-Technology Integration Overview –

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This presentation does not contain any proprietary, confidential or otherwise restricted information.
Activities

• Clean Cities – A voluntary, locally based government/industry partnership

• Legislative and Rulemaking

• Advanced Vehicle Competitions

• Education Programs
  • Graduate Automotive Technology Education
  • Advanced Electric Drive Vehicle Education Program
Deployment efforts accelerate market transformation by increasing public awareness & consumer acceptance/adoption of new vehicle technologies that are being developed through the Vehicle Technology Program’s (VTP) R&D activities.

Deployment programs are essential when the success of new technologies depends on consumers changing their driving and purchasing habits.

Primary Focus – Achieve Petroleum Reduction ...
by Implementing Next-Steps when R&D is completed

Roughly 10% of VTP base budget supports Deployment (Technology Introduction) efforts
Over 3.5 Billion Gallons of Petroleum Reduction since 1993

- Over 800,000 AFVs on the road
- 12,000 alternative fueling and charging stations (CC influenced >70%)
- Long term goal of 2.5B gal/year by 2020
Clean Cities Budget History

Clean Cities Budget

$ Million

25  25.5  26.8  28  26.5
FY09  FY10  FY11  FY12  FY13

$300M

ARRA Funding

Appropriation  Request
Clean Cities Portfolio of Technologies

**Alternative Fuels**
- Electric Vehicles
- Biodiesel
- Ethanol
- Hydrogen
- Propane
- Natural Gas

**Idle Reduction**
- Heavy-Duty Trucks
- School & Transit Buses
- Light-Duty Vehicles

**Fuel Economy**
More fuel efficient vehicles, adopting smarter driving and vehicle purchasing habits

- **Hybrids**
  - Light- and heavy-duty
  - Electric hybrids
  - Plug-In hybrids
  - Hydraulic hybrids

**Eliminate**
- Replace
- Reduce
Local Coalition Support / Partnership Development

- Coordination with key community and business leaders,
- Identification of potential fleet and funding partners
- Facilitating Infrastructure development projects,
- Collecting data and tracking progress
- Coalition technical training and strategy implementation,
- ~100 coalitions serving 78% of the US population

(photo courtesy of White House)
April 2011 - President Announces Clean Fleets Partnership with 5 charter partners

- Challenge to top fleets across the country to adopt alt-fuels, advanced vehicles, petroleum reduction plans
- Pace-setters for others to follow

April 2012 –
Program grown
To 20 National CF Partners

Direct Impact: The 100 largest commercial fleets account for more than 1 million vehicles. Every 2,000 vehicles converted to alternative fuel = 1M gal/year petroleum displacement.
• Non-biased source of VT data and information
• Fuel Economy Guide (FE.gov), Alt-Fuel Data Center (AFDC)
• On-line tools and cost calculators, other web resources
• Training for first responders and public safety officials
• Technical response service
• Public workshops, webinars, industry technical conferences
Deployment Within National Parks

Photos courtesy of NPS
• Address unforeseen permitting and safety issues,
• Identify chronic vehicle or infrastructure field problems
• Incident investigations (technology failures)
• Capture lessons learned and develop best practices

Model EVSE Permit

http://www.afdc.energy.gov/afdc/pdfs/EV_charging_template.pdf

(NREL stock photos)
Recent Awards - helped deploy over 1,500 stations and 8,500 vehicles (projects being presented & reviewed at AMR this week)

Future Directions - Community Readiness, Barrier Reduction, and Sustainable Policy Development

- Local public-private partnerships will collaborate to develop strategies and local petroleum reduction policies to deploy alternative fuel vehicles and infrastructure, streamline permitting processes, and address critical barriers.

- Sep 2011 - 16 electric vehicle projects in 24 states totaling $8.5 million were announced (currently being implemented).

### Clean Cities Recovery Act Awards - Total DOE Funds Disbursement by State

<table>
<thead>
<tr>
<th>Grant Dollars</th>
<th>State</th>
<th>Grant Dollars</th>
<th>State</th>
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<td>$30,954,099</td>
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<td>$7,719,451</td>
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<td>$39,559</td>
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<td>$5,519,862</td>
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<td>$4,933,814</td>
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<tr>
<td>$4,570,964</td>
<td>South Carolina</td>
<td>$297,528,630</td>
<td>Total</td>
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[cleancities.energy.gov](http://cleancities.energy.gov)
## Clean Cities Recovery Act Awards - Total Alternative Fuel Stations by State

<table>
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<th>Stations</th>
<th>State</th>
<th>Stations</th>
<th>State</th>
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<td>16</td>
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<td>Total</td>
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### Clean Cities Recovery Act Awards-Total Alternative Fuel Vehicles by State

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<td>183</td>
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**Total:** 8,490
Technology Integration Overview

Other Key Activities

- Advanced Vehicle Competitions
- Education Programs
  - Graduate Automotive Technology Education
  - Advanced Electric Drive Vehicle Education Program
Budget History
(continued – including other TI Activity areas)

- Adv. Veh. Competitions
- Graduate Automotive Technology Education
- Legislative & Rulemaking

$40 million

FY 2009
FY 2010
FY 2011
FY 2012
FY 2013 Req.*

* Comparable to FY 2012 structure.
Training the Next Generation of Engineers

Provide a new generation of engineers with knowledge and skills in developing and commercializing advanced automotive technologies.

Advanced Vehicle Competitions

• Since 1987, DOE has sponsored more than two dozen university-level advanced vehicle technology competitions.

• Provides college engineering students an opportunity to conduct hands-on research and development with leading-edge automotive propulsion, fuels, materials, and emissions control technologies.

• Virginia Tech took top honors!
EcoCAR 2: Plugging into the Future

Provide a new generation of engineers with knowledge and skills in developing and commercializing advanced automotive technologies.

- Challenges students from 15 North American Universities
- 3 year competition following a real-world engineering process
- Joined by Natural Resources Canada, General Motors and over 25 other industry sponsors
- Each team is building its own unique PHEV architecture and renewable fuel such as Hydrogen, Ethanol or Biodiesel

March 22, 2012
President Obama visits with Ohio State University EcoCAR2 Team after Energy Address

Year 1 Simulation and Modeling finals to be held in Los Angeles, CA – May 18-23, 2012
EcoCAR2 Teams
Training the Next Generation of Engineers

Graduate Automotive Technology Education

• Receive DOE funding for student fellowships and curriculum development.

• Each center has established a graduate engineering education program that offers courses emphasizing that center's technology specialty.

• In 2011, 7 GATE Centers awarded - $6.4 million (DOE) over 5 years

• Focus on three critical automotive technology areas: hybrid propulsion, energy storage, and lightweight materials.

Seven Centers of Excellence Awarded in 2011

• The Ohio State University - Energy Storage and Hybrid Propulsion

• University of Michigan, Dearborn - Hybrid Propulsion

• University of Colorado, Colorado Springs (UCCS) and the University of Colorado, Boulder (CU-Boulder) - Energy Storage and Hybrid Propulsion

• Purdue University - Hybrid Propulsion with emphasis on Medium/Heavy Duty

• Clemson University - Hybrid Propulsion

• Pennsylvania State University - Energy Storage

• University of Alabama, Birmingham - Lightweight Materials
Accelerate the development and production of various electric drive vehicle systems through support of educational programs to substantially reduce petroleum consumption.

- Engineering Degree & Certificate Programs
- Emergency Responder and Safety Training
- Consumer & K-12 Educational Outreach
- Developing and Providing Teaching Materials
- Training Service Personnel, Vehicle Mechanics, and Supporting Infrastructure
Advanced Electric Drive Vehicle Education Program

- Selections announced by President Obama on August 5, 2009.
- 10 projects receive $39.1 million in ARRA funding.
  - National Fire Protection Association
  - Missouri University of Science and Technology
  - Wayne State University
  - West Virginia University
  - University of Michigan
  - J. Sergeant Reynolds Community College
  - Michigan Technical University
  - Purdue University
  - City College of San Francisco
  - Colorado State University
www.vehicles.energy.gov

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Clean Cities
U.S. Department of Energy

Vehicle Education

Legislative & Rulemaking