ELECTRIC DRIVE VEHICLE DEMONSTRATION AND VEHICLE INFRASTRUCTURE EVALUATION

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OVERVIEW

TIMELINE
Project Start: 10/1/09
Project End: 3/31/13
Percent Complete: 1%

BUDGET
Total Project: $199,600,000
DOE Share: $99,800,000
Contractor: $86,396,560
ORNL FWP: $6,800,000
INL FWP: $6,603,440

BARRIERS
Infrastructure Deployment
Vehicle Deployment
Standards Development

PARTNERS
Nissan North America
11 Cities
10 Electric Utilities
2 National Laboratories
2 Universities
BUILDING CONSENSUS
Deploy 4,700 Nissan Leaf Battery Electric Vehicles In 5 Regions
Establish Mature Charge Infrastructures To Support Leaf Vehicles
Identify And Resolve Barriers To Infrastructure Deployment
Develop An Infrastructure Utilization Data Base
Evaluate Infrastructure Effectiveness
Develop Models For Future Infrastructure Deployments
Model Infrastructure For The Next 5 Million Vehicles
MILESTONES

- Project Initiation: 10/01/09 (complete)
- Complete 10-Year Plans: 04/30/10 (complete)
- Complete EV Micro-Climates: 08/30/10
- Initial Infrastructure Installation: 11/01/10
- Initial Vehicles Deployed: 12/01/10
- Deployment Complete: 09/30/11
- Initial Lessons Learned: 06/30/12
- Data Collection Complete: 12/31/12
- Final Reports: 03/31/13
INFRASTRUCTURE PLANNING

- Organize Regional Stakeholders
  - Government
  - Utilities
  - Employers
- Develop 10-Year Plan
  - Deployment Area
  - Vehicle Penetration
  - Infrastructure Requirements
- Develop EV Micro-Climate
  - Initial Deployment
Vehicle Deployment

- ≈ 1,000 Nissan Leaf Battery EVs In Each Region
- Residential EVSE Provided By EV Project At Vehicle Purchase
- ETEC Customer Relations Management System Coordinated With Nissan Customer Purchase Journey
- Residential EVSE Installed By EV Project
- ETEC Certified Contractor Network Used For Installation
- Vehicle Data Collection Via Telematics Over 18 Month Operating Period
- Vehicle Data Base Maintained And Analyzed At INL
INFRASTRUCTURE DEPLOYMENT

- EVSE Designed And Manufactured To Allow Power And Energy Data Collection And Demand Response Control
- Residential EVSE Installed For All Vehicles
- 1,300 Commercial EVSE Deployed In Each Region
- 150 Public EVSE Deployed In Each Region
- ≈ 50 DC Fast Chargers Deployed In Each Region
- Data Collected From All Chargers Via Internet
- Infrastructure Data Base Maintained And Analyzed At INL
Vehicle Data Collected Using Navigation System Telematics

Vehicle Data Set On Key On/Key Off Event
  - Vehicle Identification Number
  - Time & Date
  - Location (GPS Coordinates)
  - Battery Indicated State-of-Charge

Raw Data Transmitted From Nissan Global Data Center

Vehicle Data Merged With Charger Data At INL
CHARGER DATA COLLECTION

- Charger Data Collected Using GPRS Cellular Modem
- Charger Data Set Based On Metered Output
  - Power vs. Time
  - Total Energy per Charge
  - Numerous Event Based Times
- Access Controlled For Commercial, Public And Fast Chargers
  - Identifies User Of Charger
  - Allows Development Of Revenue Models
- Web Portals And Mobile Applications Established For Chargers Users
PROJECT MANAGEMENT

- Project Staffing Complete (50 New Personnel)
- Project Offices Established
  - Home Office
  - 4 Regional Offices
- Project Management System Installed
  - Project Cost And Schedule
  - Project Reporting And Earned Value
- Customer Relations Management System Established
  - Charger Installation Management
  - Operational System Management
TEN-YEAR PLANS

◆ Infrastructure Guidelines Issued
  ◆ Phoenix/Tucson
  ◆ Seattle
  ◆ Portland
  ◆ San Diego
  ◆ Tennessee

◆ Ten-Year Plans Complete
  ◆ Phoenix/Tucson
  ◆ Seattle
  ◆ Portland
HARDWARE MANUFACTURING

- Industrial design Complete
- Meter Selected (Sagem)
- Connector Selected (REMA USA)
- GPRS Modem Selected Qualcom
- Manufacturing Engineering By Roush Industries
- Manufacturing Partners Under Negotiation
- Certification Established With UL
- Validation Plan Established With Nissan
NETWORK DEVELOPMENT

- Software Developer Contracted
- Software Architecture Developed
- INL Servers Purchased And Setup
- User Interfaces Under Development
- Nissan Global Data Center Link Under Development
MOBILE APPLICATIONS

Charge Status
UL CERTIFICATION

- UL Joined EV Project As Partner
- UL Certification To New Standard 2594
  - Level 2 EVSE
  - DC Fast Charger
- Collaboration On Installer Standards
- Collaboration On Certification Issues
  - Plug-Connected EVSE
  - Meter Certification
Adopted Chademo (Japanese) Standard
  - Physical And Communication Interface
  - Compatible With Nissan, Mitsubishi And Subaru

Obtained Proprietary Release From Chademo
  - Level 2 EVSE
  - DC Fast Charger

Presented Technical Description To SAE J1772 Committee
  - Agreement Obtained From Other Charger Suppliers
  - Initial Deployment In United States (260 Chargers)

SAE Committee Delaying Adoption
Collaboration With San Diego Gas & Electric
- Test Four Different Time-of-Use Rates
- Peak To Off Peak Ratios Vary From 2:1 To 6:1

California Public Utilities Commission Approval
- Implement With EV Project
- Provide Rate Design Data For All California Utilities

Billing Calculated Using EVSE Meter
- Eliminates Separate Meter Installation Cost
- Minimizes Energy Diversion Potential
FIRST RESPONDER TRAINING

- Input From California First Responder Training
- Coordination With National Fire Protection Association
- Safe Response Practices
- Hazardous Material Inventories
- Site Cleanup
- Vehicle Storage
ADA REQUIREMENTS

◆ Coordinate Requirements With States
◆ Working Towards Consensus
  ◆ First EV Charger Handicap Accessible
  ◆ First EV Charger Van Accessible
  ◆ Building Accessibility Not Required
◆ Developing Parking Lot Designs
EVSE DEPLOYMENT

- Deploy 12,000 Level 2 EVSE
- Deploy 260 DC Fast Chargers
- Chargers Assembled In United States
- Chargers Installed Using Local Contractors
  - Certified To Pay Prevailing Wages (Davis Bacon)
  - Certified To Safety Requirements
  - Trained On Installation Requirements
  - Equipped To Interface With ETEC Network Scheduling
SOFT INFRASTRUCTURE

- Establish Consistent EV Charger Signage
  - Highway
  - Parking Lot
- Train First Responders And Roadside Service Providers
- Resolve Issues Concerning Electricity Resale
- Develop Methods For Utility Notification When EVSE Installed
- Streamline Permitting In Each Region
  - Online Permit Initiation
  - Credit Card And Account Payment
  - Self inspection And Energization
REPORT PREPARATION

- Vehicle Report
  - Characterize Vehicle Utilization
  - Establish Owner used Range

- Charger Report
  - Characterize Charger Utilization
  - Time of Day Use
  - Energy Transfer
  - Power Demand

EV Report
DEMAND RESPONSE

- Utility Data Generation
  - Load Duration
  - Energy Use
  - EV Project Data
  - 10-Year Projections
- Demand Response Demonstration
  - EVSE Control
  - User Transparency Evaluation
- GIS Based Data
  - Distribution Effects
  - Clustering
BUSINESS MODEL DEVELOPMENT

- Development of EVSE Cost Models
  - Cost Of Commercial Charging
  - Cost Of Residential Charging

- Development of EVSE Revenue Models
  - Commercial Charging Price Testing
  - Quantification Of Non-Revenue Benefits

- Development Of Business Models
  - Allow Viral Deployment of Commercial EVSE
  - Models For Infrastructure Deployment In The Next 500 Cities

Future Work