ILLINOIS COMMERCE COMMISSION

Initiative on Plug-in Electric Vehicles

Commonwealth Edison Company

Initial Assessment of the Impact

of the Introduction of

Plug-in Electric Vehicles on the Distribution System

December 15, 2010

TABLE OF CONTENTS

I. Executive Summary

Commonwealth Edison Company ("ComEd") appreciates the opportunity to assist the Illinois Commerce Commission ("ICC" or "Commission") in assessing the potential impacts of the introduction of Plug-in Electric Vehicles ("PEV") on the ComEd system. ComEd has been proactively supporting the development and deployment of alternative fuels and alternative fuel vehicles for several years as part of its "Green Fleet" strategy to reduce greenhouse gas emissions from its fleet. For example, ComEd first began using soy-based biodiesel in 2002, and uses it exclusively for on-site fueling of the diesel vehicles in its fleet. Additionally, ComEd has participated actively with the commercial fleet industry in the development of hybrid utility service vehicles and was among the first utilities in the country to deploy hybrid bucket trucks in its fleet in 2006.

ComEd has continued to expand its Green Fleet since that time, incorporating additional alternative fuels and alternative fuel vehicles, including over 1,900 trucks running on biodiesel, 320 "flex fuel" vehicles capable of running on E85 ethanol, 11 hybrid bucket trucks, 40 hybrid sedans, 142 hybrid SUVs, and 10 converted plug-in hybrid sedans equipped with smart charging technology. Approximately 68% of ComEd's vehicle fleet is alternatively fueled, eliminating over 4,200 metric tons of greenhouse gas emissions annually, prompting GreenBiz.com in 2009, to rank ComEd the nation's 7th largest Green Fleet. ComEd remains active in promoting use of alternative fuels and alternative fuel vehicles, both in the industry and locally, with partners such as the Chicago Area Clean Cities organization, City of Chicago, and the Illinois EPA.

ComEd is currently involved in a number of PEV projects with a variety of partners, and has been actively assessing many of the issues about which the Commission has requested information.

ComEd's Initial Assessment is structured around the four Guidelines that the Commission identified in its letter of September 13, 2010 ("Assessment Letter"), wherein the Commission requested this assessment. Responses to each of the eleven more specific issues that the Commission identified in its Assessment Letter are embodied in the responses to the Guidelines and are identified by reference in footnotes. In addition, Appendix A provides a matrix identifying where in this Initial Assessment each of the 11 issues are addressed. This Executive Summary provides a short discussion of ComEd's response to each of the four Guidelines.

PEV and PEV Charging Infrastructure Deployment

The penetration of PEVs in the ComEd system over the next 2-3 years is not expected to be significant. Most PEV manufacturers intend to target the West Coast with the initial rollout of their PEVs. PEVs will not be actively marketed in Chicago and the Midwest until the latter part of 2011. As a result, even the most optimistic projections show less than 20,000 PEVs in the ComEd territory by the end of 2013. Less optimistic projections show only a few thousand PEVs in that same timeframe.

PEV charging infrastructure comes in three types: Level 1, Level 2 and DC Fast Charging. Level 1 charging operates at 120 volts and can consist of nothing more than a standard household electrical outlet. However, stand-alone Level 1 chargers are available that include more sophisticated technology, such as remote communications and control.

Level 2 charging operates at 240 volts, while DC Fast Charging converts the standard alternating current ("AC") into direct current ("DC") for much faster charging capability.

The deployment of PEV charging infrastructure will be dependent on what entities are allowed to deploy and operate that infrastructure. For private use at home or at a business site, no additional infrastructure (other than a standard electrical outlet) is necessary if Level 1 charging is utilized. However, stand-alone Level 1 and Level 2 electric vehicle supply equipment ("EVSE"), commonly referred to as "charging stations", are available. The entity that can supply these charging stations to customers depends on whether the charging stations can or should be considered a part of the utility's distribution system. Historically, infrastructure located on the customer's side of the meter, where charging infrastructure will be located, has not been considered a part of the utility's distribution system. Thus, any third party should be allowed to provide such infrastructure to a customer.

Similarly, public charging stations will be located on the customer's side of the meter and should be allowed to be provided by any third party. However, there is an addition issue in the public charging station scenario since the owner or operator will be allowing the general public to use the charging station to charge their vehicles. This situation raises the issue whether a sale or resale of electricity is involved in the transaction. If charging services involves the sale or resale of electricity, only utilities and alternative retail electric suppliers ("RES") would be able to provide charging services. On the other hand, if charging services uses electricity only as an input into the offering of a broader, competitive service, then this infrastructure can be supplied and operated by virtually any entity. ComEd believes that public charging services may be

more appropriately considered to be a competitive service, but that this issue needs further discussion. ComEd looks forward to the workshop process to work through all of the considerations and implications prior to making a formal recommendation to the Commission.

Distribution System Impacts

The small penetration of PEVs in the ComEd territory that is expected in the near-term will limit any impacts to the ComEd distribution system in the short-term. Several other factors will also act to limit any near-term impacts. It is widely anticipated that most charging of PEVs will take place at home. EV manufacturers will offer 120v charging (i.e. Level 1) as the standard, but the vehicles will also be capable of 240v (i.e. Level 2) charging. Due to the added cost and additional home wiring upgrades required for installing Level 2 charging, EV owners can generally be expected to opt for Level 1 charging, by simply plugging the EV into an available 120v standard electrical outlet. ComEd's analysis shows that Level 1charging will not significantly impact the ComEd distribution system, particularly at the low initial penetration levels expected.

However, some EV owners will opt to purchase and install a Level 2 charging station for shorter charge times, and ComEd's analysis also shows that the use of Level 2 charging can pose a potential risk to the distribution system if even a small number of them are located in close proximity to each other. This is known as "clustering." It is anticipated that early PEV adoption is likely to be geographically clustered in certain areas, similar to patterns seen in early adoption of hybrid vehicles. In such a situation, multiple PEVs charging concurrently at Level 2 can quickly overload local distribution equipment, such as service transformers, if not managed appropriately.

There are several methods that could be used, on their own or in combination, to help minimize this potential risk. Requiring customers that install Level 2 or higher charging stations to give advanced notice to the electric utility provides significant benefits to the PEV owner, the utility, and other customers served by the same distribution equipment. Advanced notification enables the utility to proactively evaluate the local distribution equipment serving the customer's premises and its available capacity to service the additional PEV charging load. Secondly, the use of time variable rates by customers with Level 2 charging, or greater, would also help resolve the problem. Such rates act as an incentive for customers to charge their vehicles off-peak, when prices and demand on the system are typically lower. Lastly, the use of direct load control technology, similar to that which ComEd currently uses with its air conditioning cycling program ("AC Cycling Program")[1] could also minimize any potential negative impacts by allowing the utility to directly control when a charging station could operate.

Rate Options

ComEd currently has two rates that can be offered to customers for charging their PEVs. Rate BES – Basic Electric Service ("Rate BES") is available to residential and small (i.e. <=100 kW) commercial and industrial customers. It is a flat charge that differentiates only between the summer and non-summer periods. While it is simple and easy to understand, it provides no incentive for customers to shift their electrical usage to off-peak periods.

[1] Rider AC – Residential Air Conditioning Load Cycling Program, Ill. C. C. No. 10, Original Sheet No. 335.

Rate BESH – Basic Electric Service Hourly Pricing ("Rate BESH") is the other rate that ComEd currently has available. It is available to all of ComEd's customers. Its charges are based on the hourly prices established by PJM. As mentioned above, time variable rates, such as real-time pricing, provide a strong incentive for customers to switch usage to lower-priced, lower-demand, off-peak periods. In fact, ComEd's analysis shows that PEV charging customers could save between 27-67% by opting for Rate BESH instead of Rate BES and charging their PEVs during the nighttime hours.

While not currently offered by ComEd, a time-of-use ("TOU") rate is another option that may be considered for PEV charging. TOU rates vary charges by certain periods, such as peak and off-peak. ComEd's analysis shows that the use of hypothetical static TOU rate also allows customers the potential to save when compared to the use of a flat rate such as Rate BES. However, the potential savings are not as great as with a real-time pricing rate.

ComEd's advanced metering infrastructure pilot program ("AMI Pilot") is analyzing other dynamic pricing structures. Some variation of dynamic pricing may also be considered for use with PEV charging after the evaluation of such program is completed at the end of the third quarter of 2011.

Provision of Information to Obtain Service and Equipment

ComEd plans to conduct PEV communications in two phases. Phase I will take place in the first half of 2011, prior to the likely arrival of PEVs in Illinois. In Phase I, ComEd plans to communicate general information about PEVs and PEV charging. Such information will include information about upcoming PEV rollouts and PEV charging infrastructure requirements. Phase II will begin shortly before the planned initial offerings of PEVs in Illinois in the latter part of 2011 (current estimate) and continue through the end of 2011. The communications will focus on public charging station locations, how to prepare for purchasing a PEV, what customers need to know once they have purchased a PEV and available electric rates for in-home or at-work charging.

II. Introduction

A. ComEd's Participation in and Support of the ICC Initiative on Plug-In Electric Vehicles

ComEd welcomes the Commission's Initiative on Plug-in Electric Vehicles. As detailed herein, ComEd has been involved with alternative fuel vehicles, including hybrid vehicles and PEVs, for several years now and is currently engaged in a variety of PEV projects with a number of partners. In these projects, ComEd has encountered many of the issues raised by the Commission in its Assessment Letter and looks forward to supporting the Commission's efforts to understand and resolve those issues.

B. Description of the Current and Past Initiatives that ComEd Has Engaged in Related to PEVs

1. Past Initiatives

ComEd's direct experience with PEVs began in 2009 with the conversion of 10 Prius hybrids to plug-in hybrids ("PHEVs") for its vehicle fleet. The conversion was performed by A123 Systems, Inc., and involved the addition of a second battery pack capable of being charged by a 120 volt outlet.

Each of the 10 Prius PHEVs in the ComEd fleet, plus two additional Prius PHEVs in the I-GO car sharing fleet, were equipped with "smart charging" technology from GridPoint, Inc. The smart charging technology consists of a vehicle control module mounted in the vehicle which communicates directly with the vehicle's on-board computer. The technology also includes wireless communications and back-end software that allows remote acquisition of vehicle performance data, as well as the ability to manage vehicle charging using a variety of advanced methods. Two such methods that ComEd demonstrated were 1) charge management through the use of real-time price signals, and 2) aggregate load management, in which the charging of a group of vehicles was dynamically controlled such that the aggregate load of the group remained below a predetermined threshold.

2. Current Initiatives

ComEd's current PEV projects are designed to support the development of a robust PEV market in Illinois, including deployment of initial public charging infrastructure; studying impacts of PEVs on the electric grid so they can be proactively

mitigated; and deploying PEVs and charging infrastructure for ComEd's own fleet. As such, ComEd's current activities provide a foundation to develop longer term strategies for PEVs as the market develops.

The table below summarizes three ComEd PEV projects and their main components:

	Chicago Clean Cities Grant	**Electric Power Research Institute ("EPRI") PHEV Bucket Truck Project**	**EPRI-General Motors ("GM") Volt Demonstration**
Vehicles	Ford Escape Hybrids Hybrid bucket trucks PHEV digger derrick	25 PHEV bucket trucks	11 GM Volt extended range electric vehicles ("EREV")
Infrastructure	Private charging stations for PHEV bucket trucks, GM Volts, and PHEV digger derrick Public solar charging stations with integrated energy storage	N/A	N/A

The following sections provide an overview of some of ComEd's key PEV projects and the current status of each.

a. Chicago Clean Cities Grant

The City of Chicago ("City") received a $15 million grant from the U.S. Department of Energy ("DOE") under the Clean Cities program to deploy alternative fuel vehicles and fueling infrastructure. The City is proposing to grant ComEd a sub-award of about $1 million under the DOE grant to deploy hybrids, PHEVs and PEVs in its fleet as well as the charging infrastructure to service these vehicles. In addition, the grant will provide funding to deploy publicly accessible solar-powered charging stations with integrated

energy storage. The City will also be granting sub-awards of varying amounts to other partners who will also be deploying various types of PEVs and charging infrastructure.

ComEd has been assisting the City in procuring the public charging infrastructure, including development of the request for proposals, evaluation of responses and consideration of potential sites for the infrastructure. Potential sites and partnerships are currently under consideration for application of grant funds to solar charging stations.

Infrastructure funding from the grant will also be used to support 25 charging stations needed for the EPRI - PHEV Bucket Truck Project and 11 charging stations for the EPRI - GM Volt Demonstration discussed below. Installation of these 36 charging stations will be completed by the end of 2010. All of these stations will be for private use by ComEd's fleet vehicles.

b. EPRI - PHEV Bucket Truck Project

ComEd is in the process of partnering with EPRI, in addition to over 40 other utilities across the U.S. and other partners to demonstrate PHEV bucket trucks in utility fleet applications through a Transportation Electrification grant from DOE. ComEd will use the sub-award from EPRI to deploy 25 PHEV bucket trucks in ComEd's fleet in 2011. These vehicles will be used to evaluate the costs and benefits of PHEV work trucks, and in particular, the benefits to job-site use of vehicle mounted aerial equipment powered by the vehicle's battery.

c. EPRI – GM Volt Demonstration

ComEd is partnering with EPRI, GM and other utilities to demonstrate GM's Volt Extended Range Electric Vehicle (EREV) under two separate studies. In the first study,

ComEd will deploy 10 GM Volts in its fleet to validate EREV performance in a fleet application. In the second study, ComEd will deploy one additional GM Volt to demonstrate the ability to manage vehicle charging using on-board original equipment manufacturer ("OEM") smart charging technology. Both studies will have a three-year duration, beginning in 2010. The testing criteria for the Volts are currently being developed with EPRI. The vehicles will be deployed in 2011.

III. PEV and PEV Charging Infrastructure Deployment

A. PEV Deployment[2]

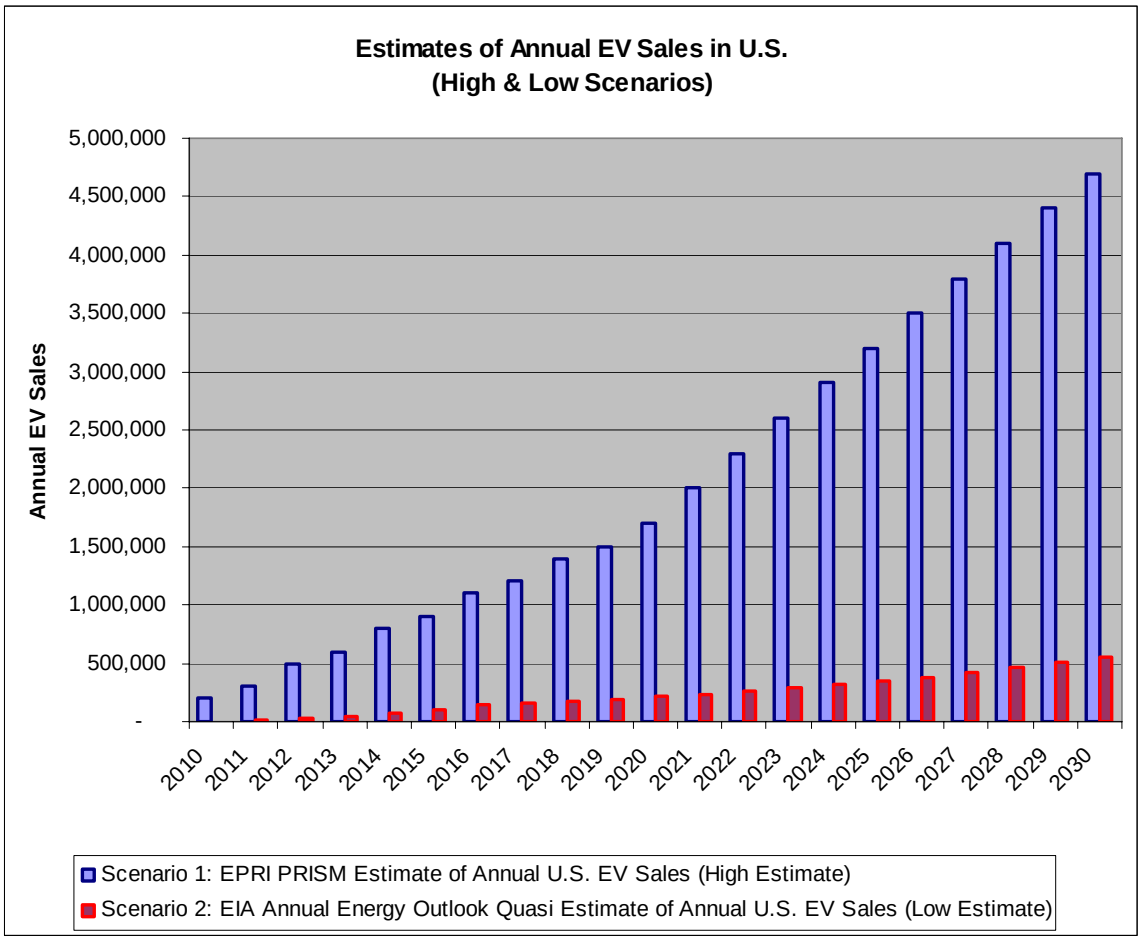
1. Current Outlook

Over the next three years, most major domestic and foreign car manufacturers will bring PEVs to market (See Appendix C). Projections for potential U.S. sales of PEVs in the next ten years vary widely, ranging from just over 200,000 to 1.7 million sold annually, representing market shares of 1.2% and 11% of U.S. new vehicle sales, respectively, in 2020. The wide variance in estimates is driven by the numerous factors that affect adoption, including gasoline prices, PEV battery costs, production capacity, perceived importance of environmental issues, and availability of charging infrastructure. Given these factors, there is a significant amount of uncertainty with respect to expected adoption of PEVs by consumers. Projections for PEV sales and adoption included in this Initial Assessment are shown solely for purposes of providing "frame of reference" upper and lower bands of possible adoption rates, and do not represent predictions of expected

[2] This section addresses issue number 2 in the Assessment Letter

PEV adoption. Diagram 1 below illustrates two such adoption scenarios from EPRI[3] and the U.S. Energy Information Administration ("EIA").[4]

Diagram 1: U.S. PEV Sales Projections



According to KEMA,[5] adoption of PEVs is expected to follow a pattern similar to the adoption of hybrid vehicles such as the Toyota Prius and the Ford Escape. Initial

[3] *Environmental Assessment of Plug-In Hybrid electric Vehicles*, EPRI, Palo Alto, CA, July 2007, 1015325 ("EPRI Scenario").
[4] *Annual Energy Outlook, 2010 Reference, U.S. Energy Information Administration*, The Paul H. Nitze School of Advanced International Studies, December 14, 2009 ("EIA Scenario").
[5] *Assessment of Plug-In electric Vehicle, Integration with ISO/RTO Systems*, KEMA, Inc. and Teratec Corporation, ISO/RTO Council, March 2010 ("KEMA Study").

Prius sales tended to be clustered on the West Coast and Northeast, rather than in the Midwest or Southeast. Using Prius adoption patterns as a leading indicator of potential PEV adoption, sales and adoption of PEVs are not likely to be distributed evenly across the U.S. during early years of market development.

This anticipated clustering is supported by GM and Nissan, the first two major manufacturers with upcoming PEV releases. Both have announced that initial releases of their new "Volt" and "Leaf" PEVs, respectively, will be focused on the West Coast and Northeast in late 2010 and early 2011; with secondary markets such as Chicago scheduled for late 2011 into 2012.

Diagrams 2 and 3 below extrapolate the U.S. PEV sale projections depicted in diagram 1 to the ComEd service territory, in terms of both annual sales and cumulative quantities of PEVs on the road, assuming three percent of U.S. PEV sales occur within ComEd's service area. Using this assumption, projections of total cumulative PEVs on the road in the ComEd service territory by 2020 vary between 32,000 and 300,000. The "High" and "Low" curves in these diagrams represent 2020 penetration rates of about 10% and 1% of ComEd's customers, respectively. Since PEV manufacturers have not targeted the Chicago area for early deployment campaigns, the Chicago area sales projections may have a time lag of several years.

Diagram 2: PEV Sales Projections in ComEd's Service Territory

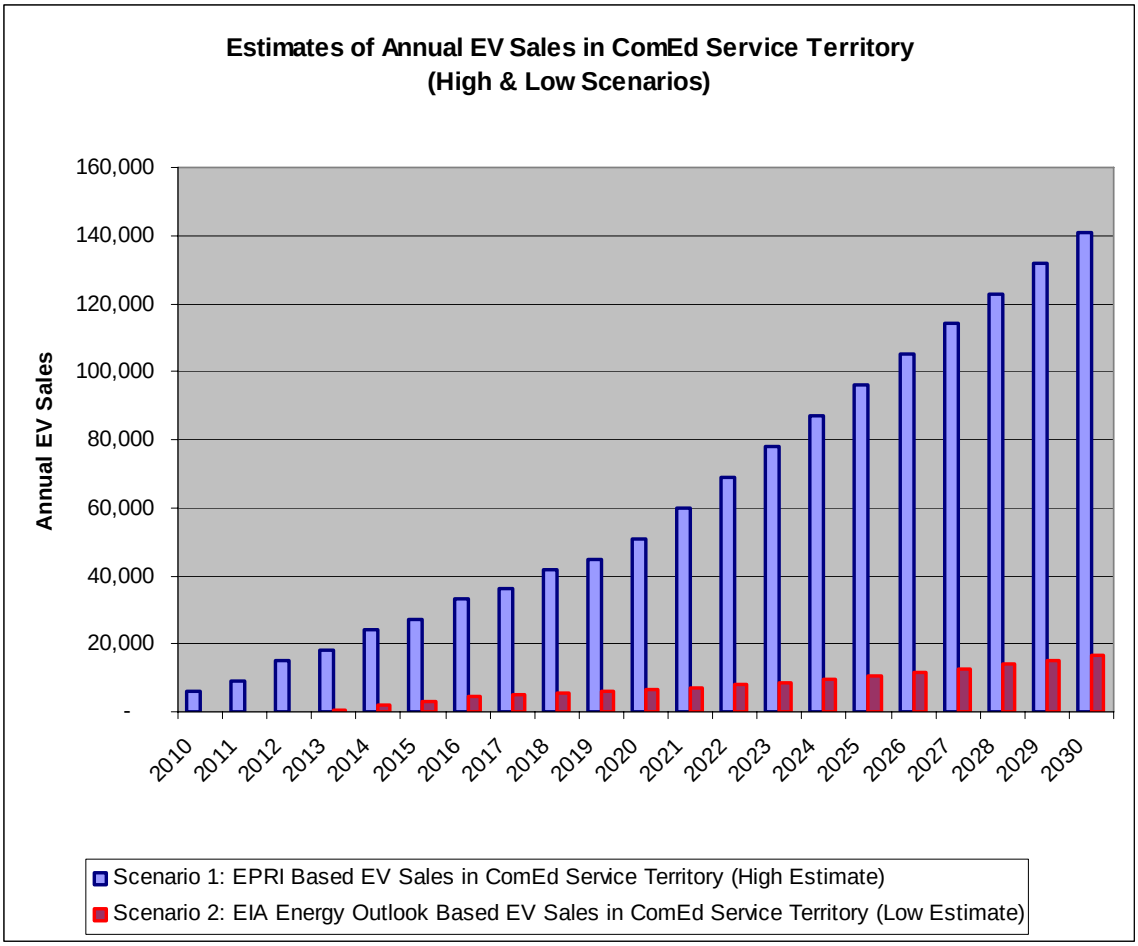
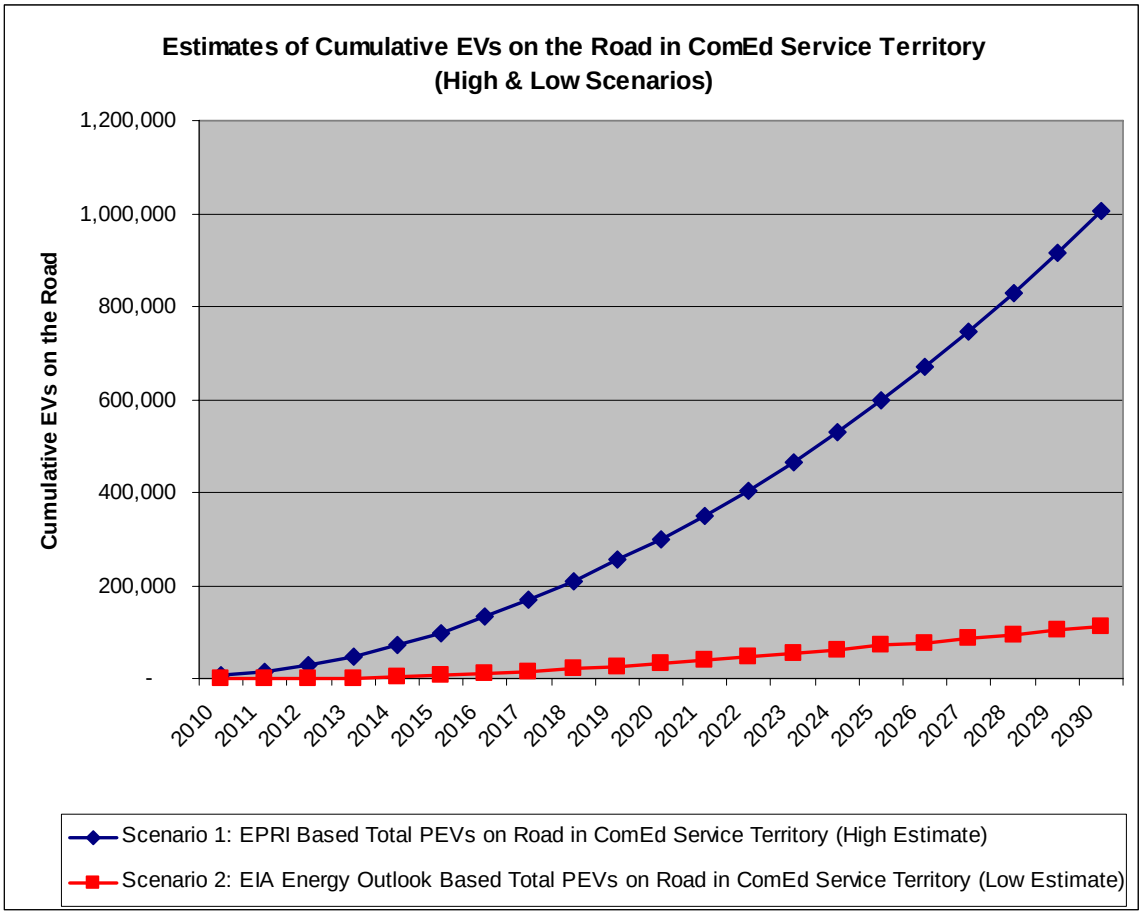


Diagram 3: Projection of PEVs "On the Road" in ComEd's Service Territory



2. Early Adopters and Phases of PEV Adoption

Early adopters of PEVs are likely to be fundamentally different in their vehicle purchase decision-making from mainstream consumers. They can be characterized primarily by their interest in new vehicle technology, fuel economy improvements, and environmental benefits. Many of them may be motivated by a vehicle that makes a "visual statement", as well. As with early adopters of the Prius, they will be willing to pay a premium for these objectives, even in the absence of economic justification.

The premiums associated with early adoption can be large. For example, using electric rates of 8.5¢ to 12¢ per kilowatt-hour ("kWh"), a gasoline price of $3 per gallon

and a conventional gasoline vehicle with a fuel efficiency rating of 27.5 miles per gallon ("MPG"), the fuel savings for a PEV are between $5,000 and $6,000 over the expected life (i.e. 7 years) of the vehicle when compared with a conventional gasoline vehicle.[6] The 2010 Ford Focus has a manufacturer's suggested retail price ("MSRP") between $16,900 and $18,780 and gets 28 MPG. The Nissan Leaf has a MSRP of $32,780 (which can potentially be reduced to $25,280 after a $7,500 federal tax credit). Thus, the smallest premium paid for the Leaf would be between $6,500 and $8,380[7]. As is evident, the premium would exceed the expected lifetime fuel savings by about $1,500 to $2,380.

Using the same assumptions, when compared with a Toyota Prius, the expected fuel savings for a PEV are between zero and $1,000.[8] Again using the MSRP of a Nissan Leaf for comparison with a Toyota Prius MSRP of $22,800, a consumer would be paying a premium of about $2,500 for the Leaf. Once again, the premium would exceed the expected lifetime fuel savings. The premium paid for the Chevy Volt, at a MSRP of $41,000, would be even higher. Even in 2030, the additional costs of a PEV over a traditional gasoline vehicle is projected to be higher than the lifetime fuel savings, unless gasoline is around $6/gal.

Assuming a typical consumer will not be willing to purchase a PEV unless the premium price for the PEV is offset by the reduced lifetime fuel cost, PEV adoption faces

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[6] *Impacts of Plug-In Hybrid Vehicles on Electric Utilities and Regional U.S. Power Grids*, Pacific Northwest National Laboratory, November 2007 ("PNNL Study")

[7] This premium would be even greater if the PEV owner decided, or needed, to purchase a PEV charging station. Depending on the type of PEV charging station purchased, the PEV owner might also need to upgrade the electrical system at its premises. In addition, the owner would incur additional costs if separate metering of the PEV load is required. Lastly, the premium would increase significantly if the federal tax credit is ever eliminated.

[8] PNNL Study.

a significant challenge. In addition, if consumers do not choose to purchase PEVs in the near term, then sales volumes will not be sufficient to generate projected cost savings associated with economies of scale.[9]

In the KEMA Study, KEMA frames the phases of PEV adoption in the following way:

- **Initial market entry (2009-2012):** Manufacturers initially introduce PEVs with limited production levels, while closely monitoring consumer use of the vehicles and vehicle performance. Purchases will be made primarily by early adopters, followed by government and private fleets.
- **Market development and growth (2013-2017):** Manufacturers increase production capacity, driving down battery and vehicle costs. Government incentives will still be needed to encourage market growth. Purchases through this period are still likely to be made by early adopters.
- **Mature market development and expansion (2018 and beyond):** This is considered as the beginning of the mass market. New PEV models and new manufacturers enter the market. Advanced vehicle features and charging capabilities are introduced. Government incentives are phased out as PEVs become more mainstream.

[9] *Electric Vehicles: 10 Predictions for 2010*, Pike Research LLC, 4Q 2009 ("Pike Study").

B. PEV Charging Infrastructure Deployment

1. Background on PEV Charging Infrastructure[10]

a. Types of PEV Charging Infrastructure

There are currently 3 types of charging infrastructure available to charge PEVs. The table below illustrates the differences between the charging infrastructure that is available.

Type	Specifications
Level 1 Charging	110/120V, AC, 15 -20 amps, 1.9 kW.[11] Onboard charger.[12] NEMA515R receptacle (standard 120v electrical outlet), with ground fault circuit interrupter, i.e. GFCI.[13] Typical charge times: 8-12 hours
Level 2 Charging	208-240V, AC, 30 amps, 7.2 kW. Onboard charger. Requires installation of EVSE, i.e. a charging station, that is hardwired to the premises electrical system and equipped with a SAE J1722 connector for connection to the PEV Typical charge times: 3-8 hours
DC Fast Charging	440V, DC, 125 amp, 55kW or higher. Off-board charger. Requires special electrical connection on PEV DC Fast Charging typically returns 50% of a PEV battery's capacity in under 30 minutes.

[10] This section addresses issue 7 in the Assessment Letter.
[11] By comparison, a typical home has a load of about 3kW.
[12] This is the device that converts the AC current from the electrical source to the DC current required by the PEV battery. This device is onboard the PEV.
[13] While Level 1 PEV charging infrastructure can consist of a special, standalone piece of equipment, it can also more simply be a standard household electrical outlet.

Most PEVs that come to market will initially be capable of charging at either Level 1 or Level 2. Currently, connection to a DC Fast Charging source requires that the PEV be equipped with an additional DC connector.

b. Public vs. Private PEV Charging

It is widely anticipated that the majority of PEV owners will recharge their vehicles primarily at home or at the work place, and rely on public charging stations as secondary resources for longer trips.[14] The Pike Study further indicates that home charging will dominate due to the convenience of plugging in overnight.

This position is further supported by a consumer research survey designed and implemented by EPRI to characterize consumers' interest in PEVs and their expectations for charging infrastructure.[15] The EPRI Survey shows that virtually all of the survey respondents expect to charge their PEV at home, and that most consumers say they would prefer to charge at night instead of during the day as it would fit better with their lifestyle.

The EPRI Survey also showed that the majority of consumers associate night time hours with off-peak electricity, and therefore expect to pay lower electricity rates for charging at night. Survey respondents further pointed out that charging PEVs during peak hours defeats the purpose of having environmentally-friendly vehicles – indicating a potential expectation by consumers of the need for time-variable rates to encourage charging at night.

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[14] *Electric Vehicles: 10 Predictions for 2010,* Pike Research LLC, 4Q 2009 ("Pike Study").

[15] *Electric Vehicles: Characterizing Consumers' Interest and Infrastructure Expectations*, EPRI, Palo Alto, CA, November 2009, 1020504 ("EPRI Survey").

While both the Pike Study and the EPRI Survey suggest that home PEV charging will be the primary charging source, publicly accessible charging will nonetheless play a role in the success of PEVs as a sustainable transportation solution. Site selection for public charging stations must be judicious and deliberate to optimize usability and convenience for PEV drivers without "flooding" the marketplace with charging stations that may get little or no usage, particularly in the early stages of PEV deployment, when public charging stations are likely to significantly outnumber PEVs on the road. This will be due, in part, to the myriad PEV infrastructure projects currently funded by government grants and stimulus funds. However, the presence of public charging facilities will be important to both consumers, to alleviate "range anxiety", and to PEV manufacturers in determining "ready markets" in which to offer their PEVs.

The level of charging selected for public infrastructure will be equally important. A mix of Level 2 and DC fast charging stations will likely support most PEV drivers, with a smaller amount of strategically placed Level 1 charging for existing PEV conversions, neighborhood electric vehicles, electric scooters, etc. Level 2 charging and, to some extent, DC fast charging should be located in areas where PEVs owners can "top off" their vehicles' batteries in 1-2 hours or less, and complete other tasks while the vehicle is charging (e.g., shopping). On the other hand, Level 1 charging requires significantly more time, and such stations are likely to be more beneficial at locations where PEVs will be parked for longer periods of time (e.g., transit centers). DC fast charging stations are ideally located along primary transportation corridors (e.g., toll way oases), given their ability to charge PEV batteries in 30 minutes or less.

Because in-home charging is likely to be the predominant method selected by PEV owners, it is important that utilities have the ability to manage the associated loads on the distribution system. This further highlights the need for time-variable rates, communication between the utility and the charging station, and advance notification to the utility prior to deployment of charging infrastructure.

2. Private (At-home or Place of Business) Deployment[16]

As discussed above, most PEVs that come to market initially will be capable of charging at Level 1, i.e. 120v. This is the standard voltage in homes and businesses. PEVs can be charged by simply plugging them into a standard electrical outlet. Thus, no special PEV charging infrastructure will need to be deployed.

However, some homes and businesses may be interested in charging their PEVs more quickly than can be done with Level 1 charging. In order to do so, these entities will need to install a Level 2 or a DC Fast Charging charging station. Who can provide and install these charging stations depends on whether or not the provisioning of the charging infrastructure is a part of a utility's service obligations. Under the Public Utilties Act ("PUA"), a utility has two general service obligations. The utility must continue to offer each tariffed service that it offered on the effective date of the Electric Service Customer Choice and Rate Relief Law of 1997 ("Restructuring Act"), and the utility must offer delivery services.[17] The utility cannot be required to offer any other service.[18]

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[16] This section addresses issues 1 (in part) and 8 in the Assessment Letter.
[17] 220 ILCS 5/16-103(a) and (b). The utility is also required by this section to offer real-time pricing as a tariffed service.
[18] 220 ILCS 5/16-103(e).

The deployment of PEV charging infrastructure is clearly not a part of any tariffed service that ComEd currently offers. Therefore, the issue becomes whether or not the deployment of PEV charging infrastructure can be considered to be a part of delivery services. The PUA generally defines delivery services as services "that are necessary for the transmission and distribution systems to function so that retail customers . . . can receive electric power and energy . . . [.]" It seems relatively clear that PEV charging infrastructure is not necessary for retail customers to receive energy to charge their cars. As noted above, residential and business customers will be able to charge their PEV by simply plugging it into a standard 120 volt electrical outlet. Special or additional PEV charging infrastructure is not needed at all in the private setting. While it may be a convenience to own a Level 2 charging station to permit more rapid charging, it is not a necessity.

Moreover, the PEV charging stations would be installed on the customer's side of the meter. It has historically been the case that the utility's distribution system ended at the meter and that the customer was responsible for all wiring, outlets and other facilities needed to get the energy from the meter to other locations on the customer's premises.[19]

Thus, the deployment of PEV charging infrastructure in the private setting is not a service obligation of the utility. Instead, the deployment of PEV charging infrastructure appears to fall within the definition of a competitive service, i.e. it is a service "related to, but not necessary for, the provision of electric power and energy or delivery service."[20]

[19] Ill.C.C. No. 10, Original Sheet Nos. 155-187.
[20] 220 ILCS 5/16-102.

However, sales of electricity to the residential or business customer for charging purposes would still need to be made by either a utility or a RES. The Commission will continue to have jurisdiction over both of these entities.

Treating the deployment of at-home charging infrastructure as a competitive service appears to minimize regulatory barriers to its deployment. However, should the Commission choose to regulate the provision of at-home charging infrastructure, then the Commission must address a number of regulatory issues, such as whether a utility can be required to offer the service;[21] if so, what are the rates that the utility may charge for the service; should a new class of RES be created to offer this service; and should the service be unbundled and a rulemaking commenced to regulate PEV charging service providers. Each of these issues has the potential to delay the deployment of at-home charging infrastructure.

3. Public Deployment[22]

The deployment of PEV charging infrastructure for the general use of the public depends on whether PEV charging services are considered to be a regulated or a competitive service. If such charging services are considered to be a regulated service, then they can only be offered by public utilities or alternative retail electric suppliers ("RES"). On the other hand, if such services are considered to be competitive services, then they could be offered by any party. ComEd believes that PEV charging service may be more appropriately considered to be a competitive service, but that this issue needs further discussion. ComEd looks forward to the workshop process to work through all of

[21] 220 ILCS 5/16-103(e).
[22] This section addresses issue in the Assessment Letter.

the considerations and implications prior to making a formal recommendation to the Commission.

a. The Statutory Framework

Under the PUA, the issue of whether PEV charging services is a regulated or a competitive service depends on whether such services are considered to be merely a sale of energy or is a broader service as to which energy is but one input, much like a dryer at a laundromat. The PUA generally defines a public utility as being an entity that owns or controls facilities used for the "sale, delivery or furnishing of . . . electricity. . . ."[23] Similarly, the PUA generally defines a RES to be an entity that "offers electric power or energy for sale . . . to . . . retail customers, . . . or that engages in the delivery or furnishing of electric power or energy to such retail customers[.]"[24] On the other hand, the PUA defines a competitive service as a service that is "related to, but not necessary for, the provision of electric power and energy or delivery services."[25]

b. Sale of Energy vs. Competitive Service

While there are reasonable arguments supporting either position, ComEd believes that PEV charging services may be more appropriately considered to be a competitive service rather than a sale of energy. As used in this Assessment, "charging service" includes both the provision of charging to the PEV, as well as the charging infrastructure itself. Charging service does not include the provision, or metering, of electric service to the charging station. While ComEd believes PEV charging service may be more appropriately considered a competitive service, the ICC and/or the State may wish to

[23] 220 ILCS 5/3-105(a).
[24] 220 ILCS 5/16-102.
[25] 220 ILCS 5/16-102.

consider some form of regulation for charging service. Such regulation would be designed to build consumer trust for this new service, while facilitating a smooth transition to PEV infrastructure.

(i). Sale of Energy

In one sense, a PEV charging station is essentially nothing more than an electrical outlet. Electric vehicle owners merely plug their PEV into a public charging station and draw electricity from the station just as they do when they plug the PEV into an electrical outlet at their homes. A PEV is just another appliance that draws electricity from the outlet/charging station in order to function. While certain charging stations (i.e. Level 2 and DC Fast Charging) utilize higher voltages or change the current from AC to DC, there is no fundamental change in the nature of the product or service that is offered to the public as there is with a dryer at a Laundromat. It is still electricity that is being transferred from the station owner to the customer.

(ii). Competitive Service

However, in another sense, the view that a PEV charging station is nothing more than an electrical outlet is overly simplistic. Owners and/or operators of public PEV charging stations provide owners and operators of PEVs with a cluster of related services that are distinct from simply selling electric power and energy. These services include the use of a physical location or parking place for the electric vehicle, the use of the charging station facilities themselves and access to a source of electricity in a variety of voltages and currents. In addition, a commercial charging station is typically equipped with an on-board computer, a digital display, user authentication such as a card reader, remote communications and a utility-grade meter, all of which can be used to provide a

number of other services. For example, the station can be programmed to automatically notify the driver by text or e-mail when charging is complete or is interrupted. A driver is even able to remotely stop or start a charging session. In addition, unoccupied charging stations can be located by any web-enabled device. Further, charging stations typically provide 24-hour customer support that can be accessed via a toll free number.

Besides these services, PEV charging stations offer PEV owners and operators the convenience of being able to charge or "top off" their PEVs at locations remote from their homes or places of business. For example, a PEV owner or operator could potentially be able to charge his or her car while shopping at the mall, while viewing a movie, while dining or while the car is in the parking garage. Public charging stations offer PEV owners the further convenience of 24-hour accessibility. In addition, these public stations offer a number of convenient payment options. The stations can be configured to be open to all users without the need for a subscription or without any relationship to a local utility or even the owner of a particular station. Drivers can access a station by paying for a single session by placing a toll free call to an identified number, by paying with a standard credit/debit card, through the use of a smart card or through subscription. These stations can be installed virtually anywhere: on a wall or pole, or mounted directly to the ground.

The equipment that comes with Level 2 and DC Fast Charging stations[26] further demonstrates how electricity is really only an input into the charging service that is provided. Level 2 stations come equipped with special connectors to allow the use of 240V AC power input for quicker charging times. DC Fast Charging stations take the

[26] These are the only 2 types of charging stations that are typically considered for public use.

AC power received from the local utility or ARES and convert it into DC power for the quickest charging times.

The functions and services that a charging station provides demonstrated that electricity is but one input into the offering of a complete electric vehicle charging service. In this regard, it is similar to the use of electricity as an input to power a battery charger for the provision of charging services by car repair shops; or as an input in the clothes drying services offered by a laundromat; or as an input in the hotel business, which allow customers to plug-in and charge electrical devices as part of their room charges; or as an input into the services provided by those businesses that invite customers to bring their laptops into their establishments (some of which, i.e. airports, even provide private areas and charge for the service).

While it may be true that it is still electricity, in some form, that is transferred between a charging station owner and a customer, that is not the dispositive inquiry under the PUA. As the Illinois Supreme Court has noted: "The mere fact that the thing sold by a company is water or gas or electricity or telephone service, such as are ordinarily sold by a public utility company, does not of itself render the seller a public utility."[27] What else is required is that the sale, delivery or furnishing of electricity be for "public use" in order to subject an entity to regulation as a public utility.[28] The Restructuring Act brought greater clarity to this phrase when used in the context of selling or furnishing electric power or energy. The Restructuring Act divided the regulation of entities engaged in the sale or furnishing of electricity into two types: electric utilities and

[27] Mississippi River Fuel Company v. Illinois Commerce Commission, 1 Ill. 2d 509, 516 (1953).
[28] 220 ILCS 5/3-105.

ARESs. For both types of entities, it is the sale or furnishing of electricity to "retail customers" that subjects these entities to regulation under the Act.[29]

Retail customer is defined in the Restructuring Act as "a single entity using electric power or energy at a single premises…" The users of charging station services do not come within this definition. Each charging station, i.e. "premises", will have multiple entities using its services. Moreover, each single entity could potentially receive charging services from multiple charging stations, i.e. "premises", at various locations. Thus, PEV charging service providers do not appear to be engaging in the sale of electricity to retail customers and should not be subject to regulation as an electric utility or an ARES.

ComEd's tariffs support a similar conclusion. ComEd's General Terms and Conditions prohibit the resale or redistribution of electric power and energy. However, that tariff then goes on to provide that the furnishing of electric power and energy to units within a multiple-unit building normally considered to be a temporary domicile, such as motels, dormitory, health care facility, or nursing home, is not the resale or redistribution of electric power and energy.[30] This is highly analogous to the charging station situation. In both situations, the entities using the electric power and energy are very mobile and only temporarily at the location the service is being provided. In neither situation do the entities using the service clearly come within the definition of retail customer.

If PEV charging services is not a competitive service that can be offered by any unregulated entity, then it is not clear who in Illinois can do so. As described above, both

[29] 220 ILCS 5/16-102.
[30] Ill.C.C. No. 10, Original Sheet Nos. 144-5.

electric utilities and ARESs are allowed by law to sell or furnish electric power and energy only to retail customers. It would seem to require a legislative change in the definition of "Retail Customer" to enable either entity to be able to offer public charging services, as no public charging station would ever serve just a single entity. Moreover, since utilities were not offering charging services as a tariffed service on the effective date of the Restructuring Act, it does not appear that they can be required to do so.[31]

c. Public Policy Considerations

ComEd acknowledges that there may be certain policy reasons that, on their face, might support regulating public charging services. The regulation of these services would give the Commission input over the location of the stations so as to ensure broad, and potentially more even, availability of the stations, particularly in more remote or less populated areas. The Commission would have direct authority over the design of charging rates so as to be able to incent or discourage usage at particular times. Finally, the Commission would have greater control over the quality of the service and the providers of that service.

However, none of these reasons is compelling. Industry research indicates that the majority of EV charging is expected to occur in the home or workplace for reasons of convenience or "fit" with consumers' life styles. Even those customers who live in more remote locations or who might desire to use their PEV to travel greater distances have other options, such as buying a hybrid, instead of a pure, PEV. Moreover, gasoline stations have never been regulated even though they are much more of a necessity than a

[31] 220 ILCS 5/16-103(e).

PEV charging station considering that gasoline-fueled cars cannot typically be refilled at home.

Even if PEV charging services is considered to be a competitive service, the Commission will continue to have significant control over rates for charging services and the entities that provide the energy for these services. As mentioned above, the primary location where PEV users will charge their PEVs are at home or at their businesses. The Commission will continue to have direct authority over the rates that utilities charge and over the quality of service that both RES and electric utilities provide to these residential and business customers for charging their own vehicles. Similarly, RESs and electric utilities will be the entities that sell electric power and energy to the charging station owners as retail customers, and the Commission will continue to have regulatory authority over the utilities' sales and the quality of service by both providers.

Lastly, there are numerous entities that are ready, willing and able to provide this service.[32] Unless it is stifled by the costs of regulation, competition can be expected to be robust.

IV. Impacts to the Distribution System[33]

A. Potential Impacts

As described earlier in this Initial Assessment, the load associated with PEV charging varies based on the level of charging selected. Because of this, ComEd's focus

[32] As described above, ComEd is currently involved with the City of Chicago in a project that involves the deployment of public charging stations in the Chicagoland area. The City has issued a request for proposals ("RFP") to deploy the stations. Fourteen entities have already expressed an interest in responding to the RFP.

[33] This section addresses issue 3 in the Assessment Letter.

on mitigating the impacts of PEV charging load is on managing and communicating with the charging stations and not with the vehicles. Additionally, since the vehicles are mobile, they may plug in and charge at any available charging station. However, the charging stations themselves are stationary and, therefore, can be tied directly to specific components of the distribution system with respect to analyzing and managing the associated load impacts. Both residential and commercial charging stations, Level 2 and above, must be "smart", meaning the charging station must support communications with the utility. These communications include remote load management capability for the utility, such the ability of the charging station to accept electricity price signals, and the ability to start/stop charging based on system load signals.

Summer peak feeder loading typically occurs around 5 PM. This coincides almost directly with peak home arrival time of most customers (see Diagrams 4 and 5).[34]

Diagram 4: Peak Feeder Load

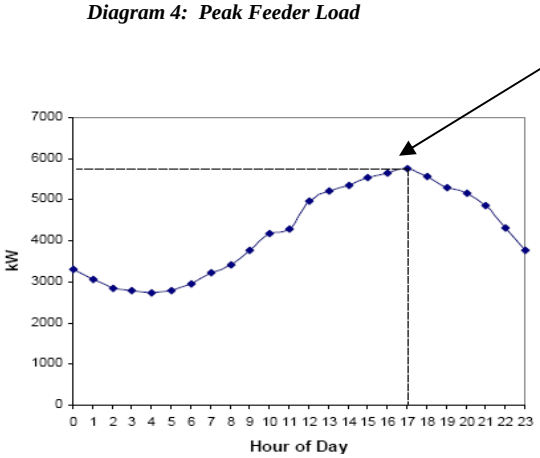
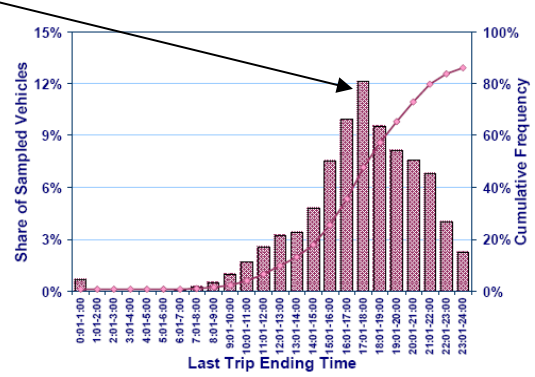


Diagram 5: Peak Home Arrival



[34] Commonwealth Edison PEV Distribution Impact Study, EPRI, November 2010 ("Impact Study")

Thus, uncontrolled charging (i.e., customers plug in vehicles when arriving home, and charging begins immediately) has the potential to contribute significantly to peak feeder loads and stress local distribution equipment, especially where multiple residential customers on the same feeder select Level 2 charging.

In order to gauge the level of impact PEV charging may pose on the distribution system, ComEd recently completed a study with EPRI using two representative feeders in Oak Park and Highland Park, respectively. The study analyzed the impacts of PEV charging at both Level 1 and Level 2, with PEV penetration rates between 2% and 30%, using actual feeder loading information provided by ComEd. The study also assessed impacts to specific distribution system components, including substation transformers, primary conductors, switches, and service transformers.

The results of the study indicate that Level 1 charging poses minimal immediate threat to distribution system components, but that uncontrolled Level 2 charging could lead to problems if not managed appropriately. The fact that PEV adoption is likely to be "clustered" by geographic area and, subsequently, by distribution system components, magnifies the potential impact. The Impact Study identified service transformers as particularly vulnerable to impacts of Level 2 charging.

ComEd is discussing a potential phase 2 study with EPRI, focused specifically on service transformers across ComEd's territory. The phase 2 study would seek to identify areas where significant penetration of Level 2 charging could pose concerns if not managed appropriately.

The ability of Level 2 PEV charging to impact reliability of electric service not only to the PEV owner, but to other customers served by the same distribution feeders

and equipment, highlights the importance of the need to find ways to manage these concerns. The use of time-variable rates, such as Rate BESH by customers with PEVs using a Level 2, or higher, charging station would largely mitigate these concerns by providing incentives for them to shift vehicle charging to off-peak periods. Similarly advance notification to the utility prior to installing charging equipment rated at Level 2 or above must be required. This information is critical to enable the utility to proactively assess the electrical capacity of local distribution infrastructure to serve the additional PEV charging load and upgrade such equipment if necessary. Because grid impacts will extend beyond individual feeders and local equipment at more significant penetration levels, the utility must retain the right to load manage Level 2 and above charging stations in extreme circumstances.

Additional solutions are discussed in the next section.

B. Equipment and Technologies to Avoid Detrimental Impacts to the Distribution System[35]

There are equipment and technology solutions that could be deployed and evaluated to encourage off-peak charging so as to lessen the potential detrimental impacts that PEV charging could have on local distribution equipment during peak periods,.

1. Residential Charging Station Load Control

Load control devices give the utility the ability to remotely shutdown, cycle or reduce the demand from high load electrical equipment. Most commercially available PEV charging stations will have built-in load control equipment, similar to the devices

[35] This section addresses issue 5 in the Assessment Letter.

currently used in ComEd's AC Cycling Program, to reduce demand during summer peak periods. The likely application for PEV load control functionality would be to reduce or shutdown the electricity demand from PEV charging during the peak periods.

PEV charging station load control uses remote communication capability similar to that used by ComEd for its residential air conditioner cycling program. The utility would determine the timing, frequency, duration and geographic region of load controlled charging stations that would be switched off, with consideration for the distribution network and the impact on consumer charging behavior.

Adding load control functionality to the solution provides more control for the utility to better manage the number of the customers charging their PEVs during the peak load time periods. However, consumers should be appropriately educated and informed so that they fully understand the impact of the load control device on their charge times and maximum travel distances.

If load control is considered, it should be evaluated along with time-variable rates to determine the best solution to manage consumer behavior and peak load demand.

2. Solar Charging Stations

Solar PEV charging stations have the potential for reducing the peak period charging for PEVs, particularly when paired with stationary energy storage, such as batteries. However, the equipment appears to be cost-prohibitive in the near-term without substantial subsidies, such as government grants.

A solar PEV charging station would likely consist of one or more Level 2 charging stations, photovoltaic ("PV") panels with supporting structures, a stationary

battery, and parking spaces for PEV charging. Since solar renewable energy generation from PV panels tends to align with peak load periods, a charging station with PV panels should reduce the energy demand to the grid from PEV charging. The stationary battery would enable the storage of solar energy during periods when the charging station is not being used, while effectively assisting PEV charging to shift load to off-peak periods.

While solar-assisted PEV charging has the potential to reduce the peak load demand from PEV charging, the primary limiting factor on broad deployment of solar PEV charging stations will be the high installation and equipment cost. The PV panels, structure, battery storage and necessary power control electronics can increase the cost of a charging station by a factor of ten.

Solar charging stations do not appear to be a cost-effective solution to reducing on-peak demand for PEV charging in the near-term without significant cost subsidies.

C. Protocols and Standards for PEV Integration with the Distribution System[36]

Title XIII, Section 1301, of the Energy Independence and Security Act of 2007 ("EISA"),[37] entitled, "Smart Grid" establishes federal policy regarding the modernization the electric utility transmission and distribution system so as to maintain a reliable and secure electricity infrastructure that can meet future demand growth. EISA also seeks to achieve each of the following objectives that characterize a Smart Grid:

> (1) Increased use of digital information and controls technology to improve reliability, security, and efficiency of the electric grid.

[36] This section addresses issue 10 in the Assessment Letter.
[37] 15 USC 17,381.

(2) Dynamic optimization of grid operations and resources, with full cyber-security.

(3) Deployment and integration of distributed resources and generation, including renewable resources.

(4) Development and incorporation of demand response, demand-side resources, and energy-efficiency resources.

(5) Deployment of ‘‘smart’’ technologies (real-time, automated, interactive technologies that optimize the physical operation of appliances and consumer devices) for metering, communications concerning grid operations and status, and distribution automation.

(6) Integration of ‘‘smart’’ appliances and consumer devices.

(7) Deployment and integration of advanced electricity storage and peak-shaving technologies, including plug-in electric and hybrid electric vehicles, and thermal-storage air conditioning.

(8) Provision to consumers of timely information and control options.

(9) Development of standards for communication and interoperability of appliances and equipment connected to the electric grid, including the infrastructure serving the grid.

(10) Identification and lowering of unreasonable or unnecessary barriers to adoption of smart grid technologies, practices, and services.

Of particular relevance to integration of PEVs are points 7, 8, 9, and 10 above. Each of these speaks to the need for two-way communications between the utility and "smart" consumer products such as PEVs and charging stations. Section 1305 of EISA directs the National Institute of Standards and Technology ("NIST") to establish protocols and standards to increase the flexibility of use for Smart Grid equipment and systems. To meet this responsibility, NIST developed the NIST Framework and Roadmap for Smart Grid Interoperability Standards, Release 1.0 ("NIST Framework"). The NIST Framework is a high-level conceptual reference model for the Smart Grid that identifies existing standards applicable to the development of the Smart Grid; specifies high-priority gaps and harmonization issues requiring new or revised standards;

documents action plans to address the gaps; and describes the strategy to establish requirements and standards to help ensure Smart Grid cyber security.[38]

Several priority action plans ("PAP") are defined within the NIST Framework. PAP 11 specifically addresses interoperability standards to support PEVs, including the development of data standards to enable charging of PEVs. The standards will cover charging at home or away from home under a special rate schedule, discharging of PEV energy storage for demand response purposes, and administration and monitoring.

Once NIST has developed standards, such standards will be presented to the Federal Energy Regulatory Commission ("FERC"), which will institute a rulemaking procedure to adopt the standards. Once a standard is enacted by the FERC, it will be incumbent on utilities, equipment manufacturers, and technology providers to comply with such standards. In ComEd's case, this will mean ensuring equipment and communications systems deployed meet the appropriate standards.

V. Pricing Options for PEV Charging

A. Authority Under the Public Utilities Act

An initial issue to be addressed in considering the appropriate pricing options for PEV charging is whether an electric utility that operates as in integrated distribution company ("IDC")[39] can choose or be required to amend its offerings of retail electric

[38] *NIST Framework and Roadmap for Smart Grid Interoperability Standards, Release 1.0*, National Institute of Standards and Technology, January 2010.
[39] On January 24, 2002, the Commission issued its final Order in Docket Nos. 98-0147/98-0148 (cons.), which gave an electric utility the option to choose between two sets of rules – the Functional Separation rules, and the Integrated Distribution Company

supply services to provide electric service for PEV charging. The PUA states "The Commission shall not require an electric utility to offer any tariffed service other than the services required by this Section, and shall not require an electric utility to offer any competitive service."[40] The only services required by that section are existing services, delivery services and real-time pricing. Similarly, the IDC rules only expressly require an IDC to offer tariffed services that are required by the PUA.[41]

Nevertheless, other provisions of the PUA and IDC Rules support the ability of a utility to choose to amend its current offerings to include a tariff for PEV charging. The PUA expressly provides that "[n]othing in this subsection shall be construed as limiting an electric utility's right to propose, or the Commission's power to approve, allow or order modifications in the rates, terms and conditions for such services pursuant to Article IX or Section 16-111 of the Act."[42] Thus, clearly, both ComEd and the Commission have authority to revise existing tariffed services. Moreover, nothing in section 16-103 or elsewhere in the PUA purports to limit a utility's ability to propose new tariff offerings under Article IX of the PUA.

Similarly, nothing in the IDC rules purports to remove the power of the utility to propose new tariff offerings. While the IDC Rules may not expressly require the offering of new or revised tariffed services, nothing in the IDC Rules prevents an electric utility from offering them. Instead, the prohibitions in the IDC Rules all relate to non-tariffed

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rules ("IDC Rules"). Subsequently, ComEd chose to operate as an IDC (83 Ill. Admin. Code § 452: Subpart B) by filing a petition on May 24, 2002 seeking Commission approval of its implementation plan for becoming an IDC, which was granted by the Commission on July 2, 2002 in Docket No. 02-0379.

[40] 220 ILCS 5/16-103.

[41] 83 Ill. Admin. Code 452.230(a).

[42] 220 ILCS 5/16-103.

service offerings and to promoting, advertising and marketing tariffed services.[43] Therefore, an electric utility could choose, but could not be required, to propose to the Commission a separate tariff to provide electric service for PEV charging. In addition, if such service was declared or determined to be a competitive service by the Commission, the utility could also choose to offer such competitive service.

However, the IDC Rules do present a different hurdle for Illinois electric utilities in making a tariff offering for supply service for PEV charging in that they do not permit an electric utility to "promote, advertise or market with regard to the offering or provision of any retail electric supply service."[44] Regardless of an electric utility's pricing structure for supply service for PEV charging, the ability to promote, advertise or market such tariff would be unavailable unless an electric utility petitions the ICC for a waiver.[45] The ICC has previously granted such a waiver in Docket Nos. 08-0411 and 09-0263 to allow ComEd to promote, advertise or market ComEd's Residential Real-Time Pricing ("RRTP") program and the Customer Applications Plan related to the AMI Pilot program, respectively. The waivers in these particular programs have assisted in the advancement of such programs in not only customer awareness but also in active participation. Therefore, a waiver of this type would be essential if electric utilities are going to successfully encourage economical and efficient decision making by electric vehicle operators with respect to how and when they charge PEVs.

B. Rates[46]

[43] 83 Ill. Admin. Code 452.230(b) and 452.240(a).
[44] 83 Ill. Admin. Code § 452.240(a).
[45] 83 Ill. Admin. Code § 452.140(b).
[46] This section addresses issue 4 in the Assessment Letter.

The types of rates offered for PEV charging is another critical component in the success of the deployment of PEVs. Issues for consideration include the rate structure to be used to recover the costs associated with PEV charging whether for private or public use and whether such rates should only apply for PEV charging as a single end-use or whether the entire residential or nonresidential premises should be charged a single rate for all end-use loads, e.g. PEV charging, HVAC, lighting, etc. In addition, a particular rate design that may be available in the initial PEV deployment may influence charging behavior but may not influence the same behavior for future deployment of PEVs. Rate structures, such as static or dynamic pricing, may need to be revisited in the future as load profiles associated with PEV charging evolve.

1. Rate BES

PEV charging can occur at residential premises or at commercial establishments that charge their own PEVs or that offer charging services to the general public.[47] ComEd's Rate BES, would be applicable to most residential and nonresidential customers with demands that are less than 100 kilowatts.[48,49] Rate BES is a bundled tariff that recovers costs for electric supply, transmission service and distribution service. Charges for electric supply under Rate BES, which is typically the greatest percentage of

[47] Whether or not commercial establishments can offer charging services to the general public depends on whether PEV charging services is determined to be a competitive service or not (see section V of this Initial Assessment).

[48] Tariffs filed with the ICC and effective November 11, 2007 pursuant to Docket No. 07-0478. Nonresidential and lighting customers with demands 100 kilowatts (kW) and greater but less than 400 kW were declared competitive and are not eligible for Rate BES.

[49] If public PEV charging services is determined to be a regulated service that only utilities or RES can offer (see discussion of this issue in section V of this Initial Assessment), neither Rate BES nor Rate BESH would be applicable to this service as both rates are available only to Retail Customers, i.e. a single entity using electricity at a single premises. A charging service customer does not fit this profile.

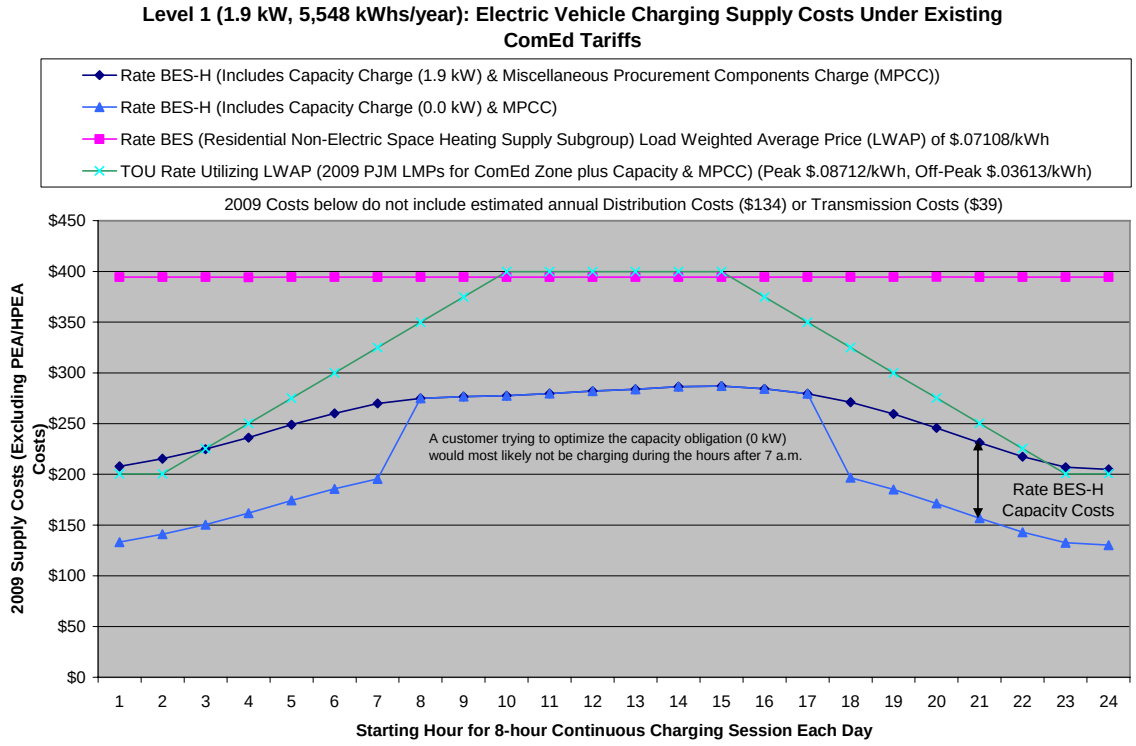
the total costs on a residential or small commercial customer's bill, are fixed and do not vary by the time-of-day. The charges do, however, differentiate seasonally between summer (June through September) and non-summer (October through the following May) monthly billing periods. The benefit of a fixed electric supply charge, also referred to as a "flat rate", includes offering simplicity to consumers. However, the fixed charge bears little relation to the cost of providing the electricity in a given hour. Therefore, consumers have no incentive to change consumption, i.e. promote conservation or shift load, which can be critical to the impact of PEV charging on the utility's distribution system.

2. Rate BESH

ComEd does offer another existing rate, Rate BESH, that can lead to load shifting or conservation by retail customers engaging in PEV charging. Rate BESH is available to all residential customers and nonresidential customers. Rate BESH is also a bundled tariff that recovers costs for electric supply, transmission service and distribution service. Charges for electric supply under Rate BESH, however, are not fixed like Rate BES. Instead, these charges vary by the time-of-day. Specifically, Rate BESH provides for real-time pricing based on the cost of providing electricity in any given hour. With real-time pricing, customers pay the market price for electricity at the time it is consumed, rather than a single, flat rate as under Rate BES. Hence, Rate BESH encourages retail customers to lower their usage during high-cost periods or shift usage to lower-cost periods. The correlation between the market price and consumption tends to result in more efficient use of not only generation but also the transmission and distribution systems.

In order to determine the economic impact of PEV charging on consumers under existing rates, ComEd examined the impact of Level 1 PEV charging (120V, 15-20 amp, 1.9 kW) on a residential customer's existing monthly electric bill over the course of a year. The analysis assumed that the customer used such charging each day for a continuous eight hour charging session during 2009. Chart IV-1, below, reflects graphically the results for a residential customer served under Rate BES or Rate BESH.

Chart IV-1



Under Rate BES, the annual cost paid for electric supply (5,548 kWhs) would have totaled approximately $394 regardless of whether the charging session occurred during the daytime or at night. Under Rate BESH, the annual costs paid would have ranged from a low of approximately $205 for a charging session that commenced at 11

p.m. central prevailing time ("CPT") each evening to a high of approximately $287 for a charging session that commenced at 2 p.m. CPT each day.

Furthermore, a residential customer that restricted its daily charging session to certain hours of the day could also potentially reduce its cost of electric supply further by reducing its Capacity Obligation[50] under Rate BESH. The annual costs paid with a Capacity Obligation of 0 kW would have ranged from a low of approximately $130, for a charging session that commenced at 11 p.m. CPT each evening, to a high of approximately $197 for a charging session that commenced at 5 p.m. CPT each day.

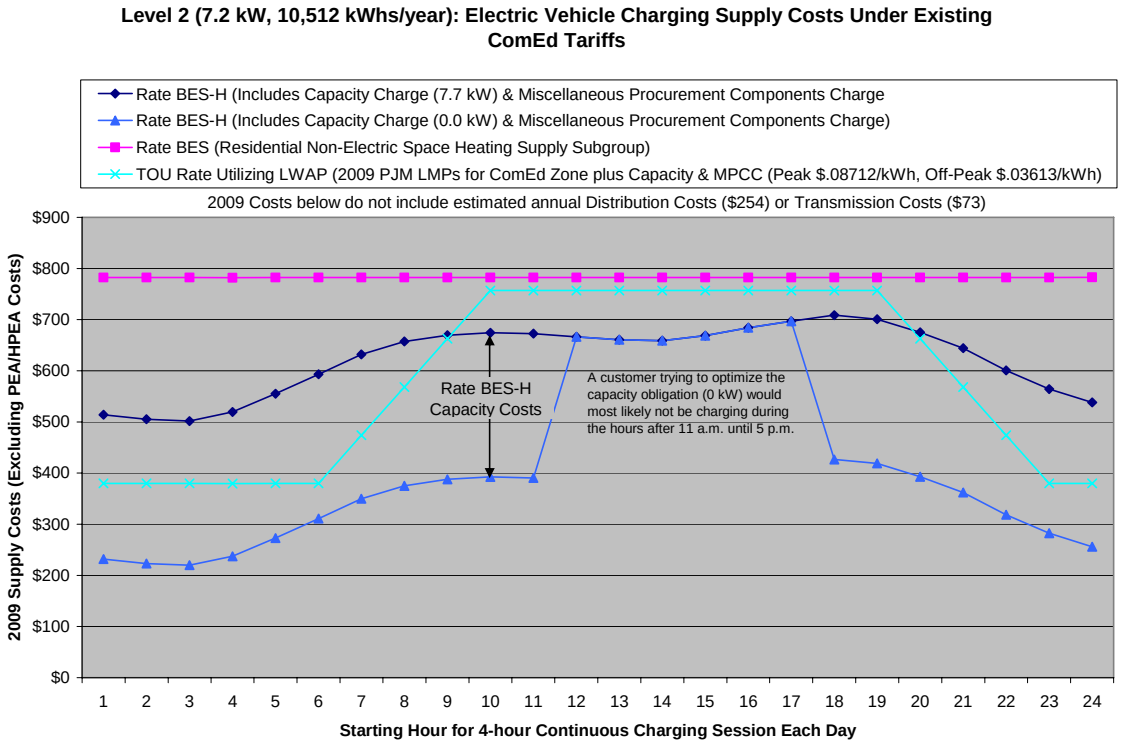
In summary, a residential customer served under Rate BESH in 2009 could potentially have saved an estimated 27% to 67% for the annual cost of electric supply using Level 1 charging as compared with service under Rate BES[51]. Such annual savings under real-time pricing provide an economic incentive to shift PEV charging to non-peak hours of the day.

ComEd also examined the impact of Level 2 PEV Charging (208 - 240V, 30 amps, 7.2 kW) on a residential customer's existing monthly electric bill over the course of a year. The analysis assumed the customer used such charging each day for a continuous four hour charging session during 2009. Chart IV-2, below, reflects graphically the results for a residential customer served under Rate BES or Rate BESH.

[50] Capacity Obligation is based on the customer's demand coinciding with the five highest PJM peak hourly periods each year. These peak periods can not occur on the same day and typically occur during the weekday afternoon of the hottest summer days.

[51] For the twelve-month period ending October 31, 2010, a residential customer served under Rate BESH could potentially have saved an estimated 13% to 66% for the annual cost of electric supply using Level 1 charging as compared with service under Rate BES

Chart IV-2



Under Rate BES, the annual cost paid for electric supply (10,512 kWh) would have totaled approximately $782 regardless of whether the charging session occurred during the daytime or at night. Under Rate BESH, the annual costs paid would have ranged from a low of approximately $502 for a charging session that commenced at 2 a.m. CPT each evening to a high of approximately $709 for a charging session that commenced at 5 p.m. CPT each day.

Furthermore, the annual costs paid with a Capacity Obligation of 0 kW would have ranged from a low of approximately $220, for a charging session that commenced at 2 a.m. CPT each evening, to a high of approximately $426 for a charging session that commenced at 5 p.m. CPT each day. In summary, a residential customer served under Rate BESH in 2009 could potentially have saved an estimated 9% to 72% for the annual

cost paid for electric supply using Level 2 charging as compared with service under Rate BES[52].

Commercial establishments taking service under either Rate BES or Rate BESH may also experience similar savings for PEV charging, and may also gain additional savings by the reduction of the Maximum Kilowatts Delivered[53] ("MKD"). MKD is the basis for the Distribution Facilities Charge ("DFC") under Rate RDS – Retail Delivery Service ("Rate RDS").[54] Specifically, nonresidential customers classified under the Small Load Delivery Class may potentially reap additional savings of approximately $111 or $420 annually by avoiding Level 1 or Level 2 charging, respectively, during weekday hours of 9:00 a.m. through 6:00 p.m.

Unlike certain commercial establishments, residential customers and Watt-Hour Delivery Class customers taking service under Rate BES or Rate BESH will not gain additional savings under Rate RDS since the DFC for residential delivery classes and the Watt-Hour Delivery Class is a volumetric charge based on total kilowatt-hours used during the monthly billing period. Regardless of when a residential customer begins charging each day for either Level 1 or Level 2 charging, the same annual kilowatt-hours of 5,548 kWh and 10,512 kWh, respectively, are consumed.

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[52] For the twelve-month period ending October 31, 2010, a residential customer served under Rate BESH could potentially have saved an estimated -17% to 68% for the annual cost of electric supply using Level 2 charging as compared with service under Rate BES

[53] A retail customer's MKD for a monthly billing period is the highest thirty (30) minute demand for electric power and energy established by the retail customer and delivered by the ComEd during such monthly billing period during the periods from 9:00 A.M. until 6:00 P.M. on Monday through Friday, except on days designated as holidays by the North American Electric Reliability Corporation (NERC).

[54]Residential customers and nonresidential customers classified under the Watt-Hour Delivery Class will not incur any savings under the Distribution Facilities Charge since the charge is a fixed price charge and does not vary seasonally or by time-of-day.

3. TOU Rates

Another common rate structure that could be considered for recovering costs associated with PEV charging is TOU rates. A TOU rate establishes time periods, e.g. peak and off-peak, which corresponds to time period specific rates. A TOU rate is set by first establishing an average customer load profile and then using that load profile to establish the different rates for the different times of the day. The TOU rate is designed to be revenue neutral, in that, for an average load profile, the TOU rate is expected to neither increase nor decrease total electric supply revenue to be collected over the course of the year as compared to the standard flat rate. Therefore, maintaining an accurate load profile and tracking changes in such load profile is necessary to account for surpluses or shortfalls in expected revenue.

Since PEV charging is in its infancy, an average load profile for PEV charging is not available and will evolve as the annual sales and cumulative quantities of PEVs on the road occurs over time. In order to compare a TOU rate with existing ComEd rates, i.e. Rate BES and Rate BESH, ComEd utilized the real-time hourly prices during 2009 to construct a simple average peak-period and off-peak period energy supply price[55] structure for a hypothetical static TOU rate ("TOU rate").

ComEd examined the impact that Level 1 charging would have on a residential customer's existing monthly electric bill over the course of a year under a TOU rate. As in previous Level 1 analyses, ComEd assumed the customer used such charging station each day for a continuous eight-hour charging session during 2009. Chart IV-1, above,

[55] The peak period and off-peak periods correspond to the Retail Peak Period and Retail Off-Peak Period, respectively, as defined in ComEd's General Terms and Conditions.

reflects graphically the results of the residential customer served under a TOU rate versus Rate BES or Rate BESH. Under TOU, the annual cost paid for electric supply would have slightly exceeded annual amounts paid for electric supply under Rate BES during charging sessions that commenced between 9 a.m. through 2 p.m. CPT each day. The annual cost under TOU rate would have been lower than costs under Rate BES for sessions that commenced in all other hours.

On the other hand, TOU potentially provided lower annual electric supply costs as compared to Rate BESH, for a customer with a Capacity Obligation of 1.9 kW, for sessions that commenced between 10 p.m. and 2 a.m. CPT each night.

In summary, a residential customer served under a TOU rate in 2009 could potentially have paid 1.3% more during certain on-peak periods as compared with service under Rate BES but could potentially have saved 2% to 7% during certain off-peak periods as compared with service under Rate BESH, , for electric supply using Level 1 charging. However, a residential customer served under Rate BESH with a Capacity Obligation of 0 kW, could potentially have saved 30% to 49% as compared with service under a TOU rate.

ComEd also examined the impact that Level 2 charging would have on a residential customer's existing monthly electric bill over the course of a year under a TOU rate. As in previous Level 2 analyses, ComEd assumed the customer used such charging station each day for a continuous four-hour charging session during 2009. Chart IV-2, above, reflects graphically the results of the residential customer served under a TOU rate versus Rate BES or Rate BESH. Under TOU, the annual cost paid for electric

supply would have exceeded annual amounts paid for electric supply under Rate BES during charging sessions that commenced between 9 a.m. through 6 p.m. CPT each day.

On the other hand, TOU potentially provided lower annual electric supply costs as compared to Rate BESH, for a customer with a Capacity Obligation of 7.2 kW, for sessions that commenced between 10 p.m. and 5 a.m. CPT each night. Hence, a residential customer served under a TOU rate in 2009 could potentially have saved approximately 3% during certain on-peak periods as compared with service under Rate BES, but could potentially have saved approximately 1% to 36% during certain off-peak periods as compared with service under Rate BESH. Finally, a residential customer served under Rate BESH, with a Capacity Obligation of 0 kW, could potentially have saved approximately 18% to 50% as compared with service under a TOU rate.

4. Summary

As demonstrated, ComEd's Rate BESH does economically encourage retail customers to lower their usage during high-cost periods and shift usage to lower-cost periods therefore potentially providing the opportunity for savings as compared to a fixed rate or a TOU rate. Although a TOU rate can potentially offer savings over a real-time pricing structure during certain off-peak periods, a real-time rate such as ComEd's Rate BESH would be the preferred rate during the early stages of PEV adoption for electric service that includes PEV charging. Depending on the adoption rates of PEVs in the future, ComEd will continue to examine other potential rate structures, including TOU, for electric service for PEV charging.

ComEd's Customer Applications Plan ("CAP") in its AMI Pilot is currently examining customer behaviors associated with demand response, load shifting and

conservation. Several dynamic pricing structures, including Critical Peak Pricing, Peak Time Rebate, Real-time Pricing, TOU, and Increasing Block Rate are being examined in the AMI Pilot and may offer more insight into alternative rates that may be applicable for PEV charging. The results from the CAP evaluation are expected in 2011. ComEd will be examining those results to explore if PEV charging is a potential candidate for some variation of dynamic pricing[56].

Utilities in several states such as California, Michigan, Alabama, and Hawaii are offering specific rates for PEV charging for residential and commercial applications that are primarily a TOU price structure. Such rates are designed for either the entire end-use load at the premises, including the PEV charging infrastructure, or as separately metered premises serving the PEV charging infrastructure.

C. METERING[57]

As previously mentioned, electric utilities are introducing rates which allow different metering arrangements for either residential or commercial applications. Typically, the metering arrangements consist of either a single-meter configuration or a two-meter configuration at a premises. The single-meter approach measures all end-use loads at the premises and does not differentiate usage associated with PEV charging

[56] The implementation of any time differentiated or dynamic pricing rate will require the applicable metering-related facilities, typically an electronic meter in lieu of an electromechanical "watt-hour" meter, pursuant to the provisions of ComEd General Terms and Conditions and other applicable tariffs in ComEd's Schedule of Rates.

[57] This section addresses issue 6 in the Assessment Letter.

infrastructure.[58] A dual-meter approach measures the usage associated with the PEV charging infrastructure separately from all other end-use load at the premises.[59]

The single-meter configuration is currently ComEd's standard approach to serving residential and nonresidential premises and is the preferred approach by ComEd for PEV charging. Although a single-meter approach may be constrained by the amperage rating of the existing service panel at the premises, most residential households would have ample service capacity for Level 1 and possibly Level 2 PEV charging in their home. Requiring a separate meter to measure the usage for a PEV charging station requires that either an additional meter socket to be added or that the existing single socket service equipment at the premises be replaced with dual socket service equipment. Either option may prove more costly to the PEV operator as both require a separate service panel and increase the amperage on the circuit, thereby potentially necessitating the upgrade of utility services to the premises. As the cost causer, the PEV owner would incur the cost for, not only the upgrade to the in-home electric service, but would also be responsible for the cost associated with the installation of additional metering. In addition, separate meters would increase ComEd's maintenance and servicing costs. These costs would be socialized across the entire rate base.

A dual-meter configuration potentially allows a customer to receive electric service under two different rate structures, one for the usage associated with the PEV charging infrastructure and the other for non-PEV charging loads at the residential or

[58] ComEd's former Rate 3 and Rate 14 provided for a single meter for all end-use load at a residential premises including electric water heating and electric space heating, respectively.
[59] ComEd's former Rate 10 and Rider 25 provided for separate metering for electric water heating and electric space heating, respectively, at nonresidential premises.

commercial premises. As previously noted, ComEd's Rate BESH does economically encourage retail customers to lower their usage during high-cost periods and shift usage to lower-cost periods. However, PEV customers may be hesitant to elect such a rate for the non-PEV charging loads at their residence or commercial establishment if they cannot easily shift such loads to lower cost periods.

ComEd's RRTP Program is available to all residential customers. Under the RRTP Program, ComEd provided real-time hourly pricing under Rate BESH to approximately 8,000 residences in ComEd's service territory during 2009. According to ComEd's RRTP Program 2009 Annual Report: "95% of RRTP Participants saved money in 2009 compared to what they would have spent if they had remained on ComEd's fixed-price rate instead of RRTP, assuming the same electricity consumption."[60] The 2009 Annual Report further states: "The average Participant reduced their electric bill by 15% in 2009 compared to what they would have spent if they had remained on ComEd's fixed-price rate instead of RRTP, regardless of how much time the Participant was enrolled in the RRTP Program."[61] The 2009 Annual Report also notes that aside from participant savings in 2009: "The average Participant reduced their electric bill by 12% between 2007 (when the program began) and 2009 compared to what they would have spent if they had remained on ComEd's fixed-price rate instead of RRTP, regardless of how much time the Participant was enrolled in the RRTP Program."[62]

Hence, residential customers have the opportunity to save on Rate BESH as compared with Rate BES for both end-use load as well as PEV charging load, provided

[60] 2009 Annual Report, p. 1. ComEd's RRTP Program Annual Reports for 2007 through 2009 were filed with the ICC under Docket No. 06-0617.
[61] 2009 Annual Report, p. 1.
[62] 2009 Annual Report, p. .

they charge their PEV during certain off-peak hours. Savings may also occur for nonresidential customers provided they too charge their PEV during certain off-peak hours to maximize savings over ComEd's fixed-priced rate, i.e. Rate BES.

VI. Information and Education to Consumers

A. Communication Plan

1. Objective

The objective of ComEd's PEV customer information and education plan is to provide information about PEVs to both residential customers and business customers to help them prepare for PEV adoption and use. This includes providing information for customers concerning how to obtain the necessary utility service, and charging infrastructure needed for in-home/business vehicle charging.

2. Strategy

Based on the PEV adoption forecasts, the initial number of PEVs that are expected to be manufactured and purchased in the first few years is limited. A broader audience may be interested in general information concerning PEVs and ComEd's role; however, only a limited audience will be interested in the detailed issues regarding PEV charging and home preparation. Due to the limited purchasing audience in the near term, specific and detailed charging and home preparation information will be posted and/or delivered to customers that have already engaged in a dialogue with ComEd, such as the ComEd.com web page or via e-mail.

ComEd will offer accurate, unbiased information for customers with respect to PEVs.

3. Plan Details

The plan will be carried out in two phases. Phase one will include all communication that takes place prior to PEVs arriving in Illinois. Phase two will begin two months before appreciable quantities of PEVs actually arrive in Illinois and will continue through the end of 2011. It is currently assumed that PEVs from major manufacturers, such as GM and Nissan, will become available in Illinois in the latter part of 2011.

During Phase I, ComEd will focus on providing general information about and the benefits and considerations of PEV ownership. The information will be targeted at residential and business customers thinking about purchasing a PEV. Such information may include: PEV availability; PEV charging levels and the in-home/business electrical infrastructure required to support them; informing customers of the need to contact ComEd when deploying Level 2 or above charging; and links to applications showing available public charging stations.

During Phase II, the information that ComEd intends to provide will become more specific. The information will focus on public charging locations, how to prepare for purchasing a PEV, what you need to know once you've purchased a PEV, and available rates to help lower electric costs by charging at night. The messaging will be separated by audience, i.e. residential, business customers or municipalities/governments.

The need to separate messages by audience is largely due to the difference in how the PEVs will be used by, and the different charging needs for, each audience.

VII. Conclusion

ComEd appreciates the opportunity to contribute to the Commission's Initiative on Plug-In Electric Vehicles and hopes that the information provided in this Initial Assessment is of assistance to the Commission. ComEd looks forward to working with the Commission in the upcoming public meetings and workshops.

VIII. Appendices

Appendix A – Assessment Letter Matrix

Appendix B – ComEd's System-Wide Fuel Profile

Appendix C – Upcoming Vehicle Introductions

Appendix A

Assessment Letter Matrix

Issue 1 – Section III(B)(2) & (3)

Issue 2 – Section III(A)

Issue 3 – Section IV(A)

Issue 4 – Sections V(B)

Issue 5 – Section IV(B)

Issue 6 – Section V(C)

Issue 7 – Sections III(B)(1)

Issue 8 – Section III(B)(2)

Issue 9 – Appendix B

Issue 10 – Section IV(C)

Issue 11 – Referenced in footnotes throughout document

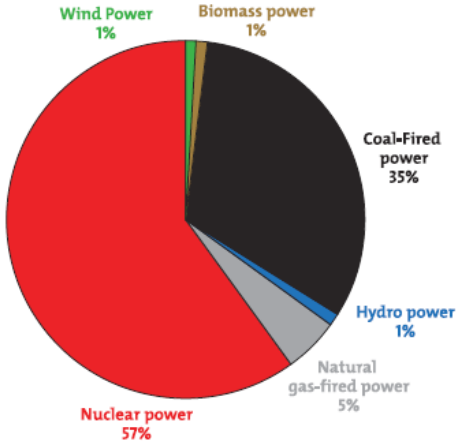
Appendix B: ComEd's System-Wide Fuel Profile

ComEd's Environmental Disclosure Statement

The disclosure of this information is required under Section 16-127 of the Electric Service Customer Choice and Rate Relief Law of 1997 and the rules of the Illinois Commerce Commission, 83 Ill Admn. Code 421.

Sources of Electricity Supplied for the 12 months ending June 30, 2010	Percentage of Total
Biomass power	1%
Coal-fired power	35%
Hydro power	1%
Natural gas-fired power	5%
Nuclear power	57%
Oil-fired power	0%
Solar power	0%
Wind power	1%
Other resources	0%
Unknown resources purchased from other companies	0%
TOTAL	100%

Sources of Electricity Supplied for the 12 months ending June 30, 2010



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AVERAGE AMOUNTS OF EMISSIONS[2] and AMOUNT OF NUCLEAR WASTE[3] per 1000 kilowatt-hours (kWh) PRODUCED FROM KNOWN SOURCES for the 12 months ending June 30, 2010	
Carbon dioxide	776.24 lbs.
Nitrogen oxides	1.18 lbs.
Sulfur dioxide	3.84 lbs.
High level nuclear waste	0.006 lbs
Low level nuclear waste	0.0004 cubic feet

[1] These figures constitute the aggregation of information provided by ComEd's wholesale energy suppliers, many of whom have indicated that their source is the "PJM system mix." The PJM system mix is the collective generation produced within the PJM Interconnection, which is the regional transmission organization that maintains the safety, reliability, and security of the transmission system and operates an efficient and effective wholesale electric market in 13 states and the District of Columbia. ComEd's electric service territory is within the PJM footprint.

[2] The source for the baseline emissions data for the portion of the emissions that are associated with PJM system mix is PJM Environmental Information Services, Inc., (www.pjm-eis.com) For energy that is sourced from the PJM system mix, emissions rates are calculated using the most current emissions data from the Quarterly PJM System Mix by Fuel Reports. These reports exclude the effects of energy imports, exports, external generation and behind-the-meter generation. Those quarterly reports also exclude the effects of any claims on any specific component(s) of the mix.

[3] Nuclear Waste rates were calculated based on Generation Net for Sale.

Additional information on companies selling electrical power in Illinois may be found at the Illinois Commerce Commission's World Wide Web site www.icc.state.il.us.

Appendix C: Upcoming Vehicle Introductions

Battery Electric Vehicles:

2010 Coda Automotive Sedan
2010 Mitsubishi i-MiEV BEV
2010 Nissan LEAF
2010 Ford Battery Electric Van
2010 Tesla Roadster Sport EV
2011 Peugeot Urban EV*
2011 Renault Kangoo Z.E.
2011 Renault Fluence Z.E.
2011 Tesla Model S
2011 BYD e6 Electric Vehicle
2011 Ford Focus
2011 Opel Ampera Extended Range BEV*
2012 Fiat 500 minicar
2012 Renault City Car*
2012 Renault Urban EV*
2012 Audi e-tron
2013 Volkswagen E-Up*
2016 Tesla EV

Extended Range Electric Vehicles:

2010 Chevy Volt Extended Range EV

Plug-in Hybrid Electric Vehicles:

2010 Fisker Karma S Plug-in Hybrid
2010 Toyota Plug-in Hybrid
2011 BYD F3DM Plug-in Hybrid
2012 Toyota Prius Plug-in Hybrid
2012 Bright Automotive IDEA Plug-in Hybrid
2012 Ford Escape Plug-in Hybrid
2012 Volvo V70 Plug-in Hybrid*
2013 BMW Vision

NISSAN LEAF

GM VOLT

MITSUBISHI i-MiEV