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Our File: 23841/0146

June 6, 2019

**VIA ELECTRONIC MAIL**

British Columbia Utilities Commission  
Sixth Floor, 900 Howe Street  
Vancouver, BC  
V6Z 2N3

**Attention: Patrick Wruck, Commission Secretary and Manager, Regulatory Support**

Dear Sirs/Mesdames:

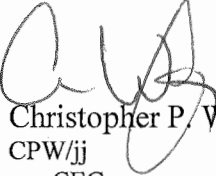
**Re: British Columbia Hydro and Power Authority ("BC Hydro") Review of the  
Regulatory Oversight of Capital Expenditures and Projects ~ Project 3698877**

We are counsel to the Commercial Energy Consumers Association of British Columbia (the "CEC"). Attached please find the CEC's Information Requests on BC Hydro's revised proposal and rebuttal evidence with regard to the above matter.

If you have any questions regarding the foregoing, please do not hesitate to contact the undersigned.

Yours truly,

**OWEN BIRD LAW CORPORATION**



Christopher P. Weafer  
CPW/jj  
cc: CEC  
cc: BC Hydro  
cc: Registered Interveners

**COMMERCIAL ENERGY CONSUMERS ASSOCIATION  
OF BRITISH COLUMBIA**

**INFORMATION REQUESTS ON BC HYDRO AND POWER AUTHORITY'S  
REVISED PROPOSAL AND REBUTTAL EVIDENCE**

**British Columbia Hydro and Power Authority Review of the Regulatory Oversight  
of Capital Expenditures and Projects  
Project No. 3698877**

**June 6, 2019**

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**1. Reference: Exhibit B-15, Rebuttal Evidence Cover Letter page 1**

On February 14, 2019, the B.C. government (the **Government**) issued its Comprehensive Review of BC Hydro: Phase 1 Final Report (the **Final Report**). As indicated in the Final Report, the Commission's jurisdiction to regulate BC Hydro will be increasing in several aspects. Amongst other changes, the Government has rescinded Direction Nos. 3, 6 and 7 (also on February 14, 2019) and issued Direction No. 8, and will be returning the review of BC Hydro's Integrated Resource Plan to the Commission. BC Hydro believes that the experience under the revised legislative structure will demonstrate that the Commission's regulatory processes, which now includes the review of BC Hydro's Integrated Resource Plan, provide a sound basis for the Commission to exercise effective oversight over BC Hydro's capital expenditures and projects.

- 1.1. Does BC Hydro believe that the rescission of Directions Nos. 3, 6 and 7 will improve the Commission's oversight materially? Please explain.
- 1.2. Please comment on how the review of BC Hydro's Integrated Resource Plan can be used by the Commission to ensure the cost-effectiveness of BC Hydro's long-term strategies.
- 1.3. Will the Integrated Resource Plan review the success and/or failures of BC Hydro's historical strategies?
  - 1.3.1. If yes, please explain how.
  - 1.3.2. If no, please explain why not.
- 1.4. Please provide BC Hydro's views of the key factors the Commission should consider and the measures that the Commission should use in evaluating the Integrated Resource Plan.
  - 1.4.1. Please comment on whether or not BC Hydro would expect to engage with the Commission before developing its IRP to establish such key factors.

**2. Reference: Exhibit B-15, Rebuttal Evidence page 2 and page 24 and *Utilities Commission Act Section 23***

- **Mr. Craig's proposal would interfere with the management of the utility:** In section 3, we explain how Mr. Craig's proposal is seeking to direct the management of the utility, which Mr. Craig acknowledges is outside the Commission's jurisdiction. Mr. Craig's proposal is not confined to the filing of oversight information as he claims, but would direct BC Hydro's management in terms of what information should be created and used to manage its capital portfolio and the standard by which our capital portfolio should be judged to be prudent.

Mr. Craig's proposal is therefore not limited to seeking oversight information, but seeks to redefine the standard by which BC Hydro's capital is judged and to direct BC Hydro management on how it should be managing its capital portfolio. Mr. Craig's proposal would therefore interfere with BC Hydro's management in a way that Mr. Craig admits is not within the jurisdiction of the Commission.

**General supervision of public utilities**

- 23** (1) The commission has general supervision of all public utilities and may make orders about
- (a) equipment,
  - (b) appliances,
  - (c) safety devices,
  - (d) extension of works or systems,
  - (e) filing of rate schedules,
  - (f) reporting, and
  - (g) other matters it considers necessary or advisable for
    - (i) the safety, convenience or service of the public, or
    - (ii) the proper carrying out of this Act or of a contract, charter or franchise involving use of public property or rights.

(2) Subject to this Act, the commission may make regulations requiring a public utility to conduct its operations in a way that does not unnecessarily interfere with, or cause unnecessary damage or inconvenience to, the public.

### **Commission must make examinations and inquiries**

**24** In its supervision of public utilities, the commission must make examinations and conduct inquiries necessary to keep itself informed about

(a) the conduct of public utility business,

(b) compliance by public utilities with this Act, regulations or any other law, and

(c) any other matter in the commission's jurisdiction.

2.1 Please confirm that pursuant to sections 23 and 24 of the *Utilities Commission Act*, the Commission is obligated to inform itself about the conduct of the public utility's business.

### **3. Reference: *Utilities Commission Act* Section 43 and 44**

#### **Duty to provide information**

**43** (1) A public utility must, for the purposes of this Act,

(a) answer specifically all questions of the commission, and

(b) provide to the commission

(i) the information the commission requires, and

(ii) a report, submitted annually and in the manner the commission requires, regarding the demand-side measures taken by the public utility during the period addressed by the report, and the effectiveness of those measures.

**(1.1)** [Repealed 2010-22-64.]

**(2)** A public utility that receives from the commission any form of return must fully and correctly answer each question in the return and deliver it to the commission.

**(3)** On request by the commission, a public utility must deliver to the commission

(a) all profiles, contracts, reports of engineers, accounts and records in its possession or control relating in any way to its property or service or affecting its business, or verified copies of them, and

(b) complete inventories of the utility's property in the form the commission directs.

(4) On request by the commission, a public utility must file with the commission a statement in writing setting out the name, title of office, post office address and the authority, powers and duties of:

(a) every member of the board of directors and the executive committee,

(b) every trustee, superintendent, chief or head of construction or operation, or of any department, branch, division or line of construction or operation, and

(c) other officers of the utility.

(5) The statement required under subsection (4) must be filed in a form that discloses the source and origin of each administrative act, rule, decision, order or other action of the utility.

#### **DUTY TO KEEP RECORDS**

**44** (1) A public utility must have in British Columbia an office in which it must keep all accounts and records required by the commission to be kept in British Columbia.

(2) A public utility must not remove or permit to be removed from British Columbia an account or record required to be kept under subsection (1), except on conditions specified by the commission.

- 3.1 Please confirm that the Commission has the authority to direct BC Hydro to provide all the information it deems necessary in order to conduct its oversight.
- 3.2 Please confirm or otherwise explain, that there is nothing in the *Utilities Commission Act* which proscribes certain forms of questions or the specifics of any information the Commission is permitted to collect.
- 3.3 Please confirm that the production of information in a format the Commission requires does not impose a requirement on management to make its own business decisions based on that information, but would instead provide information that the Utility could potentially use in its decision-making if it so deemed appropriate.
- 3.4 Is it BC Hydro's contention that the Commission does not have the authority to establish the standards by which the Commission may choose to evaluate the capital portfolio as being prudent or not? Please explain.

**4. Reference: Exhibit B-15, page 9**

**Q4. What is your response to Thomson's statement that Mr. Craig's proposal would be useful as a "repository of performance information over time"?<sup>4</sup>**

**A4.** As discussed in Part 4 of this Rebuttal Evidence, we do not believe Mr. Craig's proposal would result in a useful repository of information to gauge our performance. Furthermore, BC Hydro already collects performance information over time. Our performance is primarily benchmarked through our Service Plan<sup>5</sup> which sets four goals (Reliable and Responsive Service, Affordability, Commitment to Clean Power, and Safety) that align with our mission. Each goal has a set of performance measures. In fiscal 2018, we successfully met or exceeded all 13 of our Service Plan performance measures. For fiscal 2019, we are on track to meet all of our performance measures, with the exception of our target for Lost Time Injury Frequency. Key aspects of our performance with respect to Reliable and Responsive Service, and Affordability as they relate to our capital plan are discussed below.

<sup>4</sup> Exhibit C3-15, CEC Response to CEABC IR 4.3, p. 10.

<sup>5</sup> The Service Plan will be filed as an appendix to the Fiscal 2020 to Fiscal 2021 RRA.

- 4.1 Please confirm that BC Hydro agrees that the Service Plan as filed at pages 7 – 36 of Appendix E in the 2020 – 2021 Revenue Requirements Application, can be referenced as part of the evidentiary record in this proceeding.
- 4.2 Please identify who is responsible for setting the Service Plan goals?
- 4.3 Please provide BC Hydro's performance metrics and the results over the last 10 years.
- 4.4 Please confirm that BC Hydro, in numerous applications to the Commission, already provides much more detailed measurements and performance information than is provided in the annual Service Plan, and that even more detailed information is provided during Commission review of those applications in response to Commission and/or intervener information requests.
- 4.5 Please confirm that BC Hydro retains repositories of various kinds of detailed performance information which it uses to manage the Company and capital investments and upon which it relies to answer Commission questions.

5. Reference: Exhibit B-15, pages 12-13

Figure 3 SAIFI and SAIDI – Normalized Historical Measures

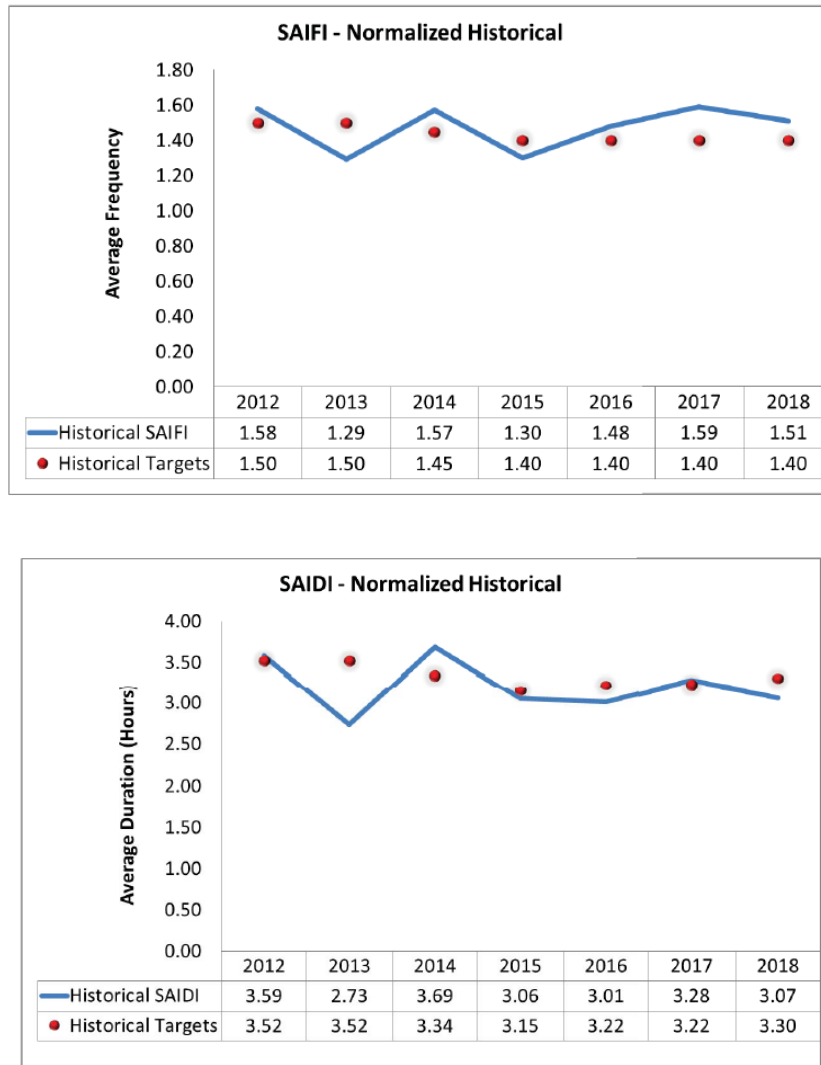
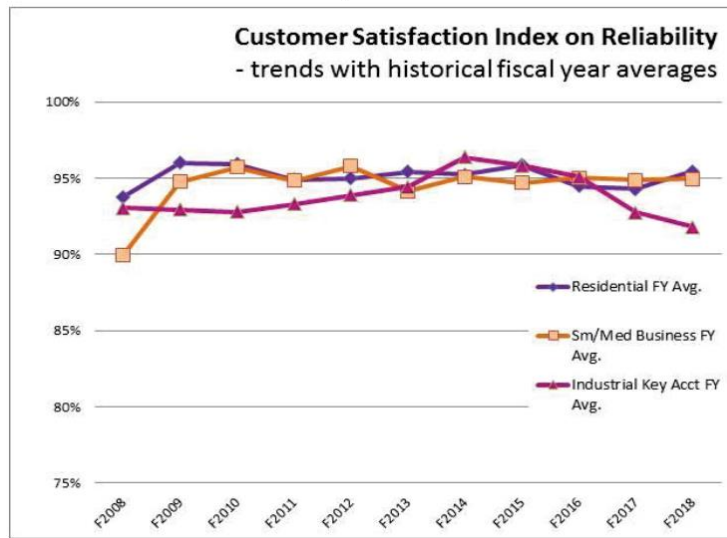


Figure 4 Customer Satisfaction Index on Reliability



5.1 Does BC Hydro experience diminishing returns for the incremental spending it now takes in improving SAIDI and SAIFI or the Customer Satisfaction Index on Reliability?

5.1.1 If yes, is BC Hydro able to provide quantification of improvements directed at making these improvements?

5.1.2 If yes, please identify in what applications, reports or other documents the Commission could expect to receive this information.

5.1.3 If no, please explain why not.

5.1.4 If BC Hydro does not know, please explain why not.



6. Reference: Exhibit B-15, page 14 and 15

***BC Hydro Has Delivered \$6.9 Billion of Projects Within 0.4 per cent of Budget***

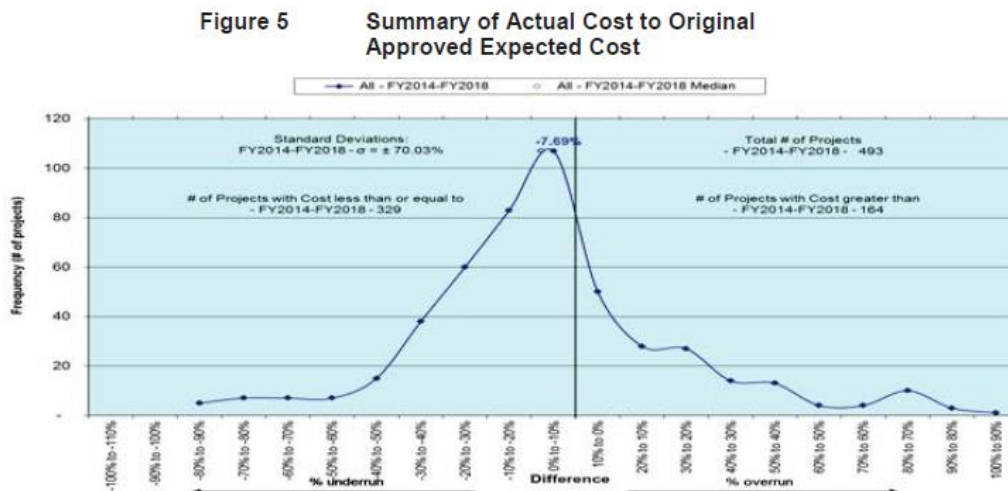
A key metric that we use to evaluate our performance in the delivery of capital projects is to compare the actual project costs for in-service projects to the original approved expected cost, over a rolling five-year period. On this metric, we perform very well. This performance measure is included in BC Hydro's Service Plan, with a target of actual costs falling within +5 per cent to -5 per cent of the original approved expected cost (First Full Funding) in aggregate, excluding project reserve amounts. This metric is calculated using the results of all Generation and Transmission projects as well as major Distribution and Properties projects.

Projects included in this metric for the five-year period of fiscal 2014 to fiscal 2018 had an aggregate original approved expected cost of \$6.936 billion. The actual aggregate costs for these projects were within \$27.9 million (or 0.40 per cent) of the original approved expected cost.

***A Significant Majority of the Projects Over the Past Five Years Were Under Original Approved Expected Cost***

In addition, of the 493 projects included in this analysis, 66.5 per cent had an actual cost that was less than original approved expected cost. The median project was 7.7 per cent below the original approved expected cost.

[Figure 5](#) below provides a visual summary of the performance of all 493 projects against the original approved expected cost.



- 6.1 Please confirm that this key metric does not provide any information with respect to the benefits which may or may not have been provided through the capital expenditures.
- 6.2 Please provide the % reductions over the last 3 years.
- 6.3 Does the 7.69% reduction from the original approved expected costs over the last 5 years represent an improvement from earlier periods? Please comment.
- 6.3.1 If yes, does BC Hydro expect to see continued improvements? Please explain why or why not.

**7. Reference: Exhibit B-15, page 15**

**Q5. What is BC Hydro's response to Mr. Craig's claim that his proposal is needed because the Commission's ability to deny expenditures at the time of an RRA is constrained as it can result in "wasted" spending by BC Hydro,<sup>6</sup> and Mr. Thomson's similar claim that it is "too late" to deny expenditures once they have been made?<sup>7</sup>**

A5. The views of Mr. Craig and Mr. Thomson are factually incorrect, inconsistent with the BCUC's obligations under the UCA, and undermine the incentive properties of the prudence standard that shape the behaviour of the utility.

First, at the time of the RRA, the Commission can make determinations with respect to whether projects are in the public interest before significant dollars have been spent. In any RRA, and indeed at any time, we have hundreds of projects in various stages of the project lifecycle, from early planning stages

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to the final implementation phase. If the Commission believes it is warranted, in a revenue requirements application it can inquire into the public interest of projects that are in their early stages, before significant dollars are spent. Further, the Commission can order BC Hydro to file a Certificate of Public Convenience and Necessity (CPCN) for extension projects, and can set the thresholds for major projects applications, which provides the opportunity to review projects in detail.

Second, by its nature, the prudence standard is always applied to dollars that have already been spent. It would be contrary to the Commission's obligations under the UCA to suggest that it is "too late" for the Commission to disallow costs if they have already been incurred. For both Crown and investor-owned utilities, the Commission is charged with approving rates that are just and reasonable. Allowing the recovery of imprudent expenditures in rates is inconsistent with that standard.

- 7.1 Please provide BC Hydro's view of the appropriate review process for a situation in which the Commission approves an expenditure as being in the public interest, but later

discovers that the decision was flawed by a lack of understanding of the full context. Could the Commission find the expenditures were imprudent? Please explain.

- 7.2 Please confirm that the Commission could hold the view that capital expenditures made, or to be made, for which the assessment of value (benefit) to be obtained is inadequately evaluated could be held to be an imprudent expenditure.

**8. Reference: Exhibit B-15, page 17**

any “earlier” look at strategies, plans, projects, or programs, but would at best give the Commission more frequent looks. At worst, Mr. Craig’s annual filing would produce a summary of data in which any single investment cannot be easily understood or evaluated.

Second, the ability to make “earlier” or more “proactive decisions” on plans, strategies, projects and programs would be similar to that in revenue requirements applications. Specifically, any attempt to make decisions at an earlier planning stage will be limited by the level of information available at these early planning stages. Because engineering work has not begun or has not progressed very far, cost estimates for projects and programs in early stages, if available at all, are highly uncertain. Details on available alternatives, stakeholder engagement, First Nations consultation, environmental impacts and other factors relevant to a cost effectiveness determination may be uncertain and only available at a high level or not available at all.

Because information on projects and programs takes time and cost to develop, BC Hydro does not give internal approval for the full funding of a project in the early stage, but instead approves its projects and programs in phases as they develop. We would not expect the Commission to approve projects and programs at early stages based on the limited information available at that time. For example, we would not be able to satisfy the Commission’s CPCN Guidelines based on the information available in the Identification Phase of a project.

Any early assessment of a strategy, plan, project or program will therefore always be subject to the later assessment of projects or programs when the information is available to assess the need, alternatives, costs, benefits, stakeholder and First Nation impacts, and all the other factors relevant to a cost-effectiveness determination.

- 8.1 Please confirm, or otherwise explain, that many projects that BC Hydro undertakes such as risk-based projects or IT projects, are not necessarily justified on a quantitative cost/benefit analysis, such that verifiable quantitative benefits exceed the anticipated costs?

- 8.2 Please confirm that BC Hydro's strategies, such as those related to IT and others, can be significant drivers for expenditures.
- 8.3 Please confirm that BC Hydro undertakes to develop projects that are consistent with its strategies.
- 8.4 Please confirm that strategy alternatives can cause projects, programs and plans to be more or less cost-effective under one strategy alternative or another.
- 8.5 Please describe how BC Hydro evaluates strategy alternatives when adopting a strategy, and whether or not BC Hydro makes estimates to deal with uncertainties and lack of detailed information, or does BC Hydro wait for detailed project/program implementation to evaluate the strategy.
- 8.6 Please confirm that optimization of values for strategies and plans is an ongoing requirement for BC Hydro's capital investment planning and management.
  - 8.6.1 Please confirm that optimization values change, with new information potentially impacting the optimization decision.

**9. Reference: Exhibit B-15, page 19**

Based on our review of Mr. Craig's proposal, we do not believe the proposed process described by Mr. Craig could result in increasing the financial cost effectiveness of the capital portfolio or that we should even adopt such a goal. Assuming that the cost effectiveness of a capital portfolio could be calculated, the cost effectiveness of the capital portfolio would increase or decrease depending on the nature of the needs and opportunities at any given time. In some years there may be a need to incur significant costs to meet reliability requirements or increase generation to meet growing load, and in other years there may not. While in other years there may be opportunities to achieve significant financial benefits from financial value-driven projects and in other years there may not. The result is that the cost effectiveness of the capital portfolio in any one year (assuming that this could be calculated) could never be judged by reference to the cost effectiveness of historical years. Therefore, Mr. Craig's proposal would not be useful in increasing cost effectiveness.

Finally, improvements in the capital portfolio cost effectiveness may not necessarily lead to financial cost savings. Cost effectiveness should consider many factors other than financial ones such as risk mitigation benefits, alignment with corporate objectives and improvements to key performance indicators. Assuming that the cost effectiveness of a capital portfolio could be calculated, increasing cost effectiveness may, for example, be the result of mitigating safety, environmental and reliability risks, which could ultimately increase financial costs but result in a higher overall net value.

- 9.1 Please confirm that many businesses, such as the insurance industry, are able to assess and quantify the benefits of risk mitigation and cost of risk compensation.
- 9.2 Please confirm that financial cost savings is not the sole objective of cost-effectiveness.
- 9.3 Please confirm that overall improvement in both financial benefit and all manner of other benefits, in the public interest, are the objective of cost-effectiveness.

**10. Reference: Exhibit B-15, page 28**

defined and evaluated. While some consideration of alternatives is undertaken during the development of strategies, plans and studies, the full evaluation of alternatives is typically undertaken when a project has been initiated and involves activities such as consultation and engagement with impacted First Nations and stakeholders as appropriate; a substantial commitment of time and resources is required to complete a reasonable level of project definition. It would be neither

- 10.1 Please confirm that adherence to strategies can become a significant part of a project's requirements and justification.
- 10.2 If BC Hydro were to become aware of a significant concern that the Commission had with regard to one of its strategies prior to or during the development of a related project, please describe the types of actions that BC Hydro might take and explain why.

**11. Reference: Exhibit B-15, page 32 and page 33**

**In Exhibit C-3-15-1, Mr. Craig in his response to CEABC IR 5.2 states:**

The objective of assessing cost-effectiveness is to identify a particular benefit of the capital expenditure and investment, determine the appropriate measure for understanding the benefit, identify the costs related to achieving that benefit and be in a position to calculate the cost for the unit of benefit delivered.

This approach is common throughout all of the CEC's preliminary identification of methodology for examining cost-effectiveness, regardless of the group with particular types of capital investments and expenditures to manage. Of course, details vary with type but the fundamental principle of analysis remains the same.

**Is this aligned with how BC Hydro defines cost effectiveness?**

- 16. Our definition of cost effectiveness aligns with our understanding of the Commission's use and definition of the term as referenced in a number of Decisions. In the Vancouver Island Generation Project (VIGP) decision in 2003, the Commission Panel made a distinction between cost effective and least cost. The Commission Panel stated that "cost-effective" included a "consideration of project characteristics such as reliability, dispatchability, timing, and location as well as cost or price, in the case of an EPA. Least-cost is taken to only include cost or price considerations."<sup>18</sup>

In the Vancouver Island Transmission Reinforcement (VITR) Project CPCN Application decision in 2006, the Commission Panel referenced the description of cost effectiveness in the VIGP decision, and provided further



Our understanding of the Commission's use of the term "cost effective" is that it considers not just the economic cost of a capital investment or the economic benefits from undertaking that capital investment, but also the non-quantifiable or non-economic considerations such as safety and environmental risks as the case permits. We view the Commission's description as broad enough to assess both capital investments where adding economic value is a priority and capital investments undertaken to minimize the impact of safety, environmental, or reliability risks. We believe this broader view of capital investments is necessary to assess what capital investments are in the public interest and whether rates are just and reasonable.

- 11.1 How would BC Hydro label an assessment that provided an evaluation of the overall costs vs. the overall benefits, where the benefits such as dispatchability, risks, timing and location and others are quantified according to a standardized metric for each, but not necessarily assigned a dollar value?

**12. Reference: Exhibit B-15, page 36**

(ii) Developing Strategies, Plans, and Studies

As defined in our Revised Proposal filed as Exhibit B-7, we develop strategies, plans, and studies to seek solutions to effectively invest in the power system and infrastructure, and investigate and / or implement broader regional, system, or business unit solutions or policies. In our response to CEC IR 1.19.1 filed as Exhibit B-4, we explained that the primary purpose of our strategies, plans, and studies for the power system is to document the identification of system needs and risks along with potential response to allow us to coordinate and optimize the development of the power system in

response to those needs over a long time frame. Optimizing the development of the power system minimizes the risk of stranded assets and ensures we mitigate risk by maintaining future system performance and anticipating load growth. Similarly, the primary purpose of our strategies and plans for Technology is to document the identification of our technology needs and risks along with potential responses. This is a holistic cost-effective approach to managing the development of the power system and supporting infrastructure given that strategies, plans, and studies, and proposed solutions change over time in response to changing needs and emerging risks.

Typically a financial benefit analysis or a net present value analysis is not included in strategies, plans, and studies for the reasons stated in the preceding paragraph. Undertaking a financial benefit analysis for proposed solutions would be doing so before the Initiation Phase as seen in [Figure 6](#) below, before the scope has been defined and at a time when the costs are reflective of high-level planning allowances. There are a few exceptions where undertaking a financial benefit analysis to determine the proposed solution is appropriate. In those situations, the strategy, plan, or study will include the financial benefit analysis.

- 12.1 Is it BC Hydro's contention that the adoption of a strategy does not represent a financial decision? Please comment.
- 12.2 Please provide any evidence that BC Hydro is aware of that the Commission deems at least certain strategies to be a financial decision of potentially significant impact.



**13. Reference: Exhibit B-15, page 53 and 54**

A23. We primarily gauge our performance through the Service Plan Performance Measures, which we have been meeting. Capital plans are not financial approval mechanisms and, in themselves, are not an effective way for the Commission to evaluate our performance for the following reasons:

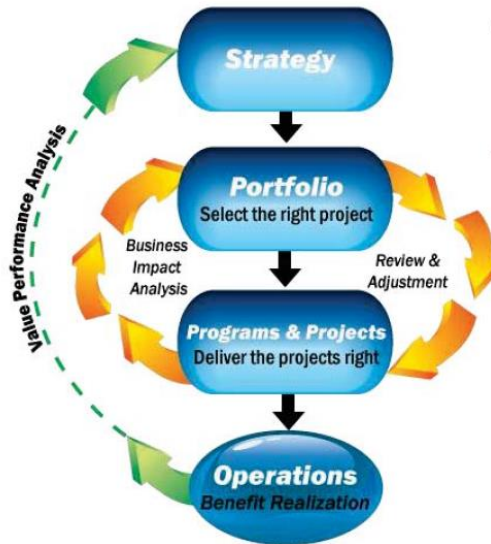
1. The long-term capital plan includes projects at various levels of project definition. It includes projects ranging from those that have not yet been initiated (i.e., future projects) to projects that are in the Implementation Phase. Future projects have a high degree of uncertainty with regards to project scope, schedule, and cost which makes any measure of their cost effectiveness too uncertain to gauge BC Hydro's performance;
2. The long-term capital plan is subject to change due to the evolving risks and emerging needs of the system; and
3. Benefits reflected in the capital plan may not be additive at the portfolio level making it difficult to assess cost effectiveness at the portfolio level.

cost, and expected impacts and outcomes are subject to review prior to approval.

- 13.1 If BC Hydro were to identify certain trends in its capital planning processes which suggested either improvements or deterioration of project values over time, please comment on whether or not the Utility might find that useful.
- 13.2 Please confirm that understanding of the full context of projects as they become available could be useful in assessing the value of a project when it is ultimately reviewed.
- 13.3 Please confirm that when BC Hydro does long-term resource planning, and particularly when it is assessing rate impacts, it does so with a long-term capital plan underlying the plans.
- 13.4 Please confirm that BC Hydro has used a 10-year capital plan and consequent rates as an input to its own capital planning.
- 13.5 Please confirm that BC Hydro's Integrated Resource Planning, Revenue Requirements Applications and other Commission regulated processes have evidence submitted providing long-term capital plans.
- 13.6 Please confirm that benefits which may not be additive have a reason for not being additive, and that such benefits may be analyzed to determine what may be an appropriate aggregate for the benefit (i.e. this issue is a technical analysis issue and not necessarily an impossibility).

14. Reference: Exhibit B-15, Appendix A page 5 of 25

## What is Organizational Project Management?



- **Portfolio management:** Making the decisions that deliver the greatest business value
- **Program and Project management:** Efficiently delivering the business value of your decision
- Establish a review and adjustment process
- Achieve the benefits promised to the organization

14.1 Would BC Hydro agree that optimizing the total end benefits vs the total end cost subject to constraints and risk management, is an appropriate definition of delivering the 'greatest business value'?

14.1.1 If no, please provide BC Hydro's definition of the 'greatest business value'.

14.2 Please provide BC Hydro's view of 'efficiently delivering the business value of your decision'.

14.3 Over what periods of time does BC Hydro conduct its Business Impact analyses?

14.4 Please provide the metrics BC Hydro uses to conduct the Business Impact analyses.

14.5 Are the Business Impact analyses reported to the Commission?

14.5.1 If yes, when?

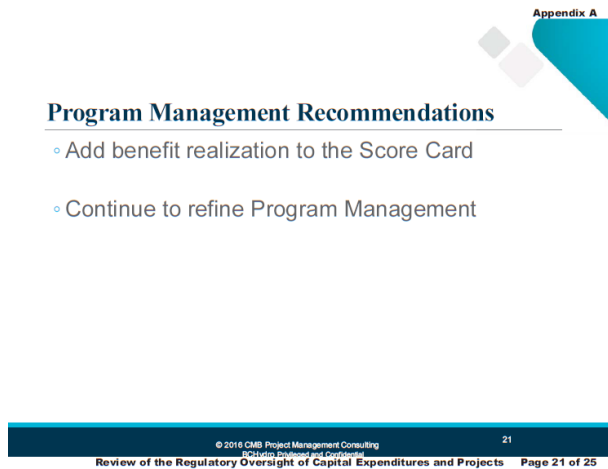
14.5.2 If no, why not?

**15. Reference: Exhibit B-15, Appendix A page 20 of 25**



- 15.1 Please elaborate on exactly what is meant by the recommendation to ‘improve Project Management scalability’ and identify what issues were found that require improved scalability.
- 15.2 What steps are BC Hydro undertaking to improve the project management scalability, and when were these implemented?
- 15.3 Please elaborate on the need to monitor performance metrics and how these will be used in BC Hydro’s project management and capital planning functions overall. How has BC Hydro addressed these recommendations?
- 15.4 Please provide a comprehensive list of performance metrics to be used in BC Hydro’s project management and capital planning functions and please provide this for each of the major divisions in BC Hydro with capital management responsibilities (i.e. Generation, T&D, IT, Buildings, Fleet, etc.).

**16. Reference: Exhibit B-15, Appendix A page 21 of 25**



- 16.1 Please elaborate on the recommendation to ‘add benefit realization’ to the Program Management score card. Please comment on how such an addition will assist BC Hydro in its Program Management and identify what BC Hydro has done to address this recommendation.
- 16.2 Please elaborate on the recommendation to continue to refine Program Management. What refinements are required and why? Has BC Hydro addressed this recommendation and if so, when?

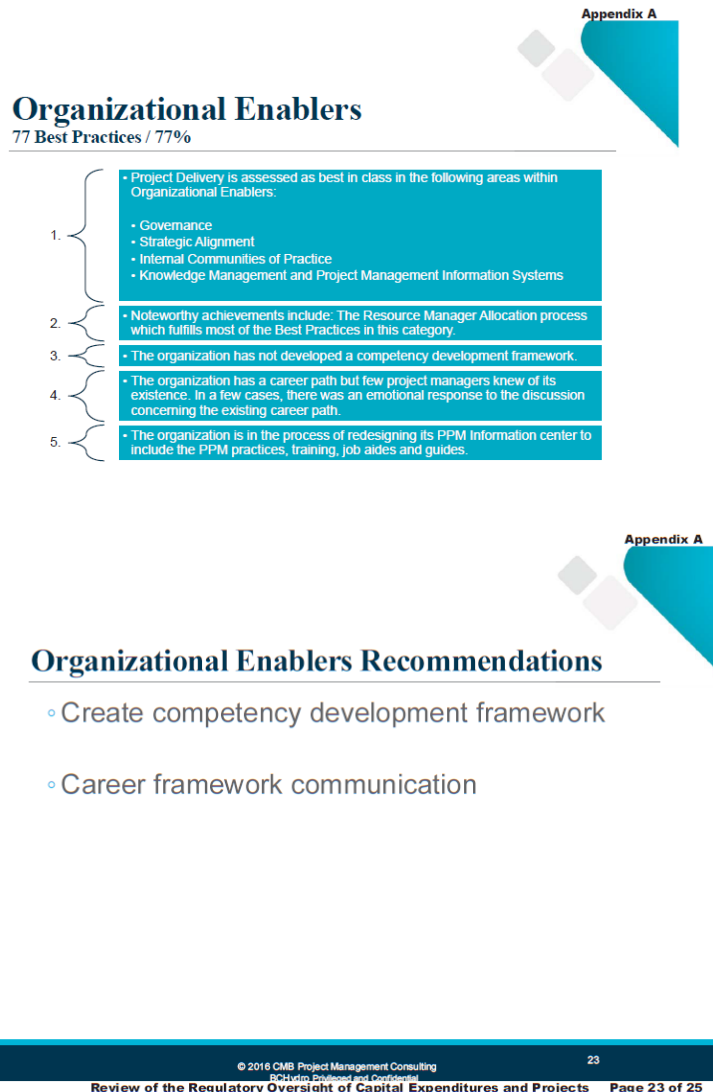
**17. Exhibit B-15, Appendix A page 22 of 25**



- 17.1 Please elaborate on exactly what is meant by the recommendation to ‘Increase portfolio optimization’ and provide examples.
- 17.2 Please explain how the recommendation to ‘Increase portfolio optimization’ will assist BC Hydro in its capital management.

17.3 Given that such a system (portfolio optimization) has been under development in BC Hydro for over 18 months, does this recommendation change the existing development or complement and reinforce the existing plans? Please explain.

18. **Reference: Exhibit B-15, Appendix A pages 17 and 22 of 25**



18.1 Please elaborate on ‘organizational enablers’.

18.2 Please elaborate on the recommendations to create a ‘competency development framework’ and what this is intended to accomplish. How will this framework aid the utility in its decision-making?

18.3 Please explain the meaning of ‘Career framework communication’ and its role in the organization and decision-making.

**19. Reference: Exhibit B-15, page 34-35**

(i) Developing our Capital Plan

BC Hydro's capital investments planning process is described in Chapter 6 of the Fiscal 2017 to Fiscal 2019 RRA and an updated description will be provided in Chapter 6 of the Fiscal 2020 to Fiscal 2021 RRA. The annual capital planning process applies a common approach to planning, prioritizing and governing investments across BC Hydro so that the Capital Plan is updated and prioritized to respond to the latest information on the system risks and needs. This is done by selecting the highest priority investments that can be cost effectively delivered given available financial and labour resources in order to meet overall business objectives and provide a consistent and appropriate management of risks across all asset categories. This view of cost effectiveness is consistent with the Commission's approach as discussed in [A16](#) and reflects our obligation to serve. Our Service Plan Performance Measures, which set four goals related to Reliable and Responsive Service, Affordability, Commitment to Clean Power, and Safety, allows us to ensure our Capital Plan is achieving the desired results.

Given the size and complexity of BC Hydro's capital portfolio, we have been working over the past 18 months in a structured and deliberate manner to enhance our existing enterprise prioritization framework by implementing a value-based decision making approach that will build on our existing capital investment planning processes. The value-based decision-making approach is a prioritization tool that will capture the relative importance of the capital cost and value of an investment by translating a variety of investment benefits into a common economic scale. Using this tool, the capital portfolio can be optimized by selecting the investments that will bring the highest total net

value to the organization while satisfying any financial, resource, or timing constraints.

This value-based decision making approach is aligned with our Service Plan commitments and corporate priorities, and considers value to be elements such as our service plan measures, risks mitigated (reliability, safety, environmental risks etc.), cost savings, and costs avoided. It will allow for a better understanding and communication of the implications of our capital investments, and is similar to the approach being taken by a number of our utility peers in Canada.

The value-based decision making approach differs from what Mr. Craig has proposed in its capacity to:

- Appropriately optimize BC Hydro's capital portfolio given its complexity and size;
- Align with the commitment and priorities of BC Hydro and with BC Hydro's asset management practices and framework; and
- Take into account the changes in investment value over time for optimization purposes.

- 19.1 What criteria does BC Hydro believe is necessary to consider in 'optimizing the capital portfolio given its complexity and size'. Please be specific.
- 19.2 How can the Commission determine if the capital portfolio is 'optimized'?
- 19.3 Please elaborate on the 'changes in investment value over time for optimization purposes'. Please identify what types of changes could occur and how they might impact the capital portfolio optimization.
- 19.4 Please provide the complete documentation for the value-based decision-making approach and prioritization tool including the design of the content metrics.
- 19.4.1 Please provide the name of the project and when it was commenced.
- 19.4.2 Please provide the expected cost of the project.
- 19.4.3 Please provide the 'prioritization framework' being referenced.
- 19.4.4 When does BC Hydro expect the work developing the decision-making approach to be complete?
- 19.4.5 Please identify what party or parties provided the design for the decision-making approach.
- 19.4.6 Please identify who has or will approve the final decision-making approach.



- 19.4.7 Please provide the key objectives of the project and any criteria being used as a foundation for the project.
- 19.4.8 Please comment on whether or not the Commission has been consulted and/or provided input into the appropriate metrics or other considerations such that the decision-making approach will provide value to the Commission in its determinations.
- 19.4.9 Please comment on whether or not the Government of BC has been involved in or provided input to the project, either as a result of the government review of BC Hydro or other participation. Please explain.
- 19.4.10 Are the results of the decision-making process project included in the Capital Guidelines? Please explain why or why not, and elaborate on where these are included if they are included.
- 20. Reference: Exhibit B-15, page 35- 36 and RRA Appendix K pages 31, 51, 63, 67, 74, 76, 77, 78, 79, 81, 84 and 86**

(ii) Developing Strategies, Plans, and Studies

As defined in our Revised Proposal filed as Exhibit B-7, we develop strategies, plans, and studies to seek solutions to effectively invest in the power system and infrastructure, and investigate and / or implement broader regional, system, or business unit solutions or policies. In our response to CEC IR 1.19.1 filed as Exhibit B-4, we explained that the primary purpose of our strategies, plans, and studies for the power system is to document the identification of system needs and risks along with potential response to allow us to coordinate and optimize the development of the power system in



response to those needs over a long time frame. Optimizing the development of the power system minimizes the risk of stranded assets and ensures we mitigate risk by maintaining future system performance and anticipating load growth. Similarly, the primary purpose of our strategies and plans for Technology is to document the identification of our technology needs and risks along with potential responses. This is a holistic cost-effective approach to managing the development of the power system and supporting infrastructure given that strategies, plans, and studies, and proposed solutions change over time in response to changing needs and emerging risks.

Typically a financial benefit analysis or a net present value analysis is not included in strategies, plans, and studies for the reasons stated in the preceding paragraph. Undertaking a financial benefit analysis for proposed solutions would be doing so before the Initiation Phase as seen in [Figure 6](#) below, before the scope has been defined and at a time when the costs are reflective of high-level planning allowances. There are a few exceptions where undertaking a financial benefit analysis to determine the proposed solution is appropriate. In those situations, the strategy, plan, or study will include the financial benefit analysis.

In Appendix K of the Fiscal 2020 to Fiscal 2021 RRA, we will provide summaries of strategies, plans, and studies that are related to projects listed in Appendix I and will provide in Appendix L the Technology Strategy and 5-Year Plan. We expect this will assist the Commission and interveners in contextualizing the identified solutions or projects within the strategies, plans, and studies; and

**Name of Capital Strategy, Plan or Study:**

**Generation Asset Management Strategy - Penstock Recoating**

**Summarize Issue:**

There are 67 penstocks supplying 79 units at BC Hydro's hydroelectric generating stations. Penstocks are high-value assets that convey water to a generating unit's turbine. Generally, the exterior and interior surfaces of the steel penstocks are coated to protect the underlying material from abrasion, corrosion, and ultimately material loss and a reduction in structural strength.

Over time, the coatings wear, degrade and fail, leading to corrosion of the underlying penstock material. Recoating of the penstock ensures that its life can be preserved, however, if the window of opportunity to recoat the penstock is missed, the underlying material will continue to corrode over time, and eventually, the penstock can no longer be used to safely convey water to the generating facility.

If the corrosion is too severe, it may not be possible to re-coat the penstock, resulting in a number of issues and risks:

- Financial - A much more expensive penstock replacement and significantly longer generating unit outage would be required;
- Reliability - the asset can no longer safely convey water to the turbine forcing the generator to be taken out of service; and
- Safety and Environmental - severe corrosion and metal loss can result in sudden and large uncontrolled releases of water. BC Hydro mitigates this risk by monitoring the condition of its penstocks over time and would pro-actively remove an asset from service if degradation became too severe.

Currently, approximately 13 penstocks are between 50 and 60 years old, and 23 are more than 60-years old (of which three are no longer in service). Age is one factor but operating environment and water pressure, the quality of the coating and design factors have a larger effect on the asset health.

Approximately 32 (48 per cent) of the penstocks have been assessed as Poor or Unsatisfactory, primarily due to issues with the coatings, indicating there is an increased likelihood of loss of structural strength if not addressed in a timely manner.

**Summarize Solution:**

BC Hydro has undertaken a number of activities to better understand the condition of the penstocks and coatings. Work was undertaken to assess the health of all of its penstocks to establish a baseline of condition and risks. An enhanced penstock asset health methodology was developed to assess both the condition of the penstocks and its coatings. The information has been used to identify the poorest condition penstock coatings and to estimate the window of time remaining to re-coat the penstock before a replacement of the asset would be required.

As a result of this work, a number of capital projects have been identified to remediate the risks associated with the higher risk penstocks with a focus on penstock coatings. The planned scope and timing of these investments has considered factors such as:

- The need to re-coat both the exterior and exterior, or whether one surface is a higher priority;
- The need to recoat an entire penstock or whether only localized coating refurbishment would be sufficient;
- The opportunity to co-ordinate the investment with similar duration unit outages; and
- The operating pressure of the penstock with higher pressure penstocks generally given higher priority for re-coating.

Given the coating condition of a large number of penstocks, consideration was given to a project delivery strategy that minimizes costs, reduces quality risks and more efficiently delivers the recoating projects.

**Short-Term:**

The condition of assets is reviewed on a regular basis considering such factors as recurring test results, visual inspections, and detailed engineering assessments. This information is used to assess the condition of each penstock to help prepare a consolidated list across the fleet to identify the most appropriate time to address the risks while best coordinating other planned generating unit outages. Below is a list of those

penstocks with higher priority requiring investment in the short-term:

- Ash River steel penstock (external recoating);
- Bridge River 1 penstocks 1 to 4 (internal recoating);
- Bridge River 2 penstock 2 (internal recoating);
- Cheakamus penstocks 1 and 2 (internal and external recoating);
- Jordan River penstock (external recoating);
- Lake Buntzen 1 penstock (external recoating);
- Puntledge steel penstock (internal and external recoating); and
- Wahleach penstock (internal and external recoating).

**Medium-Term:**

There are a number of penstock coating refurbishment projects that will need to be initiated in the medium term. The strategy and prioritization will be adjusted over time to respond to new information becoming available from penstock condition assessments. Currently, the following locations have been identified as higher risk:

- Bridge River 1 penstocks 1 to 4 (external recoating);
- Kootenay Canal penstocks 1 to 4 (internal recoating);
- Lake Buntzen 1 penstock (internal recoating);
- Peace Canyon penstocks 1 to 4 (external recoating);
- Walter Hardman penstock (exterior recoating);
- Mica Creek penstocks 1 to 6 (targeted recoating);
- La Joie south penstock (interior recoating);
- Seton penstock (interior recoating); and
- GM Shrum penstocks 1 to 10 (interior recoating).

**Long-Term:**

Over the next 10 years, a number of penstock coatings will continue to degrade. Remediation of the risks associated with these assets will be required in the long-term, applying similar assessment and prioritization techniques to those outlined above.

<p><b>Name of Capital Strategy, Plan or Study:</b>  <b>Asset Management Strategy – Section 3.1.8: Street Lighting</b></p>
<p><b>Summarize Issue:</b>  BC Hydro owns and maintains approximately 90,000 street lights mounted on BC Hydro or Joint Use (co-owned with TELUS) poles, and 4,200 leased private outdoor lighting units installed on customer or BC Hydro owned poles located on private property. Most BC Hydro street lights are high pressure sodium technology while most private outdoor lights are mercury vapour technology.  BC Hydro provides street lighting service to various customers (mainly municipalities) to:</p> <ul style="list-style-type: none"> <li>• Support night-time safety for the general public; and</li> <li>• Contribute to reliability by reducing outages due to vehicular accidents.</li> </ul> <p>The main issues and risks associated with street lighting include:</p> <ul style="list-style-type: none"> <li>• Approximately 20 per cent of BC Hydro's street lights may contain polychlorinated biphenyls (<b>PCBs</b>), which must be removed from the system by December 31, 2025 in accordance with Federal PCB Regulations;</li> <li>• Municipalities are increasingly interested in implementing various cost and energy-saving initiatives such as Light Emitting Diode (<b>LED</b>) technology lights and adaptive controls; and</li> <li>• Meeting the street lighting outage response target of 10 working days is challenging in certain smaller districts of the province due to lack of dedicated resources.</li> </ul>
<p><b>Summarize Solution:</b>  The objective of this strategy is to replace conventional street lighting with LEDs and consider new technology to provide customers with increased flexibility of use.  A street light replacement program to convert existing high pressure sodium and mercury vapour technology street lights to LED technology is current being developed with a target to being implementation in mid-2020.</p> <p><b>Short-Term:</b>  Work is ongoing to qualify manufacturers of LED street lights and adaptive control systems. Business justification is in progress to recommend a preferred LED solution which may or may not include adaptive controls. Once justification is approved, a rate application will be made to include LED technology as part of existing street light and private outdoor light rates. The current target to begin implementation of the conversion program is mid-2020.</p> <p><b>Medium- and Long-Term:</b>  The timeframe for to complete implementation is currently estimated in the range of two to four years after commencement of implementation.</p>

- 20.1 The above items are labelled as 'strategies' and there are approximately 12 provided in Appendix K. How can the Commission determine whether or not the BC Hydro strategies together are comprehensive in addressing the Utility's existing and future requirements?
- 20.2 How can the Commission determine the likely cost of the various strategies and the importance of the issue identified?
- 20.3 Please explain how the Commission can determine whether or not the strategies or 'solutions' are the most cost-effective approach vs other strategies it may have considered and discarded for each issue.
- 20.4 Please explain how the Commission can evaluate the success of the strategies over time.

- 20.5 Would BC Hydro agree that the above strategies are generally related to condition/sustainment and risk mitigation?
- 20.6 From the information provided, how can the Commission understand the total value of the strategies such as how long the life extension for the penstock may be and how long the coating is expected to last?
- 20.7 Please provide the quantitative plan over 10 years for penstock and for 2-4 years for street lighting.
- 20.8 How can the Commission determine whether or not there are alternative types of coating which could be used and why the selected coating have been chosen?



21. **Reference: BC Hydro RRA F2020-F2021 Appendix K page 3, 5, 7, 10, 12, 13, 15, 17, 18, 20, 22, 24, 26, 28, 29, 33, 35, 37, 39, 41, 42, 44, 48, 54, 56, 59, 61, 62, 65, 69 and 71**

<p><b>Name of Capital Strategy, Plan or Study:</b> Alouette Facility Asset Plan</p>
<p><b>Summarize Issue:</b></p> <p>The single unit, 9 MW Alouette facility is located in the Fraser Valley and was commissioned in 1928. It forms part of the Stave River system, with Stave Falls and Ruskin facilities located downstream. It consists of the Alouette Lake Reservoir, Alouette Dam, Power Tunnel from Alouette Reservoir to Stave Lake Reservoir, and Alouette Generating Station. Alouette is a Strategic facility for asset management purposes and Alouette Dam is an Extreme consequence dam per the BC Dam Safety Regulation. The original dam was replaced in 1983 when the current earthfill dam was constructed immediately downstream of the original dam. Alouette Generating Station has been out of service since 2010, due to condition and reliability issues with the majority of the generating equipment; however, the water conveyance components of the facility remain an important mechanism for conveying water to the Stave Falls and Ruskin facilities.</p> <p>Although Alouette Generating Station is currently out of service, investments are being made to ensure safety, water conveyance, and environmental risks are mitigated. BC Hydro has invested over \$5 million over the past 10 years. These investments include safety upgrades, and operating gate and trashrack replacements. The most significant remaining issues and risks associated with the Alouette facility include:</p> <ul style="list-style-type: none"> <li>• <b>Dam Safety:</b> <ul style="list-style-type: none"> <li>- Potential damage to the dam's spillway in a major earthquake expected to occur once every 1,000 to 2,500 years that would render it unsafe for spills or drawdowns after the earthquake;</li> <li>- Potential failure of the dam's right abutment foundation in a major earthquake expected to occur once every 2,500 years, which would lead to the eventual failure of the concrete weir structures that regulate flow over the spillway;</li> <li>- Expected failure of the power tunnel's headworks and surge tower structures and ancillary equipment in an earthquake expected to occur once every 100 to 200 years, which could block the post-earthquake discharge of water from Alouette Reservoir to Stave Lake Reservoir; and</li> <li>- Potential rupture in a major earthquake of the seismically deficient low level outlet conduit (having unquantifiable withstand) that runs under the dam and provides environmental flows into the Alouette River downstream of the dam, which introduces the risk of internal erosion damage to the dam.</li> </ul> </li> </ul>
<p><b>Summarize Solution:</b></p> <p>The Alouette Facility Asset Plan presents short and long term investment strategies to mitigate risks related to dam safety, water conveyance, and the environment. In the short term, investments at Alouette will focus on addressing deficiencies related to post-earthquake discharge of the reservoir and associated risks posed to the dam by ensuring post-earthquake operability of the power tunnel leading from Alouette Lake Reservoir to Stave Lake Reservoir, and by constructing a new passage for passing environmental flows past the dam and down the Alouette River. The medium to longer-term focus will be to preserve the operational capability and infrastructure and, when appropriate, restore generation.</p> <p><b>Short &amp; Medium-Term:</b></p> <ul style="list-style-type: none"> <li>• <b>Dam Safety:</b> <ul style="list-style-type: none"> <li>- Headworks and Surge Tower Seismic Stability Improvement; and</li> <li>- Environmental Flow Discharge Upgrade and Low Level Outlet Sealing.</li> </ul> </li> </ul> <p><b>Long-Term:</b></p> <ul style="list-style-type: none"> <li>• <b>Generating Equipment:</b> <ul style="list-style-type: none"> <li>- Powerhouse Redevelopment.</li> </ul> </li> </ul> <p>The following are retained risks that are intended to be managed by completion of the Headworks and Surge Tower Seismic Stability Improvement project that is presently underway. These include:</p> <ul style="list-style-type: none"> <li>• Seismic deficiency of the dam's right abutment foundation and spillway weir; and</li> </ul>

- Seismic deficiency of the dam's spillway.
- On completion, this project will provide post-earthquake reservoir discharge into Stave Lake Reservoir via the power tunnel, thereby protecting these potentially damaged dam and spillway assets. Prior to the project's completion, Alouette Lake Reservoir will be operated in a manner that provides sufficient time to provide emergency response following a major earthquake.

<p><b>Name of Capital Strategy, Plan or Study:</b> Ash River Facility Asset Plan</p>
<p><b>Summarize Issue:</b> The single unit, 28 MW Ash River facility is located on Vancouver Island and was commissioned in 1959. It consists of Elsie Lake Reservoir, Elsie Main Dam, four Saddle Dams, Elsie Spillway Dam, and Ash River Generating Station. Ash River is classified as a Strategic facility for asset management purposes and the dams are classified per BC Dam Safety Regulation as follows:</p> <ul style="list-style-type: none"> <li>• Elsie Main Dam – Extreme consequence;</li> <li>• Saddle Dam 1 – Extreme consequence;</li> <li>• Saddle Dam 2 – Very High consequence;</li> <li>• Saddle Dam 3 – Significant consequence;</li> <li>• Saddle Dam 4 – Significant consequence; and</li> <li>• Elsie Spillway Dam – High consequence.</li> </ul> <p>Investments totaling over \$5 million have been made to address safety and reliability concerns at the facility over the past 10 years. Completed capital investments have included upgrading the fire protection system, extending the life of the pressure regulating valve, improving security at Elsie Dam and upgrading the powerhouse crane.</p> <p>The most significant remaining issues and risks associated with the Ash River facility include:</p> <ul style="list-style-type: none"> <li>• <b>Generating Equipment:</b> <ul style="list-style-type: none"> <li>– Unsatisfactory condition of the generator, elevating the reliability risks associated with the single unit and increasing the likelihood that the facility may experience an extended forced outage; and</li> <li>– Obsolete and deteriorating protection and controls and metering systems pose a reliability risk and could result in misoperation, equipment damage, and forced outages.</li> </ul> </li> <li>• <b>Dam Safety:</b> <ul style="list-style-type: none"> <li>– The coatings on the steel penstock have failed which will lead to corrosion and metal loss of the underlying material, thereby reducing the life of the penstock. A finite window of opportunity exists to re-coat the assets before a much more extensive replacement / refurbishment is required; and</li> <li>– The ongoing deterioration and accelerated decay of the woodstave penstock is reducing its ability to continue to safely convey water which may prematurely impact ongoing generation from the facility.</li> </ul> </li> </ul>
<p><b>Summarize Solution:</b> The Ash River Facility Asset Plan presents a strategy to replace assets on a component by component basis (i.e., undertake discrete investments as needed) considering factors such as condition, rate of deterioration, the operating environment and criticality.</p> <p>In the short term, activities to address the risks with the steel penstock, generator, and protection and control and metering systems will be undertaken in order to address reliability and power supply risks. In the medium-term, risks with the woodstave penstock will be mitigated. In the longer-term, work on other major unit components will be undertaken in order to mitigate reliability risks.</p> <p><b>Short-Term:</b></p> <ul style="list-style-type: none"> <li>• <b>Generating Equipment:</b> <ul style="list-style-type: none"> <li>– Generator upgrade; and</li> <li>– Protection and control and metering systems upgrade.</li> </ul> </li> <li>• <b>Dam Safety:</b> <ul style="list-style-type: none"> <li>– Steel penstock re-coat.</li> </ul> </li> </ul>

<p><b>Medium-Term:</b></p> <ul style="list-style-type: none"> <li>• <b>Dam Safety:</b> <ul style="list-style-type: none"> <li>– Woodstave penstock replacement.</li> </ul> </li> </ul> <p><b>Long-Term:</b></p> <ul style="list-style-type: none"> <li>• <b>Generating Equipment:</b> <ul style="list-style-type: none"> <li>– Turbine overhaul;</li> <li>– Governor replacement.</li> </ul> </li> </ul>
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21.1 Appendix K of the F2020-F2021 RRA presents approximately 30 plans. Please confirm that the Utility has likely conducted significant quantitative analysis in determining its plans.

- 21.2 How does BC Hydro track all of its individual plans to various larger strategies? Please explain where this would be presented to the Commission.
- 21.3 Please explain how the Commission can understand the appropriate prioritization of the plans included in Appendix K versus each other and against other spending requirements. Please identify the criteria the Commission should use.
- 21.4 Please explain how the Commission can understand and assess the cost-effectiveness of the various plans in Appendix K based on the information provided when there are no quantitative measures included in the information presented.
- 21.5 Please explain how the Commission can track the cost-effectiveness of the various plans over time.
22. **Reference: BC Hydro F2020-F2021 Appendix L pages 23-25 of 27**

## Appendix L

### 5-Year Plan Investment summary

With the application of prioritization and constraints, our investments over the next five years will be driven primarily by compliance, security and sustainment. There will be some investment in managing our safety, operations and business risk with limited opportunities to improve business capabilities. Major initiatives are listed here under the appropriate outcome.

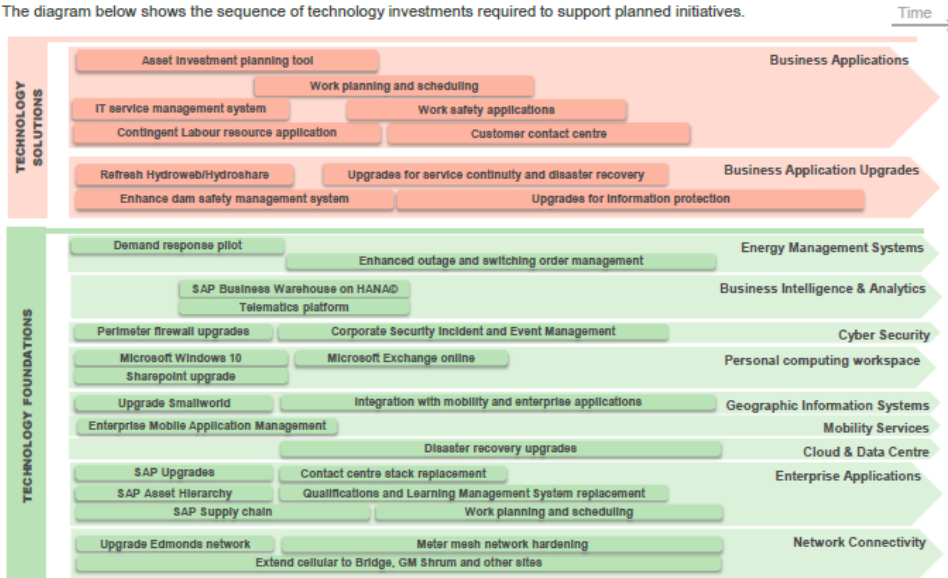
Investment category	Outcome description
Enhance our Capability	<p><b>Integrated and optimized investment planning</b></p> <ul style="list-style-type: none"> <li>Asset investment is integrated and optimized based on enterprise priorities</li> <li>Information is available for vehicle asset optimization and performance management</li> </ul> <p><b>Operations planning and work scheduling</b></p> <ul style="list-style-type: none"> <li>Work is scheduled centrally based on priority, available skillsets and location of resources (partial)</li> </ul> <p><b>Optimized planned outage management</b></p> <ul style="list-style-type: none"> <li>Integrate planned outage management across Generation Supply Operations and Grid Operations</li> </ul> <p><b>Optimized supply chain function</b></p> <ul style="list-style-type: none"> <li>Optimized process for procuring contingent labour resources</li> <li>Optimized supply chain processes</li> </ul>
Manage our Risk and Sustain Productivity	<p><b>Resilient OT and IT systems</b></p> <ul style="list-style-type: none"> <li>Sustain systems to ensure product support and systems availability</li> <li>Improve service continuity and disaster recovery capability</li> </ul> <p><b>Safety practices integrated into work processes on site</b></p> <ul style="list-style-type: none"> <li>Access to safety information and worker (including contractor) qualifications confirmed on site</li> </ul> <p><b>Enhanced dam safety systems</b></p> <ul style="list-style-type: none"> <li>Dam safety engineers have easy access to dam safety information</li> <li>Sensor and telecommunications networks are extended to increase dam safety visibility</li> </ul>
Compliance & Security	<p><b>Physical grid security</b></p> <ul style="list-style-type: none"> <li>Ensure compliance with NERC CIP regulation</li> </ul> <p><b>Secure OT and IT systems</b></p> <ul style="list-style-type: none"> <li>Maintain our cyber security risk posture</li> </ul>



## 5-Year Plan

### Investment summary

The diagram below shows the sequence of technology investments required to support planned initiatives.



24

## 5-Year Plan

### Measuring our success

The Technology group has a variety of ways to track and measure the success of our capital investments. These range from the immediate and quantifiable, such as operational and delivery metrics, to the completely qualitative business satisfaction survey. We recently introduced a benefits tracking process for business capability driven initiatives. In this process both quantitative and qualitative assessments are made over a period of time following deployment of a solution.

- **Operational Metrics** – Technology uses a number of metrics to evaluate and track the performance of our systems, services, and vendors.
- **Delivery Metrics** – Technology uses a number of metrics to assess and track the performance of our delivery which include measures on cost, schedule, and quality.
- **Business satisfaction** – Technology conducts an annual satisfaction survey to solicit feedback from across the business of the level of satisfaction with Technology delivery and services.
- **Project Benefits** – Benefits from initiatives undertaken as part of implementing technology solutions will be tracked to assess how well they deliver on the expectations set out in their respective business cases.

- 22.1 Considering the information contained in Appendix L in the BC Hydro 2020-2021 RRA, please explain how the Commission can evaluate the cost-effectiveness of BC Hydro's Technology strategies, and whether or not they optimize the benefits/costs when compared to alternative strategies.
- 22.2 Please explain how the Commission can evaluate the appropriateness and necessity of BC Hydro's proposed IT Investment spending as a whole.
- 22.3 Please provide the metrics BC Hydro considers to evaluate the appropriateness of IT spending relative to its benefit value.

22.4 Please provide the metrics used to track the performance of systems, services and vendors.

**23. Reference: Exhibit B-15, page 26 and BC Hydro RRA F2020-F2021 page 1-23**

(d) Project and Portfolio Monitoring and Measurement: Our framework for capital post-implementation performance evaluation and reporting is outlined in our management and accounting policies and procedures. The policy requires a Project Completion and Evaluation Report (**PCER**) for all projects with a forecast cost over \$1 million and outlines the required content, roles and responsibilities, timing, and required approvals for the PCER.

The Project Budget to Actual Cost measure evaluates our performance, from a portfolio perspective, in the delivery of all Generation and Transmission projects as well as major Distribution and Properties capital projects. The measure compares the actual project costs for projects placed in service to the original approved expected cost, over a rolling five year period. As noted in [A4](#), this performance measure is included in our Service Plan, with a target of actual costs falling within + 5 per cent to - 5 per cent of budget, excluding reserve amounts.

We provide descriptions of our capital planning, authorization, delivery, and measurement frameworks, processes, policies, procedures, and practices in revenue requirements applications. This information is provided in Chapter 6 of the Fiscal 2020 to Fiscal 2021 RRA expected to be filed in late February 2019, and in Chapter 6 of the Fiscal 2017 to Fiscal 2019 RRA. We also provided additional information in response to information requests in the Fiscal 2017 to Fiscal 2019 RRA proceeding.

**1.5.16 We Have Developed a Benefits Realization Process for Technology Investments**

In its Decision, the BCUC stated that it was unclear on the types of analysis performed by BC Hydro to support its technology investments. The BCUC also stated it was unable to assess how technology investments would result in quantifiable efficiencies and cost savings.<sup>29</sup>

BC Hydro has implemented a benefits realization process for technology projects. This process is in place so that:

- Benefits claimed in business cases are realized once projects are in service; and
- Ownership for benefits included in technology project business cases extends beyond project completion.

- 23.1 Please confirm that comparing the actual project cost to the original project cost does not provide any assessment of the success of the project in realizing benefits or its ultimate cost-effectiveness.
- 23.2 BC Hydro states that it has developed a benefits realization process for technology investments. Please provide the process metrics.
- 23.3 Does BC Hydro provide benefits realization processes for other areas of investment? If not, please explain why not.
- 23.4 Please explain how the Commission can assess the value of completed projects against the values anticipated in the original project applications in projects in which there is no benefits realization process.
- 23.5 Please confirm that benefit realization can be an ongoing process and may not be definitive at a particular point in time.
- 23.6 How can the Commission assess the durability of benefit realization over time under BC Hydro's benefit realization process?