

Leveraging Renewable Energy

Background

One motivating factor for PEV adoption is the desire to reduce the volume of greenhouse gas emissions created by conventional gasoline-powered vehicles. While fully electric BEVs produce no tailpipe emissions, there is concern that vehicle charging could increase emissions related to generating electricity from nonrenewable sources. In California, however, utilities have a renewable energy portfolio mandate to increase procurement of energy from renewable resources to 33% of total procurement by 2020. Despite this policy, it is difficult for local PEV drivers to know exactly what type of energy source is charging their vehicle.⁴² One method of overcoming this situation is for PEV drivers to install and charge with a residential solar photovoltaic (PV) system.

Key Issues

Charging Plug-in Electric Vehicles with Residential Solar Systems

Electric vehicles and PV systems are compatible and complementary technologies. While charging a PEV will add an additional electrical load to a driver's residence, a PV system can produce up to 100% of the power required for all household appliances and the vehicle. This will depend on certain variables including how much drivers charge their vehicle each day, the efficiency of the car and the size (wattage) of the PV system. As a long-term investment, PEV drivers with larger solar electric systems, sized to meet their household needs and charge the PEV, can be considerably more cost-effective than continuously buying electricity from a utility provider. After the system has paid itself off, the cost of powering a PEV becomes minimal.

Solar-EV households also can take advantage of special time-of-use (TOU) utility rates. They are usually the best choice for PEV owners because they offer very low electricity prices at night when PEVs are normally charged. On the other hand, TOU rates are significantly higher during the day. A solar electric system helps offset the higher-priced electricity consumed by the household during peak hours. In this way, homeowners can take advantage of inexpensive electricity at night and generate their own energy during the day when TOU rates are higher.

⁴² *San Joaquin Valley Utilities' Electricity Sources* in the Appendix shows in-depth information about SJV utilities' renewable energy portfolios.

Regional Landscape: Solar and Plug-in Electric Vehicle Adoption Rates

According to market research by Sunible, a California solar installer, the cities of Bakersfield, Fresno and Clovis are among the top ten solar adopters in the state. These top solar cities are also the top adopters of electric vehicles in the San Joaquin Valley.⁴³ In fact, 36% of PEV owners in the Valley have a residential solar system installed at their homes, according to the [California Plug-in Electric Vehicle Driver Survey Results](#) (February 2014). More than half of these solar and PEV owners have sized their PV systems for their EV load.

Overall, the rate of solar adoption is higher than the rate of PEV adoption in the San Joaquin Valley. In the City of Clovis, for example, 4.6% of households have installed solar panels whereas only 0.25% of Clovis households are PEV owners. The data imply that many Valley residents are solar adopters or likely to have a positive view of solar. Effective PEV outreach strategies to solar adopters could spur PEV growth in the region.

Detailed statistics on regional solar and PEV adoption rates are found in the Appendix: *Regional Residential Solar and Plug-in Electric Vehicle Adoption*.

Case Study: Manteca Unified School District

The Manteca Unified School District (MUSD) has pursued a solar project that allows for electric vehicle charging. In September 2013, MUSD's \$30 million solar energy project went online after a year of planning.

The project installed solar panels at 26 sites in the district expects to produce 6,720 MWh (6.72 million kWh) per year. In all, the district and expects to reduce their electricity bill by more than 60%.

Students will track the energy savings and renewable energy usage, and classroom studies will emphasize the energy technologies.

Solar panels at the school district offices, as well as at the Environmental Studies Center (photo on next page), will also power PEV charging equipment. Electric vehicle charging will be available directly from the solar power generated during on-peak daylight hours and at night, during off-peak hours, by energy stored on site.

Funding for this project came from an ultralow interest (less than 1%) Qualified Zone Academy Bond (QZAB).

Read more about Manteca Unified School District in the Appendix.

⁴³ This uses rebate information from both the California Solar Initiative and the California Clean Vehicle Rebate Project. Number of rebate applications act as a proxy for number of solar and PEV adopters.

Recommendations

There are several ways for local governments, businesses and residents to leverage renewable energy for charging electric vehicles.

1. Renewable energy generation and storage technologies should be encouraged in incentive programs for electric vehicles.
2. When installing renewable energy projects, such as larger commercial solar projects, add the necessary prewiring required for future PEV charging.
3. Incentivize battery storage projects to spur investment and growth.

