

SACOG PEV Readiness Project

UC Davis proposal

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TASK 4 PEV CHARGING INFRASTRUCTURE PLANNING

TASK 4.1 PEV Charging Infrastructure Plan Development

The goal of this task is to submit a report based upon, but not limited to, data and consultation from subject experts and planners, including the U.C. Davis Plug-in Hybrid & Electric Vehicle Research Center, on the most favorable types of public charging locations in our region. The report will include a map of known existing public charging infrastructure and recommendations for future sites. The report also will assess the PEV charging infrastructure needs of multi-unit dwellings, workplaces and fleets.

UC Davis has done some preliminary analysis on public charging for Sacramento and will use this opportunity to improve the analysis and provide more integrated answers and answers over time. By examining the travel patterns of 46 GPS tracked vehicles in Sacramento households, a preliminary examination of fast charging has been done (Figure 1).

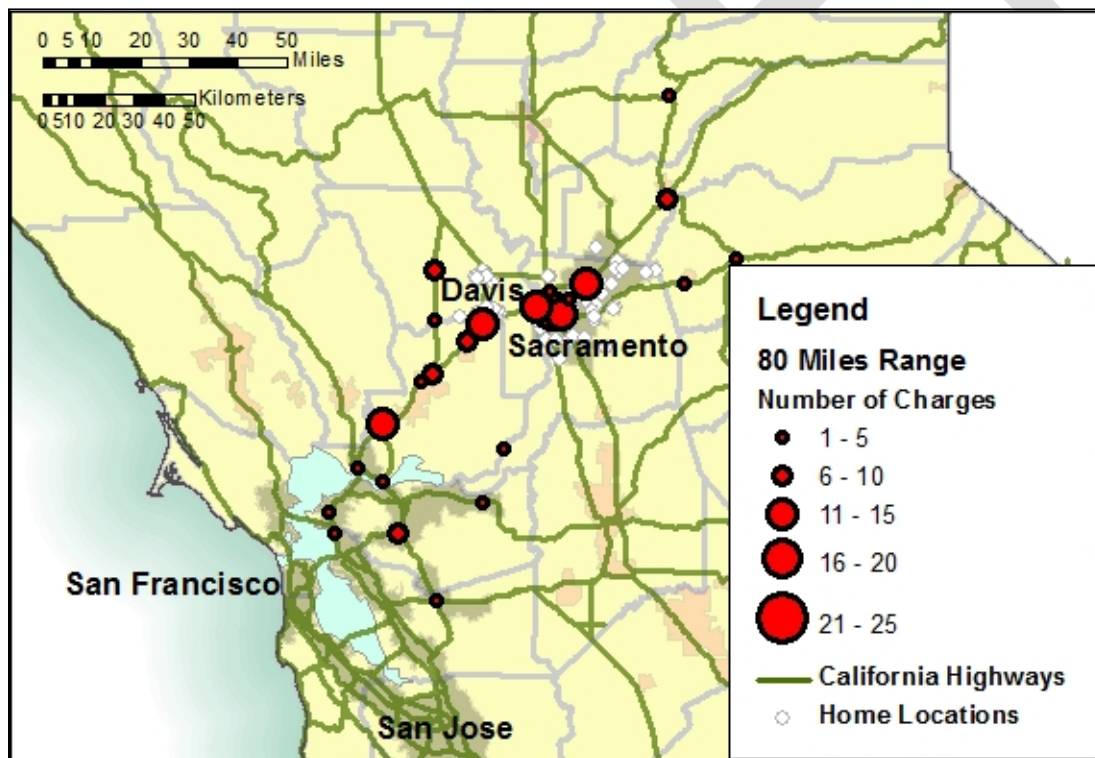


Figure 1 Fast chargers needed for EVs with 80 miles range based upon travel patterns from GPS tracked Sacramento Area households.

Using the patterns from gasoline vehicles, we can posit the need for charging based on when a battery electric vehicle (BEV) would run low on charge. However, this analysis for Sacramento can be improved with greater sample size and a greater scope of analysis. For example, for fast

charging, much of the demand will come from outside the Sacramento area. By including these travelers, a more accurate representation of charging demand can be estimated. Level 1 and level 2 charging at work and in public are also a focus. How many more miles can workplace charging provide? What is the role of public level 2?

In addition to models UC Davis can also use recent survey results where over 1000 Leaf owners in California were surveyed about their charger preferences. An example of the Sacramento choices is shown in Figure 2.

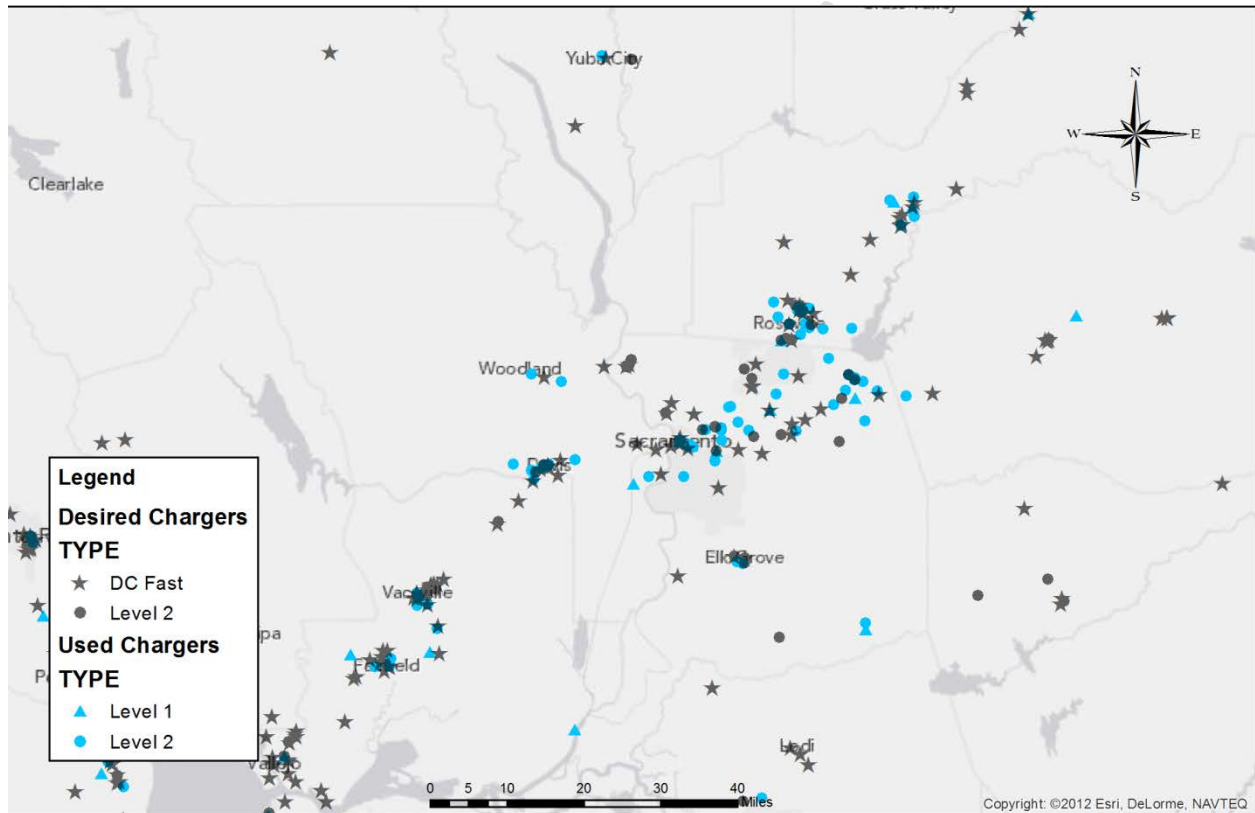


Figure 2 Charger choices in the Sacramento Region from a statewide survey

Using existing models combined with survey data and travel datasets a comprehensive look at charging in the Sacramento region can be assessed.

UC Davis shall:

Model the demand for level 1, level 2 and DC fast EVSE for the region. The result of this forecasting model will include the following parts:

1. A spatial forecasting model of households with higher propensity to purchase plug-in vehicle. We will use data on current PEV owners, hybrid owners, socio demographic data, and housing data to estimate the demand for current and future PEVs.

2. A demand model for work place charging based on commute trip data calibrated for household who are more likely to purchase the vehicles and for workplaces that are more likely to attracted PEV owners.
3. A DC fast charging forecast based on travel patterns of current drivers in the region and beyond, calibrated to represent future PEV owners.
4. A public location demand model based on the commuter data and on other trips that may need L2 charging. This model will focus on charging locations that may be needed for extending the usage of PEVs and generating Electric VMT and not on all the places PEVs may stop.

The analyses will utilize data collected by UC Davis PH&EV center and data available at SACOG to create a state of the art forecasting model of the demand for electricity for plug in vehicles that will allow for better planning of the electricity grid and the total demand. The results can also be used for estimating the impact of PEVs on local GHG and local emissions. The analysis will include thru traffic especially along Interstate 80, Interstate 5, Highway 99 and Highway 50 corridors in Sacramento County.

UC Davis will study charging behavior in different areas based on the EV projects to compare the impact of different methods to encourage PEV charging during “off peak” both at home and at public locations. We will focus on costs from two perspectives: the impact of time of use rates at hom (based on Sacramento Municipal Utility District data), and the cost and availability of charging at public locations.

Deliverables:

- Report on estimates of projected PEV deployment and public infrastructure needs for the region by census tract. The report will focus on the demand for both level 2 EVSE and the demand that can be met by 20amp 120v outlets or level 1 EVSE especially at the workplace.
- Report on different models of providing widespread networked EVSE.
- Identify sources for maps, websites and mobile apps of publicly accessible EVSE in Sacramento County.
- Report on methods to encourage PEV charging during “off peak” hours for electric utilities.

	Deliverable	Cost
1	Report on the demand (by time and location) for DC fast, level 2 EVSE and workplace charging based on travel models and EV user survey data	\$60,000
2	Report on different business models of providing widespread networked EVSE. Identify pros and cons for businesses and	\$15,000

	consumers.	
3	Identify charging information sources and gaps including map websites and mobile apps. Suggest a framework for information dissemination.	\$10,000
4	Report on methods to encourage PEV charging during “off peak” hours and review of relevant research. Suggest preferred methods for the region.	\$15,000

References and related publications

[Nicholas, Michael; Gil Tal; Jamie Davies and Justin Woodjack. , DCFast as the Only Public Charging Option? Scenario Testing from GPS-Tracked Vehicles, accepted for presentation at the TRB 91st Annual Meeting \(January 22-26, 2012\) Washington DC.](#)

[Tal Gil; Nicholas M.; Woodjack J. "Plug-in Vehicles in California: Exploring the impact of Hybrid vehicle and solar panel" Presented at the Behavior, Energy and Climate Change \(BECC\) Conference November 12 –14, 2012 at Sacramento, CA.](#)

[Tal Gil; Nicholas M.; Woodjack J.; and D. Scrivano, “Who Is Buying Electric Cars in California? Exploring Household and Fleet Characteristics of New Plug- In Vehicle Owners” Accepted for presentation at the Transportation Research Record on August 1st ,2012.](#)

[Nicholas Michael; Tal G and Woodjack J “California Statewide Charging Survey: What do Drivers Want?” Accepted for presentation at the Transportation Research Record on August 1st ,2012.](#)

Tal Gil, Michael Nicholas, Justin Woodjack, and Thomas Turrentine., Consumer Viewpoints – Expectations Toward PEVs and Charging Options, Presented at the 2012 Plug-In Conference (July 23-26 2012) San-Antonio, Texas.

[Tal,Gil; MichaelNicholas; Who Wants and Who Can Buy a Plug-in Vehicle: Modeling the SpatialDemand for Plug-ins Vehicles among Different Areas in the San-Diego RegionCharging behavior. Presented at the EVS 26 Electric Vehicle Symposium\(May 6-9 2012\) Los-Angeles California](#)

[Michael Nicholas, Gil Tal, Justin Woodjack , and Thomas Turrentine., Fast Charging Network Dynamicsin California: Modeling Travel Diary Data and Surveys. Presented at the EVS 26Electric Vehicle Symposium \(May 6-9 2012\) Los-Angeles California](#)

[Woodjack Justin, Dahlia Garas, Andy Lentz, Tom Turrentine, Gil Tal and Michael Nicholas, \(Forthcoming\) Consumers’ Perceptions and Use of Electric Vehicle Range Changes over Time Through a Lifestyle Learning Process Transportation Research Record](#)

Gil Tal, Michael Nicholas (2011) Final Report: Implementation of Washington State Electric Vehicle Corridors: Analytic Support., Washington State Department of Commerce.

<http://www.electricdrive.wa.gov/>

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