Advancing the Clean Energy Future

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Mark D. Marini, Secretary
Department of Public Utilities
One South Station, 5th Floor
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Dear Secretary Marini:

Acadia Center appreciates the opportunity to file initial written comments as specified in the Investigation by the Department of Public Utilities ("Department") on its own Motion into the Modernization of the Electric Grid – Phase Two (D.P.U. 20-69), responding to the Department's questions about a targeted deployment of advanced metering functionality ("AMF") to electric vehicle ("EV") customers. Acadia Center is a non-profit research and advocacy organization committed to advancing the clean energy future. Acadia Center is at the forefront of efforts to build clean, low carbon and consumer-friendly economies. Reliable information, comprehensive advocacy, and problem solving through innovation and collaboration characterize Acadia Center's approach.

Introduction

Acadia Center supports the deployment of EVs, the broader use of opt-out time-varying rates for customers, and the use of AMF as essential components to unlock the clean energy future. As the Department is aware, replacing gasoline vehicles with EVs significantly reduces greenhouse gas (GHG) emissions and other tailpipe pollution, and pairing increasing levels of renewable electricity with electric vehicle adoption provides a viable pathway to achieving the Commonwealth's long-term GHG emissions reductions mandate. However, many of the grid and consumer benefits that EVs provide cannot be realized without the use of time-varying rates and the deployment of AMF.

Massachusetts lags behind many states in the deployment of AMF, but the state now has the opportunity to set the stage for an accelerated deployment of AMF. AMF has the potential to deliver benefits to both consumers and utilities and to help grow the market for and better integrate distributed energy resources (DER). A grid with AMF has improved system-wide efficiency, more sophisticated data to inform load forecasting, and greater demand flexibility. Why would Massachusetts not want to unlock that energy future?

Questions Presented

1. Please discuss all factors the Department should consider when determining whether a targeted deployment of advanced metering functionality to EV customers is appropriate. As part of your response, identify any unique factors that should be considered for particular EV customer segments (e.g. residential customers, low-income customers, C&I customers, EV charging site hosts).

In Order 12-76-B, the Department established four requirements for advanced metering functionality:

1. "The collection of customers' interval data, in near real-time, usable for settlement in the ISO-New England energy and ancillary services markets;
2. Automated outage and restoration notification;
3. Two-way communication between customers and the electric distribution company;
4. and, with a customer's permission, communication with and control of appliances."

Acadia Center supports both the use of time-varying rates for electric vehicle customers and the deployment of AMF. However, the Department would benefit from considering all possible alternatives for achieving the objective of TVR for EV customers. If the use of TVR is possible through charging stations in a more cost-effective way compared to AMF technology, the Department should consider that alternative. But if deploying AMF to enable TVR for EV customers is explicitly connected to longer-term goals of broader AMF deployment and access to TVR, then that would be a preferable option. The Department should not pursue AMF for EV customers if it would result in an inability to expand beyond a small subset of customers or if it locked in communications or back office technologies that would not be well-suited for large-scale deployment.

With these caveats in mind, to determine whether a targeted deployment of AMF to electric vehicle consumers is appropriate and meets the Department's requirements above, the Department should consider:

- How to ensure that AMF deployment helps customers save money, improve system resiliency, and prepare for the integration of distributed energy resources in the future.
- How to enable customers to have the necessary understanding and access to their energy usage data to make use of price signals through AMF and to control their energy use.
- How to ensure that data privacy and security protocols are sufficiently robust.
- How to determine which entities will own and operate the advanced metering infrastructure and whether third parties will have sufficient access to customer data.
- Whether potentially more cost-effective alternative technologies, such as utilizing the charging station itself, would enable TVR for EVs, without requiring AMF.
- How to collect lessons learned and best practices after providing AMF to EV customers in order to inform broader AMF deployment in the future, as well as other grid modernization efforts, including vehicle-to-grid integration.
- Whether existing communications infrastructure, including communications networks and data management systems, are sufficient for using AMF to its full potential, or whether infrastructure upgrades will be required.
- If communications infrastructure requires upgrades, are there feasible opportunities to partner with IT or telecommunications companies in order to simultaneously fund AMF deployment and increased broadband access?
- How deployment of AMF for EVs would set the stage for broader deployment – both as an opportunity to gauge customer preferences and learn from a more targeted rollout first, and as an opportunity to begin installing the communications and infrastructure upgrades necessary to sustain a larger rollout.
- How cost and scalability of technology will impact the rate of deployment and expense. For example, a technology like cell phone signals (which may be potentially more cost-effective at a small, widely

distributed scale) may be more cost-effective for deployment of AMF to only EVs. However, building a more complex system that requires mesh networks may be far more cost effective for the large-scale deployment necessary to achieve a modern grid. The Department must be careful to ensure that this rollout does not impede future efforts.

- How the program will be measured and evaluated, recognizing that some of the AMF benefits require broader deployment and that per-meter cost installation declines as more customers are included.
- How to establish companion programs to ensure that AMF (or other functionality necessary to have TVR) is available to EVs that serve LMI populations (e.g. buses, car shares) and those who may rely on public charging stations. For example, off-peak and on-peak TVR rates for EV customers could include an additional charge in order to fund electrifying transit options in environmental justice communities.
- How to enable access to any AMF/TVR program by competitive service or municipal aggregation customers.
- Whether the technical requirements for AMF deployment are sufficient to deliver the full range of AMF benefits beyond just billing, including data management and collection; real-time visibility into the distribution system to inform operations; and optimizing planning decisions to modernize the grid as it becomes increasingly complex.
- How to ensure that the full suite of AMF costs and benefits are equitably distributed. Will all ratepayers pay into this program that will initially serve only customers who own an electric vehicle and a private charging station? If so, what are viable options to more equitably distribute the benefits of transportation electrification and the use of TVR?
- How to ensure that the costs for the AMF program are recovered equitably. Many of the benefits of advanced metering are related to energy savings, peak load management, and distribution cost controls, in addition to benefits directly related to customer billing and connection costs. Therefore, the full cost of AMF should not be recovered in fixed monthly charges. Traditionally, meters are considered a customer-related cost, and metering costs are recovered in rates as part of the monthly customer charge. Because of all the non-billing functions that AMF provides, a significant portion of the cost of AMF and communications and data systems should not be treated as customer-related costs.
- At what level of penetration does AMF deliver the full suite of smart grid benefits that it is technically capable of providing?
- What is the potential size of the load-shifting impact from using TVR for EV customers?

2. Please a) describe generally what basic service supply TVR design options each company should make available to the following EV customer segments: (1) residential EV customers; (2) C&I EV customers; and (3) EV charging site hosts. Identify and discuss the basis for any differences between TVR design options for each EV customer segment;

Electric vehicles are a perfect example of why time-varying rates are important. Without the proper incentives, the most natural path for residential customers with EVs may be to charge a vehicle as soon as they get home, often in the late afternoon. From a system perspective, late afternoons are often peak hours. A simple on/off-peak rate can provide an incentive to begin charging an EV later in the evening instead. Alternatively, if the customer truly needs to charge at that time, they will be paying appropriately for the costs they cause. Relatedly, TVR rates provide an economically justified way to lower fueling costs for EVs, with lower electricity costs during off-peak hours. Time-varying rates can provide better economic incentives to reduce overall costs and provide customers with opportunities to save money by taking advantage of low-cost hours. While there are a range of specific TVR, the Department should consider which type of rate design is best suited to enable the functionality that AMF and EVs provide.

Demand charges can serve as a major barrier for EV charging, particularly for C&I EV customers and EV charging site hosts, including public and private entities that have invested in DC fast charging (DCFC) applications. In particular, entities that have invested in DCFC are often enrolled in C&I electricity rates, which typically include a demand charge. Demand charges often charge customers based on the highest average 15-minute interval of energy use. Unlike factories, for example, which have relatively uniform electricity load profiles, customers with DCFC can experience significant peaks in their load profiles because the charging equipment requires a higher power draw for relatively short periods of time. Poorly designed demand charges penalize municipalities, private companies, and other entities for offering EV charging infrastructure. Demand charges for EVs also penalize public charging stations with low utilization rates, such as in rural or low-income areas, creating further equity concerns. During the most recent Mass EV Stakeholder Action Challenge on DC Fast Charging, stakeholders identified demand charges as the most significant obstacle to greater deployment of DCFC. Any demand charge for EV customers should be appropriately scrutinized.

Rather than adopting demand-based rates that can penalize DCFC charging and create equity concerns, the DPU should consider:

- Using higher volumetric pricing either instead of or alongside demand charges, which can provide more certainty for operators of charging stations where utilization is low.
- A monthly bill credit measured using a percentage of the nameplate demand of a charging station located behind a commercial customer's metered service.
- "Rate limiters," which set a limit of a certain cents/kWh value for the average cost equivalent of a customer's demand charges.

For any time-varying rates, the peak and off-peak windows must be targeted sufficiently in order to motivate behavior change for EV customers. TVR must be targeted to customers that have the ability to respond to different prices signals. They must also be targeted at peak system demand with a sufficiently narrow window in order to deliver the most grid benefits and customer savings. Time-varying rates must consider customers who are unable to change their energy usage (e.g. because they use health equipment that cannot be turned off).

While the Department is rightfully focused on the role that time-varying rates can play in enabling the benefits of AMF to be fully realized, if the Department is committed to promoting electric vehicles, it must pursue additional policies. Dedicated programs to enable low-income residents to adopt electric vehicles, amendments to residential and commercial building codes to enable cheaper installation of charging infrastructure in the future, more education and outreach, and a wide range of other policies are needed to achieve the Commonwealth's goals for EV adoption and the requirements for GHG emissions reductions.

b. With respect to the C&I EV customer segment, discuss whether a separate TVR design option should apply to EV fleets;

In general, EVs that make use of TVR through AMF can provide several potential grid services: shifting load demand away from peak periods; providing responsive load to draw power from the grid to charge at times that might reduce the curtailment of renewables; and acting as mobile batteries (i.e. non-wires alternatives) to provide storage or load in specific locations where need arises. C&I EV fleets are particularly well-suited to provide all three of these services. Given that C&I fleets are more likely to have EVs plugged into charging stations most of the day and night, C&I EV load profiles may appear relatively flat. If combined with well-designed TVR and appropriate demand response incentives, C&I EV customers could provide responsive demand for grid operators.

c. For each identified basic service supply TVR design option, discuss whether there should be an accompanying distribution TVR design option;

A time-varying rate should accurately reflect underlying cost drivers; those may be different for supply and distribution, but nevertheless, both have cost drivers that can be reflected in time-varying rates. A TVR for supply does not need to be the same as a TVR for distribution, but they should both send appropriate price signals.

d. For each identified TVR design option in (a) through (c), discuss whether the TVR should apply only to the EV-charging portion of the customer's load or to the customer's entire load;

The Department should give residential customers the option over whether time-varying rates are applied to a customer's entire load, or just the EV-charging portion. While some customers may prefer TVR for their EV-charging load only, a broader application of TVR will deepen customers' familiarity with dynamic rates and could increase their comfort level in using TVR for other applications beyond EVs in the future. Moreover, applying TVR only to the EV-charging portion could unnecessarily complicate customers' bills, limiting customers' ability to understand the relationship between changes in charging behavior and their bills. Load-wide application of TVR should be accompanied by extensive customer education programs and integration with software that can enable customers, especially residential customers, to manage their household load, including their EV to take advantage of price signals and not be caught off guard by unexpectedly high bills.

e. For each identified TVR design option in (a) through (c), discuss how it is designed to provide effective price signals to EV customers so that they can take actions that will contribute to reducing system peak demand; and

An overly broad definition of on-peak periods will limit the potential of time-varying rates to reduce peak demand and the costs of the energy system. If a peak period covers most of the day, customers may not be able to shift their consumption to adapt. Instead, concentrating peak-related charges into a narrower peak period that coincides with the hours of peak system demand could enable better customer response and track closer to underlying electricity cost drivers. Granular time-varying rate designs that reflect periods of peak system demand will create clear price signals to motivate EV customers to charge their vehicles at different times of the day when charging is cheaper. This will help shift load from EV charging to off-peak times of the day, helping to reduce system peak demand.

Peak periods should be defined as a relatively small period within a certain zone of hours. However, in order for customers to make full use of TVR in response to peak periods, it is critical to provide the tools and infrastructure for device automation. Without devices and software that can automatically respond to peak period price signals, changes in customer behavior will require more advanced notice and effort, which may reduce the effectiveness of any TVR program.

f. Where applicable, provide citations to jurisdictions where the identified TVR design options have been applied.

Acadia Center has identified several EV rate design best practices:

1. Time-varying rates for EVs must include a peak window that is narrow enough to motivate customer behavior change and to deliver the intended peak-shifting benefits.
2. The ratio between on-peak and off-peak rates must be large enough for customers to see a noticeable difference in their bills and to motivate changes in charging behavior.
3. Transparent pricing is key for helping customers understand and act in response to different price signals.
4. Customer education and outreach programs are essential for increasing customer enrollment in EV rates.
5. Opt-out programs achieve higher levels of long-term customer enrollment than opt-in rates.

Examples of EV-specific time-varying rates employing some of these best practices include:

- PG&E, 2020: Includes two EV rates, one applied to EVs only, the other applied to the entire household load. The whole-household rate varies between on-peak ($.48/kWh between 4pm-9pm) and off-peak ($.17/kWh between 12am-3pm) and includes a narrow peak. The EV-only rate includes a wider peak (2pm-9pm), but with rate tiers of $.54/kWh, $.30/kWh, and $.15/kWh).
- SDGE, 2020: Includes a narrow peak window with clear difference between on-peak and off-peak, as well as significantly lower "super off-peak" rates; includes options for EV-only rates, or whole-household rates. EV-only summer rate ranges from $.55/kWh between 4pm-9pm and $.19/kWh between 1am-6am.
- Southern California Edison, 2020: Includes a narrow peak window with a clear difference between on-peak and off-peak, as well as significantly lower "super off-peak" rates. Also includes options for EV-only rates, or whole-household rates. The TOU-D-Prime rate is available to customers with EVs, a residential battery, and/or an electric heat pump. The summer rates range from $.41/kWh between 4pm-9pm and $.15/kWh all other hours.
- NV Energy, 2020: Includes several rates depending on location within the service territory, each with large on- and off-peak ratios. For example, summer rates for northern Nevada single family homes vary from $0.52/kWh (1pm-6pm) to $0.04/kWh (10pm-8am).

These best practices also hold true for economy-wide TVR programs, including examples from Arizona Public Service, Oklahoma Gas and Electric, Sacramento Municipal Utility District, and PG&E.

3. Please discuss how municipal aggregators can facilitate the participation of their EV customers in TVR to achieve the benefits of advanced metering functionality.

One issue left unresolved by the Department's Order in 15-120/121/122 was whether customers who were not on basic supply were eligible to receive AMF. Eversource proposed in testimony to remove AMF from customer homes if they were to switch onto competitive supply, due to the expense of the meter and assumed lack of ability to charge time-varying supply rates. In the intervening years, the concentration of customers on competitive supply has only increased due to the proliferation of municipal aggregation programs throughout the state – including Boston's recently approved program. In guiding the utilities' plans for both an EV-specific deployment of AMF and a larger scale deployment, the Department must require a solution that allows competitive supply customers to have access to TVR programs. Any TVR and AMF program must be designed with this goal in mind.

4. Please describe any alternative solutions that may be compatible with the Companies' current communications, data management, and billing systems to allow each company to collect and communicate interval data without prematurely retiring existing AMR meters.

In order to assess whether the Department should replace existing AMR meters as part of a program to deploy AMF for EV customers, the Department should compare the difference in benefits provided by AMF compared to the continued use of AMR meters with the addition of smart chargers. Smart chargers may theoretically enable the use of TVR for EVs only. However, such a set up would eliminate many of the other benefits that AMF can provide. The Department should fully investigate the benefits that AMF provides in order to compare to the cost of replacing AMR meters. In particular, the Department should investigate how much electric load EV charging represents in the state and how much load could feasibly be shifted to off-peak hours using a combination of TVR, AMF and automated communications. If the benefit of load-shifting (which could be provided by AMR meters and smart chargers) is a small portion of the total benefits, it would strengthen the case for full AMF deployment given the many benefits beyond simply load-shifting that it provides.

5. Please discuss whether the Department should require all new service meters to be capable of providing advanced metering functionality when installed to replace an existing meter that reaches the end of its useful life or otherwise needs to be replaced.

Yes, the Department should require all new service meters to be capable of providing advanced metering functionality when replacing a meter that has reached the end of its life. AMF offers customers and grid operators a wide range of benefits and can provide data management and communications tools that are necessary for a modern grid that is much more distributed and complex. The recent vintage of AMR meters has stopped Massachusetts from adopting widespread TVR and AMF in the past – we should not add to stranded meter costs by continuing to install AMR.

Sincerely,

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