Vehicle and Systems Simulation and Testing

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Office of Vehicle Technologies
OVT Program Structure

OVT/PHEV Program Mgmt.

Industry/Gov’t Collaboration

Technology Assessment
- Benchmarking
- Analytical Studies
- Risk Assessment

Research & Development
- Energy Storage
- Power Electronics & Electric Motors
- Engines and Fuels
- Vehicle Efficiency Technologies

Testing & Validation
- Standard Procedures
- Lab Testing and Validation
- Field Reliability Testing and Validation
- Field Testing and Demonstration

Deployment Issues
- Grid Interactions
- Automotive-Utility Industry Interactions
- Incentives
- Education and Learning Demonstration
- Codes & Standards
Focus Area activities provide direct and indirect support for evolution of high efficiency vehicles as real world product offerings.

**Component & Systems Evaluation**
- Validate performance of advanced components in a systems context via R&D activities in Virtual Vehicle Environment

**Modeling & Simulation**
- Develop & use modeling tools to support development and analysis of vehicle components & systems
- Focus & accelerate R&D activities on technologies of greatest potential for petroleum displacement

**Stakeholders & Partners**
- OEMs
- Utilities
- Consumers
- Fleet Owners
- VTP Programs
- DOE Programs
- Policy Makers

**Lab & Fleet Vehicle Evaluation**
- Benchmarking of real-world performance for advanced vehicle technologies in support of VTP activities
- Validation of vehicle modeling/simulation platforms
- Collection of 112M miles of on-road operational vehicle test data by 2015

**Vehicle Systems Optimization**
- Reduce auxiliary and parasitic loads that significantly affect vehicle efficiency

**Codes & Standards Development**
- Development of a unified, consistent set of standards for grid-connected vehicle infrastructure, communication, testing, safety, etc.
- Eliminate barriers in a way that doesn’t impede technology advances & smooth transition of advanced technologies
Modeling & Simulation

- Develop Modeling Tools
  - Autonomie
  - System Models
- Support GPRA Reporting

- Vehicle & Component Simulations
  - Configurations
  - Control Methods
  - Requirements
  - Sizing
  - Interactions
Component/Systems Evaluations

Hardware in the loop (HIL) and advanced controls simulation speeds development of new solutions.

- MATT (Modular Automotive Technology Testbed) development and utilization
- PHEV energy management strategy (coordination with University of Tennessee)
- Smart Charging demonstration

Vehicle components are Controlled with simulated components

Component and control algorithm tests developed on the bench
Structured, repeatable testing methods and real-world usage

- Advanced Vehicle Testing Activity (AVTA) data collection of advanced technology light duty in-use vehicles
- Advanced Powertrain Research Facility (APRF) vehicle test and test development
- Medium duty drive cycle analysis and route optimization
- Truck cab environmental control optimization (Cool cab) and evaluation
- OEM CRADAs

~ 75 Testing partners in the U.S. and Canada,
  - Utilities
  - State & local governments
  - Universities and colleges
  - Private companies/advocacy organizations
  - Canadian provinces
  - U.S. military organizations
  - OEMs & conversion companies
Recommended Practices for Plug-in Vehicles, Charging Equipment and Grid Connectivity

- SAE standards committees participation
- Development and validation of standards
- Technology development

National Recommended Practices for permitting and installation of charging equipment (streamlined/automated process)
Heavy vehicle optimization poses a growing opportunity for directly impacting petroleum displacement.

- Aerodynamic drag reduction
- Friction and wear reduction
- PACCAR CRADA for nucleate boiling
- Boundary layer lubrication
- TARDEC/ANL fuel economy demonstrator (FED)
- Parasitic & auxiliary load reduction
- Navistar Hybrid School Bus
- Auxiliary power units
- SuperTruck
## Vehicle & Systems Simulation & Testing

<table>
<thead>
<tr>
<th>Project</th>
<th>FY 2010 Appropriation</th>
<th>FY 2011 Current Appropriation</th>
<th>FY 2012 Request</th>
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<tbody>
<tr>
<td>Simulation &amp; Validation</td>
<td>5,525</td>
<td>5,260</td>
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<td>HIL &amp; Component Evaluations</td>
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<td>Laboratory &amp; Field Evaluations</td>
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<td>Codes &amp; Standards</td>
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<td>Heavy Vehicle Systems Optimization</td>
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<td><strong>Total, Vehicle Systems</strong></td>
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<td><strong>38,685</strong></td>
<td><strong>54,500</strong></td>
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## American Recovery and Reinvestment Act Funds

<table>
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<tr>
<th>Program</th>
<th>Amount</th>
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<tr>
<td>Transportation Electrification (FY 2009)</td>
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<tr>
<td>Electric Drive Technology Demonstration</td>
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<tr>
<td>Education &amp; Outreach</td>
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Largest US EV & Charger Deployment Ever

- Approximately $400 million in federal funding to
  - Automotive and Charging Industry
  - Educational Institutions
- Deploys over 13,000 electric-drive vehicles & 22,000 charging stations
- Collect detailed data
- Two EVSE specific projects
Thank you