Clean & Prosperous Washington

Low Carbon Prosperity Institute

CHARGING INFRASTRUCTURE

Preliminary Needs Assessment

PROJECT BACKGROUND

STATE ENERGY STRATEGY FORECAST

1 MILLION EVS BY 2030

2.3 MILLION EVS BY 2035

Some level of EV uptake will occur without expanded public charging infrastructure, but the overall pace and breadth of EV uptake will be limited without a reliable and distributed public charging network. Charging infrastructure needs assessments have recently been completed in California and Oregon,[6] while Washington is requiring modeling of the state's infrastructure needs to facilitate EV uptake. The State Energy Strategy forecasts that meeting GHG emissions limits will require light-duty vehicles (LDVs) to reach one million EVs by 2030 and over 2 million EVs by 2035. Early retirement of existing vehicles, transitioning to EVs, could help meet the GHG emissions limits at lower cost by decreasing the need for imported synthetic fuels to fuel existing cars at typical rates of vehicle stock turnover.

Washington's Legislature has recently taken several actions regarding EV charging, including EV charging requirements for parking spots in new buildings and standardizing charging session rates based only on the electricity used.[7] Washington has recently joined California in Zero-Emissions Vehicle (ZEV) and Advanced Clean Truck regulations. Charging infrastructure support and vehicle incentive programs lag behind those offered in California.

PROJECT DESCRIPTION

For charging infrastructure, we evaluate long-term infrastructure needs for on-road vehicle electrification. This includes a target of 2.3 million LDVs on the road by 2035 and a 50% electrification of the medium- and heavy-duty fleet (MHDV). While infrastructure needs and the relative importance of establishing infrastructure to spur additional uptake are uncertain, there are some projections of both needs and costs. Examples of average charging infrastructure costs for MHDV range from around $20,000 to $100,000 per vehicle.[8,9,10] There is wide variability depending on the use-case, grid access, grid capacity, and other case-specific considerations. According to MJ Bradley & Associates research, the current MHDV fleet in Washington includes over 45,000 Class 7-8 trucks, over 210,000 Class 3-8 buses and trucks, and over 280,000 class 2b heavy-duty pickups and vans that travel over 8.5 billion annual miles and consume nearly 900 million gallons of fuel. Electrifying half of this fleet would total roughly 270,000 vehicles of varying classes with varying infrastructure needs.

For LDVs, Oregon and California have released EV Charging Infrastructure needs assessments, each evaluating at least 1 million EVs on the road. These assessments come to different conclusions about the relative mix of Level 2 (greater in the California assessment) versus direct-current fast-charging (DCFC; greater in the Oregon assessment). The needs range from one Level 2 public charger for every 7 to 20 vehicles and from one fast-charger for every 70 to 200 vehicles. Estimated public charging installation costs range from $650 per kW of capacity[11] –with limited opportunities to decrease this cost–to $1,332/kW for Level 2 chargers or $2,000/kW for fast-charging.[12] Combining this range of public infrastructure needs and installation costs indicates an average per-vehicle cost of between $500 and $1,800.

RESULTS

For MHDV, the wide-range of infrastructure cost estimates lead to a similarly wide-range of combined investment needs for facilitating 50% electrification. With costs ranging from as little as $5,000 per vehicle (L2 charging for class 2b trucks and vans) to $100,000 per vehicle (high-cost DCFC for class 7-8 trucks), the combined investment needs are $1.8 billion to $9.2 billion. These infrastructure needs are already integrated into our drayage truck and motor coach case studies.

Estimated LDV public charging investment needs

$1.1 BILLION to $4.2 BILLION BY 2035

For LDVs, a market of 1 million electric LDVs by 2030 and 2.3 million by 2035 translates to total charging infrastructure investment of $500 million to $1.8 billion through 2030, and another $600 million to $2.4 billion from 2031 to 2035. Therefore, LDV public charging investment needs beyond those captured in our passenger vehicle case study are estimated at $1.1 billion to $4.2 billion by 2035.

DISCUSSION

With EV infrastructure needs growing into the billions of dollars before the end of this decade, the investment distribution among private, federal, utility, or state sources remains highly uncertain. This allocation consideration should be informed by the infrastructure needs modeling approved by the Washington state legislature in 2021 and will be influenced by Federal decisions including infrastructure and climate-focused packages.

In California, the latest EV charging infrastructure related $1.4 billion, 3-year implementation plan calls largely upon general funding sources, front-loads spending, and prioritizes MHDV charging infrastructure.[13] The California electric vehicle infrastructure project (CALeVIP) has collected installation cost data for both Level 2 and DCFC charging connections, covering a small portion of statewide connections.[14] For those that CALeVIP has covered, about 45% of Level 2 installation costs and about 66% of the DCFC installation costs have been covered by rebates.

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[6] *Oregon's Transportation Electrification Infrastructure Needs Assessment (t.ly/pizM) and California's Electric Vehicle Charging Infrastructure Assessment - AB 2127 (t.ly/OMOf)*

[7] *Mui, S., & Long, N. (2021, May 3). Setting the stage for an EV future in Washington State. NRDC. t.ly/hqCw*

[8] *Lowell, D., Saha, A., Freeman, M., MacNair, D., Seamonds, D., & Langlois, T. (2021). Clean Trucks Analysis: Costs & Benefits of State-Level Policies to Require No- and Low-Emission Trucks. MJ Bradley and Associates. t.ly/fGfi*

[9] *California electric vehicle infrastructure project (CALeVIP) cost data. (2021). California Energy Commission. t.ly/uuFj*

[10] *Table 18. Appendix H Draft Advanced Clean Trucks Total Cost of Ownership Discussion Document. (2019). California Air Resources Board. t.ly/JDQW*

[11] *Lowell, D., Saha, A., Freeman, M., MacNair, D., Seamonds, D., & Langlois, T. (2021). Clean Trucks Analysis: Costs & Benefits of State-Level Policies to Require No- and Low-Emission Trucks. MJ Bradley and Associates. t.ly/fGfi*

[12] *Alexander, M., Crisostomo, N., Krell, W., Lu, J., & Ramesh, R. (2021). Electric vehicle charging infrastructure assessment - AB 2127. California Energy Commission. t.ly/MbOq*

[13] *t.ly/CTE3*

[14] *CALeVIP DC Fast Chargers Data (t.ly/zkZY) and CaleVIP Level 2 charger data (t.ly/iFhJ).*