September 21, 2018

VIA ELECTRONIC FILING

Hon. Kathleen H. Burgess  
Secretary to the Commission  
New York State Public Service Commission  
Three Empire Plaza  
Albany, New York 12223-1350

Re: Case No. 18-E-0138: Proceeding on Motion of the Commission Regarding Electric Vehicle Supply Equipment and Infrastructure

Dear Secretary Burgess:

Advanced Energy Economy Institute (AEE Institute) is pleased to submit these comments in response to the August 16, 2018 request of the Public Service Commission ("PSC" or "Commission") for comments on topics raised at the July 2018 conference on plug-in electric vehicles (PEVs) and electric vehicle supply equipment (EVSE) and infrastructure. AEE Institute applauds the PSC’s engagement on these issues.

AEE Institute has long supported policies and processes that advance the deployment of the best available technologies for meeting the energy needs of today and tomorrow. In the transportation sector, we believe that PEVs offer substantial value to the citizens of New York, including broad-based cost savings for ratepayers, enhanced consumer choice amongst transportation options, better economic competitiveness as human transportation transforms, improved security from reduced dependence on imports of conventional fuels, and improved air quality. At the same time, PEVs provide drivers with substantial performance improvements over conventional vehicles. The improvements range from the financial – lower fuel and maintenance costs mean that the total cost of ownership for an electric vehicle is lower than that of a comparable internal combustion engine (ICE) vehicle – to the driving experience – PEVs offer a smoother and quieter ride with instant torque allowing the vehicles to accelerate faster.

New York has long recognized the benefits that PEVs can provide to New Yorkers and society at large, and over time has pursued a series of initiatives that call for and are designed to encourage substantial deployment of PEVs in the state. Two efforts stand out in terms of establishing the scale of the state’s PEV ambitions. New York adopted California’s vehicle emission standards in the early 1990s, which include zero-emission vehicle (ZEV) sales quotas that by the end of the year 2025 will require approximately 800,000 light-duty EVs operating in the state. The commitment extends beyond the light-duty sector as

well – in 2018, NYC Transit committed to converting all of its 5,700 buses to electric models by 2040.\textsuperscript{5} Meanwhile, the 2015 State Energy Plan set a goal of reducing the state’s greenhouse gas (GHG) emissions 40 percent by 2030 relative to 1990 levels, and over time, Executive Orders have expanded this to an 80 percent reduction in GHG emissions by 2050 relative to 1990.\textsuperscript{6} Given that the transportation sector is the state’s largest emitter– responsible for roughly a third of New York’s GHG emissions - and is one of the few sectors with rising emissions,\textsuperscript{7} the 2017 progress report on the 2015 State Energy Plan noted that, “[t]he state’s climate goals cannot be achieved without a rapid transition to vehicles powered by electricity”.\textsuperscript{8}

Since many of New York’s ambitious PEV goals have been in place for some time, the question is how the state is progressing towards them. There is some good news in that 2017 PEV sales of a little over 10,000 units was 67 percent higher than 2016.\textsuperscript{9} Nevertheless, in aggregate, it is quite clear that the state is not on track to meet its targets. At the end of 2017, the state had sold a little over 30,000 PEVs,\textsuperscript{10} which is a long way from the target of 800,000 light-duty vehicles by 2025.

In New York, a large part of the challenge in accelerating the market to a pace that will hit the state’s targets is the need for better and more widespread PEV charging infrastructure, yet current metrics indicate that New York is struggling with charging infrastructure. The state ranks 30th amongst U.S. states in charging stations per capita\textsuperscript{11} and was rated poorly by the International Council of Clean Transportation on availability of urban charging stations.\textsuperscript{12} Consumer surveys make it clear that a shortage of charging infrastructure significantly impacts consumer decision-making regarding potential PEV purchases. A recent report corroborates other research, finding that among individuals who are aware of PEVs, 85% cited a lack of charging infrastructure as a reason they are not buying the vehicles.\textsuperscript{13} Governor Cuomo reflected the significance of the infrastructure challenge in New York when he established a charging infrastructure target (10,000 PEV chargers by 2021) for the first time in his 2018 State of the State address.\textsuperscript{14}

It is with that context, and the recognition that there are a number of regulatory considerations with important implications for EVSE and infrastructure, that we filed a letter on March 19, 2018 supporting a petition that had been filed requesting that the PSC open a separate proceeding to address those PEV considerations. As such, we commend the PSC for opening the proceeding, hosting the technical conference, and soliciting comments. Our responses to the specific questions in the solicitation are provided below.

Please do not hesitate to reach out to our team if you have any questions or need additional information.

Respectfully Submitted,

Matt Stanberry, Vice President

\textsuperscript{7} New York State Greenhouse Gas Inventory: 1990-2014. Final Report. 2015
\textsuperscript{11} AEE analysis based on data provided by Alternative Fuels Data Center and US Census Bureau.
1. What role should the utility play in supporting Electric Vehicle Supply Equipment (EVSE) deployment? Please address this question from the perspective of utility ratepayers, Electric Vehicle (EV) suppliers, and providers of EVSE. How should utility investment costs, if any, be compensated or recovered? Should utilities have the opportunity for earnings adjustment mechanisms related to successful EVSE deployment?

**UTILITY ROLE**

One particularly important issue that regulators will need to consider is the role that utilities have to play as it relates to EVSE deployment, including how the capabilities of utilities can be leveraged to facilitate market development and PEV adoption. There are five potential roles for the utility covering the range of possibilities: 15

1. Utility as **Facilitator**: The utility treats PEV charging like any other potential load, providing nondiscriminatory electric service when and where requested, but not engaging directly in the business of vehicle charging.

2. Utility as **Enabler**: The utility deploys additional infrastructure up to the point of connection to the EVSE to proactively build out capacity in key areas to enable project development – also called the “make-ready” option – but does not take a direct role in installing, owning or operating the EVSE.

3. Utility as **Manager**: In addition to delivering electric service to the location of the vehicle charger, the utility manages the charging operation to better integrate charging with grid capabilities and grid needs.

4. Utility as **Provider**: (includes Manager role): The utility delivers electric service to the charging equipment, which the utility owns and is able to earn a return on, and the utility provides charging services. 16

5. Utility as **Exclusive Provider**: (includes Manager role): Vendors other than the utility are prohibited from reselling electricity to the public, which could be inclusive of charging service, effectively extending the utility monopoly functions to PEV charging and EVSE deployment.

With the exception of the Exclusive Provider role, all options should be on the table at the present time. At this relatively early stage of PEV market development in New York, all capital resources should be brought to bear, including but not limited to: private capital, utility investment, automaker and other partner direct support, public funds, and other sources of funding (e.g., Volkswagen settlement money via the Environmental Mitigation Trust). This approach will accelerate the deployment of charging infrastructure, in turn spurring PEV adoption, and improving the utilization of the aforementioned grid infrastructure. As such, both utilities and third-party charging infrastructure companies have critical roles to play in the deployment of EVSE. Third parties should be able to develop, own, and operate charging facilities. Utilities should likewise take an active role – up to and including ownership and operation of PEV charging.

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15 These are adapted from the paper, Electric Vehicles as Distributed Energy Resources, https://www.rmi.org/insights/reports/electric-vehicles-distributed-energy-resources/

16 Utilities can also facilitate EVSE on customer premises via alternative payment methods such as on-bill financing, http://my.cleanenergyroadmap.com/ViewRoadmapGoal/207
infrastructure – under appropriate rules when there is a failure of the marketplace to provide sufficient services, as is seen in today’s PEV charging infrastructure market. In particular, as of 2018, it is difficult for non-utility companies to make a business case for developing, owning and operating public EVSE under many circumstances, such as in low PEV penetration markets, owing mainly to relatively low EVSE utilization rates and challenges in certain aspects of the private market business case. Currently, the market by itself cannot deploy sufficient charging infrastructure for all customer classes, uses, and geographies. This in turn slows PEV adoption and the broad public benefits that it can provide.

The goals of the PSC should be to eliminate underlying market barriers to facilitate the development of an expanded competitive market while simultaneously ensuring service provision in areas that are outside the reach of the competitive market. Third-party EVSE ownership and operation harnesses the power of the competitive market in a way that ultimately benefits consumers, while allowing for utility participation under appropriate market rules ensures that sufficient infrastructure will be deployed, particularly in the near term, to support market growth across all customer classes, uses, and geographies.

The PSC should foster an environment that allows for diverse stakeholder input into proposals for EVSE deployment, and the PSC should encourage utilities and third parties to propose various solutions that include both private capital and utility capital. This way, multiple types of stakeholders, both public and private, can work with utilities to deploy EVSE, and different business models can be tested and refined.

In some cases, it may make sense for the utility to act as the Enabler and build out the infrastructure up to the EVSE (so-called "make-ready" investments) to facilitate the efforts of third-party EVSE companies. It should be noted that utility ownership of make-ready infrastructure can address some market challenges and can significantly reduce upfront costs for parties wishing to construct EVSE. In other cases, including some public DCFC and multi-unit dwelling deployments, it may make sense for the utility to act as a Provider. For example, in California the utility commission recently ruled that the state’s three major investor-owned utilities should be permitted to own EVSE on a case-by-case basis. In these cases, utility ownership and management can help in ensuring equitable access to PEVs and that the full range of benefits discussed above accrue back to the grid and to all ratepayers.

Even in cases where the utility is only acting as Facilitator, utilities need to carefully plan for any major changes in the grid. Thus, regardless of ownership structure, the PSC and EVSE providers should work closely with utilities on deployment to maximize the benefits that PEVs can provide to the grid and to ensure successful integration of the additional loads from PEV charging. This might include, but is not

17 California Public Utilities Commission Application A1502009, Decision D1612065 and Application A1404014, Decision 1601045
limited to, identifying preferred sites for EVSE to be located, including where there is a specific market need, such as for low-income customers, fleet owners, and rideshare drivers.

**UTILITY INVESTMENT COMPENSATION**

When considering how to support EVSE deployment, the PSC has a few options. Given the foregoing discussion on the rationale for utility ownership of EVSE or make-ready investments, if the PSC does permit such ownership, they need to further consider how to handle cost recovery of those investments.

1. One option, which is preferable given the foregoing discussion, is to allocate costs associated with EVSE, along with any additional grid investments, to customers within existing rate classes, consistent with the rationale that PEV deployment ultimately provides benefits to all customers, not just those with PEVs. This approach would also be consistent with the policy objective of accelerating PEV adoption and raising charging infrastructure utilization by lowering the cost hurdles associated with early EVSE deployment.

2. Another option is to allocate some of those costs more directly to EVSE users, via the rates charged for use of the EVSE. Such an allocation could be based on a sufficiently detailed benefit-cost analysis (BCA) that seeks to quantify the benefits to EVSE users, all utility customers, and society as a whole, provided that the BCA process does not slow down deployment.

3. A third option would be to recover most or all of the incremental investments from EVSE users only. An example of this is Xcel Minnesota’s PEV pilot, where Xcel is providing turn-key PEV charging (EVSE, installation, operation and maintenance) to residential customers for a monthly fee that covers the full cost, amortized over the life of the EVSE. The chief risk with this option is that it likely negates the primary benefit of utility participation, as it will mean much higher costs for charging, absent other incentives.

Whatever option is chosen, the PSC should revisit this issue periodically to see if conditions warrant a change in approach – while avoiding retroactive decisions that may negatively impact earlier investments. Note that utility participation that involves including EVSE costs in the rate base could take various forms, including direct ownership or utilities providing incentives to third parties.

Regarding the opportunity of using Earnings Adjustment Mechanisms (EAMs), we note first that AEE Institute has been broadly supportive of using EAMs to create appropriate incentives for utilities to focus on achieving desired outcomes consistent with New York State policy and customer benefits. We supported the development of EAMs regarding beneficial electrification in the last National Grid rate case, which established EAMs for achieving PEV deployment above a specific baseline. Building on this experience, we

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would support further exploration of the use of EAMs to achieve desired outcomes with respect to PEVs.
We do note that the metrics and associated financial incentives should be tied to outcomes (e.g., PEV
deployment and use) and not inputs (e.g., number of charging stations deployed).

2. What are the most significant changes the Commission can make in order to enhance the utilities’
roles in supporting EVSE deployment? What are the benefits and problems with utility ownership
of EVSE?

As discussed above in our response to Question 1, several different roles for the utility can be considered
by the PSC. Regardless of the specific determination by the PSC, it is critical that the PSC make this
determination early on, so that all stakeholders understand the “rules of the road”. By clearly identifying
parameters under which utilities can provide PEV charging services to their customers, the PSC will
promote fair competition, and enable all stakeholders to move ahead with implementing their business
plans.

With that said, the Commission can also consider establishing financial incentives for the utilities to achieve
the targeted outcomes. The Commission already has similar experience with its approach to non-wires
solutions, and is gradually establishing and refining performance incentives for a range of desired
outcomes via the Earnings Adjustment Mechanisms (EAMs).

3. What role should the utility play in encouraging EV adoption? Should the role of the utility
extend beyond customer education and awareness? Please address this question from the
perspective of utility ratepayers, EV suppliers, and providers of EVSE. How should utility costs, if
any, be compensated or recovered?

Beyond what we have provided in our responses to Questions 1 and 2 above, we focus here on the role of
the utility with respect to market transparency, PEV awareness and empowering consumers to choose
PEVs on their merits, which can help accelerate PEV deployment, bring the benefits associated with PEVs
forward in time, and create a self-sustaining market for PEVs.

Market data indicates that one of the biggest barriers to PEV adoption is lack of consumer awareness
related to PEVs. Despite the fact that 91% of survey respondents believe it is important to buy a car that is
inexpensive to operate (i.e., the car has low fuel costs), and over 60% think it is important to buy a car that
has zero emissions or is eco-friendly,20 a recent report found that 60% of survey respondents were
unaware of the existence of PEVs.21 In other words, when these individuals consider vehicle purchases,
they do not even consider PEVs despite desiring the attributes provided by PEVs. Even in California, which

20 https://blog.enervee.com/revving-up-the-ev-market-8c90d21610f0
out-electric-vehicle-adoption/, https://electrek.co/2017/01/03/electric-vehicle-adoption-awareness/
has the largest PEV market in the country, the vast majority of car buyers are still unable to name a single PEV model.\textsuperscript{22} There are a number of reasons for the lack of consumer awareness, including the relatively brief time that these vehicles have been available in the mass market, a shortage of automobile manufacturer marketing, unavailability of PEV models in specific markets, and a lack of market transparency in terms of the relative operational efficiency and emissions of vehicles across fuel and engine types.

Given the challenges, the PSC should recognize that much of the evolution of transportation will depend on the choices of consumers and that consumers respond to better information when it is presented simply and clearly by an objective and trusted source. Some market data suggests that when consumers are armed with a simple and credible way to choose vehicle models that are zero-emission, inexpensive to operate, and do not cost more to purchase, 84\% would be likely (45\% extremely likely) to opt for an electric over an ICE car model.\textsuperscript{23}

Utilities are uniquely placed to provide information on the complex web of considerations that come into play with respect to PEVs. Consumers need not only to understand the PEV options available in the auto market, but also need information about:

- Charging options available for buyers, information on electrical installation options in residential situations, and listings of qualified EVSE installation contractors
- Public charging station locations,
- PEV-specific rate options and demand response programs,
- Financial incentives,
- PEV benefits, and
- Rooftop and community solar options for renewable charging.

In the interest of accelerating PEV adoption and EVSE utilization, the PSC should look for ways to improve access to information and make it as easy as possible for individuals to research and purchase EVSEs and PEVs. One specific step for the PSC to consider is leveraging the relationships that utilities have with their customers by encouraging utilities to improve market transparency and develop data-driven customer engagement programs that leverage behavioral insights, as has been done with utility energy efficiency programs. National Grid Cars\textsuperscript{24} and the comprehensive suite of decision aids offered by Consolidated

\textsuperscript{22} https://www.greentechmedia.com/articles/read/consumers-lack-ev-awareness-even-in-the-nations-largest-market#gs.xknMVp8
\textsuperscript{23} https://blog.enervee.com/revving-up-the-ev-market-8c90d21610f0
Edison\(^\text{25}\) are examples of new consumer-centric technology innovations to meet this need, and other utilities should be encouraged to do the same.

Given the important implications of PEV rate designs for PEV adoption, utility customer education programs should include a significant emphasis on helping customers understand the different pricing schemes for charging and the PEV charging products and services available to help customers respond. Under short dwell-time scenarios, such as shopping center parking lot charging, customers need to understand the benefits of adjusting behavior in response to dynamic rates. In long dwell-time scenarios however, such as in overnight garages, customers generally do not need to change their behavior at all. They just need a smart, networked charger programmed to their particular needs and preferences that will respond to TOU or hourly price signals.

With respect to cost recovery for utility efforts to accelerate PEV adoption and EVSE utilization, we propose that the PSC rely to the extent possible on existing mechanisms, possibly modeled after cost recovery for EE programs to the extent that the expenditures types are similar. If these efforts are successful at driving PEV adoption, the utilities would benefit from EAM achievement (e.g., DER Integration EAM, Emissions EAM), and could also earn a return on prepaid platform license fees, if utility efforts include the use of third-party services that qualify for this type of regulatory treatment. The PSC can also use the already-approved National Grid\(^\text{26}\) and Consolidated Edison\(^\text{27}\) PEV education programs as models.

With the advent of more rapid charging, there may be a need for distribution system investment not anticipated during the previous rate case, but that cannot wait until the next rate case. To the extent that existing cost-recovery mechanisms for such types of investments are insufficient, the Commission could consider additional options to apply between rate cases for the specific spending to support PEV charging. In exchange for timely reflection of this in rates, the utility should demonstrate an optimized planning approach that includes all options for providing the necessary capital including all forms of non-wires alternatives.

4. **What is the best way for utilities, charging station providers, and site hosts to work together to locate charging stations where they best meet electric system, customer, and community needs? What data is needed to further this collaboration?**

We believe that the DSIP filings and associated stakeholder engagement processes can serve as an appropriate venue for addressing siting of EVSE, including but not limited to, identifying where public PEV


\(^{27}\)https://www.greentechmedia.com/articles/read/new-york-utilities-want-to-help-you-buy-an-electric-car#gs.fMmP2rM
infrastructure is needed to animate the market and how to optimize siting to most benefit the grid.

Another potential venue is state-level planning by the appropriate New York state agency, an approach adopted by California in recent legislation.\textsuperscript{28}

It is important to note that load forecasting is a key element that underpins a utility's investment plans. Forecasts should include granular projections of PEV potential and expected customer adoption on different parts of the system, and the resulting effects on load, including the effect on system-wide peak and distribution system peaks, especially when PEVs are clustered. To inform load forecasting, the PSC should take into consideration broad stakeholder input for setting scenario and forecast assumptions. For example, utilities may not have full, up-to-date information on PEV goals for transit agencies or large commercial and industrial customers in their service territory, which may significantly impact their forecasts. Stakeholder input may also help with development of the macroeconomic and other broad assumptions that help define different scenarios and with understanding how PEV customers' load shapes may differ from those of non-PEV customers. The PSC can also help ensure that assumptions are shared between different planning activities and planning bodies, within the utility and beyond, thus improving results.

5. Are there any communities or customer groups that require special consideration in the placement of EVSE facilities? What role should the utility play in encouraging or facilitating increased EV usage by low- to moderate-income households?

As the PEV market unfolds, particular attention should be given to low-income and vulnerable populations. The PSC should look to ensure that these communities can access the benefits that PEVs can provide and to mitigate any impacts for these households of rate design changes and the use of the rate base to finance EVSE buildout.

PEVs offer these communities some particular potential benefits – for example, low-income and disadvantaged communities on average have disproportionally worse air quality than other communities, so the transition to PEVs could provide an outsized impact.\textsuperscript{29} However, these populations also face specific challenges utilizing PEVs. For example, low-income communities have a higher proportion of residents in apartments and other multi-unit dwellings, where the provision of PEV charging is a bigger challenge and will rely more heavily on public charging for PEVs. New York City in particular has a very high proportion of customers living in multi-unit dwellings and customers that lack access to dedicated parking facilities.

Given the current economics of PEV charging – with a significant up-front investment that must be

\textsuperscript{28} Assembly Bill No. 2127. http://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB2127

\textsuperscript{29} https://ajph.aphapublications.org/doi/abs/10.2105/AJPH.2017.304297
amortized over up to 10 years – it can be unappealing for landlords and, thus, a situation where low-cost, patient utility capital can help.

Even for residents of single-family homes, older homes and buildings in low-income communities may have inadequate electrical service capacity to support vehicle charging loads, requiring infrastructure investments to enable charging. Given the challenges, regulators should consider PEV programs that focus on alleviating specific problems (e.g., public charging initiatives, multi-unit dwelling projects) and achieving equity in access. Here again, low-cost, patient utility capital could help.

When it comes to protecting these communities from rate and any other cost impacts, the PSC can build a foundation by focusing on rate designs that support smart charging behavior to smooth demand and improve asset utilization. Smart planning and energy efficiency programs can further reduce new capacity needs and efficiency programs can ensure that existing loads are cost-effectively minimized in conjunction with the addition of PEV loads to homes and businesses. Finally, the PSC can apply approaches used for other programs to protect these communities, including low and moderate income (LMI) discounts and special programs for energy efficiency.

6. What rules, requirements, and standards are needed to enable EVs and EVSE to operate as a source of grid services and system value, including possible data and instrumentation needs?

At the outset, it is important to clarify that PEVs are the source of grid service and system value, and that EVSE are enabling technology. EVSE are not paid to provide flexibility; PEV owners are paid to provide that flexibility. Managed, or “smart”, EVSE enable remote monitoring and control and automated response to price signals that will further enable PEVs to act as grid assets.

To get the most out of PEVs as a resource, make the customer experience as seamless as possible, ensure equitable access to charging infrastructure that is funded with public money, prevent technological obsolescence and the stranding of assets, and ensure the reliability of the grid, the PSC should address interoperability issues. One way in which the PSC can help prevent technological obsolescence is by requiring utilities to adopt industry interoperability standards for their investments in publicly-funded, publicly available EVSE equipment. Just as fleet operators see standards as critical for making investments in private EVSE equipment at scale across different utility service territories, states or even across international borders, so too should regulators when it comes to publicly-funded, publicly available EVSE equipment. Since the PSC oversees the prudency of utility investments, it has an important role in ensuring that utility investments in PEV charging infrastructure meet industry standards, as is normal practice in other areas of investment. For example, the open charge point protocol (OCPP) is a standard protocol for
communication between an EVSE and a charging station network, and OpenADR is a standard protocol for sending demand response signals.

There are several elements of interoperability standards when it comes to PEVs and EVSE, but they generally fall into three categories: the physical connection between the EVSE and vehicle, payment systems, and data and communications protocols. Charging networks that have been deployed to date with public funds have too often lacked true payment system interoperability. For example, some require customers using a network to have a membership in a private network in order to pay for charging their vehicle. The resulting balkanized system makes it difficult for drivers to move from a charging station in one network to a station in another network. Requiring that payment systems for publicly-funded EVSE have standardized options, at the minimum having the ability to use credit cards via a card reader or telephone option, will ensure that no PEV driver has the experience of pulling up to a station that is publicly-funded only to find themselves unable to charge their vehicle.

Interoperability of data and communications protocols take shape through the use of open standards, such as OCPP. These open standards for data communications ensure that publicly-funded, publicly available charging equipment from different vendors can communicate under the same software network and that this network can be expanded at any point using any hardware that also adheres to open standards. Likewise, a network owner/operator of a public network could also elect to switch to a different network provider. At the same time, it reduces the risk for the investors in public networks in the event that a vendor or charging provider goes out of business in the future because it allows for other vendors or charging providers to take over the network and add new charging equipment, knowing that all the units on the system can still communicate. Together, these features help prevent the very real risk of vendor lock-in and subsequent stranded assets, and can help protect ratepayers from stranded assets/investments.

Beyond interoperability standards, there is a strong need for utilities to make customer usage data available, to allow for personalization of products and services offered to PEV users. Customer-authorized third-party access to customer data, including information on charging behaviors, will allow for better service and a wider array of products offered to PEV consumers. As already directed by the Commission, utilities should move forward with the Green Button platform to provide customers the option to authorize third parties to access their consumption and billing data, including the data that will emanate from PEV usage. At the same time, utilities need appropriate levels of data access, including data on non-utility-owned charging station availability and type, to inform planning and operations.
Data is critical for both customer engagement and system design and operations to maximize the benefits of PEVs. Nevertheless, data should be shared in a way that ensures that sensitive system information, company trade secrets or individual customer personal identifiable information are protected.\textsuperscript{30} The PSC has already addressed data access issues in other proceedings, including in REV and the Consolidated Edison proceeding on AMI\textsuperscript{31}, and it can draw upon the record and decisions in those cases to develop more seamless data access policies that also include EVSE and PEVs.

7. What are the barriers to treating EVs and EVSE as Distributed Energy Resources (DERs)? How does rate design affect the ability of EVs and EVSE to provide this value? How does rate design affect the extent to which the value provided by EVs and EVSE (including environmental and economic benefits) is compensated?

8. Should EVs and EVSE be treated as DERs? If so, what factors need to be addressed to include EVs and EVSE within the DER market and compensation structure for DERs?

Given the similarities between Questions 7 and 8, we have provided here a single set of responses. As another general matter, we again note that PEVs are DERs that provide flexibility via their energy storage capability. EVSE are not DERs and are merely the connection to the grid and devices to manage a DER.

We do support the treatment of PEVs as DERs, noting that there are some unique considerations that may be specific to them. PEVs are different than other DERs in that they are mobile resources. Also, at this time, PEVs are not quite ready to serve as sources of energy and services comparable to stationary energy storage that are designed to readily discharge energy, as well as charge. Nevertheless, over time, PEVs and EVSE will present the electric grid with a new and powerful DER. In order to integrate PEV loads into the system in a way that maximizes their benefits, reduces any impacts on the grid, and supports their potential future use as a resource, it is necessary to adequately prepare the grid by investing in advanced technology solutions. Investments that can help to manage and integrate these and other distributed assets include but are not limited to: advanced metering infrastructure (AMI) needed for time-varying rates, advanced and expanded supervisory control and data acquisition (SCADA) systems and sensors, advanced distribution management systems (ADMS), advanced communications systems, smarter and more automated distributed energy resource (DER) monitoring and dispatch systems (i.e., DER management systems or DERMS), and advanced and expanded asset management and predictive analytics tools. Through these technologies, PEVs can be used either directly or indirectly (i.e., incenting charging behavior) as a flexible load to reduce demand when needed or build load to use excess generating capacity.

\textsuperscript{30} For more details on a recommended data access framework see our Issue Brief on Access to Data, available at http://info.aee.net/21ces-issue-briefs
(e.g., times of peak renewable generation). This not only improves the operational flexibility and utilization of the grid, but it also improves the utilization of vehicles themselves.

As PEVs grow in number, utility and grid operators will have tools for managing the incremental demand from vehicle charging. One of the foundational ways this can be accomplished is by encouraging smart charging behavior. Smart chargers, which include capabilities for remote communications and sub-metering of PEV charging consumption, facilitate this behavior. In its simplest form, smart charging involves incenting PEV owners to control when vehicles charge their batteries, either to reduce load during peak times or to add load during times of excess energy generation.

With smart charging, analyses have shown that PEVs can reduce their electricity use by between 65% and 95% during demand response events without impacting mobility, indicating that PEV load can be highly flexible. In the future, the batteries in PEVs may also be used as dispatchable energy storage to optimize grid operations. As the size of the PEV fleet grows, the ability to aggregate and manage PEVs in a coordinated fashion has the potential to amplify these benefits. For example, as of 2017, eMotorWerks – a charging system operator – estimated that California’s PEV market translates to 4 GWh of dispatchable energy storage resources or about 700 MW of peak-shifting load.

With respect to rate design, PEV owners will be faced with similar issues as other DER customers, in that rate designs can either encourage or discourage PEV usage in a way that provides benefits to those customers and to the grid as whole, or for that matter encourage or discourage PEV adoption altogether. Although we discuss rate design issues in more detail in our response to Question 9 below, we note here that rate design (or more generally electricity pricing) is one of two key ways utilities can influence/affect PEV charging behavior. The other is the establishment of new, or expansion of existing, load management programs, such as demand response programs, to include PEVs.

AEE Institute has been an active participant in the Value of DER proceeding (15-E-0751), and has supported the efforts of the PSC to establish well-designed successor tariffs to net energy metering, and to work towards making tariffs that apply to DER customers that are more technology neutral and that move towards more precise valuation and compensation of DER based on the value it provides. That proceeding has demonstrated how challenging a task it can be to undertake such a process while maintaining market growth. Thus, the same principles that have been developed and applied in the Value of DER proceeding, including that of gradualism, should be applied to PEVs.

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32 http://papers.sae.org/2015-01-0304/
9. What considerations should be taken into account in designing rates for charging stations? For example, should a typical three-part tariff (customer, demand and energy charge) be applied? Should the rate design be different for residential versus commercial use? Should the rate design be expected to change over time as EV penetration increases? Should time-of-use rates be required for EV charging? Should utility residential EV charging tariffs (filed in Case 180206) be modified? Please address these questions from the perspective of utility ratepayers, EV owners, and EVSE suppliers.

The greatest benefits from PEV deployment will be achieved if charging is done in such a way as to minimize the need for building additional infrastructure, including generation, transmission, and distribution. It is important that utilities implement well-designed rates for PEV charging before adoption is too high because studies have shown that consumers are creatures of habit. San Diego Gas & Electric conducted a multi-year PEV pricing and technology study that concluded there is a learning curve for PEV customers on new rates and that in order to optimize charging, utilities should develop well-designed tariffs before customers adopt poor charging habits.34 Moreover, if done right, the additional load from PEV charging can improve the utilization of existing utility assets and drive down rates for all customers. These benefits can be achieved by incenting charging behaviors through by addressing a few areas of rate design as outlined below.

**PEV-ONLY TARIFFS**

In general, rate designs should align with utility cost causation, incent charging behaviors that optimize the use of the grid, and ensure that customers have the ability to manage their energy usage and energy costs. As discussed above, the impacts of PEVs on the grid are largely dependent on the manner in which they are charged, and potentially in the future, discharged for grid support. Rates for PEV charging should also align with cost causation but should be available as “PEV-only” tariffs. This means that the tariffs can be applied to the PEV-load only, as opposed to the whole home or business. This is important, because many PEV owners like time-varying rates for their PEVs but do not want the rates for their entire home.

One mechanism for moving in this direction is establishing PEV-only rates that can be implemented by installing a second utility meter or by utilizing a billing-quality sub-meter built into the EVSE. While the accuracy of the sub-meters needs to be ensured, the latter approach can be significantly less expensive as demonstrated through San Diego Gas & Electric’s (SDG&E) program.35 Importantly, national standards for such sub-metering already exist, including the NIST PC-44 standard.36

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35 https://www.sdge.com/residential/electric-vehicles/choosing-rate
As of 2017, over 25 utilities offered PEV tariffs; most of them incent charging during off-peak hours, with rate reductions of up to 95%. Over time tariffs that rely on on-/off-peak hours should be revisited regularly as the power production profile of the grid changes. For example, in some regions, PEV tariff design is likely to change with an increase in solar power penetration, allowing for lower rates during midday hours that coincide with peak solar production. In this case, PEV loads become valuable in that they provide demand for renewable energy that might otherwise be curtailed.

It should be noted that the design of PEV-only rates will differ by sector. A rate design that may work for home chargers may not be suitable for public charging or fleet infrastructure. For example, customers who primarily rely on home chargers or workplace chargers have a greater ability to manage their charging because their cars will usually be sitting idle for a longer period of time and are therefore more likely to be responsive to rates that vary throughout the day. On the other hand, customers charging at a public DCFC have a much smaller window during which to charge and therefore less ability to adjust their charging habits in response to price signals.

TIME-VARYING RATES

A key aspect of helping to align charging behavior with system needs is offering appropriately designed, optional time-varying rates (TVR). Well-designed TVR can encourage charging during off-peak hours (even if not a PEV-specific rate), aid with grid reliability, and prevent expensive transmission and distribution upgrades, which will benefit all utility customers. TVR encompasses a range of tariff design options, from simple time-of-use (TOU) rates with predefined peak and off-peak periods, to fully dynamic pricing, where rates vary by the hour (or more frequently) based on the actual market price for electricity. Dynamic rates based on day-ahead price forecasts are another option that can provide customers information in advance, allowing them to plan around times of high pricing.

Research has shown that TVRs are effective at changing charging behavior and can provide significant ratepayer benefits. An Idaho National Laboratory study found that 78% to 85% of owners on a PEV-specific TOU rate set their car to charge during off peak hours (usually in the middle of the night). TOU rates have also been shown to save PEV customers and all ratepayers money. A study of the top five cities for PEV sales in the United States (Los Angeles, San Francisco, Atlanta, San Diego, and Portland, Oregon) found that TOU PEV rates saved PEV customers between $116 and $237 per year. Another analysis concluded that
PEV TOU rates would save California customers $1.2 billion compared to a traditional flat-rate from 2015 to 2030.\textsuperscript{40}

Given their effectiveness in managing PEV charging, the PSC should pursue well-designed TOU rates for residential, workplace, and fleet charging and explore more granular TVRs options over time that include dynamic pricing elements. When coupled with smart, networked EVSE, TOU rates allow customers to respond automatically via pre-defined "set it and forget it" preferences. These capabilities may also facilitate an eventual move to bi-directional flow of electricity where PEVs could export electricity to the grid at times when it is most valuable to the electricity system.

In terms of specific design considerations, research shows that larger differentials between on-peak and off-peak rates, increase the likelihood of changing customer charging habits. A recent study by The PEV Project and SDG&E found that a 2:1 price ratio between the peak and off-peak shifted 78\% of charging to the off-peak period and a 6:1 price ratio shifted 85\% to the off-peak period.\textsuperscript{41}

Some utilities have also implemented more sophisticated real-time pricing (RTP) rates – prices that vary by the hour as determined by day-ahead market prices or real-time spot market prices for electricity. For example, a study of an hourly PEV charging program offered by Commonwealth Edison in Illinois found that participants reduced their energy supply costs by 45\% when compared with a standard rate and 38\% when compared with a TOU rate.\textsuperscript{42} In a pilot in Washington D.C., low-income customers also achieved bill savings on RTP, with satisfaction levels of approximately 90\%.\textsuperscript{43} RTP has proven to be effective, compared to other, simpler TVRs, and smart, networked EVSE allows even the average customer to respond to such price signals easily and automatically.

**DEMAND CHARGES**

Demand charges, which usually apply to large commercial and industrial (C&I) customers (but not residential and small commercial customers), are an important consideration when it comes to PEV rate design. Demand charges are based on the highest level of electricity usage on a per kW basis for a certain time period (typically the highest 15 minutes) during each billing cycle. Demand charges are intended to better align revenue collection with utility costs, because the electricity system is designed, built, and maintained to meet peak demands at the customer, local, and wholesale system levels. Demand charges provide a price signal to incentivize customers to adjust their usage decisions to account for their impacts.

\textsuperscript{41} https://www.rmi.org/wp-content/uploads/2017/10/RMI-From-Gas-To-Grid.pdf
\textsuperscript{43} https://www.energy.gov/oe/downloads/powercentsdc-program-final-report
on the grid. However, depending on its design and magnitude, a demand charge can significantly undermine the economics of PEV and charging station ownership.

Although demand charges are common for large C&I customers, which often have the tools for managing them, they present some unique challenges when it comes to PEVs, especially for charging station owners and operators. Demand charges, which can account for over 90% of a public charging station’s electricity costs, can significantly increase costs for companies trying to establish PEV charging businesses. The impact is especially pronounced at the current, early stages of PEV adoption when EVSE utilization rates (i.e., the time spent charging as a percentage of total time in a day) are quite low for public applications. As a result, demand charges translate into very high average per kWh rates and can stifle infrastructure investment, which is already lagging PEV deployment in many parts of the country and suppressing PEV adoption.

While there are tools like smart charging and energy storage available to help mitigate some of these costs (discussed more below), at this stage of the market’s development in 2018, it is important to reduce the burden of demand charges on public charging retail accounts in the near-term, especially DCFC, and to evaluate appropriate rate design for public chargers in the long-term.

With respect to what types of installations should be eligible for demand charge relief, the PSC should distinguish between public charging-dedicated retail accounts (i.e., PEV-only applications) and accounts where public charging demand is combined with the overall demand of the customer premises. Balancing general rate design principles with the needs of the nascent PEV industry, it is reasonable to grant relief for PEV-only retail accounts, while the applicability of such relief to standard retail accounts with behind-the-meter public charging is unclear.

Several utilities have begun experimenting with alternative demand charge approaches. The programs and proposals identified in the box below provide some examples of demand charge relief that are being explored.

- In April 2017, PacifiCorp in Oregon received approval in their transportation electrification proposal to implement a transitional demand charge approach for DCFC. The tariff offers an initial 100% discount on demand charges that steps down to 0% by the end of the 10-year program to reduce barriers to DCFC deployment.

- Southern California Edison, in their 2017 transportation electrification program, implemented a moratorium on demand charges for their commercial rate program for the first five years, with a

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subsequent five-year phase-back. The demand charge at the end of the ten-year period will only be 60% of the current demand charge.\footnote{Application 17-01-021. http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M215/K380/215380424.PDF}

- In June 2014, Connecticut’s Public Utilities Regulatory Authority approved a five-year PEV rate rider pilot for Connecticut Light & Power that replaces a demand charge with a higher per kWh charge.\footnote{Docket 13-12-11. http://www.dpu.state.ct.us/dockhistpost2000.nsf/8e6fc37a54110e3e852576190052b64d/0fdcd8bddd5bdfdc8525829c0073540c/$FILE/FINAL131211.docx}

- In July 2013, the Hawaiian Electric Co.’s received approval to implement a five-year PEV charging pilot, Schedule EV-F, where the demand charge is replaced with a higher TOU per kWh charge.\footnote{http://energy.hawaii.gov/hawaiian-electric-companies-offer-new-rates-for-public-ev-charging}


**ROLE OF TECHNOLOGY IN PEV RATE DESIGN**

Smart EVSE & Sub-metering: One element of tariff design that can facilitate PEV adoption is allowing for the use of two meters - one for the premise at which the EVSE is located and a separate meter for the EVSE – each with its own tariff. This approach enhances the ability of utilities and regulators to address PEVs via the types of PEV-only tariffs described above. Sub-metering to allow for separate treatment and billing can be achieved through the installation of a separate meter as part of the EVSE service upgrade and installation or through the built-in meter in a smart, networked EVSE charger, which is the method that SDG&E’s effort is utilizing in its aforementioned pilot. The cost of a separate meter installed in front of the charger ranges between $500 and $1,500 (all in) as of 2018, while meters built into smart, networked EVSE can reduce that cost to less than $50 for volume deployment. In order for the utility to apply separate tariffs through the separate meter, three technological capabilities are necessary:

- The reading of the EVSE and premise meters must be synchronized,
- All of the meter data must be delivered to the utility’s software system, and
- The meter readings must be disaggregated from the premise consumption for billing purposes.

As discussed previously, the use of smart, networked EVSE, which can support billing with embedded sub-meters, also provides a technological platform to support a variety of advanced rate structures, and managed charging programs and functionality. Deploying managed charging technology-enabled EVSE is therefore a key consideration and program design element to maximize the benefits of transportation electrification.
Metering requirements should not be used as a reason to slow down the adoption of PEV-only rates and therefore should be optional. Other programs can also be developed that allow customers to earn rewards for optimal charging behavior (e.g., charging during off-peak hours) in the absence of a separate meter for billing purposes. For example, Con Edison’s Smart Charge New York program offers participants a module that plugs into the PEV’s diagnostic port that provides valuable information to the driver via an online portal, including battery health and driving efficiency. The module also tracks charging behavior – and this data can be sent to the utility for verification and rewards.

DERs, especially energy storage, are also an option (instead of, or in addition to, altering rate design), either behind the meter to mitigate demand charges, or in front of the meter to help integrate charging station load. Onsite energy storage at public charging stations, particularly DCFC, would allow EVSE operators to ensure a consistent charging price for customers and help to reduce peak loads as seen by the utility. Onsite distributed generation coupled with storage would have the added benefit of ensuring power availability even during grid-wide power outages.

As noted previously, managed charging with smart, networked EVSE can enable a PEV to act as a DER, and aggregated managed charging can be a resource for grid operators. In the California market, such aggregated PEV charging is already providing peak load reduction services.

10. How should the cost of recovering distribution network upgrades for EVSE be recovered if not through the demand charges?

To the extent that distribution network upgrades are required, we support using distribution charges, whether demand charges or other types of charges, as appropriate, for cost recovery. For example, if the PSC determines that utilities can recover “make ready” investments in their rate base, then allocation methods consistent with recovery of other network investments can be applied. Similarly, for new connections for EVSE, there may already be existing approaches for allocating costs between the customer being connected and the general rate base.

11. In designing EV and EVSE programs, how can the Commission ensure compatibility with ongoing regional initiatives, programs offered in other states, and potential private investment?

The PSC has already taken the right first step to ensure compatibility of its actions with other actors in the New York PEV space, which is to establish a collaborative process for collecting information and considering the topic. The open nature of this process, as opposed to a contested case, is key since

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52 https://emotorwerks.com/about/enewsso/press-releases/269-emwdram
stakeholders and regulators are free to share and openly discuss all types of information without the restrictions of ex-parte rules. Importantly, this type of collaborative process greatly reduces the financial and legal barriers to participation relative to contested cases, as many of the organizations with the best information on PEV issues are small and have limited resources, including companies of various sizes, many types of non-profits, academic institutions, other government agencies, etc.

Beyond retaining a collaborative process design that continues to bring forward the best market data and ideas, as noted above in our answer to Question 6, the adoptions of appropriate interoperability standards will be key to ensuring compatibility with ongoing parallel efforts in other states and at the regional level. Not only will this have an impact on PEV owners, but it will also reduce costs and barriers for private companies seeking to invest in EVSE and to develop PEV-related services.

12. Should the Commission address electrifying light-duty passenger vehicles, and medium and heavy-duty vehicles within this Case?

We believe it is important for the PSC to consider medium- and heavy-duty PEVS, in addition to light-duty PEVs in this Case. Many commercial and fleet vehicle operators are seeking opportunities to deploy PEVs for commercial purposes or to serve public transit fleets. These vehicles commonly travel significant distances – the average heavy-duty truck travels more than six times the annual average mileage traveled by a light-duty vehicle – and are in use daily. In addition, transport refrigeration unit and auxiliary power unit plug-in capabilities can be taken advantage of only when a plug-in infrastructure is available. Electrifying such fleet vehicles can therefore provide immediate and substantial financial, environmental, and public health benefits.\(^53\) Medium- and heavy-duty ICE vehicles are a large source of smog-forming emissions and fine particulates, particularly in urban areas like New York City, so electrification of buses, local delivery vehicles, transport refrigeration units and their auxiliary power units, and intermodal freight trucks have significant potential to improve air quality.\(^54\)

Medium- and heavy-duty PEVs can also provide significant operational benefits. These benefits include:

- Fuel savings
- Improved traction and vehicle stability (as electric motors have faster response rates than diesel engines and can increase, reduce, or even reverse torque quicker),
- Regenerative braking, which can improve safety, especially when going downhill
- Improved safety designs that leverage the removal of the engine and reconfigure the vehicle to protect the driver

\(^53\) https://www.afdc.energy.gov/data/10309
\(^54\) https://www.edison.com/content/dam/eix/documents/our-perspective/g17-pathway-to-2030-white-paper.pdf
• Reduced chance of human error by eliminating the need for shifting
• Reduced maintenance costs because PEVs have fewer moving parts than diesel vehicles
• Reduced operating expense
• Lower sounds levels which allow for evening distribution without disrupting local population

Many cities are recognizing the benefits and taking action. New York City, which operates the largest municipal bus fleet in the United States, recently announced a plan to transition its entire public bus system – 5,700 buses – to PEVs by 2040.\(^{55}\) Converting the fleet to PEVs is equivalent to taking over 100,000 light-duty vehicles off the road, in terms of greenhouse gas emissions. A study by Columbia University found that each electric bus could reduce health costs by about $150,000, and that shifting the entire fleet to PEVs would cut CO\(_2\) emissions by 575,000 metric tons per year and save the city $39,000 per bus per year on fuel and maintenance costs.\(^{56}\)

Utilities also have a lot to gain from transitioning their own fleets to PEVs. Not only do PEVs provide significant operating and maintenance savings, but utilities can utilize them as distributed storage devices – providing exportable power capabilities for emergency response crews that can provide new solutions and potentially reduce planned outages.\(^{57}\) It is important to note that more work is needed to determine how first-responder PEV fleets would operate in the case of extended emergencies, such as blackout, large storm-related outages, or a terrorist attack.

Many commercial delivery companies have announced plans to electrify their fleets as well. For example, UPS recently announced plans to convert 1,500 of its class 5 delivery trucks in New York City to PEVs. UPS said these new vehicles cost about the same as their traditional delivery trucks and offer over 100 miles between charges – allowing them to deliver all day in congested urban centers and then charge overnight.\(^{58,59}\)

The TCO for fleets and commercially owned vehicles varies across vehicle classes and by vehicles uses. Reports forecast that long-haul applications (over 500 km per day) are projected to reach break-even with ICE vehicles by 2025 for light-duty commercial applications, by 2028 for medium-duty vehicles, and by 2029 for heavy-duty trucks.\(^{60}\) Regional haul applications (200 km per day) are already at cost parity for light-duty commercial applications and are projected to reach their break-even points by 2021 for

\(^{57}\) http://www.eei.org/issuesandpolicy/electrictransportation/fleetvehicles/documents/eei_utilityfleetsleadingthecharge.pdf
\(^{58}\) https://electrek.co/2018/02/22/ups-electric-delivery-trucks-workhorse/
\(^{59}\) https://electrek.co/2017/11/10/ups-converting-battery-electric-delivery-trucks-new-york/
medium-duty vehicles and by 2030 for heavy-duty trucks.\textsuperscript{61} Finally, urban haul applications (100 km per day) are already at cost parity for city buses, and are projected to reach cost parity by 2021 for medium-duty vehicles, and by 2022 for light-duty commercial applications.\textsuperscript{62}

Given the substantial potential benefits of medium- and heavy-duty electrification and growing market demand and business rationale for this work, it is important to address some of the unique regulatory considerations relative to these vehicles. For example, the effect of rate design on the cost effectiveness of PEVs for commercial fleets and medium-and heavy-duty vehicles can be significant, but the specifics of the situation are different than for light-duty vehicles.

Take demand charges applied to electric transit buses for example. Electric buses and many other commercial fleet operators have two main options for charging – on-route and overnight. On-route charging allows buses or other commercial fleets to recharge in a short amount of time, a use case that requires high power demand in order to charge as quickly as possible – therefore increasing the likelihood of triggering a high demand charge. Overnight charging will usually take place at a bus depot where an entire fleet will charge at a lower rate over a longer duration. In theory this should reduce any demand charge; however, having many buses charging at the same time will lead to a very high-power demand in one location, which can trigger demand charges at the bus depot – even though they are charging during off-peak times, depending on the particular rate design. Studies have shown that demand charges have a large impact on both on-route and overnight charging for bus fleets, more than doubling fuel costs – potentially eliminating the fuel cost savings of PEV buses over diesel-powered and compressed natural gas buses.\textsuperscript{63} The industry is beginning to discuss some potential approaches, such as utilities offering time windows, when there is excess capacity on the grid, to fleet customers where their loads would be excluded from demand charge calculations.

13. How should Staff structure future stakeholder engagement in this proceeding? Should additional issue-specific working groups be held prior to Staff issuing recommendations?

Regardless of the specific structure of the stakeholder engagement, our two overarching concerns are (i) that the proceeding remain accessible to a wide range of stakeholders, which suggests careful consideration of the time commitment expected from parties, and (ii) ensuring that the proceeding is completed as expeditiously as possible. For example, there may be a need for follow-on work on

\textsuperscript{63} http://www.calstart.org/Libraries/Publications/Peak_Demand_Charges_and_Electric_Transit_Buses_White_Paper.sflb.ashx
 interoperability standards, but that should not hold up the Commission from ruling on key issues that can keep the market moving.

14. Any other issues that stakeholders wish to raise.

We commend the Commission for opening this proceeding. We respectfully urge the Commission to focus this proceeding on the top five priority issues or topics. Right now, it is very broad and wide ranging, making it more difficult to achieve closure, as well as for stakeholders to engage.