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May 3, 2018

Via email/eFile

BCUC REGULATION OF ELECTRIC VEHICLE CHARGING SERVICE INQUIRY EXHIBIT A-15

Ms. Diane Roy
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FortisBC Inc.
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Re: British Columbia Utilities Commission – An Inquiry into the Regulation of Electric Vehicle Charging Service – Project Number 1598941 – Information Request No. 1

Dear Ms. Roy:

Further to your March 16, 2018 filing of written evidence with respect to the above-noted Inquiry, enclosed please find British Columbia Utilities Commission (BCUC) Information Request No. 1. In accordance with the regulatory timetable, please file your responses on or before Wednesday, June 6, 2018.

The BCUC's Rules of Practice and Procedure (Rules) set out in Order G-1-16 provide guidance and establish requirements for participants in BCUC proceedings. Subject to section 14 of the Rules, all parties that receive an information request must provide full and adequate response to each question.

The BCUC's Rules of Practice and Procedure can be viewed here:
https://www.ordersdecisions.bcuc.com/bcuc/orders/en/127520/1/document.do

If you have any questions regarding the information request process, please contact Commission Secretary.

Sincerely,

Original signed by:

Patrick Wruck
Commission Secretary

/dg
Enclosure

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British Columbia Utilities Commission
An Inquiry into the Regulation of Electric Vehicle Charging Service

INFORMATION REQUEST NO. 1 TO FORTISBC INC.

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A. BASIS FOR EV CHARGING SERVICE REGULATION EXEMPTION

1.0 Reference: Exhibit C12-2, pp. 5, 15–16; Exhibit C19-2, pp. 7–8, 12
The British Columbia Utilities Commission (BCUC) Retail Markets Downstream of the Utility Meter Guidelines (RMDM), dated April 1997, p. 3
Degree of competition

On page 5 of Exhibit C12-2, FortisBC Inc. (FBC) states: "Based on the current state of the EV market and projections for the near future, FBC believes that investment by both utilities and government is required to encourage growth."

On page 8 of Exhibit C19-2, citing an article from the Center for Strategic and International Studies, British Columbia Ministry of Energy, Mines and Petroleum Resources (MEMPR) states:

> [The article] notes that establishing a profitable business model for EV charging infrastructure is challenging because of high upfront investment costs, low and uncertain near-term demand, and competition from home charging. The article notes that some see utilities "as the way to overcome all three of these challenges: utilities can address uncertainty by being told by regulators to install infrastructure (and at a pace directed by the regulator), can address the financing challenges by seeking ratebasing for the infrastructure, and can deploy in the immediate term if directed to do so by public utility commissions. In short, the market challenges faced by third-party EV charging vendors evaporate when the utility is the one doing the installing." Disadvantages of public utility involvement include the potential risk to ratepayers and the potential for stifled competition.

On page 7 of Exhibit C19-2, MEMPR states: "For Level 3 charging stations, there are barriers to entry, which suggests that utilities have an opportunity to play an important role in developing this market."

Further, on page 12, MEMPR states that it "supports a role for public utilities in "kick-starting" the market for EV charging services. A role for public utilities would not preclude other entities from also investing in EV charging services."

In the BCUC's Retail Markets Downstream of the Utility Meter Guidelines, dated April 1997 (RMDM Guidelines)[1], on page 3, it states:

> In general, the total range of goods and services potentially provided by energy utilities can be categorized as belonging to one of three areas… These areas are: goods and services which still clearly are defined as core monopoly products (e.g., wires and pipes), competitive products which could best be produced by a variety of players operating within a competitive market (e.g., appliance sales), and debatable/transitional products, i.e., those which are associated with the monopoly core and which may or may not be considered true monopoly activities depending on one's assessment at any given time (e.g., billing/meter information). For example, **these products might be provided by the utility as they emerge, later be produced by a mix of utility and unregulated providers as the market grows and eventually be provided solely by the competitive market when the market is mature (e.g., natural gas vehicle conversions).** Core monopoly products result primarily from economies of scale or scope and are expected to decrease as a result of advances in technology reducing these economies, competitors' demands for access to the market for these products, customers' demands for more choice and the success of deregulation elsewhere. [*Emphasis added*]

1.1 Does FBC have a position on the extent to which utilities should be encouraged to take a lead on installing EV infrastructure (Level 2 and direct current fast charging [DCFC]) as a means of scaling up significant expansion of public EV charging infrastructure in BC? Please explain whether FBC considers that public utility involvement in BC could stifle competition in the EV charging marketplace.

1.1.1 In light of the RMDM Guidelines, does FBC have a position on whether utility involvement in the EV charging service market should change as the market matures?

1.1.1.1 If so, please explain and provide any key indicators that FBC considers would demonstrate market maturity. For example, should this be the number of EVs fleet in BC, number of EV charging stations/ports per EV, distance measured between public EV charging stations, or some other measures?

1.1.2 Is FBC aware of any jurisdiction where the unregulated providers and/or private third-party investors are leading the EV charging market? Please discuss the stage of growth of the EV market in such jurisdiction, the policy environment, and the regulatory environment.

1.1.3 In FBC's view, under what market conditions would private third-party investment be more appropriate than public utility investments in the EV charging service market?

1.2 Does FBC consider that the commencement, continuation, or proliferation of regulated utilities like FBC or the British Columbia Hydro and Power Authority (BC Hydro) in the EV charging service to be a barrier for other third-party service providers to enter this market? Please explain why or why not.

1.2.1 What are the incentives for other third-party service providers to enter this market if it is/will be dominated by regulated utilities with a large customer base to spread its costs over.

1.3 Please discuss whether the RMDM Guidelines which govern activities of regulated utilities wishing to enter into a market that is after the customer's meter would apply in the case of EV charging service. Why or why not?

[1] http://www.bcuc.com/Documents/Guidelines/RMDMGuidelns.pdf

1.4 In a competitive market, there are low barriers to enter and exit. Please discuss the potential issues, if any, should EV charging service providers freely exit the market at any time.

1.5 Please discuss FBC's view on the degree of captivity of customers in multi-dwelling residences and on rural highways.

On page 16 of Exhibit C12-2, FBC states:

> FBC believes that in an emerging EV market, there is room for both public utilities and non regulated entities to participate and that any concerns can be mitigated through appropriate oversight by the Commission, such as through the establishment of guiding principles that would allow utilities to support the development of EV markets in BC.

1.6 Please outline what FBCs considers to be "guiding principles" and what that might look like.

On pages 15-16 of Exhibit C12-2, FBC states:

> Initially, the CPUC [California Public Utilities Commission] expressed strong concerns with regard to utility ownership of EV charging infrastructure and providing EV charging services, and imposed strict limits on such activities. However, in a 2014 decision (D.14-12-079), the CPUC overturned its earlier prohibition against utility EV infrastructure ownership. The CPUC cited the following as reasons for overturning the broad prohibition on utility ownership of EV infrastructure:
>
> …the utilities have a crucial role in the electrification of transportation as the infrastructure support and fuel supplier in their service territories.
>
> …certain market segments are harder for third parties to penetrate and the utilities may be better positioned to develop those market segments or support third party providers to do so.
>
> …even limited utility involvement to accelerate the PEV infrastructure market can improve the business case for third parties.

Footnote 25 on page 15 of Exhibit C12-2 identifies the initial CPUC decision (2011 Decision).[2]

1.7 Is FBC aware of any study or article that outlines what the state of the California EV charging market was before CPUC's 2011 Decision, after CPUC's 2011 Decision, and now after CPUC's 2014 Decision? If yes, please provide as a submission in this proceeding and discuss.

2.0 Reference: Exhibit C1-2, pp. 8, 12
Evolution of the EV market and regulation

On page 8 of Exhibit C1-2, BC Hydro states: "Currently in B.C. there are a limited number of DCFC stations, and outside of urban areas in particular there is not a fully competitive environment; that is, one in which charging stations can compete and fully differentiate by price, location and other attributes."

[2] CPUC Decision 11-07-029, pp. 49-50.
http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/139969.PDF

On page 12 of Exhibit C1-2, BC Hydro states: "BC Hydro supports reasonable level of regulation that enables market growth and cost recovery, at least until some future period when the market may have advanced and the Commission warrants that the regulation of EV services should be revisited."

2.1 If the EV charging service were to be regulated in the short term, and as degree of competitiveness in the EV market evolves, please discuss FBC's view on what would be specific market triggers for the BCUC to re-evaluate regulation?

3.0 Reference: Exhibit C19-2, pp. 7, 10
Other jurisdictions

On page 7 of Exhibit C19-2, MEMPR states: "Similar to the current regulatory scheme in BC, some other US States require EV charging service providers to become public utilities, subject to all other aspects of energy regulation, including pricing."

In response to the BCUC's question 3 on "Should the Commission regulate the services provided by EV charging stations? What are benefits and detriments to such regulation? ", MEMPR states on page 10 of Exhibit C19-2, "The experience from other jurisdictions shows that a variety of regulatory models for EV charging services are feasible, ranging from full regulation as public utilities to no public utility commission oversight."

3.1 Has FBC reviewed other jurisdictions to explore the different regulatory environments in EV charging service? If yes:

3.1.1 Please list the jurisdictions and discuss any key differences between the jurisdictions cited with the BC market or regulatory environment that FBC is aware of, which may affect comparability.

3.1.2 Does FBC have a view on whether any of the regulatory models in other jurisdictions as reviewed by FBC are preferred or unsuitable for BC? Please discuss.

4.0 Reference: Exhibit C12-2, p. 22
Exhibit C6-2, p. 5
The BCUC's Thermal Energy System Guidelines (TES Guidelines), p. 7
Class of cases exemption

On page 22 of Exhibit C12-2, FBC states: "Another item that may assist in the effective and efficient review of the Inquiry is to consider amendments to the UCA or an exemption from parts of the UCA that would encourage non-utility companies to participate in and encourage the development of the EV market."

4.1 Please confirm that the above statement refers to the definition of public utility in the UCA. Otherwise, please identify other proposed amendments to the UCA.

On page 5 of Exhibit C6-2, BC Sustainable Energy Association and Sierra Club BC (BCSEA) states:

> 7. The Commission should consider, either within this Inquiry or in a follow-on proceeding, exercising its authority under section 88(3) of the UCA to exempt from some or all of the provisions of the Act certain classes of entities providing EV charging services (to be defined) that but for the exemption would be "public utilities" and regulated under the Act. (For clarity, this includes entities providing EV charging services that may not currently meet the definition of "public utility" but that likely would do so if they started to receive compensation for their EV charging services.) An exemption under s. 88(3) requires the advance approval of the Minister responsible for BC Hydro, i.e., the Minister of Energy, Mines and Petroleum Resources.

On May 19, 2016 by Order G-71-16, the BCUC granted Bakerview EcoDairy an exemption from Part 3 of the UCA, except sections 25, 38, 42, 43, 44 and 49.[3]

4.2 In FBC's view, if the BCUC were to recommend a class of cases exemption to government in relation to EV charging service, what factors should be considered in developing the classes? Further, what sections of the UCA, in FBC's view, should EV charging service be exempt from?

4.3 Does FBC have a view on what the classes could be (e.g. based on different levels of EV charging equipment, charging station geographic locations, type of dwelling, owner/operator structure, some combination of the above, or others)? If yes, please describe.

On page 7 of the BCUC's Thermal Energy System Guidelines (TES Guidelines), it states:

> Strata Corporation TES[4]: A TES owned or operated by a Strata Corporation, or the Strata Corporation's lessee, trustee, receiver or liquidator, that supplies the Strata Corporation's owners, is exempt from Part 3 of the UCA other than sections 42, 43 and 44.

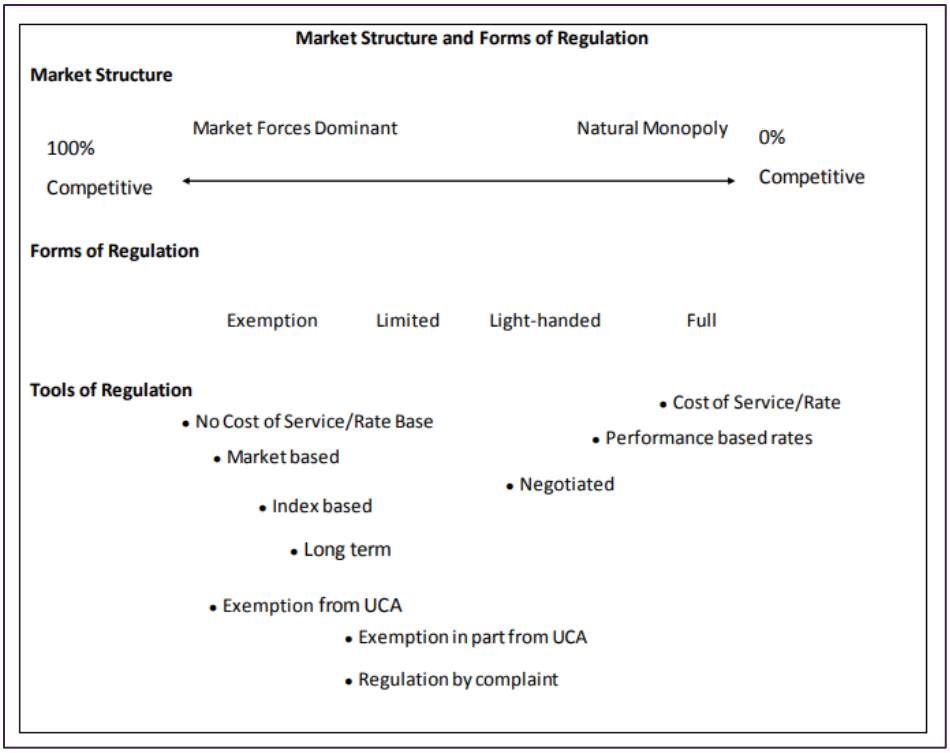
4.4 In FBC's view, should an exemption similar to the Strata Corporation exemption in the TES Guidelines be considered for Strata Corporations if EV charging service were to be regulated by the BCUC? Please discuss.

5.0 Reference: The BCUC Inquiry into FortisBC Energy Inc.'s Offering of Products and Services in Alternative Energy Solutions (AES) and Other New Initiatives proceeding, Order G-231-13A with reasons for decision, pp. 23–24
Proposed regulatory framework and guide for thermal energy service utilities

On pages 23 and 24 of the in the Reasons for Decision attached to Order G-231-13A, the BCUC states:

> The [AES] Inquiry found that the form of regulation should be determined by the market structure. The Panel agrees with this assessment. The figure below illustrates the Panel's view of the relationship between market structure and the various tools of regulation.

[3] http://www.bcuc.com/Documents/Proceedings/2016/DOC_46352_05-19-2016_Bakerview-Exemption-Approved_G-71-16.pdf
[4] As defined by the *Strata Property Act* [SBC 1998].



The Panel in Order G-231-13A also agreed with the basic regulatory concepts outlined in the AES Inquiry Report whereby regulation should be the option of last resort and competition should always be preferred over regulation.

5.1 Please discuss whether the BCUC in this EV Inquiry should consider the relationship between market structure and forms of regulation, as shown above in the diagram. If not, why not?

5.2 Suppose the BCUC uses the above diagram as a guide to determine the appropriate form of regulation. Given the market structure noted in FBC's submission, what would be the corresponding form of regulation and tool of regulation? If any different, please explain in terms of the FBC's view of the current market structure and the expected market structure in the next 3-5 years.

6.0 Reference: Exhibit C1-2, p. 11; Exhibit C26-2, p. 1; Exhibit C1-2, p. 11
Regulator's responsibility

On page 11 of Exhibit C1-2, BC Hydro states "…public utilities are well-positioned to meet the expectations of the regulator in relation to service quality and the reliability of EV charging services."

On page 1 of Exhibit C26-2, Electrical Contractors Association of British Columbia (ECABC) states:

> …ECABC wants to reinforce the importance of requiring the installation and maintenance of EV charging stations is done exclusively by appropriately trained and qualified journeyman electricians. This ensures the safety and reliability of all EV charging stations.

6.1 In FBC's view, what are the indicators for "service quality" of an EV charging station?

6.2 In FBC's view, what are the indicators for "reliability" of an EV charging station?

6.3 In FBC's view, what are the indicators for "safety" of an EV charging station?

6.4 If EV charging service is regulated, please discuss what would be the BCUC's role as a regulator in relation to (i) service quality, (ii) reliability, and (iii) safety?

Section 38 of the *Utilities Commission Act* (UCA) states:

> A public utility must
>
> (a) provide, and
>
> (b) maintain its property and equipment in a condition to enable it to provide,
>
> a service to the public that the commission considers is in all respects adequate, safe, efficient, just and reasonable.

6.5 If EV charging service is regulated, in FBC's view, does an obligation to provide a service exist? If yes:

6.5.1 What are the EV charging station's owner and/or operator's obligations to provide service?

6.5.2 Does the physical configuration of the adaptor, to ensure any type of EV can charge at the station, fall under an obligation to provide service? Please discuss.

6.6 What are FBC comments on the BCUC's jurisdictional in the regulation of safety and service? Could the BCUC regulate EV charging on the basis of safety and service yet refrain from regulating rates? Please discuss the pros and cons and market impact to stakeholders if such a model were to be recommended.

6.7 Sponsored by BC Hydro, the Canadian EV Infrastructure Deployment Guidelines 2013[5] discusses safety protocols in EV infrastructure. Please discuss FBC's involvement and requirements in terms of safety as it relates to installation, operations, and maintenance of EV supply equipment.

7.0 Reference: Exhibit C12-2, pp. 15, 20, Exhibit C35-2, pp. 4, 9–10, Potential cross-subsidization

On pages 15 and 20 of Exhibit C12-2, FBC states:

> Deployment of EV infrastructure should be considered as a whole in BC and not as individual locations. The BCUC can enable the mass deployment of public infrastructure in the public interest and which may balance the obligation to serve all customers in all locations (profitable and unprofitable) with the right to serve all locations; this is advantageous for network infrastructure that relies on having a large and diverse geography, irrespective of the costs of individual locations.
>
> Depending on how demand materializes over the coming years, there is the potential for some cross-subsidization from other rate classes to support this new service. This needs to be balanced against the need to develop the EV market, to support government policy, and the potential for net benefits to be provided to other rate classes.

[5] https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/power-smart/guides-tips/canadian-ev-infrastructure-deployment-guidelines-2013.pdf

FBC believes that the potential for significant cross-subsidization from other ratepayers is small.

7.1 What are the assumptions underlying the statement above in that the "potential for significant cross-subsidization from other ratepayers is small." Would the level of potential cross subsidization depend on the rate of EV uptake in the province, technological changes in EV batteries and charging infrastructure, any grants or subsidies from third parties, other variables? Please discuss.

7.2 What does FBC view as the key indicators of when cross subsidization becomes "unduly" discriminatory?

On page 4 of Exhibit C35-2, Victoria Electric Vehicle Association (EVA) states: "EVs contribute to gross BC Hydro revenues and do not currently present a cross-subsidization issue," and on pages 9 and 10, it submits two principals based on:

> That the original purpose of public utilities was to make energy (electricity and natural gas) available to all the citizens of a province or state recognizing that it was in the general public interest for urban area ratepayers to financially support the higher costs of providing the utility to rural areas .
>
> There is a lower risk of cross subsidization as each EV contributes additional hydro revenues with no immediate additional grid costs. Each block of 10,000 EVs entering service adds as much as $ 2.3 million per year to gross BC Hydro revenues with minimal cost impacts on the existing electricity grid infrastructure.

As per footnote 12 in Exhibit C35-2, the estimated additional revenue is based on 10,000 EVs @ 13,000 km (Stats Canada 2009) @ 160 Wh/km= 2,080 kWh / year @ 0.11.kWh = $ 2.3 m per year.

In a report authored Georgetown Climate Center and by M.J. Bradley & Associates, titled "Utility Investment in the Electric Vehicle Charging Grid: Key Regulatory Considerations" dated November 2017[6] (GCC-MJBA Report), on page 16, it states:

> … a utility can play a critical role in jumpstarting the electric vehicle market; however, such proactive investment necessitates a tolerance for risk in accepting some number of unprofitable or underutilized projects.

7.3 Please provide FBC's view on the first principal that the Victoria EVA submitted.

7.3.1 In light of the GCC-MJBA Report, please provide FBC's view on that public utility plays "a critical role in jumpstarting the electric vehicle market" but needs to accept some "unprofitable or underutilized projects."

7.3.2 Is it plausible that the EV charging market will result in public utilities taking on unprofitable or underutilized projects while site host / third-party investors will pick only high return projects?

7.4 With respect to the second principal, please comment on Victoria EVA's estimate of $2.3 million per year based on 10,000 EVs at 13,000km.

7.5 In FBC's view, is cross-subsidization measurable or verifiable? If so, how? At what point is this cross-subsidization "unduly preferential or discriminatory" or "unfair"?

[6] http://www.georgetownclimate.org/files/report/GCC-MJBA_Utility-Investment-in-EV-Charging-Infrastructure.pdf

B. INVESTMENT DECISION

8.0 Reference: Exhibit C12-2, pp. 5, 11, 12; Exhibit C20-2, pp. 3–4; Exhibit C34-2, pp. 5, 9
DCFC – business model and economics

On page 12 of Exhibit C12-2, FBC states "the current number of EV owners (buyers) and estimated demand for EV Level 3 charging service does not support recovery of the infrastructure and service costs, particularly in the earlier years."

8.1 What is FBC's estimate of the level of EV penetration required for FBC-owned DCFC stations to break-even for FBC? Provide all the assumptions including the different types of costs and revenue. Please express in terms of charges per day (or hour), if possible.

On page 5 of Exhibit C12-2, FBC indicates that there are 42 DCFC stations and 43 DCFC ports in BC excluding Tesla Superchargers.

8.2 Please comment on the benefits and costs of having multiple ports per station as compared to a single port per station?

8.2.1 Please explain if there are any economies of scale by adding multiple ports per station. What is the incremental cost for additional charging ports?

8.2.2 Please elaborate on the technical limitations or right of way concerns of having multiple ports at stations.

On page 11 of Exhibit C12-2, FBC states:

> There are financial barriers to entities entering the market due to demand being low and therefore infrastructure is not cost effective, even when considering subsidies and incentives from government and other agencies.

On pages 3 to 4 of Exhibit C20-2, AddÉnergie Technologies Inc. (AddÉnergie) states:

> AddÉnergie has provided a Generic DCFC Financial Model (the Generic Model, attached as Appendix A) based on BC Hydro's and FortisBC's respective commercial rates to illustrate how a standard DCFC is likely to perform under different charging scenarios. There are relatively limited scenarios in which a station is likely to recover costs within a decade under the current BC Hydro general service business rate or Fortis BC commercial rates even assuming a $20/hour cost of charging, which is double the rate used in Québec's Electric Circuit, Canada's most advanced EV charging network, and assuming no cost of capital (i.e., that projects are financed at 0% interest).

The Generic Model contains a number of charging station operation assumptions and charging station usage assumptions.

8.3 Please comment on the assumptions of AddÉnergie's model and if the model is a reasonable depiction of DCFC station ownership and operation.

8.4 In FBC's view, please discuss which component of AddÉnergie's model will be sensitive to material changes in the next five years given the developments in the EV market. Please explain.

On page 5 of Exhibit C34-2, Community Energy Association (CEA) provides an illustrative example of a Level 3 Charging Station Business Model. Further, CEA submits that the model is known to be incomplete regarding differences in utility versus non-utility ownership and operation.

On page 9 of Exhibit C34-2, CEA submits that "Non-utility DCFC owner/operators currently have high demand charges for DCFC equipment (typically 50kWh systems) that utilities do not appear to account for in their internal costs for DCFC."

8.5 Please comment on the assumptions of CEA's model and if the model is a reasonable depiction of DCFC station ownership and operation.

8.6 In FBC's view, please discuss which component of CEA's model will be sensitive to material changes in the next five years given the developments in the EV market. Please explain.

8.7 Please comment on CEA's assertion that public utilities do not appear to account for demand charges in internal cost estimates. Please clarify where FBC would account for the cost of peak demand on grid infrastructure.

9.0 Reference: Exhibit C20-2, p. 6; Exhibit C15-2, p. 2
DCFC - third-party investment

On page 6 of Exhibit C20-2, AddÉnergie submits:

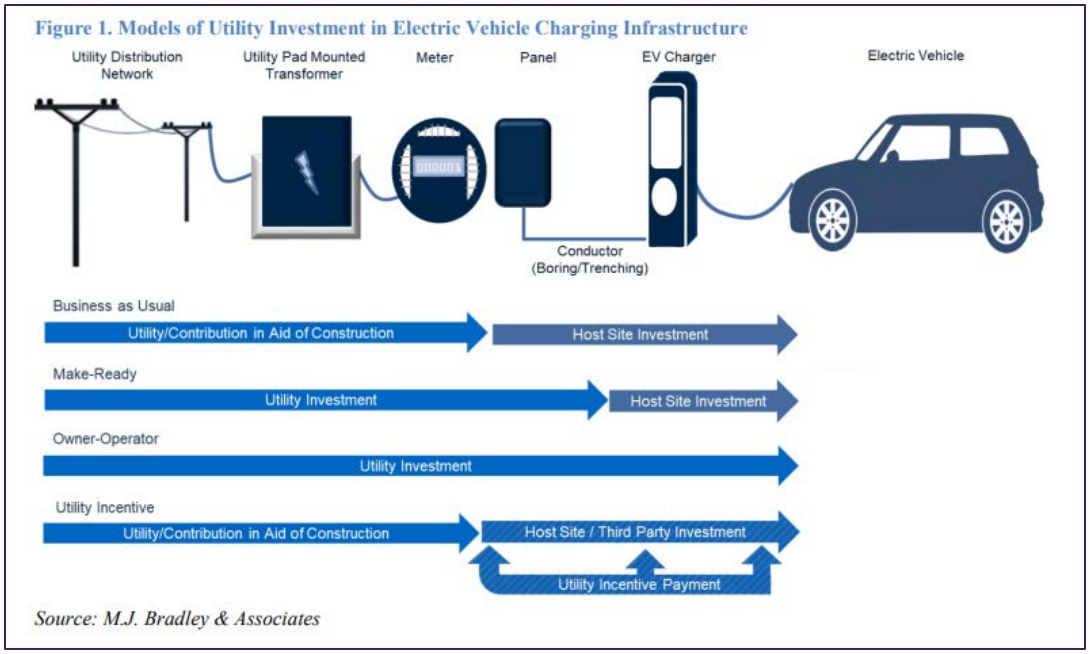
> That the major barrier to EV charging station competitiveness is that British Columbia lacks a comprehensive network of charging stations and that one is unlikely to be developed by [third-party] investment alone.

On page 2 of Exhibit C15-2, Greenlots submits:

> [Unfortunately] a sustainable, competitive market is aspirational, and is unlikely to arise prior to the adoption of a critical mass of electric vehicles. This is primarily on account of a lack of a business model for the ownership and operation of public charging stations based on sustainable revenues from charging activities, and this has thus far resulted in a fundamentally inadequate amount of [third-party] investment in such charging infrastructure.

In a report authored Georgetown Climate Center and by M.J. Bradley & Associates, titled "Utility Investment in the Electric Vehicle Charging Grid: Key Regulatory Considerations" dated November 2017[7] (GCC-MJBA Report), on page 9, Figure 1 provides the models of utility investment in EV charging infrastructure: (i) business as usual, (ii) make-ready, (iii) owner-operator, and (iv) utility incentive:

[7] http://www.georgetownclimate.org/files/report/GCC-MJBA_Utility-Investment-in-EV-Charging-Infrastructure.pdf



9.1 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 level of regulation.

10.0 Reference: Exhibit C12-2, pp. 4-5, Appendix 4, p. 1; Exhibit C28-2, p. 1; Transcript, Volume 7,p. 338
EV range and number of public EV charging stations

On page 4 of Exhibit C12-2, FBC states: "A report by Mogile Technologies Inc. (the Mogile Report) documenting the number and range of rates for Level 2 and DCFC stations across Canada… identifies a number of Level 2 and Level 3 DCFC charging locations in BC and across Canada." FBC provided it's summarized version of the Mogile Report as Table 2-2 on page 5 of Exhibit C12-2, specifically indicating in footnote 10 that the table "Excludes Tesla Chargers":

Table 2-2: EV Charging Station Types in BC[10]

Type of Charging	# of Locations	# of Ports
Level 2	532	940
Level 3	42	43
Total	574	983

On page 1 of Exhibit C28-2, Tesla Motors Canada ULC (Tesla) states:

> Tesla develops Supercharger stations which contain multiple DC-fast chargers capable of delivering approximately 270 km of driving range in 30 minutes. As of February, 28 2018, Tesla operates 78 Supercharger connectors at 10 sites in the province. In addition, Tesla has partnered in the installation of 190 public "Destination Chargers" (Level-2) at over 100 sites in British Columbia.

At the Nanaimo Community Input Session, Ms. Turner suggested:

> … The research that I've done so far has indicated that the battery capacity for a full EV used to be 250 kilometres. It's now up to 383 in the particular vehicle that I was looking at.

In two or three years perhaps that capacity will have increased, and therefore the need for charging stations will be reduced, just by virtue of not being concerned.[8]

10.1 Please comment on Ms. Turner's submission that when vehicle capacity increase, the distance range available will also increase. Thus, the need for charging stations will be reduced.

10.1.1 Please discuss how FBC's EV charging station investment decision considers the possible inverse relationship between technological growth in EV distance range and charging stations.

11.0 Reference: Exhibit C20-2, p. 2
Multi-unit residential buildings & curbside parking

On page 2 of Exhibit C20-2, AddÉnergie states:

> Direct current fast charger (DCFC) and multi-unit residential building (MURB) home charging are unlikely to be widely and comprehensively deployed in British Columbia without public utility involvement because of the current economic barriers facing charging providers and still-emerging demand for EV charging in many parts of the province. Curbside public charging faces similar cost and also regulatory challenges that are likely to inhibit its widespread deployment.

11.1 What difficulties have FBC observed regarding the installation and operation of charging infrastructure in Multi-unit residential buildings (MURBs) and curbside charging?

11.2 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).

11.3 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).

On page 2 of Exhibit C9-2, the Urban Development Institute (UDI) states "Currently, BC Hydro is not allowed to provide metering to each of the stalls in parking garages in residential buildings."

11.4 Please comment on UDI's statement. Please discuss whether FBC is able to provide metering to each stall in parking garages in residential buildings.

C. TECHNOLOGY

12.0 Reference: Exhibit C1-2, Appendix A, p. 4
Future technologies

On page 4 of Appendix A in BC Hydro's Exhibit C1-2, BC Hydro discusses a new technology, AC Level 3, which is still in development.

12.1 Please discuss the considerations the BCUC should make in this Inquiry about AC Level 3 and/or other future technologies.

[8] Transcript, Volume 7, p. 338.

13.0 Reference: Exhibit C12-2, Appendix 1, p. iv, p. 55
Energy Sale to the Grid

On FBC's website on the Net metering program,[9] FBC provides information regarding its Net Metering Program, including the Guidelines for Operating, Metering, and Protective Relaying for Net Metered Systems up to 50kW and below 750 volts (Net Metering Interconnection Guidelines):[10]

> These guidelines state the minimum requirements for safe and effective parallel operation of the FortisBC system with customer owned generation. Both customers and FortisBC personnel should be guided by this document when planning installations of other than FortisBC owned generation.

In Appendix 1 of Exhibit C12-2, FBC has included Background Report EV Technology and Market Overview from PowerTech dated October 19, 2016.

On page iv of Appendix 1 in FBC's Exhibit C12-2, FBC states: "Vehicle-to-Grid (V2G) is a concept that involves EVs acting as a source of energy, potentially to provide backup power or to support grid operations."

On page 55 of Appendix 1 in FBC's Exhibit C12-2, FBC states:

> …V2G has thus far largely remained the subject of small trials and pilot demonstrations. These demonstrations generally require the support of the automaker, as accessing the battery onboard a vehicle for V2G purposes either requires an inverter that is built into the vehicle, or at least vehicle software that permits reverse power flow while connected to a DC station.

13.1 Please discuss the benefits and drawbacks of EV's providing electric power to the grid. Include any current economic and technical challenges to implement V2G systems.

13.2 In FBC's view, should EV owners have the option to sell power to the FBC grid from stored energy in the EV's battery? Please discuss.

13.3 Please discuss if EV owners could currently transfer power to the FBC grid from stored energy in their EV's battery, and if so, whether EV owners receive compensation for the energy transferred to FBC. Alternatively please discuss any existing challenges that hinder an EV owner from selling energy to the FBC grid.

13.4 If EV owners are allowed to transfer energy from stored energy in their EV's battery to the FBC grid for compensation, does FBC anticipate it would be under the Net metering program or under a different mechanism? Please discuss.

13.4.1 If FBC considers the Net metering program to be the appropriate means to allow EV owners to sell power from EV battery storage to the FBC grid, please discuss the necessary amendments to the Net metering program to allow for this.

13.5 Please discuss what interconnection requirements would be placed on EV owners who would want to sell power to the FBC grid and how these requirements may differ from the ones in

[9] FBC Net metering program, https://www.fortisbc.com/Electricity/CustomerService/NetMeteringProgram/Pages/default.aspx

[10] FortisBC Inc., Guidelines for Operating, Metering, and Protective Relaying for Net Metered Systems up to 50kW and below 750 volts, p. 1. https://www.fortisbc.com/Electricity/CustomerService/NetMeteringProgram/Documents/Net%20Metering%20Interconnection%20Guidelines%20final.pdf

FBC's Net Metering Interconnection Guidelines.

14.0 Reference: Exhibit C12-2, Appendix 3, p. 1; Exhibit C3-2, p. 2
Open Charge Point Protocol

On page 1 in Appendix 3 of FBC's Exhibit C12-2, FBC states:

> FBC is constructing five EV DCFC stations in five communities along the Highway 3 corridor in the West Kootenay area in BC... FBC also anticipates the development of other stations over the coming years to which the DCFC Service tariff and rates will apply.

On pages 2 of Exhibit C3-2, Drive Energy states:

> …the EVSE owner, who are also clients of vendors, are captive of a monopoly/oligopoly structure in which they are tied to the provider of the hardware (charging station) that they have purchased. As mentioned above, until the smart EVSEs operate on Open Charge Point Protocol [OCPP] like ABB, Easton or Tritium DCFCs, all level 2 hardware is tied to the same company to provide payment processing & service and are very vulnerable to uncompetitive monthly fees and payment processing fee hikes.

14.1 Do FBC's EV charging stations currently use ChargePoint, AddÉnergie, or OCPP? Further, will FBC's next generation EV charging stations use the same software? Please discuss.

14.2 In FBC's view, please discuss the degree of captivity in the North American EV charging station market on a (i) manufacturer level and (ii) payment processing and service level.

14.2.1 What role would the BCUC play, if anything, in terms of captivity of a monopoly/oligopoly at the manufacturer level or payment processing and service level? Please discuss in light of the BCUC's jurisdiction as a public utility regulator. Are there other entities that would be more appropriate for such oversight?

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

15.0 Reference: Exhibit C4-2-1, pp. 3–8; Exhibit C12-2, pp. 44–46
Upgrades in technology

FBC's Appendix 1 to Exhibit C12-2 (pages 44-46), and Donald Flintoff's (Flintoff) Exhibit C4-2-1 (pages 3-8) discuss the rapidly changing and upcoming technology in the EV charging market, for example wireless charging.

15.1 Please discuss in detail the risk of stranded assets, and FBC's plan to address the risk, if FBC's EV Charging Stations become obsolete.

15.2 Please discuss the benefits and drawbacks to FBC and other participants in the EV charging market of rapidly changing technology. In particular, what can be done to keep up while minimizing the drawbacks?

15.2.1 If EV charging service is regulated, please discuss what would be the BCUC's role as a regulator in relation to rapidly changing technology.

16.0 Reference: Exhibit C4-2-1, pp. 3–6
Future technology

On pages 3-6 of Exhibit C4-2-1, Flintoff summarizes several prospective future technologies that may displace current technologies.

16.1 Please explain FBC's considerations for changes to battery technology, such as solid-state batteries, when the utility invests (owns or operates) in DCFC stations.

16.2 Please explain FBC's considerations for changes to high-capacity charging technology, such as 350-450kW charging rates, when the utility invests (owns or operates) in DCFC stations.

16.3 Please explain FBC's considerations for other changes to technology in the EV market when the utility invests (owns or operates) In DCFC stations.

D. RATES

17.0 Reference: Exhibit C12-2, p. 17
Rate design – utility ownership

On page17 of Exhibit C12-2, FBC states that rate design in the case of utility ownership needs to consider:

- a reasonable recovery of the cost of service itself;
- the willingness of customers to pay the rate; and
- an efficient use of the charging station.

17.1 Please discuss FBC's definition of reasonable recovery of the cost of service.

18.0 Reference: Exhibit C5-2, p. 12
Rate design – public utility to home EV charging

On page 12 of Exhibit C5-2, the City of Vancouver states:

> The convenience of home charging is important enough to the viability of mass EV adoption that the City believes any regulation of the EV charging service should ensure that rates for electricity supply for home charging are reasonable and support EV adoption.

18.1 Does FBC believe that its current default residential rate structure supports / hinders EV adoption? Please discuss.

18.2 Does FBC believe that its proposed residential flat rate structure supports / hinders EV adoption? Please discuss.

19.0 Reference: Exhibit C12-2, pp. 18–19; Exhibit C1-2, p. 13
Rate design – charging station to EV customer

On page 18 of Exhibit C12-2, FBC states:

> To address the possible negative consequences of very high initial rates, the Commission has accepted approaches like adopting levelized rates in the context of new utilities or new services with growing load over a long term. FBC believes that rate-setting approaches such as these should be adopted in the context of EV charging service. A levelized approach was utilized by FBC in its FBC EV Application (Appendix 3) and resulted in a rate that falls reasonably in the range of other Level 3 charging stations in the marketplace, and also making it competitive with the cost of gasoline.

19.1 The proposed levelized rate setting mechanism is normally a product of a cost of service mechanism. Please discuss FBC's views on implementing this kind of rate setting mechanism for all site hosts/owners of EV charging stations?

19.2 If the BCUC were to regulate EV charging rates, should it be postage stamp across the province? Should there be a distinction between charging levels or location of chargers (urban/rural/curbside/MURB)?

19.2.1 What if the site host/owners operate under a different business model? For example, some businesses do not want to charge for service as a form of attracting customers, should regulation enforce a rate for EV charging service?

On page 18, with respect to EV customer pricing options, FBC states:

> The possible rate structures for EV charging could include time-based, energy-based, demand based or customer-based components.

19.3 Please discuss the pros and cons and impact on cost behaviour for each: time-based, energy-based, demand based, or customer-based.

19.4 Has FBC considered Time of Use (TOU) or dynamic rate designs for use between EV charging stations and their customers? Please submit any analysis or report completed.

On page 19 of Exhibit C12-2, FBC states "time-based rates may result in more costly charging on an energy consumed-basis for vehicles with a lower charging capacity."

On page 13 of Exhibit C1-2, BC Hydro states: "It may be possible to differentiate time-based charges to vary based on vehicle capacity to address such fairness issues."

19.5 What considerations have been made for a time-based model that is based on vehicle capacity?

19.6 How would FBC differentiate EV charging based on vehicle capacity? Are there any examples from other jurisdictions?

20.0 Reference: Exhibit C1-2, p. 7; Exhibit C20-2, p. 7
Measurement Canada

On page 7 of Exhibit C1-2, BC Hydro states:

> The introduction of a new standard is expected to take some time, and in BC Hydro's view a Measurement Canada approved DC standard is several years away. Therefore, time-based rates for DC fast charging may be the only interim option.

On page 7 of Exhibit C20-2, AddÉnergie submits "that as of March 6, 2018, Measurement Canada has not certified any commercially available DCFC device to bill on the basis of energy (kWh) or time-related demand (kW)."

20.1 Has FBC sought Measurement Canada certification for any DCFC devices to bill on an energy-basis?

20.1.1 If so, please provide application status update on such processes.

20.1.2 If not, does FBC have any plans to file a request in the future?

20.2 Please explain what difficulties exist in certifying DCFC billing devices for commercial use purposes. Is it unique to EV charging stations?

20.2.1 Are AC Level 2 chargers certified by Measurement Canada to charge by energy?

20.3 With respect to a rate design that differentiates time-based charges to vary based on vehicle capacity, would such rate design be possible without Measurement Canada's certification on an approved DC standard?

21.0 Reference: Exhibit C12-2, p. 19; Exhibit C24-2, p. 37; Exhibit C20-2, p. 8
Rate design – utility to charging station

On page 19 of Exhibit C12-2, FBC states:

> FBC recommends that a new rate should be developed for electricity supply to EV charging stations, since its existing retail and wholesale rate schedules contain components, such as demand charges or high customer charges that would make them inappropriate to support the development of EV charging infrastructure in the province. The rate should reflect the unique characteristics of the service being provided.

On page 37 of Exhibit C24-2, CEC states:

> The CEC notes that electric vehicle charging applies to both commercial and residential customers, and as such, the costs are appropriately included in the rate class cost of service analysis.

On page 8 of Exhibit C20-2, AddÉnergie states:

> The Commission can support the development of DCFC public charging by providing a demand charge-free charging rate. This approach has been used in Québec in a 5-year pilot (the Québec BR rate) and has substantially reduced some of the economic barriers to providing public DCFC charging.

21.1 Please explain the relevance of demand charges for EV charging stations in a business model where the public utility is selling electricity to a site host. What are the pros and cons of having demand changes at EV charging stations?

21.2 Please elaborate on how a new EV-specific rate would be designed in a business model where the public utility is selling electricity to a site host.

21.3 What is FBC's view of an alternative EV-specific rate class such as the current Québec BR rate?

21.4 Has FBC considered alternatives to demand charges specific to EV charging in a business model where the public utility is selling electricity to a site host? What are the pros and cons of such alternative? Please explain.

21.5 Has FBC considered a TOU rate design in selling power to the site host? What are the pros and cons of a TOU rate design?

22.0 Reference: Exhibit C19-2, p. 12; Exhibit C35-2, pp. 4; Exhibit C1-2, p. 15
Cross-subsidization

At the Vancouver Community Input Session on April 16, 2018, Toronto Hydro stated:

> EV charging decreases --and I emphasize, decreases --the rates for all utility customers. The utility bills of EV customers more than offset the costs incurred by the utility to deliver the electricity to charge the vehicles. [11]

[11] Transcript, Volume 8, p. 373.

On page12 of Exhibit C19-2, MEMPR states:

> a public utility may be able to demonstrate that the cost of public EV charging infrastructure can appropriately be recovered from revenue obtained through electricity sales at all EV charging stations within their service territories (i.e., through both public and private Level 1, 2 and 3 charging stations combined).

22.1 Please comment on Toronto Hydro and MEMPR's statements.

On page 15 of Exhibit C1-2, BC Hydro states:

> Structuring the provision of these activities under a non-regulated affiliate would add additional cost and complexity to the delivery of services outside of the traditional role of regulated public utilities.

22.2 If the BCUC established regulation to prohibit or limit any cross subsidization between EV user and non-EV users, please discuss FBC's alternative course of action

22.2.1 Identify the additional cost and complexity aspects of a non-regulated affiliate.

23.0 Reference: Exhibit C35-2, pp. 5–6
EV charging stations – proposed changes to the BC Hydro Electric Tariff

On page 5 of Exhibit C35-2, for Alternating Current Electric Vehicle Charging Services (Level 1 and Level 2 AC), Victoria EVA states:

> That the charges for electricity consumption comply with the British Columbia Hydro and Power Authority (BC Hydro) Electric Tariff Terms and Conditions for the Resale of Electricity, Subsection 9.2 of the BC Hydro Electric Tariff Terms and Conditions which states as follows (with suggested revisions underlined):
>
> *i. If a Customer wishes to sell Electricity which the Customer has purchased from BC Hydro to a tenant, of that Customer at the same Premises* ***or to an owner or operator of an electric vehicle*** *on a metered basis, then the Customer shall agree that the selling price for such Electricity shall not exceed the price which BC Hydro would have charged had that tenant* ***or owner or operator of the electric vehicle*** *been a Customer of BC Hydro. This requirement shall be included in an agreement for resale between BC Hydro and the Customer.*

Similarly, on page 6 of Exhibit C35-2, for DCFCs:

> *i. If a Customer wishes to sell Electricity which the Customer has purchased from BC Hydro to an electric vehicle owner or operator on a metered basis at the same Premises, then the Customer shall agree that the selling price for such Electricity* ***shall not exceed a multiplier (TBD) of the price*** *which BC Hydro would have charged had that owner or operator of the electric vehicle been a Customer of BC Hydro. This requirement shall be included in an agreement for resale between BC Hydro and the Customer.*

23.1 In FBC's view, please discuss whether Victoria EVA's two proposals on the BC Hydro Electric Tariff are feasible.

23.1.1 Please indicate whether FBC is amenable to similar changes to its own electric tariff. If so, explain how?

E. STORAGE AND GRID STABILITY

24.0 Reference: Exhibit 24-2, p. 37; Exhibit C4-2, p. 15; Exhibit C19-2, p. 13; Exhibit C12-2, Appendix A, p. 55; Exhibit 25-2, pp. 6, 15
Grid optimization and impact

On page 37 of Exhibit C24-2, Commercial Energy Consumers Association of British Columbia (CEC) states:

> [Fast] DC charging stations utilize a great amount of power for short periods of time, potentially meaning that additional upgrades will be required to the distribution network.

On page 15 of Exhibit C4-2, Flintoff states:

> There is a financial risk of substation, and distribution upgrades that most likely to occur since the EV charging stations will add significant load on the system which, in some cases, has not been designed to accommodate the new load. Because of the high power requirements of up to 240 kWatts per station, they can't just be connected to the grid anywhere.

24.1 Please discuss whether EV uptake will require distribution system upgrades on FBCs system.

24.1.1 What level of EV adoption would trigger the need for improvements to the distribution system?

24.1.2 What type of upgrades would be necessary to support various levels of EV adoption? And what are the associated expected costs.

24.1.3 What strategy or tools has FBC contemplated to identify EVs load requirements and their effects on the distribution and grid system?

24.1.4 From FBC's perspective, who should bear the costs of these necessary upgrades and why?

24.2 Please discuss whether FBC has conducted any load forecast analysis related to EV charging. What is the proportion of EV charging relative to FBC's total load forecast? Please summarize the assumptions.

24.2.1 If available, please compare FBC's current load forecast related to EV charging against previous estimates.

24.2.2 Is FBC able to differentiate the load forecast demand between home EV charging vs. public EV charging stations? Please discuss.

24.2.3 If there is no load forecast analysis available, please explain why. Discuss the information and costs required to conduct one.

On page 13 of Exhibit C19-2, states "MEMPR encourages utilities and the Commission to explore innovative pilots such as time-of-use rates for EV charging, incentives from utilities for home and workplace charging, control of charging software and system network capability."

24.3 What considerations has FBC made with respect to incentives for home and workplace charging, control of charging software and system network capability? Please summarize any analysis or report if available.

On page 6 of Exhibit C25-2, ChargePoint states that "…we have designed the network to allow other parties, such as electric utilities, the ability to access charging data and conduct load management to enable the most efficient load integration with the grid."

On page 15 of Exhibit C25-2, ChargePoint states:

> Smart, networked charging provides new flexibility to enable more grid benefits than traditional load management, and valuable data can be collected to inform better utility planning decisions and help maintain reliability and affordability. Based on the data collected from smart charging stations, new processes can be created to better integrate EV charging utilization with available electrical capacity – helping balance loads and reduce the costs of providing clean energy.

24.4 Please comment on the benefits of utility participation with respect to smart metering, load management and efficient grid utilization under various scenarios of utility participation.