Advanced Vehicle Testing Activity – Background and EERE \ FEMP Sponsored Federal Fleet PEV Deployment Study

Jim Francfort
INL / AVTA – Principal Investigator
InterFuels
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This presentation does not contain any proprietary or sensitive information
Presentation Outline

- Idaho National Laboratory (INL) / Advanced Vehicle Testing Activity (AVTA) backgrounds
- Historical and ongoing vehicle testing experience
- ARRA and TADA data collection
- EV Project and Micro-Climate process
- Federal Fleet Support Project Planning
- DOE-JBLM Micro Climate Study
- Federal Fleet Data Analysis
Idaho National Laboratory

- Eastern Idaho based U.S. Department of Energy (DOE) Federal laboratory
- 890 square mile site with 4,000 staff
- Support DOE’s strategic goal:
  - Increase U.S. energy security and reduce the nation’s dependence on foreign oil
- Multi-program DOE laboratory
  - Nuclear Energy
  - Fossil, Biomass, Wind, Geothermal and Hydropower Energy
  - Advanced Vehicles and Battery Development
  - Energy Critical Infrastructure Protection
AVTA Description

• Advanced Vehicle Testing Activity (AVTA) is conducted by the Idaho National Laboratory (INL) for DOE’s Vehicle Technologies Program within EERE
• INL’s AVTA tests light-duty vehicles, energy storage systems, and fueling infrastructures that support:
  – 100% Electric and dual-fuel electric drive systems
  – Advanced energy storage systems
  – Advanced control systems (i.e., micro hybrid vehicles)
  – 100% Hydrogen and HCNG blended ICE vehicles
• Provide benchmarked vehicle and infrastructure testing results to R&D programs, modelers, OEMs, battery manufacturers, and target/goal setters (DOE)
• Assist early adaptor fleet managers and the general public in making informed vehicle purchase, deployment and operating decisions
• Presentations to industry groups, including via Clean Cities’ sponsored webinars and symposiums
Vehicle Testing Experience

- Plug-in hybrid electric vehicles: 14 models, 430 PHEVs, 5+ million (ml) miles
- Extended Range Electric Vehicles: 1 model, 150 EREVs, 400+ thousand (k) miles
- Hybrid electric vehicles: 19 models, 50 HEVs, 6+ ml miles
- Micro hybrid vehicles: 3 models, 7 MHVs, 200+ k miles
- Neighborhood electric vehicles: 24 models, 372 NEVs, 200k miles
- Hydrogen internal combustion engine vehicles, 7 models, 18 HICEVs, 500k miles
- Battery electric vehicles 47 models, 2,300 BEVs, 5+ million miles (includes 500+ USPS BEVs)
- Urban electric vehicles: 3 models, 460 UEVs, 1 million miles
- 18+ million test miles accumulated on 2,300 electric drive vehicles representing 110 models
INL ARRA / TADA Data Collection Support

- INL tasked with data collection, analysis and reporting for charging infrastructure and light-duty vehicle ARRA and other DOE demonstrations:
  - EV Project: 8,300 Leaf EVs and Volt EREV, and 15,300 ECOtality / Blink Level 2 EVSE and fast chargers. Data logging (DL) on all 23,600 pieces of equipment
  - 140 Chrysler Ram PHEV Pickups with DL
  - 150 General Motors EREV Volts with DL
  - 21 Ford Escape PHEV SUVs with DL
  - 4,000 Level 2 EVSE deployed by Coulomb with DL
- INL, and OEM and EVSE partners collecting real-time data
- Raw data and personal information protected by NDAs (Non Disclosure Agreements)
Data Management Process Accomplishments

INL has been collecting onboard-vehicle data since 1993

Process Affected by Disclosure Agreements

HICEVs

HEVs

PHEVs

BEVs/EREVs

EVSE & Chargers

File server

SQL Server data warehouse

Report generator

INL Vehicle and Infrastructure Data Management System

Data quality reports

Individual vehicle and charger reports

Fleet summary reports - public

Focused technical analyses and custom reports

Modeling and simulations
## Vehicle and Infrastructure Data Sources

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>HEV and Start/Stop: 15 vehicle models, 1 data logger</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HICE: 1 vehicle model, 1 data logger</td>
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<tr>
<td></td>
<td>Conversion PHEVs: 9 vehicle models, 3 data loggers</td>
</tr>
<tr>
<td>time-history data (1 second interval)</td>
<td><strong>USPS</strong> eLLV conversions: 5 models, Gridpoint wireless logger</td>
</tr>
<tr>
<td></td>
<td><strong>Ford</strong> Escape PHEV, Ford wireless logger</td>
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<tr>
<td></td>
<td><strong>Chrysler</strong> Ram PHEV, Chrysler wireless logger</td>
</tr>
<tr>
<td>Vehicle event data (key-on, key-off)</td>
<td><strong>Nissan</strong> Leaf, Nissan/ATX telematics</td>
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<tr>
<td></td>
<td><strong>Chevrolet</strong> Volt, OnStar telematics</td>
</tr>
<tr>
<td>Charger event and time-history data (15 min interval)</td>
<td><strong>ECOtality</strong> Blink networked level 2 EVSE and DC fast chargers</td>
</tr>
<tr>
<td></td>
<td><strong>Coulomb</strong> ChargePoint networked level 2 EVSE</td>
</tr>
</tbody>
</table>

Managing 29 different data models
The EV Project

- $230 million project
  - $115 million grant from US Dept. of Energy
  - $115 million match
- Purpose: To plan, build, study, and evaluate mature electric vehicle charging infrastructure in six states plus D.C.
- Product: Lessons learned
EV Project Partner Locations

Level II EVSE & Fast Chargers

- Seattle
- Portland, Eugene, Corvallis, Salem
- San Francisco
- L.A.
- San Diego
- Phoenix, Tucson
- ECOtality
- Nashville
- Chattanooga
- Knoxville
- Dallas
- Fort Worth
- Houston
- Data Analysis and Reporting
- INL
**EV Micro-Climate Plan**

Structured program to make regions “plug-in ready”

1) **Community Planning**
   - Deployment Guidelines & Stakeholder Organization
   - Long Range Plan (10 years)
   - Micro-Climate Plan (1-3 years)

2) **Road Mapping**
   - 1-3 year action plan
   - Systematic GIS mapping

3) **Infrastructure Implementation**
   - Deployment of EV charge stations
   - Targets scalable national accounts
   - Implement sustainable business models
Infrastructure Planning

Electric Vehicle Charging Infrastructure Deployment Guidelines for the Oregon I-5 Metro Areas of Portland, Salem, Corvallis and Eugene

April 2010 Final Version 3.1

ecotality™ ELECTRIC TRANSPORTATION ENGINEERING CORPORATION
Infrastructure Planning

EV Micro-Climate™ Plan for Northwestern Oregon

November 2010
Version 4.0

ecotality
NORTH AMERICA
EV Location Analysis

Figure 13 CJS Option 2
High Voltage Room

PW - building 2012
Federal Fleet PEV Support Needs

- Support president’s directive that 100% of Federal vehicles should be fuel efficient or clean energy vehicles by 2015
- Due to the large number of vehicles in Federal fleets there is a substantial opportunity for introduction of plug-in electric vehicles (PEVs).
- Data is required to assess the opportunity magnitude
  - Trip distances
  - Total distance between based location returns
  - Time between base location returns during work shifts
  - Environmental conditions
  - Electrical capacity of the base location
  - Frequency of frequent intermediate stop locations
  - Electric capacity of intermediate stop locations
- Allows for the characterization and identification of the missions and fleet locations suitable for PEV use
Federal Fleet PEV Support Plan

• Perform in-depth (Micro Climate) fleet / base electrical infrastructure analysis on 1 to 3 locations. We have initiated the first study
• Perform vehicle mission analysis with data loggers on 400 Federal fleet vehicles
• Support budgeting process based on Micro Climate fleet / base studies
• Provide training to six(?) Federal fleets to support the correct matching of PEVs and vehicle mission requirements
• Funding has been secured from both DOE’s Federal Energy Management Program (FEMP) and Energy Efficiency and Renewable Energy (EERE)
DOE / DOD-JBLM Micro Climate Study

• Supports DOE / DOD MOU Concerning Cooperation in a Strategic Partnership to Enhance Energy Security
• Perform in-depth Micro Climate study at Joint Base Lewis (Army) / McChord (Air Force)
• Task 1 – Facility fleet and infrastructure assessment
  – Inventory JBLM’s vehicle fleet, including onroad, material handling and aircraft support vehicles. Identify vehicle “owner” and vehicle type. Generic vehicle mission descriptions will be developed and vehicles classified according to mission
• Task 2 – Development of target electrification vehicles
  – Based on Task 1 results report, identify a group of vehicles that can successfully be targeted for electrification in the short term based on electrical infrastructure, mission, visibility of vehicle mission, and availability of production PEVs. Solicit “owner” to assist with data collection, training and pilot demonstration
• Task 3 – Detailed assessment of target electrification vehicles
  – Based on Task 2 results report, gather detailed data on existing target vehicle use and install data loggers in target vehicles to quantify missions
  – Surveys of the vehicle mission will also be conducted of the vehicle “owners”
  – Requirements will be compared to PEV capabilities and a vehicle recommended
  – Using quantified mission requirements obtained from data logging and surveys, charge infrastructure requirements will be developed for the target vehicles, including charge hardware, location and electrical infrastructure requirements
  – Drawings suitable for permitting of electrical installations will be developed for each target vehicle infrastructure location
DOE-JBLM Micro Climate Study – cont’d

• Task 4 – Economic analysis of target electrification
  – The equipment, installation, training, and one-year monitoring costs to implement the target electrification detailed in the Task 3 report will be developed
  – The benefits, both economic and environmental, associated with the target electrification will also be quantified
  – Provide a cost-benefit analysis report of the target electrification
Federal Fleet Data Analysis

• Use 80 data loggers 5 times to document vehicle:
  – Trip distances
  – Total distance between based location returns
  – Time between base location returns during work shifts
  – Duration of frequent intermediate stop locations
• Likely 40 vehicles at 5 fleets instrumented, with 10 high-idling candidates
• Likely some combination of 20 vehicles at 10 fleets
• Deliverables
  – Electronic vehicle data set
  – Report characterizing data collected and vehicle missions suitable for PEV applications
  – A fleet training presentation prepared to train Fleet managers on the application of PEVs, presented to six(?) fleets
Project Status

• Second meeting has been held with JBLM
  – Preliminary data obtained to support first task and project scope definition

• Final set of candidate data loggers selected
  – Seems like every day a new product is introduced, but longevity of offering companies uncertain
  – Selection requires balance of cost, functionality, and likelihood of company endurance

• Soliciting Federal fleets for participation hand-raisers (looking for guinea pigs)

• Subcontracts being defined and costed
AVTA Summary – WWW Visitors

INL- AVTA WWW Visitors & Gasoline Costs (all formulations, areas, and grades)

Visitors (left axis)
Gasoline Cost (right axis)
Linear (Visitors (left axis))
Linear (Gasoline Cost (right axis))
Acknowledgement and AVTA WWW Address

This work is supported by the U.S. Department of Energy’s Vehicle Technologies Program (EERE) and FEMP

AVTA Information, Reports, and Fact Sheets @
http://avt.inl.gov