

# Study: Are plug-ins the next wave of hybrid vehicles?

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Is America ready for rechargeable cars? Teams of researchers at the University of Michigan and Pacific Northwest National Laboratory will explore this question and others with \$2 million from the U.S. Department of Energy's offices of Electricity Delivery and Energy Reliability and Energy Efficiency & Renewable Energy.

U-M's Michigan Memorial Phoenix Energy Institute will coordinate efforts among several university departments, industry partners such as General Motors Corp., Ford Motor Co. and DTE Energy, and PNNL. The study will explore facets of the future of plug-in hybrid electric vehicles (PHEVs).

The research will be conducted over two years, but a preliminary report will be available in January during the North American International Auto Show in Detroit.

During the study, researchers will explore:

- Americans' willingness to buy PHEVs.
- When, where and how the PHEV's battery would be recharged with grid power.
- How many PHEVs the current electricity grid could support and how mass adoption of them would influence the way the grid of the future is planned, built and operated.
- The greenhouse gas savings in trading tail-pipe for power plant emissions.

- The optimum design and features of plug-in hybrid vehicles.

"This program provides an outstanding opportunity to address the technical challenges as well as the social issues that will determine the viability of the plug-in hybrid electric vehicle," said Gary S. Was, director of the Michigan Memorial Phoenix Energy Institute and a nuclear engineering professor. "The interplay between the vehicle, the nation's electric utility grid and consumer attitudes and behaviors is a microcosm of the complexity of the world's energy problem."

"PNNL's original study on this topic revealed that for the nation as a whole, about 70 percent of the energy needed to operate cars, pickup trucks, vans and SUVs could be supported using generating and transmission capacity that's already available," said PNNL energy researcher Rob Pratt. "The new study allows us to take this one step further and say now that we know there's enough electricity, what other challenges, especially at the distribution level, do we need to address to make PHEVs a reality? We will also look at environmental and grid benefits that we can realize as PHEVs are adopted into the market place."

PHEVs are considered by some experts to be the next logical step in cleaner driving. They are similar to today's gas-powered electric hybrids in that both have a gas engine as well as an electric motor.

In today's hybrid electric vehicles, the gas engine does most of the heavy lifting and an electric motor kicks in to assist during acceleration or to move the vehicle during stop-and-go low-speed driving. The battery that provides electric power can only move the car a short distance and is charged by switching the electric motor to act as a generator during braking.

Conversely, in PHEVs, a larger battery is charged by plugging the car in

to a standard household outlet. The electric motor can then propel the car a much longer distance without using any gasoline, until the battery runs low and it reverts to standard hybrid electric vehicles operation.

As part of this study, U-M will utilize its unique expertise in behavioral analysis and consumer choice modeling currently applied for publishing the widely-cited national consumer confidence index. A consumer survey, conducted by the U-M Institute for Social Research, will monitor the evolving attitudes of the American public toward PHEVs, and provide the first national-level empirical data on how driving behavior differs with these vehicles compared to conventional gasoline, diesel and hybrid vehicles. The project will be headed by ISR researchers Richard Curtin and James Jackson, director of the institute.

Source: Pacific Northwest National Laboratory

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