bcuc
British Columbia
Utilities Commission

Patrick Wruck
Commission Secretary

Commission.Secretary@bcuc.com
bcuc.com

Suite 410, 900 Howe Street
Vancouver, BC Canada V6Z 2N3
P: 604.660.4700
TF: 1.800.663.1385
F: 604.660.1102

May 3, 2018

Sent via email/eFile

BCUC REGULATION OF ELECTRIC VEHICLE CHARGING SERVICE INQUIRY EXHIBIT A-9

Mr. Fred James
Chief Regulatory Officer
Regulatory & Rates Group
British Columbia Hydro and Power Authority
16th Floor – 333 Dunsmuir Street
Vancouver, BC V6B 5R3
bchydroregulatorygroup@bchydro.com

Re: British Columbia Utilities Commission – An Inquiry into the Regulation of Electric Vehicle Charging Service – Project Number 1598941 – Information Request

Dear Mr. James:

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

bcuc
British Columbia
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Vancouver, BC Canada V6Z 2N3
bcuc.com

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

INFORMATION REQUEST NO. 1 TO BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

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A. BASIS FOR EV CHARGING SERVICE REGULATION EXEMPTION

1.0 Reference: Exhibit C1-2, Section 1, p. 1, Appendix A, p. 4
Levels of charging

On page 1 of Exhibit C1-2, British Columbia Hydro and Power Authority (BC Hydro) states:

> … [BC Hydro] note that the overall theme of our submission is that barriers to the development of the EV charging services market should be reduced or removed to facilitate growth in electric vehicle uptake. We have specifically focussed our comments on the issues and barriers that relate to direct current fast charging services (direct current fast charging referred to in this submission as DCFCs or DC fast charging) as opposed to Level 1 or Level 2.

1.1 Given that EV charging service could be provided at Level 1 and Level 2, please explain why has BC Hydro focussed on the issues and barriers related to direct current fast charging (DCFC)?

2.0 Reference: Exhibit C1-2, Section 4, p. 10; Exhibit C19-2, Section 6, p. 8
Degree of competition

On page 10 of Exhibit C1-2, BC Hydro states "until there is private sector uptake of fast charging services, utilities operating in the market are best suited to provide this service and need to have the ability to recover the costs of doing so."

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 British Columbia Utilities Commission's (BCUC) 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*]

2.1 Please discuss the potential disadvantages of public utility involvement in the EV charging marketplace.

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

2.1.1.1 If so, please explain and provide any key indicators that BC Hydro 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] http://www.bcuc.com/Documents/Guidelines/RMDMGuidelns.pdf

2.1.2 Is BC Hydro aware of any jurisdiction where 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.

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

2.2 Does BC Hydro consider that the commencement, continuation, or proliferation of regulated utilities like BC Hydro or FortisBC Inc. (FBC) 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.

2.2.1 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.

2.3 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?

2.4 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.

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

3.0 Reference: Exhibit C1-2, Section 4, 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."

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."

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

4.0 Reference: Exhibit C1-2, Section 3.2, pp. 6–7, Section 4, p. 11; Exhibit C26-2, p. 1
Regulator's responsibility

On page 6-7 of Exhibit C1-2, BC Hydro states:

> With funding from both the Federal and Provincial Governments, BC Hydro initiated the "Electric Vehicle Smart Infrastructure Project", which included the deployment of 30 DCFC stations on a pilot basis. BC Hydro owns each of these 30 stations and leases them for a nominal amount to the respective station host/operator…
>
> During 2016, BC Hydro received funding approvals from both Natural Resources Canada and the Provincial Government to support the installation of an additional 21 DCFC stations (Phase II deployment). In addition, the Community Energy Association secured funding for the deployment of up to eight stations in the Kootenay region. Once

deployed, BC Hydro will own and operate all of these stations. This second phase of DCFC deployment is scheduled to be complete by May 31, 2018.

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.

4.1 In BC Hydro's view, what are the indicators for "service quality" of an EV charging station?

4.2 In BC Hydro's view, what are the indicators for "reliability" of an EV charging station?

4.3 In BC Hydro's view, what are the indicators for "safety" of an EV charging station?

4.4 If EV charging service is regulated, please discuss BC Hydro's view on 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.

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

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

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

4.6 What are BC Hydro 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.

4.7 Sponsored by BC Hydro, the Canadian EV Infrastructure Deployment Guidelines 2013[2] discusses safety protocols in EV infrastructure. Please discuss BC Hydro's involvement as it relates to installation, operations, and maintenance with respect to the safety of EV supply equipment.

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

5.0 Reference: Exhibit C19-2, Section 6, p. 7, Section 8, p. 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."

5.1 Has BC Hydro reviewed other jurisdictions to explore the different regulatory environments in EV charging service?

5.1.1 If yes, please list the jurisdictions and discuss any key differences between the jurisdictions cited with the BC market or regulatory environment that BC Hydro is aware of, which may affect comparability.

5.1.2 Does BC Hydro have a view on whether any of the regulatory models in other jurisdictions as reviewed by BC Hydro are preferred or unsuitable for BC?

6.0 Reference: Exhibit C1-2, Section 5, p. 16
Bakerview EcoDairy Application for Exemption from Part 3 of the UCA for Electric Vehicle Charging Service Providers proceeding, Exhibit C1-3, BCUC Order G-71-16; BCUC Thermal Energy System (TES) Guidelines, p. 7
Class of cases exemption

On page 16 of Exhibit C1-2, BC Hydro states:

> In this Inquiry the Commission may wish to consider whether to make recommendations to government in relation to the existing regulatory regime applicable to non-utilities engaging in EV charging services and how services should be charged. For example, this could be by way of recommending a change to the definition of public utility in the UCA or by way of recommending a class of cases exemption for persons engaged in such activities. [*Emphasis added*]

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.

In response to the BCUC information request in the Bakerview EcoDairy proceeding, BC Hydro submitted the following in regards to class exemptions:

> In BC Hydro's view, it is premature to contemplate an exemption (i.e., a class exemption) beyond the one sought by Bakerview in its Application. Given the nascent nature of the electric vehicle charging market, there remain significant uncertainties regarding the appropriate market structure and regulatory framework going forward.

6.1 Please discuss why BC Hydro now views class exemptions in the EV charging market as a viable consideration.

6.2 In BC Hydro'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, in BC Hydro's view, what specific sections of the UCA should EV charging service be exempt from?

6.3 Does BC Hydro have a view on what the classes could be (e.g. based on different levels of EV charging equipment, geographic locations of charging stations, 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 it states:

> Strata Corporation TES[3]: 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.

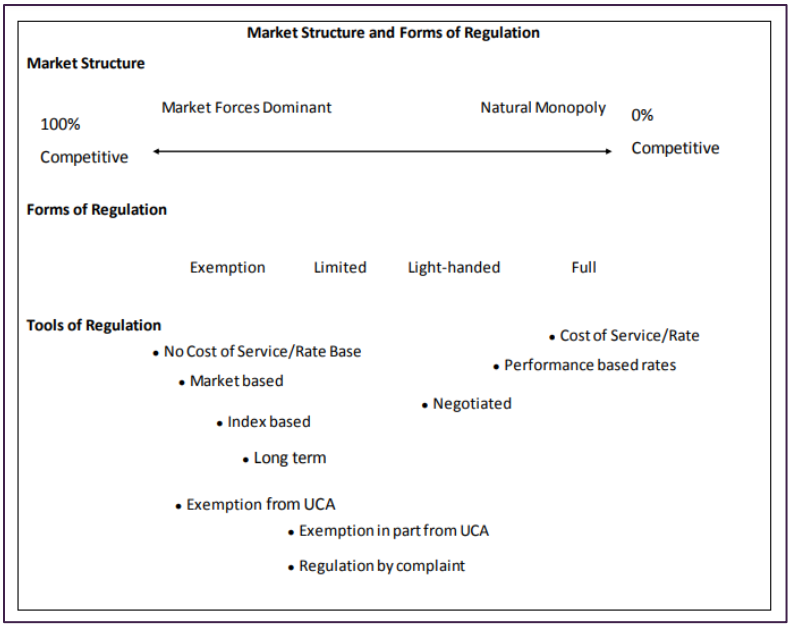
6.4 In BC Hydro's view, should an exemption similar to the Strata Corporation exemption in the TES Guidelines be considered for MURBs/Strata Corporations if EV charging service were to be regulated by the BCUC? Please discuss.

7.0 Reference: BCUC ORDER G-231-13A, pp. 23–24
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 Reasons for Decision attached to Order G-231-13A, the BCUC states:

> The [AES][4] 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] As defined by the *Strata Property Act* [SBC 1998].
[4] BCUC Inquiry into FortisBC Energy Inc.'s Offering of Products and Services in Alternative Energy Solutions and Other New Initiatives proceeding



In Order G-231-13A, the BCUC 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.

7.1 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?

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

8.0 Reference: Exhibit C1-2, p. 4
Ratepayer impact

On page 4 of Exhibit C1-2, BC Hydro states:

> BC Hydro acknowledges that the principles set out in the AES Inquiry Report appear to be applicable to regulated public utilities providing EV charging products and services and therefore may preclude cost recovery from all ratepayers. Subject then to acceptance of the benefits to all ratepayers of developing the market for EV charging services in B.C.…

8.1 Please discuss how BC Hydro intends to communicate, define and measure "acceptance" as it pertains to the above preamble (survey, questionnaire, newsletter, etc.).

8.2 BC Hydro identifies "benefits" to all ratepayers; please identify the potential risks to ratepayers for public utility involvement in developing the market for EV charging services in BC.

9.0 Reference: Exhibit C1-2, p. 15, Exhibit C35-2, pp. 4, 9–10, Utility Investment in the Electric Vehicle Charging Grid: "Key Regulatory Considerations" Report dated November 2017, p. 16 Potential cross-subsidization

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

> Including fast charging service in a utility's rate base could result in cross subsidization and unduly discriminatory rates when viewed with a narrow lens. As discussed, BC Hydro raises the possibility that those principles could be revisited on the basis of the evidence gained through this Inquiry, including in respect of the benefits of public utilities such as BC Hydro operating in this market as well as the magnitude of the costs being considered.

On page 4 of Exhibit C35-2, Victoria Electric Vehicle Association (EVA) states that "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[5] (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.

9.1 Please provide BC Hydro's view on the first principal that the Victoria EVA submitted.

9.1.1 In light of the GCC-MJBA Report, please provide BC Hydro'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."

9.2 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.

9.3 In BC Hydro's view, is cross-subsidization measurable or verifiable? If so, how? At what point is this cross subsidization "unduly preferential or discriminatory" or "unfair"? What does BC Hydro view as the key indicators of when any cross subsidization becomes "unduly discriminatory"?

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

B. INVESTMENT DECISIONS

10.0 Reference: Exhibit C1-2, p.4
Transcript, Volume 8, pp. 442, 444
BC Hydro EV charging stations development

On page 4 of Exhibit C1-2, BC Hydro states:

> Since 2012, BC Hydro has been working with federal, provincial and local governments, businesses and other stakeholders to remove barriers to the deployment of EVs in B.C.

10.1 Please clarify whether the above referenced quote should be or whether it should be "to remove barriers to the deployment of EVs infrastructure in B.C."

10.2 Please discuss the actions taken to remove barriers to the referenced deployment since 2012.

10.3 Please discuss where BC Hydro obtained the funding required for this business development work. Please provide the amount of funds expended for this business development work, by year, since 2012.

At the Vancouver Community Input Session, Mr. Simmons from BC Hydro indicated that certain funds were provided by NRCan, and he stated:

> …BC Hydro has put in an application to NRCAN [Natural Resources Canada] for their most recent round of funding, and we worked with Ministry of Energy Mines and Petroleum Resources and the Ministry of Transportation Infrastructure to develop what that next group will be
>
> …Beginning in 2012 with the NRCAN, the province of B.C., BC Hydro embarked on the Smart EV Infrastructure Project. Our focus in that project was a deployment of 30 DC fast charging stations on a pilot basis. The last of these stations was deployed in October 2016, and the first was in 2013.[6]

10.4 Please clarify whether these funds from NRCAN were used in relation to the business development work or were they used to specifically purchase and install EV Infrastructure in BC, or both.

11.0 Reference: Exhibit C1-2, pp. 5, 8; Transcript, Volume 2, p. 93
EV charging station costs and partnerships

On page 5 of Exhibit C1-2, BC Hydro states: "The relatively low capital and maintenance costs of Level 2 chargers have enabled participation by a large number of players."

On page 8, BC Hydro states: "DC fast charging service entails relatively low capital costs…"

11.1 Please quantify the above statements for each of level 3 chargers and DCFCs. In BC Hydro's view, what dollar value is considered "low capital and maintenance costs" (for Level 2 chargers) and "low capital costs" (for DCFCs)?

11.2 What number of players is considered "large"?

[6] Transcript, Volume 8, pp. 442, 444.

At the Kelowna Community Input Session, Ms. Lohmann from the Community Energy Association stated:

> THE CHAIRPERSON: And you said that you've got funding for these 40 Level 2 stations. So where's the funding come from?
>
> MS. LOHMANN: And 13 Fast Chargers, yeah.
>
> THE CHAIRPERSON: Yeah.
>
> MS. LOHMANN: A variety of sources, from Federation of Canadian Municipalities, Columbia Basin Trust, the utilities are partners, the province of B.C.[7]

11.3 Does BC Hydro have any partnerships with the city of Kelowna? Please further discuss how BC Hydro determines which municipality to partner with? What are BC Hydro's criteria for potential partnerships structures? Please discuss.

12.0 Reference: Exhibit C1-2, pp. 5–6
Vancouver Input Session, Transcript Volume 8, pp. 444-445
BC Hydro DCFC infrastructure investments

On page 5 of Exhibit C1-2, BC Hydro states:

> The development of DCFC infrastructure is at an early stage in Canada and B.C. The costs and risks at this stage are generally higher than private investors have been willing to accept, and the bulk of DCFC infrastructure has been funded by governments.
>
> …
>
> The first phase of the DCFC infrastructure build out in B.C. (Phase I deployment) began in 2012. With funding from both the Federal and Provincial Governments, BC Hydro initiated the "Electric Vehicle Smart Infrastructure Project", which included the deployment of 30 DCFC stations on a pilot basis. BC Hydro owns each of these 30 stations and leases them for a nominal amount to the respective station host/operator. As owner, BC Hydro is responsible for keeping these stations operational and for any costs associated with repairs should a station fault occur.

12.1 Please provide a detailed list of BC Hydro's capital investment in these 30 DCFCs, showing the gross capital expenditures and any contributions / grants. Please also include any prefeasibility and business development costs deployed and identify whether these additional costs were included in the total capital costs.

12.2 Please clarify whether these 30 DCFCs are included in BC Hydro's regulated ratebase.

12.3 Please separately show BC Hydro's annual operating costs for each station.

12.4 Please separately show BC Hydro's annual repairs associated with each station fault.

12.5 Please clarify whether the annual operating and repair costs are included in BC Hydro's regulated O&M expenditures each year.

12.5.1 Please clarify whether any repair costs were/are considered capital expenditures or operating costs.

[7] Transcript, Volume 2, p. 93.

At the Vancouver Community Input Session, BC Hydro stated that:

> BC Hydro owns all 30 stations; they're leased to the station operator for just a nominal sum. I think it's a dollar a year, or a dollar a month. And in 28 of those instances, so for 28 of those sites, the operator is the municipality which the station is located. And because the municipalities are exempt from certain parts of the Utilities Commission Act, they are able to charge customers, should they desire to do so, for electric vehicle charging.[8]

12.6 Please confirm whether the lease revenue is $1 per year or $1 per month.

12.7 How long is the lease revenue anticipated to be expected?

12.8 Please clarify whether this lease rate is applicable to all municipalities.

12.9 How did BC Hydro determine the appropriate amount of lease revenue? Please discuss why the lease revenue is not higher.

12.10 Please discuss how BC Hydro is treating this lease revenue. Is it included as miscellaneous and/or other revenue, offsetting its overall revenue requirement?

12.11 Please quantify the total amount of lease revenue recognized by BC Hydro for each year since 2012.

On page 6 of Exhibit C1-2, BC Hydro further states that "Station hosts/operators are responsible for the cost of electricity provided to the station (through, for example, BC Hydro's Medium General Service tariff), and for the collection of any revenues from fees for vehicle charging."

12.12 Please identify each of these host/operators. How many are private companies? How many are municipalities?

12.13 Given the municipality exemption (as stated in the definition of "public utility" in the UCA), please explain why municipalities do not own and operate these EV charging stations instead of leasing them from BC Hydro.

12.14 Please explain whether there is risk transferred from site hosts/third-party operators to BC Hydro in this model. For example, host/third-party operators do not risk investing in possible stranded assets.

12.15 Do risks of BC Hydro translate into risk for BC Hydro's ratepayers? Please discuss.

12.16 Please clarify how much, if any, of the revenues from customer charging fees go back to BC Hydro. If none, please explain why not?

On page 6 of Exhibit C1-2, BC Hydro states:

> During 2016, BC Hydro received funding approvals from both Natural Resources Canada and the Provincial Government to support the installation of an additional 21 DCFC stations (Phase II deployment). In addition, the Community Energy Association secured funding for the deployment of up to eight stations in the Kootenay region. Once deployed, BC Hydro will own and operate all of these stations.

12.17 Please discuss BC Hydro's observations, learnings, and challenges of the Phase I pilot.

[8] Transcript, Volume 8, pp. 444–445.

12.18 In reference to the Phase II deployment, and in consideration of the funding approvals received from NRCan and the Provincial Government, what was the total dollar amount of capital investment made from BC Hydro?

12.19 Please clarify whether the additional 8 stations from the Community Energy Association are included in the 21 DCFC Phase II deployment.

12.20 Please explain why a different model of ownership is used for Phase II as compared to Phase I, where BC Hydro owns but leases the stations to site hosts/third-party operators?

12.20.1 Please discuss the pros and cons for each of the business models.

12.21 Please discuss BC Hydro's decision making factors and criteria for selecting the different business model for Phase II.

13.0 Reference: Exhibit C1-2, pp. 8–11
BC Hydro's role in DCFC charging market

On page 8 of Exhibit C1-2, BC Hydro states:

> While in the longer term the private sector is expected to play a much larger role in DCFC charging market, the current financial context likely requires that governments and utilities continue to actively support the deployment of DCFC infrastructure. [Underline added]

13.1 Please clarify the "current financial context" as noted in the above preamble.

On page 9 of Exhibit C1-2, BC Hydro states:

> Investment and provision of DC fast charging services will not entail a fully competitive market for the foreseeable future until utilization rates increase, economics improve and regulatory barriers are eased.

13.2 Aside from the issue identified in the context of the above preamble (the definition of "public utility" in the UCA) and the stated difficulty in applying for an exemption, what are the other regulatory barriers in BC? Please also discuss the actions that can be taken by the BCUC, in the context of this Inquiry, to address those barriers.

On page 10 of Exhibit C1-2, BC Hydro states:

> BC Hydro's general view is that barriers to market development should be reduced or removed to facilitate growth in investment in all electric vehicle charging technologies and services. However, until there is private sector uptake of fast charging services, utilities operating in the market are best suited to provide this service and need to have the ability to recover the costs of doing so.
> …
> BC Hydro is supportive of private sector participation, and removing regulatory barriers that prevent the private sector from investing. A key consideration if regulatory barriers are removed is the extent to which the Commission could preserve its ability to step back in and regulate the private sector while the market develops; [Underline added]

13.3 In reference to the first underline item above, please clarify who are these "utilities operating in the market?" Would that be BC Hydro and FortisBC Inc.?

13.4 In reference to the second underline item above, please explain why utilities operating in the market are "best suited" to provide this service?

13.5 In reference to the third underline item above, please explain what it means to "have the ability to recover the costs." Is this referring a regulated utility's traditional cost of service model? Please clarify whether this means that all utility customers would ultimately be responsible for paying the cost recovery of the EV infrastructure?

13.6 In reference to the last underline item above, please explain how the BCUC could "preserve its ability" to step back in and regulate the private sector when it does not currently have the ability to forebear from regulation.

13.7 What are the market triggers that would suggest that it is the right time for the BCUC to "step back in and regulate the private sector…"? Please discuss.

13.8 At the time that the BCUC "steps backs in" to regulate the market, does BC Hydro anticipate that it would continue to participate in such market? Why or why not?

13.9 Please explain why BC Hydro believes that public utilities have the responsibility to provide the service to facilitate growth in the EV market infrastructure. Would BC Hydro's view be any different if the public utility is private investor owned?

On pages 10-11 of Exhibit C1-2, BC Hydro states:

> …in order for this to not present its own, new barrier, clarity would need to be provided as to when and how this right may be exercised.

13.10 What are BC Hydro's views on the criteria of "when" and "how"? What are the market triggers of when scaling back regulation is optimal?

13.11 Does BC Hydro believe that the BCUC currently have the ability to "scale" its oversight powers or would the BCUC require certain legislative changes for this to occur?

On page 11 of Exhibit C1-2, BC Hydro states:

> [Certain] considerations highlight the issues with attempting to regulate service provision from the private sector during a period of market development; for example, what would be the incentive for the private sector to respond to sanctions to improve a service on which it is not able to make a profit?

13.12 Please further discuss the quoted preamble. Is BC Hydro suggesting that an allowed profit margin (such as the public utility's ratebase/rate of return model) is necessary for the market development phase to shield investors from start-up risk?

13.12.1 If so, should the BCUC enforce this business model on all potential service providers as opposed to relying in public utilities to build this market? Would the same results be achieved? Please discuss.

On page 11 of Exhibit C1-2, BC Hydro states:

> If public utilities are allowed to own fast charging stations and have more certainty that they will recover costs from ratepayers, the benefits would include more fast charging service being available, which would encourage greater take-up of electric vehicles, lowering GHG and increasing utility revenue through additional electricity sales. Other benefits include the ability of public utilities to leverage institutional knowledge and

management of grid and system operations….

13.13 If there are other third-party service providers of EV charging service, what are the incremental cost that this would pose on BC Hydro in terms of grid management, system operations, and planning? Quantify where possible.

13.14 Given BC Hydro's experience with the 30 DCFC of Phase 1 EV pilot program since 2012, please provide evidence on load and system impact. Quantify costs where possible.

14.0 Reference: Exhibit C1-2, pp. 6–7
DCFC – Business model and economics

On page 6 of Exhibit C1-2, BC Hydro states:

> BC Hydro owns each of these 30 stations and leases them for a nominal amount to the respective station host/operator. As owner, BC Hydro is responsible for keeping these stations operational and for any costs associated with repairs should a station fault occur. Station hosts/operators are responsible for the cost of electricity provided to the 18 station (through, for example, BC Hydro's Medium General Service tariff), and for the collection of any revenues from fees for vehicle charging.

14.1 Please provide the expected useful life of BC Hydro's current DCFC systems.

14.2 Please indicate whether there are any arrangements to facilitate the expansion or upgrading of BC Hydro's owned DCFC stations with respect to future technologies and/or increasing EV adoption rates.

14.3 Please discuss the risks of stranded assets, if any.

14.4 Please explain if BC Hydro collects any information regarding charging data and usage patterns of the existing BC Hydro owned DCFC stations. Please summarize any preliminary findings/reports.

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

> Sites for the 30 stations under Phase I deployment were selected with the objective of extending the useful range of EVs by providing fast charging opportunities along highway corridors at intervals that would allow inter-city travel by EVs (e.g., Vancouver to Kamloops). Site selection for the Phase II deployment of 21 stations relied on a "gap analysis" prepared by the Fraser Basin Council.

The Fraser Basin Council "Gap Analysis"[9] makes several recommendations for Phase II, such as redundant level 2 charges at DCFC stations and accommodating for future expansions and upgrades.

14.5 Please elaborate on the Fraser Basin Council "Gap Analysis." What recommendations did the Fraser Basin Council make?

[9] A Gap Analysis for BC's Electric Vehicle DCFC Network. Fraser Basin Council. August 31, 2015; https://pluginbc.ca/resource/a-gap-analysis-for-b-c-s-fast-charging-infrastructure

15.0 Reference: Exhibit C1-2, p. 9; Exhibit C12-2, p. 5; Exhibit C20-2, pp. 3-4; Exhibit C34-2, pp. 5, 9 Financial models

On page 9 of Exhibit C1-2, BC Hydro states:

> First, in part due to generally low penetration of electric vehicles presently, there is relatively low utilization of DC fast charging stations and thus the costs of owning and operating a DC fast charging station are expected to exceed direct revenues received.

15.1 Please confirm that the above submission on page 9 refers to the business model in which BC Hydro owns DCFC stations with a third-party station host/operator. If not confirmed, please clarify.

15.2 Please explain whether BC Hydro has an estimate of what level of EV penetration is required for BC Hydro-owned DCFC stations to break-even for BC Hydro. 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, FortisBC Inc. indicates that there are 42 DCFC stations and 43 DCFC ports in BC excluding Tesla Superchargers.

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

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

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

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.

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

15.5 In BC Hydro'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 vs site host/third-party ownership and operation.

On page 9 of Exhibit C34-2, CEA states 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."

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

15.7 In BC Hydro'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.

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

16.0 Reference: Exhibit C20-1, p. 6; Exhibit C15-2, p. 2
DCFC - Third-party investment

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

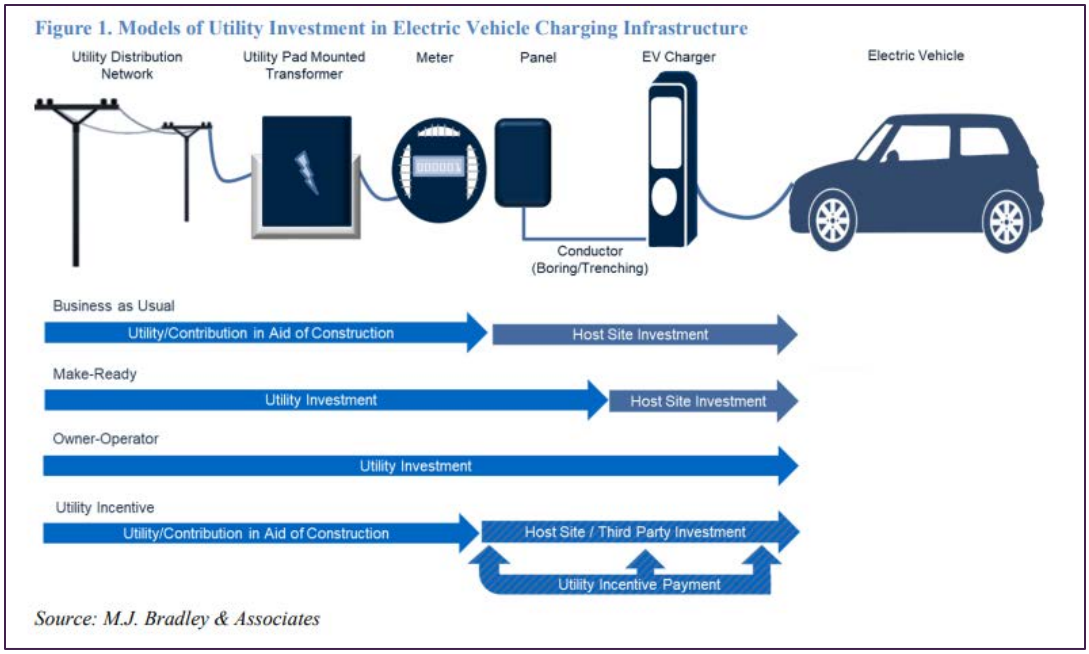
> That the major barrier to EV charging station competitiveness is that British Columbia lacks a comprehensive network of charging stations and that one is unlikely to be developed by [third-party] investment alone.

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

> [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[10] (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.

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



16.1 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 appropriate level of utility regulation.

17.0 Reference: Exhibit C20-2, p. 2; Exhibit C9-2, 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.

17.1 Please discuss the issues BC Hydro observed regarding the installation and operation of charging infrastructure in Multi-unit residential buildings (MURBs) and curbside charging.

17.2 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).

17.3 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."

17.4 Please comment on UDI's statement. If applicable, please explain why BC Hydro is not allowed to provide metering to each stall in parking garages in residential buildings.

C. TECHNOLOGY

18.0 Reference: Transcript Volume 8, pp. 433–434, 460–461; Transcript Volume 7, p. 338
Exhibit C4-2-1, pp. 3–8; Appendix 1 to Exhibit C12-2, pp. 44–46
Upgrades in technology

At the Community Input Session in Vancouver, BC Hydro stated "all the stations that we have installed or deployed are 50 kilowatts."

In response to the Panel's question on fast changing technology and BC Hydro's plan to adapt, BC Hydro stated:

> [W]e have ordered a next generation fast charging unit that we're going to deploy at Powertech Labs… And that charging station is 150 kilowatts versus the 50. And it's built using three 50 kilowatt modules.[11]

The Panel stated its concerns about a five year useful life of an EV charging station posing some issues with respect to stranded assets. In response, BC Hydro stated:

> [T]he stations could still be useful. For example, of the stations we've taken out of service, we have jurisdictions that we don't really have an intention of putting in DC Fast Charging, asking us, can we have that station? Rather than us take it to the junk yard, they would like it.[12]

18.1 Could BC Hydro's 50 kW EV charging stations that have passed their five year useful life also be used to build BC Hydro's next generation fast charging 150 kW station? If not, please discuss.

18.2 What is the current market value of the 50kW stations if sold to a third party? Would BC Hydro treat this as a salvage value to offset the capital cost of the original stations?

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.

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

18.4 Please discuss the benefits and drawbacks to BC Hydro and other participants in the EV charging market of rapidly changing technology. In particular, what can be done to keep current on technological changes while minimizing the drawbacks?

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

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.

[11] Transcript, Volume 8, pp. 433–434
[12] Transcript, Volume 8, pp. 460–461.

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.[13]

18.5 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.

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

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

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

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

20.0 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.

20.1 Please discuss BC Hydro's considerations for changes to battery technology, such as solid-state batteries, in the implementation of BC Hydro owned or operated DCFC stations.

20.2 Please discuss BC Hydro's considerations for changes to high-capacity charging technology, such as 350-450kW charging rates, in the implementation of BC Hydro owned or operated DCFC stations.

20.3 Please discuss BC Hydro's considerations for other technological changes in the EV market in the implementation of BC Hydro owned or operated DCFC stations.

21.0 Reference: Exhibit C1-2, Section 3.1, p. 5; Exhibit C12-2, Appendix 1, p. iv, p. 55
Energy sale to the grid

On page 5 of Exhibit C1-2, BC Hydro states "Roughly 95 per cent of these charging stations are AC 240V Level 2 charging stations that are capable of fully charging a plug-in hybrid EV in two to four hours and a battery electric EV in four to eight hours." It references footnote 5 which identifies "EV Technology and Market Overview, Powertech Labs. October 19, 2016."

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

21.1 Please confirm that "EV Technology and Market Overview, Powertech Labs. October 19, 2016" referenced in BC Hydro's Exhibit C1-2 footnote 5 is the same as FBC's Exhibit C12-2 Appendix 1.

21.1.1 If not confirmed, please provide a copy of the report referenced in BC Hydro's Exhibit C1-2 footnote 5.

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

21.1.2 If confirmed, is this the latest version of the report? If not, please file the most recent version.

On BC Hydro's website on Net Metering,[14] the BC Hydro Distributed Generation Technical Interconnection Requirements 100 kW and Below document (DGTIR-100) states:[15]

> BC Hydro provides a means for distribution-connected customers to connect a small energy source to the BC Hydro Distribution System to offset their load and participate in the Net Metering program (RS1289) or other energy procurement offers.
>
> This document contains the technical interconnection requirements for connecting small generators to BC Hydro's Distribution System. The total generation must have an aggregate nameplate rating of 100 kW or less.

On page iv of Appendix 1 in FBC's Exhibit C12-2, the Background Report EV Technology and Market Overview from PowerTech dated October 19, 2016 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, it 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.

21.2 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?

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

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

21.5 If EV owners are allowed to transfer power from stored energy in their EV's battery to the BC Hydro grid for compensation, does BC Hydro anticipate it would be under the Net Metering Program or under a different mechanism? Please discuss.

21.5.1 If BC Hydro considers the Net Metering Program to be the appropriate means to allow EV owners to sell power from EV battery storage to the BC Hydro grid, please discuss the necessary amendments to the Net Metering Program to allow for this.

21.6 Please discuss what interconnection requirements would be placed on EV owners who would want to sell power to the BC Hydro grid and how these requirements may differ from the ones in DGTIR-100.

22.0 Reference: Transcript, Volume 8, p. 433; Exhibit C3-2, p. 2

[14] BC Hydro Net Metering, https://www.bchydro.com/work-with-us/selling-clean-energy/net-metering.html
[15] BC Hydro's Distributed Generation Technical Interconnection Requirements 100 kW and Below, p. 1, https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/regulatory-planning-documents/integrated-resource-plans/current-plan/dgtir100.pdf

Open Charge Point Protocol

At the Community Input Session in Vancouver, in response to the Panel's question on fast changing technology and BC Hydro's plan to adapt, BC Hydro stated:

> [W]e have ordered a next generation fast charging unit that we're going to deploy at Powertech Labs… And that charging station is 150 kilowatts versus the 50. And it's built using three 50 kilowatt modules.

On page 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.

22.1 Do BC Hydro's EV charging stations currently use ChargePoint, AddÉnergie, or Open Charge Point Protocol (OCPP)? Further, will BC Hydro's next generation EV charging stations use the same software? Please discuss.

22.2 In BC Hydro'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..

22.2.1 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 regulators that would be more appropriate for such oversight?

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

D. RATES

23.0 Reference: Exhibit C1-2, p. 7, 12–13; Exhibit C5-2, pp. 12, 17
Rate design – charging station to EV customer

On page 13 of Exhibit C1-2, BC Hydro states:

> Other considerations when the utility can provide a regulated rate is the ability to provide rates that encourage management of load and impact on the system (e.g., curtailable rate or TOU).

23.1 For its Phase I deployment of EV Infrastructure, please discuss whether BC Hydro has considered TOU or any other rate as a fee for EV charging to encourage management of load and impact on the system? Please summarize any analysis or report completed.

On page 17 of Exhibit C5-2, City of Vancouver (CoV) indicates two concerns regarding BC Hydro's current residential rate structure:

> The current tiered residential rate structure creates an unintended distinctive for switching to EVs because residents that are using electricity efficiently can still consistently be bumped into the Tier 2 rate….
>
> The current residential rate structures don't provide any incentive to shift demands to

off-peak time, which is a missed opportunity for BC Hydro to avoid the costs associated with increasing capacity.

23.2 Does BC Hydro agree with the two concerns highlighted by the CoV? Why or why not?

On page 12 of Exhibit C5-2, CoV 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.

23.3 Does BC Hydro believe that its current default residential rate structure supports / hinders EV adoption? Please discuss.

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."

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

23.5 How would BC Hydro differentiate EV charging based on vehicle capacity? Are there any examples from other jurisdictions?

23.6 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)?

23.6.1 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?

On page 12 of Exhibit C1-2, BC Hydro states:

> Traditional cost of service to assign the costs of fast charging to a utility class of service comprised of fast charging customers would result in costs to those customers that would be uneconomic and prohibitive to the utilization of the service.

23.7 Please elaborate on why establishing rates for EV customers based on a traditional cost of service model would be uneconomic and prohibitive.

24.0 Reference: Exhibit C1-2, pp. 7, 13; 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 states "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)."

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."

24.1 Does BC Hydro have an estimate for when an approved standard with Measurement Canada will

be established?

24.2 Has BC Hydro sought Measurement Canada certification for any DCFC devices to bill on an energy-basis?

24.2.1 If so, please provide any details available of the current status of any application.

24.2.2 If not, does BC Hydro have any plans to file a request in the future?

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

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

24.4 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?

24.5 Please discuss BC Hydro's preferred rate structure (e.g. energy-based or time-based rates) in the event that DCFC billing devices are certified for commercial use by Measurement Canada. What is the basis for this preference?

25.0 Reference: Exhibit C1-2, p. 14; Exhibit C12-2, p. 19; Exhibit C20-2, p. 8
Rate design – utility to EV charging station

On page 14, BC Hydro states:

> Presently, BC Hydro charges resellers of electricity whose fast charging station is behind their meter at the existing rates applicable to those customers. For customers who install a stand-alone fast charging station, BC Hydro charges them under general service rates.

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 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.

25.1 Please comment on FBC's statement that a new rate should be developed for electricity supply to EV charging stations, including the appropriateness of demand charges.

25.2 Please provide BC Hydro's view of a new EV-specific rate class, such as the current Québec BR rate.

25.3 Please explain whether BC Hydro has considered alternatives to demand charges specific to EV charging stations.

25.3.1 If yes, what considerations have been made?

25.3.2 If no, what considerations should be made when designing an alternative to demand

charges?

25.4 Please explain whether BC Hydro has considered TOU or any other rate method specifically for EV charging stations. What are the pros and cons for each rate design considered?

26.0 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 Exhibit C35-2, for DCFCs, Victoria EVA states:

> *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.*

26.1 Please discuss whether Victoria EVA's two proposals on the BC Hydro Electric Tariff are feasible.

27.0 Reference: Exhibit C1-2, pp. 11, 15; Transcript, Volume 8, p. 373; Exhibit C19-2, p. 12; Exhibit C35-2, pp. 4, 9–10
Cross-subsidization

On page 11, BC Hydro states:

> If public utilities are allowed to own fast charging stations and have more certainty that they will recover costs from ratepayers, the benefits would include more fast charging service being available, which would encourage greater take-up of electric vehicles, lowering GHG and increasing utility revenue through additional electricity sales.

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

> Including fast charging service in a utility's rate base could result in cross subsidization and unduly discriminatory rates when viewed with a narrow lens. As discussed, BC Hydro raises the possibility that those principles could be revisited on the basis of the

evidence gained through this Inquiry, including in respect of the benefits of public utilities such as BC Hydro operating in this market as well as the magnitude of the costs being considered.

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.[16]

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).

27.1 Please confirm that "utility revenue" is currently commensurate with the sales of electricity to site host under BC Hydro's commercial rate schedule.

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

27.3 Please provide any forecasts or analysis available that estimates utility revenues according to various projections of EV uptake.

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.

27.4 If the BCUC established regulation to prohibit or limit any cross subsidization between EV users and non-EV users, please discuss BC Hydro's alternative course of action.

27.4.1 Please identify the additional cost and complexity aspects of a non-regulated affiliate.

27.5 In Exhibit C12-2, Appendix 3, pages 21 to 23, FBC provides a Rate Impact Assessment. Has BC Hydro carried out a similar rate impact assessment or sensitivity analysis on existing electricity customers? If so, please summarize BC Hydro's findings. If not, why not? Does BC Hydro plan to conduct such analysis?

E. STORAGE AND GRID STABILITY

28.0 Reference: Exhibit C24-2, p. 45
BC Hydro 2013 Integrated Resource Plan (IRP), p. 2-3, pp. 6-106, 6-109, Appendix 2A Resource planning analysis

On page 45 of Exhibit C24-2, CEC states:

> BC Hydro's integrated resource plans indicate that the utility is likely to become more capacity constrained in the future, whereas in the past this was not as significant a problem. BC Hydro also is approaching the point at which it will has developed all of the inexpensive capacity it had available and is now having to consider planning for much more expensive capacity options.

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

Consequently, it will become increasingly valuable for BC Hydro to consider implementing TOU pricing.

In chapter 2, on page 2-3 of BC Hydro's 2013 IRP,[17] BC Hydro states:

> Electric vehicle (EV) loads are included in the 2012 Load Forecast. EV load impacts are forecast to be minimal in the first 10 years, resulting in an increase of 14 GWh/year in F2017 before losses, rising to 1,396 GWh/year by F2033.

Appendix 4 of BC Hydro's IRP Appendix 2A[18] provides an analysis on EVs, including EV impacts on energy demand, EV load forecast, and EV impact on system peak demand.

In chapter 6, on pages 6-106 and 6-109 of BC Hydro's 2013 IRP,[19] BC Hydro states:

> A portion of the potential general electrification load is from the transportation sector. The corresponding capacity requirements are significant but it is assumed that there is opportunity to reduce this requirement by half by shifting charging to off peak hours, for example, by encouraging the installation of a timer which prevents the charging of vehicles during the system peak hours in the evening.
>
> [BC Hydro could] Continue distribution system studies and related activities to ensure that BC Hydro is able to supply the increased loads (e.g., electric vehicles, heat pumps) that could result from significant electrification
>
> [BC Hydro could] Continue to investigate the opportunity of managing capacity requirements from electric vehicles such as through the use of timers.

28.1 Does BC Hydro have any updated information that is similar to Appendix 4 of its 2013 IRP Appendix 2A, as referenced above? If so, please provide the updated analysis. Summarize BC Hydro's findings including any significant differences since 2013.

28.2 Please discuss BC Hydro's progress to date regarding the opportunity to manage capacity requirements from EVs such as through the use of timers.

29.0 Reference: Exhibit 9, , p. 9; Exhibit C25-2, pp. 6, 15; Exhibit C19-2, p. 13; Exhibit C12-2, Appendix 1, p. 55; Exhibit C24-2, p. 37; Exhibit C4-2, p. 15; Exhibit C9-2, p. 2-3
Grid optimization and impact

On page 9 of Exhibit C28-2, Tesla states: "Increasing the utilization of the fixed costs, especially during off-peak periods, reduces the per unit cost of the fixed assets."

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."

[17] https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/regulatory-planning-documents/integrated-resource-plans/current-plan/0002-nov-2013-irp-chap-2.pdf
[18] https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/regulatory-planning-documents/integrated-resource-plans/current-plan/0200a-nov-2013-irp-appx-2a.pdf
[19] https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/regulatory-planning-documents/integrated-resource-plans/current-plan/0006-nov-2013-irp-chap-6.pdf

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.

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

On page 13 of Exhibit C19-2, MEMPR states that "[it] 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."

29.2 Please explain what BC Hydro has considered in terms of incentives for home and workplace charging, control of charging software and system network capability? Please provide any analysis or report if available.

On page 37 of Exhibit C24-2, 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.

29.3 Please discuss whether EV uptake will require distribution system upgrades on BC Hydro's system.

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

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

29.3.3 What strategy or tools has BC Hydro contemplated to identify EV load requirements and their effects on the distribution and grid system?

29.3.4 From BC Hydro's perspective, who should bear the costs of these necessary upgrades and why?

On page 2-3 of Exhibit C9-2, the Urban Development Institute (UDI) states in reference to retrofitting existing buildings with EV chargers and infrastructure:

> There may be BC Hydro infrastructure upgrades that need to occur to service the added

load to buildings. This has significant cost implications ranging from tens of thousands of dollars to hundreds of thousands of dollars.

…

In some cases, there may be added BC Hydro infrastructure costs because of the additional assumed load from the EVC infrastructure (e.g. a building could now require a unit substation whereas before a transformer would have sufficed). Again, these costs could be as high as $150,000.

29.4 Please comment on the estimates as cited by UDI. Are they reasonable? Why or why not?

F. HYDROGEN FUEL CELL TECHNOLOGY

30.0 Reference: Exhibit C19-2, pp. 2, 4; Exhibit C12-2, Appendix 1, p. 25; Appendix 3 2016 Powertech Labs EV technology and market overview

On page 2 of Exhibit C19-2, MEMPR states that "The Province is active in promoting the uptake of zero emission vehicles (ZEVs), including battery-electric, plug-in hybrid, and fuel cell vehicles." Fuelling and charging infrastructure are key components in ensuring more ZEVs are on BC's roads. The Clean Energy Vehicle (CEV) Program includes funding for investments in EV charging infrastructure (for battery-electric and plug-in hybrid vehicles) and hydrogen fuelling infrastructure (for fuel cell vehicles).

In a news release dated March 27, 2017,[20] the Government of BC noted its Clean Energy Vehicle (CEV) Program, which in February 2016 it announced an investment of $40 million for the CEV Program over three years (2017-18, 2018-19, 2019-20), including the expansion of public, residential, and workplace charging and hydrogen fuelling infrastructure.

In Appendix 1 of FortisBC Inc.'s (FBC) evidence in Exhibit C12-2, the 2016 Powertech Labs EV Technology and Market Overview report dated October 19, 2016, on page 25, it states that "Since the late 1990's, a number of different types of "electrified" vehicles have come to market with varying levels of ability to move using electric power." The Fuel Cell Electric Vehicle (FCEV) is a vehicle with an electric powertrain which may include a battery but primarily relies on a hydrogen fuel cell for power, and which can only be refueled with hydrogen.

Powertech Labs is a wholly owned subsidiary of BC Hydro.[21] There is currently one public hydrogen fueling station operating at Powertech Labs in Surrey, BC.[22]

In accordance with the UCA:

> **"Public utility"** means a person, or the person's lessee, trustee, receiver or liquidator, who owns or operates in British Columbia, equipment or facilities for
>
> the production, generation, storage, transmission, sale, delivery or provision of electricity, natural gas, steam or any other agent for the production of light, heat, cold or power to or for the public or a corporation for compensation

[20] Exhibit C12-2, Appendix 3, FACTSHEET: Clean Energy Vehicle Program/Innovative Clean Energy Fund, dated March 27, 2017.
[21] https://www.bchydro.com/about/who_we_are/subsidiaries.html
[22] https://www2.gov.bc.ca/gov/content/industry/electricity-alternative-energy/transportation-energies/clean-transportation-policies-programs/clean-energy-vehicle-program/hydrogen-fuelling

30.1 To the best of BC Hydro's knowledge, please provide an estimated number of FCEVs relative to ZEVs registered in BC. Please provide the breakdown the information by vehicle type (e.g. private passenger vehicles), if possible.

30.1.1 From a charging infrastructure perspective, please compare and contrast the pros and cons of FCEVs relative to battery electric and plug-in hybrid electric vehicles.

30.1.2 From a user perspective, please compare the pros and cons of FCEVs relative to battery electric and plug-in hybrid electric vehicles.

30.2 Please clarify whether the existing public hydrogen fueling station in BC is owned and operated by Powertech Labs.

30.3 What is the business model of the Powertech Labs public hydrogen fueling station?

30.3.1 How many fueling sessions occur per day (or per month) at the Powertech Labs public hydrogen fueling station?

30.3.2 Approximately how long does it take to fully refuel a FCEV? What is the typical range of a FCEV?

30.3.3 Does Powertech Labs charge a fee to use the hydrogen fueling station? If so, what is the pricing structure?

30.4 In BC Hydro's view, would companies owning or operating public hydrogen fueling stations for the sale of hydrogen also fall within definition of a public utility as defined in the UCA?