

---

# Joint Merit Review Vehicle Technologies Program Overview

May 18, 2009

---

***Patrick Davis, Program Manager***

Vehicle Technologies Program

Energy Efficiency and Renewable Energy

U.S. Department of Energy



# Conclusion of Challenge X and Launch of EcoCAR





**DEER 2009** DEARBORN

**DIRECTIONS IN ENGINE-EFFICIENCY  
AND EMISSIONS RESEARCH CONFERENCE**



U.S. DEPARTMENT OF  
**ENERGY**

**AUGUST 3-6, 2009**

# Clean Cities 15<sup>th</sup> Anniversary Celebration



**Clean Cities Odyssey Day Event**



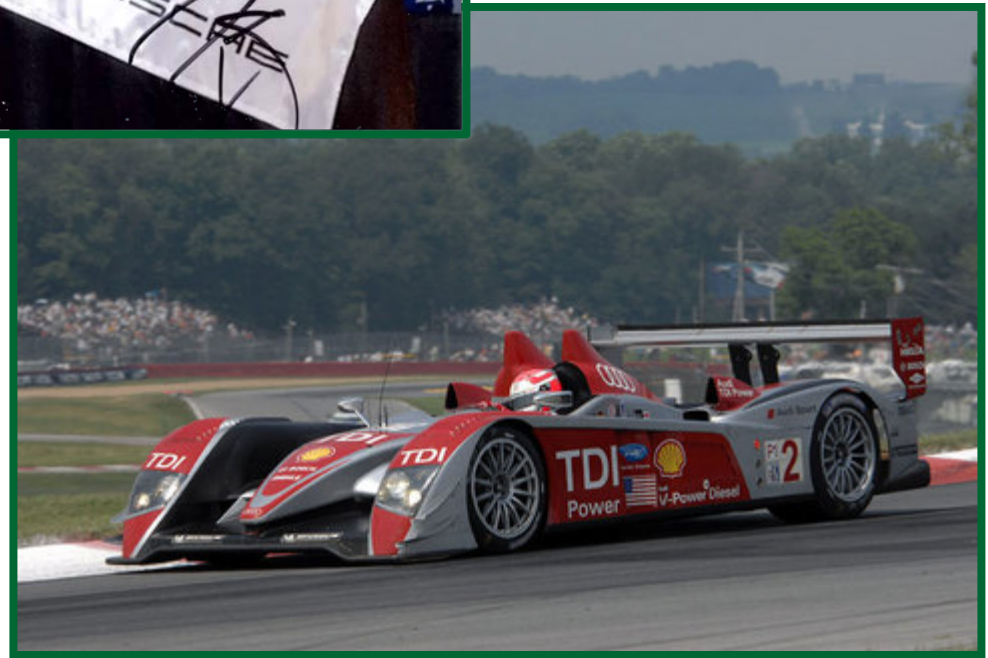


## Introduction of Utilities into FreedomCAR and Fuel Partnership





# Green Racing Launch at Road Atlanta





**Washington Auto Show  
Press Conference and  
Exhibit**





# EcoCAR: Washington Auto Show & SAE World Congress







"This investment will not only reduce our dependence on foreign oil, it will put Americans back to work. It positions American manufacturers on the cutting edge of innovation and solving our energy challenges."

**President Obama**

## President Obama at SoCal Edison Announces Two Major ARRA Vehicle Technologies Solicitations



"We will invest \$15 billion a year to develop technologies like wind power and solar power, advanced biofuels, clean coal, and fuel-efficient cars and trucks that are built right here in the United States of America." **President Obama**



“Over the next three years, we will double this nation's supply of renewable energy. We've also made the largest investment in basic research funding in American history -- an investment that will spur not only new discoveries in energy, but breakthroughs in science and technology.” **President Obama**

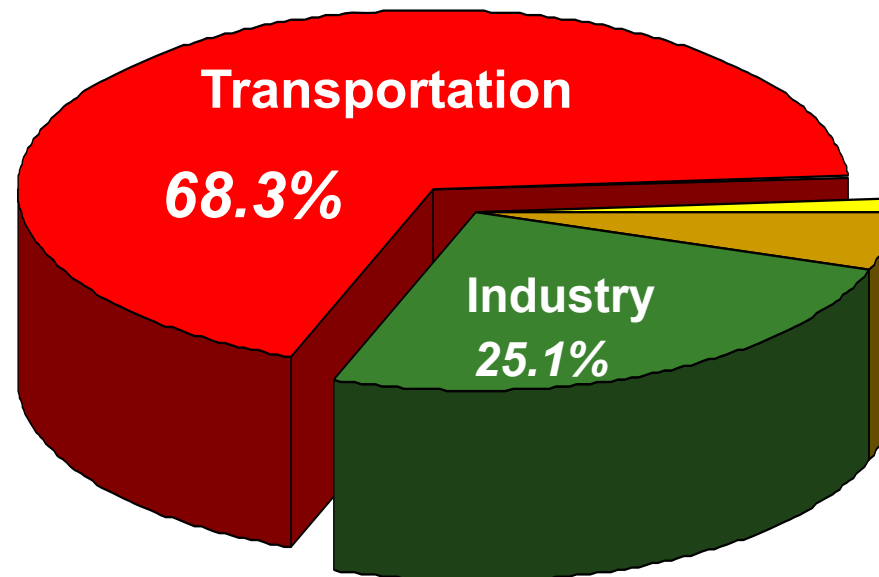


# Petroleum Dependence - Importance of the Transportation Sector



The Vehicle Technologies Program's mission is to develop more energy efficient and environmentally friendly highway transportation technologies that will enable America to use less petroleum. The long-term aim is to develop "leap frog" technologies that will provide Americans with greater freedom of mobility and energy security, while lowering costs and reducing impacts on the environment.

## Oil Consumption by Sector



On-Road vehicles comprise ~80% of transportation petroleum use

# Vehicle Technologies Budget



## Budget Request

Funding (\$ in thousands)

Activity	FY 2008 Approp.	FY 2009 Approp.	FY 2010* Request
Hybrid Electric Systems *	94,135	125,709	164,661
Advanced Combustion Engine R&D	44,591	40,800	57,600
Materials Technology	39,636	39,903	54,905
Fuels Technology	17,836	20,122	25,122
Technology Integration *	16,845	46,704	31,014
<b>TOTAL</b>	<b>213,043</b>	<b>273,238</b>	<b>333,302</b>

\* Three activities are transferred to the Fuel Cell Technologies Program as part of reprioritization of fuel cell and hydrogen fuel R&D (FY 2009 is not comparable to FY 2010 with funding of \$31.5 M for the three moved activities in FY 2009).

**Recovery Act funding of \$2.8B in addition to ongoing R&D**

## Key Activities

- **Increase R&D by \$42 M for plug-in hybrid electric vehicle (PHEV) technologies** - high energy batteries, vehicle demonstration & testing, and power electronics & motors
- **Expand commercial vehicle R&D** by \$20M for improving energy use efficiency to reduce oil use and carbon emissions
- **Demonstrate conventional passenger vehicles** with a 25 to 40% increase in fuel economy resulting from improvements in engine efficiency by 2014
- **Expand R&D by \$15 M to develop lightweight materials** for vehicle structures and powertrains. Reduce the modeled weight of a passenger vehicle body and chassis by 50%
- **Biofuels R&D** (E85, biodiesel, etc.) will address engine efficiency optimization, performance, and potential of mid-level ethanol blends
- **Increase the emphasis (+\$5 M) on deployment** of alternative fueled vehicles and non-petroleum fuels
- **\$2.8 Billion of ARRA funds** with a principal focus on battery manufacturing, vehicle electrification, and alternative fueled vehicle deployment

# Budget Allocation Across Partners



2% Federal

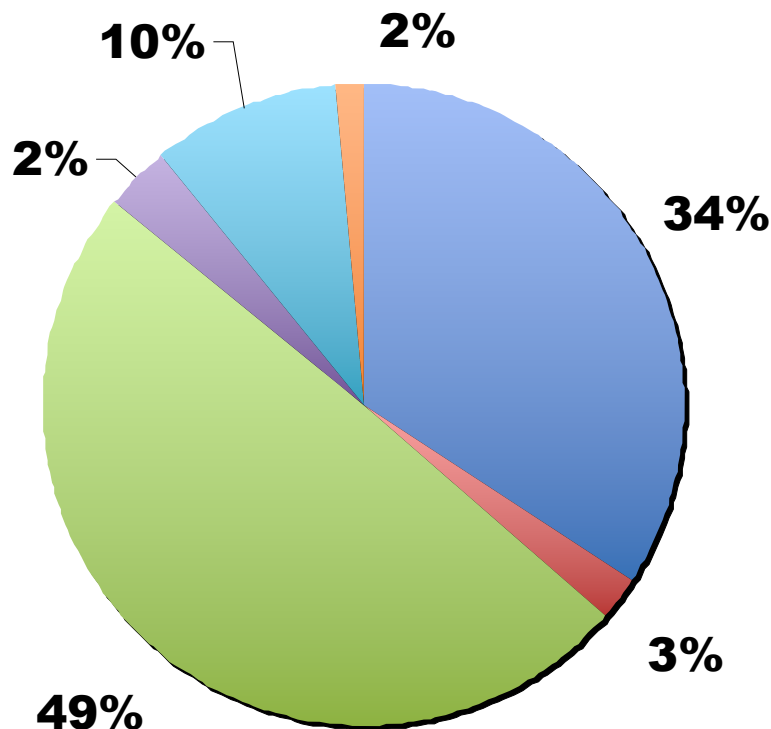
Work with other Federal Agencies (e.g., National Science Foundation, Navy)

10% Consortia

Work with the U.S. Advanced Battery Consortium and the U.S. Automotive Materials Partnership

3% Universities

Work conducted with a variety of universities



34% Industry

Work with Industry partners and automotive suppliers

2% OEMs

Cost-shared projects directly with the automotive OEMs

49% National Laboratories

R&D conducted at the National Laboratories



# Vehicle Technologies' Diverse Portfolio



## Advanced Technologies for High Efficiency Clean Vehicles

### Hybrid Electric Systems

- Advanced Batteries
- Power Electronics/ Inverters/Controllers & Motors
- Systems Analysis and Testing
- Aerodynamics, Rolling Resistance & Accessory Loads



### Tech Introduction

- EPA Act/EISA
- Rulemaking
- Deployment
- Validation
- Student Competitions
- Graduate Automotive Technology Education

### Advanced Combustion Engine R&D

- Low Temp. Combustion R&D
- Emission Controls
- Light- & Heavy-Duty Engines
- Waste Heat Recovery
- Health Impacts

### Fuels Technology

- Bio-Based Fuels
- Clean/Efficient Combustion Fuel Characteristics
- Fischer-Tropsch Fuels & Blendstocks
- Advanced Lubricants

### Materials Technology

- Lightweight Structures
- Composite Development
- Processing/Recycling/ Manufacturing
- Design Data Test Methods
- High Temperature Materials Laboratory

# Research Focus



- **Electrification of Drivetrain**
  - Plug-In Hybrid Electric Vehicles
  - Electricity Delivery Infrastructure
  - Electrical Machines and Motors
  - Thermoelectrics
- **Alternative-Fueled Vehicles**
- **Advanced Combustion Research**
  - Low Temperature Combustion (HCCI)
  - Emission Controls
- **Lightweight and High-Strength Vehicles**



# Success Stories



## Dual-Mode Hybrid

Available in hybrid transit buses  
and GM Tahoe and Yukon vehicles

**High-strength Stainless Steel,  
Hybrid Power System**  
Fisher Coachworks hybrid buses





# Success Stories



## Quick Plastic Forming of Aluminum

Chevrolet Malibu MAXX 2004, Cadillac and GM Vehicles



## Nickel Metal Hydride Batteries

Every U.S. hybrid vehicle sold has IP from this battery research

**Magnesium Engine Cradle**  
In partnership with magnesium industry and GM developed lightweight engine cradle



# Collaborations



**The FreedomCAR and Fuel Partnership** -- focusing on the high-risk research needed to develop the necessary technologies...to provide a full range of affordable cars and light trucks that are free of foreign oil and harmful emissions.



**21<sup>st</sup> Century Truck Partnership** -- pursuing dramatically improved fuel economy with near-zero emissions through advanced combustion engines, renewable fuels, and reduced parasitic energy losses.



U. S. Department of Energy

**Clean Cities** - supporting local decisions that contribute to the reduction of petroleum consumption



# External Review



- **NAS Review of FreedomCAR & Fuel Partnership—Phase II: Completed April 2008**
  - “The FreedomCAR and Fuel Partnership is well planned, organized, and managed. It is an excellent example of an effective industry/government cooperative effort.”
  - “There has been significant progress in most areas since the Phase I Report, and the committee commends management on its thorough and generally receptive responses to the recommendations in that report.”
- **Review of the 21st Century Truck Partnership**
  - The review examines and comments on how well the program has accomplished its goals, evaluates progress in the program, and makes recommendations to improve the success of the Program.



# Recovery Act



## Domestic Battery Manufacturing (\$2B)

- Vehicle batteries
- Battery components
- Electric drive components

## Transportation Electrification (\$400M)

- Demonstrate advanced vehicles
- Electrification infrastructure
- Education

## Automotive Pilot Program (\$300M)

- Alternative fueled vehicles
- ULSD vehicles
- Infrastructure development





# For More Information



***Patrick Davis, Program Manager***  
***202-586-8055***

***[www.vehicles.energy.gov](http://www.vehicles.energy.gov)***