

18 Electric Transportation

Program Overview

Program Description

The Electric Transportation program conducts research and development on vehicle and infrastructure technologies that enable the use of electricity as a transportation fuel. The program has played a leading role in the development of plug-in hybrid electric vehicle (PHEV) technologies that are now at the forefront of automotive industry development efforts. EPRI also serves as the focal point for the development of infrastructure standards and technology to support PHEV adoption by utility customers. EPRI's non-road electric transportation efforts have demonstrated the cost-effective use of battery electric vehicles in numerous commercial and industrial applications and serve as the technical foundation for successful, customer-focused utility non-road electric transportation market expansion programs.

Industry Needs and Issues Addressed

- Electricity is the only potential energy source for transportation that addresses the simultaneous need for fuel diversity, energy security, reductions in greenhouse gas emissions, and improvements in air quality that is widely available and produced domestically. Electric utilities must understand the paradigm shift that will occur with an inevitable transition of transportation energy from petroleum to electricity—as well as their new role as a fuel provider for vehicles.
- The major automotive companies, including General Motors, Ford, and Toyota, are competing to be first to market with PHEVs.
- Nearly all of the major automakers are reaching out to the utility industry to develop and standardize infrastructure for recharging plug-in hybrids.
- Fleets can offset high fuel costs and meet environmental requirements by incorporating plug-in hybrid or battery electric vehicles into operations.
- Adoption of non-road electric vehicles at customer sites can reduce fuel costs and increase customer satisfaction. Emission-constrained sites like seaports and airports can reduce the cost of environmental compliance.

Impact

- Collaborate with the automotive industry on major PHEV test and demonstration programs
- Quantify the economic and environmental value of electrifying transportation—to utilities and society
- Develop appropriate intelligent infrastructure technology and standards to maximize PHEV value to a utility—including the optimization of off-peak charging
- Understand utility system impacts of PHEV adoption
- Lower utility fleet operating costs as electric vehicles reduce consumption of imported fuel
- New vertical market business opportunities arising from development and deployment of advanced electric drive technologies
- Enhance customer satisfaction and retention through improved productivity and reduced operating costs and emissions
- Utilize investment through EPRI's collaboration with public and private organizations

Key Accomplishments

- Formation of major collaborative PHEV programs with the automotive industry, including General Motors, Ford Motor Company, and Eaton Corporation
- Developing proof of concept plug-in hybrid-drive systems in multiple transportation platforms
- Expanding market penetration of electric drive in the non-road market through value demonstrations

- Validating the environmental benefit of electric vehicles (EVs) to commercial and industrial entities and communities in which the entities are located
- Analysis of potential impacts to utility systems

Current Year Objectives

- Demonstrate utility fleet prototype PHEVs and acquire and analyze field test data
- Develop the utility value proposition for PHEVs
- Develop and test advanced battery. Develop battery production cost model
- Develop communication protocols for PHEVs connecting to the electrical grid
- Demonstrate advanced electric-drive technologies in non-road applications

Industry Involvement

- Estimated 2009 funding: \$3.0M

Program Technical Lead

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Summary of Projects

PS18A Plug-In Hybrid Electric Vehicle Development (056053)

Project Set Description: This project set addresses the technologies and products that demonstrate the value of electric-drive systems and components in PHEV and battery electric vehicle (BEV) applications.

Project Number	Project Title	Value
P18.001	Plug-in Hybrid Electric Vehicle Evaluation and Test Data Analysis	Testing, data collection, and analysis of prototype plug-in hybrid electric vehicles.
P18.002	Advanced Technology Development for PHEV Systems	Advanced PHEV design and technology approaches for vehicle manufacturers that will optimize PHEV efficiency and reduce cost.
P18.003	Advanced Battery System Development and Testing	Battery system testing and development, modeling, simulation, and cost assessment for both mature and emerging advanced battery technologies.
P18.004	PHEV Systems Analysis	Vehicle system analysis for PHEVs. Identify current technology issues and needs. Rapid response to emerging issues.

Project Descriptions

P18.001 Plug-in Hybrid Electric Vehicle Evaluation and Test Data Analysis (062128)

Issue

Several large automotive manufacturers have publicly stated their intent to commercialized plug-in hybrid electric vehicles (PHEVs) as early as late 2010. In 2009, there will be a number of active PHEV prototype test and demonstration programs in utility and public fleets and with customers. These programs are important opportunities to collect and analyze real-world operating data. This activity will enable utilities to understand the performance and operation of different types of PHEVs and to determine benefits and impacts to their systems.

Description

This project provides a comprehensive real-world test program for EPRI and utility PHEV demonstration fleets. EPRI has developed a sophisticated system for collecting and processing detailed vehicle systems and reporting the results to participants. This information is valuable for utilities to understand how real-world PHEV use impacts their system and business, to guide fleet “greening” and other environmental compliance issues, and to determine the most promising PHEV technological approaches.

The scope of data collection and analysis includes

- development of test procedures for field testing of prototype PHEV fleets;
- acquisition and analysis of vehicle and system data—including PHEV Sprinter, PHEV Trouble Truck, among other demonstration fleets;
- reporting and dissemination of vehicle test data;
- comparison to laboratory battery and component tests, and verification of vehicle simulation data; and
- surveying transportation applications to determine potential PHEV candidates and performing performance profile analyses on these candidates.

Value

- Increased understanding of PHEV product performance
- Reduced fleet operating costs
- Facilitation of fleet environmental compliance
- Real-world data to support PHEV benefit and impact analysis at the utility

How to Apply Results

Utilities can incorporate PHEV test results into their internal analyses. Fleet managers can use the test data and vehicle specifications to acquire PHEV technology for utility fleet operations. In addition, this project will enable EPRI and its advisors to carefully review the transportation sector, to identify transportation operating profiles and specific vehicle platforms as candidates for PHEV operation.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Plug-in Hybrid Electric Vehicle Evaluation and Test Data Analysis	10/31/2009	Technical Update

P18.002 Advanced Technology Development for PHEV Systems (065233)

Issue

Plug-in hybrid vehicles (PHEVs) will not realize their energy saving and carbon dioxide (CO₂) emission reduction potential until the market has matured to the point that vehicle manufacturers are providing PHEV systems that take full advantage of advanced batteries and drive systems. Stakeholders will benefit from a careful review of the optimal methods of combining internal combustion and electric motor and engine power to maximize PHEV’s operational benefits while meeting performance requirements.

Description

This project will utilize the modeling competency developed at EPRI to interpret the test results obtained from the PHEV prototype testing, to develop a specification for an optimized design. The modeling effort will compare the performance characteristics of the various PHEV potential configurations. The information compiled will enable EPRI to recommend to vehicle manufacturers new design approaches

that will lead to next-generation PHEV technology. Finally, this project will define a 2010 initiative that will lead to the establishment of projects that advance specific PHEV technologies.

Value

- Increase benefits and reduce costs of utilizing PHEVs across multiple platforms
- Contribute to reduction of CO₂ emissions through decreased petroleum consumption

How to Apply Results

The specifications developed for optimized vehicles will be used by the project participants and their customers to acquire PHEV drive systems that maximize the benefits of fuel savings and emission reductions. Procurement specifications ensure that the vehicles acquired will achieve the maximum desired benefits.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Advanced Technology Development for PHEV Systems	12/31/2009	Technical Update

P18.003 Advanced Battery System Development and Testing (063272)

Issue

The potential for PHEVs to achieve widespread market acceptance depends heavily on the cost, performance, and durability of advanced lithium-ion (Li-ion) battery systems. Early testing by EPRI and utilities of Li-ion battery systems against PHEV duty cycles provided some of the earliest evidence of the capability of the technology to meet PHEV requirements. New PHEV design requirements and emerging battery technologies will continue to require additional systems development, technology evaluation, and testing.

Description

EPRI will continue its industry-leading battery technology development and evaluation program. This project will identify and address issues of importance to the development and verification of PHEV battery systems, including the following:

- Development of suitable test procedures and methods for evaluation of advanced batteries for PHEV applications
- Long-term life-cycle testing of candidate battery technologies
- Identification of technical issues related to PHEV battery system, including cost, environmental impact, recycling, or manufacturing technology
- Analysis and recommendations regarding the current status of battery technology for PHEVs

Value

- Verify maturity and readiness of PHEV battery technology
- Reduce PHEV battery system cost and environmental impact
- Obtain early identification and testing of promising emerging battery technologies
- Identify and address issues that affect PHEV battery commercialization

How to Apply Results

The results from this project will provide utilities with world-class, specific technical and cost information regarding battery technology for PHEVs. Utilities will gain a thorough understanding of the readiness of Li-ion battery technology for PHEVs—the single most substantial technical challenge to the development and commercialization of these vehicles.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Advanced Batteries for PHEVs: Status 2009	12/31/2009	Technical Update

P18.004 PHEV Systems Analysis (065234)

Issue

Historically, EPRI has provided leadership in the development of electric-drive solutions. As the focus on energy security, energy efficiency, and carbon dioxide (CO₂) emissions reductions becomes even more prevalent, EPRI should continue its leadership role in representing its members to ensure that the benefits of electric transportation are clearly understood and recognized. This will help ensure a positive transition away from imported oil to electricity as an energy source through federal, state, and local actions.

Description

This project will fund a full-time position dedicated to monitoring current actions and issues relating to electric transportation, as well as continuing to respond to member advisor guidance in implementing the necessary leadership actions to influence developments. The scope of work will be as follows:

- Define the leadership expectation for EPRI and its electric transportation advisors
- Identify critical path actions that should be implemented
- Execute the above actions

Value

- Foster recognition of the electric power industry's proactive role in leading electric transportation developments
- Ensure accurate dissemination of information about electric transportation
- Provide timely responses to issues and concerns about electric transportation

How to Apply Results

On behalf of its members, EPRI will develop timely responses to issues and concerns expressed by policy makers and other interested parties. This information will be shared with the utility industry to ensure accurate repeatable responses.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Summary of PHEV Systems Analysis	12/31/2009	Technical Update

PS18B Non-Road Electric Transportation Market Expansion (056054)

Project Set Description: This project set focuses on the application of electric-drive systems in non-road industrial, commercial, and airport and seaport markets whose technology successes will advance the awareness of the value of electric-drive systems.

Project Number	Project Title	Value
P18.005	Non-Road Utility Education Campaign	Educates senior utility managers about the benefits of a non-road EV program and provides a “starter kit” that will enable the utility to initiate a non-road EV program.
P18.006	Market Transformation Demonstrations	Demonstrations of non-road EV applications in diverse industry settings will promote continued adoption of EV technologies in these market sectors.
P18.007	PHEV Drive Systems for Airport and Port Applications	Development and demonstration of PHEV technology in airport, seaport, and other non-road applications.

Project Descriptions

P18.005 Non-Road Utility Education Campaign (065237)

Issue

The value proposition for electrifying non-road transportation applications has been proven among the few utility non-road programs that currently exist. These programs have shown that market expansion can occur, kilowatt hour sales can increase, demand response requirements can be adjusted to off-peak periods, and customer satisfaction can be increased. By communicating these benefits to more utilities, decisionmakers can consider the implementation of similar programs in their own service territories.

Description

This project will develop and execute an education campaign that focuses the attention of senior managers within the utility industry on the benefits of a non-road electric vehicle (EV) program. The project will also create a starter kit so utilities can initiate a non-road EV program. The scope of work is as follows:

- Execution of a market survey to determine which utilities are current conducting non-road EV market growth campaigns
- Establish criteria to identify likely successful utility candidates for a non-road EV market growth campaign
- Develop the necessary education material
- Conduct regional or individual utility conferences to educate appropriate utility personnel

Value

- Increase penetration of EVs in the non-road market
- Expand the market for utility products while enhancing customer satisfaction
- Achieve greater carbon dioxide (CO₂) emissions reductions

How to Apply Results

The project will enable members to more easily establish effective non-road EV market growth campaigns. The campaign material will be used by the commercial and industrial account manager to execute an internal campaign once a budget has been approved by senior management.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Non-road Utility Education Campaign	12/31/2009	Technical Update

P18.006 Market Transformation Demonstrations (060498)

Issue

Increased success of non-road electric vehicle (EV) market penetration has most often resulted from actual product demonstrations spanning a diverse industry base that includes airports, food processing plants, and automotive manufacturers. Continued efforts in this area will enable ongoing market expansion.

Description

This project will continue to seek and execute non-road EV demonstration projects across the United States. The scope of work is as follows:

- Review past demonstrations to identify types, locations, and level of success
- Define criteria that resulted in successful demonstrations
- Identify potential future demonstration projects across the United States and develop a scope of work for these projects

Value

- Increase penetration of EVs in the non-road market
- Expand the market for utility products while enhancing customer satisfaction
- Achieve greater carbon dioxide (CO₂) emissions reductions
- Demonstrate EV technology validation in increasingly diverse applications
- Provide valuable market information to a national audience

How to Apply Results

Utility account executives will use case studies and reports that document the value of EV applications to establish interest in electric transportation from customers in their service territories as part of a non-road EV market growth campaign.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Non-road Electrification Demonstration	6/30/2009	Workshop, Training, or Conference

P18.007 PHEV Drive Systems for Airport and Port Applications (065238)

Issue

Market penetration of electric vehicles (EVs) in airport applications has been successful, with the exception of trucks that operate on airport tarmacs. In 2006 and 2007, the first demonstrations of EV technologies in seaport applications were conducted. Further work is necessary to further EV penetration in these market sectors.

Description

In 2008, seaport and airport applications will be continued, with a strong focus on bringing the PHEV drive system technology to vehicles operating in these complex environments, such as food service and airline fueling trucks at airports and hostlers at seaports. The scope of work is as follows:

- Extending the audit of airports and seaports to determine vehicle applications with service requirements that can be met by plug-in hybrid vehicle (PHEV) drive systems
- Preparing a scope of work that would enable the conversion of an internal combustion vehicle to a PHEV and initiate efforts to develop a supplemental project to demonstrate PHEVs in airports and ports

Value

- Further extend the applicability of PHEVs in non-road airport and seaport applications
- Reduce carbon dioxide (CO₂) emissions in airport and seaport environments

How to Apply Results

Utility representatives calling on seaports and airports can utilize results from technology demonstrations of PHEVs in these sectors to engage those customers with applicable product solutions. Demonstrations of the PHEV technologies can be implemented at additional airports and seaports, further documenting the value.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Performance of a PHEV Yard Hostler in Port Application	12/31/2009	Technical Update

PS18C Environmental and Economic Analysis of Electrifying Transportation (056055)

Project Set Description: This project set utilizes environmental knowledge to advance the cause of electric-drive technology in metropolitan regions.

Project Number	Project Title	Value
P18.008	Economic Analysis for Electric Transportation	This project will deliver an analysis of the environmental, economic, and societal benefits of on-road and off-road electric transportation in an easy-to-understand language directed at decision makers and their constituencies. It will also determine specific community and utility economic impacts.
P18.009	Environmental and Policy Analysis for Electric Transportation	This project will produce an analysis of the environmental benefits of electric transportation and of the impacts of policy proposals on utilities and vehicle manufacturers and their affect on the adoption of PHEVs.

Project Descriptions

P18.008 Economic Analysis for Electric Transportation (063274)

Issue

In 2006, EPRI initiated an environmental analysis that assessed the environmental benefits of electric transportation with a regional analysis conducted around the Cleveland metropolitan area and state of Ohio. Further analysis needs to be performed to assess the environmental benefits in other U.S. regions that take into account unique regional differences.

Description

In 2009, EPRI will continue to explore the impacts of plug-in hybrid vehicles (PHEVs) at a regional level. Using the results from the initial analysis, EPRI will create region-specific reports that demonstrate the environmental, economic, and societal benefits of electrifying on-road and off-road transportation in easily understandable language suitable for decisionmakers and their constituencies. The scope of work is as follows:

- Review of the California, Ohio, and other 2007 studies for lessons learned, with an application of this knowledge to a regional project scope of work
- Establish utility champions within each recommended region
- Develop a schedule, budget, and work plan for each region
- Initiate the regional analysis with utility champions located in each region

Value

- Demonstrate the environmental benefits of electric transportation
- Demonstrate the proactive utility response to reduce the environmental impact of transportation on a regional basis
- Eliminate barriers to greater adoption of electric transportation solutions

How to Apply Results

Environmental managers within the funding utilities will either conduct the analysis in their own specific regions or apply results to estimate similar benefits of implementing broader electric transportation solutions throughout their area of operation. The EPRI analysis team will be able to join the interested manager to extrapolate the results to the specific region in question or to conduct a detailed environmental analysis if required.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Regional Economic Analysis of the Impact of Electric Transportation	12/31/2009	Technical Report

P18.009 Environmental and Policy Analysis for Electric Transportation (063273)

Issue

Assessments of the environmental impacts of PHEVs by EPRI and other organizations point to significant environmental benefits, particularly with respect to greenhouse gas emissions and air quality. Policy treatment of emissions offsets or other treatment of PHEVs as agents of positive impact to energy security or the environment could create incentives for greater adoption of electric transportation, leading to increased energy savings as well as further reductions in CO₂ emissions. Understanding the impact of proposed policies and developing new approaches can improve PHEV adoption significantly.

Description

This project will identify and conduct detailed analyses of environmental and policy approaches that affect electricity as a transportation fuel, including both on-road and non-road applications. These include the following:

- Develop approaches to determine and capture the value of PHEV CO₂ and greenhouse gas offsets, including Low Carbon Fuel Standards (LCFS)
- Identify and address analytically other environmental issues affecting electricity as a transportation fuel
- Develop recommended approaches to capturing the environmental value of electricity as a transportation fuel

Value

- Enable the determination and utilization of CO₂ offsets from PHEVs
- Identify and address issues that impact the environmental value of electricity as a transportation fuel

How to Apply Results

Members that finance this project will be able to use the strategy developed to implement a simplified emission credit process to enable mobile source credits to be substituted for stationary credits in their area of operation.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Summary of Environmental and Policy Analysis for Electric Transportation	12/31/2009	Technical Report

PS18D Advanced Infrastructure Development for Plug-In Hybrid Electric Vehicles (056057)

Project Set Description: This project set addresses issues surrounding EV infrastructure and impacts on the utility grid as electric-drive systems enter the marketplace. Special attention is paid to the potential of plug-in hybrid and fuel cell vehicles to provide power to homes, commercial sites, and potentially the grid itself.

Project Number	Project Title	Value
P18.010	Infrastructure Working Council	Support of the Infrastructure Working Council (IWC) in its role as facilitator of infrastructure review and analysis
P18.011	Identification of PHEV Infrastructure Requirements	Identification of critical issues that impact PHEV-grid connectivity so that recommendations for enhancing the charging infrastructure can be made
P18.012	Vehicle and Infrastructure Connectivity and Communication	Development and evaluation of different communication pathways between PHEVs and charging infrastructure
P18.013	Infrastructure Technology Demonstrations	Development and testing of vehicle, battery, and on-board communication systems to support and enable PHEV-grid connectivity

Project Descriptions

P18.010 Infrastructure Working Council (065239)

Issue

The Infrastructure Working Council (IWC) was established to provide a forum for utilities, automotive manufacturers, suppliers, and other stakeholders to address issues regarding electric infrastructure for plug-in hybrid and electric vehicles. The IWC focuses on ensuring intercompatibility, safety, and simplicity of grid infrastructure as electrically powered vehicles enter the marketplace. EPRI is well-positioned to represent its members through support of the IWC and its activities to foster continued adoption of electric transportation technologies.

Description

In 2009, the IWC will continue to serve the industry as the facilitator of infrastructure review, analysis, and standardization. Project 18.010 will provide support to IWC for the execution of infrastructure analysis that positively affects the commercialization of PHEVs and battery electric vehicles (BEVs) in the automotive and truck industries. This project will also conduct a representative sample audit of airports and seaports across the United States and prepare a report with recommendations on airport and seaport infrastructure issues that should be addressed by the IWC. The scope of work is as follows:

- Lead utility industry participation in SAE J2293 standards development.
- Review related U.S. and international standards (IEEE 1547 and others) and participate in these efforts on an as-needed basis.
- Continue to identify and execute infrastructure projects that address issues, concerns, and standards that impact PHEV and BEV commercialization.

Value

- Standardization of vehicle and stationary charging connection, equipment, and infrastructure to ensure interoperability and the safety of vehicle recharging
- Ensure that new standards facilitate communication between vehicle and grid to support industry needs for off-peak charging and electricity billing and tracking
- Minimize connectivity costs from both the grid and vehicle perspectives

How to Apply Results

Results from the IWC analysis will enable clean vehicle technology management teams at funding utilities and their customers to implement connectivity between the grid and EV systems. The reports developed will be used by members to ensure that connections are achievable and cost-effective.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Infrastructure Working Council Annual Report	12/31/2009	Technical Report

P18.011 Identification of PHEV Infrastructure Requirements (065240)

Issue

Plug-in hybrid vehicle technology development is accelerating within the automotive industry. Existing and new standards are in the process of being updated. Technology is changing rapidly—including the proposed methods of interfacing these vehicles to the grid.

Description

This project will compile the knowledge accumulated from these technology demonstrations into a single document and will update recommendations for PHEV charging infrastructures. The scope of work is as follows:

- Review and catalogue the PHEV infrastructure issues and concerns regarding grid connectivity
- Establish and prioritize a list of actions and recommendations for PHEV infrastructure standards
- Develop a scope of work to initiate project(s) required to address specific PHEV infrastructure actions

Value

- Enable simple and safe connectivity between PHEV systems and the grid
- Enable intelligent communication between electric vehicles (EVs) and the grid
- Provide guidance to members in preparation for programs to implement EV market penetration

How to Apply Results

Utility distribution management will use work papers and planning documents based on PHEV knowledge and prior supplemental infrastructure projects to execute a review of their own infrastructure and to implement a plan for PHEV market penetration.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Requirements of PHEV Infrastructure	9/30/2009	Technical Update

P18.012 Vehicle and Infrastructure Connectivity and Communication (067434)

Issue

Communication between PHEVs and grid infrastructure is the key element to maximizing the value of PHEVs as a connected load. As the market adopts PHEVs, utilities will need a means of communicating with these vehicles, to incentivize off-peak charging, tracking, and billing the consumption of electricity as a transportation fuel and to optimize their use as distributed storage devices. There are number communication protocols and physical media—both wired and wireless—and their integration in advanced metering and other Smart Grid applications must be well understood.

Description

This project will provide the technical analysis and development work to support a single communication protocol and physical media that will be adopted as a standard by the automotive industry for vehicle-to-grid communication. The technical results of this project will support ongoing standards efforts in Project 18.010 and physical demonstrations in Project 18.013.

Value

- A technical specification for vehicle-to-grid communication
- Understanding of technical issues regarding vehicles communicating to grid infrastructure
- Development of a viable approach to create a single-communication methodology applicable to plug-in hybrid vehicles from all automotive manufacturers

How to Apply Results

Results will be used in advanced planning for the integration of PHEVs into distribution systems. Utilities will receive a technical specification document that can be used to clearly proscribe requirements to advanced metering infrastructure suppliers, regulators, and other stakeholders.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Communication Requirements for PHEVs	12/31/2009	Technical Update

P18.013 Infrastructure Technology Demonstrations (065241)

Issue

This project will conduct field demonstrations of advanced infrastructure connected to prototype PHEVs to address the issues, concerns, and technologies required to maximize the benefits of PHEV technology as it connects to the utility grid. The project focused on four major objectives:

- Determining the feasibility of PHEVs as distributed resources for generating electrical power to improve the security and reliability of electrical power distribution
- Defining and testing a communication protocol that would enable PHEVs to communicate with tomorrow's intelligent grid and smart home
- Validating interoperability between PHEVs and charging stations, charging stations and building emergency medical services (EMS), and building EMS and energy service providers
- Analyzing current urban and rural distribution systems to understand the impacts of PHEV/battery electric vehicle (BEV) charging on the current infrastructure, with recommendations on near-, mid-, and long-term modifications needed to support the merging of transportation and electricity

Description

This project will focus on continued development and testing of the vehicle, battery, and on-board communication systems to ensure potential benefits are maximized when PHEVs are connected to the grid. The scope of work is as follows:

- Review of findings from the 2007 advanced infrastructure connectivity supplemental projects to identify the vehicle-specific issues and concerns to be addressed
- Prepare a project plan that addresses the identified issues and concerns
- Establish alliances within the automotive and utility industries to address the issues and concerns
- Develop a project plan for 2009 to evaluate the systems required as part of a vehicle and intelligent grid system

Value

- Increase knowledge about advanced issues of PHEV-grid connectivity
- Provide planning information for mid- and long-term conversion to PHEV commercialization
- Enable necessary modifications to infrastructure to support anticipated consumer demand

How to Apply Results

Distribution managers and fleet operators will receive detailed information on infrastructure impacts, enabling mid- and long-term planning to accommodate PHEV charging and support consumer demand. The knowledge resulting from this project will enable distribution and communication planners to ensure the linkage of electric-drive vehicles to the intelligent grid and smart home through advanced metering systems.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Status of Advanced-Infrastructure Connectivity Analysis and Demonstrations	12/31/2009	Technical Report
