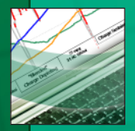
the source
.....for PHEV data!



Argonne is the Source for Comprehensive PHEV Test Data

Argonne National Laboratory provides a comprehensive research approach to developing technologies needed for hybrid and plug-in hybrid vehicles. Argonne's facilities, expertise, reputation, and locations ensure the most comprehensive, accurate, convenient, and unbiased technology evaluation available.

For more information:

Argonne National Laboratory Transportation Technology Research and Development Center
www.transportation.anl.gov/phev

Contact:

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Delivering the Data Needed for PHEV Assessment

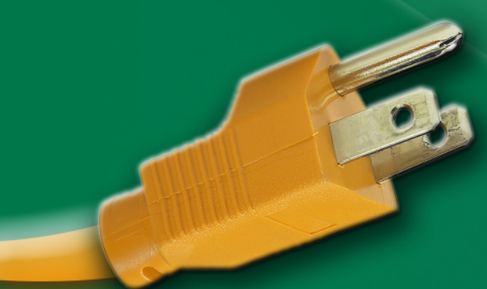
The U.S. Department of Energy's (DOE's) FreedomCAR and Vehicle Technologies (FCVT) Program is actively evaluating plug-in hybrid electric vehicle (PHEV) technology and researching the most critical technical barriers to commercializing PHEVs.

Argonne National Laboratory leads DOE's efforts to evaluate PHEVs and PHEV technology with the nation's best vehicle technology evaluation tools and expertise. Argonne is a Center for Excellence that combines state-of-the-art facilities; world-class expertise; long-term collaborative relationships with other DOE national laboratories, industry, and academia; and an unparalleled reputation for delivering consistent, unbiased technical evaluation results.

Battery Testing and Evaluation

Battery testing and evaluation capabilities include:

- Evaluation of advanced lithium-polymer, lithium-ion, nickel-metal hydride, and lead-acid cells
- Testing for small cells to full-size (500-volt, 500-ampere) batteries
- Testing to any profile over a wide range of temperatures
- Ability to conduct over 120 separate tests simultaneously
- Documentation of measurement and uncertainty principles for process and data quality
- Development of advanced analysis procedures for battery and capacitor scaling, thermal management, capacity, and power fade
- Using hybrid electric vehicles in fleets to evaluate the batteries' "end-of-life"
- Performance and life testing of batteries supplied by manufacturers for use in hybrid vehicles as well as electric-only vehicles
- Hardware-in-the-loop evaluation of advanced batteries for plug-in vehicle application (Battery HIL)



TODAY — Argonne is the source for comprehensive data on PHEVs

Vehicle Simulation Software

Argonne's award-winning Powertrain System Analysis Toolkit (PSAT), the primary vehicle modeling software used by the DOE's FreedomCAR and Vehicle Technologies Program, allows:

- Accurate simulation of advanced vehicle fuel economy and performance
- Implementation of detailed component models
- Development of realistic control strategies for testing on a bench or in a vehicle

Mobile Advanced Technology Testbed (MATT)

MATT is a wheeled test bed outfitted with scalable engine components, custom instrumentation, and flexible transmission technology to allow testing of PHEV systems. When used with Argonne's award-winning Powertrain System Analysis Toolkit (PSAT and PSAT-PRO) and hardware-in-the loop (HIL) techniques, MATT allows researchers to:

- Add, rearrange, and interconnect systems and components
- Equip selected systems and components with instrumentation
- Simulate real-world vehicle operation
- Identify which combination of components will result in a vehicle that best meets efficiency, emissions and performance

Advanced Vehicle Testing

Argonne's capabilities for state-of-the-art testing of hybrids, diesels, and hydrogen vehicles include:

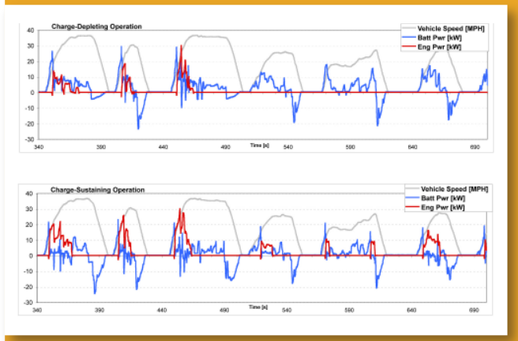
- Four-wheel-drive chassis dynamometer
- Experience with testing and analysis of several PHEVs, including a highly instrumented Toyota Prius
- Custom data acquisition/control system for advanced vehicles
- Most comprehensive database of advanced vehicles anywhere
- Pioneering in-vehicle engine torque instrumentation

Technology Viability Assessment

Argonne National Laboratory is working collaboratively with the Idaho National Laboratory (INL) to:

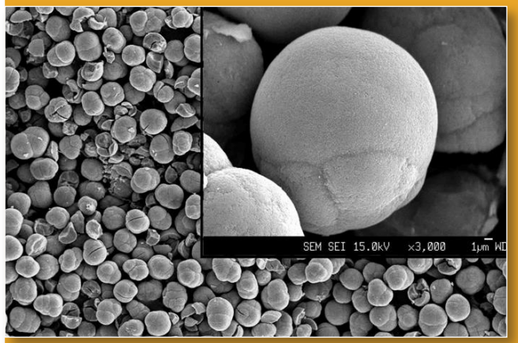
- Perform beginning- and end-of-life vehicle dynamometer testing
- Develop on-board data acquisition systems for collecting in-fleet hybrid electric vehicle (HEV) and PHEV performance data
- Characterize in-use fuel usage issues such as air conditioning, cold weather, hot weather, and real-world driving styles

Characteristics of Charge-Depleting Behavior



- This example compares engine power and battery power using the data acquired in the Argonne's 4WD chassis dynamometer.
- Data from Argonne test vehicles include engine torque measurements taken directly from experimental sensors installed in the powertrain.
- Using this comprehensive data, the characteristics of charge-depleting behavior in a Toyota Prius equipped with an aftermarket plug-in hybrid system can be observed.

New High-Capacity Lithium-ion Battery Material



- Argonne has developed new cathode materials for lithium-ion batteries with an energy storage capacity of >250 mAh/g (compared with 150 mAh/g for state-of-the-art materials).
- Powder density has been improved from 1.3 g/cc to >2 g/cc.
- These materials enable batteries to meet energy storage requirements of PHEVs.