The Utility Guide to Plug-in Electric Vehicle Readiness

November 2011
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In collaboration with the Electric Drive Transportation Association
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Plug-in electric vehicles (PEVs) are here. These new electric cars and trucks will be available in all 50 states by the end of 2011. Most major auto manufacturers and numerous start-ups will each offer their own PEVs by 2013.¹ From compact two-seaters, four-door sedans, and luxury sports vehicles, to SUVs and trucks, PEVs will soon be coming to a car dealership near you, if they are not there already.

Electric transportation has tremendous potential to directly benefit society as a whole—reducing the nation’s dependency on foreign oil, increasing national energy security, lowering overall transportation fuel costs, improving air quality nationwide, and spurring economic development.² Utilities have an important role in supporting, encouraging, and enabling this technology. Moreover, the strategic value of integrating electric transportation into your overall corporate goals and objectives is substantial—from new business opportunities, to operational and system benefits, to improved customer satisfaction. Utilities should engage now to shape the future of this market and prepare for being the transportation fuel providers of the coming decades.

To help your company get ready, the Edison Electric Institute (EEI) and its member companies have prepared this Utility Guide to PEV Readiness. The Guide draws on the insight and lessons learned by many of EEI’s member companies and other industry leaders, as well as from other groups such as the Electric Power

Research Institute (EPRI) and the Electric Drive Transportation Association (EDTA). Through their experiences, we hope the Guide will save you time and money in preparing your company and your customers for PEVs.

The Guide focuses on the four areas that every company will need to address to make sure PEVs get off to a fast start in their service area:

- **Getting Your Company Up to Speed**
  - Getting your company structured and organized for PEVs
  - Adding PEVs to the company fleet
- **Enhancing the Customer Experience**
  - PEV educational topics for utilities
  - PEV communication channels
- **VIPs (Very Important Passengers) to Include**
  - State regulators
  - Federal, state, local governments
  - Third-parties
  - Additional stakeholders collaborations
- **Plugging into the Grid**
  - How much power do PEVs use?
  - Is the grid up to it?
  - What about your company’s distribution system?
  - Helping your customers get a charge out of it
  - Streamlining the installation process
  - Looking toward the future

In each section, the Guide offers you a road map to ensure that your company and your customers get the most benefit from this innovative electric technology—and it is a technology that utility customers believe their electric utility should be encouraging.

In fact, an EEI survey in late 2010 found that almost three in four (71%) residential customers feel that electric utilities “should [be] working and investing now to assure that the proper infrastructure [is] in place for convenient recharging of electric vehicles.” Furthermore, almost two-thirds (61%) wanted their “utility [to] take a leadership role in encouraging a shift toward electric transportation.”

PEVs are a rapidly evolving technology and market. To help keep you connected to what is going on, we encourage you to become a part of our online EEI Electric Transportation Working Group. And we invite you to consider other PEV resources as well, including GoElectricDrive.com, EPRI’s Electric Transportation Program, EDTA, the Electrification Coalition, and the Department of Energy’s (DOE’s) Clean Cities Program.

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3 EEI Power Poll, Quarter 4, 2010. Nearly identical results were obtained in EEI Power Poll, Quarter 3, 2011.
4 Contact Erik Brownsword at ebrownsword@eei.org for more information.
Introduction

To help get your company ready for PEVs, we have divided the Guide into four sections:

- Actions that your company can take to get ready.
- How you can help your customers get ready.
- Allies whose help you will need.
- How to make sure that your company and your customers are ready to charge PEVs.

In large part, the Guide draws on what electric utilities have done in each of these areas to prepare for PEVs. The Guide also presents the advice and input of a number of EEI member companies and transportation industry leaders. However, the Guide is not intended to advocate for a specific plan or uniform position for all electric utilities. Rather, it discusses relevant issues, offers examples from industry peers, and lists alternatives for utilities to consider in developing PEV readiness plans to fit their specific situation.

To start preparing for PEVs, please review the brief descriptions of each of the Guide’s steps below.

**Getting Your Company Up to Speed**

PEVs will affect nearly all aspects of your business. Here are some issues to consider in getting your company up to speed on PEVs.
Getting Your Company Structured and Organized for PEVs—Customer-facing employees and media staff will need training. Regulatory and policy staffs need to understand how PEVs can impact rates and legislation. Engineers and planners may need new tools for forecasting loads and managing distribution systems. PEVs may also involve demand management programs, grid modernization initiatives, and customer information and billing systems. PEVs are cleaner than gasoline-powered vehicles; therefore, you may also wish to analyze the environmental benefits to form the basis of future carbon credits and emissions actions.

Adding PEVs to the Company Fleet—Including PEVs in your company’s fleet can return a number of benefits:

- Gain direct, valuable experience in PEV technology.
- Test charging infrastructure and demand response systems.
- Make a positive public statement of the company’s position on clean transportation.

There are several types of PEVs that you can add to your company’s fleet of vehicles, including PEV bucket trucks, delivery vans, SUVs, and 4-door sedans. Some are available commercially, while others are only available through demonstration projects or trial programs.

To fund the PEV additions, some utilities have used traditional means, or they have used them as components of a research project (smart charging, demand-side management, grid modernization, emissions or load research). Funding from Clean Cities, DOE, or others may be available to offset the PEV cost premium.

Enhancing the Customer Experience

For PEVs to be a success, the customer must be happy. To help ensure that positive customer experience, education and outreach will be essential. You will want to present a uniform set of basic PEV facts to your customers, supplemented with your own rates, incentives, and program information.

- Your customers will need to know about the availability and benefits of specific PEV rates, vehicle “fueling” cost, and basic charging information.
- Commercial and governmental fleet managers will want guidance on how to best integrate PEVs into their fleets.

Plug-in electric vehicle (PEV) is the general term used to cover all types of plug-in vehicles. PEV encompasses three primary plug-in vehicle types, all of which have batteries that can be recharged by plugging into the grid:

A Battery Electric Vehicle (BEV) operates solely on an electric motor and the energy stored in its rechargeable battery pack.

An Extended Range Electric Vehicle (EREV) has an electric motor and an internal combustion engine (ICE). EREVs drive 100% of the time on electricity, using the ICE only as a generator to extend the total range beyond the initial battery charge.

A Plug-in Hybrid Electric Vehicle (PHEV) uses an ICE and an electric motor and can use either (or both) for propulsion.
• Local media will want to report what the local utility is doing to enable the new technology.

• Local government agencies will be seeking guidance on best practices.

To get the word out about PEVs, electric utilities are using a wide variety of communication channels. These include bill inserts, brochures, public events and speeches, along with a host of electronic methods, including websites, emails, and social media.

**VIPs (Very Important Passengers) to Include**

To successfully introduce PEVs into your service area, you will need the help of many different groups and stakeholders. Below is a quick look at these groups and the issues and activities your company will likely be working on with them.

• **State Regulators**—Your company will likely want to get appropriate PEV rates and programs approved for customers, and your state’s utility commission will be vital for doing so. Providing education and information to regulators will be essential. Other issues that your company will most likely need to address with state regulators include: adequacy of resources to serve PEV loads; rate impacts and cost allocations of PEV infrastructure and programs; the use of metering and smart technologies to manage, track and bill PEV energy usage; and new PEV rates or programs to manage or prevent peak load increases.

• **Federal and State Legislators**—Your company, and other utilities around the nation, will be the fuel providers of the future PEV fleet. This will have wide-ranging policy impacts at the federal and state levels. To ensure the success of PEV technology, your company should broadly support the policies that offer short-term incentives for vehicle purchase and home charging installations, as well as incentives for investment in research and manufacturing of vehicles, batteries and components.

• **Third-Parties**—Many states have established regional or statewide working groups to address the many issues and barriers surrounding transportation electrification. These broad stakeholder collaborative groups, which typically include state agencies, utilities, automakers, environmental groups, commercial interests, and local communities, have become a best practice to educate a broad audience, foster the adoption of favorable PEV policies, and remove many policy barriers to PEV adoption. It is recommended that your company participate actively with these groups, taking a leadership role or forming new groups where needed.

**Plugging into the Grid**

Finally, as more and more PEVs are purchased, more pressure will be created for your distribution system and for customers to get the charging network they need. You will need to consider a number of factors to ensure that the new PEVs in your service area run smoothly for both your company and your customers.
• **How much power do PEVs use?**—It is important to begin by recognizing that PEVs are different than other electric appliances. They vary greatly in how much electricity they use and when they use it.

• **Is the grid up to it?**—Studies have shown that in terms of generation and transmission, widespread PEV adoption will have little to no effect on the electric system for many years.

• **What about your company’s distribution system?**—EPRI has done studies that indicate distribution systems are not likely to have any major problems, even if PEV sales grow at moderate levels. Two big mitigating factors will be when and where customers recharge their PEV. In one scenario, where home and workplace charging were available to all vehicles, the average load per PEV peaked below 0.75 kWh.

• **Helping your customers get a charge out of it**—Next to the PEV itself, the system for charging it is most important. Your company can fill several key roles to ensure that both conventional and “critical” charging infrastructure is in place when your customers need it.

• **Looking toward the future**—The Institute of Electrical and Electronics Engineers (IEEE), EPRI, The Society of Automotive Engineers (SAE) and other groups are collaborating on the development of smart charging standards that will integrate PEVs with utility meters and smart grid systems.

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Getting Your Company Up to Speed

PEVs will be available nationwide by early 2012. As the PEV market evolves in your service area, you will most likely need to update many existing company processes, or create new ones.

To start preparing, below are two main areas to focus on now to start getting your company up to speed on PEVs:

- Getting Your Company Structured and Organized for PEVs
- Adding PEVs to your company’s fleet.

Getting Your Company Structured and Organized for PEVs

The size and scope of your company’s electric transportation staff will vary depending upon its strategy, regulatory position, and proximity to active PEV markets. As it develops, your PEV organization may take on many forms and be staffed to different levels as Figure 2 indicates.

Some utilities currently center PEV responsibility within an emerging technologies, R&D, or program development organization as a part-time responsibility, which is a realistic manner to begin PEV activities. However, as the needs of your customers and your program expand, it may make sense to establish a dedicated program and staff.
Southern California Edison’s (SCE) 25-full-time-employee PEV Readiness Program is an example of a very mature program. It is composed of four parallel workstreams: Operations, Infrastructure, Customer Education & Outreach, and External Engagement.7 Any organizational structure can be effective, so long as there is a well-defined, single-point responsibility with adequate budget, support, and authority to implement the organization’s PEV strategy.

Internal utility training programs are another step to take in getting your company ready for PEVs. The programs should, at a minimum, include employees from these departments:

- Executive staff
- Media relations, community relations, and corporate communications staffs
- Rates/regulatory staff
- Customer-facing staff: Call center, key account managers, and community relations
- Utility fleet managers
- Distribution planners, engineers, and line-service managers
- IT staff
- DSM and Smart Grid staffs

Getting ready for PEVs also will require that you consider a number of issues. Below is an overview of these topics along with examples of how other utilities have addressed them (note that more detail on these topics is available in their related sections in the Guide):

- You may want to update customer information systems to track data on PEVs and charging stations (vehicle type, battery type, charging level, etc.), and to enable billing of new rates. You should also consider implementing end-to-end workflow management tools to support your PEV-related processes and ensure customer satisfaction, as these utilities have done:
  » Hawaiian Electric Company (HECO) has added PEVs to appliance saturation surveys to track penetration rates.
  » San Diego Gas & Electric (SDG&E) has enabled “subtractive billing,” to allow the use of a second meter for billing the PEV circuit without the cost of a separate service drop.

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» At least one utility marketing research company (Direct Options) is redesigning their utility customer surveys to add PEV usage data to the standard utility customer energy data collected.

• You will want to determine the potential affect that PEVs may have on your distribution network.

» Commonwealth Edison (ComEd), Dominion, Duke Energy, Public Service Electric & Gas (PSE&G), and several other utilities have worked with EPRI to model impacts on their distribution systems.

» United Illuminating, CenterPoint Energy, Baltimore Gas and Electric Company (BG&E) and others have worked with KEMA to determine distribution impacts in their service territory.

» Indianapolis Power & Light (IPL) worked with Purdue University to model transportation flows and identify likely PEV travel distances and grid impacts.

» DTE and Tampa Electric (TECO) have entered PEV load scenarios into their distribution modeling systems to estimate PEV impacts.

• Another factor to consider is the rate at which PEVs will be added to your service area.

» PSE&G worked with the Rutgers University Business School to conduct a PEV study to determine PEV-buyer demographics, charging behaviors, concerns and market size.

» DTE has conducted a widespread customer survey to determine customer expectations and preferences.

» MidAmerican Energy and ComEd have worked with EPRI to forecast PEV adoption rates and impacts and included those results in reports to the Illinois Commerce Commission in conjunction with the Commission’s Initiative on Plug-in Electric Vehicles.

» Southern Company worked with EPRI to conduct a customer survey of metro-Atlanta customers regarding PEV purchase and use.

» Seattle City Light used results from a 2007 EPRI/NRDC study to forecast penetration of PEVs for its 2010 Integrated Resource Plan.

• Set-up a process to alert you to where PEVs are being plugged in.

» SDG&E loads early notification information into its distribution database, plans any needed upgrades, and contacts customers immediately to offer program information.

» BG&E uses early notification information to review distribution system impacts as PEV sales are reported by OEMs.

» IPL and other utilities communicate directly with PEV dealers to make PEV program information and home assessments available to buyers prior to PEV purchase.

• Consider how your company will facilitate charging station installations.

» DTE worked closely with the equipment manufacturers to develop a streamlined process that combines utility charging programs with third-party installers.

» Southern Company has conducted charger installation training for over 300 members

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of the local chapters of the International Association of Electrical Inspectors.

» SCE has redesigned its end-to-end customer processes (residential and non-residential) and cut average charger installation cycle time in half.

» IPL has documented their internal process separately for residential, fleet and public charging scenarios.

» Pacific Gas & Electric (PG&E) has produced a guidebook that covers all of the key issues around charger installation that can easily be updated and adapted for use by other utilities.9

• Your company’s regulatory and policy staff will need to learn how PEVs can impact rates and legislation.

» Arizona Public Service Company (APS) retained Navigant Consulting to help prepare their 2010 ev-Ready Project study and subsequent Electric Vehicle Readiness Demonstration Project filing.10

» SCE and PSE&G have used EPRI survey results to design possible PEV rate structures and charging programs.

» As a part of Indiana’s Project Plug-IN, Duke Energy and IPL worked with the state to offer a comprehensive set of PEV-friendly rates, incentives, and manufacturing tax credits to attract PEV-related industry to and accelerate PEV deployment in the state.11

• Because PEVs are cleaner than gasoline-powered cars, your company may want to consider how they will affect future carbon credits and emissions actions.

» Progress Energy, PSE&G, and MidAmerican Energy have all used data or methodology from the 2007 EPRI/NRDC study to estimate the environmental impacts of PEVs in their own territories.12

**Additional Readiness Resources**

• Center for Automotive Research forecast of PEV sales by state that can be a starting point for utilities to estimate their PEV penetration.13

• Pacific Northwest National Lab economic study of PEV adoption would form a good basis for estimating revenue and rate impact.14

**Adding PEV Vehicles to Your Fleet**

Adding PEVs to your company’s fleet of vehicles can return a number of benefits in helping your company get ready. These include:

• Insights into potential PEV charging impacts.

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• A platform for researching PEV smart-charging and load management.
• A way to educate customers, stakeholders, and the media on PEV benefits.
• Data to develop PEV charging profiles.
• Demonstrate corporate commitment to the environment and new technology.

**Types of Utility PEV Fleet Vehicles**—There is a growing variety of PEVs available for fleet consideration. Following the successful use of conventional PEVs for worksite aerial and accessory operations, plug-in line/service trucks and other medium duty trucks have been introduced for utility use. Some utilities also are incorporating pickup trucks, 2-door and 4-door sedans into their PEV fleets as part of an overall “green fleet” strategy that may also incorporate natural gas, hybrid electric, E85, and biodiesel vehicles.

Demonstration programs managed by EPRI and by the Hybrid Truck Users Forum (HTUF) have been instrumental in accelerating the development of these vehicles to market. Below are some examples of the PEV trucks currently available either commercially or for test use in fleet applications:

<table>
<thead>
<tr>
<th>Make &amp; Model</th>
<th>Available</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ford/Azure Dynamics Transit Connect Electric</td>
<td>2010</td>
<td>Van</td>
<td>BEV, range up to 80 miles</td>
</tr>
<tr>
<td>Smith Newton Electric Vehicle (SEV)</td>
<td>2010</td>
<td>Multi-platform truck</td>
<td>BEV, range up to 100 miles</td>
</tr>
<tr>
<td>Navistar eStar</td>
<td>2011</td>
<td>Step van</td>
<td>BEV, range up to 100 miles</td>
</tr>
<tr>
<td>Dueco/Odyne Truck</td>
<td>2009</td>
<td>Bucket Truck</td>
<td>PHEV diesel/elec, can power boom function for 8 hours</td>
</tr>
<tr>
<td>Freightliner/Enova Systems Chassis</td>
<td>Custom</td>
<td>Delivery Van</td>
<td>BEV/PHEV, range TBA</td>
</tr>
<tr>
<td>Boulder Electric Vehicle</td>
<td>Custom-built</td>
<td>Trucks, Vans, Shuttles</td>
<td>BEVs, range tailored to customer requirements</td>
</tr>
<tr>
<td>Electric Vehicles International EREV &amp; BEVs</td>
<td>2011</td>
<td>Bucket Truck, Med. Duty, Delivery Van</td>
<td>EREV Bucket Truck, BEV Medium Duty Trucks &amp; Delivery Vans</td>
</tr>
<tr>
<td>Ford/Azure Dynamics F-550</td>
<td>2013</td>
<td>Pickup</td>
<td>PHEV Conversions</td>
</tr>
<tr>
<td>VIA Motors EREVs</td>
<td>2011</td>
<td>Pickups, SUVs &amp; Vans coming soon</td>
<td>EREV Conversions</td>
</tr>
<tr>
<td>Protean Electric F150</td>
<td>Coming soon</td>
<td>Pickup</td>
<td>BEV F150 conversion, range TBA</td>
</tr>
</tbody>
</table>

Other vehicle platforms are under development and may be available as prototypes or test vehicles through EPRI research projects. For more options see the HTUF online vehicle direc-

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15 See [http://www.calstart.org/Projects/Hybrid-Truck-Users-Forum.aspx](http://www.calstart.org/Projects/Hybrid-Truck-Users-Forum.aspx)
Utility PEV Fleet Examples—Dozens of utilities have added hundreds of PEVs to their light and medium duty fleets with many more on order for delivery in 2011-12:

- As part of the Clinton Global Initiative, Duke Energy and Florida Power & Light (FPL) pledged to transition 100% of new fleet vehicles to PEVs by 2020.¹⁷
- PG&E, SCE and other utilities have made significant fleet PEV purchases and commitments, as discussed further below.
- FPL will have 45 PEVs in its fleet by year-end 2011, including Ford Transit Connect vans, Navistar eStar trucks, Chevrolet Volts, Nissan LEAFs, Think City cars, Toyota Prius PHEV conversions, Ford Escape PHEV conversions and Quantum Ford F-150 trucks.
- HECO has four Nissan LEAFs and is expanding its PEV fleet to over 12 vehicles by 2012.
- PSE&G is one of many utilities testing Chevrolet Volts as part of an EPRI study to understand PEV grid impacts and to research smart charging technology.
- PG&E has over 30 light duty PEVs in its fleet of 112 PEVs, which includes electric flatbed and bucket trucks from Smith Electric, Ford F550 PEV trouble trucks, and Raser and Navistar eStar trucks, in a fleet that includes over 3,000 “green” vehicles.

Funding PEVs for Fleets—The options for funding PEV purchases include your company’s standard fleet budget, sometimes supplemented with funding from program development, business development, corporate communications, DSM, or research budgets within the company. Utilities have also taken advantage of a wide variety of federal, state and regional grants to buy PEVs, including grants from Clean Cities, various other DOE programs, and state and local clean air organizations.

The state of Indiana, for example, has grants for the purchase of PEVs made in state.¹⁸ California has a purchase assistance program for HEV and PEV buses and trucks, providing a voucher for $10,000 to $40,000 for qualified vehicles (California Hybrid Truck and Bus Voucher Incentive Project [HVIP]).¹⁹

Additional PEV Fleets Resources

- DOE’s Clean Cities program offers many resources for fleet customers, including buyer’s guides and training.²⁰
- DOE Alternative Fuels Data Center: www.afdc.energy.gov/afdc/
- www.calstart.org/htuf-vehicle-directory.aspx
- www.GoElectricDrive.com
- www.pluginamerica.org/vehicles

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¹⁸ http://www.afdc.energy.gov/afdc/progs/ind_state_laws.php/IN/ELEC
¹⁹ See http://www.californiahvip.org/eligibleveh.asp
²⁰ http://www1.eere.energy.gov/cleancities/publications.html
Anticipated U.S. Commercial Passenger PEV Launches

- **2010**
  - Roadster since 2008 – Over 2,000 sold ($109k)

- **2011**
  - 2011 Chevrolet Volt – 10,000 ($42k)
  - 2011 LEAF Launch – 10,000 ($33k)
  - i Launch ($27k)
  - Active E, Mini E Launch - 2012
  - Karma Launch ($100k)
  - CODA Launch ($45k)

- **2012**
  - 2012 Volt production up to 45-60k ($40k)
  - 10,000 more LEAFs ($35k)
  - Focus Electric Launch – 19 States
  - Model S Launch – 20,000/year ($57k)
  - Karma Launch ($100k)
  - CODA Launch ($45k)

- **2013**
  - 2013 Volt production up to 100k (<$40k)
  - 2013 LEAF production up to 100k in U.S.
  - C-Max ENERGI PHEV Launch
  - Model X Launch ($35k)
  - New RAV4 EV Launch

*All prices are base model MSRP before federal, state, local, or employer incentives. Leasing options are typically available and competitive (i.e., $350/mo for Volt or LEAF currently).*

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*Source: EEI Analysis*
Anticipated U.S. Commercial Fleet PEV Launches

- Newton BEV Truck Available in many applications
- Navistar eStar BEV Truck Available
- PHEV Med. and Heavy Duty Trucks (including Bucket Trucks) Available
- Transit Connect Electric Van Available
- EREV Pickup Trucks Available
- EREV SUVs & Vans Coming Soon
- BEV F150 Conversion Coming Soon
- PHEV Applications in the Future
- EREV Bucket Truck and BEV Med. Duty Truck & Delivery Van Available
- Purpose-built BEV Trucks, Vans, and Shuttles Available
- Enova/Freightliner PHEV Truck Coming Soon

Source: EEI Analysis

PHEV Bucket Truck
Enhancing the Customer Experience

For PEVs to really get up to speed in your service area, your customers will need to not only be aware of them, but also have confidence in them. To help achieve both goals, all partners in the transition to PEVs—automakers, electricians and inspectors, charging station manufacturers, municipalities, utilities, and many others—have unique roles in educating the public about this new electric technology. For example:

- Automakers and dealers are best positioned to promote the financial and driving experience benefits to consumers and fleet operators.
- Charging equipment manufacturers need to inform customers about new systems for charging their car.
- Charging equipment installers must be a source of information on local utility programs as well as municipal codes and standards.

PEV Educational Topics for Utilities

Your company, as with all utilities, also has a special role to play in educating customers about PEVs. At minimum, your company should be prepared to offer the following PEV information:

- Utility rate options, programs, or incentives for PEVs.
- PEV charging and technology basics, including FAQs and steps to get a residence PEV-ready.
• Any role that your company will play in the installation of charging equipment, as well as a list of qualified installers.
• A company contact to resolve PEV-specific questions and issues.
• News and information about local or regional charging sites.

PEV Communication Channels

To get the word out about PEVs, electric utilities across the country are communicating through a wide variety of channels. Your company should consider communicating about PEVs in different ways too. It will help you to reach more of your customers, and it will serve to reinforce your information and messages about PEVs.

Below are some examples of the many different ways that utilities are talking about PEVs.

Bill Inserts, Newsletters and Email—These messengers give you a low-cost way to reach your customers.

• HECO has a bill insert specifically addressing electric vehicles, PEV rates, and incentives.
• DTE has used bill inserts to promote its PEV website, including its online savings calculator.
• FPL, Duke Energy, and other utilities have also included PEV information in their email newsletters to customers (see Figure 3).

PEV Websites—By creating a website dedicated to PEVs, you can provide PEV-related information to customers with minimal ongoing resources. Many utilities have created PEV web “portals” that contain a broad spectrum of PEV information including FAQs, rates, incentives, videos, customer testimonials, and rate or fuel cost calculators (see Figures 6 & 7). If your company provides natural gas and electricity, you may want to produce a “Clean Transportation” website like PG&E or SDG&E that includes both compressed natural gas and electric vehicles (Figure 8).

Northeast Utilities has even set up a completely new brand and website (PlugMyRide.org) as the umbrella for all their customer-facing PEV engagement efforts. The unique Plug My Ride logo will be featured on charging station signage throughout the northeast (Figure 5). Westar Energy’s ElectroGo site and brand is a similar undertaking.

Printed or Online Brochures—Printed materials can be easily distributed at company events and publics forums, and can be formatted for web download as well.

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21 For example, see: http://www.tampaelectric.com/environmental/electricvehicles/;
http://www.dteenergy.com/residentialCustomers/productsPrograms/electricVehicles/overview.html; www.comed.com/ev
23 http://plugmyride.org/index.html
24 http://westarelectrogo.com/index.html
Portland General Electric created this logo to be use free of charge on charging stations and signage in Oregon.

Figure 3: Duke Energy January 2011 PEV eNewsletter

Figure 4: PGE Charging Logo

Figure 5: Plug My Ride Logo

Figure 6: Westar Energy's ElectroGo Website

Portland General Electric created this logo to be use free of charge on charging stations and signage in Oregon.
Enhancing the Customer Experience

Figure 7: Commonwealth Edison’s PEV Web Portal

Figure 8: San Diego Gas and Electric’s Clean Transportation Website
• Portland General Electric (PGE) has created a 1-page FAQ with embedded links to more details on charging stations, rates, incentives and vehicle information. They frequently hands out cards with links to information, rather than a paper brochure, since PEV information tends to be updated frequently.  

• ComEd has a “Guide to Electric Vehicles” brochure with information on PEVs and charging for residential, commercial and municipal customers.

• FPL has an 8-panel brochure highlighting the benefits of driving electric, a savings comparison chart and basic charging information.

• Puget Sound Energy (PSE) has created a 2-page fact sheet that walks customers through the steps in planning and installing a home charging station.

• PG&E also has a 2-page residential “Getting Started Guide” with a simple 5-step process for EVSE installations.

• SCE provides extensive education materials, including 1-page brochures covering PEV basics and “3 Steps to get Plug-in Ready” as well as a 4-page Electrician’s Guide and a guide to using their online rate tool.

• DTE has a downloadable 6-panel brochure that explains Level 1 vs. Level 2 charging, shows rates and monthly costs, and offers a $2,500 rebate on a Level 2 charger.

**Online Videos**—These are a popular method for companies to offer instruction, promote programs and demonstrate products and technologies. They are particularly appropriate to the new electric transportation technologies.

DTE has produced a short online video that shows the benefits of PEVs and the DTE PEV programs. Many other utilities have produced online videos, or participated in events that were filmed and reported online. Here are some of the many utility PEV online videos (see index for Web Video URLs):

- Southern California Edison
- Southern Company
- San Diego Gas & Electric
- Xcel Energy
- Portland General Electric
- Tennessee Valley Authority
- Con Edison
- Tampa Electric

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27 http://pse.com/aboutpse/PseNewroom/Mediakit/086_electric_vehicles.pdf
31 http://www.dteenergy.com/residentialCustomers/productsPrograms/electricVehicles/pevInteractives.html
Enhancing the Customer Experience

**Social Networking and Electronic Media**—These give you tools to reach a broad audience, particularly younger customers. Austin Energy, DTE, Xcel Energy, TECO, Consumers Energy, and many others have used social media such as Facebook or Twitter to post information about their PEV efforts.

![Tampa Electric tweets about its new PEV site](image)

**Public Events**—These are an easy, low cost way to get consumers familiar with and excited about PEV technology. Many utilities demonstrate their fleet PEVs at public gatherings, schools, and municipal and state government events.

- IPL and Duke Energy sponsored a PEV rally in which PEV owners drove a lap of the Indy 500 course.
- HECO, ConEdison, DTE, and others have exhibited PEVs at local or regional auto shows.
- DTE and the Center for Automotive Research cofounded a new annual PEV conference called The Business of Plugging In (BPI), as part of a Michigan Public Service Commission grant. BPI was held for the third year in Dearborn, MI in October 2011.³²
- Many utilities have sponsored and/or co-organized EPRI’s Plug In annual conference over the last few years. Most recently, Duke Energy and Progress Energy were local organizers when the conference moved to Raleigh, NC in July 2011.³³
- FPL, its regional planning councils, and Clean Cities coalitions are co-sponsoring an annual PEV conference to improve PEV readiness throughout its service territory.
- PGE partnered with Portland State University and the City of Portland to host a large event to celebrate the opening of

their Electric Avenue project in August 2011. The event, featuring PGE’s CEO, Portland’s mayor, and flash mob fanfare, received extensive national media coverage.34

Public Speeches—Many utilities have spoken about PEVs at conferences and meetings of local groups such as homeowners associations, Chambers of Commerce, League of Cities/Municipalities, business leadership councils, Association of Counties, Clean Cities coalitions, EV clubs, schools and universities, city and regional planners.

Schools—Student education offers an excellent opportunity to teach the next generation of drivers.

- Oncor has added a page on PEVs to its K-12 school education “Electrical Safety World” website.35
- Progress Energy sponsors a middle school sustainable transportation curriculum, which culminates in an annual model EV competition.
- HECO displays its fleet PEVs in support of Science, Technology, Engineering and Mathematics night at local schools.

Dedicated Communication Channels—Consider developing targeted methods for communicating with PEV customers.

- DTE put together a specialized customer response team that is dedicated to handling all incoming PEV calls, emails and inquiries.
- IPL and Consumers Energy have added separate toll-free phone numbers for PEV inquiries that go directly to PEV-trained employees for faster customer response.
- Consumers Energy, FPL, IPL, PSE&G, and other utilities have added email addresses for PEV inquiries that go directly to specific PEV-trained employees for rapid response.

Commercial, Industrial, and Governmental Audiences—Hawaiian Electric Company, Progress Energy and others have used their commercial & industrial (C&I) newsletters to promote PEV information. These targeted C&I emails and newsletters can focus on the unique questions that larger customers have, including fleet adoption of PEVs and workplace charging stations.

Educating your larger customers’ fleet managers on PEV availability, charging infrastructure, energy costs and benefits of PEV ownership will help you to ensure that PEVs get full consideration in their future fleet purchases.

- PGE has offered test-drives of PEV delivery vans to key account fleet managers.
- PG&E is working with the USPS, UPS, Safeway, and AT&T in order to incorporate PEVs into their customer fleets. ConEdison is working with Fedex, USPS, and DHL to do the same.
- SCE has a plan to meet with all of their cities directly and has conducted workshops and webinars to provide guidance on PEVs and the key issues faced by municipalities.

Further PEV Education

To give your customers more information about this new technology, you may wish to link to websites like PlugInCars.com, Clean Cities, PlugInAmerica.org, GoElectricDrive.com or FuelEconomy.gov to access additional information about:

- Plug-in Electric Vehicle FAQs
- Technical information on PEVs and batteries
- Vehicle information with links to automaker sites
- Information on incentives and programs available for PEV or EVSE ownership

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For PEVs to deliver their full benefits to your customers and your service area, you will need to engage with a number of groups. Among the most important allies to seek out are regulators, federal, state, and local legislators, and third-party groups.

**State Regulators**

Your state’s utility commission will be a crucial ally. Everything from the effect that PEVs could have on your local distribution systems, to transmission upgrades that might be needed to accommodate more PEVs in the future, to creating new PEV rate structures will require the support of regulators. Among the most important topics for education and outreach to the regulatory community will be special rates for home PEV charging.

**Types of PEV Charging Rates**—Most utilities see a clear advantage to moving home charging to off-peak hours. However, it may be too early to tell what rate structures work best for the utility and the customer. To discover this, utilities are currently experimenting with many rate structures. Here are some examples:

- Some utilities are applying existing whole-house time-of-use (TOU) rates to the additional PEV load. This avoids establishing a new PEV rate with minimal data, and also avoids setting a precedent for a specific end-use rate. A whole-house TOU rate, however, may not meet the needs of customers who cannot shift normal household loads. As a result, you may need to gain more experience to determine if whole-house TOU rates offer sufficient off-peak differentials to motivate customers to shift their PEV charging to off-peak hours.
• Other utilities are offering PEV flat rates, which set a fixed monthly cost charging a PEV:
  » DTE developed an introductory separately metered, flat rate option of $40/month for unlimited PEV energy usage per vehicle.
  » Consumers Energy also offers a separately-metered, flat rate of $35/month for up to 300 kWh of vehicle charging energy.
  » Both programs are available to the first 250 customers and have been approved by the Michigan Public Service Commission.

• Utilities are offering single-meter TOU PEV rates that apply to the entire premise, but only PEV-buyers are eligible for them. These rates do not differentiate between the energy used for PEV charging versus energy used for other purposes. They generally have a higher off-peak differential than standard TOU rates, and they may influence residents to shift other energy use as well. To ensure to the new load is shifted to off-peak hours, you may wish to include mandatory demand management as a requirement for this rate plan, similar to the rate filed by Arizona Public Service. Single-meter PEV rates can be cheaper for the utility and for the customer, since they do not require the installation of a second meter. This rate concept may require a method of synchronizing vehicle registrations with customer rate schedules.

• And still other utilities are offering two-meter or sub-metered TOU rates for PEVs. This requires a separate meter for the PEV, typically metering the vehicle on a lower TOU rate, while metering all other energy at a standard or household TOU rate.
  » DTE’s simple experimental EV rate for Level 2 charging provides a year-round discount of $.105/kWh for all PEV charging between 11pm and 9am.
  » NV Energy’s Hybrid Electric Vehicle Recharge Rider provides a summer TOU differential of $.33/kWh for PEV charging between 10pm and 6am.
  » SCE, Consumers Energy, Sacramento Municipal Utility District (SMUD), PG&E and others also have 2-meter rate options. Some of these rates have participant limits.
  » SDG&E has a 2-meter PEV rate that avoids much of the cost of a second meter by sub-metering the PEV charging circuit, then subtracting that usage from the main meter and billing it separately at the PEV rate. Some utilities favor development of charging stations with built-in revenue-grade metering that would perform a similar billing function.

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Once a PEV rate is established, it is important for you to use simple “plain language” rate explanations and graphic explanations, like the HECO example below:

<table>
<thead>
<tr>
<th>Rate</th>
<th>Time of Day (Weekday)</th>
<th>Time of Day (Weekend)</th>
<th>Cost/kilowatt-hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowest Rates</td>
<td>9:00pm to 7:00am</td>
<td>9:00pm to 7:00am</td>
<td>6 cents below typical rates</td>
</tr>
<tr>
<td>Higher Rates</td>
<td>7:00am to 5:00pm</td>
<td>7:00am to 5:00pm</td>
<td>2 cents above typical rates</td>
</tr>
<tr>
<td>Highest Rates</td>
<td>5:00pm to 9:00pm</td>
<td>Not Applicable</td>
<td>5 cents above typical rates</td>
</tr>
</tbody>
</table>

**PEV Credits and Rebates**—Working with your regulators to offer PEV customers credits or rebates can help you track and preemptively address PEV load additions to your distribution networks: one example would be giving a customer a credit for installing a home charging station, if the customer agrees to notify you when they buy a PEV. This will help to keep you apprised of the new demands on your distribution networks.

Other reasons for PEV-specific credits or rebates include:

- Collecting load, behavior, or energy usage data to support the development of future PEV rates or programs.
- Leveraging smart grid investments; passing on lower costs from existing smart grid infrastructure to enable smart charging.
- Using state or federal grant dollars that can be passed on to PEV owners.
- Collecting data on the installation process.
- Gaining more early adopters to help streamline the installation process.
- Helping to achieve environmental goals.

**PEV Legal and Regulatory Issues**—Several states, including Michigan, Connecticut, California and Oregon, have significantly researched the legal and regulatory issues surrounding plug-in vehicles, including cost assignment, rate impacts, resale of power by a third party, metering requirements and public charging.

In California, for example, the state has ruled that electric vehicle service providers (EVSPs) are not public utilities and will not be regulated by the state. EVSPs are free to operate any type of charging services with any pricing models and rates. However, the state can exercise limited jurisdiction in certain areas such as procurement requirements (if the provider procures electricity on the wholesale market).

California also has ruled on a number of other PEV issues:

- Directed electric companies to apply a protocol to support the use of third party-owned sub-meters and also discouraged electric companies from owning sub-meters.
- Prohibited electric companies from owning charging stations, except when used to charge their own electric vehicle fleets or provide workplace charging for utility employees.
• Established clear principles for education and outreach efforts by IOUs, including the obligation to inform customers on key PEV readiness elements such as available metering arrangements or rates. The CPUC also directed IOUs to provide targeted PEV education about the environmental and societal benefits of PEVs. It clarified that IOUs must communicate in a competitively neutral manner, except when the information relates to safety, reliability, and off-peak charging.

Utility rates and regulations are evolving rapidly as the industry gains experience with the energy, load and infrastructure impacts of PEV vehicles. To keep up to speed with the complex regulatory issues surrounding PEVs, we encourage you to participate in the EEI Electric Transportation Working Group “Rates and Regulatory” Issue Team, as well as EEI’s Rates Committee. 38

Federal, State, Local Governments

Government has a significant role to play as well in securing a place for PEVs. Federal and state incentives will help to break down market barriers, and government support will be needed for new electrical codes and standards, charging station installation and permitting, road taxes, public charging infrastructure, and vehicle taxes and incentives.

National PEV Issues—The following is a list of key national PEV issues that would likely be of interest to your company:

• National PEV Deployment Policies and Legislation—Legislation establishing a national PEV deployment policy that could speed the deployment of PEVs through a wide-ranging set of standards, education and initiatives.

• National Regulation—Regulations that affect new light duty vehicle purchases (EPA/NHTSA fuel economy and tailpipe GHG emissions standards for Model Years 2012-2016, and rulemakings for 2017-2025) and medium/heavy duty vehicle purchases (EPA/NHTSA fuel economy and tailpipe GHG emission standards starting in 2014), along with updated fuel economy and emissions labeling standards for light duty vehicles, which are mandatory starting in 2013.

• Vehicle and Infrastructure Incentives—Federal and state tax credits and rebates can help to break down market barriers to the commercial-scale deployment of electric vehicles and related infrastructure. But the current federal tax credits (up to $7,500 for PEV purchase, up to 30% of charging equipment cost) face repeated challenges. 39

• National Low Carbon Fuel Standard—Low Carbon Fuel Standards (LCFS) are complex programs that could provide credits for providers of low carbon fuel in transportation (including electricity). The notion of creating a national LCFS is not politically feasible at the moment. However, a great deal of progress is already being made at state and regional levels to implement them.

• Early notification—Legislation or standards to establish a national clearinghouse of PEV registration in order to provide early notification of PEV ownership to all parties.

38 Contact Erik Brownsword at ebrownsword@eei.org for more information.
39 http://www.fueleconomy.gov/feg/taxevb.shtml
• **Smart Grid Legislation**—Smart meters can aid in billing and tracking of PEV charging, and a smart grid could aid in the efficient delivery of renewable energy. One relevant national policy would allow accelerated depreciation of smart grid investments.

Other federal policies that could affect PEV commercialization include:

• Accelerated depreciation of smart grid investments
• Incentives for PEV and battery research and manufacturing
• Mandates for federal fleet deployment
• Standardization of battery specifications
• Continued increases in Corporate Average Fuel Economy (CAFÉ) standards

It is important that your company stay abreast of these and other PEV-related legislative measures. Your company may wish to work through its own staff, and supplement those efforts by joining organizations that have a track record in PEV policy advocacy.

You are also encouraged to join EEI’s Electric Transportation Working Group Policy Issue Team, as well as the EEI Washington Reps Task Force. ETA and the Electrification Coalition are other groups that are dedicated to PEVs and other electric transportation technology and effectively develop and promote PEV policy on behalf of their membership, including many electric utilities.

Although EPRI does not lobby on any policy issues, utilities have been working within the organization since the 1990s to facilitate development of technology standards and coordinate research and deployment activities with automakers.

**Key State PEV Issues**—Legislative action at the state level also can affect your PEV strategies. Below is a list of legislative issues that your state may be focusing on today:

• **Public Charging Provider status as utilities**—Most state regulations require that companies that engage in the sale or resale of electricity are considered to be utilities and fall under the jurisdiction of the public utilities commission. California’s PUC has recently ruled that third party charging service providers are not utilities. This issue is still to be resolved in most states, and one that may involve state legislative interaction.

• **Vehicle Road Tax**—States are concerned over the loss of road tax revenue from declining gasoline sales. Several approaches have been proposed to recover these lost road revenues, such as annual “green vehicle” flat fees, universal Vehicle Miles Traveled (VMT) taxes either utilizing GPS devices or annual inspections, or a tax on PEV energy sales, which could be required to be billed on the utility bill.

• **PEV Parking and Charging Access**—Access to PEV parking and charging can be an issue on the local or the state level. On the state level, for example, Hawaii has mandated free PEV parking at state and county facilities, and mandated that parking facilities over 100 spaces allocate one percent of the parking for PEVs and include at least one charging station. Hawaii also now provides that multifamily building owners cannot prohibit charging station installations.

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40 Contact Erik Brownsword at ebrownsword@eei.org for more information.
41 http://et.epri.com/ETinfo.html
• **LCFS**—California has already implemented an LCFS, though it is still being modified.\(^\text{42}\) A collaboration of 11 Northeast and Mid-Atlantic states is working to implement their own, which will likely resemble California’s program.\(^\text{43}\)

• **PEV & Charging Station Incentives**—Many states are implementing incentives to promote electric transportation. Several websites catalogue and update state and local incentives available across the nation.\(^\text{44}\) Below is a summary of some state incentives:
  
  » Twelve states now offer rebates or income tax credits up to $6,000 for PEV purchase.
  
  » Many states offer exemptions from sales tax, excise tax or emissions inspections.
  
  » Several states offer non-monetary incentives such as preferred parking or HOV lane access or reduced license and registration fees for PEVs

• Other PEV favorable state laws and actions:
  
  » Illinois has mandated state fleet PEV purchases (5 percent in 2015, 15 percent in 2025).
  
  » Several states, including Hawaii, Washington, Oregon and California are using ARRA funding to install PEV charging.

**Local Policies**—Your company can work with local governments on a number of issues to accelerate PEV deployment too. Among these issues are:

• Faster local permitting and inspection for charging stations.

• Affordable, accessible public PEV charging.

• Adoption of PEVs in municipal or county fleets.

• Reduced tolls and fees for roads and bridges.

• Incentives/grant funding for infrastructure deployment.

• Regional PEV infrastructure planning.

**Third-Party Outreach and Collaboration**

Ensuring a positive customer and company experience with PEVs will require the involvement and support from a diverse group of public and private organizations as well. Working within or leading these groups is often the most effective way for your company to not only encourage PEV adoption, but also to guarantee that due consideration to the grid and your business is given during these policy and planning discussions.

**Nationwide Collaborative Organizations**—There are numerous national organizations that have been establishing these types of stakeholder collaborations often for many years. Beyond bringing stakeholders to the same table, these groups bring together and focus years of experience and a great deal of resources towards a common goal. Many utilities have been involved in these organizations to great success. Here are some of the most well-regarded and effective groups to consider.

\(^{42}\) [http://www.arb.ca.gov/fuels/lcfs/lcfs.htm](http://www.arb.ca.gov/fuels/lcfs/lcfs.htm)


• **Rocky Mountain Institute**—Rocky Mountain Institute (RMI) leads the national “Project Get Ready” (PGR) initiative focused on fostering city and state readiness. PGR advises and coordinates local and regional group action, and facilitates sharing of “best practices” through its web presence. PGR currently has 14 partner cities, states or regions that have developed broad stakeholder coalitions that meet regularly to foster PEV adoption. Nearly all of these “Ready” cities or states were selected as early launch markets by the major automakers for their new PEV offerings. This is no coincidence—most automakers cite this kind of preparation and local collaboration as a major criterion for that selection process.

• **Clean Cities**—The Department of Energy’s Clean Cities program provides another opportunity for collaboration. Its national network of nearly 100 Clean Cities coalitions brings together “local, state, and federal agencies; public health and transportation departments; commercial fleets; transit agencies; and other government offices; as well as auto manufacturers, car dealers, fuel and equipment suppliers, public utilities, and nonprofit associations.” Clean Cities coalitions develop and implement regional strategies to reduce petroleum consumption, including biofuels, natural gas, and electric transportation. Since Clean Cities’ inception in 1993, the program has helped displace three billion gallons of petroleum through alternative fuels and vehicle efficiencies. Under the Obama administration, this program’s budget has been significantly increased and its directive has shifted to put greater focus on expanding PEV charging infrastructure and deployment.

• **EPRI**—The long-standing EPRI Electric Transportation research program is an excellent forum for utilities to learn from each other and participate in research into PEV grid impacts, grid/vehicle communications, and many other issues. EPRI also leads the PEV Infrastructure Working Council and several utility/OEM collaborations in which utilities collaborate with other stakeholders to develop PEV technologies and policies.

• **EDTA**—EDTA’s GoElectricDrive.com is another initiative that collects and distributes accurate, timely PEV information nationwide. Utilities could use this resource to help make their PEV rates and programs more accessible to their customers and also gain knowledge and content to include in their own customer communications.

**State-level Industry Examples**—Several states, including Connecticut, Illinois, and Michigan have established special Executive Councils or Committees specifically to recommend and implement policies to promote PEV adoption and to coordinate interagency strategies. These councils show promise in removing barriers, synching local regulations, and speeding PEV adoption.

Other states have formed PEV coalitions or working groups without government mandate, which have been equally effective in addressing PEV barriers and promoting PEV policies.

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45 http://www.projectgetready.org/
46 http://projectgetready.com/category/city
48 http://www1.eere.energy.gov/cleancities/coalitions.html
49 http://www1.eere.energy.gov/cleancities/pdfs/51677.pdf
50 http://www1.eere.energy.gov/cleancities/accomplishments.html
51 See http://www1.eere.energy.gov/ba/pba/pdfs/ty2012_eere_congressional_budget_request.pdf
Several examples are offered below:

- Founded in 1980 by the North Carolina Utilities Commission, Advanced Energy is a non-profit research, consultancy, and education corporation that works to expand the use of energy efficient technologies in North Carolina and around the world. Its Electric Transportation team researches, develops, and deploys electric motors and commercial PEVs, in addition to spearheading comprehensive community readiness efforts in North Carolina and elsewhere.  

Advanced Energy and its partners have produced a Community Planning Guide that channels many of the lessons learned in North Carolina’s multi-stakeholder PEV readiness efforts.  

- SCE and PG&E are both participants in the California PEV Collaborative, along with elected and appointed officials, automakers, infrastructure providers, and environmental organizations.  

This California group published a statewide PEV plan in 2010 and is now working on implementation initiatives.  

- Dominion Virginia Power and Old Dominion Electric Cooperative participated in the Virginia Get Ready working group coordinated by Clean Cities. Virginia Get Ready successfully identified several issues and barriers to PEV adoption in Virginia, issuing an initial “Electric Vehicle Plan” with recommendations for action in October 2010.  

- Michigan utilities working with their state Public Service Commission convened a task force with the goal of making Michigan a leader in PEV deployment. Named Plug-In Michigan, the task force is made up of a cross-industry group of stakeholders that includes automakers, building and electrical inspectors, environmental groups and non-profits from around the state. Plug-In Michigan has been instrumental in achieving changes in Michigan building codes and establishing statewide education and outreach programs.  

- In Connecticut, the Governor established the Connecticut EV Infrastructure Council (EVIC) that includes Northeast Utilities and United Illuminating. EVIC recommended several state initiatives, some of which have already been implemented into law, such as a requirement that the state building code be updated to include PEVs and an exemption from the state sales tax for new PEV purchases.  

- In Illinois, the Governor signed into law the Illinois EV Advisory Council in July 2011. The council is made up of lawmakers, regulators, utilities, regional and national environmental organizations, automakers and municipal leaders. The Council is tasked with investigating and recommending strategies that the Governor and the Illinois General Assembly may implement to promote the use of PEVs, including potential infrastructure improvements, state and local regulatory streamlining, and changes to electric utility rates and tariffs.
Local/Regional Electric Utility Working Groups—You also may want to form or participate in a regional initiative to develop PEV policies. The Western Electric Industry Leaders Group, for example, has formed a PEV sub-group for the development of coordinated policies and regulations around PEVs. New England has a Regional Electric Vehicle Infrastructure group that supports regional and state policy goals to reduce emissions and develop alternate fuels by utilizing the region’s existing electric system to charge PEVs.

Other examples of utility collaboration include the following:

- Duke Energy, IPL, and other local stakeholders are a part of Project Plug-IN that seeks to spur PEV deployment and related economic development in Indianapolis in part by attracting battery-maker Ener1 and automaker Th!nk to open facilities outside the city.
- PG&E participates in several San Francisco Bay Area PEV outreach, education, and readiness organizations such as Plug-In Bay Area and the Bay Area Climate Collaborative.
- CenterPoint Energy participates in a Houston-area working group to develop a local PEV “roadmap.”
- Progress Energy is active in a Raleigh, NC based collaboration that has streamlined city permitting for PEV infrastructure.

Additional Stakeholder Collaborations

Electrical Contractors/Inspectors—Many state or Project Get Ready collaborations include electrical contractors and inspectors. These groups are both critical to the seamless installation of PEV charging infrastructure and an overall positive customer experience. Utilities generally have good contacts with these groups and can assist with their education and training directly (as Southern Company and others have done with their local inspectors) or through broader coalitions. The National Electrical Contractors Association (NECA) sponsors the Electric Vehicle Infrastructure Training Program (EVITP) that is delivering training programs for the installation of EVSEs with the support of electric utilities. Local chapters of electrical contractors and inspectors can be found through their national organizations: NECA and the International Association of Electrical Inspectors (IAEI).

Research Collaborations—Sponsoring, funding or guiding PEV research at the university level can accelerate PEV developments while fostering good community relationships. The following are some examples of such efforts:

- SMUD, PG&E, SCE, and SDG&E all serve on the Advisory Council for the Plug-In Hybrid & Electric Vehicle Research Center at UC Davis.
VIPs (Very Important Passengers) to Include

- Duke Energy, American Electric Power, and FirstEnergy sponsor PEV research at Ohio State University’s Center for Automotive Research.\(^\text{72}\)
- Progress Energy and Duke Energy jointly sponsor the North Carolina State University Advanced Transportation Center’s PEV research.\(^\text{73}\)

**Resources for Additional Information**

- EEI’s Washington Reps Task Force and Electric Transportation Working Group Policy Issue Team.\(^\text{74}\)
- The Electric Drive Transportation Organization has an active policy advocacy arm.\(^\text{75}\)
- Securing America’s Future Energy and the Electrification Coalition perform non-partisan, thorough research, issue policy briefs and reports on a regular basis, and advocate aggressively to end the country’s dependence on foreign oil, with PEVs playing a large role in the solution.\(^\text{76}\)
- DOE’s Alternative Fuels and Advanced Vehicles Data Center (AFDC) houses a very useful tool to track federal, state, and local laws, regulations, and incentives pertaining to alternative fuel vehicles.\(^\text{77}\)
- The Indiana University School of Public and Environmental Affairs issued a 2011 report on Plug-in Vehicles with policy analysis and recommendations.\(^\text{78}\)

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\(^{72}\) [http://www.car.osu.edu/smartatcar](http://www.car.osu.edu/smartatcar)


\(^{74}\) Contact Erik Brownsword at ebrownsword@eei.org for more information.

\(^{75}\) [http://electricdrive.org/](http://electricdrive.org/)

\(^{76}\) See: [http://secureenergy.org/about](http://secureenergy.org/about); [http://www.electrificationcoalition.org/](http://www.electrificationcoalition.org/)

\(^{77}\) See [http://www.afdc.energy.gov/afdc/laws/](http://www.afdc.energy.gov/afdc/laws/)

\(^{78}\) Indiana School of Public and Environmental Affairs, Plug-in Electric Vehicles: A Practical Plan for Progress, 2011. [http://www.indiana.edu/~spea/puts/TEP_combined.pdf](http://www.indiana.edu/~spea/puts/TEP_combined.pdf)
Of course, as more consumers buy PEVs, the technology’s affect on the grid and your local distribution network will grow. And your customers will want to be sure that they can charge their new PEV when and where they need to. To make sure that charging PEVs works smoothly for both your company and its customers, there are a number of issues to consider.

**How Much Power do PEVs Use?**

It is important to begin by recognizing that PEVs are different than other electric appliances. They vary greatly in how much electricity they use and when they use it. One factor that determines a PEV’s power demand is the size of its battery. The batteries in the electric cars now being introduced range from PHEVs like the Plug-in Prius (3kWh) and Chevrolet Volt (16kWh total, 10kWh usable) to BEVs like the Nissan LEAF (24 kWh) and Tesla Model S (42 kWh to 85kWh).

Two other factors that affect a PEV’s demand on your system are the level of charging being used, and how low the battery is when it starts recharging. At Level 1 (120V), a Nissan LEAF will take roughly 16-20 hours to recharge a fully depleted battery. At 3.3kW Level 2 (240V), this charging time is effectively halved. A DC fast charging station can recharge a LEAF to 80 percent in 30 minutes. That said, Level 2 can support higher draws than 3.3kW (the next tier being 6.6kW). Already, several

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79 The Electric Power Research Institute has done a significant amount of research on this subject, often in direct conjunction with utilities. For more detailed analyses of distribution impacts, see: Electric Power Research Institute, Transportation Electrification: A Technology Overview, July 2011
manufacturers have announced 2012 vehicles that will support that increased demand, reduc-
ing charging time, but potentially requiring more distribution system preparation.

Below is a table of the three charging levels and their characteristics as they are standardized in the U.S.

<table>
<thead>
<tr>
<th>Charging Level</th>
<th>Voltage</th>
<th>Amperage</th>
<th>Demand Range</th>
<th>Typical Demands</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Level 1</td>
<td>120V</td>
<td>12 – 16A</td>
<td>1.44 – 1.92 kW</td>
<td>1.44 kW</td>
</tr>
<tr>
<td>AC Level 2</td>
<td>208/240V</td>
<td>12 – 80A</td>
<td>2.5 – 19.2 kW</td>
<td>3.3 kW, 6.6 kW</td>
</tr>
<tr>
<td>DC Level 2</td>
<td>200 – 450V</td>
<td>&lt;=200A</td>
<td>&lt;=90 kW</td>
<td>~50 kW</td>
</tr>
</tbody>
</table>

Is The Grid Up to It?

Studies have shown that in terms of generation and transmission, widespread PEV adoption will have little to no effect on the electric system for many years. The Pacific Northwest National Laboratory found that, if charged overnight, nearly 75 percent of the current U.S. light duty car parc could be supported as PEVs without adding a single power plant.

Put another way: if 80 percent of 2010 U.S. sales of cars, SUVs, and light trucks were replaced by PHEVs with 40 miles of electric range (like the Chevrolet Volt), the resulting load from those 10 million cars would add less than one percent to the total U.S. electrical energy consumption (see Figure 10).

These estimates, however, are predicated on proper management of this new load. If the majority of charging is not deferred to off-peak hours, or if daytime public or workplace charging turns out to be utilized more than currently estimated, these predictions may not hold true.

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What About Your Company’s Distribution System?

EPRI studies indicate that most companies are not likely to have any major problems, even if PEV sales grow at moderate levels. Two big mitigating factors will be when and where customers recharge their PEV. In one scenario, where home and workplace charging were available to all vehicles, the average load per PEV peaked below 0.75 kW (Figure 11).

Some localized disruptions may occur, however, in neighborhoods with high PEV adoption (“clustering”), or where distribution transformers are already overloaded due to load growth or older distribution loading standards, and assets have little marginal load capacity. A number of PEVs recharging at the same time may, in some cases, shorten transformer life too, due to their larger power draws. To prepare for these possibilities, your company may want to update its distribution standards and budgets for replacing transformers.

To help minimize the impact PEVs can have on your distribution system, your company may want to consider these proactive steps that other utilities have taken:

- **Statistical Analysis and Modeling**—Many utilities have begun by modeling PEV adoption to forecast overall volumes and total system loads for generation and transmission planning. Several models exist for PEV adoption forecasts, based on demographic factors or prior purchase of hybrid electric vehicles (HEVs). EPRI has assisted several utilities in developing PEV adoption forecasts that were used as a basis for subsequent impact analyses.

- **Assessing High-Level Distribution Risks**—A number of utilities also have assessed overall load shape impacts and high-level distribution impacts. The high-level distribution analysis consists of a general inventory of utility circuit loading over the entire system to determine areas of possible early impact. Following the high-level analysis, utilities may want to conduct a component-level analysis to understand how existing distribution system and circuit designs will be impacted by PEV adoption.

- **Feeder and Circuit Analysis**—Many utilities are developing proactive distribution readiness plans and detailed feeder/circuit analyses. EPRI has conducted such an analysis for several utilities that have used the results to identify specific potential asset risks and also to update their distribution engineering standards.
As part of EPRI’s distribution impact analysis, Duke Energy performed a detailed market assessment to model PEV adoption, preference of PEV types, and propensity to charge at night. Duke’s market assessment study examined how the adoption of electric vehicles can often cluster within a neighborhood or on a particular street. The study successfully identified PEV market segments that occur in geographical clusters.88

DTE modeled HEV data, applied this data to various distribution circuits and overlaid assumptions for Level 1 and Level 2 charging loads. The models were used to study potential transformer overloads in clustered areas and also as a foundation for a new PEV rate.88

Helping Your Customers Get a Charge Out of It

For your customers, determining how they will charge their new PEV will be almost as important as the type of PEV to buy. And the decisions they make about when and where they charge their PEVs will have the most impact on your distribution network.

The electric power industry’s priority (as shown in the pyramid in Figure 12) is for consumers to charge their PEVs overnight at home—where the vast majority of automobiles end their day. This time period represents a significant charging window, but note that not all of it is necessarily off-peak (see Figure 13). The second priority is for consumers to charge their PEVs at work. The third is charging at public locations, such as street-side locations in downtown areas, parking decks, entertainment venues, along major interstates, or retail shopping centers.

In many cases, Level 1 charging may be sufficient: for home charging of PHEVs, most workplace charging, and locations such as parking garages where vehicles are likely to be parked for over a day. Level 2 will probably be appropriate for home charging of BEVs, street-side and retail locations, and centralized fleet recharging. Given the costs of installation and power, DC fast charging may remain appropriate only for limited uses like providing a critical recharging network for BEVs and connecting city centers. However, these assumptions must be tested in real world scenarios. Several large-scale, as well as many smaller-scale, projects are already underway to gather and analyze these vital data.90

Figure 12: PEV Infrastructure Priority

Figure 13: Home Arrival Time Distribution

Source: EPRI

88 Electric Power Research Institute, Transportation Electrification: A Technology Overview, July 2011, p. 5-30
The goal of the electric utility industry should be to encourage the level of charging that is most appropriate for a given situation. To that end, it is important to collaborate with and educate relevant parties—from residential customers to commercial and industrial customers to city planners, state departments of transportation, Clean Cities coordinators, and other stakeholders.

**Early Utility Notification**—If you can receive early notification from automakers and/or dealers of customers buying PEVs, it can help to give you a head start on improving the installation process for charging stations. This early notification process, which is voluntary on the customers’ part, provides you with advance information of where a new PEV will be charging. This will help you determine if your distribution system is ready. Early notification is also helpful for municipalities and installers for planning permitting, inspections, and installations.

The concept of advance notification began in the California market on an ad hoc basis. The CPUC has now directed utilities to conduct an assessment of early notification efforts with a view to formalize the notification process and potentially expand it beyond the state.° In addition to the California statewide effort, there are also utility/automaker early notification processes in place in other states.

**Incentives for Charging Stations**—To help stimulate the sales of PEVs, utility commissions in some states are allowing utilities to pilot charging station programs, including leasing programs for charging infrastructure, incentives for buying/installing charging stations or using utility-owned infrastructure. However, other states, such as California, now prohibit investor-owned utilities from owning or operating charging stations.

A challenge for utilities that can implement infrastructure programs is to justify and fund such programs, and to install the infrastructure prior to large-scale PEV adoption. Some utilities are using federal or state grant funding to establish pilot charging programs. Several of these projects, funded with $400 million of federal stimulus funding, will deploy over 13,000 PEVs and over 22,000 charging stations, primarily in two large projects:

- **The EV Project**—With $230M in matching public-private funding, the EV Project will install over 15,000 charging stations to support 8,500 LEAF and Chevrolet Volt owners in 18 cities over five states and the District of Columbia. ECOtality, a provider of charging stations and energy storage devices, manages the project, with Blink providing the charging stations. Driving and charging behavior data will be collected and analyzed by the Idaho National Laboratory.°

- **ChargePoint America**—Coulomb Technologies, another charging station supplier, is using $15 million in federal funding to establish 4,600 charging stations and deploy 2,400 PEVs in nine target regions.°

DOE has several additional programs that offer grants or loans for charging station deployment, local, state, or regional PEV readiness planning efforts, or demonstration programs.°

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° California Public Utilities Commission Phase 2 decision establishing policies to overcome barriers to electric vehicle deployment and complying with public utilities code section 740.2
° See, for example: [http://www1.eere.energy.gov/cleancities/projects.html](http://www1.eere.energy.gov/cleancities/projects.html) and [http://www1.eere.energy.gov/cleancities/electric_vehicle_projects.html](http://www1.eere.energy.gov/cleancities/electric_vehicle_projects.html)
For example, IPL, Kansas City Power & Light, Progress Energy, and others will use federal Smart Grid funding to install several hundred residential and business charging stations. Several utilities are offering credits or rebates to customers for charging station installation, often as part of a research program. In order to gain regulatory approval and establish budget limits, the programs often are limited in terms of customers, generally between 500 to 5000 customers, and/or duration, often two to five years. For example:

- United Illuminating and Connecticut Light & Power are installing free residential and public charging stations as part of a research project.
- Consumers Energy offers a $2,500 incentive for charging station installation to install a separate meter and adopt the company’s EV TOU rate.
- DTE is offering a $2,500 incentive toward charging station installation and meter installation for customers that qualify, if they use the DTE branded installation program.
- Indiana Michigan Power offers $2,500 for charging station purchase/install.
- Austin Energy offers a 50 percent rebate up to $1,500 for charging station purchase/install.
- CPS Energy offers a 50 percent rebate up to $1,000 for charging station purchase/install.
- LADWP provides rebates of up to $2,000 to residential customers who install a Level 2 charging station with a separate TOU meter at their home.
- Long Island Power Authority provides a $500 incentive to customers who purchase a PEV.

Other Utility-Directed Infrastructure Programs—Non-regulated NRG Services has announced a broad company-owned charging network (eVgo) starting with the Houston and Dallas markets. The network will include home, workplace, and public charging infrastructure with tiered monthly fees for subscribers, similar to mobile phone plans. ComEd is hosting 280 Level 2 and DC fast charging stations in its service area. These stations will generally be installed at no cost to the utility or host location by the California-based company 350 Green, which will recoup its investment through user fees on top of kWh sales. Others are likely to join and compete in this space.

Public Charging Station Advocacy—Your company may wish to advocate for a safety net of “critical” infrastructure along major thoroughfares and in rural areas. Critical charging infrastructure is public infrastructure that is provided to prevent BEVs from being stranded with a depleted battery. It may take the form of strategically placed charge stations within a community, a network of charging stations along highway routes or a mobile charging service for roadside assistance. AAA is already beginning to offer these kinds of services to its millions of members across the world.

Much of this infrastructure will see infrequent use and be difficult to justify through a standard business case. Utilities can advocate for such a network through legislative means or through state and regional collaborative organizations, rather than take a direct role as a provider of such infrastructure.

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95 https://www.evgonetwork.com/
96 http://chicago.cbslocal.com/2011/02/20/electric-vehicle-owners-getting-more-places-to-charge-up/
Streamlining the Installation Process

The installation, inspection and permitting of charging stations is another PEV-related issue for your company to consider. Charging station installation is a multi-party process that can take three or more weeks in some cases.

Streamlining this process is a cornerstone activity for automakers and many of the regional and statewide PEV coalitions. Your company should review its end-to-end processes for installation or connection of charging stations in diverse situations (e.g. include multi-family dwellings, workplace, and public Level 1, 2, and DC fast charging stations).

Charging Station Codes and Standards—The transition to PEVs also will require significant changes or updates to many national codes and standards including the National Electric Code (NEC), state and local building and permitting codes, Society of Automotive Engineers (SAE) standards, American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) building efficiency standards, International Code Council (ICC) standards, UL listings, and other codes, standards and ordinances. You will likely want to participate in these developments to ensure your customers’ PEV driving and charging experiences are safe, reliable, affordable and accessible.

National Codes and Standards—Several important national codes and standards, such as the electrical code and PEV communications standards are being addressed in the respective organizations (e.g. NEC, SAE, ASHRAE, ICC, Institute for Electrical and Electronics Engineers (IEEE)), which obtain utility inputs from EEI, EPRI or utility members. Most utilities will not want to be involved with vehicles standards, but some will want to be involved in battery specifications, as those standards may relate to broader energy storage potential. Those battery and vehicle specifications are summarized in a 2010 NREL technical report.98

Your company is welcome to participate in EEI’s Electric Transportation Working Group Codes and Standards Issue Team,99 and in the EPRI Electric Transportation Infrastructure Working Council (IWC). Both are important ways for utilities to be involved in the national codes and standards process.

State and Local Regulations—PEV installation and charging are governed by a variety of state and local regulations, including building codes, electrical codes, parking regulations, zoning laws, permitting and inspection processes. Statewide PEV stakeholder initiatives have been effective in accelerating local and state code development. If such a statewide process does not exist, you may want to take the lead in forming one in order to speed the process and foster code uniformity on a statewide basis.

You may also want to work with your municipalities, either directly or through stakeholder collaboration, to adopt favorable public ordinances and practices. Here are some examples:

- The state of Washington’s electric vehicle law requires that all local governments allow electric vehicle charging. The state has also issued a set of model regulations to assist cities in complying.100

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99 Contact Erik Brownsword at ebrownsword@eei.org for more information
100 http://www.afdc.energy.gov/afdc/progs/ind_state_laws.php/WA/ELEC
• The Associations of Bay Area Governments (in California) has issued guidelines for communities including a discussion of the regulations that may apply.\textsuperscript{101}

• The state of Oregon has adopted statewide charging station permitting and inspection rules and allows electricians to install charging stations under its “minor label” program.

• Hawaii’s Act 156 requires designated EV parking in commercial and governmental facilities with at least 100 parking spaces.

• Several cities are adopting regulations to provide free parking for PEVs.\textsuperscript{102}

\textbf{Code and Standards for Charging Station Hardware}—Charging station safety and testing standards are covered by one of several Underwriters Laboratories (UL) standards for safety, (2202, 2231, 1998), personal protection (2594) and testing (991).\textsuperscript{103} UL listing is required for charging station units sold to the public and utilities should know which units are listed. UL listed charging stations can be found on Plug In America’s website.\textsuperscript{104}

SAE J1772 is the standard that specifies the single Level 1 and Level 2 connector to be used by all charging stations in the U.S. The SAE committee is now working on the DC fast charging connector standard, which will likely be different from the “CHAdeMO” standard that is being deployed in Japan, Norway, and in certain parts of the United States. Unfortunately, the current situation may lead to the possibility that some current DC “fast charging” stations will not be compatible with vehicles built in the future to a different DC “fast charging” connector standard. Utilities that want DC fast charging available to their customers can participate in this discussion through the EPRI IWC.

\textbf{Installer Training}—Finally, there is a focused effort by a broad, non-profit coalition of companies to establish a standard level of charging station installer qualifications. This coalition (the Electric Vehicle Infrastructure Training Program or EVITP) has developed and delivered initial charging station training to 54 licensed electricians, electrical engineers and electrical inspectors from 21 states. These “Master Instructors” are now qualified to establish local training programs in local community colleges and industry training centers in their home states.

UL has its own Electric Vehicle Charging System Installation training course as well.\textsuperscript{105} The Department of Energy’s Clean Cities program also offers detailed training videos on charging station installation and inspection.\textsuperscript{106}


\textsuperscript{102} See http://www.afdc.energy.gov/afdc/fuels/electricity_laws.html for more details on all of these laws and regulations.

\textsuperscript{103} See http://www.ul.com/global/eng/pages/offering/industries/powerandcontrols/electricvehicle/evstandards/ for more information on these standards.

\textsuperscript{104} See http://www.pluginamerica.org/accessory-tracker?ul=listed

\textsuperscript{105} See http://www.ul.com/global/eng/pages/offering/industries/powerandcontrols/electricvehicle/contact/ for information on the courses and http://www.ul.com/global/eng/pages/offering/industries/powerandcontrols/electricvehicle/evinstallers/ for a list of companies that have already completed it.

\textsuperscript{106} See http://www.cleancities.tv/FeaturedContent/Training/EVSE ResidentialChargingInstallation.aspx
Looking Toward the Future

IEEE, EPRI, SAE and other groups are collaborating on the development of smart charging standards that will integrate PEVs with utility meters and smart grid systems. If your company is developing smart grid or HAN systems, you will want to also stay abreast of the evolving standards that will govern vehicle-to-grid communications and may wish to join one or more of the separate ZigBee, WiFi, HAN or HomePlug alliances that are working on energy communications technology standards. Participation in the EPRI IWC allows utilities to stay abreast of these rapidly evolving technologies.

Although technical capabilities have been demonstrated, grid-to-vehicle communications commercial applications will take several years to be fully explored and deployed. There are several competing systems and technologies that need to be developed and tested. Communications protocols need to be standardized and customer behaviors and needs are yet to be confirmed. We recommend that if you are interested in investigating or deploying grid/vehicle communications programs, that you participate in one or more of the EPRI, HAN, NIST or other industry working groups that are exploring the technology and standards.

Conclusion

We hope this has been a useful resource for your PEV Readiness planning efforts. Just as your efforts will continue and evolve, so will this guide. Look for updates and supplements in the coming months and years. By way of conclusion, find an extensive action item checklist on the following pages to consider in your program development. Good luck.
# Getting Your Company Up to Speed

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<th>Action Items for Getting Your Company Up to Speed</th>
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<th>Plans in Place</th>
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<td>Define PEV strategy</td>
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<td>Appoint single line-of-sight responsibility for PEV activities</td>
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<td>Implement employee training program</td>
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<td>Develop PEV-specific processes</td>
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<td>Initiate PEV rate / program development</td>
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<td>Update all company data and process systems for PEV data</td>
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<td>Forecast PEV loads, revenue and future costs to serve</td>
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<td>Educate utility policy representatives on PEVs and favorable PEV policies</td>
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<td>Forecast utility and regional transportation emissions</td>
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<td>Educate utility policy representatives on PEVs and favorable PEV policies</td>
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<td>Keep employees informed of PEV policies to support</td>
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<td>Install employee PEV charging</td>
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### Getting Your Company Up to Speed (Fleets)

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<th>Plans in Place</th>
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<tr>
<td>Establish strategy for PEV use in company fleet</td>
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<td>Research current PEV fleet options</td>
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<td>Determine best fit for fleet needs</td>
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<td>Determine PEV charging locations and costs</td>
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<td>Develop total cost of ownership and business case for fleet PEVs</td>
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<td>Locate fleet funding, including grant funding opportunities</td>
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<td>Integrate PEVs into fleet</td>
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<td>Implement appropriate practices and processes, (insurance, maintenance, safety, first responder training, etc)</td>
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<td>Participate in EPRI/HTUF working groups for latest PEV updates</td>
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<td>Integrate fleet PEVs into company media events</td>
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# Enhancing the Customer Experience

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<tr>
<td>Implement “hand-holding” process for early adopters</td>
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<td>Create PEV websites</td>
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<td>Create PEV literature / brochures</td>
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<td>Create PEV bill inserts and newsletters</td>
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<td>Create Online videos of PEV actions</td>
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<td>Create PEV school materials and programs</td>
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<td>Launch PEV speakers bureau</td>
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<td>Create PEV social networking postings</td>
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<td>Sponsor PEV conferences and events</td>
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<td>Advise customers on PEV fleet deployments</td>
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### VIPs (Very Important Passengers) to Include

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<td>Conduct educational sessions for public staff and commissioners</td>
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<td>Gain clarity of PUC positions on key PEV issues including cost allocation and utility ownership of EVSE</td>
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<td>Investigate PEV rate options</td>
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<td>Review business case for PEV or EVSE incentives</td>
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<td>Investigate PEV impacts on regional emissions, total customer energy costs</td>
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<td>Determine PEV impacts on state efficiency, consumption and demand goals</td>
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<td>Support a “roadmap” for state/local transportation electrification</td>
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<td>Support grant applications for PEV infrastructure</td>
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<th>Action Items for Outreach and Collaboration</th>
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<td>Support university PEV research</td>
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<td>Participate in research projects and collaborative forums</td>
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<td>Collaborate with local/statewide stakeholders to support PEV policies</td>
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<td>Assign high priority to adoption of PEV policies at local, state and federal levels</td>
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<td>Participate actively in the organizations that are influencing PEV policy</td>
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## Plugging Into the Grid

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<td>Analyze and prepare plan for managing grid impacts</td>
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<td>Educate Distribution Engineers and Managers on potential PEV impacts</td>
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<td>Attend PEV conferences workshops</td>
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<td>Participate in EPRI Infrastructure Working Council meetings</td>
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<td>Identify potentially high adoption distribution circuits</td>
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<td>Develop plan for prioritizing proactive infrastructure upgrades</td>
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<td>Develop plan for rapid response to unplanned PEV impacts</td>
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<td>Implement early notification process</td>
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<td>Provide rate options to customers to encourage off-peak charging of PEVs</td>
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<td>Streamline processes to reduce the cost, complexity and time of charging station installations</td>
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<td>Test charge point installation processes in employee and customer homes</td>
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<td>Research cost-based or grant-funded credits/rebates for customer PEV infrastructure</td>
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<td>Encourage or sponsor local EVITP training programs</td>
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Southern California Edison
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Southern Company
   • http://www.youtube.com/watch?v=u0ASr4mxdn4&feature=related&list=UL

San Diego Gas & Electric
   • http://www.youtube.com/watch?v=0fyFRuYwikjE&NR=1

Xcel Energy
   • http://www.youtube.com/watch?v=SFlq31dILnI

Portland General Electric
   • http://www.youtube.com/watch?v=FeXCnCkHhfo&feature=related&list=UL

Tennessee Valley Authority
   • http://www.youtube.com/watch?v=QrHXE2XeZnE&feature=related
Con Edison
  • http://www.coned.com/electricvehicles/

Tampa Electric
  • http://www.youtube.com/user/TECOEnergyInc#p/c/761EC92C9360DA86/1/j9tiWMm1e5k

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