U.S. Department of Energy, Vehicle Technologies Program
- Advanced Vehicle Testing Activity (AVTA)

VSATT Update – 02/04/09

John Smart
Idaho National Laboratory
Advanced Vehicle Testing Activity

This presentation does not contain any proprietary or sensitive information
HEV Candidate Test Vehicles

• Obtain two of each HEV test model
• One of each HEV model will be tested on test track (Phoenix) and dynamometer (Argonne’s APRF) when new
• Two of each HEV model 160,000-mile accelerated tested with data loggers
• Each HEV battery will be tested at beginning (BOT) and end (EOT) of the 160,000-mile accelerated testing per the DOE FreedomCAR Battery Test Manual for Power-Assist Hybrid Electric Vehicles

• 2009 HEV test vehicle candidates:
  – Honda Insight
  – Toyota Prius
  – Ford Fusion
  – Saturn 2 mode VUE

• 2010 Probable HEV vehicle test candidates:
  – Mercedes S400 Bluetec Hybrid
  – Lexus 250h
PHEV Candidate Test Vehicles

- Obtain PHEV test models of unknown numbers per model
- One of each PHEV model will be tested on test track (Phoenix) and dynamometer (Argonne’s APRF)
- Each PHEV will be 5,440-mile accelerated tested and fleet tested if possible with data loggers
- Depending on manufacturer/converter, each PHEV battery will be tested at BOT and EOT for the 5,540-mile accelerated testing, and at the end of extended fleet testing per the DOE Battery Test Manual for Plug-in Hybrid Electric Vehicles

- 2009 PHEV test candidates include:
  - Ford OEM Escape
  - Toyota OEM Prius

- 2010 PHEV test candidates will likely include one OEM PHEV and one converter PHEV
EV Candidate Test Vehicles

• Obtain groups of pure EV test models
• One of each EV model will be tested on track (Phoenix) and dynamometer (Argonne’s APRF) when new
• Depending on capabilities, each EV will be 5,440-mile accelerated tested and fleet tested with data loggers
• Each EV battery will be tested at BOT and EOT for the 5,540-mile accelerated testing, and at extended intervals during fleet testing to one or more DOE EV test manuals
• 2009 PHEV test candidates include:
  – BMW Mini E
  – Mitsubishi i Miev
  – Magna/Ford Focus EV
  – Renault EV?
• 2010 PHEV test candidates include:
  – Nissan EV-02 (maybe ’09)
  – Ford Transit Connect
  – Chrysler EV
  – Hi-Pa Drive Ford F150
  – Toyota iQ derivative
Other Electric Drive/Infrastructure Work ‘09

• Lead Acid HEV *Ultra Battery* develop, lab testing, and 100,000-mile accelerated testing in a mule vehicle

• Bi-directional PHEV fast charge test to document infrastructure requirements, costs, and feasibility

• Testing support for DOE’s PHEV Technology Acceleration and Deployment Activity

• Testing support for DOE’s American Recovery and Reinvestment Act electric drive demonstrations

• Continue National PHEV Fleet Demonstration, expanding to 200 PHEVs with data loggers

• Continue NEV testing support to CARB

• Expand time of day PHEV charging studies

• Continue PHEV infrastructure charging study

• Continue HEV battery testing
Overall Hymotion Prius Fleet
(V2Green Data Logger)
Summary Report for 2008
Breakdown of Hymotion Fleet FE

Distribution of Annual Vehicle Fuel Economy - 2008
87 Hymotion Priuses with over 500 miles driven

Fleet cumulative FE = 50 mpg
Breakdown of Hymotion Fleet FE

Distribution of Monthly Fuel Economy
Hymotion Priuses with over 200 miles driven per month

Number of Car Months

Monthly Fuel Economy (mpg)
Breakdown of Hymotion Fleet FE

Range of Monthly Vehicle Fuel Economy
Entire Hymotion Prius Fleet - 2008

>200 mi / month
Impact of Aggressiveness

Effect Of Driving Aggressiveness on Fuel Economy This Month

- 0-2:
  - Trip Fuel Economy (mpg):
    - 0
    - 100
    - 200
    - 300
    - 400
    - 500

- 2-4:
  - Trip Fuel Economy (mpg):
    - 0
    - 100
    - 200
    - 300
    - 400
    - 500

- 4-6:
  - Trip Fuel Economy (mpg):
    - 0
    - 100
    - 200
    - 300
    - 400
    - 500

- 6-8:
  - Trip Fuel Economy (mpg):
    - 0
    - 100
    - 200
    - 300
    - 400
    - 500

- 8-10:
  - Trip Fuel Economy (mpg):
    - 0
    - 100
    - 200
    - 300
    - 400
    - 500
Impact of Aggressiveness

Hymotion Prius Fleet Fuel Economy vs. Aggressiveness
10,459 trips from 61 cars   Mar - Dec 2008

Removed trips < 1 mi
Impact of Aggressiveness

Hymotion Prius Fleet Fuel Economy vs. Aggressiveness
10,459 trips from 61 cars  Mar - Dec 2008

Trip Aggressiveness (% time @ >40% accel pedal) vs. Trip Fuel Economy (mpg)

CD trips only
Removed trips < 1 mi
Impact of driving behavior and external conditions

Selected 250 ideal trips randomly from all 2008 according to these criteria:

Charge depleting operation only
Trips > 3 miles
First 2 miles removed from all trips

No A/C usage
Amb temp 60 to 90 deg F

\[ \text{Cum FE} = 93 \text{ mpg} \]
over 1500 mi
Impact of driving behavior and external conditions

Selected 250 ideal trips randomly from all 2008 according to these criteria:

Charge depleting operation only
Trips > 3 miles
First 2 miles removed from all trips

No A/C usage
Amb temp 60 to 90 deg F

Cum FE = 93 mpg
over 1500 mi
Impact of driving behavior and external conditions

Selected 250 ideal trips randomly from all 2008 according to these criteria:

- Charge depleting operation only
- Trips > 3 miles
- First 2 miles removed from all trips
- No A/C usage
- Amb temp 60 to 90 deg F

Cum FE = 93 mpg over 1500 mi
Continue to influence U.S. gasoline prices
Acknowledgement

This work is supported by the U.S. Department of Energy’s Vehicle Technologies Program
Lee Slezak, David Howell, and Pat Davis

Additional Information

http://avt.inl.gov
or
http://www1.eere.energy.gov/vehiclesandfuels/avta/