EV-Grid Activities at the Idaho National Laboratory & Collaboration with the EU

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This presentation does not contain any proprietary or sensitive information
INL Background

• INL conducts the light-duty vehicle portion of the Advanced Vehicle Testing Activity (AVTA) for the U.S. Department of Energy’s Vehicle Technologies Office
• 103.5 million test miles accumulated on 11,500 electric drive vehicles and 18,000+ EVSE and DCFC
• Currently, 1 million test miles collected every 6 days
  – More of a focus on field-based real world testing and data collection activities
  – Includes the grid / vehicle infrastructure interface and fueling requirements
  – Following pages are examples of ongoing EV / grid related activities
EV Project Infrastructure Reporting

- 21,000 discrete data sources (Vehicles, EVSE and DC Fast Chargers) from DOE’s/ECOtality’s EV Project. INL analyzes grid use and vehicle data for reporting
  - Supports the what, when, and where of grid infrastructure deployment decisions
  - Document impact when public EVSE costs money
  - Document economic incentives to shift charge times
  - Document drivers’ real-world grid-use decisions
  - Document BEV versus PHEV grid use
  - Document regional grid-use variations
  - Provide electric utilities with service territory specific grid demand information
ChargePoint Infrastructure Reporting

- **4,200 ChargePoint EVSE demonstration**
  - Demonstrates residential, private commercial and public grid use
  - Supports what kind of and where grid infrastructure should be placed
  - Document regional grid-use variations

![Graphs showing electricity demand]

- **Public Demand**
- **Commercial Demand**
- **Residential Demand**
Conductive EVSE & DCFC Testing

• Tested and reported 13 Levels 1 & 2 EVSE, and DC Fast Chargers (DCFC), with additional units in the test queue
• Developing with SAE multi EVSE, DCFC and PEV compatibility testing regime
  – Benchmarks grid-to-vehicle and grid-to-battery efficiencies, standby power requirements, power quality feedbacks
  – Reduces SAE J1772 incompatibility problems

See http://avt.inel.gov/evse.shtml for individual testing fact sheets
Wireless Charging Testing

- Testing two lab and vehicle based Wireless Charging systems with additional NDA’s being signed
- Developing with SAE wireless charging testing procedures
  - Benchmark grid-to-vehicle and grid-to-vehicle wireless efficiencies, standby power requirements, power quality, FCC compliance, and safety
  - Supports SAE’s development testing procedures
  - Independent assessments of alternative charging technology
Other Grid Infrastructure Activities

• Fleet grid demand reduction demonstration in AZ
  – Demonstrating DCFC grid demand reduction use at existing test fleet with distributed energy storage

• “Reduce Your Use” electric utility demonstration in CA
  – Demonstrate 24-hour forecast of peak demand and grid communications capabilities to reduce on peak charging with human override (start next month)

• EVSE Grid Study for DOE Office of Electricity
  – Time of use rate impacts on pricing elasticity

• Cyber security testing of 5 Level 2 EVSE CY-13
  – Examines vulnerabilities from EVSE to back office operations, and potentially connected utilities

• Eventual cyber security testing wireless charging
  – Will examine wireless vulnerabilities
Other Grid Infrastructure Activities – cont’d

• New York City electric taxi and infrastructure study
  – For the NYC Taxi and Limousine Commission and DOE, document BEV taxi travel and EVSE and DCFC grid use in highly congested environment
  – Supports inner city EVSE and DCFC planning

• Dublin Ireland electric taxi study
  – Signing NDA to document BEV taxi travel and EVSE and DCFC grid use in EU congested environment
  – Supports US/EU partnership and comparison to NYC
Other Grid Infrastructure Activities – cont’d

• Singing NDA for I-5 DCFC travel corridor study
  – For DOTs of Oregon and Washington, document DCFC use for multi-leg and single-leg trips
  – Supports USDOT and state DOTs: where to place interstate travel corridor EVSE & DCFC quandary

• NYSERDA 580 EVSE L2 data collection. 6+ Manufacturers
  – Demonstrates private commercial and public grid use in challenging environments in New York State
  – Supports the where of grid infrastructure

• Grid and vehicle study at three DOD bases. Fourth base EVSE deployment and data collection
  – Determines DOD base grid suitability to support new EVSE and DCFC based on travel patterns
  – Supports DOD’s petroleum reduction and DOE/DOD MOU
Other Grid Infrastructure Activities – cont’d

• Nissan Leaf DCFC Testing
  – Grid and battery impacts from DCFC charging
  – Probable secondary use distributed storage study
• Battery Mule Testing of advanced batteries
  – Traction battery testing will provide secondary use battery for distributed energy study
• Chevy Volt and other OEM demonstrations
  – Demonstrates BEV, PHEV and EREV grid use
• Grid Interaction Technical Team
  – Project(s) selection and execution as team member

This presentation is available alphabetically in the Publications section of the AVTA website:
http://avt.inl.gov