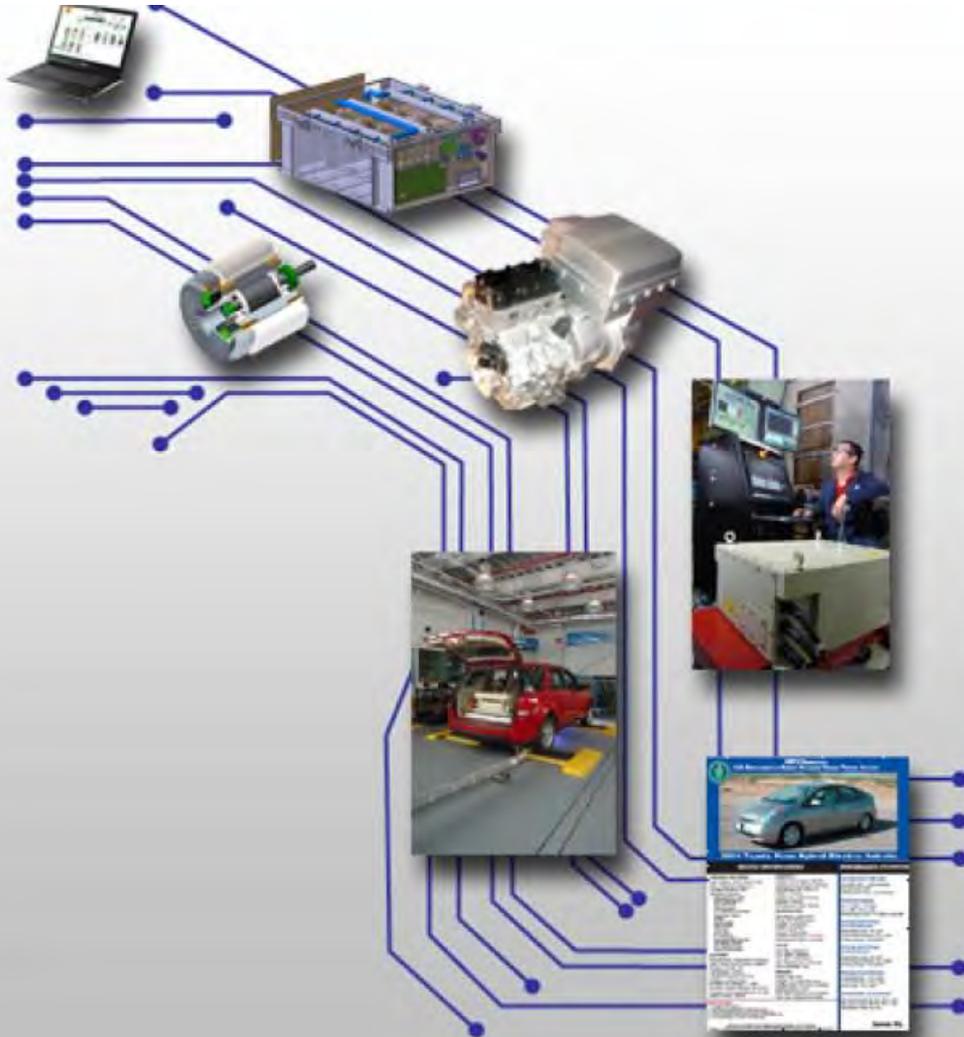




# U.S. Department of Energy Energy Efficiency and Renewable Energy

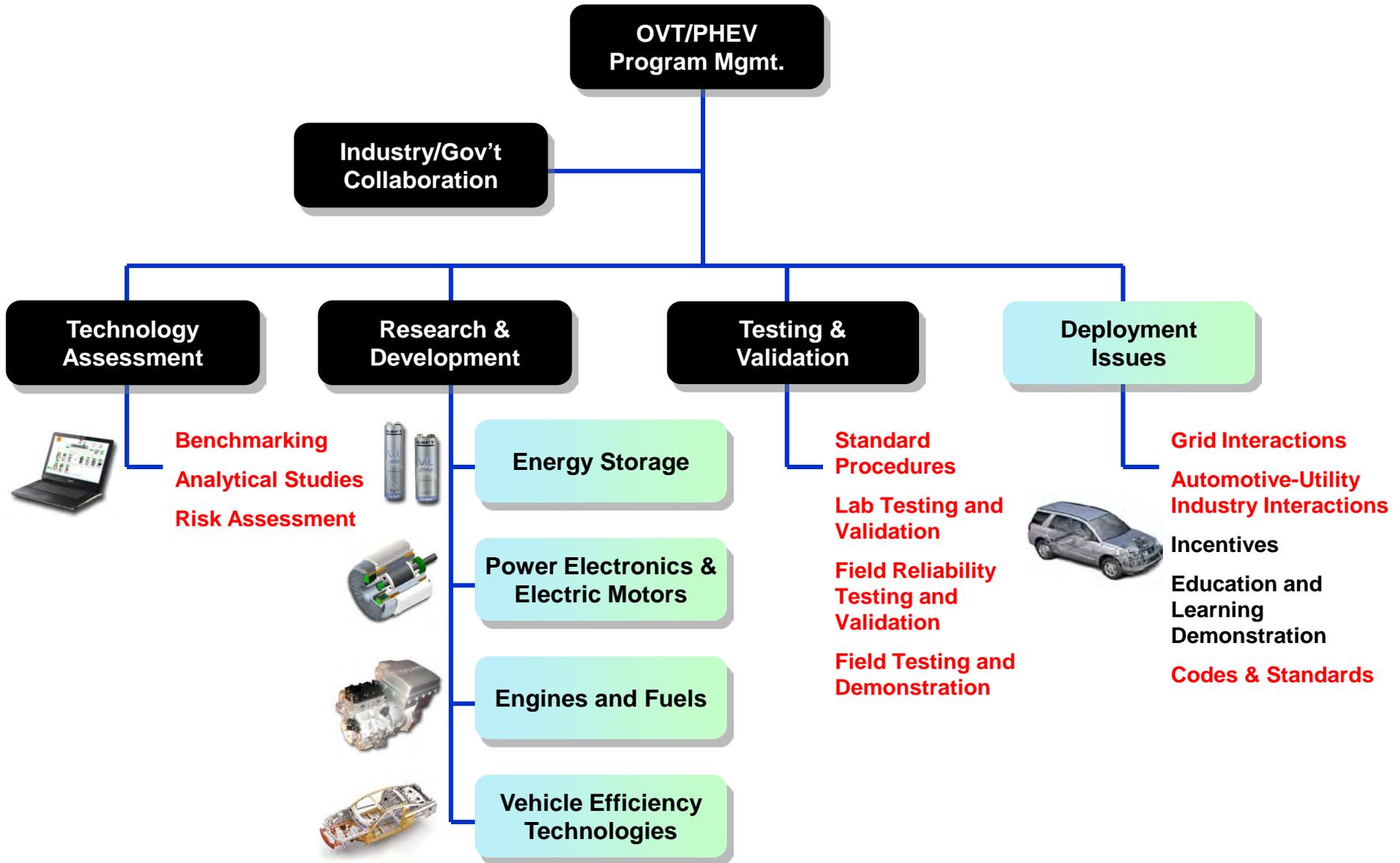
Bringing you a prosperous future where energy  
is clean, abundant, reliable, and affordable



## *Vehicle and Systems Simulation and Testing*

Lee Slezak  
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

### 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

### Stakeholders & Partners

OEMs  
Utilities  
Consumers  
Fleet Owners  
VTP Programs  
DOE Programs  
Policy Makers

### Modeling & Simulation

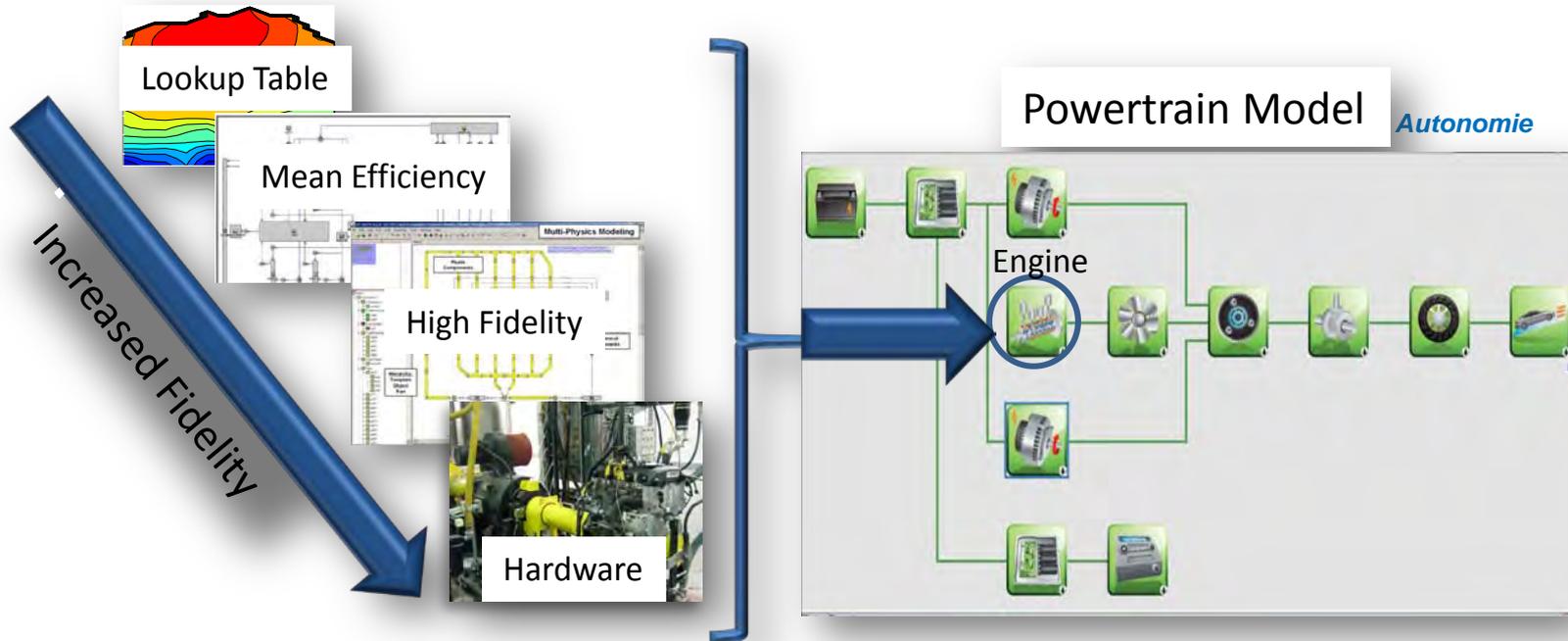
- Develop & use modeling tools to support development and analysis of vehicle components & systems
- Focus & accelerate R&D activities on technologies of greatest potential for petroleum displacement

### 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



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

- Vehicle & Component Simulations
  - Configurations
  - Control Methods
  - Requirements
  - Sizing
  - Interactions



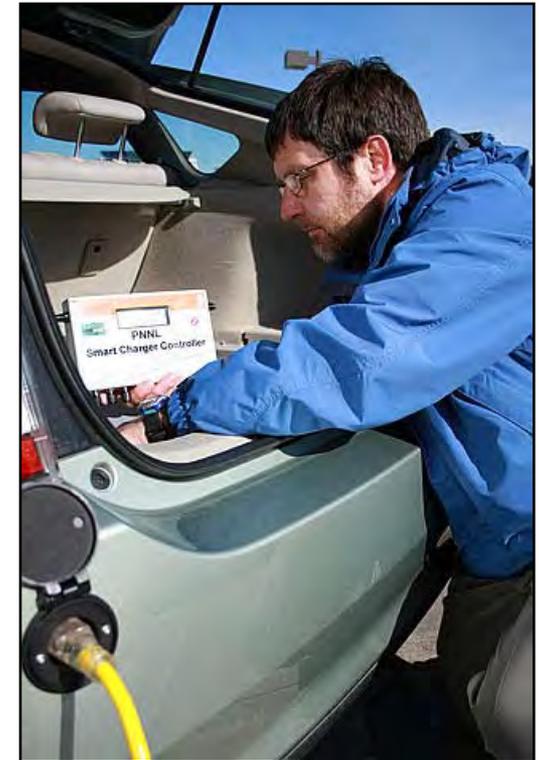
## Hardware in the loop (HIL) and advanced controls simulation speeds development of new solutions.

- 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



(dollars in thousands)

	FY 2010 Appropriation	FY 2011 Current Appropriation	FY 2012 Request
<b>Vehicle &amp; Systems Simulation &amp; Testing</b>			
Simulation & Validation	5,525	5,260	5,000
HIL & Component Evaluations	2,350	1,950	2,000
Laboratory & Field Evaluations	27,215	25,690	26,500
Codes & Standards	2,225	3,560	5,500
Heavy Vehicle Systems Optimization	1,790	2,225	0
Vehicle Systems Optimization	0	0	7,500
Wireless Charging	0	0	8,000
<b>Total, Vehicle Systems</b>	<b>39,105</b>	<b>38,685</b>	<b>54,500</b>
<b>American Recovery and Reinvestment Act Funds</b>			
Transportation Electrification (FY 2009)	400,000		
Electric Drive Technology Demonstration	360,000		
Education & Outreach	40,000		



## *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





U.S. Department of Energy

## Energy Efficiency and Renewable Energy

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**Thank you**