greenlots®

June 6, 2018

Mr. Patrick Wruck
Commission Secretary
British Columbia Utilities Commission
6th Floor, 900 Howe Street
Vancouver, BC V6Z 2N3

Dear Mr. Wruck,

Enclosed please find Greenlots' response to Information Request No.1 from the British Columbia Utilities Commission as part of its Inquiry into the Regulation of Electric Vehicle Charging Service, Project No.1598941.

Sincerely,

Thomas Ashley
Vice President, Policy

June 6, 2018
Project No. 1598941: 'Inquiry into the Regulation of Electric Vehicle Charging Service'

Greenlots Response to Information Request No. 1 from the British Columbia Utilities Commission

A. INVESTMENT DECISION

1.0 EVCS business model and economics

1.1 In Greenlots' view, what asset utilization rate does Greenlots' view third-party investment would make economic sense? Please discuss the state of the EV market, including any market metrics if possible, where it would be economic for third-party to invest in EV charging infrastructure.

Response:

Greenlots' business model is to sell its products and services to motivated buyers. These products and services are in the deployment and management of EV charging infrastructure and don't tend to include direct to driver charging. That said we have engaged in or had visibility of many modeling exercises regarding DCFC profitability for third-party owner operators. While there can be many different electricity rate structures, demand charges, pricing options, maintenance requirements, etc. it is clear at this time that there may not be a feasible level of utilization at reasoned prices that would create a positive business case for third-party investment in and ownership and operation of charging infrastructure.

Part of the challenge here is that there is a practical limit on how much utilization a charger could reasonably facilitate, taking into account the time to switch cars, overnight hours, etc. That number seems to be in the range of 40-50% as a ceiling on feasible utilization. Economic modeling often tends to conclude that a utilization percentage beyond this feasible ceiling is necessary to get to break-even or indeed, profitability.

1.2 What particular regulatory and financial challenges do private and public entities face when making investment decisions in EV charging infrastructure?

Response:

The challenges most relevant to private entities making investment decisions regarding EV infrastructure are largely financial in nature. At the highest level, such investments simply do not pencil out. Even in a scenario where there are no upfront costs, it is difficult for charging infrastructure to pencil out as a business for private entities.

For regulated electric utilities, there are both regulatory and financial challenges. In the near term, financial motivation for utilities to invest in charging infrastructure can largely be related to the ability to leverage ratepayer funds and earn a regulated rate of return on those infrastructure investments.

In many jurisdictions, there is not a clear regulatory pathway for utilities to file infrastructure investment plans. While we believe Commissions have inherent authority and ability to approve such plans, many Commissions have been reticent to do so without clear enabling policy or guidelines, preferring not to be or perceived to be policymakers.

1.3 In Greenlots' view, if the regulatory definition of public utility did not apply to EV charging infrastructure to site hosts/third-parties, would private investors be able to charge a fee for EV charging services and still successfully compete with free EV charging from entities such as municipalities? Please provide any supporting evidence available.

Response:

This question contemplates a future scenario that currently seems far away. Namely 1) that there would be a level of EV adoption and therefore potential charging station utilization that could be profitable; and 2) that private investors would have business models focused on or primarily focused on charging for charging.

From a cost of product/service standpoint (free v. not free), it would be difficult to compete with free with anything other than free, unless there was a value add associated with the more expensive service. However, it seems somewhat far away when drivers will be price sensitive between different EV charging options. Indeed, that scenario would mean that there is a much more robust deployment of infrastructure that allows drivers to be price sensitive rather than most focused on convenience and need. Such price sensitivity is a natural frontier and evolution from the current price sensitivity evinced by EV drivers seeking to save fuel costs over gas.

Similar to the business model around gas stations, private investors may seek to pursue an economic model that relies not on profit or revenue related to charging for charging, but for other services or the sale of items such as the coffee, food, and goods that gas stations rely upon for profitability. Indeed, this seems a more plausible future model for the private market than charging for charging, but it inherently relies on a level of EV adoption that we are currently far from.

1.1 [should be labelled as 1.4] Please discuss the pros and cons of the four business models that are noted in the GCC-MJBA Report. Include considerations such as market growth, business sustainability, customer impacts, public interest, competition, and appropriate level of utility regulation. [question is in relation to DCFC specifically]

Response:

Neither the 'Business as Usual' nor the 'Make Ready' models will result in sufficient private investment in publicly-accessible DCFC at this stage in the market, even without regulatory barriers to private investment or the resale of electricity. The 'Utility Incentive' model would likely require an incentive as high as 100% and at the same time result in a fractured, less cohesive buildout of DCFC that is less likely to serve the public interest when the utility is not developing that infrastructure itself. Customers also

would not benefit from the well-documented and needed maintenance and reliability benefits that come from an end-to-end utility 'Owner-Operator' approach. For these reasons, and as detailed in our written evidence, Greenlots believes the utility 'Owner-Operator' model is the only model that currently fits the bill for the build out of publically-accessible DCFC.

2.0 Multi-Unit Residential Buildings (MURBs) & Curbside Parking

2.1 What difficulties have Greenlots observed regarding the installation and operation of charging infrastructure in MURBs and curbside charging? What products or services does Greenlots offer for this market?

Response:

While Greenlots offers many products and services that are appropriate for these market sectors, these are not areas that we have been significantly active in, primarily due to the lack of motivated buyers in these areas. As discussed elsewhere, utility programs and investment to overcome market barriers that exist in market segments such as these, such as the split incentive issue with MURBs, are powerful and oftentimes essential to accelerate the market and overcome such barriers. Curbside charging faces largely the same challenges as other forms of public charging, and for this reason similar tactics to animate the market, utility and public investment in particular, is appropriate and in many cases needed.

2.2 Please discuss which EV charging business model that is most suitable for MURBs (e.g. a public utility or third-party site host owned or operated).

Response:

As discussed in the previous response, Greenlots believes direct utility ownership and operation is the best approach to overcome the unique barriers that this market segment faces. An incentive-based approach could require an incentive as high as 100% in addition to make-ready costs being covered, and this approach would not bring the other benefits of utility ownership and operation that we've discussed elsewhere.

2.3 Please discuss which EV charging business model that is most suitable for curbside public charging (e.g. a public utility or third-party site host owned or operated).

Response:

Greenlots has seen a few different models for curbside charging, including direct experience supporting utility and municipal clients that have deployed curbside public charging. Depending upon the jurisdiction, there can be parking, sidewalk, access, and other challenges that a municipality may be best positioned to overcome. At the same time, the municipality will likely have a limited budget for deploying charging, meaning that a more comprehensive program would more likely be accomplished by the utility. Curbside is an area where innovative private market models that incorporate advertising or other value streams could have an increased likelihood of success over other market deployment contexts.

B. TECHNOLOGY

3.0 Open Charge Point Protocol (OCPP)

3.1 Please discuss Greenlots's view on the benefits and drawbacks of using OCPP. Would there be additional costs association with OCPP?

Response:

Greenlots is a strong, active and vocal proponent of open standards for both front-end and back-end interoperability, and we believe utilization of open standards significantly reduces and avoids costs rather than increase them.

As more and more EVSE is deployed and EVs are added to the roadways, the implications of competing, proprietary standards and networks become increasingly dire. Especially in the context of the lack of a profitable business model for charging deployments and networks as described previously, and the solvency issues that plagued this industry's pioneers, closed proprietary networks represent an unjustifiable increased risk that utilities, and ratepayers could be left with stranded assets or systems that do not meet evolving needs. Additionally, such networks stifle innovation and competition in both the EVSE hardware and software space, as infrastructure owners are limited in their selection of hardware to suit their varying needs and operational parameters and in their ability to easily switch software systems.

OCPP is the leading and freely available universal communication protocol that enables component vendors and network operators to mix and match interoperable hardware and software. It was developed by the Open Charge Alliance in response to these challenges associated with proprietary networks and is the de facto network communications protocol throughout Europe, the de facto open standard in the U.S. and is used in over 75 countries worldwide. In the United States, Volkswagen, as part of its $2 billion Electrify America investment, is requiring its network to be based on OCPP, and leading utilities are mandating it in their investments.

Because there has been little regulatory oversight of this space, the Commission need be aware that to date, the application of this open standard by some market participants is inadequate to ensure full flexibility and ongoing choice. Indeed, some applications have included proprietary components within this communication pathway. One such example is if the actual operation involves a closed, proprietary protocol between the back-office network and charging stations, and then a built interface between that server and another OCPP-compliant server, in effect translating between the proprietary protocol and OCPP, rather than ensuring a clean open communication pathway through and to the end device.

If in an attempt to promote competition among EV charging hardware companies, many utilities and regulators have not adequately considered the impact of proprietary networks, the complexity resulting from shoehorning the closed network the EVSE hardware runs on into an open and interoperable system will likely add significant cost and difficulty in harmonizing the management of charging station loads. It will also

significantly limit future flexibility for switching hardware and software, and in so doing, limit the potential for ongoing competition for both software and new hardware models. As competition is the driver of innovation, and innovation is what leads to customer choice, such a dynamic can have profoundly negative impacts on hardware and software markets and products.

This outcome can be avoided by a utility managing a charging station network in its territory using OCPP. Such a network would then support a truly competitive charging station hardware market, where companies compete to sell hardware to customers, with the charging network manager having the ability to integrate a broad array of stations via OCPP.

This approach has a number of advantages. First, the utility will have direct access to the data it needs to manage the charging stations for the ratepayers' benefit. Second, the approach promotes competition across the spectrum. Hardware companies will compete to sell hardware – and network companies will compete to manage the network — both at the point of initial decision-making, but also at any (or every) point forward. To the extent that a utility wants to switch out its network vendor, it can because the stations in the network will be accessible via an open protocol. Third, it reduces the risk of utility programs having ratepayer or taxpayer-funded stranded assets in the field. This is not just about if or when a company operating a proprietary charging station ceases operations — or fails to maintain its stations— it is also about the pace of innovation and whether a network or product set is providing the features and services desired. If the station is compatible with OCPP, it is easy to continue to access that station and operate it in the former scenario, and easy to switch network providers if the incumbent is not delivering what the utility desires.

With such a network in place, significant complexity and risk is eliminated for the utility and ratepayers while providing maximum choice and competition.

Those in the industry will remember analogous troubles in the earlier days of demand response programs and networks, in addition to more recent issues with the rollout of AMI hardware and networks. The strategy as described above would learn from these experiences and avoid making similar mistakes while creating a robust platform for EVSE hardware and software competition and innovation that also best protects ratepayer investments.

C. RATES

4.0 Grid Optimization and Ratemaking

4.1 Please elaborate on specific methods that utility participation can encourage better grid use and lower rates. How would this be measured?

Response:

There are many ways that a strong utility hand in transportation electrification can encourage better grid use and lower rates. The sizable amount of new load that will be

brought onto the grid as a result of transportation electrification is well documented, as is the reality that this load growth can either exacerbate or existing grid constraints or be a key tool in mitigating such problems. One of clearest examples through which an active utility role can ensure benefits to the grid is through the implementation of managed charging programs. Such programs can be designed to be responsive to utility signals reflecting actual grid conditions, or forecasted and incorporated into smart charging algorithms.

Greenlots believes that one of the most effective way to maximize grid benefits is through the utilization of smart charging technologies. Indeed, such technology is the key to more advanced rates generally, as it allows loads to be responsive to such programs and utility signals based on pre-programed consumer preferences and needs without any active role on the part of consumers. Of course, a simpler and less impactful approach is to do this through rate design. While we are cognizant of the fact that some of the benefits of managed charging may be less applicable to a hydro-abundant grid, utilizing these tools to avoid problems and make the system more efficient while increase utilization nevertheless has the power to lower costs to all ratepayers.

Several other intervenors and participants in this process have elaborated on this topic also. For example, Toronto Hydro in its comments offered at the Vancouver community input session discussed how increased EV charging can decrease rates for all utility customers with a central utility role requiring "experience by entities who are used to developing electricity infrastructure", referencing the power of managed charging and citing a study by E3 (see transcript at page 373).

There are many other valuable reference materials on this topic also. Please see "Utilities and Electric Vehicles: The Case for Managed Charging" published by SEPA in April 2017, available here: https://sepapower.org/resource/ev-managed-charging/ Please also see "Electric Utility Roles in the Electric Vehicle (EV) Market: Consensus Principles for Utility EV Program Design" published by the Midcontinent Transportation Electrification Collaborative in April 2018, in particular the section "System and Consumer Benefits" beginning on page 9, available here: http://www.betterenergy.org/wp-content/uploads/2018/04/MTEC_White_Paper_April_2018-1-1.pdf

Additionally, please see the section titled "How Should the Costs and Benefits of Utility Investment in Charging Infrastructure Be Assessed, and How Can Programs Be Designed to Maximize the Benefits?" beginning on page 16 of the MJB&A report "Utility Investment in Electric Vehicle Charging Infrastructure" cited by BCUC in the "Investment Decision" question section of this information request.

Finally, please see "A Plug for Effective EV Rates" published by Synapse Energy Economics" in March 2017, available here: http://www.synapse-energy.com/sites/default/files/A-Plug-for-Effective-EV-Rates-S66-020.pdf

These are just some of a wealth of research, studies and resources on this critical topic.

4.2 Please elaborate on how benefits, such as avoiding fossil fuel emissions and efficient grid use, can be incorporated into traditional cost of service ratemaking (or other types of regulated public utility ratemaking).

Response:

In short, this should be done by ensuring that quantifiable benefits associated with electric vehicles – beyond those specific to the grid – in addition to related public policy goals, are considered alongside the costs. This is another topic on which it is likely more helpful to point to more comprehensive resources. Please see Ontario Energy Board's "Handbook to Utility Rate Applications" regarding how it incorporates public policy goals into ratemaking, available here: https://www.oeb.ca/oeb/_Documents/Regulatory/OEB_Rate_Handbook.pdf

Please also see the section titled "How Should Utilities Recover the Costs of Infrastructure Investment?" beginning on page 18 of the previously referenced MJB&A report.

Finally, please see "The Economics of EVs and Grid Integration" in beginning on page 23 of Rocky Mountain Institute's "From Gas to Grid" report, available here: https://www.rmi.org/insights/reports/from_gas_to_grid/

These also are just some of a wealth of research, studies and resources on this important topic.

4.3 Please elaborate on how environmental benefits and costs can be accounted for in traditional cost of service ratemaking, or other types of regulated public utility ratemaking.

Response:

In a similar vein to our previous answer, this should be done by ensuring that quantifiable benefits associated with electric vehicles – beyond those specific to the grid – in addition to related public policy goals, are considered alongside the costs. The materials referenced above are also good resources for this question.

4.4 In the absence of dynamic pricing options as described in the preamble, what is Greenlots' view on other rate structures that could be employed by public utilities to charge EV charging station site hosts?

Response:

The previously cited resources provide a significant amount of perspective on this topic. In short, in the context of EV-specific rates, Greenlots believes that rates should reflect actual grid conditions and costs as closely as feasible to deliver as accurate of a price signal to consumers as possible. That may mean only TOU rates if other more nuanced options aren't feasible or perhaps if grid costs are not dynamic enough to justify more dynamic rates.

5.0 Rate design – charging station to EV customer

5.1 What is Greenlots' view on alternative rate structures, such as BC Hydro's suggestion to differentiate time-based charges to vary based on vehicle capacity?

Response:

Greenlots is supportive of and can facilitate a wide range of pricing and smart charging approaches. As we understand the suggestion, this approach would require further investigation.

5.2 Please explain whether Greenlots' systems would be able to differentiate EV charging rates based on vehicle capacity.

Response:

Without access to vehicle telematics or a manual (at least initially) communication from the driver, it is difficult to determine a vehicle's battery capacity in an AC Level 2 charging scenario. For DC, there is a communicated awareness of the battery characteristics when the vehicle is plugged in and a charge initialized. While there is a methodology that allows for a rough determination of remaining battery capacity on AC Level 2, it is less precise than desirable, and does not allow for an awareness of the original battery capacity regardless of state of charge.

D. HYDROGEN FUEL CELL TECHNOLOGY

6.0 Fuel Cell Electric Vehicle (FCEV)

6.1 Please discuss whether Greenlots has any involvement in FCEVs and/or FCEV fueling infrastructure.

Response:

Greenlots does not participate in the FCEV fueling market.