

Economic Impacts of Plug-in Electric Vehicles (PEVs)

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Members of the Pacific Northwest Transportation Electrification Collaborative (PNW Collaborative) joined together and sponsored an in-depth study, performed by Energy and Environmental Economics (E3), to gain a better understanding of the potential economic benefits of plug-in electric vehicle (PEV) adoption. The study, finalized in March 2017, examined benefits to the utility system as well as broader regional benefits and environmental benefits.

The study used the most up-to-date information possible and publicly available forecasts of trends in energy and vehicle prices. Overall, the study found that the region (Washington and Oregon) would benefit from transportation electrification through lower overall spending on energy and reduced greenhouse gas emissions.

This study considered the impacts of PEV adoption over a 20-year horizon, addressing the costs and benefits of PEVs sold from 2017 to 2036 in Washington and Oregon. The study considered multiple electric vehicle segments, including personal light-duty vehicles, taxi and transportation network company (TNC) vehicles, forklifts, buses and parcel delivery trucks.

Given that the future is uncertain, the PNW Collaborative made sure that the study’s findings would be consistent, so the group tested the sensitivities of the results across a broad range of projections and assumptions.

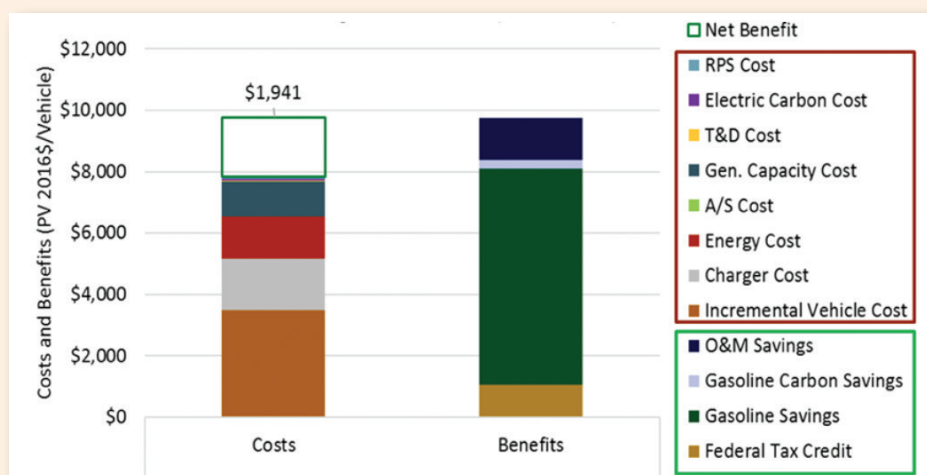
Costs and benefits of PEV adoption were measured from two perspectives, the Regional Perspective, which considers costs and benefits across a broad set of stakeholders, and the Ratepayer perspective, which only considers the costs and benefits from the perspective of utility ratepayers. Typically, the costs of EV adoption (such as higher vehicle costs and charger costs) are incurred in the short-term, and the benefits (lower spending on gasoline) accrue over the longer term.

Regional Perspective

The Regional Perspective considers the benefits flowing in and out of the region due to PEV adoption. This test answers the question: is EV adoption economically advantageous for the region?

This includes costs incurred by utilities to serve added load, incremental vehicle costs over a conventional vehicle and the costs of charging infrastructure. The benefits include federal PEV incentives, avoided gasoline, carbon and operating and maintenance costs for vehicles.

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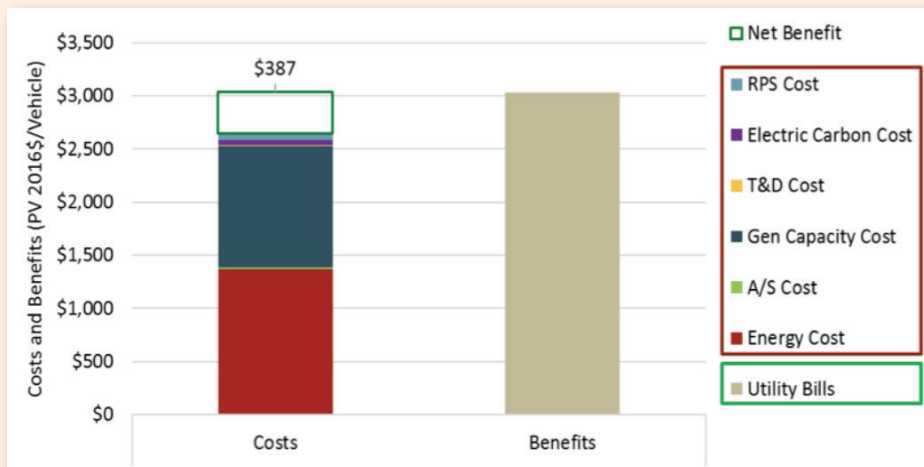
For Washington and Oregon, PEV adoption provides a Regional Net Benefit of \$1,942 per PEV on average.

Ratepayer Perspective

The Ratepayer Perspective considers the impact of PEV adoption on all electric utility customers. It compares the utility's cost of serving PEV charging load with the revenue from charging PEVs. The difference between these costs and benefits is the Ratepayer Net Benefit. This net benefit can be applied to reduce rate pressures, invest in programs to support PEV adoption or make other investments.

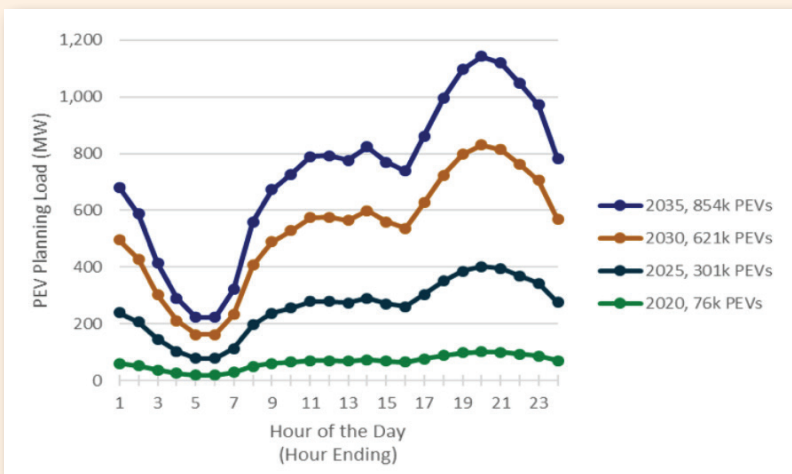
For Washington and Oregon, PEV adoption provides a \$387 Ratepayer Net Benefits per PEV on average. The total Ratepayer Net Benefit is projected to be \$278 million. Importantly though, Ratepayer Net

Benefits vary significantly by utility and vehicle types. For instance, one utility was projected to have negative net benefits but sees broader regional benefits in supporting PEV adoption.



Potential Value of Managed Charging

PEV drivers are generally expected to begin charging once they return home in the evening. Shifting these electric loads away from these periods of very high system demand can significantly lower the costs of serving PEV charging. A number of options can be pursued for managing charging away from utility peaks,



including time varying rates and direct management of electric usage. Illustrating this impact is this graph of future planning loads for a typical weekday attributable to PEV adoption as electrical loads increase between 2020 and 2035.

Next Steps

The participating utilities are publishing these regional results to assist all the region in understanding regional costs and benefits of transportation electrification. Some participating utilities are also studying the

impacts on their specific service territories. The PNW Collaborative hopes that these efforts inform utility development of programs supporting transportation electrification in their respective service territory. While each utility may, and should, offer programs that best fit the needs of their customers.

More broadly, the PNW Collaborative is working actively together to share knowledge and experience in supporting transportation electrification, both among the members as well as utilities nationally. Collaboration among utilities will help the members examine emerging issues, evaluate potential opportunities, synchronize efforts across utility service areas and create a cohesive regional approach and provide the greatest benefits to our customers.