



CALIFORNIA STATEWIDE PLUG-IN ELECTRIC VEHICLE INFRASTRUCTURE ASSESSMENT

A CALIFORNIA ENERGY COMMISSION REPORT

PREPARED BY THE NATIONAL RENEWABLE ENERGY LABORATORY

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Background

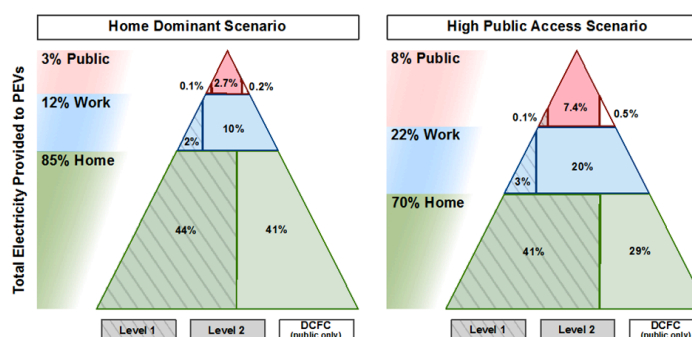
In 2012, Governor Brown established the goal of 1.5 million zero-emission vehicles (ZEVs) on California roadways by 2025. Shifting California's vehicle fleet to ZEVs, which includes plug-in electric vehicles (PEVs), is needed to help reduce greenhouse gas pollution, improve air quality, and reduce petroleum consumption. As more PEVs are deployed, PEV infrastructure expansion is needed to achieve adequate home, workplace, and public charging capability for consumers and their vehicles.

Statewide PEV Infrastructure Assessment: Scenarios to Meet the ZEV Goals

While information on current technology and market trends may be sufficient to support PEV infrastructure planning at the local and regional levels, infrastructure expansion trends at the corridor, statewide, and interstate levels are more uncertain due to a lack of data reflecting both a broad consumer base and long-term technology trends.

This assessment therefore employs a scenario analysis approach to projecting future electric vehicle supply equipment (EVSE) requirements. Two quantitative scenarios are used as a starting point, to illustrate the nature of EVSE expansion necessary to meet California's goal of 1.5 million ZEVs by 2025.

Scenarios Analyzed:



Home Dominant Scenario: While both scenarios assume most PEV charging occurs at home, this scenario assumes that 85 percent of the electricity needed for PEV drivers is provided at home, compared to 70 percent in the "high public access" scenario. Workplace and public charging provide 15 percent of PEV electricity.

High Public Access Scenario: This scenario assumes that 1) future PEV drivers place a higher premium on workplace and public charging, with 30 percent of electricity for PEV drivers provided outside the home, and that 2) EVSE installers and suppliers receive significant benefits from installing EVSE stations.

The National Renewable Energy Laboratory (NREL) Estimates Between 124,000 and 215,000 Workplace and Public Setting Charge Points and Between 550 and 1,550 Fast Charge Points Are Needed Statewide by 2020

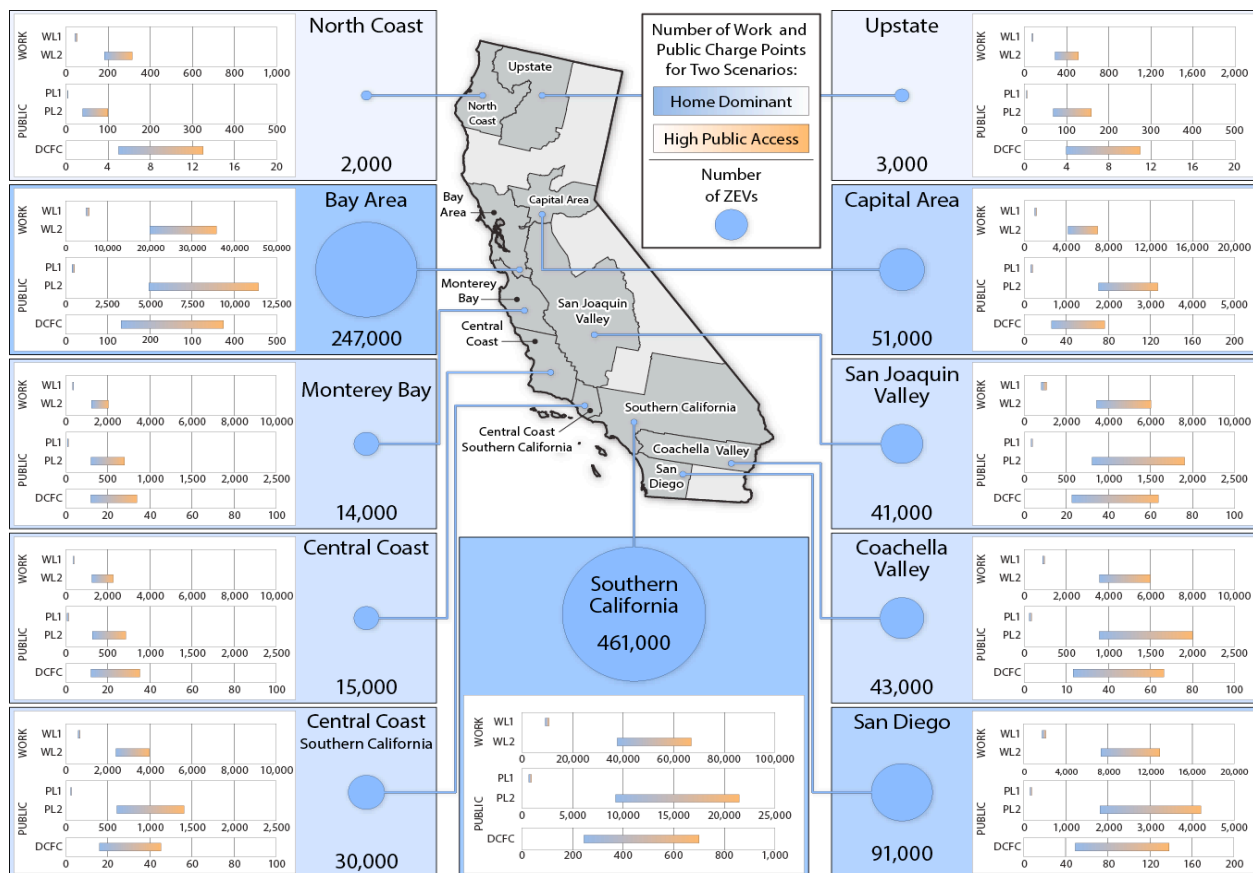
NREL estimates the bookends of EVSE deployment necessary to support California's PEV fleet as it grows to meet the ZEV goal by 2025. The table below summarizes the range of charge points that may be needed statewide by 2020.

| Total Statewide EVSE Charge Points by Location and Type (2020) | | | | | | | |
|--|---------|---------|---------|---------|-----------|-----------|-------|
| Scenario | L1 Home | L2 Home | L1 Work | L2 Work | L1 Public | L2 Public | DCFC |
| Home Dominant | 511,000 | 365,000 | 20,100 | 82,000 | 1,620 | 20,100 | 551 |
| High Public Access | 517,000 | 289,000 | 22,900 | 144,000 | 2,100 | 46,500 | 1,550 |

Source: NREL

Estimates of the total EVSE charge points needed by type and location for each California planning region are also quantified, as shown in the following figure:

Estimated Workplace and Public EVSE Stations by Region (2020)



Source: NREL

Additional Data Needed to Further Support Analytical Tools and Planning

The need for additional data and experience is a recurring theme. While the scenario approach of this assessment provides a way of improving the analytical basis of EVSE planning, additional empirical and statistical data are needed to further refine and calibrate efforts. Key data needs include:

- **Trends in EVSE product and network development**, to better inform decision-making on the best locations to install different types of EVSE and enable efficient use of capital.
- **Trends in usage of and demand for Level 1 EVSE (standard electricity connections used in homes) and Level 2 EVSE (higher-power connections that charge vehicles more quickly) in workplace and public settings**, to evaluate investment tradeoffs between charging levels and locations, depending on local objectives.
- **Trends in usage of and demand for direct current fast charge (DCFC) stations that can charge a vehicle fully in about 30 minutes**, to better understand the need and best location for additional fast chargers in the State that will increase range confidence and PEV adoption.
- **Customer payment methods used, prices, and associated customer response**, to help develop predictive EVSE demand models for planning.

Moving Forward: Additional Data Will Be Gathered to Help Prioritize Key Locations for EVSE

This assessment is a flexible and evolving document that reflects the Energy Commission's engagement in the early phases of long-term infrastructure planning. NREL anticipates incorporating new data and lessons learned to update this assessment so that it continues to serve as a current and relevant actionable and adaptive statewide plan.

For more information:

- Access the full NREL report:
<http://www.energy.ca.gov/2013-ALT-01/documents/>
- *ZEV Action Plan: A Roadmap Toward 1.5 Million Zero-Emission Vehicles on California Roadways by 2025* (March 2013):
[http://opr.ca.gov/docs/Governor's_Office_ZEV_Action_Plan_\(02-13\).pdf](http://opr.ca.gov/docs/Governor's_Office_ZEV_Action_Plan_(02-13).pdf)
- Regional PEV Infrastructure Plans:
<http://www.energy.ca.gov/2013-ALT-01/documents/>