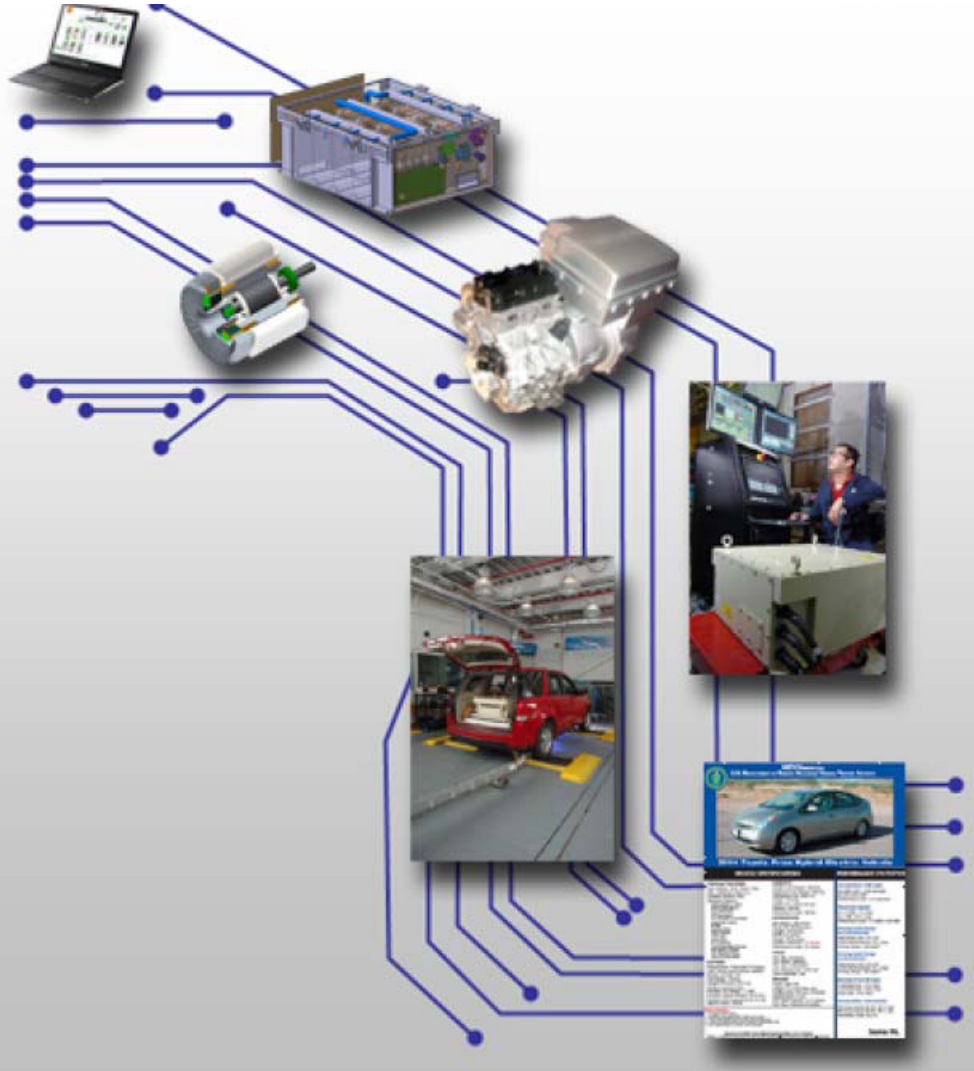


Vehicle and Systems Simulation and Testing

Lee Slezak
US Department of Energy
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 Testing and Validation
- Field Testing and Demonstration

Deployment Issues

- Grid Interactions
- Automotive-Utility Industry Interactions
- Incentives
- Education and Learning Demonstration

Integrated Analysis & Testing

Analysis & Model Validation

- Policy
- Vehicle Design
  - Configurations
  - Control
  - Component requirements
  - Reference Vehicle Definition
  - Technology Verification
- PSAT

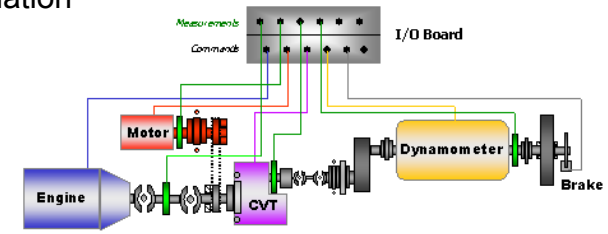
Validation in Vehicle Testing

- Advanced Vehicle Testing Activity
- Dynamometer Laboratory Testing
- On-Road Vehicle Performance Evaluation
- PHEV Technology Acceleration & and Deployment Activity)
- Fleet Data Collection
- Model Validation

R&D

Development and Validation in Emulated Vehicles

- Hardware-In-the-Loop (HIL) & PSAT-PRO©
- HIL System Integration
- Technology Validation



Near-Term Focus

Technology Assessment and Planning

Hybrid vehicle with 40 mi (64 km) electric range to substantially displace petroleum in urban driving

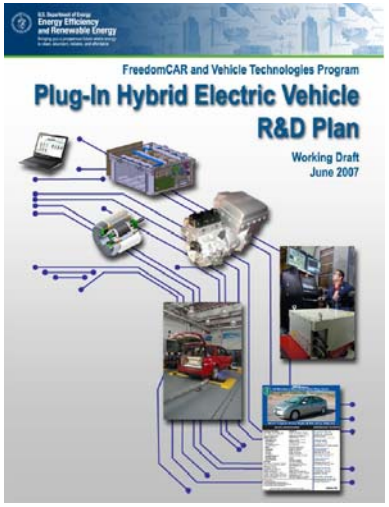
Analysis

- Various configurations, electric ranges and control strategies
  - Component requirements
  - National benefits and impacts

Testing

- Lithium-ion batteries
- PHEV conversions
- Standard procedures

R&D Plan



- Analysis
- Development
- System integration
- Testing & validation
- Commercialization

Solicitation

•Vehicle demonstration

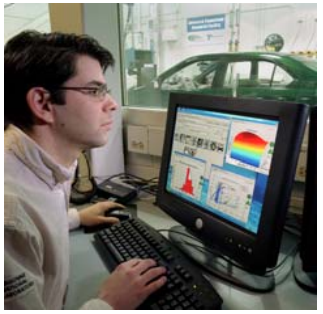
Program Interactions

- Ties all of the hardware R&D together
- System-level simulations help specify the necessary performance characteristics of the hardware and predict the overall vehicle performance for a given configuration.
- Both simulation and testing activities can be used to evaluate the development and progress of individual components, and predict how well they will integrate with other components being developed.
- Tests and simulations also evaluate how well the program is approaching its whole-vehicle goals, and provide the technical inputs to models of future economic benefits.

Heavy Vehicle Systems Optimization

Heavy Vehicle Systems Simulation and Validation

- PSAT modeling, component validation and benchmarking of emerging component and vehicle level technologies



Aerodynamic Drag Reduction

- CFD tools/simulation model development and assessment with wind tunnel testing and fleet demonstrations of drag reduction devices

Friction and Wear Reduction

- Systems approach examining development and interaction of materials, lubricants and components focusing on boundary regime

Thermal Control

- Nanofluids and nucleated boiling analyses to optimize radiator performance, size, and pumping losses

Office of Vehicle Technologies Budget

(dollars in thousands)	FY 2008 Appropriation	FY 2009 Current Appropriation	FY 2010 Request
Hybrid Electric Systems			
Vehicle & Systems Simulation & Testing	28,201	21,126	53,353
Energy Storage R&D	48,236	49,457	74,521
Adv. PEEM R&D	15,462	15,604	25,182
SBIR/STTR	2,236	2,385	3,744
Total, Hybrid Electric Systems	94,135	103,361	166,161
Vehicle & Systems Simulation & Testing			
Simulation & Validation	7,900	6,000	8,250
HIL & Component Evaluations	6,500	4,120	7,750
Laboratory & Field Evaluations	8,500	7,700	29,500
Heavy Vehicle Systems Optimization	5,301	3,306	7,853
Total, Vehicle Systems	28,201	21,126	53,353
American Recovery and Reinvestment Act Funds			
Transportation Electrification	0	400,000	0
Electric Drive Technology Demonstration	0	360,000	0
Education & Outreach	0	40,000	0
Total, Hybrid & Electric Propulsion	59,240	0	0

Thank you