British Columbia Utilities Commission

Site C Inquiry
Order G-120-17
BCUC Project No. 1598922

Submission of
B.C. Sustainable Energy Association

October 11, 2017

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Part I – INTRODUCTION

1. This is the final submission of the B.C. Sustainable Energy Association (BCSEA) to the B.C. Utilities Commission in the Site C Inquiry.[1] These submissions are filed on October 11, 2017 in accordance with the regulatory timetable established by Order G-120-17 dated August 9, 2017.[2] The Commission established the inquiry pursuant to OIC 244/2017 which was issued on August 2, 2017.

A. Key points

2. The following are the key points of BCSEA's submission:

3. Site C should not be allowed to proceed without an integrated resource planning process independently scrutinized by the Utilities Commission in a full public proceeding under the Commission's Rules of Practice and Procedure, with intervener participation, expert evidence, information requests and cross-examination.

4. BCSEA does not consider the current three-month limited-scope inquiry to constitute the full independent public scrutiny of Site C that is required.

5. BCSEA has serious reservations about the Site C project, including:

   (a) Energy efficiency and conservation has great potential to reduce the need for additional generation.

   (b) Existing technologies like wind and solar power are rapidly developing and becoming more cost-competitive.

   (c) The potential benefits of major technological developments like battery storage should be considered for their potential to affect long term planning and grid operation.

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[1] The Commission's Site C Inquiry was established pursuant to the Lieutenant Governor in Council's August 2, 2017 OIC 244/2017 under section 5 of the *Utilities Commission Act*.
[2] Exhibit A-2.

(d) Once in service, Site C would create an immediate oversupply of electricity, in contrast to smaller projects, which could be brought into service to match the timing of the need.

(e) Site C is a gigantic mega-project. All its economic and social impacts occur in a single area of the province. More overall economic and social benefits, including local partnership opportunities, would be achieved with smaller but more numerous energy developments located in different areas of the province and built when the need for the power materializes.

6. There needs to be a complete re-examination of BC Hydro's 20-year electricity needs and the best ways to meet those needs, taking into account enhanced energy efficiency measures, wind and solar power, the advantages of smaller generating projects throughout the province compared to a single mega-project, and the optimal timing of any new generating projects.

7. BCSEA said in December 2014 there is a substantial risk that Site C's cost would be much higher than BC Hydro predicted. That risk has already materialized. Even in the past week, BC Hydro's Site C's cost estimate has risen again. There is a substantial risk that the cost would be much higher than BC Hydro's latest estimate if the government chooses to complete the Site C project.

8. BC Hydro is significantly failing to acquire all cost-effective conservation and efficiency savings. DSM is far more cost-effective than supply-side resources. It reduces the need for new transmission and distribution assets, and it avoids environmental impacts. Conservation and efficiency should be prioritized before Site C or other new generation resources.

9. BCSEA strongly supports the panel's determination in the Preliminary Report that the government's 2014 change in BC Hydro's financing costs

for Site C "distorts the analysis of unit energy costs comparisons."[3] The change reduces ratepayers' costs of equity capital for Site C but increases the financial burden to taxpayers by a corresponding amount.

10. The cost of new renewable generation resources will continue to decline substantially during the coming decades. This must be taken in account in the portfolio sensitivity analyses.

11. BC Hydro's current load forecast would be substantially reduced if BC Hydro began to systematically acquire all cost-effective energy and capacity savings from efficiency and conservation measures. Historically, BC Hydro's load forecasts have over-forecast electricity loads more often than they have under-forecast them. Together with future behind-the-meter customer self-generation, these factors point toward actual electricity demand being lower than BC Hydro has forecasted.

12. Low-carbon electrification to meet BC's share of Canada's climate action commitments by replacing fossil fuel usage with clean renewable electricity will require substantially more electricity than BC Hydro has forecasted.

13. The inquiry terms of reference preclude consideration of new fossil-fuel electrical generation because that would not maintain or reduce BC's 2016-2017 greenhouse gas emission levels.

14. BCSEA respectfully maintains that there is a discrepancy of $0.5 billion in BC Hydro's evidence of the sunk costs of Site C between the Final Investment Decision in December 2014 and December 31, 2017.

15. With respect, the panel should reject BC Hydro's assumption that it would be possible to restart the Site C project after a seven-year period of suspension. A resurrected Site C project would require new regulatory approvals at both the federal and provincial levels. Federal environmental assessment is already more rigorous than it was at the time of the Joint Panel Review. And, it would be illogical for the government to suspend

[3] Preliminary Report, p.86

construction of the Site C project without providing that a decision to recommence construction would be made in the context of a comprehensive BC Hydro integrated resource plan independently reviewed by the BCUC.

B. BCSEA interests in the proceeding

16. BCSEA is a non-profit association of citizens, professionals and practitioners committed to promoting sustainable energy, energy efficiency and energy conservation in British Columbia. BCSEA has five chapters across B.C. and approximately 500 individual and corporate members. BCSEA works toward the province's transition to a lower-carbon economy. Many members of BCSEA are ratepayers and potential ratepayers of BC Hydro.

17. BCSEA's interests in this inquiry proceeding are as a non-profit public interest energy policy organization, and as a representative of its members' interests as ratepayers.

C. BCSEA involvement in the proceeding

18. BCSEA endorses its earlier submissions dated August 4,[4] August 8,[5] August 30,[6] August 30,[7] September 24,[8] and September 25, 2017.[9]

19. Under separate cover, BCSEA has filed expert evidence dated October 7, 2017 by Dr. Mark Jaccard.[10]

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[4] Exhibit F29-1, http://www.sitecinquiry.com/wp-content/uploads/2017/08/DOC_90033_F29-1_BCSEA_Site-C-Submission.pdf.
[5] Exhibit F29-2, http://www.sitecinquiry.com/wp-content/uploads/2017/08/DOC_90034_F29-2_BCSEA_Site-C-Submission.pdf.
[6] Exhibit F29-3, http://www.sitecinquiry.com/wp-content/uploads/2017/08/DOC_90075_F29-3_BCSEA_Site-C-Submission.pdf.
[7] Exhibit F29-4, http://www.sitecinquiry.com/wp-content/uploads/2017/08/DOC_90090_F29-4_BCSEA_Site-C-Submission.pdf.
[8] Exhibit F29-5, http://www.sitecinquiry.com/wp-content/uploads/2017/09/DOC_90229_F29-5_BCSEA_Site-C-Submission.pdf.
[9] Exhibit F29-6, http://www.sitecinquiry.com/wp-content/uploads/2017/09/DOC_90239_F29-6_BCSEA_Site-C-Submission.pdf.

20. In preparing these final submissions BCSEA has reviewed all of the submissions posted on the inquiry website.[11]

21. BCSEA has reviewed in depth all of the filings by interested parties who provided technical submissions up to October 6, 2017. This includes but is not limited to:

    (a) Bryenton (F6 series),

    (b) Eliesen (F13-1),

    (c) McCandless (F17-1),

    (d) Clean Energy Association of BC (F18 series),

    (e) Sierra Club BC (F23 series),

    (f) Allied Hydro Council of BC (F24-1),

    (g) Ruskin (F26 series),

    (h) Harcourt (F27-1),

    (i) Prophet River and West Moberly First Nation (F28 series),

    (j) Alaska Hydro Corporation (Grandison; F11 series),

    (k) Clean Balance Power (F33 series),

    (l) PVLA/PVES (McCullough evidence; F35 series),

    (m) Swain (F36-1),

    (n) Finn (F44-1),

    (o) Canadian Centre for Policy Alternatives (F60-1),

    (p) Dauncey (F62-1),

    (q) Ansar (F-64-1),

    (r) Canadian Geothermal Association (F66-1),

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[10] Exhibit F29-8, http://www.sitecinquiry.com/wp-content/uploads/2017/10/00475_F29-8_BCSEA_SiteC_Submissions.pdf .

[11] BCSEA has not sought access to the confidentially filed material.

(s) Hydro Battery (F67-1),

(t) Kleana Power Corporation (F53-1),

(u) Scott (F77 series),

(v) Commercial Energy Consumers (F82-1),

(w) Atlantic Pacific Spaceline Enterprise Inc. (F101 series),

(x) Canadian Wind Energy Association (F104 series),

(y) Bakker, Raphals, Hendricks (F106 series),

(z) Swan (F131-1),

(aa) Swain, Finn, Chiesa, Bryenton (F204-1).

22. BCSEA has reviewed in depth most of the content of the text[12] filings by BC Hydro prior to October 4, 2017.[13] BCSEA has done its best to examine BC Hydro's evidence posted on October 4 and 6, 2017.[14] However, due to the lack of time in the regulatory timetable, BCSEA has been unable to complete what it considers to be an adequate examination of this component of the BC Hydro evidence.

23. BCSEA has reviewed in depth both of the two reports by Deloitte LLP[15] filed by the Commission.

24. BCSEA has reviewed in depth the Inquiry Panel's September 20, 2017 Preliminary Report.[16]

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[12] BCSEA has not had time to explore the spreadsheets and data tables provided by BC Hydro.

[13] Exhibits F1-1 to F1-7, and A-12, http://www.sitecinquiry.com/wp-content/uploads/2017/09/DOC_90183_A-12_Panel-questions_BC-Hydro-responses.pdf.

[14] Exhibits F1-8 to F1-11.

[15] Exhibit A-8, http://www.sitecinquiry.com/wp-content/uploads/2017/09/DOC_90149_A-8_Site-C-Inquiry_Deloitte-LLP-Independent-Report-No1-1.pdf; and Exhibit A-9, http://www.sitecinquiry.com/wp-content/uploads/2017/09/DOC_90150_A-9_Site-C-Inquiry_Deloitte-LLP-Independent-Report-No2.pdf.

D. Inquiry Questions and Constraints

25. OIC 244/2017 requires the Commission generally to advise Cabinet on the implications of completion, suspension or termination of the Site C project.[17]

26. Specifically, OIC 244/2017 requires the Commission to provide responses to four questions that can be abbreviated as follows:

    (a) Is the Site C project currently on time and within the proposed budget of $8.335 billion?[18]

    (b) What are the costs of suspending the Site C project, while maintaining the option to resume construction until 2024?[19]

    (c) What are the costs of terminating the Site C project?[20]

    (d) What Without-Site C portfolio of generating projects and demand-side management could provide benefits similar to the benefits of a Site C portfolio at a similar or lower cost?[21]

27. In addition, for the costs of suspension and the costs of termination, OIC 244/2017 requires the Commission to identify "the potential mechanisms to recover those costs."

28. BCSEA sees the portfolio question as the one that directly addresses the financial consequences of the completion, suspension and termination options. The answers to the questions regarding the costs of completion of Site C, and the costs of suspending or terminating Site C, provide some of the key inputs to the portfolio analysis along with information regarding many other parameters.

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[16] Exhibit A-13, http://www.sitecinquiry.com/wp-content/uploads/2017/09/DOC_90185_A-13_Preliminary-Report-2.pdf.
[17] OIC 244/2017, s. 3(a)
[18] OIC 244/2017, s. 3b(i)
[19] OIC 244/2017, s. 3b(ii)
[20] OIC 244/2017, s. 3b(iii)
[21] OIC 244/2017, s. 3b(iv)

29. OIC 244/2017 sets out significant constraints on the resource options that can be considered in the Commission's response to the portfolio question. Key constraints are:

    (a) the energy objectives set out in the *Clean Energy Act*,

    (b) generating projects in the Without-Site C portfolio are "commercially feasible,"[22] and

    (c) the benefits of the Without-Site C portfolio are to be similar to the benefits of the Site C portfolio in terms of:

        (i) firming,

        (ii) shaping,

        (iii) storage,

        (iv) grid reliability, and

        (v) maintenance or reduction of 2016/17 greenhouse gas emission levels.

30. OIC 244/2017 also imposes constraints on the before-DSM energy and capacity load forecasts that together with the stack of committed resources define the system requirements for planning purposes:

    (a) The starting point is BC Hydro's July 2016 forecasts of peak capacity demand and energy demand.

    (b) The July 2016 forecasts will be adjusted for subsequent developments that will impact demand in the short, medium and longer terms.

    (c) Consideration will be given to other factors that could reasonably be expected to influence demand from the expected case toward the high-load or the low-load case.

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[22] It is grammatically ambiguous whether "commercially feasible" in s.3(b)(iv) of OIC 244/2017 also applies to demand-side management initiatives. In any event, DSM measures have to be considered "viable" to be included in a DSM portfolio for resource planning purposes.

31. OIC 244/2017 contains a general constraint that “the inquiry is not a reconsideration of decisions made in the environmental assessment process or by statutory decision makers.”[23]

32. In terms of the role of the public, OIC 244/2017 requires the Commission to consult interested parties respecting the matters referred to in paragraphs 3(a) and (b).

33. In terms of reporting, OIC 244/2017 requires the Commission to provide to the Minister responsible for BC Hydro (the Honourable Michelle Mungall, the Minister of Energy, Mines and Petroleum Resources):

    (a) a preliminary report outlining progress to date and preliminary findings by September 20, 2017, and

    (b) a final report, including the results of the Commission's public consultations, by November 1, 2017.

E. Outline

34. Part II presents BCSEA’s view on Site C. Part III addresses the load forecast, with particular attention on the prospect of the Current Load Forecast being over-estimated and the impact of low-carbon electrification on load. Part IV addresses several miscellaneous topics: the categories of costs regarding Site C, the treatment of sunk costs and termination and remediation costs, natural capital and ecosystem services, the GHG emissions constraint in the terms of reference, and potential mechanisms for recovering the costs of suspension or termination of the Site C project. Part V addresses the first inquiry question: whether Site C is on time and on budget. Part VI addresses the question of the costs of the suspension option. Part VII addresses the costs of terminating the Site C project. Part VIII addresses the fourth inquiry question: whether an alternative portfolio would provide the benefits of Site C at an equal or lower cost. Finally, Part IX is a brief conclusion.

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[23] OIC 244/2017, s.3(b)(e)

Part II – BCSEA Views on Site C

35. BCSEA's perspective on Site C is based on BC Hydro's integrated resource planning and not merely on Site C alone. BCSEA has participated in BC Hydro's integrated resource planning and revenue requirements applications since 2006.

36. In December 2014, before the government approved Site C, BCSEA produced a lengthy analysis of Site C.[24] BCSEA took the position that Site C should not be approved prior to a full public review of the Site C project and BC Hydro's long-term plan by the Utilities Commission. BCSEA maintains that position.

37. The legal background is that the 2010 *Clean Energy Act*, s.7, exempted BC Hydro from the requirement to obtain a Certificate of Public Convenience and Necessity from the Commission for the Site C project. And, s.3 of the *CEA* exempted BC Hydro's long-term resource plan from review by the Commission under s.44.1 of the *Utilities Commission Act* and required BC Hydro to submit its integrated resource plan to the minister of energy for approval by the Lieutenant Governor in Council.

38. BCSEA said in its December 2014 report that it would be financially imprudent for the government to approve Site C based only on BC Hydro's own in-house cost estimate. BCSEA said the estimated cost of such a large project as Site C should be given full independent public scrutiny by the Utilities Commission. To be clear, BCSEA does not consider the current three-month limited-scope inquiry to constitute the full independent public scrutiny of Site C that is required.

39. BCSEA said the Province's then-impending final investment decision on the Site C project should be postponed and that the government should order BC Hydro to update its Integrated Resource Plan (IRP) and submit it to the

[24] "BCSEA Position on the Site C Hydro-Electric Project," November 2014, p.2. http://www.bcsea.org/sites/bcsea.org/files/bcsea_site_c_position_-_final-corrected-10dec14.pdf

BC Utilities Commission for a thorough public review. BCSEA said there should be a complete re-examination of BC Hydro's 20-year electricity needs and the best ways to meet those needs, taking into account enhanced energy efficiency measures, wind and solar power, the advantages of smaller generating projects throughout the province compared to a single mega-project, and the optimal timing of any new generating projects. BCSEA maintains and reiterates this position today. The need for a full planning analysis is urgent, despite, or indeed because of, the partial construction of the Site C project.

40. BCSEA expressed significant reservations about the Site C project. These reservations persist and are highly relevant to the inquiry:

    (a) Energy efficiency and conservation has great potential to reduce the need for additional generation.

    (b) Existing technologies like wind and solar power are rapidly developing and becoming more cost-competitive.

    (c) The potential benefits of major technological developments like battery storage should be considered for their potential to affect long term planning and grid operation.

    (d) Once in service, Site C would create an immediate oversupply of electricity, in contrast to smaller projects, which could be brought into service to match the timing of the need.

41. Equally important, BCSEA expressed and maintains serious concern that Site C is a gigantic mega-project. All its economic and social impacts occur in a single area of the province. More overall economic and social benefits, including local partnership opportunities, would be achieved with smaller but more numerous energy developments located in different areas of the province and built when the need for the power materializes.

42. In addition, BCSEA said in December 2014 and continues to maintain that Site C should not proceed unless and until the rights of Treaty 8 and other

First Nations have been addressed and appropriately accommodated.

43. BCSEA assesses Site C from a sustainability perspective, considering energy planning and cost effectiveness issues, and also considering non-energy sustainability issues:

    (a) Cost-effectiveness, including cost risk and the cost of alternative resources,

    (b) Energy system benefits, such as energy, capacity and ability to firm up intermittent generation,

    (c) Economic benefits, including employment,

    (d) Greenhouse gas emissions reductions and other environmental effects, including inundation of agricultural land, and

    (e) First Nations rights.

44. In December 2014, BC Hydro's estimate of the cost of Site was $7.9 billion and BCSEA said that with a large, complex, multi-year mega-project like Site C, there is a substantial risk that the cost would be higher – perhaps much higher – than BC Hydro's estimate.

45. That risk has already materialized. When the inquiry began, BC Hydro's cost estimate for completion from FID was $8.335 billion. As of October 4, 2017, Hydro's total project cost forecast is $8.945 billion (not including the roughly $0.5 billion in the Site C deferral account.)[25] And, as in December 2014, it remains the case that there is a substantial risk that the cost would be much higher than BC Hydro's latest estimate if the government chooses to complete the Site C project.

46. The costs, and cost risk, of Site C are borne directly by BC Hydro ratepayers and BC taxpayers. In contrast, IPP (independent power producer) alternatives to Site C carry a smaller cost risk for BC Hydro

[25] Exhibit F1-7.

ratepayers and BC taxpayers, because the IPPs develop the generation projects and assume the cost risk.

47. BCSEA has long maintained that BC Hydro is failing to acquire all cost-effective conservation and efficiency savings. Demand side management (DSM) refers to energy conservation and efficiency produced by BC Hydro's Power Smart programs and conservation rate structures. DSM can substantially reduce the amount of energy and capacity required to meet customers' needs. DSM is very cost effective and has inherent advantages over supply-side (generation) resources. It avoids environmental disruption, does not require ongoing energy inputs and reduces the need for transmission infrastructure. BCSEA continues to maintain that conservation and efficiency should be prioritized for consideration before Site C or other new generation resources.

48. Most recently, in June 2017, BCSEA asked the Commission to reject BC Hydro's F2019-F2019 DSM Plan and instead to find that higher DSM expenditures and savings based on the 2013 IRP would be in the public interest. BCSEA said the following and this remains BCSEA's position:

> "The DSM Plan is inconsistent with the Government-approved 2013 IRP. It would entail economically inefficient waste of energy. With the 2013 IRP, total customer bill savings would be $842 million more over F2016-F2024 than with the DSM Plan on a portfolio basis. These are real financial savings that would be forfeited due to BC Hydro's preoccupation with rates on a cents/kWh basis. With the 2013 IRP, capacity savings would be 223 MW more over F2016-F2024 than for the DSM Plan on a portfolio basis. These are substantial additional capacity savings that should be considered in relation to the value of deferring the need for new pumped storage generation capacity and upgrades to local facilities given that gas-fired generation is not the marginal capacity resource."[26]

[26] BC Hydro and Power Authority F2017 to F2019 Revenue Requirements Application and Demand-Side Management Expenditure Schedule Final Submission of B.C. Sustainable Energy Association and Sierra Club B.C., June 13, 2017. http://www.bcuc.com/Documents/Arguments/2017/DOC_49469_06-13-2017-BCSEA-

49. To reiterate, BCSEA's position today remains that Site C should not proceed without an integrated resource planning process independently scrutinized by the Utilities Commission in a full public proceeding under the Commission's Rules of Practice and Procedure, with intervener participation, expert evidence, information requests and cross-examination.

50. It is understood that following its receipt of the Commission panel's report scheduled for November 1, 2017 the Government will determine which Site C option (completion, suspension or termination) will be selected. In this submission BCSEA focuses on the financial issues within the scope of the inquiry. However, BCSEA urges the government to take into account – in making its decision about the future of the Site C project – not only the financial consequences of the three options but also other important factors that are beyond the scope of this inquiry.

Part III – Load forecast

A. Outline

51. BCSEA sees a significant difference between the adjustments to the July 2016 load forecasts required by s.3(c)(i), and the identification of factors that may tend to push up, or down, the actual load within the forecast range required by s.3(c)(ii).

52. Section s.3(c)(i) requires revised numbers in the pre-DSM energy forecast and the pre-DSM capacity forecast. Presumably, the purpose is to plug the revised load forecast numbers into the planning requirements for the portfolio analysis. In BCSEA's view, the main specific development since July 2016 affecting the current load forecast is the diminished prospect of new LNG export facilities in BC. This should be reflected in a reduction in the LNG load component of the Current Load Forecast.

Final-Argument.pdf. At the time of writing, the Commission has not issued a decision in the BC Hydro F2017-F2019 RRA proceeding.

53. Section 3(c)(ii) does not require numbers, it requires the identification of factors that may cause the load to deviate from the mid-point of the forecasts. The purpose is to identify factors for sensitivity analysis.

54. Many factors potentially affecting future electricity load have been identified by interested parties, including much more aggressive efficiency and conservation measures, and behind-the-meter customer self-generation. BCSEA commends those submissions to the inquiry panel.

55. In this submission, BCSEA focuses on two main factors:

    (a) The prospect of the Current Load Forecast being an over-estimate, a factor that will tend to push future load toward the low-load forecast, and

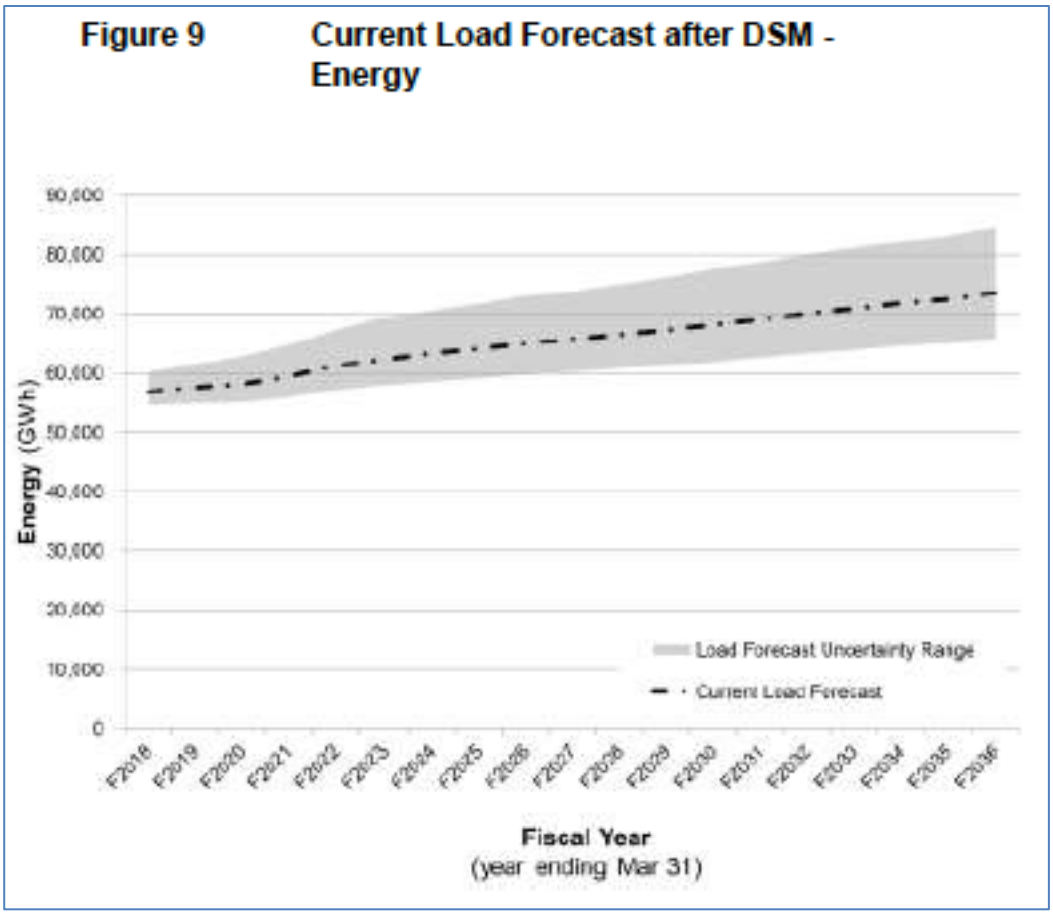
    (b) Low-carbon electrification, a factor that will tend to push future load toward the high-load forecast.

56. This Part begins by setting out for reference the Current Load Forecast for energy and for capacity. The prospect of the Current Load Forecast being an over-estimate is addressed in section B. Low-carbon electrification is addressed in Section C.

B. Current Load Forecast

57. The Current Energy Load Forecast after DSM is shown in Figure 9:[27]

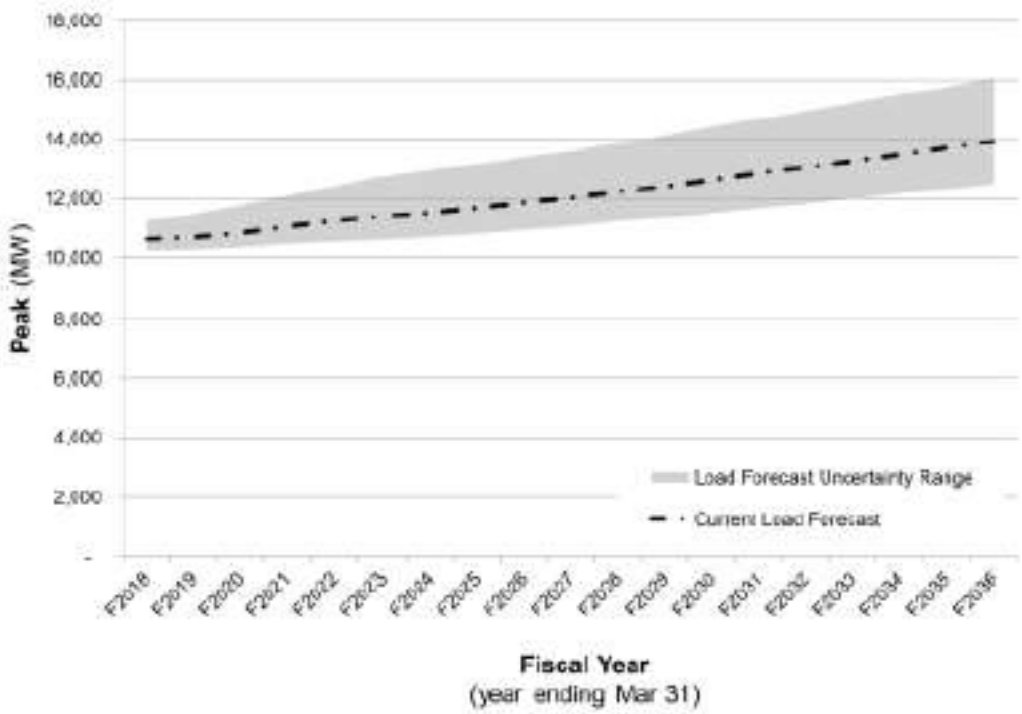
Figure 9 Current Load Forecast after DSM - Energy



[27] Exhibit F1-1, Figure 9, page 46

58. The Current Capacity Forecast after DSM is shown in Figure 10:[28]

Figure 10 Current Load Forecast after DSM - Capacity



B. BC Hydro's record of load forecasting accuracy

59. Historically, BC Hydro's load forecasts have over-forecast electricity loads more often than they have under-forecast them.

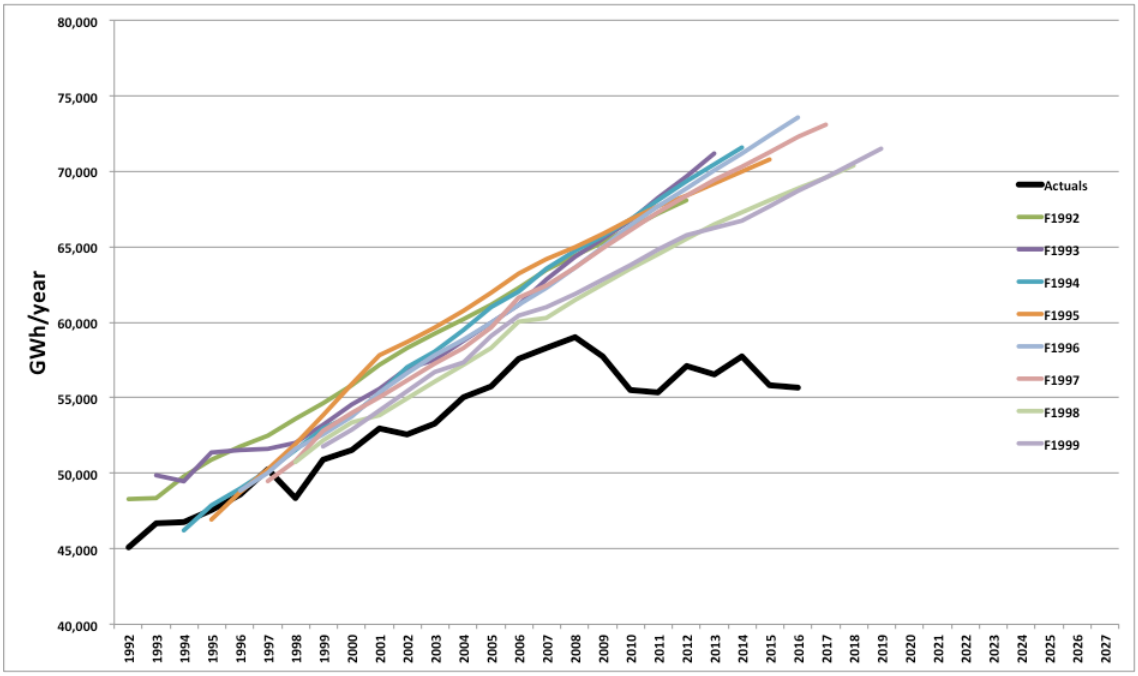
60. Deloitte states:

> "BC Hydro has run a load forecast model every year from 1964 onwards. Each model forecasts loads between five and twenty years into the future, as well as current fiscal year requirements. For all models between fiscal 1964 and 2016, there were 647 point estimates that can be compared to actual load demand. Of

[28] Exhibit F1-1, Figure 10, page 46

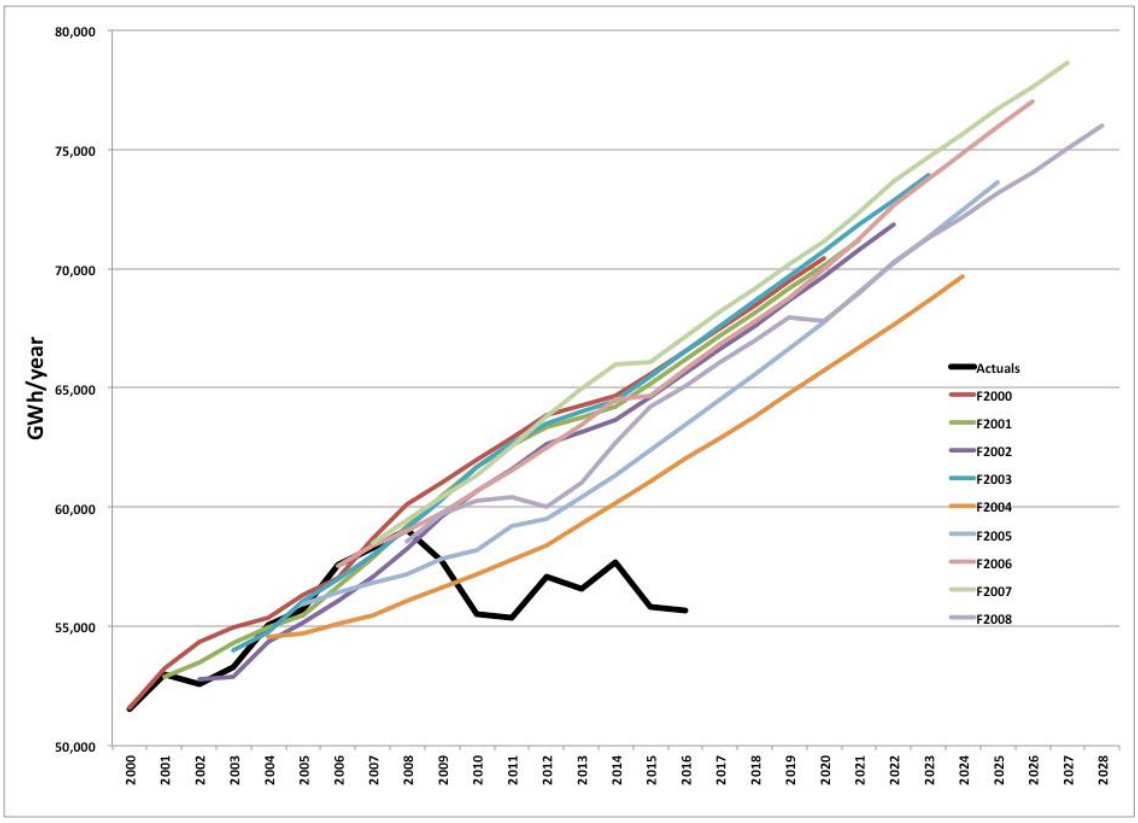
the 647 forecasted points, 500 (77%) were overestimates, with this being especially common since the global financial crisis."[29]

61. Hendricks, et al., provide a figure[30] showing BC Hydro forecasts of total gross requirements, after DSM for F1992 to F1999. The dark line shows Actuals:



62. Hendricks, et al., also provide a figure[31] showing BC Hydro forecasts of total gross requirements, after DSM for F2000 to F2008. Again, the dark line shows Actuals:

[29] Exhibit A-9, *Site C – Alternative Resource Options and Load Forecast Assessment*, Deloitte LLP, 2017
[30] Hendriks, Richard, Philip Raphals, Karen Bakker. Exhibit F106-1, pdf p.30
[31] *Ibid.*



63. Hendricks, et al. conclude on this point:

> "This pattern could be seen as a reflection of the substantially increased level of uncertainty in future requirements, and of the challenges that BC Hydro is having modeling that uncertainty. **However, the pattern also raises questions about whether BC Hydro's load forecasting was strategically optimistic in order to support a favourable decision by government to develop the Site C Project.**"[32]

64. BC Hydro says its load forecasting methodology has been in place for many years, that it has been accepted by the Utilities Commission, the government and the Site C Joint Review Panel, and that it was reviewed favourably by a third party expert retained by BC Hydro.[33]

[32] F106-1, pdf p.106, bold in the original
[33] F1-1, p. 47

65. In response to statements that BC Hydro's load has "flat-lined" in the past ten years, BC Hydro maintains that:

> "BC Hydro's load growth over the past 10 years has included a major reduction due to the 2007/08 recession but this has been followed by recovery and load growth... BC Hydro's load has grown over the last 10 years, even when considering the effects of a significant recession in 2007-2008 and a slower than expected economic recovery following it."[34]

66. BCSEA agrees that BC Hydro has historically over-forecast loads. BCSEA is not aware of any clear evidence in this inquiry to explain the reasons for the over-forecasting, apart from BC Hydro's explanation relating to the recession, permanent loss of pulp sector load and slow recovery in the past 10 years. Nor is BCSEA aware of evidence confirming that the Current Load Forecast (2016 adjusted) would be free from whatever systemic upward bias may have operated in the past.

C. Low carbon electrification

67. BC Hydro admits that:

> "Electrification has the greatest potential to affect load forecast. Low carbon electrification has significant potential to increase consumption across all sectors."[35]

68. However, BC Hydro acknowledges that the Current Load Forecast does not include policy-driven low-carbon electrification. The forecast does include a modest amount of forecasted electric vehicle (EV) load. Table H-1[36] is

[34] F1-1, Appendix H, p. 41, 42
[35] F1-1, Appendix J, page 1
[36] Exhibit F1-1, Appendix H, Table H-1, page 17

reproduced here:

Table H-1 EV Load, Number of Electric Vehicles, and Market Share

Fiscal Year	EV Energy[1] Sales (GWh)	EV Peak Demand[1] (MW)	Total Number of Projected EVs	Market Share Percentage of Total Vehicles[2] %
F2018	20	6	8,211	0.3
F2019	28	9	11,171	0.4
F2020	38	12	15,007	0.5
F2026	323	101	125,114	3.6
F2030	856	299	299,258	8.1
F2036	1,770	648	578,268	14.5

Notes:

1. The EV load above does not include system losses and are before rate impacts as the values arethe raw projections from BC Hydro's in house energy and peak EV models.
2. For fiscal 2018 the estimate of the total number vehicles in BC is about 3.1 million cars and at the end of the forecast the estimate based on driving population growth is about 4 million cars

69. However, the Current Load Forecast does not include electrification of other forms of transportation, such as buses and urban delivery trucks. Nor does it include electrification of fossil fuel usage for industrial energy or heating. BC Hydro states:

> "BC Hydro has not revised the Current Load Forecast upward to account for electrification initiatives directed at reducing greenhouse gas emissions because the timing and magnitude of the increase is uncertain at this early stage."[37]

70. BCSEA has filed expert evidence dated October 7, 2017 by Dr. Mark Jaccard.[38] Dr. Jaccard's report is fully self-explanatory and will not be repeated here. His concluding statement regarding forecasting BC electricity demand in the context of GHG policy is as follows:

> "In summary, my analysis shows that achieving GHG emission reductions would substantially increase demand for electricity. As already noted, however, I do not comment on the overall accuracy of BC Hydro's forecast, and thus my analysis does not say if I think the its forecast is biased upwards or downwards in aggregate. My analysis simply shows, all things being equal, by how much it could be biased downwards if governments achieve their GHG reduction commitments. For several reasons, notably

[37] Exhibit F1-1, Appendix J, page 27
[38] Exhibit F29-8

related to intensifying climate impacts, this is a trajectory that cannot be easily dismissed."[39]

71. BCSEA also notes that Guy Dauncey has filed a lengthy report[40] in which he lays out a scenario involving substantial low-carbon electrification without Site C.

Part IV – Miscellaneous Topics

A. Categories of Site C costs

72. The costs related to Site C fall into several categories:

(a) Costs incurred by BC Hydro prior to the Government's approval of implementation of the Site C project. These costs are in the Site C regulatory account. No new significant costs have been added to the Site C regulatory account except the ongoing accumulation of interest. By December 31, 2017 the Site C regulatory account will be approximately $0.5 billion. The Site C regulatory account is not included in the term "project costs," which applies to costs incurred after the December 2014 Final Investment Decision (FID).

(b) Costs incurred by BC Hydro between FID and June 30, 2017. These are actual costs that should be known with a high degree of certainty.

(c) Projected project costs between July 1 and December 31, 2017. These are known with a relatively high degree of certainty.

(d) Estimated project costs between January 1, 2018 and project completion. These are referred to as the costs to completion.

(e) The Site C Project Budget includes costs between FID and the completion date of November 24, 2024. At FID, the Project Budget was $8.335 billion. The Project Budget includes certain funds earmarked as contingency. The Project Budget does not include the Treasury Reserve.

[39] Exhibit F29-8, p.18
[40] Exhibit F62-1

(f) The Treasury Reserve of $0.440 billion is ‘on top of’ the FID Project Budget. It was conditionally approved along with the FID Budget, but it cannot be drawn upon without government approval.

(g) Termination costs are an estimate.

(h) Remediation costs are an estimate.

B. Treatment of sunk costs and costs of termination and remediation

73. The treatment of sunk costs and the costs of termination and remediation of the Site C project is addressed here because it affects the second, third and fourth inquiry questions. The treatment of sunk costs and termination/remediation costs is relevant to the comparison of costs to ratepayers of the three Site C options.

74. In BCSEA’s view, a valid financial comparison of an approved option that has incurred costs toward its completion against a mutually exclusive option or options requires comparison of the costs of each option going forward from the deemed date of the comparison. Costs incurred prior to the date of the comparison (sunk costs) are not included in any of the options. And, the necessary costs of terminating and remediating the approved option are added to the cost of the alternative options.

75. This is standard principal of financial analysis, routinely accepted by the Commission. BC Hydro’s evidence follows the standard treatment of sunk costs and costs of termination and remediation. Deloitte LLP concurs. Most if not all of the expert evidence filed by interested parties adopt the standard treatment of sunk costs and the costs of termination and remediation.

76. Some interested parties have said that it is unfair to add the costs of terminating and remediating Site C to the Without-Site C portfolio, and this is an understandable concern. However, implementing a Without-Site C approach necessarily requires terminating and remediating Site C, which would entail real costs that would be reflected in BC Hydro’s rates. Due to the government’s December 2014 approval of the Site C project, BC no

longer has the opportunity to compare With-Site C and Without-Site C futures without taking into account the costs of termination and remediation of construction to date.

C. BC Hydro's UEC presentation is non-standard

77. BC Hydro's tables on pages 62 and 63 of Exhibit F1-1 show UECs (in $/MWh) for Site C and a wind-based alternative with adjustments for factors intended to make the 'bottom line' UEC results comparable with each other. While BC Hydro's underlying analysis adopts the standard treatment of sunk costs and costs of termination/remediation, its presentation of results in UEC form is non-standard in several respects, including in terms of the treatment of sunk costs and costs of termination/remediation.[41] This is not analytically incorrect, but it may be confusing to readers looking to understand how sunk costs and costs of termination/remediation are dealt with.

D. Natural Capital and Ecosystem Services

78. The David Suzuki Foundation submitted an extensive assessment and valuation of the "natural capital and ecosystem services" of the Peace River watershed.[42]

79. Natural capital is defined as follows:

> "Natural capital refers to the Earth's land, water, atmosphere and resources. Organized and bundled within the Earth's natural ecosystems, this capital provides resources and flows of services to support all life."[43]

80. Ecosystem services are defined to include:

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[41] The presentation first includes sunk costs in the Site C UEC and then deducts sunk costs from the Site C UEC. The presentation deducts the costs of termination/remediation from the Site C UEC, rather than adding them to the cost of the wind alternative.
[42] Exhibit F87-1, *The Peace Dividend: Assessing the Economic Value of Ecosystems in B.C.'s Peace River Watershed*, by Sara J. Wilson for the David Suzuki Foundation.
[43] Ibid, page 13.

> "storage of floodwaters, water capture and filtration, absorption and treatment of pollution from water and air, and climate regulation resulting from carbon storage in trees, plants, soils, sediments and marine habitats."[44]

81. The study filed by DSF assigns monetary values to natural capital. It concludes that the NPV of natural capital and ecosystem services in the Peace River watershed is between $83.7 and $333.7 billion over a 50-year time span.[45]

82. The Commission, in its preliminary report, noted that it was unclear whether this issue represented a direct cost to ratepayers. It invited further evidence from the David Suzuki Foundation and comments from other participants in the inquiry.[46]

83. BC Hydro responded to this issue, challenging some of the calculations in the DSF report and arguing that "The Environmental Assessment [of the Site C project] took into account the project area's ecological features."[47]

84. BCSEA endorses DSF's recognition of the value of natural capital and ecosystem values. These are values that the government should consider in making its decision regarding Site C.

E. Recovery of costs of suspension or termination

85. OIC 244/2017 asks the inquiry panel to identify the potential mechanisms to recover the costs of suspension, or of termination, of the Site C project.

86. BC Hydro and the Commission approached this question in terms of the appropriate length of the recovery period. The panel cited with apparent approval BC Hydro's statement that "if the project were terminated, commonly applied regulatory principles would account for the following factors in determining an appropriate recovery period: The amount of time

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[44] Ibid, page 13.
[45] Ibid, page 11.
[46] Exhibit A-13, *BC Utilities Commission Inquiry Respecting Site C: Preliminary Report to the Government of British Columbia*, ["Preliminary Report"], page 87.
[47] Exhibit F1-8, BC Hydro response to Commission IR 2.30.0, pdf page 89.

ratepayers receive benefit from the cost; and Avoidance of rate shock."[48]

87. BC Hydro reviewed scenarios of one, five and ten year periods. In the Preliminary Report, the inquiry panel calls for consideration of spreading the costs over a longer recovery period. It states:

> "The Panel finds that recovery of expenditures over a longer period rather than a shorter period in the event of termination as proposed by BC Hydro is reasonable. If a shorter time period were considered the impact on ratepayers would be significant with potentially extreme consequences. Spreading the costs over a longer period would allow ratepayers a better opportunity to absorb the impact and plan accordingly."[49]

88. Notably, the panel went on to say that "Any determination of the appropriate recovery mechanism, including the period of recovery, would need to be made in the context of a future proceeding."[50]

89. BCSEA will address a different aspect of the question.

90. Generically, the costs of suspension and/or termination (and sunk costs) could be to the account of the BC Hydro ratepayers or to the account of B.C. taxpayers, or some combination. The default expectation is that if the Site C project is suspended or terminated, unless the matter was settled first by a government order, the Commission would conduct a prudency review to determine how much (if any) of the Site C costs BC Hydro would recover from ratepayers (and if so, when) and the balance of the Site C costs not recovered from ratepayers would be to the account of B.C. taxpayers.

91. BCSEA's point on the cost recovery mechanism topic is that given the size and significance of the Site C project to both BC Hydro ratepayers and B.C. taxpayers, the interests of ratepayers and B.C. taxpayers are closely aligned and the panel's responses to the inquiry questions should be the same regardless of the mechanism for recovering the costs of suspension

[48] Preliminary Report, p.119, citing BC Hydro
[49] Preliminary Report, p.120
[50] *Ibid.*

or termination.

92. Put another way, where OIC 244/2017 asks for the "costs to ratepayers" of the suspension option and the termination option, BCSEA submits that the intention is to include the costs that could be borne by the ratepayers if that was the outcome, and to exclude "external" costs that would not be borne by ratepayers in rates in any event even though such external costs may be very real to those who would bear them.

F. No increase in GHG emissions levels in the alternative portfolio

93. OIC 244/2017 section 3(b)(iv) requires that the Without-Site C portfolio of generation and demand-side resources provide similar benefits as Site C in terms of, among other things, "maintenance or reduction of 2016/17 greenhouse gas emission levels."

94. In the Preliminary Report, the panel sets out and invites comments on the following interpretation of "maintenance or reduction of 2016/17 greenhouse gas emission levels":

> "Maintenance or reduction of 2016/2017 greenhouse gas emission levels means that the alternative portfolio must not increase the greenhouse gas intensity of BC Hydro's greenhouse gas emissions, as measured in CO_2 tonnes equivalent per GWh generated."[51]

95. BCSEA respectfully disagrees with the Commission's preliminary interpretation that the OIC 244/2017 GHG requirement means GHG intensity. The Lieutenant Governor in Council can be deemed to be aware that in the GHG policy world there is a fundamental difference between GHG emissions levels and GHG emissions intensity.

96. The intensity interpretation would mean that in the alternative portfolio BC Hydro's GHG emissions levels from electricity generation could increase corresponding to an increase in the amount of energy generated. And, an increase in electricity generation can be expected given that the after-DSM

[51] Preliminary Report, p.76, underline added

Current Load Forecast is upward sloping for all of the mid-load, high-load and low-load cases.

97. BCSEA submits that an interpretation of the "maintenance or reduction of 2016/2017 greenhouse gas emission levels" requirement that would allow the alternative portfolio to increase GHG emissions levels would be contrary to the wording of the provision and inconsistent with the overall intention of the terms of reference.

98. In BCSEA's view, the "maintenance or reduction of 2016/2017 greenhouse gas emission levels" constraint is intended to preclude inclusion of new gas-fired generation in the Without-Site C portfolio.

99. This constraint new and it is significant because new gas-fired generation played an important role as a potential resource for planning purposes in the 2013 IRP. In particular, new gas-fired generation was a resource option used to provide a dispatchable capacity resource in the "Without Site C, Clean + Thermal Generation Portfolios." A limited amount of new gas-fired generation (which is not a clean or renewable resource) would not be inconsistent with the *CEA* s.2(c) BC energy objective to generate at least 93% of the electricity in British Columbia from clean or renewable resources, because BC Hydro had (and continues to have) non-clean headroom.

Part V – Is Site C On Time, On Budget?

A. Not on budget, unlikely to be on time

100. The Site C project is not "on budget." That was confirmed by BC Hydro's CEO Chris O'Riley in his October 4, 2017 letter to the Commission.[52] He acknowledged that BC Hydro will not be able to meet the current timeline for river diversion in 2019. He said that "this development in the project is expected to increase its cost by 7.3 per cent or $610 million, for a total

[52] Exhibit F1-7

forecast project cost of $8.945 billion." This compares to the FID budget of $8.335 billion that BC Hydro had said in its August 30, 2017 submission it was confident it would meet despite the risks and pressures.

101. Regarding "on time," Mr. O'Riley says that "we had a one year float built into our schedule and are confident we can still deliver this project on time, by November 2024."[53]

102. If the decision is made to complete the construction of the Site C project, BCSEA is skeptical that the project will be completed either within the mostly recently increased project budget or by the scheduled completion date of November 2024.

103. BCSEA is not in a position to assist the Commission in quantifying a reasonable forecast of the cost and date of completion of the project. It is noted that Deloitte provided cost overrun estimates ranging from 0% (already surpassed) up to 50%. In BCSEA's view the probabilities of cost overruns of varying degrees should be examined as sensitivities within the portfolio sensitivity analysis.

104. In the remainder of this Part, BCSEA first addresses the evidence regarding cost overruns experienced by other large hydroelectric projects. Then it address the project costs from FID to December 31, 2017.

B. Large hydroelectric project cost overruns

105. There is considerable evidence of cost overruns experienced by large hydroelectric projects in Canada and around the world.

106. Mark Eliesen (former President and CEO of BC Hydro) states:

> "The notion that Site C will be completed on time and on budget is illusionary. The likely scenario is that costs will escalate significantly as has been the experience of Manitoba Hydro with the Keeyask Generating Station (34 percent increase) and

[53] *Ibid.*

> Nalcor's Muskrat Falls Generating Station (72 percent increase)."[54]

107. Atif Ansar of the Blavatnik School of Government and Saïd Business School, University of Oxford, UK says:

> "Actual costs were on average 96% higher than estimated costs; the median was 27% (IQR 86%). The evidence is overwhelming that costs are systematically biased towards underestimation …
>
> Large dams built in North America (n.40) have considerably lower cost overrun (M.11%) than large dams built elsewhere (M.104%). Although after controlling for other covariates such as project scale in a multilevel model, reported below, the differences among regions are not significant."[55]

108. Deloitte cites cost overruns of 90%, 78% and 55% for Muskrat Falls, Wuskwatim and Keeyask, respectively.[56]

109. The Commission Panel in the Preliminary Report concludes:

> "The Panel acknowledges the work done by Ansar to identify possible systematic problems with estimating schedules for large dam projects. However, the Panel gives more weight to the evidence specific to the Site C project than to the conclusions drawn by the Ansar study, which the Panel views as providing guidance on risks rather than specific evidence."[57]

110. BCSEA's view is that the evidence of cost overruns experienced by large hydro-electric projects in Canada and around the world highlight the very real potential for the Site C project to incur further cost overruns.

C. Spending from FID to December 31, 2017

111. BCSEA respectfully submits that there is uncertainty in the evidentiary record regarding the amount of the actual and projected spend between FID and December 31, 2017, the deemed date for comparison.

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[54] Exhibit F13-1, An Evaluation of the Need for the Site C Project, Marc Eliesen, 2017
[55] Exhibit F64-1, .pdf page 18, *Should we build more large dams? The actual costs of hydropower megaproject development*, Ansar, Flyvbjerg, Budzier, Lunn
[56] Exhibit A-8, Site C – Construction Review, Deloitte, LLP, Table 17, page 36
[57] Exhibit A-13, *British Columbia Utilities Commission Inquiry Respecting Site C: Preliminary Report to the Government of British Columbia*, page 20

112. By way of background, on September 24, 2017 BCSEA filed a letter[58] requesting clarification of whether spending from FID to December 31, 2017 is $1.6 billion or $2.1 billion. Correspondingly, the question is whether Total Sunk Costs (including the $0.5 billion Site C regulatory account) at December 31, 2017 are $2.1 billion or $2.6 billion.

113. In a letter dated October 10, 2017, the Commission responded to the request for clarification.[59] The Commission referred BCSEA to the following statement on page (iv) of the Preliminary Report Executive Summary, which states:

> "The Panel accepts BC Hydro's figures that, as of December 31, 2017, there will be a balance of $500 million in the Site C regulatory account for expenditures incurred prior to the Final Investment Decision, and $1.6 billion project costs incurred since the FID, for a total sunk cost of $2.1 billion."[60]

114. The Commission further refers BCSEA to the Panel's "analysis and preliminary findings" on page 43 of the Preliminary Report which re-iterate the statements made in the Executive Summary:

> "The sunk costs of the project on December 31, 2017 consist of the balance in the Site C regulatory account and the project costs to date. The Site C regulatory account was established in 2006 to capture project costs prior to the end of 2014. The project costs include expenditures incurred since the final investment decision at the end of 2014. The Panel accepts the figures provided by BC Hydro for the balance in the Site C regulatory account ($500 million on December 31, 2017) and the project cost to date ($1.6 billion on December 31, 2017) for the purposes of this analysis. The Panel accepts a figure for sunk costs as of December 31, 2017 of $2.1 billion for the purposes of this analysis."[61]

115. The Commission concludes:

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[58] F29-5.
[59] Exhibit A-20
[60] Underline added. The question is whether "costs incurred since the FID" means costs at June 30 or December 31, 2017. This is addressed in the Commission's next quote.
[61] Underline added.

> "Accordingly, the Commission confirms that the Panel's analysis and preliminary findings in the Preliminary Report are consistent in stating that the Panel accepts BC Hydro's figures of $1.6 billion in spending from FID to December 31, 2017 and a total sunk cost of $2.1 billion as of December 31, 2017."[62]

116. To reiterate, the Panel accepts BC Hydro's figures of $1.6 billion in spending from FID to December 31, 2017.

117. To be clear, however, BCSEA is not necessarily disagreeing with the Panel's acceptance of BC Hydro's figures of $1.6 billion in spending from FID to December 31, 2017.

118. Rather, BCSEA is questioning how the figure of $1.6 billion in spending from FID to December 31, 2017 is reconciled with the BC Hydro's statement on page 2 of F1-1, where it states in no uncertain terms:

> "We have spent $1.8 billion (or 22 per cent) of the budgeted $8.335 billion as of June 30, 2017, and we forecast that by 30 December 2017 we will have spent $2.1 billion."

119. BC Hydro's figure of $1.8 billion from FID to June 30, 2017 is supported by BC Hydro's Table D-2 and discussion on page 3 of Appendix D. Table D-2 is reproduced here:

Table D-2 Total Project Expenditure Summary ($ million Nominal) Actual Compared to Plan at Final Investment Decision

Description	Final Investment Decision Plan to Date	Actual to June 30, 2017	Variance
Total Project Costs	1,321	1,800	(479)

120. In the Preliminary Report, the Commission cites page 3 of BC Hydro's Appendix D as the source of BC Hydro's statement that it has spent $1.8 billion to June 30, 2017 out of the FID budget. The report states:

> "BC Hydro states it has spent $1.8 billion to June 30, 2017,[107] representing 22 percent of the budget of $8.335 billion.[108] BC Hydro compares the $1.8 billion spent to date with the FID planned

[62] Underline added.

> spending to June 30, 2017 of $1.321 billion, and shows that it is $479 million higher than planned.[109]"[63]

121. BCSEA notes that while the Preliminary Report recites BC Hydro's statement that it has spent $1.8 billion of the FID budget by June 30, 2017 the Commission does not state that it has accepted this figure.

122. However, the Preliminary Report does appear to accept the figure of $1.8 billion of the FID budget by June 30, 2017 where it states:

> "The Panel is concerned that the amount spent on the project as of June 30, 2017, $1.8 billion, might not accurately represent the spending that should have happened based on the project activities to date."[64]

123. BCSEA respectfully submits that the discrepancy between different portions of BC Hydro's evidence on this important financial fact warrants reconciliation. Does the Panel's explicit acceptance of "BC Hydro's figures of $1.6 billion in spending from FID to December 31, 2017" imply rejection of BC Hydro's evidence that it has spent $1.8 billion of the FID budget by June 30, 2017 and that by 30 December 2017 it will have spent $2.1 billion?

124. The Preliminary Report states:

> "Throughout this Preliminary Report, the Panel has made preliminary findings and seeks additional information. Readers are cautioned that these are preliminary and subject to change as we complete the consultation process and as additional information becomes available."[65]

125. BCSEA emphasizes this point because it involves a difference of $0.5 billion in the sunk costs of Site C (Total Sunk Costs of $2.1 billion versus $2.6 billion). BCSEA is not quarrelling with a Commission finding of fact. Nor does BCSEA take a position that one figure should be preferred over the other.

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[63] Preliminary Report, p.21
[64] Preliminary Report, p.iii, underline added
[65] Preliminary Report, p.1

Part VI. Cost of Suspension

126. BCSEA's main point regarding the cost of suspension question concerns regulatory risk to Site C completion after suspension.

127. BC Hydro states that it is working under the assumption that if, after a period of suspension, a decision was made to resume construction it would be possible to restart the project.[66] BCSEA respectfully submits that the inquiry panel should reject this assumption.

128. BCSEA believes that the concept of completion of Site C after a period of suspension involves substantial regulatory risk that must be taken into account.

129. In BCSEA's view, it would be unreasonable to assume that after a period of suspension of up to seven years a decision to recommence and complete construction of the Site C project could be made without full regulatory approval at both the provincial and federal levels.

130. This would presumably include federal and provincial project assessment under the regulatory regimes then in place. The federal project review process is already broader in scope and more rigorous than it was at the time of the Joint Panel Review.

131. At the provincial level, it would be illogical for the government to suspend construction of the Site C project without providing that a decision to recommence construction would be made in the context of a comprehensive BC Hydro integrated resource plan independently reviewed by the BC Utilities Commission.

132. The panel in the Preliminary Report requested BC Hydro to "confirm whether it believes there is any plausible circumstance which would restrict its ability to complete the project and if so provide details."[67]

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[66] Preliminary Report, A13, pdf p.49
[67] A13, p.39, pdf p.53

133. BC Hydro's response[68] does identify a "general risk" of the possibility of a "determination from either the provincial or federal government that a new environmental assessment is required for the re-started project."[69] However, BCSEA believe that this severely understates the likelihood that recommencement of the Site C project following a period of suspension would require new regulatory review and approvals.

134. Further, while BC Hydro acknowledges that "Such a determination would substantially increase the costs and risks of proceeding with the project,"[70] BCSEA submits that it is reasonably foreseeable that the probability of a recommenced Site C project actually receiving regulatory approval is low.

Part VII – Costs of Terminating the Site C Project

A. Two components

135. The third inquiry question is: What are the costs of terminating the Site C project?[71]

136. As the Panel confirms in the Preliminary Report, this includes both the costs of termination and site remediation, and the costs of acquiring alternative energy and capacity resources (both demand-side and supply-side) necessary to meet the system requirements that would otherwise have been met by Site C.

137. The cost of acquiring alternative resources is the larger and more complex of the two components. It is dealt with in the portfolio analysis aspect of the inquiry and is addressed in Part VIII, below.

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[68] F1-8, pdf 142, 2.81.2
[69] F1-8, pdf p.143
[70] *Ibid.*
[71] OIC 244/2017, s. 3b(iii)

B. Costs of termination and remediation

138. BC Hydro says it would incur additional construction and overhead costs after the termination date associated with terminating work and remediating the site totaling approximately $1.0 billion.[72] This is comprised of $300 million for termination and a Class 5 estimate of $700 million PV for remediation of the site.

139. The components of BC Hydro's estimate are:

(a) construction contract termination costs (payment of outstanding contract costs and contractor demobilization costs);

(b) consulting and engineering contract termination costs;

(c) cost of remediation work, including among other things, grading and contouring slopes for drainage and reclamation of key disturbed areas; and

(d) cost of maintaining a project team.[73]

140. Deloitte "estimates the total incremental cost of the Termination Scenario to be approximately $1.2 billion, excluding inflation impacts and interest costs."[74] Key activities would include:

(a) Termination of major contracts,

(b) First Nations and Community Benefit Agreements and archeological impacts,

(c) demobilization,

(d) engineering, permitting and procurement activities, and

(e) construction activities for site remediation and reclamation.[75]

141. The Preliminary Report states:

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[72] Exhibit F1-1, section 6.1.2, page 68.
[73] Ibid, pp. 70-72.
[74] Exhibit A-8, Site C – Construction Review, Deloitte LLP, page 66.
[75] Ibid, pp. 71 – 76.

> "BC Hydro estimates termination costs to be $300 million, whereas Deloitte provides a figure of $481 million[216]. Both figures are presented as being Class 5 estimates. **The Panel finds that both estimates are reasonable, and that an appropriate estimate for termination costs is $391 million**, being the mid-point between the BC Hydro and Deloitte estimates, and being within the +100 percent and -35 percent range of both those parties' estimates."[76]

142. The Commission Panel in the Preliminary Report finds that the total cost for termination and remediation would be $1.1 billion.[77]

Table 20: Preliminary Panel Findings – Termination and Remediation

Findings	Cost
Termination costs	$391 million
Remediation costs	$662 million
Total	$1.1 billion

143. BCSEA notes that the estimates for the costs of termination and remediation are Class 5 estimates, which is a "-35%/+100%" estimate. As a result, accepting a $1.1 billion Class 5 estimate is equivalent to accepting an estimate of $700 million to $2.2 billion for termination/remediation. This makes a big difference in readers' understanding of the financial information provided.

144. Similarly, BCSEA notes that the range of uncertainty of the estimated cost of completion of the Site C project would be useful information for the reader.

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[76] Preliminary Report, p.43, bold in the original
[77] Exhibit A-13, *British Columbia Utilities Commission Inquiry Respecting Site C: Preliminary Report to the Government of British Columbia*, 2017, page 44.

Part VIII – Alternative Resources

A. Introduction

145. The fourth inquiry question is the one that goes to the heart of the matter: What Without-Site C portfolio of generating projects and demand-side management could provide benefits similar to the benefits of a Site C portfolio at a similar or lower cost?

146. In the next section of this Part, BCSEA addresses the importance of the portfolio sensitivity analysis methodology. Section C addresses the cost of equity capital issue. Section D addresses DSM as a portfolio model input assumption. Finally, section E discusses the portfolio sensitivity results under the aggressive input assumptions required by the panel in the Preliminary Report.

B. Portfolio approach versus UEC

147. In BCSEA's view, portfolio analysis, and especially the sensitivity analysis of how the portfolio results change with changes in input assumptions, is the primary methodology that the Commission should rely on in answering question 3(a)(iv).

148. BCSEA submits that the results of portfolio sensitivity analysis should be presented in terms of unit energy cost (UEC) for communication purposes and to respond to the wording of the terms of reference.[78]

149. The Preliminary Report emphasizes the UEC Analysis to the exclusion of portfolio sensitivity analysis. Significantly, the Preliminary Report makes no mention of BC Hydro's Table 20 "Sensitivity Analysis: Summary."[79]

150. Table 20 shows how the results of BC Hydro's analysis of the cost of

[78] OIC 244/2017 s.3(a)(iv) uses the term "unit energy cost."
[79] Exhibit F1-1, p.97, pdf p.106. Under the heading "BC Hydro Portfolio Results," the Preliminary Report provides BC Hydro's tables showing the resources selected in the three key portfolios (pp.94-96). However, these are only stage results. The 'bottom line' results of the portfolio analysis is the NPV for each portfolio and the sensitivity analysis that is shown in BC Hydro's F1-1 Table 20, and F1-8, IR 2.46.0, Tables 1 to 4.

completion, termination, and suspension-and-completion portfolios, and, of crucial importance for the inquiry outcome, it shows how the portfolio results change when key input assumptions are changed.[80]

151. In BCSEA's view, Table 20 (the format, not the numbers) is the presentation of the results of the analysis that will determine the Commission's findings in response to question 3(a)(iv). (New portfolio results based on stringent input assumptions are provided in F1-8, and these are discussed below.)

152. The Preliminary Report notes various limitations[81] of BC Hydro's approach to UEC Analysis. In BCSEA's view, these are limitations of UEC Analysis itself that can't be fully resolved by successive adjustments to UEC figures. These limitations are exactly what portfolio sensitivity analysis provides and UEC Analysis does not provide.

153. The Panel in the Preliminary Report identified a number of important 'sensitivities' that it required BC Hydro to address in the UEC Analysis. BCSEA's view is that these sensitivities (and others) should be analyzed first in the portfolio analysis and then the key results of the portfolio sensitivity analysis presented in a UEC format, in addition to being presented as the results of the portfolio analysis in a format such as that of Table 20 in F1-1.

154. BCSEA submits that the inquiry panel should rely on portfolio sensitivity analysis to deal with the complex, fact-dependent topics such as load forecasting, future export markets, cost of equity capital, declining costs of renewable generation alternatives and so on. These topics are the subject of numerous detailed questions for BC Hydro in the Preliminary Report.[82] In

[80] For example, if the cost of completion of Site C is higher, or the cost of non-Site C alternatives is lower, than in BC Hydro's base case.
[81] E.g., resource energy and capacity attributes, financing costs, project life spans, project timing, trade revenue, line losses, network upgrades, cost of incremental firm transmission, wind integration, capacity credit adder.
[82] Regarding export market prices, the Preliminary Report asks questions regarding electricity markets, past and forecast prices, transmission constraints on exports,

BCSEA's view, there has not been enough time in this abbreviated three-month inquiry for the panel, or the interested parties, to address and adequately resolve all of these complex topics. Rather, BCSEA submits that the best, most accurate conclusions will be obtained by focusing on appropriate values for portfolio sensitivity analysis.

C. Cost of equity capital

155. When the BC government approved the construction of Site C in December 2014 it also announced that the 2013 Ten Year Rates Plan had reduced BC Hydro's cost of capital for Site C by $26/MWh on a UEC basis.[83]

156. In January 2015, BCSEA asked the Minister of Energy and Mines for an explanation of the $26/MWh reduction in Site C's UEC and received this response:

> "The $26 per MWh is the reduction in the Site C UEC at the point of interconnection based on a reduced cost of financing the project, as a result of the Government's 10 Year Rate Plan (Plan) for BC Hydro that was announced in 2013."[84]

157. This reduction in BC Hydro's cost of capital is codified by BC OIC 590-2016.[85] OIC 590-2016 has the effect of reducing ratepayers' costs of equity capital for Site C and implicitly increasing the financial burden to taxpayers by a corresponding amount.[86]

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export-related transmission planning, regulatory restrictions in key export markets, technological advances such as smart inverter technology, Site C operational constraints, synchronous condense and sales of capacity, and the Energy Imbalance Market. Preliminary Report, Appendix C, question 22.

[83] Government of British Columbia: Backgrounder: Comparing the Options, page 2, 2014. https://www.sitecproject.com/sites/default/files/backgrounder-comparing-the-options.pdf

[84] F29-3, Appendix A, April 29, 2015 email message from Les MacLaren to Thomas Hackney, pdf p.30

[85] "With OIC No. 590-2016, BC Hydro's net income is now a fixed amount. Hence, the cost to the ratepayer of financing Site C is equal to BC Hydro's cost of debt." Exhibit F1-1, footnote 36, p.61, pdf p.70.

[86] Of course, most BC Hydro ratepayers are also BC taxpayers and so the financial consequences to both ratepayers and taxpayers are important.

158. As a result, from the perspective of the cost to ratepayers, Site C (being constructed by BC Hydro) has a cost advantage not available in electricity purchase agreements by BC Hydro from IPPs for power from new supply-side resources.

159. BC Hydro acknowledges that this change in BC Hydro's cost of equity capital reduced the UEC of Site C by $26/MWh in 2013$.[87]

160. Harry Swain interprets the $26/MWh as a transfer of risk from BC Hydro ratepayers to BC taxpayers:

> "BC Hydro is merely outsourcing this risk to the general BC taxpayer. They are not making it go away. And as for financing billions at current rates, the risk is overwhelming that refinancing costs during a 70-year term will be significantly higher than they are at present. Transferring these risks to the taxpayer owners of the company without compensation is irresponsible financial sleight-of-hand."[88]

161. The inquiry panel in the Preliminary Report states that the reduction of the Site C UEC (by $26/MWh) due to the change in BC Hydro's financing costs for Site C "distorts the analysis of unit energy costs comparisons."[89] BCSEA supports this point.

162. The inquiry panel explains the point in detail as follows:

> "**Financing costs:** The reduction of financing costs of $26/MWh, which is enabled by transferring some of the financing costs from BC Hydro ratepayers to taxpayers, does not appear to be built into the Alternative Block UEC. If two portfolios are being compared, it is important to ensure that the basis of comparison is the same. If the same debt financing assumption is not being applied to the Alternative Portfolio, and a full weighted-average cost of capital is assumed instead, the Panel also draws a preliminary conclusion that this reflects an implicit assumption that the Alternative Portfolio will not be constructed by BC Hydro. This results in an "apples to oranges" comparison. The Panel finds that the

[87] Exhibit F1-1, p.62, line item "Debt Finance as per OIC No.590-2015 Net Income Frozen," for which the figure is: -26 $/MWh.
[88] Exhibit F36-1, *Site C: Complete, Mothball, or Abandon?*, Harry Swain, 2017, page 18
[89] Preliminary Report, p.86

> reduction of the UEC to account for reduced financing costs distorts the analysis of unit energy costs comparisons."[90]

163. In the Preliminary Report, the panel required BC Hydro to provide portfolio sensitivity analysis results to test the hypothesis of energy alternatives to Site C being developed by BC Hydro at BC Hydro's advantageous rate of financing.

164. BC Hydro did provide the requested portfolio sensitivity results, and acknowledged that the assumption that new alternative generation resources would be constructed using BC Hydro's (advantageous) cost of financing has an impact on the portfolio sensitivity results, and an impact much larger than that of the other aggressive input assumptions the panel required BC Hydro to model. BC Hydro states:

> "The assumption that BC Hydro becomes the developer and financier of alternative resources has a much greater impact on the PV comparison."[91]

165. BC Hydro acknowledges that "The Commission is correct that BC Hydro has applied different financing costs to different resources."[92] However, BC Hydro defends this on the grounds that it does not have a mandate to develop alternative energy resources[93] and that IPPs' costs of financing are properly higher than BC Hydro's in reflection of higher risks.[94]

166. BC Hydro argues that energy resources developed by IPPs do not cause cost overrun risk to ratepayers (unlike the Site C project), but are subject to higher financing costs, which reflect development and cost overrun risk. BC Hydro states:

> "The benefit of the IPP industry undertaking these exploration and development activities is their ability to raise capital where investors are willing to assume those risks for the return of an EPA with a reasonable return on equity. If IPPs pursue a risky

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[90] Preliminary Report, page vii, underline added
[91] Exhibit F1-8, BC Hydro response to Commission IR 2.46.0, pdf page 102
[92] Exhibit F1-8, BC Hydro response to Commission IR 2.42.0, pdf page 96
[93] Exhibit F1-8, BC Hydro response to Commission IR 2.42.0, pdf page 95
[94] Exhibit F1-8, BC Hydro response to Commission IR 2.46.0, pdf page 102

> undertaking that does not become a project, the costs do not flow to ratepayers. …
>
> IPPs have a materially higher cost of capital than BC Hydro, and customers will pay that higher cost of capital when BC Hydro acquires the resources [from IPPs]."[95]

167. Without going into the appropriate quantum for the premium in the cost of capital for IPPs, BCSEA accepts that a higher risk of investment will be reflected in higher financing costs. Nevertheless, the $26/MWh deduction from the Site C UEC represents a policy driven transfer of the cost of Site C from ratepayers to taxpayers.

168. In BCSEA's view, this cost of capital advantage is highly material to assessing the costs and risks of Site C to both ratepayers and BC taxpayers. BCSEA respectfully recommends that the panel address the cost of capital topic openly and transparently in its report to the government.

D. DSM as an input assumption

169. BCSEA submits that the Without-Site C portfolio should include all DSM energy savings that are (a) cost-effective in modified total resource cost terms and (b) less expensive than the least-expensive supply-side resource.

170. In the Commission's recent review of BC Hydro's F2017-F2019 Revenue Requirements Application, BC Hydro argued against increasing the amount of cost-effective DSM that it would seek to acquire in the test period, on the grounds that higher DSM investments, at the level contemplated in the 2013 IRP, would tend to drive up electricity rates, contrary to the intention of the "Ten-Year Rates Plan."[96]

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[95] Exhibit F1-8, BC Hydro response to Commission IR 2.42.0, pdf 96

[96] BC Hydro Final Argument, F2017-F2019 Revenue Requirements Application, at http://www.bcuc.com/Documents/Arguments/2017/DOC_49332_05-23-2017_BCHydro-Final-Argument.pdf; BC Hydro Reply Argument, at http://www.bcuc.com/Documents/Arguments/2017/DOC_49571_07-04-2017_BCHydro-Reply-Argument.pdf

171. OIC 244/2017 is silent regarding the Ten-Year Rates Plan. Accordingly, BCSEA submits that the Ten-Year Rates Plan should not be treated as a constraint imposed by OIC 244/2017 on the amounts of cost effective DSM that can be included in the resource portfolios required by s.3(b)(iv). BCSEA has found no information in BC Hydro's August 30, 2017 submission[97] as to whether BC Hydro continues to be guided by the Ten-Year Rates Plan.

172. In addition, the Without-Site C portfolio should include capacity-focused DSM in amounts and at costs that BC Hydro said in the F2017-F2019 Revenue Requirements Application[98] would likely be available. This is important for a valid comparison with the Site C portfolio, because the dispatchability of Site C is one of its significant advantages and, as BC Hydro said in the RRA proceeding, "BC Hydro's next supply-side capacity resource beyond Revelstoke Unit 6 [which is a committed resource] will come in increments of hundreds of MW, cost hundreds of millions of dollars and take eight to 10 years to build."[99]

173. Sources of information on available DSM energy and capacity savings include: BC Hydro's F2017-F2019 RRA, cited above, and the January 18, 2017 "British Columbia Conservation Potential Review" by Navigant prepared for BC Hydro, Reference No. 180336.

E. Portfolio sensitivity results

174. In the Preliminary Report, the inquiry panel required BC Hydro to redo the portfolio sensitivity analysis using a series of aggressive input assumptions.[100] The panel did not state the exact criteria it used to

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[97] Exhibit F1-1
[98] Exhibit B-14, BCUC IR 2.317.3, pdf pp.979-983 (at http://www.bcuc.com/Documents/Proceedings/2017/DOC_48630_B-14_BCH-Response-BCUC-IR2.pdf)
[99] *Ibid.*, pdf p.980; and *see* Exhibit B-9, BCUC IR 1.81.3, pdf pp.1434-1436 (at http://www.bcuc.com/Documents/Proceedings/2016/DOC_48161_B-9_BCH-Responses-to-BCUC-IRs.pdf)
[100] A-13, p.103

determine these input assumptions. However, in general it could be said that these input assumptions correspond to what is sometimes referred to as ‘realistic worst case’ assumptions. Worst case here means in the direction of reducing the cost-effectiveness of the Site C portfolio compared to the Without-Site C portfolio.

175. BC Hydro was required to test the results of the following input assumptions:

(a) a 50% Site C cost overrun,

(b) the low-load forecast (which extends the period of selling surplus power from Site C into the market),

(c) low market prices (which reduces the revenue from selling surplus power from Site C into the market,

(d) new IPP generation projects being financed at BCH's government-reduced Site C financing costs (which reduces the cost of IPP generation projects), and

(e) reductions in the costs of new wind energy, solar energy and battery storage of 45 per cent, 60 per cent and 50 per cent by 2040 compared to BC Hydro’s numbers in the Reference case used for its August 30 portfolio analysis.

176. Regarding its implementation of the 50 per cent reduction in the assumed cost of new battery storage in 2040, BC Hydro states that the portfolio model selected pumped storage ahead of the reduced-cost battery storage. BC Hydro explains:

> “Battery systems are assumed to be Lithium-Ion batteries at 100 MW size and 1,000 MWh energy storage capacity. Lithium-Ion technology is selected due to the dominance in the North American battery system market since 2015 (for a discussion of different storage technologies, please refer to section 6.4.5 of Appendix L of Aug 30 Filing). …
>
> The estimated cost of capacity (unit capacity cost) for battery storage systems in 2040 is $651/kW-year ($2018), not including a

cost of energy lost during charging/discharging inefficiencies. A portfolio analysis has been done that included the above battery storage systems (using a minimum project size of 100 MW) as well as pumped storage (using a minimum project size of 1,000 MW), however the model selects pumped storage as a lower cost option than batteries. Please refer to BC Hydro's response to BCUC IR 2.46.0 for further sensitivity analysis."[101]

177. BC Hydro describes its implementation of these required input assumptions as follows:

"- BC Hydro's estimates of optimistic future cost reductions for wind, solar, and battery storage as discussed in BCUC IRs 2.46.0, 2.47.0 and 2.48.0.

- Low Market Prices: As described in section 8.6.2 of the Aug 30 Filing using the lower market price scenario shown in Figure 15 of the submission.

- BCH Financing of Alternatives: Alternative resources normally built by IPPs were assumed to be financed by BC Hydro at 3.43 per cent (nominal) cost of debt.

- Low Cost Wind Renewal Assumptions: BC Hydro's estimate of reducing costs of renewals as discussed in BCUC IR 2.40.0."[102]

178. In addition, the panel in the Preliminary Report required BC Hydro to include further assumptions which tend to reduce cost-effectiveness of the Site C portfolio, stated by BC Hydro as follows:

"GMS Units 1 to 5 Resource Smart project is assumed to be available as a resource as discussed in BCUC IR 2.59.0.

A very early assessment of capacity focused DSM has been added as per BCUC IR 2.73.0.

Renewing the other 50 per cent of existing IPP biomass EPAs and making biogas available as a resource – refer to BCUC IRs 2.66.0 and 2.67.0.

200 MW of geothermal has been assumed to be available – refer to BCUC IR 2.61.0."[103]

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[101] F1-8, pdf pp.106-107
[102] F1-8, pdf pp.101-102
[103] F1-8, pdf p.101

179. The results of the portfolio sensitivity analysis using the aggressive input assumptions are presented in Exhibit F1-8 Table 3, reproduced here:

Table 3 Commission Portfolio Sensitivities

Commission Portfolio Sensitivities	Benefit Site C Portfolio vs. Alt. Resources Portfolio (PV - $ billion)	Site C Portfolio Unit Energy Cost ($/MWh)	Alternative Resources Portfolio UEC ($/MWh)
Mid Gap - UEC Sensitivities	6.2	73	96
+10% Site C Project Cost	5.8	75	96
+20% Site C Project Cost	5.4	76	96
+50% Site C Project Cost	4.3	81	96
Mid Gap - UEC Sensitivities + Low Market Prices	6.0	75	99
Mid Gap - UEC Sensitivities + BCH Financing of Alternates	4.7	62	79
Mid Gap - UEC Sensitivities + BCH Financing of Alternates + Low Cost Wind Renewals	4.6	61	78
Mid Gap - UEC Sensitivities + BCH Financing of Alternates + Low Cost Wind Renewals + Low Market Prices	4.1	65	81
Small Gap – UEC Sensitivities	6.1	35	73
Small Gap – UEC Sensitivities + Low Market Prices	4.7	38	70
Small Gap – UEC Sensitivities + Low Market Prices + BCH Financing of Alternates + Low Cost Wind Renewals	3.8	34	59
+10% Site C Project Cost	3.4	35	59
+20% Site C Project Cost	3.0	37	59
+50% Site C Project Cost	1.9	43	59
Large Gap – UEC Sensitivities	9.7	128	154

Note: The three project cost sensitivities are applied to the: "Mid Gap - UEC Sensitivities" and "Small Gap – UEC Sensitivities + Low Market Prices + BCH Financing of Alternates + Low Cost Wind Renewals" scenarios.

180. Under the aggressive input assumptions the putative financial benefit of Site C to ratepayers drops to below $2 billion compared to the Without-Site C alternative portfolio.

Part IX – Conclusion

181. BCSEA's position is that Site C should not be allowed to proceed without an integrated resource planning process independently scrutinized by the Utilities Commission in a full public proceeding under the Commission's Rules of Practice and Procedure, with intervener participation, expert

evidence, information requests and cross-examination.

182. BCSEA does not consider the current three-month limited-scope inquiry to constitute the full independent public scrutiny of Site C that is required.

ALL OF WHICH IS RESPECTFULLY SUBMITTED.

October 11, 2017

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