Comments on BC Hydro's Appendix M: "Flaws in Hendricks [sic] /Rafals [sic]/Baker [sic] ("UBC") Report"

Richard Hendriks
Philip Raphals

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<tr><th></th><th>Topic</th><th>BC Hydro Comment</th><th>Response</th></tr>
<tr><td>1.</td><td>Environmental Assessment</td><td>The Report mis-characterizes the Joint Review Panel (JRP) report (pages 8-10). Given section 3(e) of the Terms of Reference, the Commission will not be reconsidering decisions made in the environmental assessment process. However, the Report's discussion of the process is flawed in several respects.

The JRP Report provided a "balance sheet" presenting both adverse effects and benefits of the Project.

Contrary to the Report's statement (page 11), the federal Governor in Council did provide reasons through Order in Council 2014-1105, in which they stated, among other things, that "the concerns and interests of Aboriginal groups have been

reasonably balanced with other societal interests including social, economic, policy and the broader public interest".

With respect to effects identified on the use of land and

resources by six First Nations (referred to at page 12), BC Hydro and BC have offered to enter benefit agreements to address these effects through land protection measures, transference of

land in fee simple, and other benefits. Four BC First Nations have entered agreements. (BC Hydro has also</td><td>Considering section 3(e) of the Terms of Reference, the Commission will not be reconsidering decisions made in the environmental assessment process. However, BC Hydro's comments contain several omissions and errors that merit correction.

The BC Hydro Report neglects to mention the primary findings of the JRP Report, namely that the Site C Project would have an unprecedented number of significant adverse environmental effects. Table 1: Significant adverse environmental effects under the CEAA[1] from Hendriks et al. is reproduced below.
<table>
<tr><th>Project</th><th>Number of Significant Effects</th></tr>
<tr><td>Site C Clean Energy Project</td><td>20</td></tr>
<tr><td>New Prosperity Gold and Copper Mine Project</td><td>5</td></tr>
<tr><td>Lower Churchill Hydroelectric Generation Project</td><td>5</td></tr>
<tr><td>Jackpine [Oilsands] Mine Expansion Project</td><td>5</td></tr>
<tr><td>Pacific Northwest LNG[2]</td><td>3</td></tr>
<tr><td>Encana Shallow Gas Infill Development Project</td><td>2</td></tr>
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[1] For details concerning the nature of the significant adverse environmental effects, see: UBC Program on Water Governance. 2016. Briefing Note #2: Assessing Alternatives to Site C: Environmental Effects Comparison, Table 2.1 and Table 2.2. (Available at www.waterpartners.ca/projects/sitec)

[2] For details concerning the significant adverse environmental effects see: Canadian Environmental Assessment Agency. September 2016. Pacific Northwest LNG Project Environmental Assessment Report, p.189. (Accessed 17 April 2017 at: https://www.ceaa.gc.ca/050/documents/p80032/115668E.pdf)

		entered agreements with two Alberta First Nations providing financial benefits.) The authors' statement that "it is very unlikely that any of these effects [of alternatives to Site C] would be significant" (page 10) should be given no weight. No conclusion can be made regarding effects of alternative projects that have not been identified or assessed. Reference: JRP Report; 2015 FC 1027, paras. 19, 41	<table><tr><td>Kemess North</td><td>2</td></tr><tr><td>Northern Gateway Project</td><td>1</td></tr><tr><td>White Pines Quarry</td><td>1</td></tr><tr><td>LNG Canada</td><td>1</td></tr><tr><td>Labrador-Island Transmission Link</td><td>1</td></tr></table> Our conclusion that "it is very unlikely that any of these effects [of alternatives to Site C] would be significant" follows from the analysis conducted elsewhere by the UBC Program on Water Governance.[3] It is unclear whether BC Hydro reviewed this research in making its observations. The alternative portfolio reviewed in that research consisted of the following resources: ▪ Capacity upgrades at GM Shrum and Revelstoke 6 ▪ Municipal solid waste ▪ Natural gas (SCGTs) ▪ Pumped storage ▪ On-shore wind The basis for the conclusion that the alternative portfolios would be very unlikely to have significant adverse environmental effects follows from several factors, including the following: ▪ Some resources have already been assessed as having no significant adverse environmental effects (i.e. capacity upgrades). ▪ Some resources are exempt from environmental assessment legislation on the basis that they have no potential for significant adverse environmental effects (i.e. municipal solid waste).

[3] UBC Program on Water Governance. 2016. Briefing Note #2: Assessing Alternatives to Site C: Environmental Effects Comparison. Available at www,watergovernance.ca/projects/sitec/

			▪ The spatial flexibility of the alternative resources allows them to be designed and located so as to avoid or minimize environmental effects (i.e. wind, pumped storage hydro and natural gas). ▪ Cost-effective, technically feasible and proven mitigation measures are available to address the residual effects of the alternative resources (i.e. all resources). Our conclusion regarding the very low likelihood of significant adverse effects from the alternative portfolios would extend to the following resources as a result of their spatial flexibility, and the availability of proven mitigation measures: ▪ Energy-focused DSM ▪ Capacity-focused DSM ▪ Solar PV ▪ IPP renewals ▪ Battery storage ▪ Geothermal ▪ Biomass There is thus a very high likelihood that technically feasible, cost-effective alternative portfolios to the Site C Project can be developed that would not entail significant adverse environmental effects.
2.	Load Forecast/ Optimistic	The authors review past load forecasts of BC Hydro and state that BC Hydro has a tendency to be "optimistic". (pp. 14-28) BC Hydro addresses historic variances in its load forecasting in Appendix H.	The "optimistic" nature of BC Hydro's load forecasts was a conclusion first reached by the BCUC in response to BC Hydro's load forecasts filed in support of its application to the Commission to develop the Site C Project in the early 1980s.[4] It is worth noting that the Commission's expert consultant (Deloitte) repeats and restates many of the observations

[4] British Columbia Utilities Commission. 1983. Site C Report: Report & Recommendations to the Lieutenant Governor-in-Council, p.85. (Available at: https://www.sitecproject.com/sites/default/files/19830500%20Report%20and%20Recommendations%20to%20the%20Lieutenant%20Governor%20in%20Council%20-%20BCH.pdf)

		BC Hydro's load forecasting methodology has been endorsed by - Government in its 2011 review; - The Joint Review Panel, who said: "BC Hydro's forecasting methods did not differ substantially from best practices among utilities across North America. This forecasting, as revealed in the Evidentiary Update and in response to Panel questions, was professional and not "conservative," in that it aimed to be high half the time and low half the time. BC Hydro, understanding the necessary uncertainties, has been forthright about some of the factors and judgments that can affect forecasts … The Panel concludes that BC Hydro's forecasting techniques are sound, but uncertainties necessarily proliferate in long-term forecasts." (pages 284-285) - An external expert retained for BC Hydro's internal Audit. (See Appendix I)	made in Hendriks et al. concerning BC Hydro' historic load forecasts, including: ▪ The frequency of overestimates compared to underestimates; ▪ The deteriorating performance of BC Hydro's forecasting in the long-run (i.e. as measured in years after the forecast date); ▪ The use of a price elasticity value that is lower than many other estimates used in the industry and presented in the literature; ▪ The decline in BC Hydro's energy-focused DSM savings to 0 GWh/year by 2036. The Commission has also observed BC Hydro's propensity for over-forecasting, and has raised specific concerns, including that: "the accuracy of BC Hydro's historical industrial forecasts looking out three and six years have been considerably below industry benchmarks."[5]
3.	Load Forecast/ Collapse	The authors refer to the "Collapse of BC Hydro's 2012 Load Forecast". They state (at pages 32-33), "the requirement for energy in the 2016 Load Forecast is substantially lower than in the 2012 Load Forecast used to justify proceeding with the Site C Project. Throughout the 20-year forecasting period, the difference is on the order of 5,000 GWh/year of energy." In fact: - The Government had an updated 2013 load forecast when it decided to proceed with the Project.[5]	BC Hydro acknowledges that **the utility filed incorrect information concerning the F2013 mid-load forecast with the BC Utilities Commission.** Like the Commission we rely on BC Hydro to file accurate information. BC Hydro indicates that it provided this corrected information on April 28, 2017, three days after the release of Hendriks et al. (on April 25, 2017). It has not indicated whether or not the publication of Hendriks et al. led to the correction. BC Hydro's corrected load forecast information results in the following changes to Hendriks' et al.:

[5] BCUC Preliminary Report, p.60.

		▪ The difference between the 2013 load forecast and the Current (2016) Load Forecast is ○ approximately 2500 GWh for fiscal 2024 ○ less than 1000 GWh/year by fiscal 2030 (i.e., one- fifth of the amount suggested by the Report). ▪ The authors' conclusion relies on and refers to BC Hydro's Response to Information Request CEC 2.135.1 filed with the Commission in the F2017-F2019 Revenue Requirements Application. That response had contained an error that BC Hydro had corrected on April 28, 2017. The authors' reliance on the wrong data results in an overstatement of the change in BC Hydro's load forecast.	▪ Section 3.2.2 – "BC Hydro's data reveal, though, that ~~**85%**~~ **84.3%** of these data point projections were overestimates." ▪ Section 3.2.2 – "Since 1992, when BC Hydro began producing annual forecasts, ~~**89.5%**~~ **86.7%**of the utility's mid-load projections were overestimates. ▪ Section 3.2.4 – "Figure 5a) illustrates that, from 2009 through 2013, BC Hydro's load forecast increased markedly. "Using forecast loads for F2024 as an index, the load forecast increased by about ~~3,000~~ 2,500 GWh/year in 2010 and 2011, by ~~5,000~~ 4,500 GWh/year in 2012, ~~and~~ before decreasing by ~~8,000~~ 3,800 GWh/year in 2013. **The forecasts of energy requirements in F2024, when the Site C Project is due to be commissioned, vary from 60,592 GWh/year in the F2009 Load Forecast to ~~78,134~~ 70,180 GWh/year in the ~~F2013~~ F2012 Load Forecast, a difference of nearly ~~18~~10,000 GWh/year – ~~more than three times~~ nearly double the annual generation of Site C**. ▪ Section 3.2.4 – "Figure 5b) presents BC Hydro's forecasts for the years 2013-2016. It shows that BC Hydro's load forecast for F2024 ~~fell just as quickly as it had increased –~~ increased by ~~8,000~~ 1,500 GWh/year in 2014, ~~and~~ before decreasing by ~~another~~ 2,000 GWh/year in each of 2015 and 2016." ▪ Section 3.2.4 – "Following the decision in 2010 to proceed with the environmental assessment of the Site C Project, the forecasted requirements for F2024 increased dramatically by up to ~~18~~10,000 GWh/year ~~leading up~~ prior to the decision to approve the Project. ▪ Then, following the approval in ~~F2014~~F2015, the load forecasts steadily declined with projections for requirements in F2024 ~~nearly~~ ~~15,000~~ about 2,500 GWh/year lower in the F2016 Load Forecast than they were just three years earlier.

4.	Load Forecast / Electrification	The authors critique (page 35) the findings of two analyses (Deep Decarbonization Pathways Project (**DDPP**) and Trottier Energy Futures Project (**TEFP**)) that the Government of Canada relied on in developing its climate change mitigation strategy. The DDPP and TEFP reports conclude that reliance on large-scale hydroelectric generation is necessary to achieve deep reductions in Canada's GHG emissions. BC Hydro discussed in section 5 and Appendix J of this Filing how low carbon electrification has the potential to significantly increase load beyond what is included in the Current Load Forecast. Many of the authors' critiques of the DDPP and TEFP studies are unsubstantiated, speculative, and contrary to the views of organizations they themselves cite. For example: ▪ The authors criticize the large hydro buildout suggested in the DDPP and TEFP studies and instead suggest wind and storage as an alternative. They refer several times to studies by the International Renewable Energy Agency (IRENA) that describe potential cost reductions in wind energy. BC Hydro notes the recent comments made by the Director General of IRENA: "*One of the problems we have with new electricity systems, in terms of the reliability that comes with wind and solar, is balancing that with some of kind of predictability, and hydro provides that. Hydro is probably the best electricity source we can have to balance reliability across the system.*[6]" ▪ The authors state that higher electricity prices and demand-side management could result in	BC Hydro claims that Hendriks' et al. "critiques of the DDPP and TEFP studies are unsubstantiated, speculative, and contrary to the views of organizations they themselves cite." Hydro's support for this statement consists of single quotation from the Director General of IRENA. Our major critiques of the DDPP and the TEFP include: ▪ **GDP**: Use of GDP rates that are higher than the Federal Department of Finance; ▪ **Price elasticity**: No analysis of the effects on electricity demand of a projected long-term increases in real electricity prices of 60% by 2050; ▪ **DSM**: Lack of a detailed analysis of the costs or potential of DSM; ▪ **Distributed generation**: Omission of distributed generation from the analysis in the TEFP; ▪ **Solar PV**: A finding in the TEFP that there would be less generation from solar PV in 2050 than today, based on a price of solar PV in 2017 of $2,733/W;[6] ▪ **On-shore wind**: The assumption in the TEFP that the real costs of on-shore wind will remain unchanged to 2050, contrary to available evidence; ▪ **Capacity**: No electricity capacity analysis in the DDPP, and omission of capacity upgrades at existing hydroelectric facilities in the TEFP; and ▪ **Cost of large hydro**: Estimates of hydroelectric development costs used in the TEFP substantially understate actual large-scale hydroelectric development costs of resources currently under construction in Canada. We note, in reviewing the Preliminary Commission Report, that the Commission raises a nearly identical set of issues in relation to Site C:

[6] Trottier Energy Futures Project. April 2016. Canada's Challenge & Opportunity: Transformations for major reductions in GHG emissions, p.94.

		electricity requirements for electrification being much lower than estimated. This statement is made without any analytical detail regarding potential demand side volumes or customer behaviour in response to electricity rate increases.	▪ **GDP**: Concerns with differences between BC Hydro's (higher) forecast of GDP compared to those of the Conference Board of Canada (s. 5.1.4.3); ▪ **Price elasticity**: Concerns about no real rate increases between F2025 and F2036, and recommendations to BC Hydro to update its elasticity assumptions (s. 5.1.4.4); ▪ **DSM**: the importance of the availability and costs of additional DSM (App. A.1.1.5); ▪ **Distributed generation**: The need to include battery storage in the analysis as a potential candidate for alternative generation (App. A.1.1); ▪ **Solar PV**: The need to include utility scale solar PV in the analysis as a potential candidate for alternative generation, based on a price of solar PV in 2017 of $1,640/kW or less, at least 40% lower than the assumed cost in the TEFP (App. A.1.1.8);[7] ▪ **On-shore wind**: The Panel notes its concern that BC Hydro's $85/MWh is not supported, and that the price of energy from wind is likely to be lower (App. A.1.1.4); ▪ **Capacity**: The Panel has requested BC Hydro to provide further information on up to 440 MW of additional capacity at existing facilities, excluding John Hart and Revelstoke 6 (App. A.1.1.1); and ▪ **Cost of large hydro**: The Panel does not yet have enough information to assess possible budget overruns in relation to Site C, and has requested more information (s. 4.1.3).
5.	Overstated Site C Project Cost	The authors made an assumption about the way the Project would be financed, which was incorrect. The financing for Site C is, in fact, derived from Order in Council No. 590 which sets BC Hydro's net income at $712 million for fiscal 2019 and subsequent fiscal	OIC 590 reads as follows: ▪ On the recommendation of the undersigned, the Lieutenant Governor, by and with the advice and consent of the Executive Council, orders that Direction No. 7 to the British Columbia Utilities Commission, B.C.

[7] Trottier Energy Futures Project. April 2016. Canada's Challenge & Opportunity: Transformations for major reductions in GHG emissions, p.94.

		years. The authors' error yields a very inflated Unit Energy Cost of $85 to 88 per MWh. Using the correct financing inputs, the actual Unit Energy Cost for the Project at the time of the decision to proceed was $58 to 61 per MWh. As a result, the Report significantly overestimates the cost of the Project in comparison to alternatives. This error is perpetuated throughout the Report's analyses and in its conclusions. The Unit Energy Cost associated with completing the Project is even lower (better) than it was at the time of the Final Investment Decision, in part because so much of the Project has already been completed.(See Section 6 and 7 of Filing). The Unit Energy Cost associated with completing the Project is less than half the Unit Energy Cost used in the Report.	Reg. 28/2014, is amended by repealing section 4 (d) and substituting the following: ▪ (d) achieve an annual rate of return on deemed equity, (i) for F2017, that would be necessary to yield a distributable surplus of $684 million, (ii) for F2018, that would be necessary to yield a distributable surplus of $698 million, and (iii) for F2019 and subsequent fiscal years, that would be necessary to yield a distributable surplus of $712 million. OIC 590 dictates the rate of return to be applied to BC Hydro's total deemed equity, such that its distributable surplus will remain invariant. OIC 590 is silent as to the financing of the Site C Project.
6.	Overstated Site C Project Costs	The authors overstate the potential for cost overruns Pages 59-62. BC Hydro has accounted for the potential for cost overruns by including contingency in its budget. The Treasury Board has also set aside an additional $440 million reserve for unanticipated costs. As outlined in BC Hydro's core submission, Site C remains on-time and on-budget. The authors also assume that wind resources will see significant cost declines of 20% in the next decade and presume that the technological advancements that are required to drive this decline will occur with certainty. Additionally, the authors ignore the fact that wind resources are subject to the same cost overrun factors they have identified for Site C such as First Nations opposition, labour costs or instability, exchange rates, interest rates, and geotechnical risks.	BC Hydro claims that Hendriks' et al. "overstate the potential for [Site C] cost overruns." In fact, our report reads as follows: > Rather, it is reasonable to expect that there may be cost overruns for the Site C Project, based on recent experience with greenfield hydroelectric and transmission projects across Canada, including BC Hydro projects. However, the full extent of any cost overruns will not be known until the Project is further advanced. (p.64) Our sensitivity modelling considers a potential for a 25% cost overrun. This compares favourably to the three potential future scenarios for Site C prepared by Deloitte: ▪ Low: 0% to 10% ▪ Moderate: 10% to 20% ▪ High: 20% to 50% With regard to the forecast costs of wind power, both Deloitte (Report #2, s.4.1.1.1) and the Commission Preliminary Report (App.A.1.1.4) support our forecasts, rather than the utility's.

7.	GHG Emissions from the Project	The authors incorrectly characterize the GHG emissions from the Project (pages 56-59). The effects arising from GHG emissions of the Project, both during construction and operations were assessed in the environmental assessment. The analysis in the Environmental Impact Statement and Joint Review Panel Report demonstrated the following: - The Joint Review Panel was of the view that BC Hydro's analysis with respect to the Project's contribution to GHGs was accurate, and observed that Environment Canada agreed with BC Hydro's assessment; - The Joint Review Panel found that the Project would produce more energy per gram of GHG emissions (called the **GHG intensity**) than any alternative (save nuclear) over its lifetime; - The EIS demonstrated that, during operations, the GHG emissions of the Site C Project would be approximately 1 per cent of the emissions produced by coal-fired generating facilities and approximately 2 per cent of emissions produced by natural gas-fired generating facilities for the same amount of energy; - The location and design of the Site C project allows it to have lower GHG emissions than even other boreal	The GHG emissions data for Site C used in Hendriks et al. are drawn directly from the Site C EIS.[8] They reflect the fact that creation of the Site C reservoir will alter the stocks and fluxes from pre-inundation conditions, resulting in net GHG emissions. BC Hydro estimated the net cumulative emissions (excluding construction emissions) over the first 100 years of operations to be 4.3 MT CO_2e in the "likely" scenario and 5.8 MT CO_2e in the "conservative" scenario, with about 80% of these emissions occurring in the first 10 years after inundation.[9] BC Hydro affirms that these net emissions were determined in accordance with IPCC guidelines. These guidelines do not consider the emissions resulting from flooding to be fundamentally different to those resulting from fossil fuel combustion.[10] **We recommend that the Panel give no weight to BC Hydro's statement that "GHG emissions from hydroelectric generating stations are fundamentally different than emissions from electrical generating stations burning fossil fuels".**

[8] BC Hydro. 2013. Site C Clean Energy Project Environmental Impact Statement. Volume 2 Appendix S: Site C Clean Energy Project: Greenhouse Gases Technical Report. Prepared for BC Hydro by Stantec Consulting Ltd., Table C-4 and Table C-6. Available at: http://www.ceaa-acee.gc.ca/050/document-eng.cfm?document=85328.

[9] Volume 2 Appendix S: Site C Clean Energy Project: Greenhouse Gases Technical Report. Prepared for BC Hydro by Stantec Consulting Ltd., p.92.

[10] IPCC. 2006. 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Agriculture, Forestry and Other Land Use – Appendix 2 Possible Approach for Estimating CO2 Emissions from Lands Converted to Permanently Flooded Lands: Basis for Future Methodological Development. Available at: http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html.

		reservoirs, which themselves are among the lowest GHG emitters per unit energy. BC Hydro's expert stated at the JRP hearing: "To put Site C into perspective of other boreal hydroelectric reservoirs, the physical characteristics of Site C that allow it to have essentially lower relative emissions compared to other boreal hydroelectric reservoirs where there's a fairly narrow, fairly steep-sloped reservoir, compare that to other boreal hydroelectric reservoirs such as some of those in Northern Quebec which are flooded lakes that are enormous in size and flood a much larger amounts of biomass for the relative amount of energy produced, and that's what will give you the relatively lower emission intensities of this versus other boreal hydroelectric sites;" ▪ During operation, GHG emissions from hydroelectric generating stations are fundamentally different than emissions from electrical generating stations burning fossil fuels. Whereas a fossil fuel burning generator emits CO_2 that was previously in some form of geological storage, the carbon emissions from a hydroelectric development represent carbon that is already engaged in the cycle between the atmosphere and green plants; and ▪ Over the life of the Project, it is estimated the Project would result in the avoidance of somewhere between 34 and 76 million tonnes of CO_2 equivalents in the western grid, and potentially more, due to the sale of surplus electricity.[7]	
8.	Overstated Project Cost	The report's inclusion of a carbon tax during operations is not accurate. No carbon tax would be applied to Site C during operations. (p. 56-59). The inclusion of carbon tax in the Project cost overstates the Unit Energy Cost.	BC Hydro estimated the net cumulative emissions (excluding construction emissions) over the first 100 years of operations to be 4.3 MT CO_2e in the "likely" scenario and 5.8 MT CO_2e in the "conservative" scenario, with

			about 80% of these emissions occurring in the first 10 years after inundation.[11] The IPCC requires reporting of GHG emissions from "Land converted to flooded land".[12] As such, the emissions from Site C are to be included in Canada's national inventory. **The inclusion of a carbon tax on the emissions from Site C reflects the social cost of these carbon emissions and also reflects the fact that Canada must report them in its emissions inventory.** Whether or not this tax is actually levied by the BC Government, it represents a real cost resulting from the Project's GHG emissions. For the same reasons that DSM costs are evaluated based on the Total Resource Cost test, which includes costs that are not paid by the utility, these GHG costs must be taken into account in an economic analysis.
9.	Overstated Project Cost	The authors incorrectly characterize the Project progress (page 69). As described in Section 4 of this Filing, the Project is currently on schedule to be in-service by fiscal 2024, and within the Project budget of $8.335 billion. Section 8 includes sensitivities related to costs.	BC Hydro's reference to page 69 of Hendriks et al. is in error, so it is not possible to respond specifically. All references to the progress of the Site C Project in Hendriks et al. are taken from BC Hydro quarterly progress updates filed with the Commission.
10	Understated Cost of Termination and Suspension – Rate Impacts	The report states "In the event that the Site C Project is cancelled, these sunk costs will need to be repaid. It is presumed that these costs are repaid over a 70-year period, similar to the repayment of the Site C Project if it were developed to completion." (p. 70) There is no reason or precedent to presume sunk costs would be amortized over a 70-year period. The applicable accounting standards require an immediate	This issue is addressed in section 3.5.3 of Raphals and Hendriks (October 2017).

[11] Volume 2 Appendix S: Site C Clean Energy Project: Greenhouse Gases Technical Report. Prepared for BC Hydro by Stantec Consulting Ltd., p.92.

[12] IPCC. 2006. 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 1 General Guidance and Reporting, Chapter 8 Reporting Guidance and Tables, Table 8.2.

		write-off (expense) in the case of both termination and an suspension of uncertain duration. While these costs could be captured in a regulatory account (as BC Hydro would propose), regulatory principles would not suggest amortization of the balance over 70 years. Two key considerations in determining the period over which account balances are reflected in rates are (1) the period over which customers are benefitting from the expenditure, and (2) rate stability. There are no long-term benefits associated with the costs if the Project is terminated.	
11.	Understated cost of termination	The report states "... cancellation costs for the Site C Project as of June 30, 2017 are estimated to be on the order of $600 million to $900 million, including demobilization costs" (p.70-72) As described in Section 6, the costs associated with termination and remediation is significantly higher ($1.1 billion) than the authors are estimating.	Table 20 of the Preliminary Commission Report presents the Panel's preliminary findings respecting termination costs of $391 million and remediation costs of $662 million for a total of $1.1 billion. This value has been used in our updated analysis in Raphals and Hendriks (October 2017).
12. and 13.	Understated cost of suspension	The report states "Contract cancellation and demobilization costs are presumed for the purposes of the analysis in this report not to apply to a suspended Site C Project" (page 72): This assumption is implausible, and significantly affects the authors' analysis. In the event of a suspension longer than a several months, it is expected that: ▪ Many contracts would be cancelled, and if not cancelled, BC Hydro would be subject to penalties for delay; and ▪ Many if not all contractors would demobilize their equipment for multiple reasons (for example, equipment may be rented from third parties; it may be needed or could be used	Section 4.2 of the Preliminary Commission Report finds that $1.1 billion is a reasonable estimate of the costs of suspension and maintenance for the project. This value has been used in our current analysis. With respect to the costs of restarting the project following suspension, the Panel has not yet reached a conclusion regarding the total costs for the project in the event that it is suspended and restarted at a later date. Our revised approach to addressing the cost of suspension is addressed in section 3.4.2 of Raphals and Hendriks (October 2017).

		elsewhere; and there are security reasons not to leave equipment on site). While the report does not incorporate demobilization costs, it does include remobilization costs, implicitly recognizing the requirement to demobilize and remobilize. 13. The report states "The costs to suspend the Site C Project are therefore estimated to be on the order of $15 million per year based on the annual site maintenance costs at a large and currently suspended mine site (Potash mine in New Brunswick)" (pp.72-73). It is inherently unreliable to extrapolate the suspension costs from a potash mine in eastern Canada to a hydroelectric dam in northern British Columbia. As set out in Section 7 of the Filing, the cost of suspension until 2024 ($1.2 billion) is even higher than termination given the additional complexities.	
14.	Misstating BC Hydro's Plans for DSM	The report states "… following fiscal 2021, no new additional demand-side measures are contemplated to replace and improve upon existing measures. This situation is illustrated in Figure 19 derived from BC Hydro's 2016 RRA where new DSM measures cease after fiscal 2021 and the additional energy savings from DSM decline by more than 40% by fiscal 2024 and to zero by fiscal 2036." (page 80). This statement is not correct. The fiscal 2017 to 2019 Revenue Requirements Application demonstrates BC Hydro plans to spend approximately $85 million per year after fiscal 2021 to secure new, incremental DSM savings.	Table 3-8 in the RRA, upon which Figure 19 in Hendriks et al. is based, illustrates that incremental energy savings from DSM decline to 0 GWh/year by 2036.
15.	Alternatives to Site C – Canadian Entitlement	The authors have made an inaccurate assumption about BC Hydro's ability to rely on the Canadian Entitlement. (p. 86 to 108). The Canadian Entitlement, in addition to not meeting the self-sufficiency requirement of the *Clean Energy Act*, cannot be relied on as a long-term energy	As indicated in note 84 of Hendriks et al., it is implausible that the Americans would simply abrogate the Treaty, given the important benefits that it provides them. It is however possible that Downstream Benefits will be reduced in the future, which is why we have reduced their amounts by 50% in our modelling.

		resource given that either party has the ability to cancel the treaty with ten-years notice. See Appendix L for more details.	
16.	Alternatives to Site C – Capacity-focused DSM	The inputs in the authors' modelling (set out in Table 24) include 570 MW of capacity-focussed DSM at $50/kW-year (p. 86 to 108) The authors have made inaccurate assumptions about BC Hydro's ability to rely on capacity focussed DSM and its cost. ▪ Page 108: the report says 126 MW of capacity-focussed DSM has been demonstrated in BC Hydro's pilot programs to date, and an estimated 500 MW of capacity-focussed DSM is considered to be feasible by 2030. BC Hydro finds that approximately 85 MW can be counted on for planning purposes based on the Year 2 pilot results for industrial load curtailment and is still trialing and piloting demand response. Therefore the 500 MW figure is premature and aggressive and cannot be relied on. ▪ Page 108: the report estimates the cost of capacity-focussed DSM to be $50/kW-year. This figure is based on costs of the load curtailment pilot for Year 1 set out in the Revenue Requirements Application, but it is too early to know whether this cost is representative of the cost of capacity-focussed DSM overall as it is based on a one-year pilot program for one sector. This was set out in a response to an IR in the Revenue Requirements Application. ▪ 570 MW of capacity-focussed DSM is unproven. As observed in the 2013 Integrated Resource Plan (**IRP**),	BC Hydro did not include any capacity-focused DSM in its 2013 IRP, though it did identify 575 MW of potential. This represents about 5% of its current capacity requirements (see Table 3-9 in the RRA). In its August Submission, BC Hydro identified 85 MW of industrial load curtailment. In its responses to the BCUC, it has identified an additional 450 MW of demand response by F2027, at a levelized cost of $55/kW-yr.[13] This amount is additional to the 85 MW of industrial load curtailment previously identified. BC Hydro's current estimates of capacity-focused DSM (including demand response) are thus nearly identical to those modelled in Hendriks et al. BC Hydro emphasizes that: "these initial results have a high degree of uncertainty", and considers that "further work is required before they can be used for planning purposes."

[13] BCUC IR 2.73.0, page 3 of 4.

		long-term capacity-focussed DSM requires further testing and piloting before it can be relied on: at present, both program initiation dates and customer participation rates are unknown. Therefore this is an inappropriate and imprudent input.	