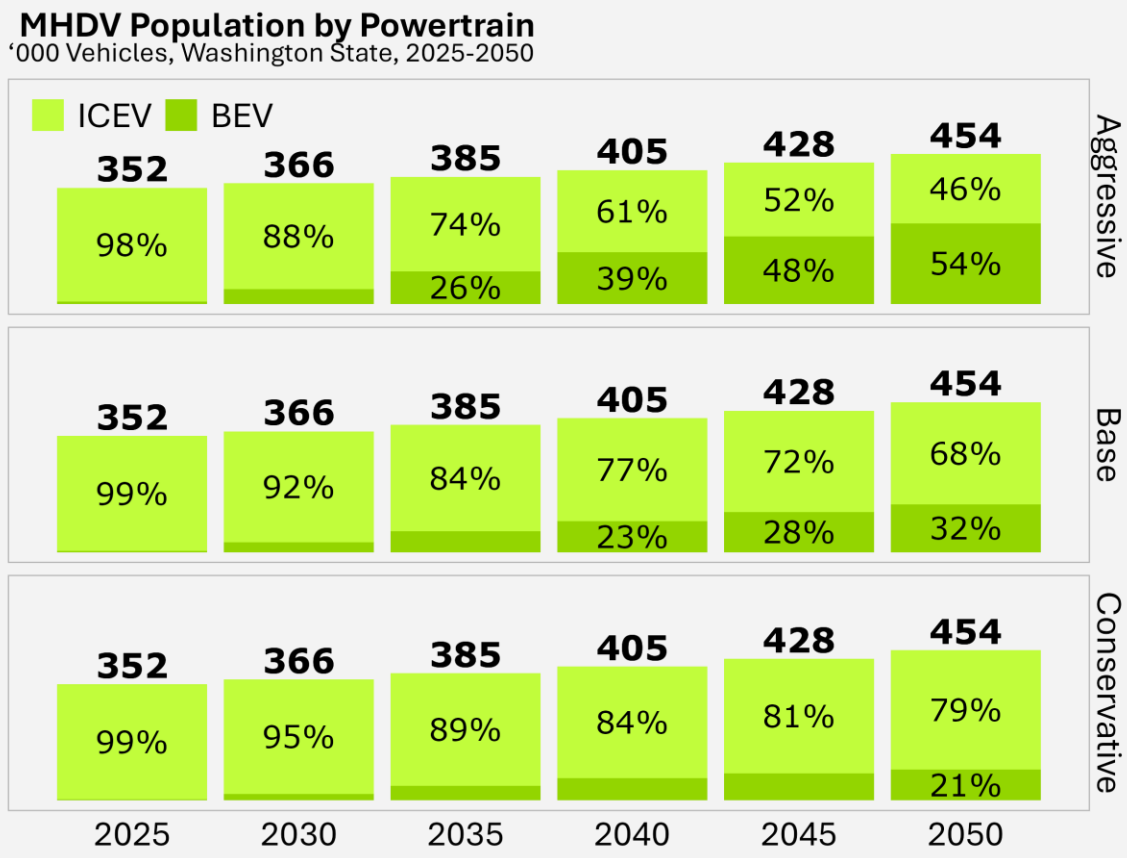
More electrification and BEVs in Aggressive Scenario



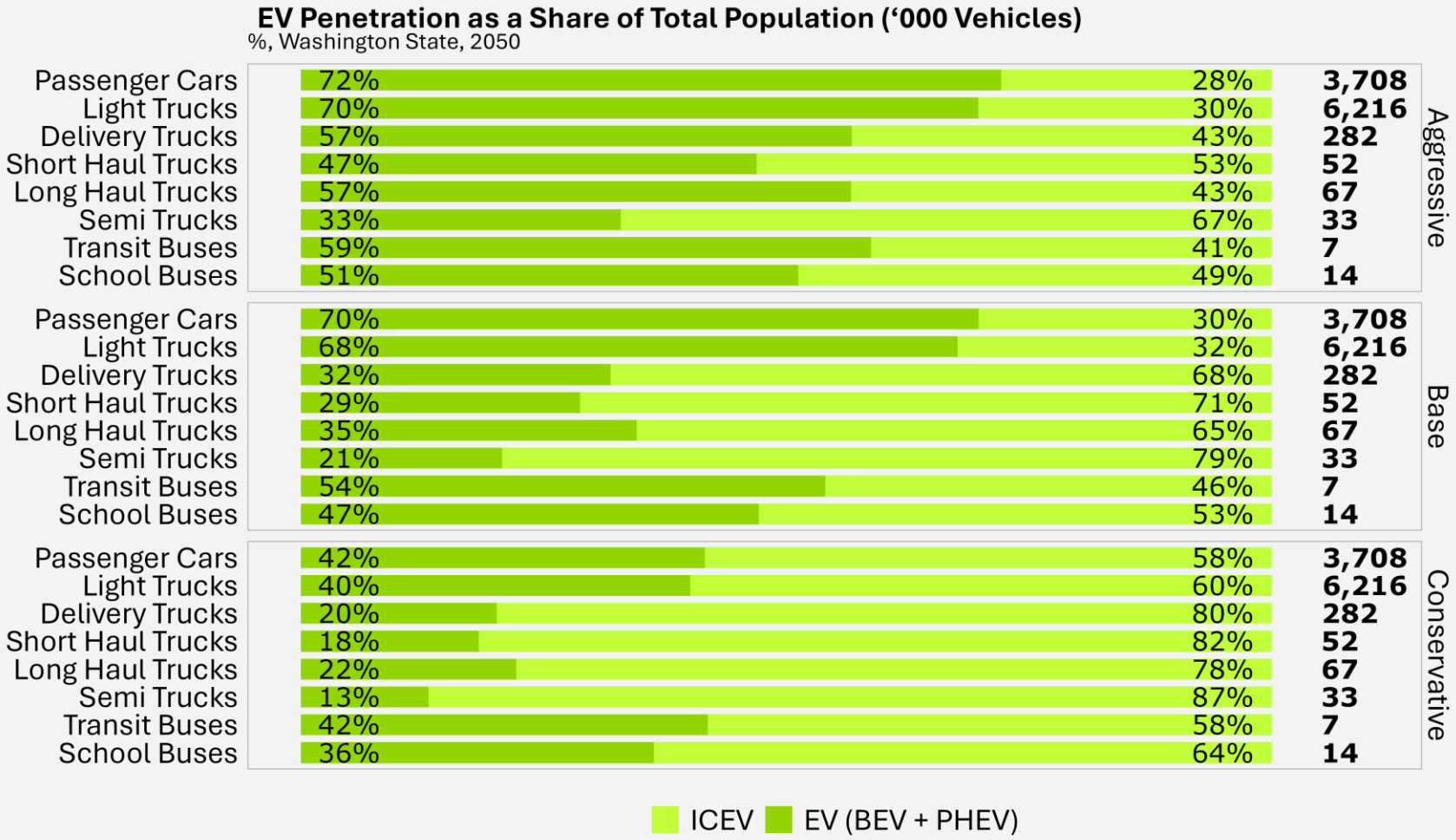


Scenario levers have big impact on MHDVs

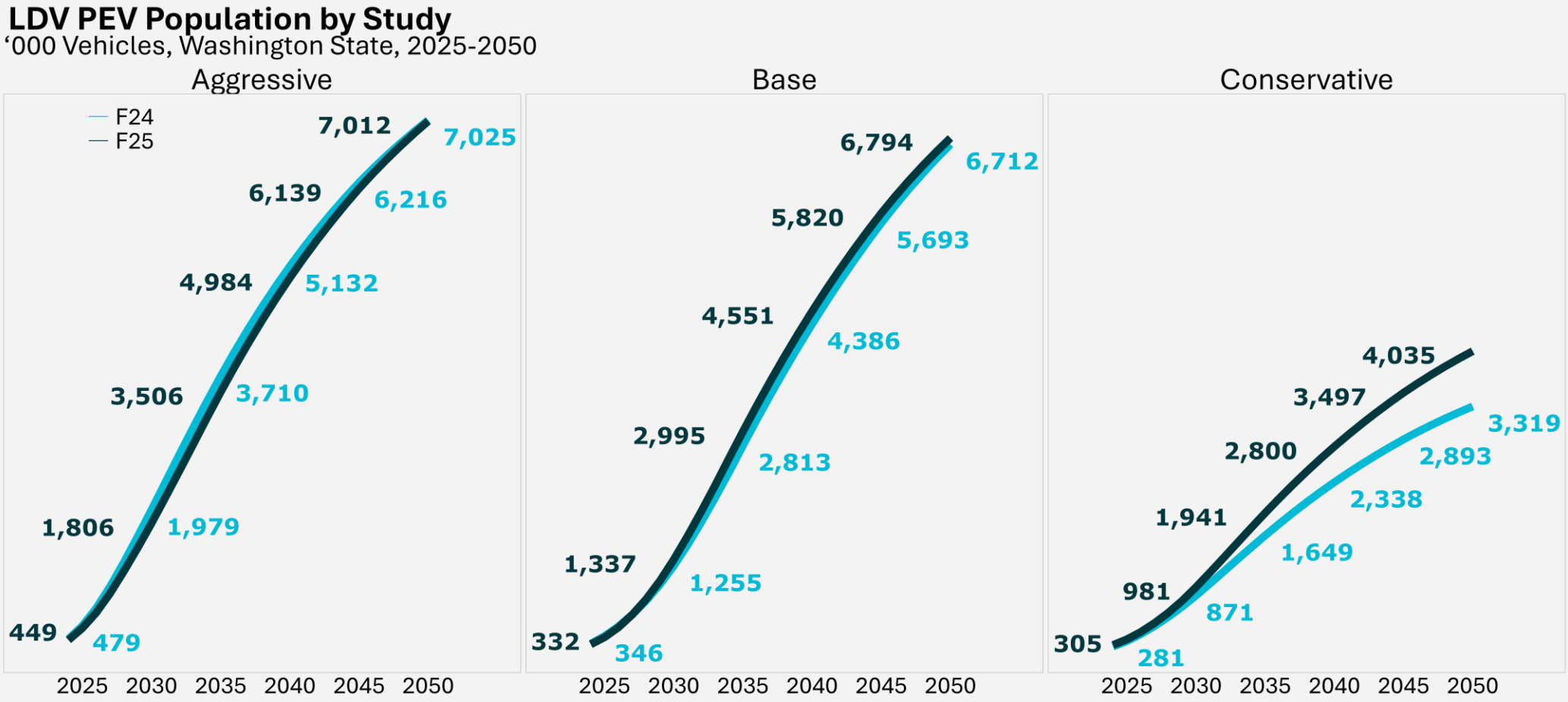




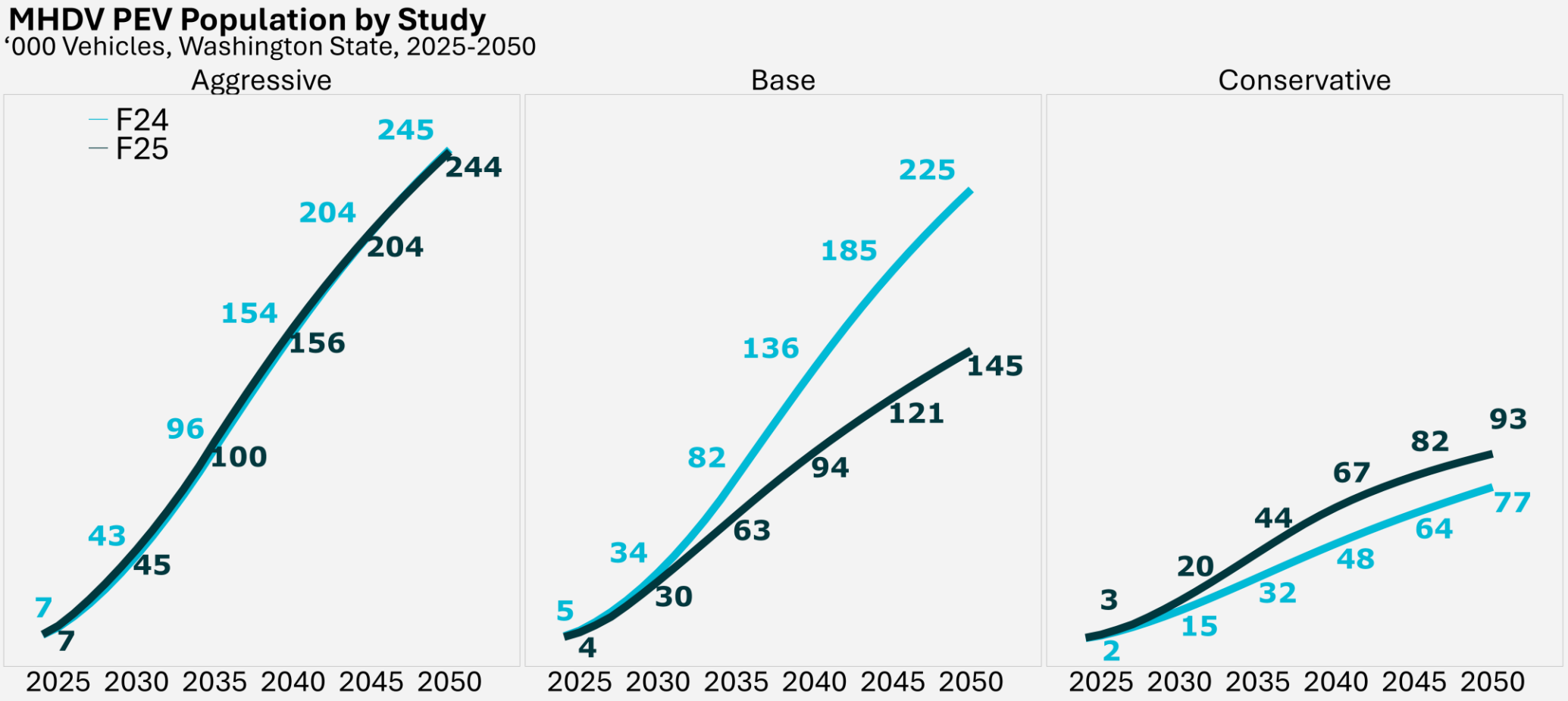
All EVs lag in conservative scenario



Similar LDV electrification between F24 and F25



Drop in F25 base scenario due to ACT policy change



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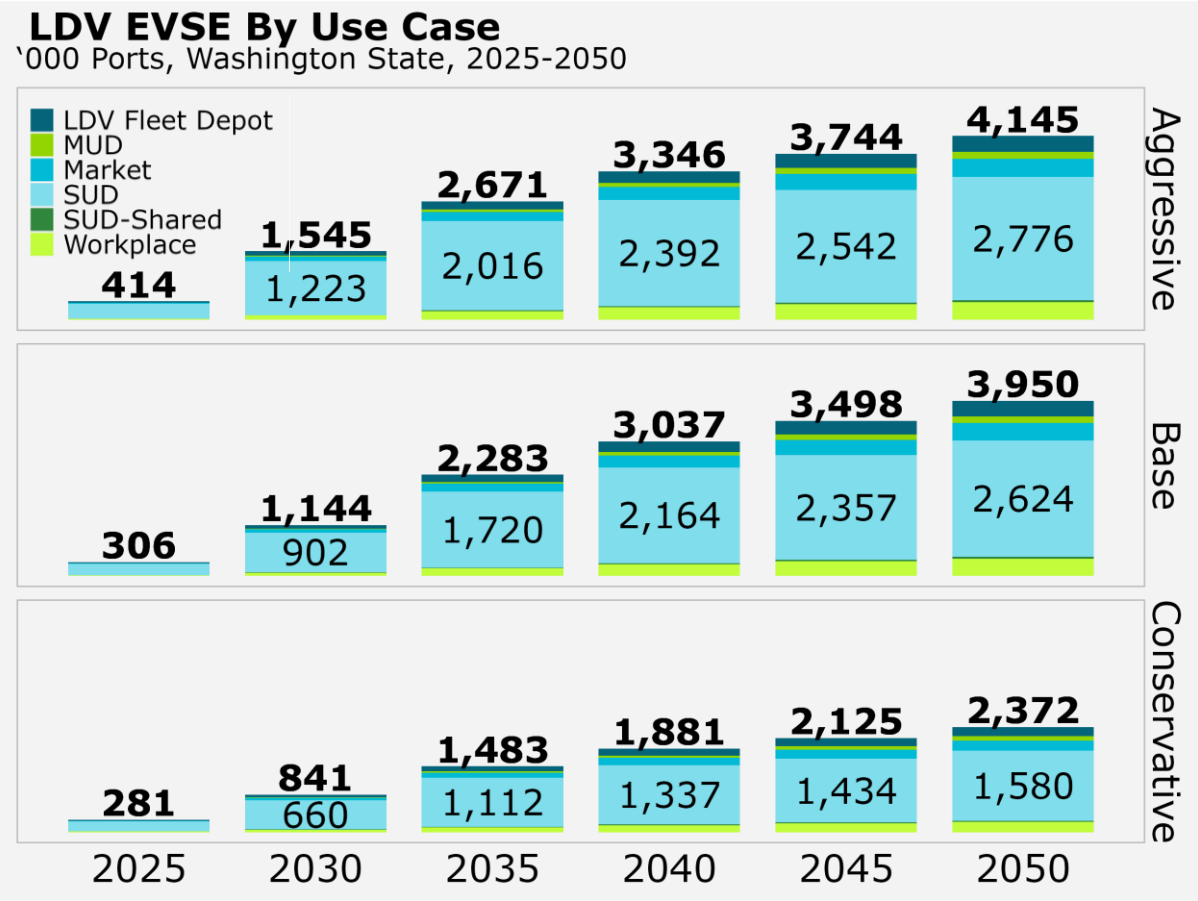
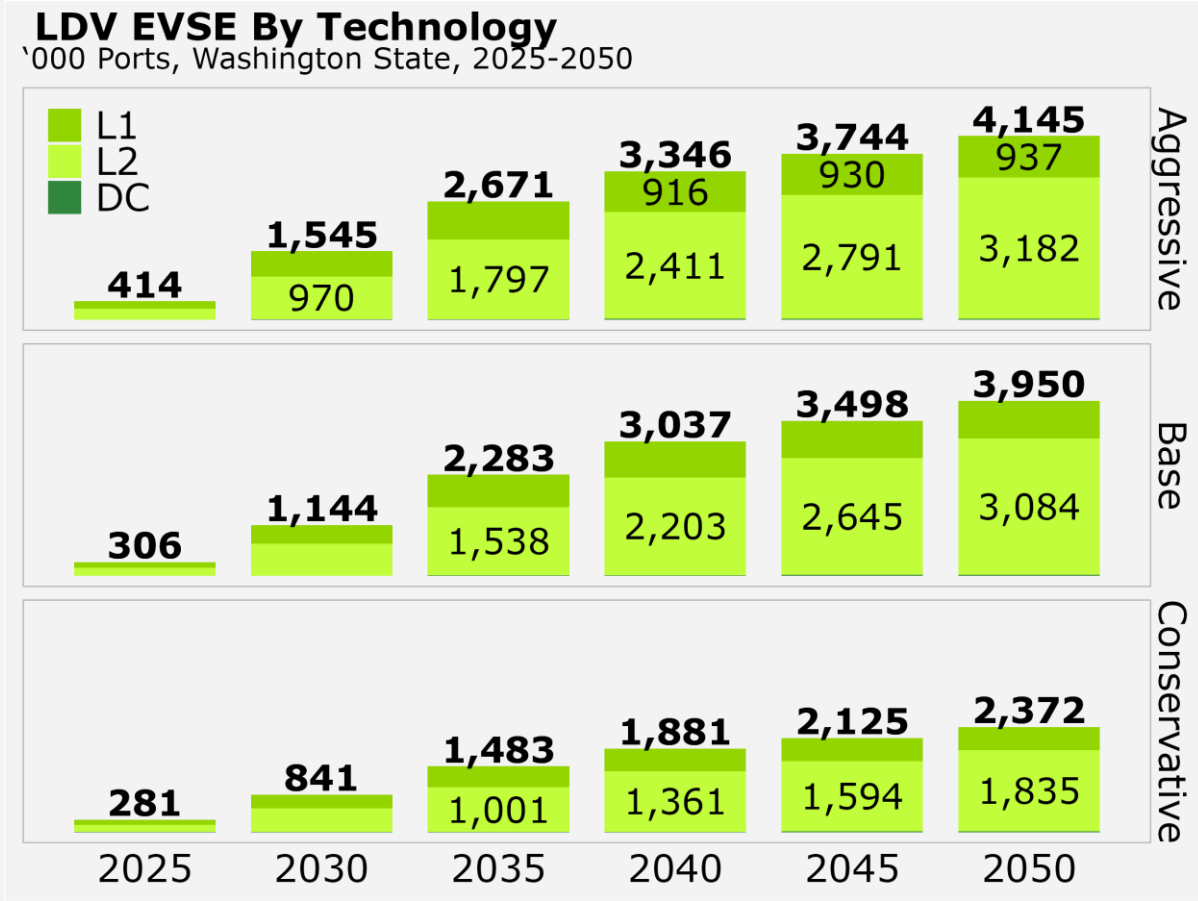
Washington State EVSE Needs Forecast Results

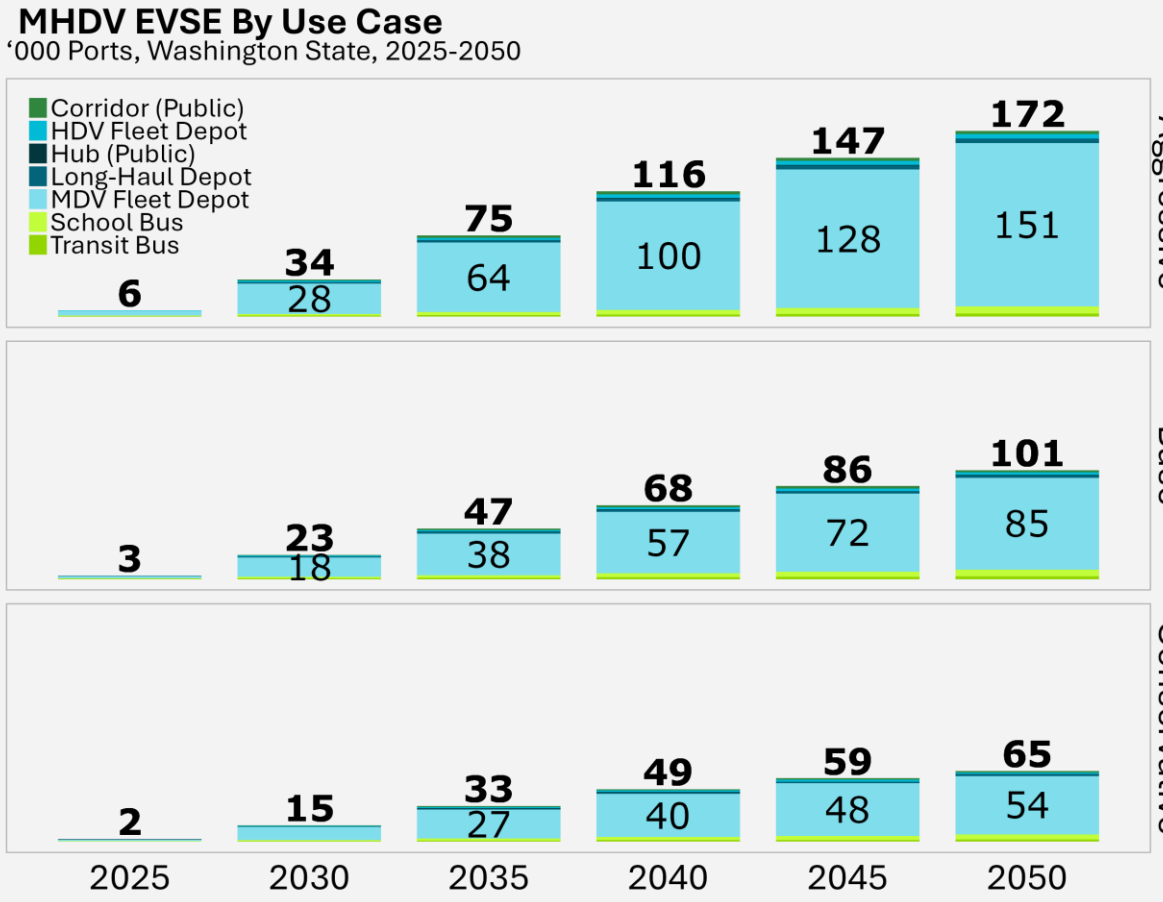
VEHICLE ELECTRIFICATION

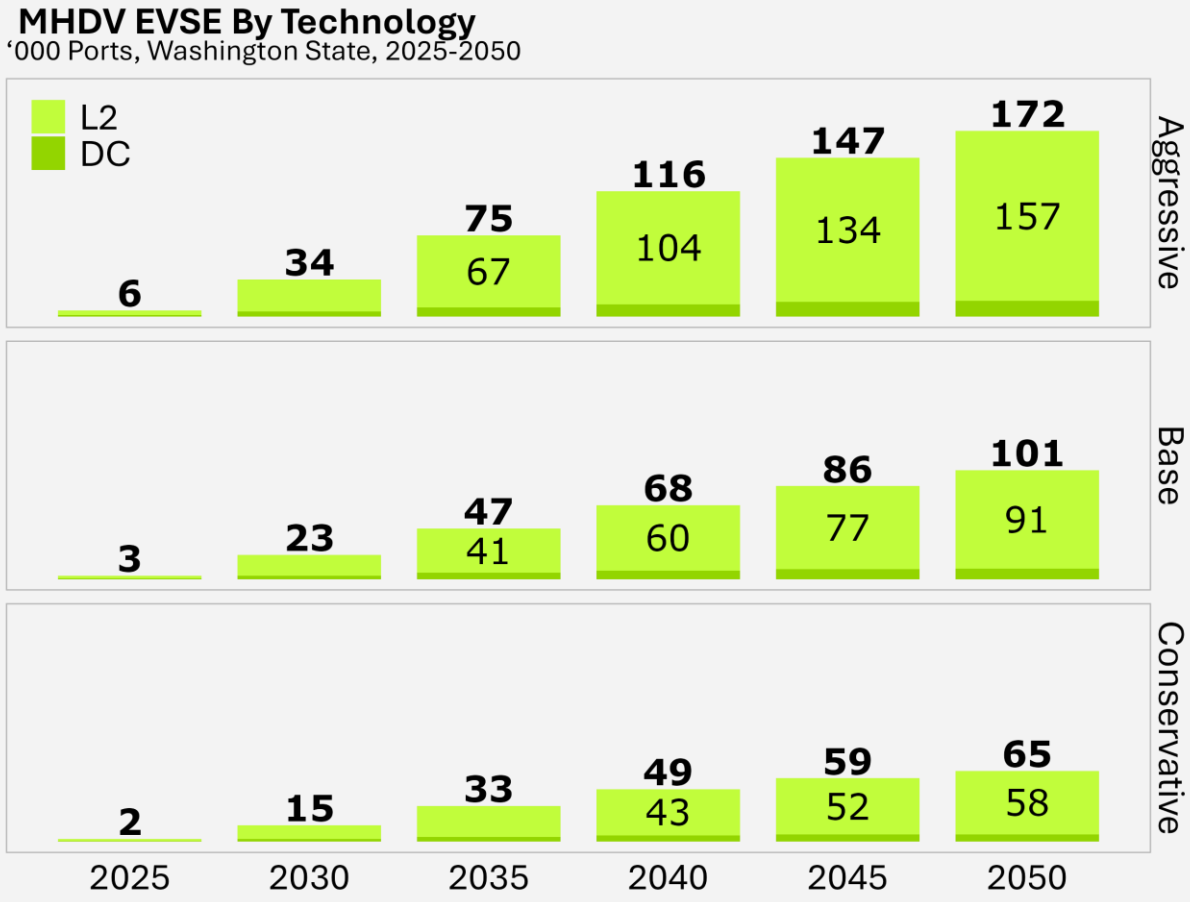
LDV port counts follow adoption trends



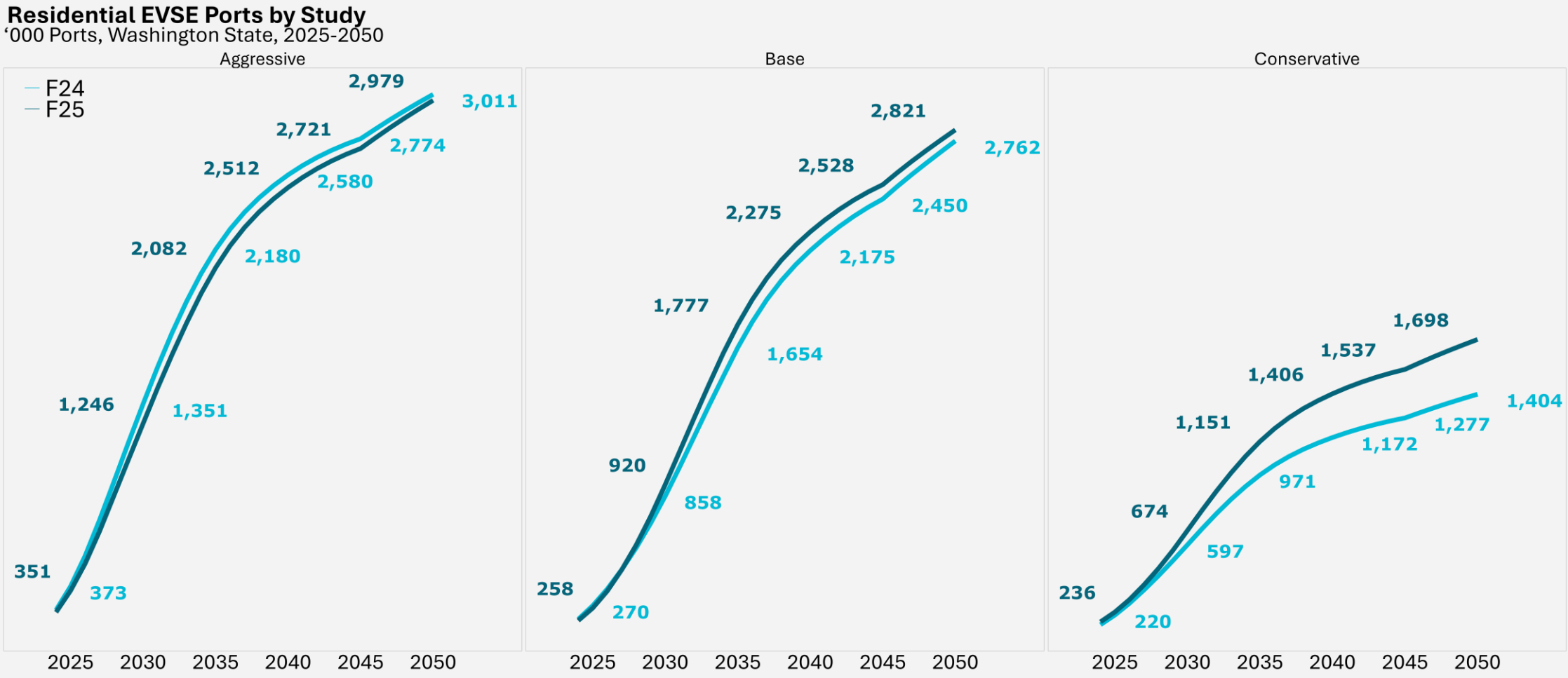


MHDV port counts follow adoption trends



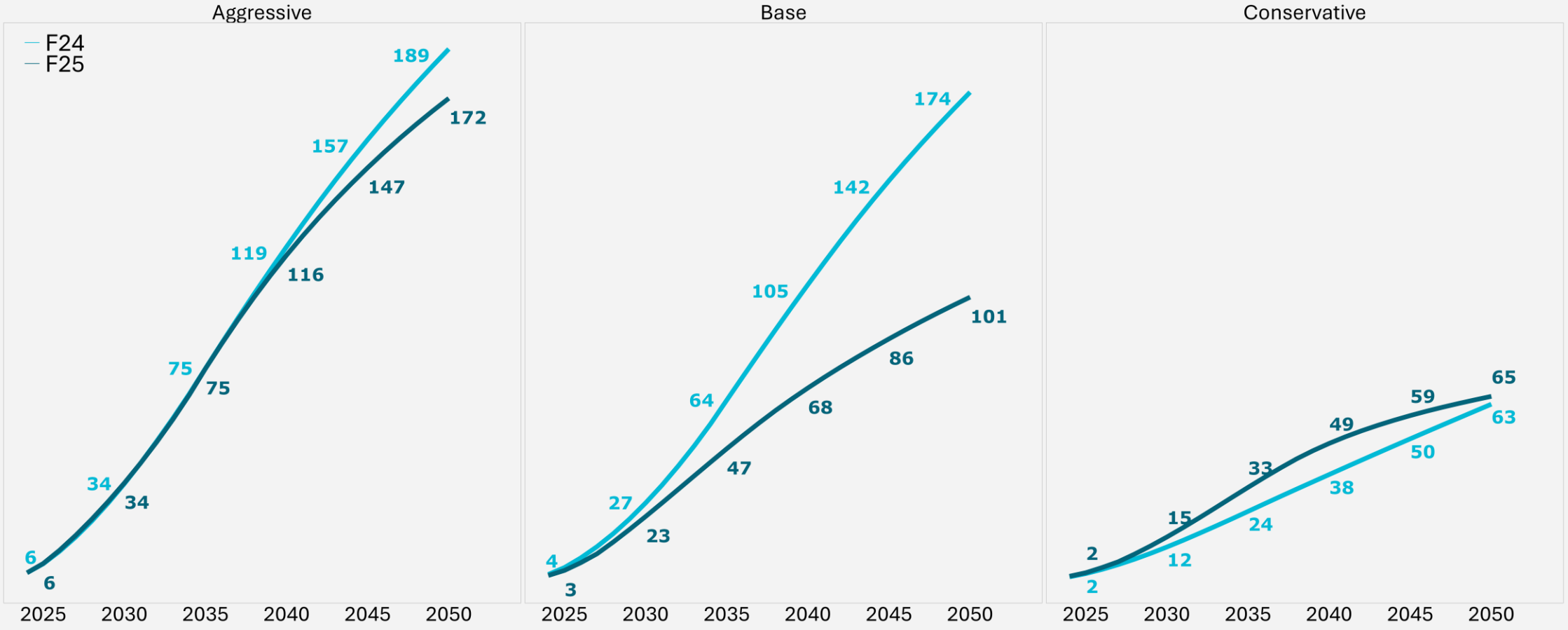


F25 LDV ports similar to F24 figures



F25 MHDV port count lower due to port sharing

MHDV EVSE Ports by Study
'000 Ports, Washington State, 2025-2050



Next steps

PUGET SOUND ENERGY

Upcoming activities

Date	Activity
June 24, 2025	RPAG meeting
June 25, 2025	Feedback form for this meeting closes
July 29, 2025	RPAG meeting

PUGET SOUND ENERGY

Contact us

- Via email at isp@pse.com
- Via feedback form at: https://www.cleanenergyplan.pse.com/contact
- Leave us a voicemail at 425-818-2051
- Subscribe to our email list
- Visit our website: cleanenergyplan.pse.com

PUGET SOUND ENERGY

Public comment opportunity

PUGET SOUND ENERGY

How to participate in the public comment opportunity

- Please use the “raise hand” if you would like to provide comment
- Each speaker will have up to **3 minutes** to give comments
- Comments should relate to **today’s meeting topics**
- Please keep remarks respectful – no personal attacks
- Comments and questions will be included in the feedback report
- You are welcome and encouraged to send written feedback to isp@pse.com

PUGET SOUND ENERGY

Thanks for joining us!

PUGET SOUND ENERGY

Appendix

PUGET SOUND ENERGY

F24 Scenario Definitions

Drivers	Description	Low Scenario	Base Scenario	High Scenario
Incentives	Dollar per EV tax incentive ($)	Any existing and planned **incentives discontinued**	**Currently existing and planned** incentive policies	**Additional "cash on the hood" incentive** per vehicle covering 50% of incremental cost of EV over ICEV[1]
Vehicle Cost	EV MSRP ($)	**15% higher EV MSRP** vs. base forecast (leading to increased EV operating costs)	**Base EV MSRP** forecast - GHI	**15% lower EV MSRP** vs. base forecast (leading to decreased EV operating costs)
Fuel Prices	Gasoline and diesel prices ($ per gallon)	**25% lower gasoline and diesel prices** vs. base (leading to decreased operating ICEV costs)	**AAA average base** assumption, adjusted for inflation	**75% higher gasoline and diesel prices** vs. base (leading to increased operating ICEV costs)
Consumer Awareness & Acceptance	Marketing & outreach impacting customer familiarity (i.e., awareness, acceptance)	**1/3 lower consumer awareness and acceptance** vs. base (leading to decreased EV adoption)	**Base assumption**, calibrated to Washington's historical consumer awareness metrics - GHI	**1/3 higher consumer awareness and acceptance** vs. base (leading to increased EV adoption)[1]
Regulations	Policies regulating ICEVs and EVs	**Policy overturned or not met**	**Adoption consistent with relevant regulatory rules**, including Advanced Clean Cars II and Advance Clean Trucks	**Adoption consistent with relevant regulatory rules**, including Advanced Clean Cars II and Advance Clean Trucks

[1]Incentives and Consumer Awareness and Acceptance drivers will be adjusted to achieve regulatory targets per Regulations driver requirement.

Additional Forecast Options

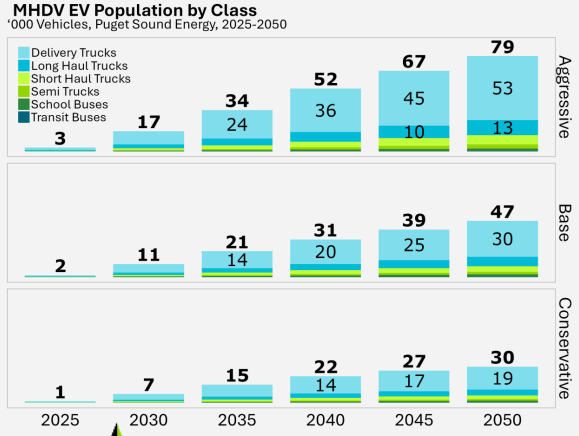
- Charger Accessibility: Lower residential charging/higher public charging
- Fleet Charging: Primarily depot charging/corridor charging

Key Takeaways

Policy is a major driver of EV adoption, infrastructure, and impacts

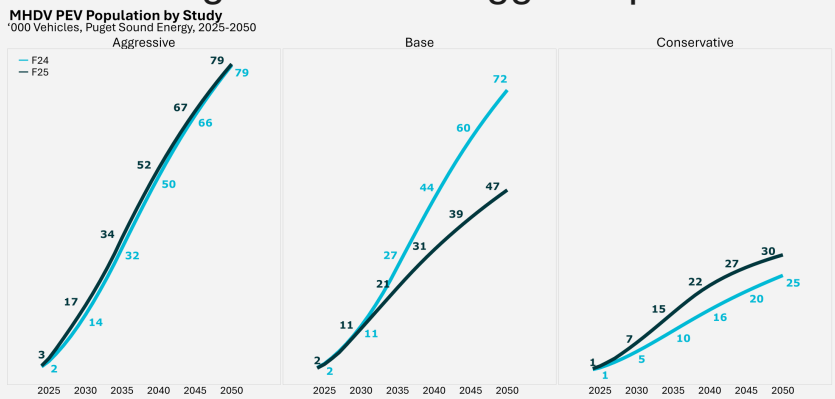
Adoption

- Scenario parameters increased MHD BEVs by **68% in aggressive scenario** and decreased by 36**% in conservative scenario**
- The aggressive scenario pushed up adoption of **electric semis**, while the conservative scenario had fewer **delivery truck** BEVs.



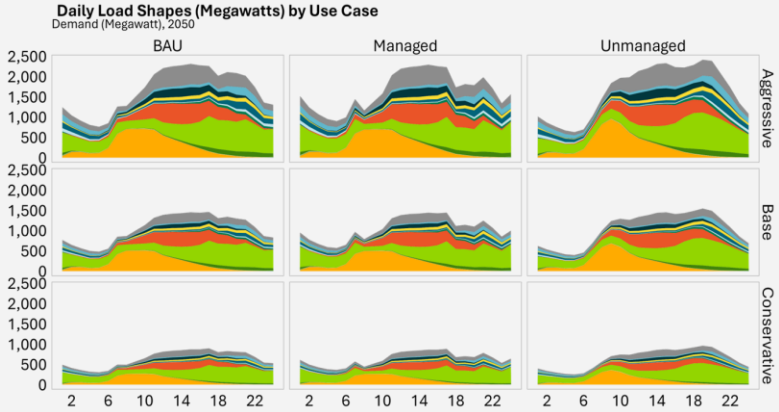
EVSE

- Big **decrease** in MHDV EVSE in conservative scenario – due to fewer **delivery trucks** that have a **1:1 vehicle to charger ratio**.
- **Similar port count** in base and conservative scenarios, but **big difference in impacts** – since electric semis have higher vehicle to charger ratio and bigger impacts.



Impacts

- Managed charging **flattens load** from SUD impacts and pushes peak to middle of day.
- For unmanaged charging scenario, aggressive scenario has **56% higher peak** demand due to additional **corridor** and **market** charging in middle of day.



Acronyms

Acronym	Meaning
ACC/ACC II	Advanced Clean Cars policy
BEV	Battery electric vehicle
EREV	Extended-range electric vehicle
EV	Electric vehicle
ICE	Internal combustion engine
IIJA	Infrastructure Investment and Jobs Act
IRA	Inflation Reduction Act
LDV	Light duty vehicle
MHDV	Medium and heavy-duty vehicle
MSRP	Manufacturers suggested retail price
MW	Megawatt
NREL	National Renewable Energy Laboratory
OEM	Original equipment manufacturer
PEV	Plug-in electric vehicle
VAST	Vehicle Analytics & Simulation Tool
VMT	Vehicle miles traveled
ZEV	Zero emissions vehicle

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