



March 1, 2019

Case No. 18-2660-INV  
-Via Electronic Filing-

Ms. Judith C. Whitney, Clerk  
Vermont Public Utility Commission  
112 State Street  
Montpelier, VT 05620

RE: Comments of Greenlots in Response to Commission Questions Regarding Rate Design and Grid Management

Dear Clerk Whitney,

Greenlots submits these comments in response to the Vermont Public Utility Commission's ("the Commission") February 4, 2019 "Notice of Workshop Re: Rate Design and Grid Management" encouraging written comments on identified topics in advance of the March 15, 2019 workshop.

Greenlots is a leading provider of electric vehicle ("EV") charging software and services committed to accelerating transportation electrification in Vermont. The Greenlots network supports a significant percentage of the direct current fast charging ("DCFC") infrastructure in North America, and an increasing percentage of the Level 2 infrastructure. Greenlots' smart charging solutions are built around an open standards-based focus on future-proofing while helping site hosts, utilities, and grid operators manage dynamic EV charging loads and respond to local and system conditions.

Greenlots appreciates the opportunity to provide written comments in advance of the upcoming workshop. Below Greenlots responds to each of the five issues/topics identified by the Commission in its February 4, 2019 notice:

- 1. Planned or currently available EV-specific rate offerings for both home charging and service to public charging stations, how they will be or are being implemented, how successful the offerings are expected to be or have been, and any difficulties expected to be encountered or that have been encountered in offering such rates.**

In general, Greenlots believes that the development of rates and programs that send accurate price signals to EV loads reflecting local or grid constraints and realities is essential to align the increased electrification of transportation with the interests of the grid and the broader public. Static EV time-of-use ("TOU") rates represent a rather blunt but in some cases appropriate beginning instrument to deliver these price signals, especially at low levels of EV market penetration. Other strategies, including managed or smart charging and real-time or dynamic pricing represent more accurate instruments that can better shape, utilize, and dispatch flexible EV loads at charging stations with longer dwell times, such as residences and workplaces, to better maximize system-wide benefits and cost reductions. Other dynamic pricing instruments

can also be deployed in higher power charging and shorter dwell time contexts, including DC fast charging. For these reasons, we encourage the Commission to look beyond TOU rate design to technology-facilitated smart/managed charging programs, including how technology can complement various rate structures.

Technology is also key to unlocking baseline power levels for chargers — and corresponding charging speeds — needed to maximize the impact of shifting or managing EV loads. Additionally, and especially in the residential market, smart networked chargers are critical to help enable consumers to be able to respond to advanced rates and charging programs utilizing pre-defined, but potentially evolving and reconfigurable hands-off “set it and forget it” preferences. What is key to understand here is that EV-specific rates and programs governing a single load type managed with technology does not require active customer involvement to respond to price signals, as the technology embedded within the charger and network software handles this actively on behalf of the customer or site host. This capability not only makes traditional arguments against advanced rate structures inapplicable, but it also makes it practical and warranted to move to advanced rates and rate alternative technology-driven programs leveraging the capabilities of the underlying technology at the outset, and in an ongoing manner.

Looking not too far down the road, and recognizing the value provided by technological solutions already being deployed in EV charging hardware and software today, it is relatively easy to envision a future where the needs addressed and values historically provided by rate design are instead provided by these technological solutions in a (potentially significantly) more effective manner. Indeed, to reiterate, managed charging programs are not limited to complementing rate design, but can instead go further and be a more effective alternative strategic solution for maximizing outcomes.

A good illustrative example of an advanced, technology-facilitated rate design and program is the rate offered through San Diego Gas & Electric Company’s (“SDG&E”) “Power Your Drive” pilot program. This program, approved by the California Public Utilities Commission in January of 2016, provides for the installation of up to 3,500 utility-owned and operated charging stations at apartments, condominiums, and workplaces. What makes this program unique, however, is the design of the rate offered to drivers and site hosts, which aligns grid demands, charging behavior, and state policy through the use of an hourly dynamic rate. Prices are published a day in advance, and customers are provided an app where their needs and preferences can be set to appropriately charge in response to price signals and their charging needs for a given charging session:

**Prices**

Hourly Prices (¢/kWh)

| Hours    | Today<br>7/17/2018 | Tomorrow<br>7/18/2018 |
|----------|--------------------|-----------------------|
| 12-1 am  | 16.747 ¢           | Not Available         |
| 1-2 am   | 16.288 ¢           | Not Available         |
| 2-3 am   | 16.262 ¢           | Not Available         |
| 3-4 am   | 16.248 ¢           | Not Available         |
| 4-5 am   | 16.262 ¢           | Not Available         |
| 5-6 am   | 16.735 ¢           | Not Available         |
| 6-7 am   | 17.625 ¢           | Not Available         |
| 7-8 am   | 18.977 ¢           | Not Available         |
| 8-9 am   | 17.601 ¢           | Not Available         |
| 9-10 am  | 18.180 ¢           | Not Available         |
| 10-11 am | 18.621 ¢           | Not Available         |
| 11-12 pm | 18.722 ¢           | Not Available         |
| 12-1 pm  | 22.240 ¢           | Not Available         |
| 1-2 pm   | 22.130 ¢           | Not Available         |
| 2-3 pm   | 22.011 ¢           | Not Available         |
| 3-4 pm   | 21.621 ¢           | Not Available         |
| 4-5 pm   | 22.777 ¢           | Not Available         |
| 5-6 pm   | 23.977 ¢           | Not Available         |
| 6-7 pm   | 28.038 ¢           | Not Available         |

**Charge**

Your location  
Century Park 'O' North Parking  
Upper level, San Diego, CA 92123 -  
Charger #3 (1 kW)

Automatic | View Prices

Charge me a maximum price of  
\$ 0.250 kWh

My departure time is  
5:00 PM

Minimum kWh needed (optional)  
999 kWh

Start Charging

Source: SEPA/SDG&E<sup>1</sup>

This advanced functionality is made possible by a centrally-managed turnkey utility program which prequalifies chargers and related software and network services to work with SDG&E's backend systems while providing this front-end functionality to drivers. This program has successfully demonstrated both customer response to advanced price signals given appropriate technological tools, and the ability of technology to facilitate advanced rate design that aligns charging behavior with the needs of the grid.<sup>2</sup>

<sup>1</sup> Screenshots are an example of the app SDG&E developed for its employees to provide and respond to day-ahead, hourly pricing information for their workplace chargers. Image source: <https://sepapower.org/knowledge/three-things-you-think-you-know-about-evs-are-wrong/>

<sup>2</sup> For more information on this rate and program, see generally SDG&E's semi-annual reports, available here: <https://www.sdge.com/regulatory-filing/10676/sdge-electric-vehicle-grid-integration-pilot-program>

**2. Demand charges and DC fast-charging stations, including the effects of demand charges on the deployment of such stations and how such effects can be mitigated or eliminated without undue impact to electric ratepayers.**

A reoccurring theme seen by stakeholders and utility regulatory bodies across the country is a discussion of how to provide demand charge relief to operators of DC fast chargers (“DCFC”). This is due to the fact that at low asset utilization, demand charges can be perceived as a market barrier and negative financial impact on the economics of investing in, owning, and operating DCFC infrastructure. This said, and as discussed above, sending accurate price signals through rates is critically important in aligning driver/operator interests with those of the grid (and site), and ensuring benefits are maximized and can accrue to all ratepayers, and costs are limited.

As such, and for additional reasons, Greenlots generally has tended not to advocate for the removal or retiring of demand rates for DC fast charging, which provide for an important price signal. While transportation electrification holds strong promise of benefits to the system and all ratepayers, such benefits are largely contingent upon management of charging in relation to grid conditions. Unmanaged charging could prove to create more costs than benefits to ratepayers – especially if it coincides with difficult grid conditions. This concern increases as DCFC power levels increase, which they are quickly doing. As such, demand charges serve an important purpose in relation to EV charging. By and large, demand rates are also more attractive to DCFC infrastructure owners than volumetric rates at a certain level of utilization (which for the most part is not yet being seen). Greenlots has therefore tended to believe it to be important that infrastructure owners/site hosts have the option of choosing or returning to their current demand rate if another rate treatment is taken forward.

Again, Greenlots notes that technology has a critical role to play, and electricity costs to drivers and site hosts certainly should not be seen as entirely an issue of rate design. Importantly, there are a variety of technology solutions that can be employed to address many of the same issues and mitigate negative rate impacts, including numerous managed or smart charging strategies. While Level 2 charging presents significant opportunity for managed charging given longer dwell times, there is also opportunity for DCFC. Unfortunately, there has been a trend towards unmanaged DC fast charging, premised on the notion that in this context, drivers always need full power immediately and must be as fully charged as desired as quickly as possible. There are in fact opportunities to reduce both site host and system cost through technology and dynamic rates or fee structures. For example, a driver could be given the option to save a few dollars on their charging session if they are able to wait a few minutes to begin charging. Or they could be offered a similar discount for a slightly longer session at a lower power level. While there are implications if other drivers are queued up, there are very workable solutions to reduce site and system costs associated with DC fast charging. This is likely to become more critical over time with a shift to higher and higher power charging.

While integrating storage with charging can provide more flexibility, smart charging technology alone – without integrated storage – can significantly reduce costs associated with demand charges or otherwise unmanaged charging. Indeed, managed charging can be a critical complement to rate design, but can often also be more effective or achieve deeper results than a rate approach.

**3. Incorporation of growing EV charging load into the electric grid and issues associated with serving that new load.**

As discussed in both of the sections above, effective management of EV load is critical to fulfil the promise of EVs to the grid, and as Greenlots has emphasized, leveraging technology is fundamental to address. While potential grid impacts today may be minimal, given the scale at which EV adoption and transportation electrification will grow, especially in jurisdictions where supporting this growth is a matter of state policy, it is critical that planning is done now and good foundational regulation and programs are established. As we've described, technological solutions represent the platform on which powerful, effective, and customer-friendly load management solutions will be built, and planning for regulators, utilities, and stakeholders to think through how to leverage this technology is important in the near term.

**4. The potential benefits of managed EV charging to the electric grid, including using EV batteries for purposes such as peak shaving and regulation, and the likelihood of realizing such benefits based on EV usage in Vermont and existing and expected technological capabilities.**

In the sections above, and in the context of a variety of examples, we've detailed the critical importance of technology-forward solutions, including managed charging, in delivering on the tremendous promise of EVs to the grid, and unlocking the benefits of transportation electrification. These solutions, in maximizing the ability to shift and shape EV load, are also key in helping to accelerate grid modernization and decarbonization efforts, through pairing with and supporting the integration of variable renewable energy resources. Indeed, while EVs themselves may not be a distributed energy resource, EV *charging* most definitely is. However, the extent of its impact and value is dependent on how intelligently the charging is managed, implicating, and requiring the leveraging of technology.

As illustrated in answers to the preceding questions, the technical capabilities to provide these benefits exist today and are mature, tested and proven. In industry parlance, these smart or managed charging solutions are referred to as "V1G", which often are overshadowed by discussions of future state bi-directional EV charging, known as "V2G", where vehicle batteries can also export power. While industry is actively working towards this future state, Greenlots emphasizes that most all of the benefits of V2G can be accomplished through current state V1G

technology. Indeed, all of the capabilities posed by this question — peak shaving and regulation — most definitely are commercially proven through current state V1G technology.

Greenlots emphasizes that the underlying key in providing these benefits and unlocking this value, in addition to technology, is a central utility role. Advanced rate design or technology-driven alternatives require advanced technology and communication norms to allow consumers to respond to TOU or more dynamic price signals, or participate in smart charging programs. Similarly, allowing utilities to actively manage the charging of EVs in response to real-time grid demands or constraints, requires appropriate software and hardware to make this both seamless for customers and the utility to implement. Managed charging programs then can provide grid services in the same way that demand response programs do, but can be more impactful as they can also increase load. This capability of load increase and decrease can be an extremely powerful tool in helping to manage and maximize the efficiency and utilization of grid assets and deliver value to all utility customers.

While keeping an eye towards the future, regulators and utilities should be working towards fully leveraging the technological capabilities that are already available today, which will both set the foundation for tomorrow, and position the grid to more fully realize the promise of transportation electrification. It is for these reasons that any taxpayer or ratepayer funded EV program should try to take best advantage of or otherwise utilize smart charging/smart chargers and the capabilities of technology-forward managed charging solutions.

## **5. The accuracy of electric metering and submetering technology for charging EVs.**

Submetering of EV loads is an important tool in working towards more effective load management, allowing for tariffs to be applied on an EV-only basis, providing customers with actual kWh use and costs for power associated with charging their EV, and avoiding the need for a costly separate utility meter. Greenlots notes, however, that the challenges associated with submetering aren't primarily associated with accuracy, as Level 2 internal metering can already largely meet revenue-grade accuracy requirements. The challenges instead tend to stem from utility-specific certification and testing, in addition to communications/telemetry costs and standardization, and data integration costs and complexity with utility backend billing systems (i.e. the technical interface, data format, business processes, exception management, etc.).

While these are challenges that should be worked on and overcome, Greenlots notes that alternative smart/managed charging solutions can provide similar benefits and create similar impact while avoiding many of these metering-related issues. For example, if an EV customer is compensated a flat amount monthly for participation in a managed charging program, there is no need for precise metering data for billing purposes, as the compensation to the customer isn't based on price response to a specific rate structure. Therefore, we encourage stakeholders and the Commission to both recognize the challenges that exist with submeters, and alternative solutions to overcome them. In many cases today, it may make the most sense to use submeters

within EV chargers for their value aside from providing revenue grade data for billing (i.e. for EV-specific consumption and cost data for the customer), while leveraging a managed charging program to create the beneficial charging behavior rather than awaiting uncertain price response to a specific rate.

## Conclusion

Greenlots appreciates the opportunity to respond to these key questions and issues, and the Commission's consideration of them. Utilizing technology such as smart, networked electric vehicle chargers and the advanced rate and managed charging capabilities they facilitate is key to more fully unlocking many of the benefits promised by transportation electrification and not leaving value for ratepayers on the table, now and in the future. We look forward to the workshop on March 15<sup>th</sup>, and continued investigation into the key issues related to best supporting transportation electrification and advanced mobility in Vermont.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Thomas Ashley', with a stylized, cursive script.

Thomas Ashley  
VP, Policy