

NREL releases report on testing electric vehicles to optimize their performance with power grids

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Researchers at the U.S. Department of Energy's National Renewable Energy Laboratory (NREL) have released a technical report that could help improve the performance of electric vehicles (EVs) and the efficiency of the electric utility grids that power them.

The report documents a series of test procedures designed to enable engineers, [designers](#) and utilities to evaluate the performance of various EVs and hybrids to optimize how they connect with electric utility grids today – and “smart grids” in the future. As more vehicles with large batteries come into use and smart grid technology advances, grid operators in the future may be able to take advantage of the two-way flow of power from EVs and hybrids plugged into utility grids to smooth spikes in demand and improve the reliability of their systems. Evaluating today’s [vehicle](#) technologies will advance the goal of transforming the nation’s transportation system to maximize [efficiency](#) and use of clean energy.

Engineering vehicles capable of interconnecting to the power system for bi-directional power flow is a key component of emerging “vehicle-to-grid” systems, in which plug-in EVs communicate with the power grid to deliver electricity or modulate their charging rates. The global vehicle-to-grid (V2G) market is expected to grow at a rapid pace, reaching the \$2.25 billion mark in 2012 and accelerating to \$40.4 billion by 2020, according to a new market analysis from GlobalData.

“This report offers the first nationally available set of test procedures for V2G applications,” NREL Director of Energy Systems Integration Ben Kroposki said. “Unleashing the potential of [electric vehicles](#) to optimize grid performance will be instrumental as the world moves to a smart grid with much higher use of renewables, energy storage and load control.

The NREL report, *Interim Test Procedures for Evaluating Electrical Performance and Grid Integration of Vehicle-to-Grid Applications*, documents a series of tests developed to evaluate various V2G capable electric and hybrid electric vehicles to determine their ability to store and provide power to the utility grid and to connect and disconnect from the utility grid, while complying with IEEE standards. The report includes a general discussion on safety requirements and general test setup, as well as an overview of vehicle characteristics and test equipment. Each test scenario discusses the purpose of the test, test procedure, corresponding standards, and how the results are reported.

“NREL has developed these procedures based on our experience testing V2G-capable electric and [hybrid](#) vehicles,” said Sudipta Chakraborty, NREL research engineer and lead author of the report. “As we test additional vehicles, we expect that the test procedure will evolve to become more universal.”

The intent of this report is to provide a way to evaluate V2G applications for utility interconnection – helping pave the way for wider use of EV’s and hybrids, as well as clean renewable energy for transportation – in the future. The test procedures also might become the industry standard down the road.

“We developed the test procedures in this report using actual prototype vehicles equipped with advanced power electronics and advanced energy storage technologies,” said Bill Kramer, acting group manager for NREL’s Distributed Energy Systems Integration Group. “Once testing is

expanded to a wider variety of vehicles, these procedures could become the foundation for testing standards for V2G applications.”

Funding for the development of the test procedures was provided by the U.S. [Department of Energy](#)'s Office of Electricity Delivery and Energy Reliability.

More information: Download a copy of the report www.nrel.gov/docs/fy11osti/51001.pdf

Provided by National Renewable Energy Laboratory

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