

ADVANCING NEXT-GENERATION VEHICLES



As the U.S. Department of Energy's (DOE's) lead laboratory for researching advanced vehicle technologies, including hybrid, plug-in hybrid, battery electric, and alternative fuel vehicles, Argonne provides transportation research critical to advancing the development of next-generation vehicles. Central to this effort is the Lab's Advanced Powertrain Research Facility (APRF), an integrated four-wheel drive chassis dynamometer and component test facility.

WHAT IS ARGONNE DOING?

Benchmarking and Analyzing Advanced Technology Vehicles

OPPORTUNITY: As the U.S. strives to lessen its dependence on foreign oil, new breeds of advanced technology vehicles are developing rapidly. To establish a benchmark and help set future research goals, these new technologies need to be evaluated from the component level to the vehicle system level for energy consumption, emissions, and performance.

SOLUTION: With an expert staff and state-of-the-art testing equipment, the APRF is capable of evaluating conventional, hybrid, and electrified vehicles using a wide variety of fuels, including alternative fuels and hydrogen.

OUTCOME: Working with the DOE and the U.S. automotive industry, Argonne researchers help provide solutions to support DOE goals of significantly improving vehicle efficiency and emissions. As the "go-to" vehicle benchmark center for government and industry, the APRF's research results are used to:

- Support the DOE in evaluating petroleum displacement, benchmarking current technologies, and developing future transportation goals and policy
- Aid in the development and optimization of advanced technologies to expand commercial applications

Developing Standards and Test Procedures for PHEVs

OPPORTUNITY: PHEVs are expected to gain favor with consumers in the coming years. Manufacturers are already developing some plug-in vehicles, and the President's goal to have 1 million PHEVs on the road by 2015 will accelerate their commercialization. These new vehicles use two energy sources along with two operating modes (charge depleting and charge sustaining) which require a revision of the conventional vehicle test protocols.

SOLUTION: Argonne researchers lead a Society of Automotive Engineers (SAE) committee dedicated to determining test procedures for establishing fuel economy estimates for PHEVs. The SAE committee works to update the existing hybrid test procedures (SAE J1711) to incorporate a consistent and practical approach of evaluating plug-in hybrid vehicles.

OUTCOME: The updated J1711 test procedure is the industry-wide recommended practice for testing the fuel economy and electrical energy consumption for PHEVs.

Testing Alternative Fuel Vehicles for Near-Zero Tailpipe Emissions

OPPORTUNITY: A hydrogen-capable independent test lab was needed to conduct emissions tests on BMW's Hydrogen 7 vehicles. Testing hydrogen vehicles at near-zero emissions presented a new challenge as it pushed the envelope for measuring emissions.

SOLUTION: Argonne's APRF was found to be the only North American public test facility capable of evaluating these hydrogen vehicles. Argonne engineers worked through the challenges of accurately measuring emissions from hydrogen-powered engines at such low tailpipe levels.

OUTCOME: Argonne engineers measured BMW's Hydrogen 7 vehicles at less than 4 percent of Super Ultra Low Emissions Vehicle (SULEV) limits for nitrogen oxide, with tailpipe hydrocarbon emissions measured below ambient concentrations. These independent tests found the vehicles to have one of the lowest-emitting combustion engines that have been manufactured.