Vehicle and Systems Simulation and Testing

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US Department of Energy
Office of Vehicle Technologies
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

**Lab & Fleet Vehicle Evaluation**
- Benchmarking of real-world performance for advanced vehicle technologies
- Validate vehicle modeling/simulation tools
- Collection of 112M miles of on-road operational vehicle test data by 2015

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

**Vehicle Systems Optimization**
- Reduce auxiliary and parasitic loads that significantly affect vehicle efficiency
- Speed introduction of wireless and other charging solutions

**Codes & Standards Development**
- Development standards for grid-connected vehicle infrastructure, communication, testing, safety, etc.
- Eliminate barriers & 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
Hardware in the loop (HIL) and advanced controls simulation speeds development of new solutions.

- Electric Drive Advanced Battery Test Mule Development and Utilization
- Improved Cold Temperature Thermal Modeling & Strategy Development
- Meritor Dual Mode Hybrid Powertrain Controls Development (CRADA)

Component and control algorithm tests are developed on the bench.

Components are tested in a real-world environment.

Vehicle components are operated real-time in an emulated vehicle context.
Structured, repeatable testing methods and real-world usage

- Advanced Vehicle Testing & Evaluation (AVTE) in-use data collection
- 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
- EDV Charging Infrastructure Evaluations

~ 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) turned over to Clean Cities.
Vehicle Systems Optimization poses a growing opportunity for directly reducing petroleum consumption.

- 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
- Wireless EDV Charging
- Advanced HVAC Systems
- SuperTruck
### Office of Vehicle Technologies Budget

(dollars in thousands)

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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