U.S. Department of Energy FreedomCAR & Vehicle Technologies Program

Advanced Vehicle Testing Activity – *Hybrid Electric Vehicle and Idle Reduction Technology Activities*

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Presentation Outline

• AVTA Goal
• AVTA Testing Partners
• Hybrid Electric Vehicle Testing (Performance)
• Hybrid Electric Vehicle Policy Support
• Hybrid Electric Vehicle Provisions in pending Energy Bill
• State and Local Idle Reduction Activities
• State and Local Idle Reduction Regulations
• DOE Idle Reduction Demonstration Project
AVTA Goal

• Benchmark and validate the performance of light-, medium-, and heavy-duty vehicles that feature one or more advanced technologies, including:
  – ICE’s burning advanced fuels, such as 100% hydrogen and hydrogen/CNG-blended fuels
  – Hybrid electric, pure electric, and hydraulic drive systems
  – Advanced batteries and engines
  – Advanced climate control, power electronic, and other ancillary systems
AVTA Testing Partners

- Qualified Vehicle Testers (50 – 50 cost share)
  - Electric Transportation Applications (lead)
  - Arizona Public Service (APS)
  - Bank One
  - Ford Motor Company
  - Luke AFB
  - New York Power Authority
  - Red Cross
  - Southern California Edison
  - Salt River Project
  - Cities of Palm Springs, Palm Valley, Phoenix, Vacaville, and San Diego
Hybrid Electric Vehicle Testing

- Honda Insight
- Honda Civic
- MY ’02 & ’03 Toyota Prius
- MY ’04 Toyota Prius
- Fleet and accelerated reliability testing (900,000+ miles)
  - Bank One, Red Cross, Arizona Public Service, ETA
  - Fuel use, maintenance, repairs, driver experience
- Baseline Performance testing (dynamometers and closed test tracks)
  - Fuel economy, acceleration, max speed, braking, & handling
Hybrid Electric Vehicle Testing

- Fleet and accelerated reliability testing
  - 6 Honda Insights (302,000 miles) ~45.8 mpg
  - 4 Honda Civics (248,000 miles) ~38.1 mpg
  - 6 Model year 02 & 03 Toyota Prius (344,000 miles) ~41.0 mpg
Hybrid Electric Vehicle Testing

- Fleet and accelerated reliability testing

**Monthly Fuel Economy**

- Insight Monthly (45.8 mpg)
- Civic Monthly (38.1 mpg)
- Prius Monthly (41.0 mpg)
Hybrid Electric Vehicle Testing

- Baseline Performance testing
Hybrid Electric Vehicle Testing

- Baseline Performance testing results
Hybrid Electric Vehicle Testing

- Baseline Performance testing results (SAE J1634)
Hybrid Electric Vehicle Testing

- Baseline Performance, fleet and accelerated reliability, and EPA testing results

![Drive Cycle (SAE J1634) and Fleet/AR Testing]

- Fleet/AR Testing
- With Air - J1634
- Without Air - J1634
- EPA City
- EPA Highway

Miles per gallon

- Civic
- Insight
- Prius
Hybrid Electric Vehicle Testing

- 2004 HEV candidate test vehicles
  - MY 04 Toyota Prius (started testing)
  - General Motors Sierra pickup
  - Toyota Highlander SUV
  - Lexus RX400 SUV
  - Honda Accord
  - Ford Escape SUV
Hybrid Electric Vehicle Policy Support

- $1,500 Federal income tax deduction
- HOV lane access (VA, CO, FL, AZ, GA)
- Exemption from emissions testing (MD)
- Government purchases (NY, CA)
- State tax incentives/rebates (CA, OK, OR)
- VA Legislature introduced Bill in Jan ’04 exempting HEVs from emissions testing
- Maryland General Assembly introduced bill in Jan ’04 allowing HEVs in HOV lanes with single occupants

Source: Electric Drive Transportation Association
HEV Provisions in Pending Energy Bill

- HEVs allowed as compliance option (except Federal Fleets) for EPAct – up to 1 credit based on fuel efficiency and battery pack maximum power
- Allow HEVs (as defined by states) with single occupant in HOV lanes
- $250 to $1,000 tax credit for HEVs <8,500 lbs GVW based on rechargeable energy storage system maximum power
- $500 to $3,000 tax credit for HEVs meeting vehicle mileage performance (125-250% increase in MY ’00 city fuel economy)

Source: Electric Drive Transportation Association
State/Local Idle Reduction Activities - NY

• NY State Energy Research and Development Authority (NYSERDA) working to accelerate development and commercialization of Truck Stop Electrification (TSE) equipment, systems design, and services

• NY State Thruway Authority, in partnership with NYSERDA and Niagara Mohawk Power Co., share financing of a two-year $500,000 TSE program for the installation of up to 44 IdleAire multi-service consoles at 2 sites along rest stops in Syracuse

• Installation of 2 shorepower TSE facilities on the Adirondack Northway pending
State/Local Idle Reduction Activities - CA

• $200k EPA grant awarded to EPRI, SMUD, and other partners for idle reduction project
  – Demonstrate use of onboard AC power
  – Reimburse fleets for 50% of purchase price for any one of 3 approved idle reduction packages
  – Installation of technology package and driver training provided by EPRI
• 16 AC power receptacles installed by SMUD at Sacramento’s 49er Travel Plaza - free power on a first-come basis. More units upon demand
State/Local Idle Reduction Activities - CA

- Carl Moyer Clean Engine Incentive Program - provide fleets with up to $1,500 per vehicle for the installation of anti-idling technologies
  - Subsidy of $2,500 per vehicle for advanced technology systems such as fuel cell auxiliary power units (APUs)
  - All devices must be certified and operated within California for at least 100 hours per year for five years
## State/Local Idle Reduction Regulations

<table>
<thead>
<tr>
<th>State</th>
<th>Applicability</th>
<th>Idling Time Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>AZ</td>
<td>Heavy duty diesel vehicles &gt;14,000 lbs GVW</td>
<td>5 minutes*</td>
</tr>
<tr>
<td>CA</td>
<td>• Marine terminals @ ports &gt;100,000 containers per year&lt;br&gt;• Pending: limit idling MY 2007 and later on-road heavy-duty vehicles. Sleepers can use automatic start-stop or other IR technologies</td>
<td>• 30 minutes*&lt;br&gt;• Engine off if idling &gt;5 minutes</td>
</tr>
<tr>
<td>CO</td>
<td>Any motor vehicle</td>
<td>10 minutes in any 1 hour*</td>
</tr>
<tr>
<td>CT</td>
<td>• Mobile source engine&lt;br&gt;• School buses</td>
<td>• 3 consecutive min*&lt;br&gt;• off &gt; 3 minutes*</td>
</tr>
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</table>

Source: CARB and EPA

*with some exemptions
## State/Local Idle Reduction Regulations

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<tr>
<td>DC</td>
<td>Diesel/gasoline vehicles</td>
<td>3 minutes*</td>
</tr>
<tr>
<td>HI</td>
<td>All motor vehicles</td>
<td>No specified time*</td>
</tr>
<tr>
<td>MD &amp; MA</td>
<td>All motor vehicles</td>
<td>5 minutes*</td>
</tr>
<tr>
<td>MN (St. Cloud)</td>
<td>All motor vehicles within 2 block area of city</td>
<td>5 minutes*</td>
</tr>
<tr>
<td>MO (St. Louis)</td>
<td>All motor vehicles</td>
<td>10 minutes*</td>
</tr>
<tr>
<td>NV / NY</td>
<td>Diesel truck or bus</td>
<td>15 / 5 minutes</td>
</tr>
<tr>
<td>NH</td>
<td>Diesel/gasoline vehicles</td>
<td>5 min* &gt;32°C &amp; 15 min* &gt;-10°C &amp; &lt;32°F</td>
</tr>
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*Source: CARB and EPA

*with some exemptions
## State/Local Idle Reduction Regulations

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<tr>
<td>NJ</td>
<td>Diesel-powered motor vehicles</td>
<td>3 min* / 15 min* if stopped &gt;= 3 hrs</td>
</tr>
<tr>
<td>NYC</td>
<td>All motor vehicles</td>
<td>3 minutes*</td>
</tr>
<tr>
<td>PA (Philly)</td>
<td>Diesel vehicles &gt;8,500 lbs GVW or passenger carrying &gt;12</td>
<td>2 min for layovers / 5 min &lt;32°F / 20 min &lt; 20°F / 20 min buses w/AC &amp; no open windows &amp; &gt; 75°F</td>
</tr>
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*Source: CARB and EPA  *with some exemptions
# State/Local Idle Reduction Regulations

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<tr>
<td>TX (Houston / Galveston)</td>
<td>Diesel/gasoline motor vehicles (&gt; 14,000 lbs GVW)</td>
<td>5 min* April 1 – Oct 31 30 min* for heat/AC transit/school buses</td>
</tr>
<tr>
<td>UT (Salt Lake City)</td>
<td>Diesel vehicles</td>
<td>15 minutes*</td>
</tr>
<tr>
<td>VA</td>
<td>Buses when unattended, parked, or stopped</td>
<td>10 minutes*</td>
</tr>
</tbody>
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*Source: CARB and EPA  
*with some exemptions*
DOE Idle Reduction Demonstration

• Goal: To gather objective in-use information on the performance of available technologies by characterizing:
  – Specifications and Costs: system descriptions, capital and installation costs, payback periods
  – Vehicle Operations: fuel consumption (truck idling and IR systems), engine oil consumption and changes, maintenance (truck and IR systems)
  – Other Evaluation Information: engine and component wear, resale value, user impressions
DOE Idle Reduction Demonstration

- Reduce 800+ million gallons of annual fuel use during idling periods
- Reduce average of 2,000 hours of idling
- Fleet/component demonstration/data collection project partners:
  - Caterpillar, International Truck, Cox Trucking
  - Schneider National, Freightliner, Webasto Thermosystems
  - Espar, Wal-Mart Transportation, Truck manufacturer TBD
DOE Idle Reduction Demonstration – Caterpillar Team

• Team: Caterpillar, International Truck, and Cox Transfer
• Five new idle reduction trucks, five control trucks
• Trucks idle about 1840 hours/year
• MorElectric™ Technology
• Electrically driven accessories
• Three main components
  – HVAC unit, generator, and APU
  – IR uses 0.2 gallons fuel/hour versus 0.9 gallons fuel/hour for C13 engine
• Duration - FY03 4 Quarter – FY05 4 Quarter
DOE Idle Reduction Demonstration – Schneider National Team

- Team: Schneider National, Freightliner, Webasto Thermosystems
- 100 trucks with heating and 20 trucks with cooling systems
- Trucks idle approximately 480 hours/year
DOE Idle Reduction Demonstration – Schneider National Team (cont’d)

• Webasto Air Top 2000 cab heater
  – Self contained diesel fueled air heater
  – Offered as standard installation option from Freightliner
• Webasto Cab Cooler
  – New product that utilizes phase change cooling storage technology
  – Medium is charged during normal tractor operation using existing air conditioning system
• Duration - FY03 4 Quarter – FY05 2 Quarter
DOE Idle Reduction Demonstration – Espar Team

- Team: Espar, Wal-Mart Transportation, truck manufacturer TBD
- 20 trucks with combined heating / cooling systems
- At least two control trucks
- Espar Airtronic Bunk Heater
  - Diesel fueled coolant heater for engine pre heat
- D.C. Airco
  - Rooftop mounted electric air conditioning unit
  - Operates on starting or auxiliary batteries
- Duration - Award expected FY04
All vehicle testing reports and fact sheets available via:

http://avt.inel.gov