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October 11, 2017

VIA ELECTRONIC MAIL

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

Dear Sirs/Mesdames:

Re: Site C Inquiry – Comments on the Preliminary Report

We are counsel to the Commercial Energy Consumers Association of British Columbia (the "CEC"). Attached please find the CEC's submissions with respect to their comments on the Preliminary Report with respect to the Commission's Inquiry into Site C.

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: Registered Interveners

INTERLAW MEMBER OF INTERLAW, AN INTERNATIONAL ASSOCIATION OF INDEPENDENT LAW FIRMS IN MAJOR WORLD CENTRES

British Columbia Hydro and Power Authority British Columbia Utilities Commission Inquiry Respecting Site C - Project No. 1598922

Submission by:

Commercial Energy Consumers Association of British Columbia

<u>Comments on the Preliminary Report</u>

COMMERCIAL ENERGY CONSUMERS ASSOCIATION OF BRITISH COLUMBIA

Site C Inquiry –Comments on the Preliminary Report

Date: October 11, 2017

A. Key Issues

Potential Error in Delay Cost Assessment

> Deloitte estimates that a one-year delay in the river diversion, currently planned to start on September 1, 2019, would incur "additional costs, on the order of $382 million, excluding inflation impacts and potential delay claims"[149]. The largest single component of this cost would be additional interest during construction of $252 million, being $21 million per month for twelve months, based on figures provided to Deloitte by BC Hydro[150]. The remaining $130 million would be for "additional indirects".
>
> [1]
>
> ***Panel analysis and preliminary findings***
>
> **The Panel finds that if the river diversion is not achieved in September 2019, the project will not remain within its budget of $8.335 billion.** BC Hydro has stated that if the river diversion of September 2019 is not achieved, this "would likely trigger a draw on the Treasury Board reserve", and adds that the delay "would cost approximately $630 million". Deloitte estimates this to be $382 million. In order to analyze this cost more fully, **the Panel asks BC Hydro to provide a detailed breakdown and justification of its $630 million estimate.**
>
> [2]

1. When dealing with the likelihood of the Site C project remaining on time and on budget the Panel was provided, for the implications of delay, with BC Hydro estimates and Deloitte estimates, which were based on information provided to Deloitte by BC Hydro in response to questions asked of BC Hydro.

2. The Deloitte claim that IDC is a major cost of a one-year delay and that IDC is being added at $21 million per month appears to the CEC to be erroneous information. IDC of $252 million per year on a base expenditure to date of say $2 billion would appear to imply an IDC interest rate of approximately 12.6% per year. Conversely, it would imply that IDC on this initial $2 billion portion of expenditure after 7 years of construction would be $1,764 billion, which in and of itself is substantially greater than the IDC included in the Site C project estimate of approximately $1 billion.

3. The CEC certainly cannot understand this information and is concerned about the degree to which apparent misinformation may be in the base material being used by the Panel to inform its finding.

4. The Commission Panel should be skeptical of this information and, if in fact it represents an error and not a misunderstanding of the Deloitte report, the Panel should be concerned about whether or not other information before the Commission needs more thorough review and testing.

[1] BCUC Preliminary Report, Page 29
[2] BCUC Preliminary Report, Page 33

The UEC Analysis Should Not Equalize Financing Costs

BC Hydro calculates the Site C UEC as follows:

Table 27: Site C UEC [3][2][1]

Cost Factor	Unit Energy Cost $/MWh
Site C Cost To Ratepayers in 2013 Integrated Resource Plan (November 2013) at Point of Interconnection in F2013$	**$83**
Change to project capital and operating costs	+1
Debt Finance as per OIC No.590-2016 Net Income Frozen	-26
Site C Cost To Ratepayers at Final Investment Decision (December 2014) at Point of Interconnection in F2013$	**$58**
Updated financing rates and conversion to F2018$	-10
Adjustment for Delivery to Lower Mainland and annual shape adjustment	+10
Site C Cost To Ratepayers Today Delivered to Lower Mainland in F2018$	**$58**
Adjustment For Sunk Costs	-15
Site C Cost To Ratepayers Today Less Sunk Costs	**$43**

Cost Factor	Unit Energy Cost $/MWh
Delivered to Lower Mainland in F2018$	
Credit for avoiding termination and site remediation costs	-9
Site C Cost To Ratepayers Today Less Sunk Costs and Credit for Termination / Remediation Costs Delivered to Lower Mainland in F2018$	**$34**

[3]

Panel analysis and preliminary findings on the Site C UEC

The Panel finds that the reduction of the UEC to account for reduced financing costs distorts the analysis of unit energy costs comparisons.

[4]

5. The CEC is of the view that the Panel would be making a significant error if it proceeds with this finding. This is because equalizing financing costs between projects distorts the actual costs to create another perspective or point of view. From a ratepayer point of view having a project such as Site C financed with debt helps create affordable energy. This is the current context for Site C which the Panel should not ignore or dismiss. An IPP supplier might have an interest in seeing this equalized so that it might gain an advantage

[3] BCUC Preliminary Report, Page 79
[4] BCUC Preliminary Report, Page 86

and displace the current context thereby providing less affordable energy to BC Hydro and its customers.

6. The context, enabling debt financing for Site C, and providing affordable energy to BC Hydro customers is provided by the Provincial Government. The context might be changed by the Government and the Panel might surely point out the importance of the context and alternative potential contexts but is should not preclude the use of information useful to obtaining affordable energy for BC Hydro's ratepayers.

7. If the current government is concerned about affordable energy it might well choose to maintain this financing context or it might change the context where BC Hydro could acquire IPP projects for BC Hydro customers using its debt financing.

8. In this Inquiry the Panel should not side with a supplier point of view against a ratepayer point of view as a finding of fact.

9. The CEC notes that this process of debt financing was the foundation of BC Hydro enabling it to produce affordable energy and expand its access to all British Columbians. Using an IPP cost of financing would inflate the costs of Site C beyond what can be the actual cost. The Panel should advise the government out of this Inquiry in a way that enables the government to be informed about the context it sets for energy and how that may impact BC Hydro ratepayers.

<u>There Is A Difference Between A Write-Off And Cost Recovery From Ratepayers</u>

Panel analysis and preliminary findings

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. Any determination of the appropriate recovery mechanism, including the period of recovery, would need to be made in the context of a future proceeding.

10. From a ratepayer's perspective there is a distinct difference between costs written off and not recovered from ratepayers and costs recovered from ratepayers.

11. In its analysis of economic impacts of termination the panel is properly considering the costs prior to termination as "sunk costs." The relevant costs are the incremental costs for completion and alternative incremental costs for the replacement of the benefit. The costs of termination and rehabilitation are also costs that should be considered "sunk costs" of transferring to an alternative or "common costs" for both in comparing the alternative to the completion.

12. The CEC agrees with this method of analysis to assess incremental benefits of future alternatives.

13. However, where the costs of the Site C regulatory account and termination costs would be recovered from ratepayers over some period of time, these costs are no longer sunk costs to the ratepayer.

14. Instead the ratepayer must finance the costs being so recovered because there is no offsetting benefit being received. That is, the ratepayer experiences an opportunity cost for paying for the costs for which it received no value for the expenditure.

15. The cost to the ratepayer of a recovery of $3 billion from the ratepayers would be at a minimum the present value of the BC Hydro financing for those cost over a long period of time at BC Hydro's interest rate/cost of capital or a higher value of financing at a customer interest rate/ cost of capital. At a BC Hydro type interest rate of say 3.68% a $3 billion recovery of costs from ratepayers would impose a present value cost on those ratepayers of approximately $2 billion, making the total cost to ratepayers approximately $5 billion. This occurs before paying for any alternative and receiving the benefits.

16. If the Panel finds recovery from ratepayers is reasonable then it needs to reflect the cost to ratepayers of providing that recovery to BC Hydro and add it into its analysis of the costs of termination.

17. The CEC recommends that its advice to government contain a clear understanding of the difference between having sunk costs and termination costs written off without recovery from ratepayers and recovering those costs from ratepayers through rate increases.

Capacity Costs

18. The CEC notes that the Revelstoke 6 project will represent the last inexpensive capacity available to BC Hydro and that this capacity has a number of potential values to BC Hydro and its customers, not the least of which is enabling trading in the electricity markets for a profit utilizing the storage capacity of the BC Hydro system to the advantage of ratepayers.

19. The CEC recommends that the Panel consider a section in its report dealing with capacity, its uses and its costs. The Panel report page 66, Table 24, should contain the Revelstoke 6 project.

20. The CEC notes that the inexpensive capacity of Mica 5 and 6 and Revelstoke 5 has all been needed to support the integration of not dispatchable energy and that Revelstoke 6 may serve this purpose as well.

21. The CEC notes that the least cost incremental cost of new capacity will likely be coming from pumped storage projects and that the cost of capacity is likely to increase dramatically from its past values of $55/kW-year to over $110/kW-year. The CEC notes that BC Hydro has estimated the cost of pumped storage capacity to support wind power

supply could have a likely unit cost addition to the energy of $48/MWh representing about 1/3 of the cost of future wind supply.

22. The CEC recommends that the Panel have an explicit discussion in its report dealing with the capacity values of the Site C capacity and particularly identify the added value of being down stream of the Williston reservoir enabling optimal use of the water flows in the river. Also, the dispatchable nature of the Site C capacity has additional value.

23. The CEC is intrigued by Dr. Ruskin's assertion that additional value can be obtained from the BC Hydro system through co-ordination with the Bonneville system in the US and suggests this discussion should be added to the report.

24. The CEC recommends that the costing and evaluation of Site C entail a significant discussion of the capacity values and the credit to the costs that should be relevant to determining the cost of energy for Site C. The CEC expects that the values for pumped storage capacity should be part of the basis for establishing the energy values for the Site C project.

B. Chapter Specific Comments on the Panel Report

<u>Chapter 4 Site C Project Option</u>

25. Project On-Time and On-Budget?

Page 15

Panel analysis and preliminary findings

The Panel finds that the project is, as of June 30, 2017, on time for a final in-service date of November 2024. Both BC Hydro and Deloitte agree on this assessment, notwithstanding Deloitte's concern that the project is not using EVM to measure its progress.

Page 15

The Panel asks BC Hydro to provide its current assessment of the probability that the project will achieve the river diversion in September 2019.

26. The CEC submits that it is likely that the river diversion will be on schedule in 2019, as it is a critical milestone, with known risks and known responses. The CEC expects that there is a high probability that BC Hydro could manage this situation and keep the project on time in regard to this issue.

27. The Panel would be well served to ask BC Hydro for its probability assessment for completion at different levels of cost and for different in-service date timings, which may be relevant.

Prior BC Hydro on time project experiences

Page 18

> BC Hydro provides evidence of its recent track record in project management 85, indicating that for 32 of its recent projects on average they were placed into service 8 months after the original approved-in service date, often to outage availability.

Page 19

> **The Panel finds that it is not yet in a position to determine whether the project will remain on schedule for completion by November 2024.** There remains uncertainty regarding the likelihood of starting the river diversion in September 2019. Furthermore, should there be a one-year delay of the river diversion, the Panel has insufficient information to assess the likelihood that the project can achieve the in-service date of November 2024.

Page 20

> Furthermore, the Panel does not consider the recent evidence available on BC Hydro's on-time project performance to be sufficiently relevant to the Site C project to be useful in its analysis, since the size and scale of the Site C project is so much larger than anything BC Hydro has recently undertaken.

28. The CEC submits that 'uncertainty' is inherent in the Site C project and is pervasive in even the best evidence available and the most rigorous analyses being conducted.

29. The CEC recommends that the Panel adopt a means of evaluating and coping with the project uncertainty by including a range of outcomes in its assessments.

30. The Panel would be well served not to feel compelled to opine on a specific timing but should be find it more suitable to incorporate a range of possible outcomes into the Commission's assessments. This can facilitate better understanding of decisions by recognizing and accounting for uncertainty and the likeliness of change.

31. At this point in time the CEC recommends that the Panel consider November 2024 and November 2025 as possible outcomes, which can be assessed as having different probabilities of outcome.

Is this Project On Budget?

Page 20

> The OIC asks that, after the Panel has "made an assessment of the authority's expenditures on the Site C project to date, is the commission of the view that the authority is, respecting the project, currently within the proposed budget of $8.335 billion (which excludes the $440 million project reserve established and held by the province)?"

32. The CEC notes that the current budget summary detail is not provided in this report.

33. The CEC submits that this is an important element of the analysis and should be included as broken into its components. The CEC expects that the final cost of Site C cannot be known and that the Panel will be well served to assess a range of potential cost outcomes.

Page 21

> BC Hydro states that the project is on budget. It goes on to say the expected total cost of the Project is $8.335 billion, and it does not expect to use the additional $440 million project reserve established and held by the BC Government.

34. The CEC notes that the $8.335 billion budget is a nominal dollar as spent future in service cost budget, which the CEC expects contains an amount for interest during construction based on an assumed interest rate. Given that BC Hydro has locked in financing for $4.4 billion of these project costs a significant portion of the interest during construction is fixed in terms of rate.

35. The CEC expects that the Site C project relative to its budget will likely experience continued savings on interest during construction. The CEC notes that neither the Panel nor BC Hydro have projected out the impact of the lock in of the financing.

36. The CEC recommends that the Panel incorporate an estimate of the future value of all of the locked-in financing into its assessment of Site C completion.

<u>BC Hydro's Potential for Additional Financing Savings and Project Contingency</u>

Page 21

> Deloitte further notes that the total contingency of $356 million committed to date represents forty-five percent of the budgeted cost contingency of $794 million, a percentage "significantly higher than the 22% of total budget spent to date.

37. The CEC recommends that the Panel keep this information in the context of the whole emerging contingency, including savings on IDC, rather than focus on subcomponents of the budget. In this case the $356 million contingency committed is 29% of the total contingency of $1,195 million.

Page 24

Table 8: Changes in Contingency since Final Investment Decision

Description	$ million (Nominal)
Original Contingency Budget, at Final Investment Decision	794
Identified Savings on Forecast Interest-During-Construction: 2015 2016 2017	 89 76 150
Total identified Savings on Forecast Interest-During-Construction	**315**
Other Cost Savings identified, to June 30, 2017	86
Total identified Cost Savings	**401**
Total Contingency, June 30, 2017[24]	**1,195**

The primary reason for the increase in total contingency since the start of the project is that estimates of interest during construction have fallen by $315 million, due to lower forecast interest rates. BC Hydro adds that it has locked in "historically low interest rates by hedging 50 percent ($4.4 billion) of its forecast future debt issuances from fiscal 2017 to fiscal 2024.

38. It is not clear to the CEC how the IDC savings have been calculated but they are substantial at 22% of the $1,407 IDC in the budget. If BC Hydro continues to accrue IDC savings for the remaining years of project construction then the future contingency available may be significant. These savings and the potential contingency adjustments should be forecast for the Panel and the method of calculation and detail should be made visible.

39. The CEC recognizes the BC Hydro 'lock in' strategy as a significant opportunity for BC Hydro obtain low interest rates for the benefit of ratepayers. As expenditures continue on the project one should expect these savings in subsequent years as well. The contingency thus should continue to adjust favourably relative to the budget and therefore BC Hydro should be in a position to make and estimate of future contingency adjustments due to the 'lock in' strategy for financing.

40. The CEC recommends that the panel ask BC Hydro to project additional IDC savings for the project against budget and show the full potential for contingency adjustments due to this factor.

<u>BC Hydro History of Delivering On Budget Projects</u>

Page 25

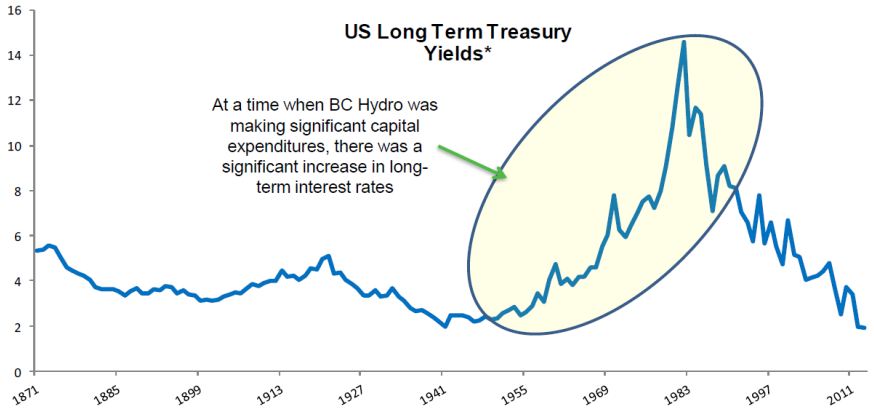
BC Hydro claims "a history of delivering projects on budget"[133], with projects coming in at "0.94 per cent less than budget on a total of $6.36 billion of spending". These data were reported in 2016/17[134]. BC Hydro does not provide information about its project cost performance on

specific projects in its filing. In its F17-F19 RRA, BC Hydro submitted the following table of projects of $5 million or greater that went over the expected amount over the last 5 years:

41. The CEC submits that the evidence submitted by BC Hydro in Table 10 is contradictory evidence of its project history, which shows that its expected cost estimates were overrun by about 23.5% on a per project basis and that its authorized budgets were overrun by 20.25% when overrun (70% of the time) and underrun by -8.2% when underrun (30% of the time) for an average of 19.89%.

42. The CEC's Executive Director was at one time the Comptroller Accounting for BC Hydro and had prepared and analysis of all of the major dam projects BC Hydro had constructed to assess the degree of overrun from pre-construction budgets. The analysis done at that time determined that BC Hydro's large construction projects had overrun the pre-construction budgets by between 25% and 75%. The CEC advises that these major dam projects were being implemented during a period of rising interest rates (1950s through to the 1980s) and so it would be reasonable to expect the overruns to be more significant than current construction work such as Site C. The graphic below is taken from BC Hydro's debt management workshop presentation.

- Long term interest rates are at historic lows:



*Source: Sidney Homer, A history of Interest Rates

43. The CEC submits that there is a probability that the project will be over-budget but that is likely that circumstances have changed such that the lower end of historical over budget projects will be closer to what can be achieved than the higher end driven in the past by rising interest costs.

Page 28

Table 12: Possible Impact Scenarios (Nominal $ Million)

Impact	Schedule Delay to FID Nov 2024 ISD	Cost Impact to FID Budget ($8.335B)		Final Cost Range at Completion	
		low	high	low	high
Low	On time	0%	10%	$ 8,335	$ 9,169
Moderate	One year delay	10%	20%	$ 9,169	$ 10,002
High	More than 1 year delay	20%	50%	$ 10,002	$ 12,503

44. The CEC submits that the Panel should address the uncertainty of completion on budget by assessing a range of potential budget overruns. The CEC finds that the Deloitte analysis provides a good basis for assessing the Site C project, albeit that the probability of each outcome should definitely be estimated and the worst outcomes should not be accorded the status of certainty.

<u>BC Hydro's Potential for Additional Contingency</u>

Page 33

> BC Hydro's increase in the amount of contingency available from $794 million to $1.195 billion is based on the current "historically low interest rates"[176]. While BC Hydro has locked in 50 percent of its forecast future debt between F2017 and F2024, it is not clear to the Panel what effect an increase in interest rates would have on the total available contingency for the Site C project. **The Panel asks BC Hydro to provide an analysis of the $315 million that has been identified as savings on forecast interest during construction, indicating what effect a rise of 0.5 percent, 1 percent or 2 percent in interest rates would have on the amount of the savings.**

45. The CEC submits that a contingency of $1.195 billion is significant. The CEC expects that interest rates for assessing the Site C budget must be examined relative to the budgeted rates. The CEC recommends that the Panel obtain these budgeted rates and the actuals to date as well as forecast rates along with the expected expenditures in order to make visible the calculation of interest during construction savings. Should these savings continue to grow and add to the contingency then there is a potential that a variety of cost impacts over the course of the Site C project could be contained largely within the contingency.

Page 34

> **The Panel finds that these results are indicative of BC Hydro's ability to deliver projects on budget on the average, but that they provide little insight into the likelihood that Site C will be delivered on budget, since Site C is so much larger than any other project BC Hydro has managed in its recent history.**
>
> The Panel notes that many submissions quoted the Ansar study and acknowledges the work done by Ansar to identify possible systematic problems with estimating costs 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.**[5]

46. The CEC submits that the Panel should take all evidence into account in establishing a range of possible outcomes. The CEC submits it is prudent for the Commission to factor in evidence related to systematic problems that affect estimating, and will likely affect the value of the evidence provided using common estimating techniques.

<u>Costs to Suspend versus Benefits to Suspend</u>

Page 35

BC Hydro states that should a decision be made to resume construction it is working under the assumption it would be possible to restart the project. BC Hydro asserts there are substantial risks with this assumption pointing out that the project is currently underway with key assets built up over a ten-year plus period. While some of these assets could be maintained during the suspension, many would be lost resulting in substantial risk to its ability to restart the project.

47. The CEC notes that if the value of these assets is lost then a suspension delay could become increasingly costly. The CEC submits that this is not a risk to be taken lightly and it should be costed into the costs of this scenario.

Page 35

Table 15: Breakdown of Suspension and Maintenance Costs[179]

Cost to put the Project site into a state of suspension and render safe	$0.9 billion
Cost to maintain the Project site for the period of suspension to preserve the option to resume	$0.3 billion
Total	$1.1 billion*

* Total is different than the sum numbers above due to rounding effects.

48. The CEC submits that estimates such as these are also subject to underestimation risk and might legitimately be augmented by adjustments or be provided as a range. The CEC would recommend a range from $1.1 billion to $1.35 billion to allow just for estimating uncertainty, let alone cost elements not factored into these estimates.

49. The CEC recommends that the Panel adopt a range for these sorts of estimates because the full costs cannot be known now.

Page 35

1) Contract termination costs – these are related to terminating all possible project construction contracts and obligations inclusive of demobilization of contractor labour and equipment from the

[5] Page 34 of 121

site. Hydro points out that the turbine manufacturing is advanced and it would seek to restructure the agreement but this would be dependent on its ability to negotiate terms with the vendor.

2) Costs related to rendering the site safe and environmentally sound. This would be less intensive than for termination as infrastructure (such as accommodation) would be left in place and environmental work would be of a temporary nature.

3) Cost of maintaining a project team for a two-year period to manage suspension work.

50. The CEC submits that there are numerous risks in addition to those listed. Community consultation would likely continue and first nations costs would likely continue. The CEC recommends a contingency be added to these estimates. There is no discussion in the suspension scenario for evaluating the continuing interest during construction from the earlier stages and from the suspension and reinstatement costs. These costs will continue to be paid by ratepayers whether accounted for or not. These are likely to further add to the cost profile of this scenario. The CEC recommends a cost range to be assessed on $1 billion to $2 billion.

Page 36

With reference to a decision to suspend the project, BC Hydro states that if at any time following completion of this it was decided to terminate the project, additional cost and work would be required to remediate the site back to the state outlined in the termination scenario. BC Hydro has estimated these costs at approximately $0.3 billion. Therefore, the total cost of suspending and maintaining project but not reinstating it in 2024 would total $1.4 billion.

51. The CEC considers BC Hydro's estimate for this risk as being too low for similar reasons to earlier discussion of this scenario.

Page 36

Under the current schedule BC Hydro estimates the cost to complete the project to be $6.2 billion as of December, 2017. However, if the project is suspended and reinstated BC Hydro's estimate would increase to $7.9 billion because of the increase in cost related to the effect of cost inflation, remobilization costs and increased risk premiums due to the schedule delay. This $1.7 billion increase in cost is in addition to the $1.1 billion to suspend and maintain the project. Therefore, the cost of suspending, maintaining and restarting the project based on BC Hydro's submissions totals $2.8 billion before any additional interest charges.

52. If BC Hydro completed the Site C project 7 years earlier than a suspension and reinstatement period, then even if the entire project output was surplus the revenue from market sales, which might be on the order of $150 million per year to $200 million per year would be a significant factor. The value of Site C capacity in the BC Hydro system would be quite significant and would be in addition to the forgoing assessment. Using a proxy value equating to the value of pumped storage capacity might result in an additional value of $100 million per year to $150 million per year.

53. The CEC recommends that the potential electricity market sales of surplus and of capacity utilization, related to earlier completion, be a factor in assessing suspension costs thus providing a mitigating offset to the costs of completing Site C too early, in addition to the sunk cost benefit of being as far into the project as BC Hydro is.

54. If Site C were going to be surplus for 7 years but could be domestically used and useful 7 years later, the potential benefit to ratepayers could be valued at revenue from sales at domestic rates versus electricity market rates. The CEC has estimated this difference to be worth approximately $2.5 billion from more optimal use of the Site C facility. If the suspension and reinstatement costs are similar to these benefits then the benefit to suspension and reinstatement would become minimal. As the suspension costs for Site C plus the reinstatement costs and the interest costs of carrying the option forward are likely to exceed the potential benefit the suspension option becomes of lesser value.

55. The CEC recommends that the Panel at a minimum explain the potential benefit of delay to obtain more optimal use revenues, as well as explaining its costs so the option can be more fully understood.

56. The CEC recommends that the Panel at a minimum explain the potential market values of early completion to have offsetting revenues for costs of completion that would provide surplus power.

57. The CEC considers that the option to suspend and restart the project is potentially a viable option. The net benefit of suspension has not been properly assessed in the Panel report. However, the CEC expects that the mitigation of Site C costs through sale of energy into electricity markets largely negates cost impacts to ratepayers. The result is that the suspension option is not of significant benefit.

Page 36 and 37

BC Hydro estimates the costs to be recovered from ratepayers under the suspension scenario would total $12.9. These are summarized as:

- $2.1 billion in sunk costs through the end of 2017;
- $1.1 billion for suspension and maintenance of the site;
- $7.9 billion to complete the project following suspension (inclusive of the $1.7 billion of additional costs previously discussed); and
- $1.8 billion in additional interest costs from 2018 through 2031.

58. The CEC considers that sunk costs and termination costs should not be included in this analysis.

59. The CEC submits that suspension costs and maintenance costs are appropriate as are the reinstatement costs and potential inflation costs for the project.

60. BC Hydro's analysis of interest costs is too high because it extends too far through to 2031, which includes completion interest costs common to the alternative scenario.

61. The CEC recommends that the Panel should be skeptical of this BC Hydro summary of the suspension costs scenario.

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Table 16: Summary of Cost Estimate – Suspension Scenario[187]

#	Suspension Scenario	Cost Impact ($ millions)
1	The cost to suspend the Site C Project	
	• Contract cancellations	331
	• FNs, community and archeological impacts	Included above[65]
	• Demobilization	50
2	The cost to maintain the Site C Project in a state of suspension	
	• Engineering (site), permitting, and procurement	25
	• Site preservation activities	445
	• Care and maintenance	40
3	The cost to remobilize the Site C Project to begin construction in 2025	
	• Engineering (design + site), permitting and procurement and site mobilization	195
	• Revalidating site	5
	Total	**1,091**
	Contingency (30%)	327
	Grand Total	**1,418**

62. Deloitte points out that its estimates include the following assumptions:

- It does not include interest costs in the event of a suspension; and
- It does not include inflation impacts of post suspension costs to complete the project.

63. The CEC submits that the cost of suspension and reinstatement should properly be augmented by a contingency because of the estimating uncertainty. The CEC submits that an inflation estimate for increased costs of a reinstated project should properly be added to these costs.

64. The CEC submits that the Deloitte estimate needs to be augmented with inflation and interest cost on the new cost but has properly left the sunk costs out of its consideration.

65. Neither BC Hydro nor Deloitte have examined the benefits of delay which should be included in the analysis.

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The Panel finds that $1.1 billion is a reasonable estimate of the costs of suspension and maintenance for the project.

66. The CEC disagrees with the Commission as to the appropriate estimate. The estimate does not include:

- Inflation increases for the project costs;
- Interest costs for the expenditures during the suspension period;
- Contingency for estimating uncertainty;
- The benefits of delay from increased optimization of the usefulness of Site C energy;
- Costs for the risk of suspension and failure to be able to reinstate the project.

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1. BC Hydro has stated that there are substantial risks with the assumption "that it would be possible to restart the project should a decision be made to resume construction in the future." BC Hydro is requested 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. The CEC notes that where risk is considered large it is appropriate to include a larger contingency. The CEC recommends to the Panel that it acknowledge this risk through additional contingency.

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2. The Panel notes that many of BC Hydro's existing facilities were built with options for expansion. For example, Mica and Revelstoke were initially built with four generators each. Many years later Revelstoke had one generator added and Mica has recently had two generators added. BC Hydro is requested to comment on the costs and benefits installing fewer generators initially at Site C, followed by more generators at a later date to perhaps better match energy and capacity needs.

68. The CEC submits that such a scenario would need to assess the retrofit costs of adding capacity versus the costs of including the capacity in the initial construction. The net savings would be a potential factor.

69. The CEC submits that a revenue context would be needed to assess the value of the periodic additional energy from the last generator as well as the capacity value which might be captured in trade revenue as well as the capacity value in achieving revenue from export markets and eventually for use in domestic markets.

Costs to Terminate and Replace

Page 40

> According to BC Hydro, the remediation work estimated at $600 million would bring the site "to a condition that does not create a risk to public safety and reduces future environmental impacts" 198, but BC Hydro has "not assumed that the site will be restored to pre-project conditions – such a standard would significantly increase" the cost estimate and timeline.

70. The CEC considers it is appropriate for the Commission to understand 'the standard' to which BC Hydro refers, and how the standards were established.

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> BC Hydro goes on the explain that the figure of $2.1 billion in costs incurred prior to termination consists of $500 million already in the Site C regulatory account and $1.6 billion in capital project costs incurred to December 31, 2017. BC Hydro adds that the balance in the Site C regulatory account includes accrued interest charges.

71. The Site C project termination should treat at a minimum the $2.1 million as sunk costs. In addition, at the conclusion of a termination if the sunk costs are written off without recovery from customers then the ongoing interest costs related to the expenditures would still be a cost to ratepayers unless these costs are also viewed as sunk costs as well and written off at the same time. To the extent that sunk costs are recovered from ratepayers and the ongoing interest costs related to the expenditures are collected from ratepayers then the termination costs need to be adjusted with their additional costs to ratepayers.

Table 17: Project-Related Costs by Category and Default Treatment Under Accounting Rules

	Cost Category	Estimated Amount ($Billion)	Description	Default Accounting Treatment Under Accounting Rules
1	Project Capital Costs Between FID and Termination Date	1.6	Forecast Project costs to December 31, 2017,	Write-off at the time of termination.
2	Pre-FID costs already in Site C Regulatory Account	0.5	Forecast balance to December 31, 2017	Write-off at the time of termination.
3	Termination-related Costs	0.3	Forecast costs	Costs BC Hydro would incur as a result of termination (e.g., payments to contractors) would be recognized as an expense at the time of termination.
4	Remediation Costs	0.6*	Present value of forecast costs*	A provision would be recognized at the time of termination, equal to the present value of expected remediation costs to meet BC Hydro's legal or constructive obligations. The amount of the provision would be expensed when the provision is recognized.
	Total Estimated Direct Project-Related Costs	**3.0**		

*Remediation costs are estimated to be $0.7 billion (nominal).

72. The CEC submits that the decision time/implementation times of December 31, 2017 is likely to be optimistic, and accordingly the costs may continue to accrue further into the future. The CEC recommends that the Panel make note of this in its advice to the government.

73. The CEC notes that the write off of the capital costs of $2.1 billion will continue to accrue interest costs ongoing into the future which if not adjusted on termination become a termination cost to ratepayers. In addition, the $.9 billion in termination and remediation costs will also accrue interest costs ongoing into the future. If recovered from ratepayers these costs would potentially be up to $3 billion and possibly greater.

74. The CEC notes that at 3.5% interest, the related interest cost amounts to approximately $100 million per year, and could potentially be expected to be much higher if evaluated at the customers' cost of funds. Unless there is a write-off of these interest costs, these costs will continue to accrue into the future and be collected from ratepayers while delivering no benefits to ratepayers. A present value of having to make these ongoing payments would be about an additional $2 billion cost to ratepayers caused by termination.

75. The CEC recommends that the Panel acknowledge at a minimum the termination cost of $4 billion to $5 billion if the presumption is collection from ratepayers.

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> Deloitte estimates the termination and remediation costs to be $1,203 million, to a class 5 accuracy of +100 percent/-35 percent, including 30 percent contingency.

76. The CEC notes that when the Deloitte termination and remediation costs are added to the sunk costs estimated at about $2 billion the total comes to about $3.2 billion. Deloitte acknowledges that it does not include interest costs considerations, which the CEC contends are essential consideration.

77. The CEC notes that there is a potential inflation cost for future expenditures not considered and potential First Nations and community consideration not costed.

78. The Deloitte analysis is therefore consistent with the BC Hydro analysis but neither analysis considers properly the impact of termination on ratepayers. This is a major value missing from the analysis.

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> 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.
>
> BC Hydro estimates remediation costs to be $600 million, whereas Deloitte estimates $722 million[217] for the same activities. On the same basis as above, **the Panel finds that both estimates are reasonable, and that an appropriate estimate for remediation costs is $662 million**, being the mid-point between the BC Hydro and Deloitte estimates.

79. The estimate of the termination costs provided by the Panel does not include allowance for cost underestimating and could be set to a range of $.9 billion to $1.3 billion.

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Table 20: Preliminary Panel Findings – Termination and Remediation

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

80. The CEC submits that the Panel's assessment of termination costs must incorporate an assessment of the interest cost of a scenario involving recovery of sunk and termination costs from ratepayers, which is the essence of the discussion of ratepayer impact in Section 7.

81. The Panel defers discussion of termination impacts on ratepayers to Section 7. Neither there nor in Section 4 are the impacts of the sunk costs and termination cost recovery nor interest costs on sunk and termination cost impacts on ratepayers discussed.

82. The CEC submits that this needs to be addressed by the Panel in one of these sections as it is a vital element of a decision to terminate depending upon the approach to termination.

83. The CEC recommends a full treatment of this subject in the Panel's final report as the CEC expects it to be a critical decision point.

C. BC Hydro's Ability to Meet Forecasted Load

Load Forecast

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> The Panel recognizes it is in the face of uncertainty that BC Hydro must ensure that there are adequate resources so that the lights go on when ratepayers turn the switch on. At the same time, if BC Hydro acquires or builds more resources than it needs there is a potential for unnecessarily higher rates for customers. The ultimate cost and economic risk of resource development decisions made today are impacted by factors that are largely out of the control of decision makers but nevertheless the decisions must be made today. To assess the cost and economic risk of different resource strategies, it is necessary to identify those future uncertainties that have the potential to significantly affect the cost or economic risk of a resource strategy, such as building Site C, and to bracket the range of those uncertainties so that an optimal decision can be made.

In this context, the Panel considers a number of load forecast issues identified to the date of this Preliminary Report, makes some comments on what it must decide for its Final Report and seeks further input and analysis of these issues from BC Hydro and other participants. The issues discussed in this section include:

1. Recent developments in the industrial sectors;
2. Accuracy of historical load forecasts;
3. Forecast drivers and sources;
4. Price elasticity and future rate increases; and
5. Potential disrupting trends[6].

84. The CEC comments on all of these below.

Understanding Accuracy and Validity of a BC Hydro Load Forecast

85. The CEC submits that the proper way to evaluate whether or not BC Hydro's load forecast is reasonably valid for planning future acquisitions is to evaluate the difference between actual demand and forecasts at least 10 years into the future and to evaluate this difference against the projected load growth for the forecast.

86. A forecast of load that is 1% higher than actual when the load growth is projected at 1% represents a 100% over forecast, because no growth occurred.

87. The Panel analysis of BC Hydro's load forecasting need to explain why loads have been relatively flat since at least 2007 and why the use per account statistics have been in a steady decline for 10 years. Furthermore, this analysis needs to include an extraordinary explanation for BC Hydro's forecast growth rates exceeding past actual growth rates. The magnitude of the over forecasting has increased in the last 10 years to close to 100% over forecasting.

Industrial Load and LNG Forecast

88. The Panel also invites further submissions from other parties on the updates made to the LNG forecasts and others identified changes in industrial load as summarized in Table 21, including any further data that could assist the Panel in concluding on the implications of developments since the Current Load Forecast was prepared that will impact industrial demand in the short, medium and longer terms.[7]

89. The CEC suggests that the FortisBC Energy Inc. Tilbury plant load forecasts need to be based on the potential NGV LNG use over the timeframe based on actual growth rates.

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The CEC is also very doubtful that the international LNG markets will lead to a go forward decision with the Kitimat project in the timeframes BC Hydro is looking for.

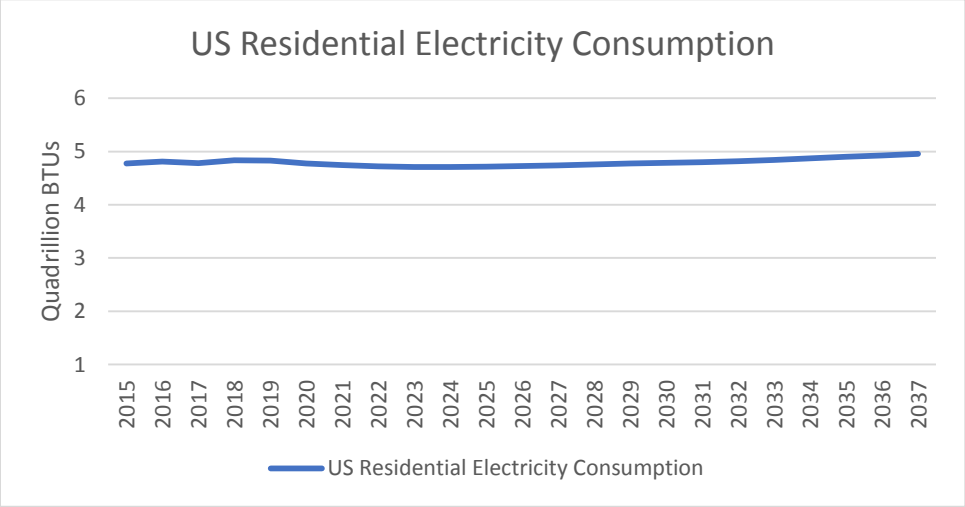
Growth Rate Support from Industry Benchmarks

90. BC Hydro's consultant, GDS, concludes its review of prior load forecasts reveal that forecast variances for the Residential and Commercial classifications are within a range of expectancy based on industry benchmarks. GDS provides the following comparison.[8]

Table 22: Comparison of BC Hydro Forecast Variances to Industry Benchmarks[272]

Forecast Period	Class	BC Hydro	EIA	Itron
1 yr. out	Residential	1.0%	1.9%	1.7%
3 yr. out	Residential	1.3%	3.9%	na
6 yr. out	Residential	4.6%	8.2%	na
1 yr. out	Commercial	0.9%	1.2%	1.7%
3 yr. out	Commercial	1.8%	2.3%	na
6 yr. out	Commercial	2.3%	8.2%	na
1 yr. out	Industrial	1.3%	1.9%	3.5%
3 yr. out	Industrial	9.5%	6.2%	na
6 yr. out	Industrial	19.6%	11.4%	na

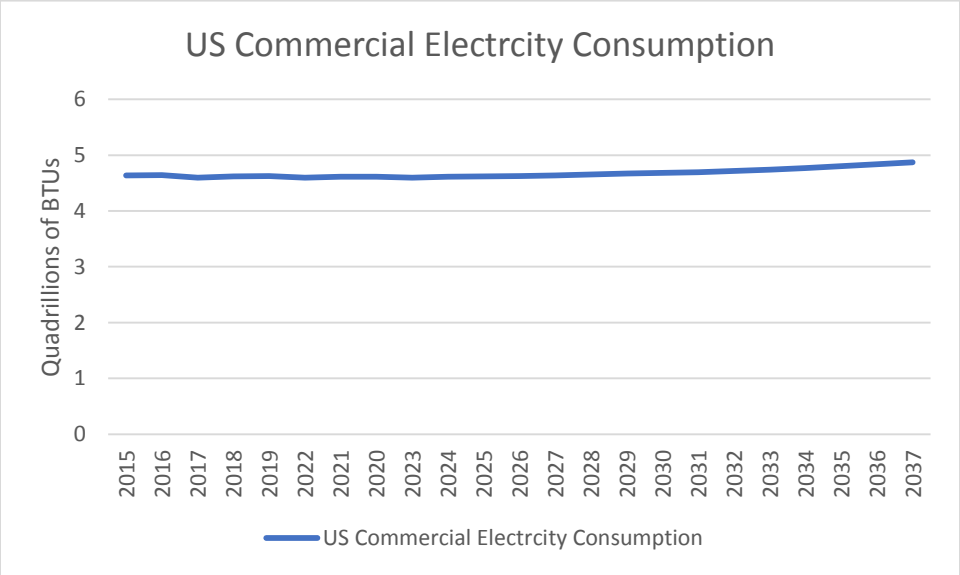
[9]



[8] Page 58 of 121
[9] Page 58 of 121

91. The CEC provides above the EIA US residential electricity demand projection demonstrating a substantially different picture than provided by GDS.

92. The US has been experiencing flat electricity load growth and has now taken to projecting flat load growth until the late 2020s and thereafter modest growth.



93. The CEC provides above the EIA US commercial electricity demand projection demonstrating a substantially different picture than provided by GDS.

94. The US has been experiencing flat electricity load growth and has now taken to projecting flat load growth until the late 2020s and thereafter modest growth.

95. The evidence is that the BC Hydro projections are out of alignment with other key jurisdictions and where other jurisdictions are showing growth they are demonstrably over forecasting.

<u>Industrial Load Over Forecasting & Historical Over Forecasting</u>

Page 59-60

> ***Panel preliminary analysis and preliminary findings***
>
> The data and analysis reviewed as of the date of this Preliminary Report suggests that the most significant issue with BC Hydro's historical forecasting accuracy relates to the industrial sector forecasts. This issue is of particular importance because BC Hydro's Current Load Forecast predicts significant growth in industrial load between now and 2036. The Panel is also concerned that over-estimating industrial load growth could have a compounding impact on the GDP estimates used by BC Hydro, resulting in possible accuracy issues for load growth in other customer classes.

In the Panel's view, to ensure effective resource planning, BC Hydro must be able to make reasonable predictions about the probability and impact of changes in industrial customer load resulting from expected load growth from both future customers, the majority of whom BC Hydro states have provided electricity service requests to BC Hydro, and existing customers. BC Hydro must also be able to effectively assess the risk of loss of load as a result of developments in a segment (e.g. forestry or mining) or customer specific financial difficulty.

The Panel finds that the historical instances of over-forecasts are greater than under-forecasts, especially in the industrial load and that the accuracy of BC Hydro's historical industrial forecasts looking out three and six years have been considerably below industry benchmarks. However, the Panel finds that we cannot yet assess the reasonableness of BC Hydro's industrial load forecast due to insufficient information.

The Panel invites submissions from BC Hydro and other parties on the implications of the historical overestimates on the Panel's assessment of the accuracy of the industrial load included in the Current Load Forecast.[10]

96. The CEC submits that BC Hydro has a consistent history of over forecasting industrial loads. The reason for this over forecasting has been threefold (1) enthusiasm for new industries, including early stage sign up and studies, (recency bias) and (2) failure to see and understand the mechanisms working to cause loss of load and loss of customers, (unknown bias) and (3) treating a recovery from a recession period as evidence of a rate of growth when it is not or projecting straight line from a dip (continuation bias).

97. The CEC submits that these problems are often driving rosy forecasts and acquisition of power only to subsequently find that industry is responding to (1) cost pressures or (2) market competition by becoming (a) more efficient or (b) dropping facilities.

<u>Recessions and Impact on Load Forecast</u>

Page 57

BC Hydro submission:

> "That BC Hydro, like most other entities, does not, and is not able to, forecast economic recessions or boom cycles'; [11]

98. Deloitte also notes BC Hydro's mid-forecast model does not explicitly incorporate recessionary periods, even though it is likely that such periods will occur over a 21-year horizon, based on the historical record.

99. The CEC submits that the Deloitte information and the BC Hydro rejection are in clear counter position to one another. Deloitte is of course correct that we can know that recessions and pull backs in world economies and our own economy occur with regular frequency but with somewhat unknown timing.

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[11] Page 57 of 121

100. The CEC submits that we have evidence of the impact of past recessions and financial crises, which will usually show up with a slide in economic activity and electricity consumption.

101. The CEC submits that whenever BC Hydro is inclined to expect large rates of growth, the optimism can be followed by a trough as a consequence of a bubble bursting, a financial system in crisis and a country or companies with overwhelming and unsustainable debts.

102. Sustained growth at the levels that BC Hydro is forecasting have not been anywhere close to being sustained over the last 10 to 20 years as the rate of load growth has declined. To now suddenly turn the growth rate into a hockey stick reversal to such extraordinary growth levels becomes increasingly improbable as a future.

103. Perhaps if conservation and efficiency stops or declines significantly certainly it will become possible for greater electricity demand to grow faster than it has been growing.

GDP and Disposable Income Factors in Forecasting

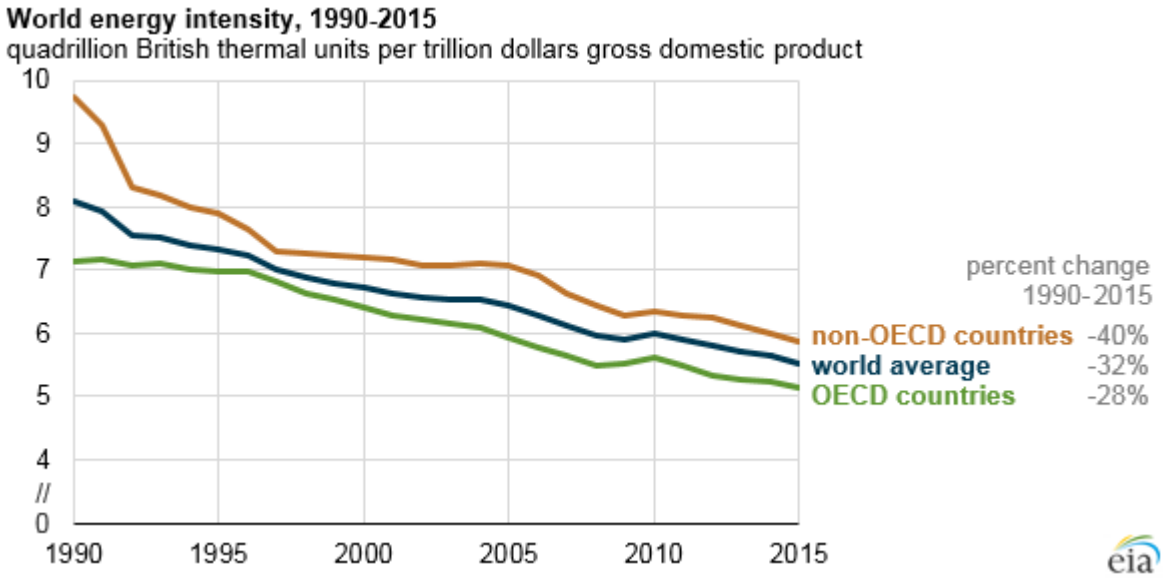
Page 61

> ***Panel analysis and preliminary findings***
> **The Panel finds that it is not yet in a position to make its finding on the reasonableness of BC Hydro's inputs for GDP and disposable income due to insufficient information.** The Panel is concerned with the differences in between BC Hydro's forecast drivers for GDP and disposable income compared to the Conference Board of Canada estimates.
>
> **The Panel requests that BC Hydro respond to the following questions related to its forecast drivers for GDP and disposable income:**
> Please address the differences noted by Deloitte in its Load Forecast Assessment related to GDP and disposable income. Please obtain whatever information from Deloitte that BC Hydro deems necessary in order to respond to this request.
>
> **Please provide an analysis of the GDP and disposable income projections developed by RFEC compared to the Conference Board of Canada (CBoC) estimates and explain the reasons for significant differences in projections. In particular, please explain why the RFEC projection for GDP is not consistent with the CBoC's projections after the first five years.**
>
> Please quantify the effect on BC Hydro's load forecast of reducing its GDP forecast to align with the CBoC's GDP projections.
>
> **Please provide data/information on the historical accuracy of both the CBoC's and RFEC's GDP forecasts and comment on which of these parties' forecasts has historically been more accurate.**
>
> Please explain what impact, if any, the recently announced halt to the Aurora LNG Project will have on GDP projections developed by RFEC. For the purposes of this response, please assume that the Aurora LNG Project will not proceed.

The Panel also invites submissions from other parties on these inputs to could assist the Panel in concluding on the reasonableness of BC Hydro's GDP and other forecast drivers.[12]

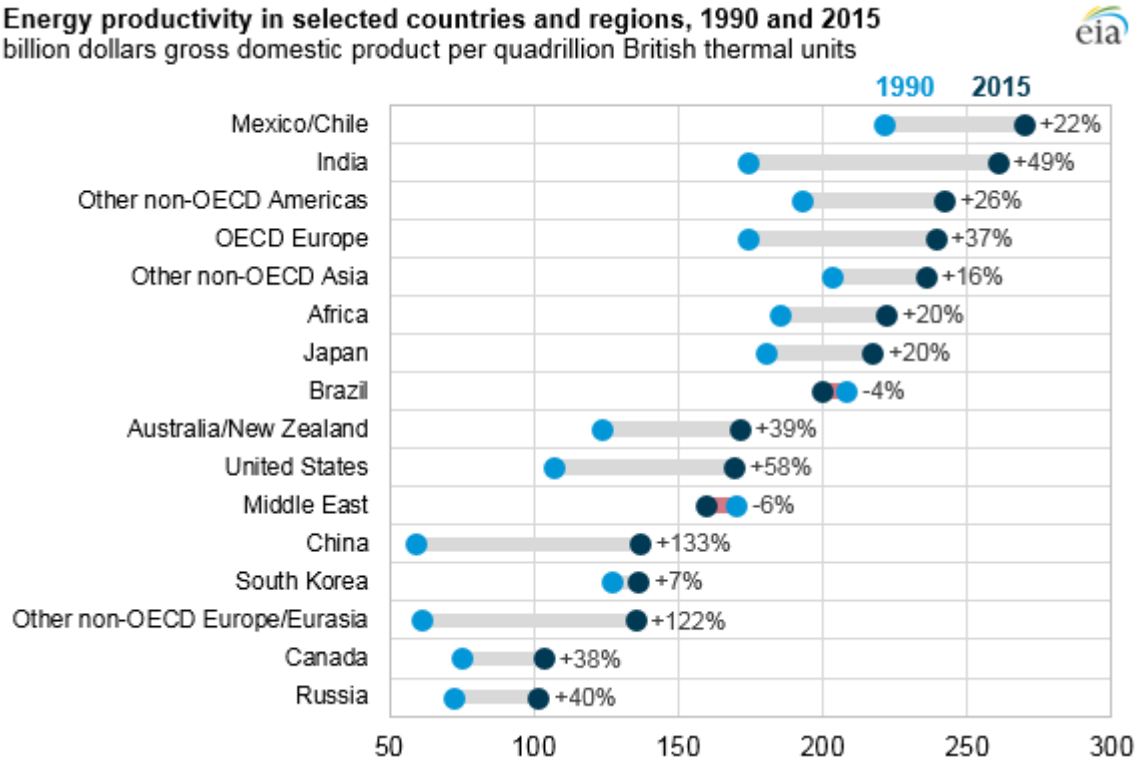
104. The CEC provides evidence that the connection between GDP and load has been dramatically diminished in the last 20 plus years. The CEC finds that world-wide the phenomena shows GDP per quadrillion BTUs continuing a significant decline.

105. The CEC recommends that the Panel focus on not only the Deloitte identified over forecasting of GDP but also on the increasing magnitude of the effects of conservation and efficiency in dampening demand for energy.

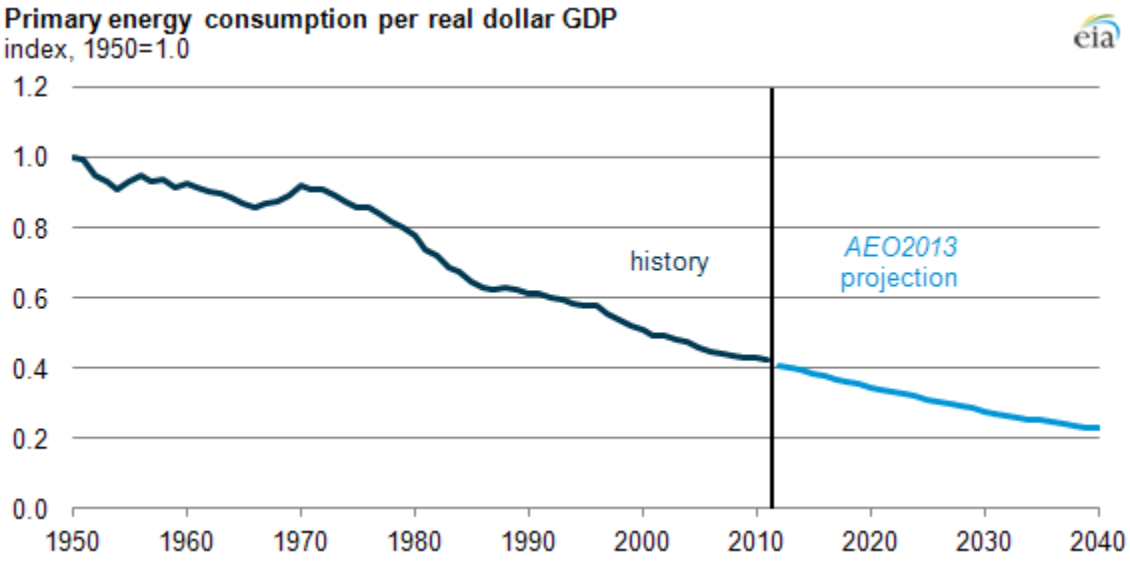


106. The CEC submits that all countries including Canada are increasing energy productivity with Canada showing plenty of room to improve its competitive position.

[12] Pages 60-61 of 121

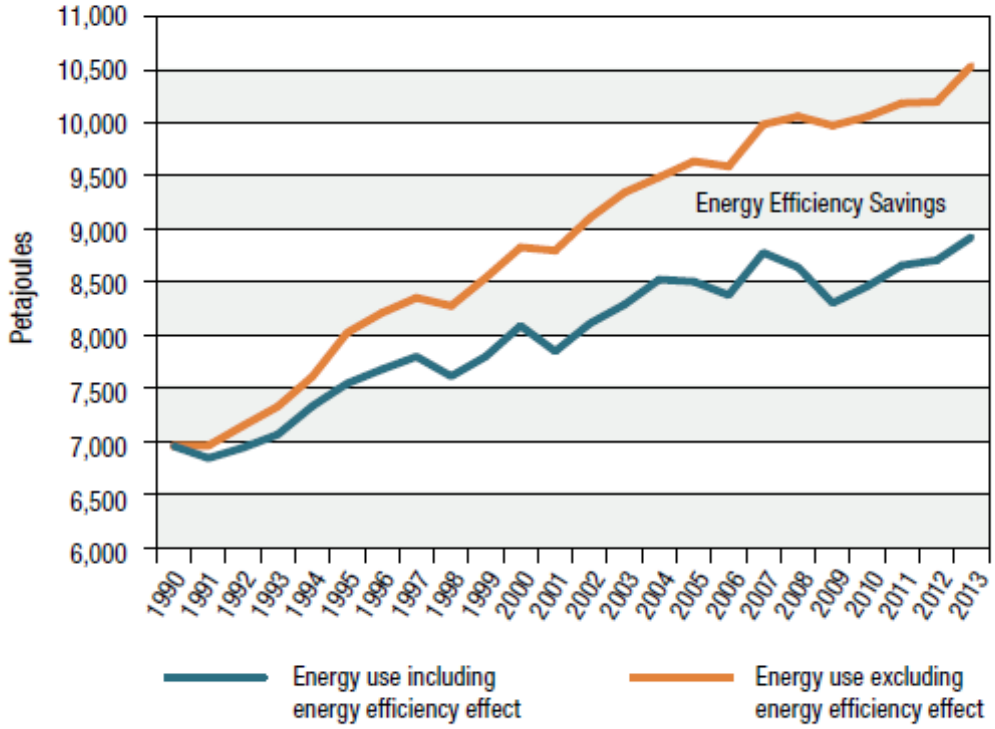


107. The CEC finds that energy intensity per unit of GDP is expected to continue to decline.



108. The CEC finds that in Canada the energy intensity relative to the GDP has been an increasingly disconnected driver over time.

Secondary energy use with and without energy efficiency improvements 1990–2013

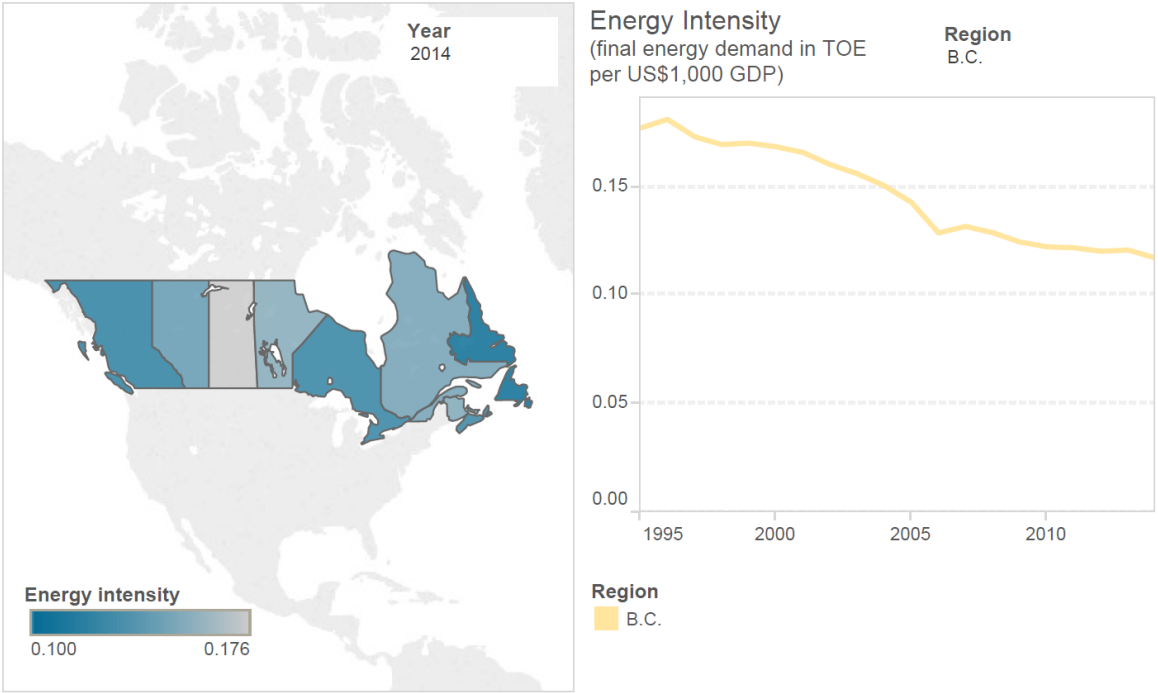


109. It is clear from this graphic that the increasing efficiency of energy use has led to a major flattening of energy use requirements in Canada and that this separation has been increasing for years. Efficiency initiatives are likely a major cause of the decline in forecast energy requirements.

110. BC Hydro's Power Smart conservation and efficiency has been a leading initiative in Canada.

111. The BC energy intensity per unit of GDP has been declining steadily as has been reported by the Conference Board of Canada.

Sources: The Conference Board of Canada; Statistics Canada; International Energy Agency; The World Bank.



112. BC Hydro's declining use per account statistics confirm that electricity is also declining in intensity. BC's electricity consumption has been relatively flat for 10 years while BC's GDP has continued to grow demonstrating a clear disconnect between GDP and electricity energy use.

113. Conservation and efficiency has been working well in BC.

<u>Elasticity and Rate Increases and Impact on Load Forecast</u>

114. The Panel also invites submissions from other parties to assist the Panel in assessing the appropriateness of the assumptions related to price elasticity and future rate increases.[13]

115. The CEC notes that there is no certainty whatsoever that the price elasticity used by BC Hydro is the most appropriate and it is unknowable as to what all of the customer response is or will be to electricity price increases. The CEC expects that the actual demand response to cumulative price increases above the rate of inflation is greater as the rate increase accumulate.

116. Quantitatively, the CEC expects that the elasticity estimating is a relatively small explanation for BC Hydro's consistent over forecasting bias.

117. The CEC submits that it is not appropriate forecasting to assume no response to rate increases for a period of time.

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Potential Disrupting Trends

Page 66

> ***Panel analysis and preliminary findings***
> The Panel is concerned that, given the long-life of the Site C asset, BC Hydro has only identified a potential upside risks to the load forecast from electrification, and has not identified any potential downside risks. **The Panel is not yet in a position to make its finding on the potential impacts of disrupting trends due to insufficient information.**
> The Commission's resource planning guidelines state that an analysis of the trade-offs between portfolios incudes assessing how they perform under uncertainty. **The Panel requests that BC Hydro (and any other parties) specifically address:**
> **The downside risk of a lower load forecast over a 70 year time horizon;**
>
> **How this risk could be mitigated (for example, policy changes to encourage electrification, sale of surplus energy to other markets); and**
>
> **To what extent the risk of a lower load forecast over a 70 year time horizon should result in a preference (all else equal) for a portfolio with smaller sized generation/demand components.** [14]

118. The CEC provides comments on these issues below.

Load Matching Versus Load Forecasting

119. The risk of a lower load forecast over a 70 years period is not as significant an issue as the time it takes for the electrical energy from Site C to be absorbed into the domestic market and become used and useful.

120. The CEC submits that the energy acquisition context in which Site C is brought into service is far more critical than possible outcomes affecting load 20 to 70 years hence. An exception to this would be if electricity were no longer required to be delivered to customers from BC Hydro.

121. The CEC submits that the risks associated with acquiring supply, which is not needed domestically depend on (1) the accurate actual domestic need for supply, (2) the quantity of supply in surplus, (3) additions to that surplus over time which extend the surplus period, (4) the price of that surplus and additional supply as a cost to ratepayers, (5) the quantity of surplus that can be delivered to export electricity markets when not needed domestically (6) the net of losses and wheeling charges prices which can be obtained for the surplus.

122. The CEC contends that there is a simple solution to the risks of over supply surpluses and the need to meet load requirements, which may become higher than anticipated. The CEC proposes that developing the flexibility to (1) add demand side management as un anticipated load develops by acquiring an option to implement load reduction as needed

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through increased flexibility by pre-qualifying projects and holding a reserve of projects ready to be implemented (2) add supply on the shortest notice possible by acquiring options on supply projects such that they remain in a pool with short lead times for construction and implementation. In doing this BC Hydro can match load requirements with supply and demand reduction as needed to maintain a balance. Self-sufficiency concepts need an acceptable performance dead band to avoid planning for additions to early.

123. The CEC recommends that the Panel advise the government that if BC Hydro develops more flexible planning as suggested the ratepayers could avoid repetitively paying for energy they do not need at costs expected to be on the order of $5 billion over the next 10 to 15 years. The cost of unnecessary surpluses is one of the most serious problems associated with the BC Hydro load resource planning and the Panel needs a section in its report expounding on this problem.

Pulp and Paper Loads

124. The CEC submits that the most significant disruption in BC has been the decline in pulp and paper loads caused by the decline in the markets for the pulp and paper products produced in BC mills. This has led to very limited investment in many of the mills and progressive closure of paper machine lines and eventually plants. The declines for these loads are an outcome of technological change in the needs of consumers. BC Hydro's load forecasts have not adequately anticipated these trends. Led

125. The CEC submits that this process has not run its course and that further adjustment in the sector will be required.

Demographic Spending Pattern Changes

126. The CEC finds that evidence of declining spending of the baby boom generation in developed economies has dampened consumer demand and that this has caused many of societies requirements for electricity to be dampened as well. The combination of the size of this cohort in the demographic data and their spending patterns is a critical trend.

127. The CEC submits that the BC Hydro load forecasts do not adequately incorporate this key disruptive trend.

Conservation and Efficiency

128. The CEC submits that perhaps one of the most important disrupting trends is extent to which conservation and efficiency initiative are transforming the market place.

129. The CEC expects that this trend will continue and grow leaving load growth throughout the developed economies, including BC's economy, significantly dampened from prior levels of growth.

130. BC's residential and commercial use per account statistics have reversed from growing to declining. As this trend continues the BC load growth is significantly restrained.

131. The CEC is aware that BC Hydro has been working on a Conservation Potential Review. Release of this report has been in abeyance for a considerable period of time. The panel should not complete its review of Site C without getting access to the information in this report and particularly understandings of the trends with respect to conservation and efficiency potential for the future.

132. The CEC recommends that the Panel ask BC Hydro to release to the Panel its best available information on conservation potential.

Globalization, Trade and Manufacturing Transfers to Developing Economies

133. The CEC submits that the ongoing integration of world manufacturing and trade has moved more electro-intensive business to developing counties and has increased the benefits of trade globally to the Canadian and BC economies.

134. The CEC submits that the US is Canada's largest trading partner and that the current NAFTA negotiations, softwood lumber disputes, and likely many other outcomes from this process will run the risk of dampening demand for electricity in BC.

135. Housing markets in Canada and the US are significant drivers of important components of the BC economy. Currently, these markets are experiencing growth but they are cyclical and will at some point in the future revert to lower growth rates.

Distributed Electrical Energy

136. The Panel notes CEABC's concerns about the 70 years modelling period that it is difficult to forecast costs over a period this long. In addition, there are possible risks that occur over the longer term. Potential disruptors include: decreasing prices of alternative energy sources such as wind, solar, batteries; improvements in energy efficiency, (for example LED lights, net zero energy home), LNG industry development risk, persistent low price of natural gas etc.[15]

137. The CEC submits that the most important of these trends is the significant developments in the solar energy industry, where potential exists for integration of electricity generation into the infrastructure of buildings and the community, where other values can be served while at the same time producing energy.

138. The potential for this trend to result in a crossover of cost of energy with energy utility rates propelling a trend to include these products into beyond the meter uses which displace utility energy requirements.

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139. The CEC finds that the 70 years period for analysis of the Site C project is not a concern. In fact, the CEC expects that a substantial portion of the Site C project assets in service will be very long-lived assets, which will have the capability to deliver benefits for many years to come.

140. The CEC recommends that the Panel should not restrict the analysis to 70 years but that it should pursue all of the significant potential values over at least 100 years plus.

Automation, Self-Driving Vehicles and Sharing Economy

141. The CEC expects the continued development of electrification in a number of sectors of the economy over the next 20 years, including transportation.

142. The CEC expects that projections of significantly increased electricity demand may be a reasonable starting place for assessing the impact of this trend. However, these trends are going to be driven by productivity, efficiency and customer service values, which are not going to stop with a projection of the way things are today.

143. The CEC expects that these trends will become huge opportunities for increased conservation and efficiency. Once the sharing economy meets the self-driving automation economy it will become possible to change the vehicle occupation statistic from typically 1 to 2 or more, creating a 50% efficiency or perhaps even greater.

144. Electricity load projections will change with technology in significant and dramatic ways as they are doing now.

Submission on Load Forecast

145. The BC Hydro submissions have one key failure, they do not acknowledge the declining use per account change and its continuation. Rather they prefer to say the recession caused the flat loads and their models now predict growth.

146. The Deloitte submissions at least acknowledge the over forecasting and look for some explanation for the over forecasting. They focus on a few of the key inputs to the BC Hydro forecasting models. Deloitte offers an alternative conservation and efficiency focused forecast with substantially reduced need for energy and capacity.

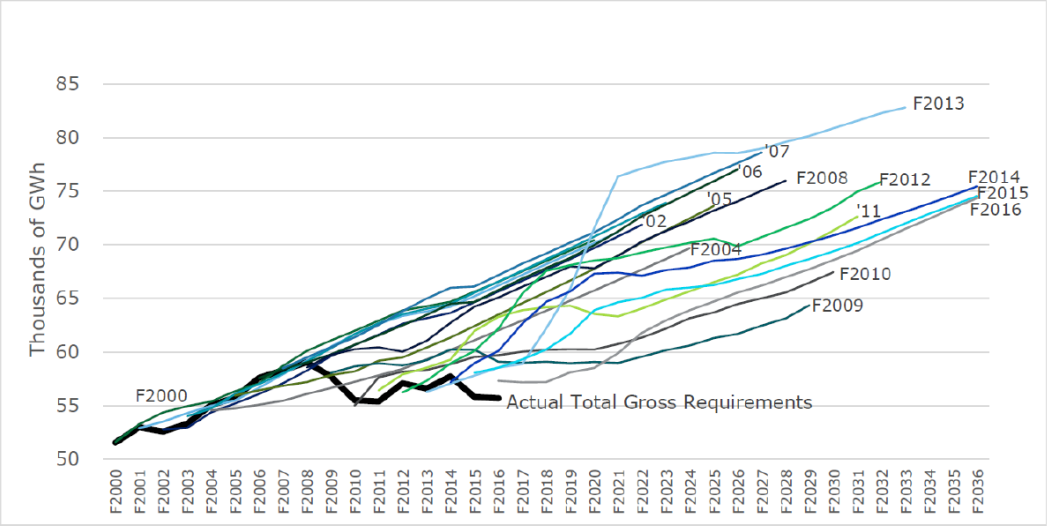
147. The CEC is concerned that the Panel has not seen in these submissions the acknowledgement that BC has declining use per account trends, which have propelled lower load forecasts.

148. Deloitte does produce the data on load forecasts and actual demand since 2000 to 2016.

`

Deloitte illustrates the performance of the model since the year 2000 in the figure below.

Figure 7: Total Gross Requirement Forecast Models Between 2000 and 2016(with DSM)[275]



149. The above is the evidence of the accuracy of BC Hydro's forecasting models over the last 16 years.

150. The CEC notes that the top forecasts represent 40% growth and increases in load of about 1000 GWh/year (85 TWh/year), the mid-level forecasts represent 30% growth and load of about 700 GWh/year (75 TWh/year), the bottom level forecasts represent 20% growth and a load of about 525 GWh/year (70 TWh/year). There are no lower forecasts made in the last 17 years. However, the actual load requirement has been between 55 TWh/year and 60 TWh/year for 13 to 14 years and continues in this direction. It is time for a load forecast closer to 10% or 15% growth at most.

151. The CEC submits that the evidence is that there is something wrong in the models. We have 17 forecasts which after 10 years are all showing over forecasting bias. The CEC notes that while there have been different forecasts they all share one common feature, they over forecast BC Hydro's customer demand.

152. The CEC recommends that the Panel find that the BC Hydro forecasting has not been adequate as a basis for acquiring supply and needs to be improved substantially.

153. The CEC notes the importance of recessions in dampening demand in 2001 and 2002 after the 'dot com' bubble followed by 2008 and 2009 after the housing bubble crisis. There are numerous bubbles in the developed economies waiting to be the next cause of slowed demand even if there is a burst of demand in between before the bust. While the timing cannot be precisely forecast it is highly probable this will happen.

154. The CEC recommends that the Panel take this evidence and follow the Site C Inquiry with an inquiry of its own into the BC Hydro forecasting models and what is needed to make sure that over forecasting does not continue as demonstrated above.

155. The CEC submits that this over forecasting and failure to recognize the fundamental success of conservation and efficiency as well as declining use per account have been very costly to ratepayers, and has cost ratepayers significantly. This threatens to continue for some time, even using BC Hydro's forecasts.

156. The CEC expects that the cost of buying too much IPP power at prices that were far too high has led to substantial surpluses at this time which are going to be paid for by ratepayers, while the power is sold for a substantial loss. The CEC expects, based on BC Hydro forecasts, that this loss will amount to approximately $2.5 billion as the power is sold into electricity markets. The CEC expects that this forecast surplus may continue for longer than BC Hydro forecasts but the CEC hopes that this risk can be mitigated by not buying more power which also may not be needed.

<u>Submission on DSM Alternatives</u>

157. DSM alternative provided by Deloitte.

Figure 4: Load Forecasts Before DSM - BC Hydro Mid and Low Compared with Alternate Scenario[251]

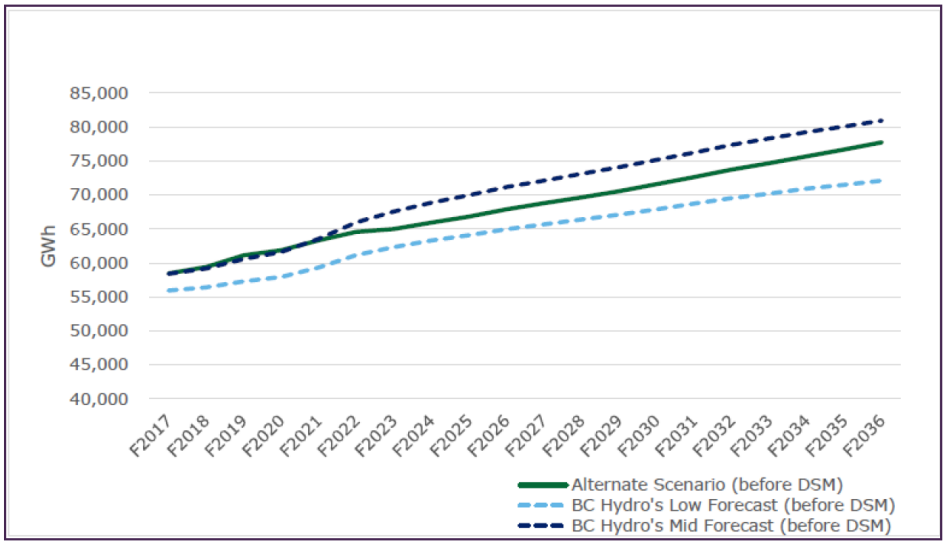
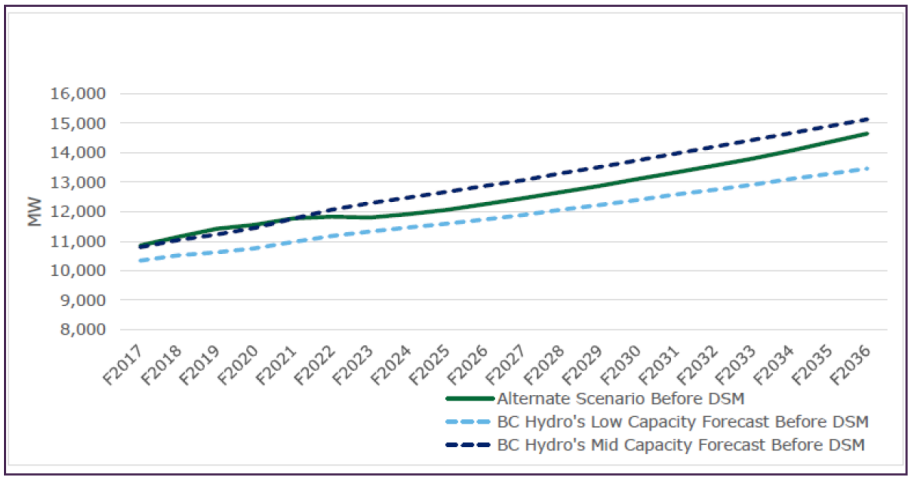


Figure 5: Capacity Forecast Before DSM - BC Hydro Mid and Low Compared with Alternate Scenario[252]



158. In Deloitte's view, taking into account its DSM adjustment, by F2026, its alternative set of assumptions could result in a reduction of the load forecast in the range of 6,000 to 6,150 GWh, and a reduction in peak capacity in the range of 1,140 to 1,160 GWh and the corresponding impacts are a reduction in load forecast of 5,950 to 6,100 GWh, and a reduction in peak capacity forecast of 1,110 to 1,130 GWh by 2036. Deloitte cautions that these projections should be considered as indicative only, since they have adjusted BC Hydro's mid forecast after the fact rather than conducting a complete rerun of the models that produced the original forecast. Deloitte states its assessment provides estimates of "the direction and order of magnitude of impacts resulting from changes to several key model inputs".[253]

159. The CEC contends that there is ample data to demonstrate the cost effectiveness of demand side reduction of load through conservation and efficiency. The Commission has annual reports from BC Hydro demonstrating the delivery of DSM savings and the costs for doing so. The CEC recommends that it include a summary of this data in the Panel report.

160. The CEC expects that for costs on the order of $1 billion to $2 billion, BC Hydro and BC could deliver energy savings on the order of 5000 GWh/year and capacity savings on the order of 1000 MW. The CEC expects that these savings can be sustained and maintained into the future.

161. The fundamental theory behind demand side management is that modest expenditures achieving savings can be used as a platform to inform government regulations and that the follow-on government regulation will lock in the savings potential. The economic validity of a variety of demand side management options and the technological development driving the options toward greater cost effectiveness is a key part of the demand side management story. The culmination of this activity is to transform markets to new normal where the savings become embedded into the society's way of life.

162. The CEC recommends that the Panel recommend that augmented demand side management initiatives whether from the utility or encouraged to become an ongoing non-profit administration outside of the utilities should be a part of any planning going forward and should become part of the planning context which the government should implement with its Site C decision.

Load Resource Balance

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The Panel notes that Revelstoke 6 was not included in Table K-1 and K-2. **BC Hydro is asked to confirm that there are no other planned resources that have been excluded from these tables. Although energy and capacity from existing and committed Heritage resources are the subject of government approved integrated resource plans, it would be informative if BC Hydro would comment on Dr. Ruskin's submission and further explain how BC Hydro determined how much energy and capacity are available from existing and committed Heritage resources.**[16]

Load Resource Balance Tables

163. The CEC finds the Load Resource Balance tables to be very useful to understanding the energy and capacity planning issues and the expected surplus issues.

164. The CEC recommends that the Panel ask BC Hydro to supply similar tables with the appropriate costing of the components. The IPP renewals will be 5515 GWh/year at the end of the planning period and that SOP acquisitions will be 2448 GWh/year. It is appropriate to see these sources costed out.

Capacity Costs

165. The CEC notes that the Revelstoke 6 project will represent the last inexpensive capacity available to BC Hydro and that this capacity has a number of potential values to BC Hydro and its customers, not the least of which is enabling trading in the electricity markets for a profit utilizing the storage capacity of the BC Hydro system to the advantage of ratepayers.

166. The CEC recommends that the Panel consider a section in its report dealing with capacity, its uses and its costs. The Panel report page 66, Table 24, should contain the Revelstoke 6 project.

167. The CEC notes that the inexpensive capacity of Mica 5 and 6 and Revelstoke 5 has all been needed to support the integration of not dispatchable energy and that Revelstoke 6 may serve this purpose as well.

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168. The CEC notes that the least cost incremental cost of new capacity will likely be coming from pumped storage projects and that the cost of capacity is likely to increase dramatically from its past values of $55/kW-year to over $110/kW-year. The CEC notes that BC Hydro has estimated the cost of pumped storage capacity to support wind power supply could have a likely unit cost addition to the energy of $48/MWh representing about 1/3 of the cost of future wind supply.

169. The CEC recommends that the Panel have an explicit discussion in its report dealing with the capacity values of the Site C capacity and particularly identify the added value of being down stream of the Williston reservoir enabling optimal use of the water flows in the river. Also, the dispatchable nature of the Site C capacity has additional value.

170. The CEC is intrigued by Dr. Ruskin's assertion that additional value can be obtained from the BC Hydro system through co-ordination with the Bonneville system in the US and suggests this discussion should be added to the report.

171. The CEC recommends that the costing and evaluation of Site C entail a significant discussion of the capacity values and the credit to the costs that should be relevant to determining the cost of energy for Site C. The CEC expects that the values for pumped storage capacity should be part of the basis for establishing the energy values for the Site C project.

Standing Offer Program

172. The context within which the Site C project is completed makes a significant difference to the economic value of the Site C project.

173. The load resource balance information shows that the standing offer program will have delivered from 800 GWh/year to 1500 GWh/year before or just after the Site C project is scheduled for completion. Not acquiring this energy and ensuring that Site C is completed, used and useful would be a more prudent context within which to complete Site C than acquiring expensive energy and having to sell it into the electricity markets as surplus.

174. The CEC submits that it would be valuable to the government if the Panel provided advice that the shaping of the energy acquisition context could be optimized to ensure more optimal values for the Site C project in a scenario where completion is appropriate.

175. BC Hydro makes the case that in the event that Site C's energy is surplus to demand it expects that it can sell the surplus in the electricity markets for prices attractive enough to cover the Site C costs.

176. The CEC expects that BC Hydro is correct that it should be able to mitigate issues of having surplus energy by sales into the electricity markets and would have a good probability of being able to do so with minimal impacts on ratepayers if the Site C

incremental costs are attractive and the electricity market prices hold in the range they are expected to be based on futures values.

IPP Renewals

177. The load resource balance information shows that BC Hydro is planning renewals of IPP purchases of 1100 GWh/year to 2200 GWh/year just before and shortly after Site C is scheduled for completion.

178. If the IPP renewals are at market prices then the addition of this energy to the surplus will be mitigated by sales into the electricity markets but if the IPP renewals are for higher costs than market then the BC Hydro ratepayers would have an increased risk of paying for losses on sale of energy while it is in surplus.

179. As the Commission controls approval of EPA pricing for IPP contracts it would be useful for the Panel to advise the government whether or not this risk of losses on acquisition of energy can effectively be mitigated through Commission evaluation of specific circumstances.

180. The CEC submits that absent an appropriate level of control on IPP renewal pricing ratepayer would be further at risk in the event of surpluses.

D. Chapter 6 Resource and Generation Alternatives

Additional IPP Renewals

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BC Hydro reports that biomass and Run of River renewals are maintained at 50 percent and 75 percent respectively.

Allied Hydro summarizes BC Hydro's current IPP contracts as follows:
In 2016 BC Hydro reported that it had electricity purchase agreements (EPAs) with 119 independent power producers (IPPs,) many of which are non-storage, run-of-river hydropower generators.

The makeup and some features of these EPAs is as follows:
 Wind - 7 EPAs, 702 MW, 2,060 GWH, 33 percent availability;

 Gas-powered - 2 EPAs, 380 MW, 3,140 GWH, 94 percent availability, new projects contrary to BC Environmental policy;

 Hydropower - 80 EPAs, 3,270 MW, 12,000 GWH, 42 percent availability, some dispatchable;

 Bio-energy - 24 EPAs, 850 MW, 3,450 GWH, 46 percent availability, dispatchable.

In 2016 it was also reported by BC Hydro that the lowest EPA contract price was $76.20/MWh, the average price was $100.00/MWh, and the highest price was $133.80/MWh for firm power

during the peak winter season. IPPs in 2016 supplied 20,454 GWh of electricity to BC Hydro about one-third of its total supply. BC Hydro will pay $58 billion to IPPs over the life of the EPAs.

Panel analysis and preliminary findings

The energy prices, as described above, appear to be on the lower side of other alternatives. Further, these resources are already developed and the infrastructure exists to deliver that energy to BC Hydro customers – fewer adders should be required. **Given this, the Panel requests that BC Hydro explain why it is not renewing more IPP contracts.**[17]

181. The CEC notes that having a segment of IPP's not getting contracts enables BC Hydro to better protect ratepayer interests than signalling that it will acquire all of the energy. The prices are negotiated and having degrees of uncertainty is valuable.

182. The CEC notes that BC Hydro is not restricted from acquiring more from IPP renewals or less if it should find that it has reasons to do so.

183. The CEC expects that the IPP alternatives to renewal are to sell their product into the electricity markets and therefore if the acquisitions are done at this level there will be little risk to ratepayers and as an alternative portfolio they will only become relevant if Site C's incremental costs exceed the market values of electricity.

<u>IPP Greenfield Wind Power</u>

184. The CEC expects that new wind power from the Peace would be the least expensive wind power and would have costs with capacity included, based on BC Hydro's analysis of between $153/MWh and $115/MWh depending upon whether or not the projected price declines could be achieved.

185. As such the CEC does not view this resource as a pragmatic option to Site C nor likely the most attractive option for future planning.

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Geothermal

Table 52: Cost Comparison to Site C

Project	Capacity	Capital Cost	Cost .per MW	Energy Cost	Capacity Factor
Canoe Reach	58MW	$300 M	$5.1 M/MW	$20.70/MWhr	95%
Lakelse Lake	23 MW	$120 M	$5.2 M/MW		95%
Site C	1,100 MW	$8.8 B	$8.0 M/MW	$57.4/MWhr	

[18]

186. The CEC submits that the potential for geothermal resources to become a future resource option for BC Hydro is significant.

187. The CEC cautions that the above table of cost comparisons is not an appropriate representation of the energy costs of geothermal, because it only accounts for capital costs. In addition to these costs one will need to add a return on capital component, a component for operating costs, costs for interconnection and delivery to the lower mainland and possibly other ancillary infrastructure costs.

188. The CEC estimates that the combined cost for geothermal projects might be in the range of $80/MWh to $100/MWh, with all costs allocated to the energy. The CEC submits that the geothermal resource and projects will have superior product quality attributes, including the important capacity attributes.

189. The CEC expects that this capacity would provide a credit of approximately $35/MWh and possibly more, making the geothermal energy an attractive resource in the range of $65/MWh to $45/MWh. The CEC submits that these resources were less attractive when capacity was valued closer to the 15% range relative the energy costs but that they now are a premium resource for future consideration.

190. The CEC believes that the Canoe Reach and Lakelse resources may be capable of providing up to 200 MW of supply and that Geothermal in BC may be capable of providing up to 600 MW's.

191. The CEC submits that a combination of DSM and Geothermal can represent a viable future for BC Hydro planning. The CEC expects that the geothermal industry could engage with BC Hydro in providing options on energy to be provided and constructed when needed and that the industry would work with BC Hydro to achieve such early development steps to shorten the lead times for construction and delivery to give BC Hydro increased value through greater ability to match loads and supply as needed.

[18] Appendix A, page 10 of 40

Demand Side Management

Table 2: Summary of DSM Options in 2013 IRP

DSM Option	Description	Energy savings by F2021 (GWh/yr)	Capacity savings by F2021 (MW)	Total Resource Cost ($/MWh)	Utility Cost ($/MWh)
Option 1	A scaling back of the current DSM activities to generally meet 66% of the load growth.	6,100	1,200	32	18
Option 2	An update of BC Hydro's current DSM Plan with a balanced offering of codes and standards, conservation rate structures, and programs.	7,800	1,400	32	18
Option 3	Expands programs to the limit of cost-effectiveness. Keeps codes and standards and conservation rate structures the same as in Option 2.	8,300	1,500	35	22
Option 4	Builds upon Option 3 and expands the codes and standards and conservation rate structure tools.	9,500	1,500	47	30
Option 5	Reflects an aggressive effort to change market parameters and societal norms and patterns in order to save electricity.	9,600	1,600	49	29

Subsequent to the 2013 IRP, the Fiscal 2017 to Fiscal 2019 Revenue Requirements Application (F17-F19 RRA) proposed an update to Option 2. This was done to further moderate the strategy for DSM investments, given the reduction in the rate of growth of demand for electricity and reduced need for additional resources[47]. Table 3 below compares BC Hydro's F17-F19 DSM expenditure schedule to that in the 2013 IRP. The "moderated" Option 2 described in the current F17-F19 DSM Plan is projected to achieve 5,300 GWh/yr in energy savings by 2021[48].

19

192. The CEC expects all the DSM costing evaluations should be revised considerably to reflect the new marginal costs of pumped storage capacity as the credit for the DSM capacity savings estimate. The CEC expects that this will lower the cost of DSM and put a premium on initiatives that have capacity savings.

193. The CEC continues to see DSM as a very attractive resource with substantially increased value because of the capacity savings that typically accompany a demand side initiative.

194. The CEC expects that DSM technologies will continue to evolve new cost-effective options for capturing savings and lowering the costs for achieving the savings.

195. The CEC finds that DSM has been the most cost-effective resource BC Hydro has been able to develop and will continue to be, particularly because these conservation and efficiency savings can be connected to market transformations leveraging their cost benefit for BC Hydro's ratepayers.

196. The CEC recommends that the Panel acknowledge that additional cost effective DSM is available and can be delivered at very low costs and the CEC recommends that the Panel

[19] Exhibit A-9, Deloitte Report page 50

advise government that additional DSM should and can be a part of the future for BC Hydro.

Kleana Power

Kleana Power Corporation describes its proposed run-of-river hydroelectric facility located on Klinaklini River. This Project has a nameplate capacity of 565 MW delivering 2,450 GWh of annual energy. The point of

connection to the BC Hydro transmission grid is located at Campbell River. Kleana submits that it has the water rights to and that, if developed, would be one of the largest run-of-river independent power projects ("IPP") in North America. Kleana compares its project's footprint to that of Site C in the following table:[511]

[20]

197. At this point in time the CEC understands that this project will be considerably above the complete Site C costs.

198. The CEC would be interested in understanding the potential UEC for this project on a comparative basis with the other options.

199. The CEC expects that it could be prudent for BC Hydro to work with this project and see if it is able to develop an option on the project to potentially bring it into service at a time when it may be needed.

[20] Appendix A, Page 21 and 22 of 40

Site C Completion

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BC Hydro calculates the Site C UEC as follows:

Table 27: Site C UEC [321]

Cost Factor	Unit Energy Cost $/MWh
Site C Cost To Ratepayers in 2013 Integrated Resource Plan (November 2013) at Point of Interconnection in F2013$	**$83**
Change to project capital and operating costs	+1
Debt Finance as per OIC No.590-2016 Net Income Frozen	-26
Site C Cost To Ratepayers at Final Investment Decision (December 2014) at Point of Interconnection in F2013$	**$58**
Updated financing rates and conversion to F2018$	-10
Adjustment for Delivery to Lower Mainland and annual shape adjustment	+10
Site C Cost To Ratepayers Today Delivered to Lower Mainland in F2018$	**$58**
Adjustment For Sunk Costs	-15
Site C Cost To Ratepayers Today Less Sunk Costs	**$43**

Cost Factor	Unit Energy Cost $/MWh
Delivered to Lower Mainland in F2018$	
Credit for avoiding termination and site remediation costs	-9
Site C Cost To Ratepayers Today Less Sunk Costs and Credit for Termination / Remediation Costs Delivered to Lower Mainland in F2018$	**$34**

21

200. The CEC submits that BC Hydro's costs for Site C should be further modified for additional ratepayer costs of termination identified by the CEC in the final section of comments in this report, which the CEC estimates would be a further termination credit of $5/MWh to $10/MWh reduction to costs.

201. The CEC submits that the Panel will need cost scenarios for cost overruns, which may be expected to add costs of $5/MWh for each billion of overrun. The CEC recommends at least three scenarios of increasing $1 billion level overruns to a cumulative level of $3 billion.

202. The CEC submits that the Panel will need to modify the above adjustments for cost overruns with an estimate of potential future savings adding to the contingency amount based on the financing costs reductions relative to those in the approved project plan, leading to possibly up to a $5/MWh reduction.

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203. The CEC expects the Panel will have other adjustments it may want to make or ranges it may want to consider.

204. The CEC will now address some of the concerns raised and discuss whether or not they should lead to adjustments.

Debt Financing for Site C

Page 86

> ***Panel analysis and preliminary findings on the Site C UEC***
>
> **The Panel finds that the reduction of the UEC to account for reduced financing costs distorts the analysis of unit energy costs comparisons.**

Page 81

> Regarding the downward adjustment of $26 per MWh for debt financing, BC Hydro states that with OIC 590, its net income is now a fixed amount. BC Hydro therefore concludes: "the cost to the ratepayer of financing Site C is equal to Hydro's cost of debt."[322]
>
> CEABC raises concerns with debt financing. "Even though the 'zero return on equity' policy was apparently adopted for the Site C project, in [the 2017 to F2019 Revenue Requirements Application CEABC IR 1.12.4], a BC Hydro response to a CEABC Information Request ("IR") unequivocally confirmed that an entirely different approach is being used in BC Hydro's financial evaluations of all other projects. The 70/30 weighted average cost of capital ("WACC") approach (including an 11.84% return on equity), was still the method being used."
>
> CEABC concludes that "[f]or the purposes of doing financial analyses for the Site C project economics there is an assumption of zero return on equity, while for everything else BC Hydro uses the 70/30 WACC methodology (including the 11.84% return on equity), which was used for all the analyses presented during the JRP Review."

205. The CEC finds it is incorrect and inappropriate to suggest that reduced financing costs are a distortion for the following reasons.

206. The use of financing available to BC Hydro with provincial backing that enables inexpensive debt financing has been the fundamental approach to developing all heritage assets for BC Hydro since the inception of BC Hydro.

207. The use of inexpensive debt financing enables BC Hydro's system to have the storage and capacity necessary for a highly cost effective electrical system.

208. From a ratepayer's point of view when the objective is least cost affordable energy the ability of the Crown Corporation utility to access inexpensive financing is a critical component of achieving ratepayer objectives.

209. Any proposal to evaluate projects with cost penalties when they are not real and going to be imposed on ratepayers is a misleading and inappropriate way to represent the project.

210. Proposals to have Site C taxed with an evaluation penalty to levelized financing costs is clearly being pursued in the interests of suppliers who might want to displace Site C so that their projects might proceed.

211. A contest between the ratepayer perspective and a supplier perspective should be made available in the evaluation and provided to government, because it is the government that will decide which perspective to take.

212. The Panel should provide the government with both perspectives and recommend that they decide which perspective to support.

213. A project like Site C cannot be properly undertaken without the backing of government and without the financing being backed by the government.

214. Neither BC Hydro nor the Commission nor the Government have an obligation to equalize the level of financing support to the IPP industry. In fact, BC Hydro is precluded from competing in the IPP industry at this time.

215. The IPP industry has received a massive amount of the same low-cost financing from BC Hydro to enable their projects. Many of the IPP projects do not have capacity or do not have adequate capacity to perform all of the electrical system functions required to deliver energy to customers. BC Hydro and its customers have paid for the addition of significant amounts of capacity in projects financed by the same low-cost financing. As such, the low cost financing is embedded in the costing for IPP energy.

216. The IPP industry has been granted by BC Hydro and government policy contracts for the purchase of power, which are sufficiently generous to pay for their financing. These IPP contracts are backed by the same government supported crown corporation with the financial capacity to make those contracts bankable. The IPP industry cannot compete or exist in this province without its share of the credit capacity of the government and the credit capacity of BC Hydro and BC Hydro's low-cot financing, albeit that the form in which this credit is provided is different between the Heritage projects and the IPP industry.

217. The ratepayer point of view is that BC Hydro exists as a crown corporation to enable and make available low-cost energy broadly across the province to all ratepayers. The ratepayer point of view is that affordable energy is what they look for from BC Hydro and from their government.

218. The CEC recommends that the Panel's report contain an ample discussion of the ratepayer point of view and contrast that with the supplier point of view such that the advice to government is that this is an existential issue for BC Hydro's mandate and it should be decided by the government. Albeit

Analysis Over a 70 Years Life Span

Page 106 and 107

> **The Panel asks BC Hydro to use its RRIM model to calculate the cost impact to ratepayers relative to BC Hydro's current baseline using each of the mid load forecast, the low load case and the high load case from the F17-F19 RRA for the following scenarios:**
>
> - **Site C goes into service in 2023 at a cost of $8.335 billion, and the capital costs are amortized over 40 years rather than 70.**

Page 97 and 98

> CEABC states that "[t]he term used for the Site C Model and Comparative Analysis is from 2024 to 2094 or from 2017 to 2094 as the amounts are being expressed in 2017 dollars. The logic is that the Site C project will be depreciated over a 70 year period which is an accounting concept and the Site C debt will be repaid over the same period. Taxpayer equity is never forecast to be repaid.
>
> In the view of CEABC, forecasts of this type and for 77 years are wild speculation and have no practical value. It points out that the terms of the fully executed Government of Canada arm's length guarantee of some of the debt for the Muskrat Falls, a hydro-electric project in Newfoundland include an amortization period of 35 years.
>
> CEABC submits that instead of the 70 year term assumed in the portfolio analysis, the "[t] erm should be 40 years which is the maximum term of any Government bond issue. The bond market is placing an upper bound on the accuracy of some of the same forecasts that are inherent in the Term of the Model and the Comparative Analysis".
>
> CEABC continues that "[a] Term of 40 years is also the maximum allowable term for the existing water licence for the Site C project, not including the development term, under the Water Sustainability Act 12 (B.C.). It is presumptuous to assume that a new licence will contain the same terms and conditions as the existing licence. There could be major modification or the decision could be made to require the decommissioning of the project because of adverse impacts especially those relating to First Nations Treaty rights or resulting from climate change. There is nothing sacrosanct about a crown corporation owned large run of river hydro project".

219. The CEC does not object to the Commission asking for an analysis run for Site C using 40 years or to a run with an amortization over 40 years. However, the CEC does object to this sort of evidence being given any credibility or weight either as a correct methodology for comparison of projects with different lives or as a methodology for adjusting for a perceived risk.

220. The IPP industry efforts to equalize time frames between Site C and an IPP project is an unsound approach to evaluation of projects in general and specifically in this case.

221. The CEC submits that the appropriate methodology for assessing projects having different life spans is to use present value calculations and levelized costing. Further it is appropriate to evaluate the tail or trailing costs and benefits of a project after the evaluation time frame.

222. Site C as a project has attributes that would be expected to extend the life time particularly of its dam component well beyond 70 years. The value of this attribute is likely going to be considerable and should not be ignored. Just as any suggestion that the Williston reservoir or the GM Shrum dam should have an expected life span of 100 years or shorter should be set aside as not credible so should shortening the life span of Site C be set aside as not a credible scenario. A 100 years life for a dam is used for accounting purposes and is not a physical life span estimate. The Panel should be clear about this in its advice to government.

223. Evaluation of risks that Site C might be technologically eclipsed in some way should be a completely separate exercise of risk assessment. To the extent that such a thing might happen, this is not a risk to the Site C project solely. It is the same risk to all of BC Hydro's facilities and to all of the IPP facilities.

224. The consequence of common risks on this nature is that they are not items which create differences between projects being evaluated.

225. The CEC recommends that the Panel eschew the supplier bias in wanting evaluation methodologies to advance their own agenda when the methodologies are so wanting for credibility. The CEC recommends that the Panel decide that the Site C information based on 70 years is relevant and further that the trailing tail values should be considered as a positive attribute.

Surplus Energy and Capacity Values

226. The Commission Panel's Preliminary Report on the Site C Inquiry has a chapter intended to deal with Surpluses and the assessment thereof.

227. The CEC respectfully submits that this section does not cover a few issues of great importance to ratepayer impacts, specifically;

- the size, duration and cost impacts of surpluses;
- the primary causes of surplus electrical energy;
- the importance of over forecasting in creating surpluses;
- the harms to ratepayers created by surplus electricity in some cases;
- the importance of electricity markets in mitigating surpluses; and
- the importance of electricity prices in the electricity markets in mitigating the cost of supply.

The Existing Surplus Expectations and its Potential for Harm to Ratepayers

228. The CEC recommends that the Panel report has a discussion in the surplus section that makes it clear that the BC Hydro system already expects a surplus and that this surplus is close to 5000 GWh/year.

229. The CEC recommends that the Panel report makes it clear that this surplus has come from acquisition of energy and that acquisition of energy had an average price of $124/MWh when BC Hydro made commitments to acquire the energy.

230. The CEC recommends that the Panel acknowledge that acquisition of energy at high cost, which then must be sold into electricity markets creates significant losses which need to be borne by ratepayers.

231. The CEC evaluates this loss at $2.5 billion under current plans.

Potential Surpluses & Over Forecasts Bias and its Potential Harm to Ratepayers

232. If the load forecasts do contain an over forecasting bias and the actual energy needs do not meet the forecasts then BC Hydro will have surpluses for much longer time periods.

233. The CEC submits that it is the surpluses and the acquisition of expensive energy creating or adding to the surpluses which together create risk and harm to ratepayers.

234. Site C at a cost of $35/MWh to $45/MWh would likely recover its costs through sale into the electricity markets. Projects with higher costs will have the electricity markets as a potential mitigation but would substantially increase the risk of losses, which would need to be borne by ratepayers.

235. The CEC recommends that the Panel's advice to government contain an ample discussion of the risk for surpluses and over-forecast bias.

Site C Contributions to Future BC Hydro Surpluses and the Potential Impact on Ratepayers

236. Site C is expected to contribute to a series of surpluses after its in-service date. However, to the extent that Site C completion is evaluated to have low unit costs the degree of mitigation of impacts to ratepayers would be significant.

237. The CEC recommends that the Panel make this explicit in the discussion of the handling of surpluses.

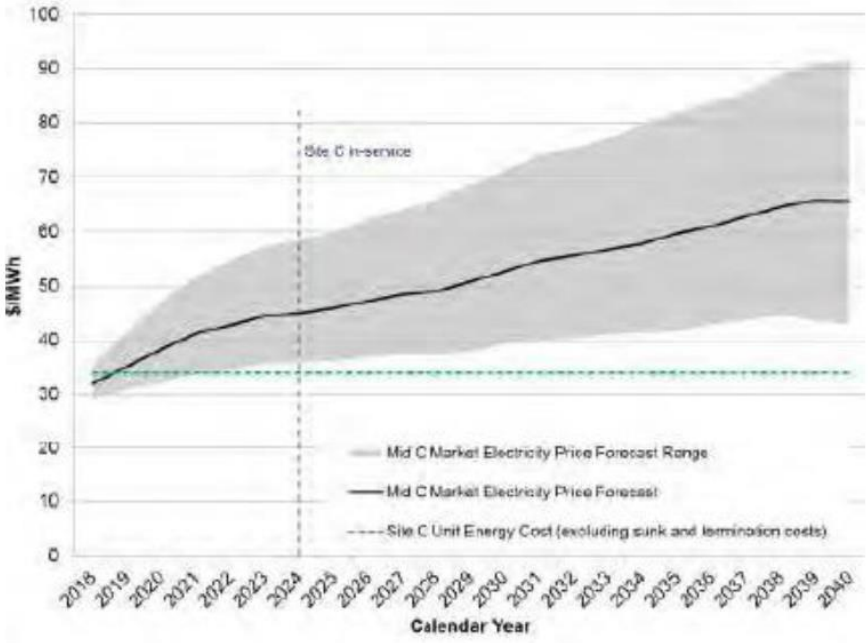
Export Opportunities and Benefits Electricity Markets and the Price of Electricity

238. BC Hydro has presented an explanation of how it might handle surplus energy and capacity in the event there is not a requirement for the additional domestic load when Site

C comes on line. BC Hydro is very optimistic that in these circumstances it has the ability to optimize the trade benefits through its subsidiary, Powerex.[22]

239. BC Hydro's anticipation of the electricity prices that will exist in future energy markets is represented in the following graphic. This shows that BC Hydro can deliver Site C at incremental costs less than the prices for which it forecasts it will have an ability to access for sales.

Figure 9: Comparison of Site C Energy Cost to Mid C Market Electricity Price (F2018$/MWh)



240. The CEC provides the forecasts of the Northwest Power and Conservation Council for the electricity markets.

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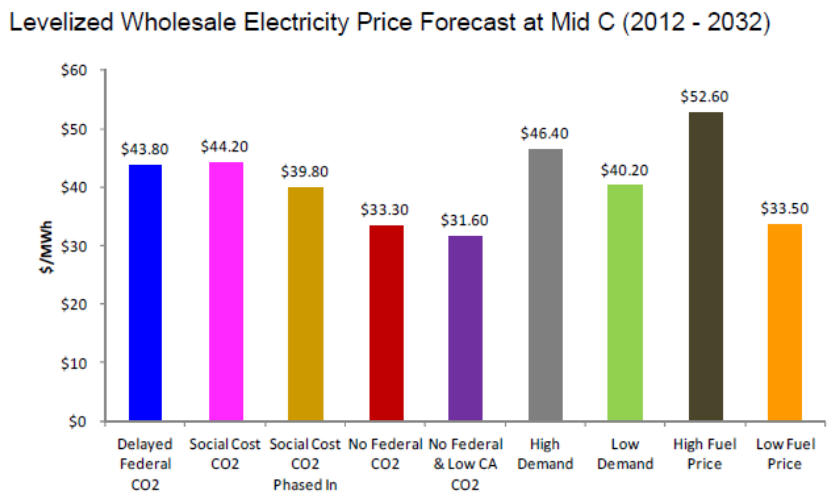
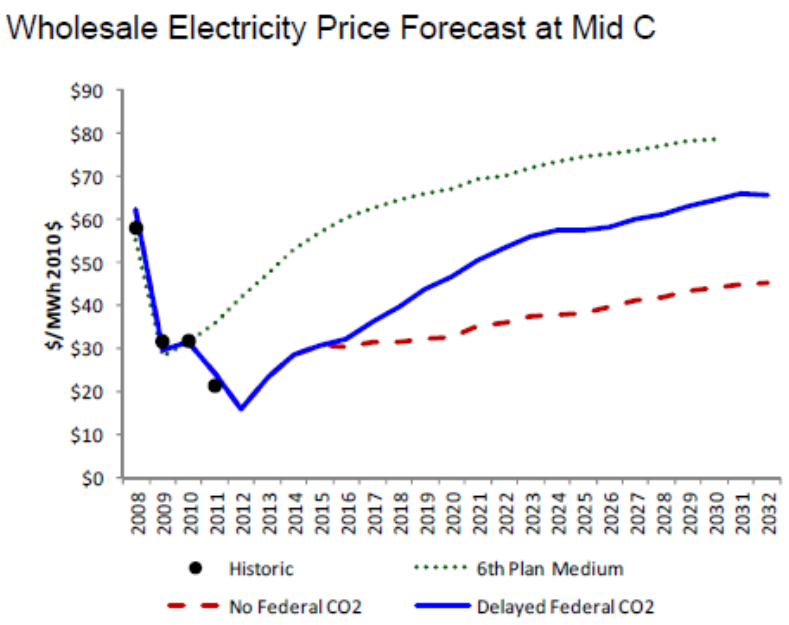


241. This analysis shows a fairly consistent assessment of the levelized wholesale market prices as being in about the $40/MWh range. The CEC notes that this data is presumed to be in USD as it is an American Council report.

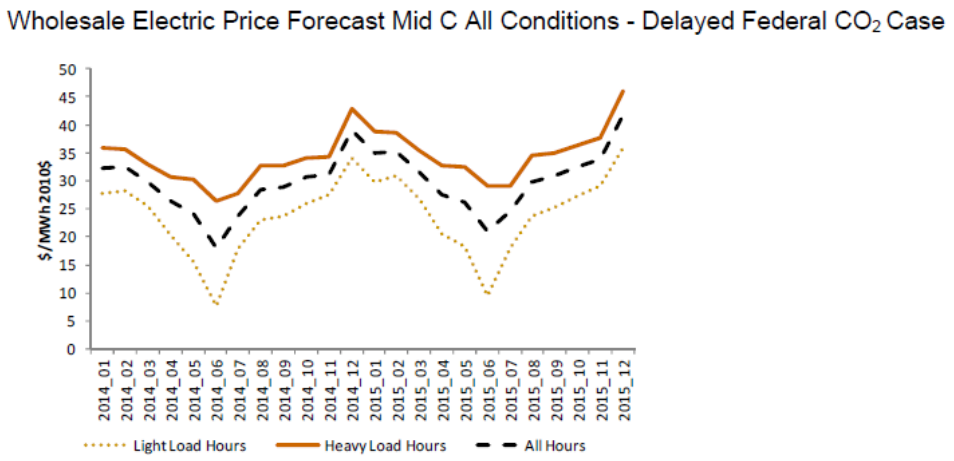
242. The NPCC report shows the data over time as shown in the line graphic below.



243. This forecast of the Mid – C market for electricity is similar to the one provided by BC Hydro and for all intents and purposes provides a clear indication of a tightening market and rising prices.

244. It should also be noted that the US federal government is reversing GHG reduction plans and giving corporate America a much lesser signal in terms of dealing with CO2 emissions.

245. The CEC notes that the seasonal changes in electricity prices as forecast by the council show significant change or variation based on the spring and summer river flows.



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BC Hydro has provided forecasts for Mid C market price estimates going forward through 2036. The Panel finds that BC Hydro and Deloitte estimates are decidedly different but both agree there is always a potential for projections to differ from what actually occurs. The Panel agrees and remains concerned as to the reliability of future forecasts. Given the variance in Mid C forecasts the Panel finds it premature to reach any conclusions on the future demand for surplus energy. Accordingly, specific questions have been developed to assist the Panel in understanding the current saleability of surplus energy and any potential impacts on future projections for energy sales in the event an energy surplus exists. These, among others are listed below.[23] (The BCUC lists several questions for BC Hydro here)

Has BC Hydro analyzed selling Site C's surplus energy and capacity within BC at discounted rates to incent incremental consumption (i.e. similar to the Freshet Rate pilot)? If so, please elaborate. If not, why not? [24]

246. The CEC has a distinct interest in finding a solution to getting the excess surplus used and useful in BC and is before the Commission in the BC Hydro module 2 rate design process to explicitly attempt to achieve such a result. The CEC expects that commercial customers will be interested in the ability to use additional electrical energy under the right circumstances.

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247. Largely the CEC evidence supports the BC Hydro estimates of the future electricity prices.

248. The CEC recommends that the Panel should have a range of future electricity prices between $35/MWh and $65/MWh and base its judgements on the potential for BC Hydro to access such prices with a probability distribution across the range increasing over time toward the high side.

249. The CEC notes that this is a vital area because of the potential for this market to mitigate cost issues with respect to Site C but also to provide an outlet for IPP energy temporarily not renewed by BC Hydro.

Unit Energy Costs

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> The Panel notes the submission of the David Suzuki Foundation regarding the economic impact of the Site C project on "natural capital". However, there is no analysis of the impact of the alternative portfolio so there is no way for the Panel to include this in its economic assessment. The DSF is invited to provide further evidence on this issue. The Panel is unclear how, or whether, this is a direct cost to ratepayers. It appears to the Panel that this is a cost that would be borne by taxpayers. **We invite further comment on this issue.**

250. The CEC submits that rather than trying to create a single economic conversion of natural capital changes related to a project such as Site C it is best to use a multi-account evaluation report in order to understand quantitatively the natural environment impacts but also to allow decision makers the opportunity to establish their own values in the trade-offs between economic, environmental and social values.

251. The CEC recommends that the Panel weigh this information carefully and also keep a broad understanding of the nature of the conflict and contests with major projects.

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> The Panel finds that if Mikisew Cree First Nation is correct in its submissions relating to either the potential downstream impacts on the PAD (Peace Athabasca Delta) or litigation relating to potential treaty infringements of Site C then this could impact the costs to Site C and ratepayers, and therefore result in an upward adjustment of the UEC for Site C energy. The Panel is unclear how, or whether, this is a direct cost to ratepayers. It appears to the Panel that this is a cost that would be borne by taxpayers. **We invite further comment on this issue.**

252. The CEC expects that costs related to such issues may have had a provincial context and appear to be potential taxpayer costs but that where practical and pragmatic governments frequently choose to have the ratepayer absorb costs rather that draw these costs into the provincial budgets.

253. The CEC has found that the nature of the law with respect to First Nations issues is increasingly better defined by the courts and the ability to assess risks is becoming more well established.

254. The CEC recommends that as the Panel addresses these types of issues it would be useful for the Commission to understand the limits and reach of the First Nations issues from the point of view of all parties. The CEC contends that separating the emotional issues and the logical issues would be helpful and competent legal council should be sought too, if the Panel is inclined to be determinative in its judgements as opposed to reviewing the status and understanding that such consultations are continuous ongoing components of the project and need not be the source of collapse of the processes.

Alternative Block UEC

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Table 32: Alternative Block UEC

Cost Factor	Unit Energy Cost $/MWh
Energy Resources (Generally Wind)	
Total Cost - Point-of-Interconnection	**$85**
Annual shape adjustment	-2
Levelized Firm Energy Price (values annual shape)	**$83**
Add Adjustments to reflect cost to Lower Mainland	
Cost of Incremental Firm Transmission	+2
Cost of Required Network Upgrades	+6
Line Losses	+9
Wind Integration Costs	+5
Wind Adjusted UEC – Delivery To Lower Mainland	***$105***
Capacity Resources (Pumped Storage)	
Fixed Costs	+31
Costs of Energy Loss (30% Pump/ Generation Cycle)	+17
Combined Clean Alternative Block	**$153**

255. The CEC agrees that the wind alternative block of energy is an important and relevant comparison to make.

256. The CEC agrees with the Panel that the base $83/MWh needs a foundation, likely in the actual EPAs for wind power BC Hydro has signed and in BC Hydro's forecast for new wind power. The CEC also supports having not just this one perspective but also one that forecasts significant cost reductions.

257. The CEC agrees with BC Hydro's inclusion of the costs for capacity because this is essential for new supply to be effective and the costs for capacity as a long term marginal cost are going to be more expensive, when supplied without natural gas generation.

258. The CEC also expects that the Panel will find alternative blocks of energy with lower costs, which may become available for the future. The CEC particularly thinks this could include the Kleana Power, Geothermal and DSM opportunities and recommends that the Panel produce UEC assessments of these opportunities and any ranges they may exhibit.

E. Chapter 7 Cost to Ratepayers of Completion, Termination and Suspension

Cost to Ratepayers to Complete

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> The Panel notes that BC Hydro has stated that a delay of the river diversion from 2019 to 2020, which would delay the in-service date of Site C until 2024, would cause the budget to be exceeded. It appears that this contradicts the assumption made in the base case of the RRIM analysis. **The Panel asks BC Hydro to confirm that the assumption made in its RRIM analysis that Site C is delivered in 2024 and within the budget of $8.335 billion is both reasonable and internally consistent.**
>
> The total revenue requirement from F2018 to F2094 is estimated as follows:
>
> > In the Base Case, rate increases are assumed to increase by 3.5 per cent in fiscal 2018, 3.0 per cent in fiscal 2019, and by 2.6 per cent each year from fiscal 2020 to fiscal 2024, consistent with the 10 Year Rates Plan. For years after fiscal 2024, BC Hydro has assumed for the purposes of this analysis annual rate increases equal to inflation of 2.0 per cent.[378]
>
> The Panel assumes this to mean that BC Hydro is expecting the cost of Site C, implemented in 2024 at a cost of $8.335 billion, to be reflected in the total revenue requirement calculated on the basis above. Thus, it follows that if Site C were to be delivered in a year other than 2024, or for a cost other than $8.335 billion, there would be cost impacts to ratepayers.
>
> In its description of the RRIM[379], BC Hydro does not refer to which load forecast it assumes. This is a critical assumption, since the load forecast determines the amount of energy that is needed and the time at which it is needed should Site C not be built. **The Panel asks BC Hydro to confirm that it has used its mid forecast from the F17-F19 RRA in this RRIM analysis.**
>
> **The Panel asks BC Hydro to use its RRIM model to calculate the cost impact to ratepayers relative to BC Hydro's current baseline using each of the mid load forecast, the low load case and the high load case from the F17-F19 RRA for the following scenarios:**

259. The cost to complete the Site C project will be unknown and unknowable as will be the case for most of the information the Panel must use to make its judgments and provide its advice to government.

260. The CEC expects that the reasonable range of potential costing for the Site C project completion will demonstrate, provided the context of government policy is appropriate, that the range of costs for Site C could represent little to no impact to ratepayers.

261. The CEC submits that if the Panel assesses that the load forecasting is over stating future requirements to the extent that flat load will continue for a very long time into the future,

then completion of the Site C project to essentially supply electricity markets would not be a prudent risk to take.

Costs to Suspend and Complete Later or Terminate

262. The CEC's examination of the suspension alternative is that its benefits would be equaled by or outweigh it costs and that the Panel should advise government that it could drop this option from further consideration without significant risk to the Inquiry's assessment purposes.

Cost to Ratepayers of Termination

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> ***Panel analysis and preliminary findings***
> **The Panel asks BC Hydro to use its RRIM model to calculate the cost impact to ratepayers relative to BC Hydro's current baseline using the mid load forecast, low load forecast and high load forecast from the 2016 Revenue Requirements Application for the following scenarios, and all using the lowest-cost portfolio of alternative energy that BC Hydro has created in response to the questions asked in section 6 above:**
>
> **Site C is terminated December 31, 2017, with sunk costs at that date of $2.1 billion, and termination and remediation costs of $1.1 billion. Site C regulatory account costs are amortized over 10 years.**
> **Site C is terminated December 31, 2017, with sunk costs at that date of $2.1 billion, and termination and remediation costs of $1.1 billion. Site C regulatory account costs are amortized over 20 years.**

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> ***Panel analysis and preliminary findings***
>
> **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. Any determination of the appropriate recovery mechanism, including the period of recovery, would need to be made in the context of a future proceeding.

263. The CEC sees in the above findings and requested analysis that the costs of termination have the impact of placing the responsibility for sunk costs and termination costs on ratepayers.

264. The CEC has examined two methods of accomplishing this, being (1) an amortization over 10 years and a one-time rate increase of approximately 10%, which would be implemented as a rate rider until the costs are recovered, and (2) a 0.5% rate increase per year for 20 years implemented as a rate rider until the costs have been recovered.

265. However, the concept of recovering the costs from ratepayers to leave BC Hydro whole does not complete the assessment of costs to ratepayers.

266. The CEC notes that this rate rider would not represent payment for any services received and therefore would deliver no benefit to the ratepayers, unlike normal costs of providing service.

267. Consequently, the ratepayers in paying these costs have a lost opportunity cost for the money used to make these payments. This is a real tangible cost impact to ratepayers which is not accounted for in any of the analysis put before the Panel.

268. When examining this issue it is relevant to understand that (1) residential ratepayers would have to make these payments out of after tax income or from assets acquired with after tax income, and (2) commercial and industrial ratepayer would have to make the payments from income, deductible for taxation purposes but because there is no value delivered for the payment the full cost net of tax deduction would impair the net income of the operation and required replacement investment and activity to recover.

269. The cost of capital for BC Hydro's customers can vary considerably but virtually none of them would have the cost of capital that BC Hydro finances its expenditures with. So the cost of transferring this responsibility to ratepayers increases the ratepayer impact over and above the amount to be paid.

270. The CEC has estimated the cost of capital for BC Hydro ratepayers across a range of 3.5% to 7%, which it suggests is quite conservatively low. The CEC has looked at the impacts on these ratepayers over the time frames of 10 and 20 years.

271. The result is that the cost of termination becomes composed of the following.

	Low Range	Higher Range
Sunk Costs	$2.1 billion	$2.1 billion
Termination Cost	$1.1 billion	$1.1 billion
Cost to Ratepayer	$1.0 billion	$2.0 billion
Total Ratepayer impact	$4.2 billion	$5.2 billion

272. Completion of Site C avoids these costs by delivering a product of value for incremental costs of completion beyond these costs.

273. Alternative portfolios replacing the Site C product delivered with another product would have ratepayers incur these costs as well as the costs of the replacement product.

274. To the extent that the replacement product was of a lower quality than the Site C product then the ratepayers would be required to carry these extra costs as well.

275. The CEC recommends that the Panel recognize this ratepayer perspective in its report and in the judgements, it has to make in determining the advice it will provide to the government.

276. The BC Hydro assessment of these costs is $7.3 billion extra cost over and above finishing Site C. These costs are made up of additional DSM costs and additional acquisition of renewable energy.

277. The acquisition cost for the DSM energy and capacity are approximately $21/MWh for the energy and about $40/kW-year for the capacity. Giving rise to about a $700 million investment.

278. The CEC finds these costs very reasonable and attractive. The CEC also finds these costs to be in the range of the Site C costs.

279. The acquisition costs for new renewable energy are based on replacing the Site C project with wind power, having a base cost of $83/MWh at the plant gate and adding incremental cost of $22/MWh to get the energy from the Peace area to the lower mainland. In addition, because these sources of power do not come with capacity BC Hydro properly adds a cost for capacity, for which it uses a generic pumped storage cost of $48/MWh.

280. The CEC finds these costs very unattractive and well above the costs of completing Site C. Even with a 45% reduction in the base costs at the plant gate these costs remain unattractive for ratepayers.

281. The CEC believes there may well be a better alternative block that could replace Site C and that it would have to exhibit properties similar to the DSM savings, carrying both energy and capacity.

282. The CEC expects that for alternatives BC Hydro should look to more DSM and to geothermal sources of supply, where the characteristics of the energy and capacity can be exceptionally good.

283. However, the CEC expects that the costs of alternatives to completing Site C would need to be exceptional, as the incremental cost to complete Site C appears to have exceptionally low costs, provided that the energy can be sold and or is needed domestically.

284. The judgement required of the Panel is not ‘what might have been better planning and better options before the government decision to proceed with Site C’.

285. The Judgement required of the Panel is ‘will the incremental cost of completing Site C be a better option for ratepayers than other alternatives of termination and replacement options or suspension and completion or termination options.

286. The CEC recommends that the Panel stay focussed strictly on the options for completing or terminating Site C from a ratepayer perspective and not on the merits of supplier options versus Site C.

ALL OF WHICH IS RESPECTFULLY SUBMITTED.

David Craig

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David Craig, Consultant for the Commercial Energy Consumers Association of British Columbia

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Christopher P. Weafer, Counsel for the Commercial Energy Consumers Association of British Columbia