New tool provides better, faster onboard PHEV performance evaluation

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The Argonne Real-Time Data Acquisition system, which makes analysis and evaluation of plug-in hybrid vehicle performance faster and better, was developed by (from left) Keith Hardy, Don Hillebrand, Daniel Bocci and Ted Bohn.

Analysis and evaluation of plug-in hybrid vehicle performance is faster and better, thanks to a new tool developed by Argonne engineers. Called the Argonne Real-Time Data Acquisition (ARDAQ) system, it provides onboard data collection and diagnostics of PHEVs.

"Argonne is the nation's lead lab for the simulation, validation and laboratory evaluation of PHEVs and the advanced technologies required for these vehicles," said Ted Bohn, ARDAQ lead developer and an electrical engineer in Argonne's Center for Transportation Research. "So when faced with evaluating a vehicle's performance, we quickly realized

that existing commercial onboard data-collection systems lacked the sophistication and range of diagnostics we require. So we developed ARDAQ."

ARDAQ was recently used by judges to determine the winner of Challenge X, a four-year long competition among 17 university student-teams to produce advanced vehicle powertrain technologies that increase energy efficiency while reducing pollution.

Meanwhile, Argonne's transportation research partners, many of whom stand at the forefront of PHEV development, seek to fine-tune and adjust their PHEV engine systems and models for mass-market production. This new research tool provides information on the most critical vehicle performance measures, Bohn said.

"Because we started from scratch, we were able to configure ARDAQ with an optimal mix of off-the-shelf components and Argonne's unique software to support its functionality and user-friendliness," said Daniel Bocci, ARDAQ co-developer and an electrical engineer in the Center for Transportation Research.

ARDAQ is based on Controller Area Network (CAN) information collected on two separate CANs. CAN technology lets microcontrollers and other devices communicate without a host computer. ARDAQ then uses the global positioning system and other sensors to simultaneously collect moment-by-moment data on a comprehensive package of 25 vehicle-performance measures, including driving and engine speed; fuel flow, use and economy; hybrid battery current; frequency of battery charge; hybrid watt-hours per mile; PHEV watt-hours per mile; and length and distance of trip.

Additionally, the standards for every performance measure are derived from physics-based computations, meaning that a range of factors is

taken into account to calculate a single performance measure, said Keith Hardy, ARDAQ co-developer and program coordinator in the Argonne Transportation Technology Research and Development Center.

ARDAQ's eight-ounce sensor module package can be quickly installed and can begin collecting information immediately. A month's worth of data can be stored on a 1-gigabyte USB thumb drive. After a trip is completed, data from the thumb drive are uploaded to a personal computer and displayed using Google Earth. Eventually, wireless data transmission will be added to ARDAQ.

PHEV technology forms part of President Bush's Advanced Energy Initiative, which emphasizes the development of technologies that can significantly reduce the nation's dependence on foreign oil.

"The information provided by ARDAQ during the research and development phase can provide key insight into the real world performance of these vehicles to enable the automakers and consumers to understand the true performance enhancements enabled by PHEV systems," Bohn said.

ARDAQ was developed to aid researchers, but it has attracted enough interest that the laboratory is evaluating ways, such as licensing, to make the technology more widely available.

Source: Argonne National Laboratory