California Energy Commission
Public Interest Energy Research (PIER) Program
TRANSPORTATION ENERGY RESEARCH

2010 Plug-In Hybrid and Electric Vehicle Research Center

Research Powers the Future
PIER Transportation Research
www.energy.ca.gov/research/transportation/

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Fact Sheet

The Issue

California is the second largest consumer of gasoline and diesel fuels in the world, surpassed only by the United States as a whole. According to the State Alternative Fuels Plan, Californians consume an estimated 20 billion gallons of gasoline and diesel fuel on state roadways annually, an increase of nearly 50 percent over the last 20 years. Lack of alternatives to conventional gasoline and diesel fuels continue this high demand, despite record petroleum prices.

Plug-in hybrid electric vehicles (PHEVs) and electric vehicles (EVs) are promising, and potentially revolutionary, keys to the success of the California economy and stabilization of its climate. By fueling the vehicle using grid electricity stored in on-board batteries, a PHEV's potential vehicle efficiency can reach 90 miles per gallon or more, about four times the efficiency of the average consumer vehicle today. EVs use no petroleum at all.

The implementation of PHEVs and EVs poses several important questions:

- How will the use of PHEVs and EVs affect electricity demand?
- Can consumer preferences be used to guide significant and sustainable PHEV and EV implementation?
- How will PHEV/EV adoption affect the use of renewable energy electricity sources, such as wind and solar power?

Photo credit: nissanusa.com/leaf-electric-car

- How will PHEVs and EVs integrate into the emerging smart grid system, and what role will they play?

Project Description

The Plug-In and Hybrid Electric Vehicle Research Center conducts research in:

- Battery second life applications.
- PH&EV/smart grid interactions.
- Consumer behavior.

Battery second life applications seek to decrease the first time cost of vehicle batteries while increasing the battery's lifetime value through secondary use as a storage device that can provide electricity as a peak demand reduction option. Use as a storage device would further enable the integration of renewable resources, such as wind and solar energy, into the smart grid system.

PH&EV/smart grid interaction will determine how PHEVs and EVs become part of the household energy system. The smart grid is expected to be the technology that will enable and connect optimal interactions among consumers, vehicles, and the

utilities. There are still many gaps in understanding these interactions that need to be resolved before an electric fuel system can successfully move forward.

Consumer behavior research initiatives include vehicle energy feedback systems that improve value, safety, and performance of vehicles for drivers as well as consumers' battery-charging behavior.

PIER Program Objectives and Anticipated Benefits for California

The Plug-In and Hybrid Electric Vehicle Research Center maximizes benefits to California electric ratepayers by advancing the research and development of battery second life applications for strategic utility services, which could establish the important and clear linkage between transportation electrification and utility ratepayer benefits. The PH&EV Center is further investigating developing the Household Energy Storage Appliance, a household user interface design that will provide smart grid control of PHEV and EV charging, and developing planning tools to help cities, utilities and regions design and implement recharging networks. By advancing PHEV and EV technology, the center will promote a cleaner and more efficient transportation sector in California.

Project Specifics

Contract Number: 500-09-041
Contractor: Institute of Transportation Studies – UC Davis
City/County: Davis, Yolo County
Assembly District: 8
Senate District: 5
Application: Statewide
Amount: $2,780,000
Term: June 2010 to June 2013

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