

# Utility Business Opportunities Related to Plug-in Electric Vehicle Adoption

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## ABSTRACT

Some program managers think that if they just ignore the issues surrounding plug-in electric vehicles (PEVs), maybe they will go away. However, it no longer appears to be a question of *whether* PEVs will hit the mainstream market, but rather *how many* and *how soon*. For those utilities that are not being prodded by their local regulatory bodies to develop plug-in electric vehicle programs, it may prove difficult to establish an initial business case for such a program. Uncertainties abound, like how many vehicles to anticipate, the location and rate of vehicle charging, the customers' willingness to pay for products and services, the ability to resell electricity through third party providers, and the degree to which utilities can and should be involved in the emerging PEV market. The experience of utilities operating in early adoption regions seems to suggest that a utility business case does in fact exist, though full capitalization will require a significant amount of careful planning and proactive behavior.

## Introduction

There are plenty of good reasons to remain skeptical about the market potential of plug-in electric vehicles (PEVs) in North America, and at the same time, the markets have never appeared so bullish on PEV technology. We are currently riding the third major wave of PEV commercialization, and after 100 years of waiting for PEVs to finally "make it" in the mainstream consumer market, there does finally appear to be a light at the end of the tunnel. Technological advances are conspiring to drive down battery and PEV prices, improve performance and reliability, and offer consumers a level of convenience and flexibility that simply did not exist even a decade ago. As this trend continues, we are seeing many more companies attempting to compete in today's PEV marketplace, and we can expect an increasing number of utility customers to begin adopting PEVs to replace their hybrids and conventional gasoline vehicles. Of course, this trend may be difficult to see at the moment; PEVs remain incredibly scarce, sales so far have been meager, and gasoline vehicles continue to dominate the landscape. Both General Motors and Nissan set goals of selling 10,000 PEVs across North America in 2011, but at the moment it looks as though their *combined* sales may not even reach this mark. At the same time, the sheer mass of companies now competing in the PEV space suggests that the tides may be changing in favor of PEV market acceptance. There are now more than 50 automotive manufacturers worldwide reportedly bringing PEVs to market, with an even larger list of manufacturers developing the components and charging equipment for these vehicles. It seems unlikely that all of these companies will succeed, but I think we can safely anticipate that at least a few of them will pull it off.

## Support Customer Preferences

The results from recent consumer surveys, including a nationwide household survey developed by E Source and administered by Nielsen-Claritas, suggest that most people are interested in purchasing a PEV, and that a large percentage would prefer plug-in hybrid electric vehicles (PHEVs) to all-electric vehicles. The main functional difference between these two types of PEVs is that plug-in hybrids can run on gasoline in addition to electricity, but all-electrics cannot. This seemingly subtle difference can

apparently have a very significant impact on consumer acceptance; the E Source survey responses collected last year from over 32,000 households across the U.S. indicate that customers favor PHEVs over all-electrics by a sizeable 7-to-1 ratio (Bloechle, 2011). Though this difference in vehicle preference is likely to vary regionally and could change over time with the wider introduction of public charging infrastructure, other recent survey assessments have come to similar conclusions. For example, Deloitte released a global study in 2011 indicating that customers want a familiar experience; longer driving ranges, shorter recharge times and a small price premium relative to conventional gasoline vehicles (Deloitte, 2011). This suggests that PHEVs with smaller batteries, like the Toyota Plug-in Prius, are more likely to garner wide near-term market appeal than all-electrics or PHEVs having larger batteries and correspondingly large price tags. Over time, once consumers are more familiar with owning and driving a PEV, we can expect to see greater acceptance and market demand for battery-dominant PEVs (Kurani, 2011).

As it turns out, consumer demand and manufacturer supply are largely mismatched at the moment, with the vast majority of manufacturers developing all-electric vehicles and only a small handful working on plug-in hybrids. This is due in part to the historical progression of technology development, since all-electric vehicles have been around for a long time and are well understood, while PHEVs are a more recent development that did not receive much popular attention until just the last decade. Another possible reason is that PHEVs represent a more complex engineering endeavor, and thus only the market leaders are likely to bring a PHEV to market successfully. The Chevy Volt is currently the only consumer-ready PHEV in the light duty vehicle market (*note*: though Chevy may call it an “extended-range electric vehicle”, it’s really just a PHEV). This year (2012), Toyota is will be releasing its plug-in Prius, a seemingly long overdue offering when you consider that individual Prius owners have been independently converting their vehicles to plug-ins since 2005. However, in light of battery safety concerns and the complexity involved with engineering a high quality consumer-ready PHEV, Toyota may have needed that extra time. It is likely this same engineering complexity that is keeping other contenders out of the PHEV market despite apparent consumer demand; having a relatively simple powertrain configuration and controls requirements, all-electric vehicles can be brought to market with fewer engineering hurdles.

All-electric cars are outselling plug-in hybrids by a significant margin so far, but this is probably more indicative of what is available to the consumer than of what consumers are consciously demanding from the market. A reversal in this sales trend would probably benefit most utilities, especially in the near term as PEV programs are ramping up. Customers that buy PHEVs are less likely to contribute to transformer overloading, placing fewer demands on utilities for expensive electric infrastructure upgrades. Owners of plug-in hybrids may well be happy with standard, 120-volt wall socket charging at about 1.9 kW or less, given that they can fully replenish their batteries overnight or while at work with no need to purchase an expensive charging unit. All-electric vehicle owners, with their greater battery capacity, are more likely to opt for faster charging from a variety of station designs ranging from 2.5 to over 20 kW. Slower electric vehicle load growth gives utilities more time to hone their electric vehicle strategies and get their programs out into the market. And in that respect, things are looking good for utilities thus far, given that PEV sales on the whole have been slow.

Regardless of the vehicle type or battery size that customers choose, there is some evidence from early adopters suggesting that the majority of charging events will probably take place at a standard 120-volt wall socket. At a utility conference in May of last year, a representative from Tesla Motors indicated that many of the company’s Roadster owners are opting to use 120-volt outlets for most of their charging needs

(Jaramillo, 2011). During that same session, the director of the Electric Transportation division of the Electric Power Research Institute (EPRI), Mark Duvall, said that his team has consistently found that PEV recharge time has very little impact on actual vehicle utility. These findings seem to run contrary to reports from Deloitte and others insisting that customers will demand short recharge times and therefore require high-power charging equipment. The difference is that of *anticipated* needs versus *actual* needs; survey respondents may consider the worst-case scenario when answering questions about requirements for driving range or recharge time, yet many people may not realize just how often their vehicles sit idle. Once consumers actually purchase a PEV and have driven it for a while, their perceptions may change.

## Consult Your Crystal Ball

Forecasting the market penetration of any new product or technology can be tricky, especially if it's expected to disrupt the economy or face stiff competition from embedded incumbents. Unfortunately, waiting is not an option. Fear of being wrong or of "misreading the market" can stall or misguide projection and planning efforts, and utilities that don't plan for major market transformations will have a difficult time catching up. You can only begin to anticipate the impact of PEVs – let alone adjust your capacity planning and demand response (DR) efforts accordingly – once you've established a range of likely penetration rates. The best forecasts are typically those that account for as many significant variables as possible, drawing from multiple data sources and observing the lessons learned from other markets and in different regions. Some of the most common techniques for developing PEV penetration scenarios include:

- Identifying hybrid (or Prius) owners and using current ownership statistics as a surrogate to estimate future PEV sales. Portland General Electric (PGE) used a database of Prius owners and their Zip+4 location information to estimate where early PEV adopters are likely to live.
- Identifying households with rooftop solar photovoltaic (PV) systems, which are more likely to show interest in purchasing a PEV and more likely to adopt early. In the 1990s, about 50% of electric vehicle owners in California also own a rooftop solar PV system. Recent E Source survey results show this trend continues, with PV owners more likely to express interest in purchasing a PEV for their next vehicle.
- Partnering with automotive manufacturers to understand their rollout timelines and compare available PEV models with survey responses related to consumer preference. Seattle City Light (SCL) has been a leader in partnering with several different manufacturers to share information and stay on top of new vehicle release dates.
- Explore other customer demographics for significant correlations with PEV willingness-to-buy (e.g. age, income, education, "green" tendencies). Austin Energy identified households with favorable demographics in order to target marketing for its Plug In Partners smart charging pilot program.
- Adapting a penetration model from another product or region to match local conditions. For example, applying lessons learned in telecommunications to the PEV market or adapting a PEV penetration scenario from another region to match local conditions.

This is not an exhaustive list of approaches, and while not all of these techniques will be appropriate for all service territories, it may be useful to borrow ideas and adapt methodologies when developing your own forecasting tool (a.k.a. “crystal ball”). Uncertainty will persist no matter how much detail is added to your models, but it’s important to keep updating and recalibrating as new information is made available over time. As one example, all of the investor owned utilities (IOUs) operating in California – a state having a very significant early adopter population and anticipated market potential – have now developed PEV penetration scenarios for their territories. Figure 1 illustrates each utility’s “medium adoption” scenario, as well as the anticipated aggregate total for all three, representing a majority of California’s anticipate PEV fleet. Though none of these utilities are acting with full confidence in these predictions, having a general sense of what lies ahead can serve as a basis for program development and planning. For more details on these forecasts and the potential grid impacts, see my presentation to the Utility Energy Forum (Jungers, 2011).

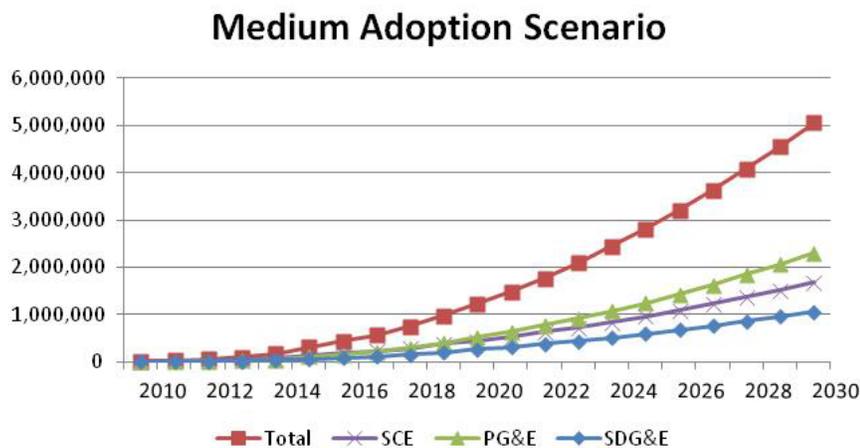


Figure 1- California IOUs rub their crystal balls to produce PEV market penetration scenarios for cumulative vehicle adoption in each service territory.

## Make Life Easier With Strong Partnerships

Operating in relatively non-competitive markets that also touch every corner of the economy, utilities are in a unique position to partner with just about everyone, including other utilities. Selecting and maintaining strategic partnerships can allow a utility to maintain a foothold in an emerging market without having to move too far outside of its relative comfort zone. In the realm of PEVs, likely partners include organizations such as universities and research labs, automotive manufacturers and dealerships, government agencies and regulators, battery and motor manufacturers, charging equipment manufacturers and integrators, and consumer and community advocacy groups. These various companies and institutions are all representative stakeholders in the emerging PEV market, and most stand to benefit from leveraging partnerships that expand capabilities and avoid duplicated effort wherever possible. Let’s consider some examples:

- *Detroit Edison (DTE) and SPX:* On March 1 of last year, DTE announced that it had selected SPX Service Solutions as the exclusive supplier-installer of residential electric vehicle supply equipment (EVSE) for its PEV rate pilot program. Though ECOTality has secured similar contracts from the federal government to install EVSE across the U.S., the partnership between DTE and SPX is unique in that it

ties utility program participation directly to a single third-party supplier. SPX has so far only been contracted to install up to 2,500 EVSE in DTE's service territory. Whether or not that contract will be extended depends upon the persistence of the PEV rate program, as well as customer and utility satisfaction with the services provided by SPX, which was also selected as the sole provider of EVSE hardware for the Chevy Volt. In theory, partnering with a single "turnkey" service provider should simplify things for DTE, offloading work that lies outside of the utility's expertise and still ensuring a single, consistent point of contact for its customers.

- *Seattle City Light and Ford:* Among other auto manufacturers, SCL has reportedly partnered with Ford to support the introduction of PEVs into the market place. Though most utilities appear to be technology agnostics with respect to all-electrics vs. PHEVs, SCL seems to be bullish on all-electric technology. This is due at least in part to the fact that Seattle residents have been profiled as being among the most "EV-ready" consumers in the American marketplace. Ford is said to be partnering with Microsoft (based in Seattle) to include utility rate details to assist the drivers of its Focus EV in finding low-cost charging opportunities. While rate details are publicly available information, SCL will likely play a key role in helping Ford to evaluate early deployment of its Focus EV and see how customers respond to rate feedback.
- *Indianapolis Power & Light (IPL) and Aerovironment (AV):* Having developed the predecessor to the EV1, AV has a long history in the EV space. This experience is what prompted IPL to partner with AV to supply residential and public EVSE for the utility's pilot installations. IPL chose to use a flat rate of \$2.50 per charging session with no time limit for its public EVSE, a friendly gesture to help foster adoption and limit range anxiety. AV provided equipment that met the utility's particular needs for this pilot, along with key fobs to be used by program participants. AV is also working with IPL to collect and analyze charging data and statistics across the utility's service territory, which will hopefully lead to intelligent citing of future charging infrastructure and a better understanding of how customers are using the equipment.
- *Austin Energy and Plug In Partners:* Austin Energy was an integral partner in the founding and management of Plug In Partners, a consumer and stakeholder advocacy group that successfully joined with other organizations to lobby for the reintroduction of PEVs into the marketplace. Once it became clear that manufacturers had gotten the message and would be delivering new vehicle models to market, Austin Energy absorbed Plug In Partners and transformed it into a smart charging pilot program. This pilot is collecting data on customer activity to see how and when PEV owners charge their vehicles, as well as exploring subscription-based payment options for PEV owners in the utility's region.

## Are You Ready?

There is no longer any reasonable doubt that most consumers are interested in adopting PEV technology, but whether or not they will depends largely on the decisions that we in the PEV stakeholder group make now. Educating your customers about the technology, products that are available in your area, and the various costs and benefits of adoption is a good first step in helping to usher in the PEV era. Whether and how we choose to work together and with our customers to ensure a smooth transition to transportation electrification could make a big difference. When the Plug-in Prius begins to hit the market later this year, we may witness a spike in PEV adoption as a wider customer segment is drawn to the technology. To properly prepare for this potential spike and others that could arrive down the road, utility must be proactive in anticipating where adoption is likely to take place and plan for managing the added load to the grid. PEVs represent a huge opportunity for utilities to grow their base load and increase electricity sales revenue without compromising a "green" image or getting

into trouble with regulators. Fully capitalizing on this opportunity will likely require added investments up front.

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