

**CLEAN ENERGY ASSOCIATION OF B.C.
(CEABC)**

**COMMENTS ON BCUC'S ALTERNATIVE PORTFOLIOS
TO
THE B.C. UTILITIES COMMISSION**

**2017 INQUIRY RESPECTING
THE SITE C PROJECT**

OCTOBER 18, 2017

1. INTRODUCTION

The Clean Energy Association of B.C. (“CEABC”) appreciates the opportunity provided by the B.C. Utilities Commission (“BCUC”) to provide comments on alternative portfolios to the Site C project. It commends the BCUC for providing this opportunity.

Generally the portfolios are reasonably thought out and are commercially viable.

The CEABC’s concern is that it does not know what the net present value (“NPV”) of the Site C project is nor how this value has been, or will be calculated. The NPV of this project will be compared to the NPV of the alternative portfolios. The CEBC has requested but has not been given access to the various Site C models and data that would assist in understanding the NPV of Site C.

There are many uncertainties concerning the continued development of the Site C project that will need to be incorporated into any Site C NPV analysis. It is a very necessary task. It is imperative that this analysis be conducted on a level playing field basis.

Even without this leveling and on a forward looking basis there is no business case for the continued development of Site C. The CEABC has reached this conclusion on the basis of the evidence on the record including the BCUC’s illustrative Alternative Portfolios. In the alternative Site C should be suspended until a business case can be made for it.

This submission contains seven sections:

2. Detailed Comments on Key Assumptions
3. Detailed Comments on Spreadsheet
4. General Comments
5. Capacity and Transmission
6. Variable Renewable Backup
7. Summary and Conclusions

2. DETAILED COMMENTS ON KEY ASSUMPTIONS

As requested in A-22 the following table comments on the BCUC’s Key Assumptions table.

Overall the assumptions for the Alternative Portfolio are reasonable. Some would benefit with slight modification. But it is critical that many of the assumptions should be equally applied to the NPV analysis for Site C.

	Assumption	Stated Portfolio Assumption	Comments Regarding Portfolio	Comments Regarding Site C
1	Discount Rate	“The discount rate proposed by BC Hydro for Site C (6% nominal, 3.9% real) has been assumed.”	Reasonable. Using the same discount rate for both cases is no change. Avoids tilting the playing field	We assume the same applies to Site C
2	Financing costs, taxes	“The financing costs of the Alternative Portfolio are assumed to be the same as BC Hydro’s financing cost for Site C (100% debt financing at a cost of 3.43%).”	Better. Using the same financing costs rate for both cases removes 2% "bias". Still does not account for relative risks.	We assume the same applies to Site C
3	Alternative Portfolio Options	"Three portfolios were developed in total, one for each BC Hydro 2016 load forecast."	Reasonable. The Mid case is the decision case, hi and lo are sensitivities. However, Mid case is no longer the "expected" case. See general comment re load forecasts.	We assume the same applies to Site C
4	Size of the Alternative Portfolio	"The Alternative Portfolio has been sized to replace Site C energy and capacity used for domestic consumption. ... not for export."	Excellent. There is no need to mimic Site C's lumpiness. Matching supply to expected domestic demand will best serve ratepayers.	Site C supply is lumpy. Its 5,100 GWh creates a big surplus for quite a few years
		"The F2017–F2019 RRA low load forecast ends in F2036. For the purpose of the low load forecast, a ramp up of 800 GWh/year for energy and 200MW/year for capacity has been assumed."	Reasonable. Alt. Portfolio is flexible enough to be "right-sized" to adjust to the pace dynamically.	Forecasts beyond 20 years are pure speculation, yet can have profound impact on the relative economics. The boosted LOW forecast will absorb Site C surpluses faster than probable.
5	Location of the Alternative Portfolio	"The Alternative Portfolio reflects a “plant gate” cost ..."	Reasonable if both options treated the same.	How will the Site C comparable be handled? Will it include the \$1.4 billion in transmission

Assumption	Stated Portfolio Assumption	Comments Regarding Portfolio	Comments Regarding Site C
			enhancements required by Site C? (see F18-5, pages 22-23)
	"The Alternative Portfolio ... has been set to be similar to Site C (Peace region) to minimize the risk of additional network reinforcements relative to Site C."	A reasonable objective , but Site C still does require \$1.4 billion in transmission enhancements to be dependable capacity. (see F18-5, pages 22-23)	Site C. Big lump. To perform as dependable capacity, Site C requires a lump of transmission.
6	Energy surplus to BC Hydro need	" ... to the extent that it is surplus to BC Hydro's requirements, the energy is assumed to be exported at a plant gate export price of 2018 \$25/MWh"	Should get higher price than Site C energy because wind qualifies for RECs (now selling in California for \$15). Whatever shaping and shifting is done with Site C energy can also be done with Alt. Portfolio.
7	Capacity surplus to BC Hydro need	" ... to the extent that it is surplus to BC Hydro's requirements, the surplus capacity is assumed to have no additional value to BC Hydro (i.e., an export price of CAD \$0/kW-year	The critical assumption is in the comparable. Many big questions. Site C does not qualify for RPS. How much system resources are needed to shape and shift the generation. Transmission available for annual volume but not at best price times. Will compete with DSB sales for CA market.
8	Energy exceeding Site C	"In any year, if the energy of the Alternative Portfolio exceeds that of the gap to fill and is used to meet BC Hydro's domestic load requirements, the cost of the Alternative Portfolio will be reduced proportionally."	Must ensure Site C is treated the same way. No market or can't get to market. Transmission to California is fully used at the necessary times.
9	Capacity exceeding Site C	"In any year, if the capacity of the Alternative Portfolio exceeds that of the gap to fill and is used to meet BC Hydro's domestic load requirements, the cost of the Alternative Portfolio will be	Reasonable. Essentially saying there is no market or, at the times some market may exist, it cannot be reached because of transmission limits.
		Reasonable. Implies no gain or loss on sale. However, the critical assumption is in the comparable.	How is the Site C's much more massive surplus to be priced? There may be annual transmission capacity to sell it, but all the best pricing times are already used. Should not get any better price than the DSBs at \$26?
		It's reasonable to have the same credit as Site C, but any positive value is highly conjectural. Having more capacity when it isn't needed, and can't be sold, has no value.	The critical assumption is in the comparable. Same comment applies. Having more capacity when it isn't needed, and can't be sold, has no value. The best that can be said is that it delays Rev6 by a few years. That is not worth \$56 million for 70 years.

	Assumption	Stated Portfolio Assumption	Comments Regarding Portfolio	Comments Regarding Site C
		credited with the assumed value of this additional capacity of \$50/kW-year. This is referred to as a capacity credit in the analysis."		
10	Energy and capacity Options	" ... wind, energy efficiency DSM programs, capacity focused DSM programs, optional TOU rate, industrial curtailment rate, and batteries"	A reasonable attempt has been made to select some realistic alternatives at realistic prices. BC has thousands of MW of wind projects that have already been identified. The amounts in the analysis will result in competitive bidding.	One technology. All eggs in one basket. Risky
		" ... there may be additional options that could reduce the cost of the Alternative Portfolios, such as codes and standards, Independent Power Producer (IPP) contract renewals, upgrade of existing BC Hydro assets, geothermal, solar, biomass, etc"	Reasonable. So the selected alternatives are a worst case. They could be improved upon. And improvements can be made dynamically.	Locked in for 70 years. Completely loses the value of preserving optionality for as long as possible, in order to benefit from technological and cost improvements.
11	Energy efficiency DSM	" ... DSM Incremental to RRA DSM option. Energy volumes have been grossed up by 11% ... "	Reasonable	N/A
		" ... societal costs/benefits of energy efficiency DSM have not been included ..."	Reasonable	N/A
		" ... cost of energy efficiency DSM has therefore been included at the utility cost to BC Hydro ..."	Reasonable. Utility Cost is consistent with assumption of 100% debt. Ignores costs paid by others outside BC Hydro. Preferred would be a recognition of equity returns, and then Total Resource Cost could be used.	N/A
12	Wind – project characteristics	"Wind project characteristics (load, annual energy, installed capacity) were taken from BC Hydro's portfolio results."	Not ideal but a reasonably available option. Adjustments have been made via the capital investment.	N/A
		"Effective load carrying	Reasonable to use ELCC for capacity	N/A

	Assumption	Stated Portfolio Assumption	Comments Regarding Portfolio	Comments Regarding Site C
		capacity and plant life for each project was taken from BC Hydro's resource options spreadsheet ..."	contributions.	
13	Wind – capital and O&M cost	"... taken from the National Renewable Energy Laboratory (NREL) 2017 Annual Technology Baseline. ... NREL costs were increased by 10%"	See joint submission of CEABC and CanWEA (prepared by Power Advisory) CanWEA	Site C capital costs have already exhausted contingencies. Should be increased to reflect typical over-runs.
		"Exchange rate (0.79) and inflation rate (2%)"	Reasonable	Same must be applied to Site C analysis
		"Wind farms are assumed to be refurbished at the end of 25 years at a cost 30% less than the cost of a new wind farm"	Increase discount. Expect a discount of at least 50% yielding \$950/kW.	Site C Refurbishing Costs are insufficient at only 10% of budgeted initial costs (plus 2% inflation). The budget for Site C is 30 times the cost per MW of Bennett Dam in 1968 -- 5 times more than inflation.
14	Wind – wind integration	" ... assumed to be \$2.5/MWh"	More reasonable but still too high , given that capacity is available in BC Hydro's system and has no avoided sales value.	Must avoid double and triple charging for wind integration, plus cost of adding capacity, plus giving capacity credit to Site C.
15	Capacity DSM	" ... estimated from the graphs on page 3-21 of BC Hydro's 2012 draft IRP ..."	No comment	N/A
		" ... assumed to be 100 MW at \$75/kW-year based on BC Hydro's industrial load curtailment pilot ..."	No comment	N/A
		"Costs are deferred and amortized over 15 years."	Consistent with current practice. Non-comparability could arise if this is varied.	N/A
16	Batteries	" ... estimated from a graph (figure 18, median line) in an August 2016 NERL report"	Seems reasonable and is supported by current utility scale installations. See footnote 1	N/A
		"A 10-year battery life was assumed."	This is reasonable today, and likely to increase as technology is improved over time	N/A
17	Exchange rate	Exchange rate of \$1 CAD = 0.7979 USD.	Reasonable	Must be consistently applied to Site C analysis
18	Firming	"... the Alternative Portfolio	Reasonable	N/A

	Assumption	Stated Portfolio Assumption	Comments Regarding Portfolio	Comments Regarding Site C
		has a similar level of firmness as Site C."		
19	Shaping, storage	"The Site C reservoir does not have sufficient storage volumes to provide seasonal shaping of generation. The Alternative Portfolio also does not provide seasonal shaping of generation"	And yet Site C's generation profile HAS BEEN STORED, SHAPED, AND SHIFTED by using the system's other resources (see F18-5, pages 18-21). Whatever treatment is afforded Site C must also be available to the Alternative Portfolio. Acceptable if treated the same as Site C	Site C's generation profile HAS BEEN STORED, SHAPED, AND SHIFTED by using the system's other resources (see F18-5, pages 18-21). This cannot be accepted for Site C if it is not allowed for the Alternative Portfolio.
20	Grid reliability	" ... similar levels of grid reliability compared to Site C as a result of (i) the inclusion of wind integration costs and (ii) by siting Alternative Portfolio resources at the end-user location (for DSM) or at the Site C location (for wind)."	Reasonable for comparability	Close to wind but not close to load. We reiterate that Site C requires \$1.4 billion in transmission enhancements to be regarded as dependable capacity for loads located in Lower Mainland or Vancouver Island.
		" ...assumed that BC Hydro already has sufficient generation assets capable of providing ancillary services to meet NERC and WECC requirements	Reasonable assumption	Presumably the same assumption
		The Alternative Portfolio does not build for export into a potential ancillary services market.	Reasonable	Presumably the same assumption
21	Greenhouse gas emissions	"...assumed that the Alternative Portfolio has similar levels of greenhouse gas emissions compared to Site C."	Reasonable but conservative. No GHGs are created by the wind, DSM and batteries in the Alternative Portfolio. If the cost or performance of batteries does not occur as forecast in the NREL report, then an alternative is to increase DSM curtailment, or add SCGTs. SCGT GHGs can be the same as Site C. If GHGs are high one could move to biogas. Or offsets.	Rotting vegetation creates methane. Site C's GHG emissions are enormous in the early years. SCGTs can easily compete till at least 2040, allowing more time for battery technology/cost to advance.

3. DETAILED COMMENTS ON SPREADSHEET

As requested in A-22 the following table comments on the BCUC's spreadsheet labeled A-22-1.

Overall the spreadsheet and its calculation of NPV is reasonable. But many of the assumptions should be equally applied to the NPV analysis for Site C.

Worksheet title or Category	Stated Input or assumption used in Alt. Portfolio Model	Comments Regarding Portfolio	Comments Regarding Site C
Energy & capacity gap	Three 2016 load forecast scenarios from BC Hydro	The three amounts vary widely. A portfolio of multiple projects can respond to variations of demand better than one big project. Acceptable assumption for comparison.	One big project with one COD cannot respond to the necessity to update forecasts and the ultimate variation of actual demand
	"Starting point is LRB from BCH F2017/19 RRA, then deduct Site C, result is Gap to Fill"	Reasonable target	N/C
	"LOW forecast ends in F2036. then moves forward at a ramp up of 800 GWh/year for energy and 200 MW/year for capacity"	The Alternative Portfolio is flexible enough to be "right-sized" to adjust to the pace dynamically. Acceptable assumption for comparison.	N/C
Portfolio - Low, Medium and High Load Forecast (LF)	"wind farms are layered-in in blocks"	Reasonable. This is normal utility procurement practice	N/A
Energy	"... energy surplus to Site C will first be used to serve domestic need ("offsetting other BC Hydro energy purchases"); if surplus to domestic load will be exported"	Reasonable, but the critical assumption is what happens to Site C's surplus when it must be exported. Will it receive the same price treatment?	Surplus from Site C should be treated the same.
Capacity	"assumes an effective load carrying capacity of wind projects of 26% of the nameplate capacity"	Reasonable, if conservative	N/A
	"Capacity focused DSM options (capacity DSM programs, optional TOU rate, industrial curtailment) and batteries are then used to fill in remaining gaps"	Reasonable in that it seeks to match the need, not to match Site C	N/A

Worksheet title or Category	Stated Input or assumption used in Alt. Portfolio Model	Comments Regarding Portfolio	Comments Regarding Site C
Portfolio costs - Low, Medium and High LF			
Batteries	\$542/kW from NREL report	Acceptable. This is middle of range of forecast prices. See reference to current utility scale installation in Australia. See footnote 1.	N/A
Wind - Initial	\$1,895/kW	Reasonable	N/A
Wind - Refurbishment	\$1,326/kW (30% discount)	Insufficient. Expect a discount of at least 50% yielding \$950/kW.	N/A
Wind - Integration	\$2.50/MWh	Reasonable	N/A
Energy price for surplus sales	\$25/MWh	Reasonable, except price should be \$15 greater than Site C earns, due to RECs	Should be equally applied to the calculation of Site C's NPV
Capacity price for surplus sales	\$50/kW-year	Too high. Could likely have no value, maximum \$25/kW-year, but same must apply to Site C	Should be equally applied to the calculation of Site C's NPV
	"No value is assumed for additional capacity surplus to BC Hydro's needs"	Acceptable. Should be applied to Site C analysis	Should be equally applied to the calculation of Site C's NPV
Energy adjustment	"calculates Site C energy as a percentage of portfolio energy (less exports), and applies this percentage to the cost of the alternative portfolio"	Reasonable in assuming there is no incremental value or cost if surplus exceeds Site C level.	N/A
Capacity credit	" ... will recognize a value if BC Hydro is in a capacity shortage.	Reasonable, but the question remains what is its value? It could fulfill a planning requirement to have a reserve margin, but still have no value operationally if it is never used and can't be sold.	Same comment applies but on a much larger scale. No value if excess to operational need, even though it fulfills a planning requirement for a reserve margin. Best case it postpones Rev6 a few years.
NPV - Low, Medium and High LF			
	Attempts to calculate a Revenue Requirement or "Cost of Service" view	The approach is reasonable , but the full costs and risks are not represented. Both sides are biased. Neither the Alternative Portfolio nor the Site C option have the cost of equity represented. They are	The taxpayers' subsidy of Site C is by far the greater bias, because Site C is by far the riskier project.

Worksheet title or Category	Stated Input or assumption used in Alt. Portfolio Model	Comments Regarding Portfolio	Comments Regarding Site C
		being treated equally, but this equal treatment does not capture the full scope of the risk differential.	
<u>Financial Assumptions</u>			
WACC	6% nominal (3.9% real)	Reasonable for discounting of both options, but only as a proxy for ratepayers time preference. Not to be mistaken for the cost of capital.	Appropriate that it applies to both Site C and the Alternative Portfolio
Inflation	2.00%	Reasonable for general inflation, as long as the declines in resource costs are dealt with separately.	Reasonable for general inflation, but the increases in refurbishment costs must be dealt with separately.
Economic life - Wind	25 years	Reasonable as long as refurbishment recognizes the longer lives of some of the initial expenditures.	N/A
Economic life - DSM	15 years	Normal practice	N/A
Economic life - Battery	10 years	Seems reasonable	N/A
Debt	3.43% @ 100% financed	Only acceptable because it is applied to both sides.	Actually, it's ridiculous to assume this rate for 70 years.
Equity	8.75% @ 0% financed	Generic rate only used for calculating the Discount Rate. Never used for the internal cost of capital	BC Hydro's BCUC approved equity rate is 11.84%
<u>Capital Calculations</u>			
Depreciation	over the assumed life of each asset	Reasonable	
Return on Equity	Calculated annual amount = 0 for all years (per row 283)	Only acceptable because it is applied to both sides. Otherwise unreasonable and unrealistic, since zero return completely ignores any reasonable assessment of risk in the investment choice.	ZERO return denies taxpayers over \$400 million per year, to which they are entitled as compensation for their \$3.5 billion investment in Site C
Interest on Debt	calculated at 3.43% for 70 years	Only acceptable because it is applied to both sides. It avoids the 2% rate penalty but still doesn't go far enough to recognize the risk differential	3.43% is a ridiculously low assumption for 70 years, plus there should be added a much needed risk premium for Site C.
Deemed Equity	Calculated annual amount = 0 for all years (per row 278)	The \$0 is the correct amount when equity = 0%	Should receive same treatment
Effective Debt	Calculated annual amounts are shown in row 279	Amounts appear to be correctly calculated	Should receive same treatment

Worksheet title or Category	Stated Input or assumption used in Alt. Portfolio Model	Comments Regarding Portfolio	Comments Regarding Site C
<u>Output</u>			
NPV	The spreadsheets "Output" is NPV	Correct metric. UEC values are too subject to fictional cost adders.	Applied to both sides
Term	70 years	A period this long should never be necessary. It is unreasonable to think forecasts this long could be meaningful.	Completely unrealistic, even if some of the assets could last this long. They could also be technologically obsoleted in 30 years. Huge risks are being ignored.
RESULTS			
Alternative Portfolio composition	591 MW of wind projects starting between F2028 and F2031	Achievable. BC has thousands of MW of wind projects that have already been identified. This amount will result in highly competitive bidding.	N/A
	DSM initiatives (energy efficiency, optional TOU rate, capacity focused DSM, industrial curtailment)	Reasonable. There are lots of DSM initiatives to choose from.	N/A
	400 MW of batteries starting between F2025 and F20262	Reasonable. Current trends in battery costs and performance should reach the above costs by 2025	N/A
Net Present Value	\$2,889 million for Medium LF	Reasonable, except for all the caveats above	UNKNOWN. BC Hydro has not revealed the NPV of Site C. And not provided models that would enable analysis.

4. GENERAL COMMENTS

The following are general comments on the BCUC’s A.22 analysis. They are a higher level view than the specific comments on Key Assumptions and the Spreadsheet.

Issue / Concern / Assumption	Comments
1 Portfolio NPV Analysis	The portfolio NPV approach is the best available analysis to use. BCH has said it regards portfolio analysis as the most important evaluation methodology - superior in many ways to the simplistic calculation of UECs. CEABC agrees with this as a general statement, although caution is necessary to avoid repeating many of the same over simplistic assumptions that plague the UEC calculations.
2 Ratepayer view vs. the overall project perspective	<p>The impact on ratepayers should be a significant consideration in the decision but not the only consideration. As presently constituted by BCH, the ratepayer view only represents one portion of the overall project perspective. It does not take into account all of the costs and risks of the project. A proper assessment of the project relative to the alternatives, needs to take into account all the costs and risks of all the available options.</p> <p>Although OIC 244 sections 3 (b)(ii) and (iii) specifically require assessment of ratepayer impacts. Section 3 (b)(iv) requires broader portfolio analysis, and Section 3 (a) is much broader in scope, requiring the commission to advise on all the implications. The use of the word “implications” permits the commission to cover a very wide scope of advice.</p>
3 Cost of capital	<p>With regard to the relative cost of capital, as between the Site C option and the alternative portfolio option, this analysis has come part way. By using the same financing rate as has been used for the Site C option (namely 3.43%), it is clearly trying to deal with the issue, and to create a more even-handed comparison. However, rather than tackling the issue directly, it takes more of a side-step to avoid it.</p> <p>By equating the rates used for each side of the comparative (Site C and the Alternative Portfolio), this appears to remove the 2% bias used by BCH, but it hasn't gone far enough to recognize the huge disparity in the underlying riskiness of the two options.</p> <p>When properly calculated, the cost of capital should recognize all of the project risks (not merely those that are allowed to pass through to the ratepayers), and the risks are far higher to develop Site C than to develop a series of smaller, quicker, less complex wind projects. Accordingly, if Site C requires a weighted average cost of capital of 8.8% to recognize its risks, then the smaller, more straightforward projects would probably need a rate of only 6.5-7% (combined debt and equity returns). That is, the 2% differential should be in the opposite direction.</p>
4 Risk recognition	It remains to be seen whether the relative risks of the two options are being recognized. The CEABC only has access to the Alternative Portfolio model. The Site C model and its assumptions are just as critical to the comparative evaluation.
5 70 year amortization period	<p>A period of 70 years is far too long for analyzing Site C and the alternative portfolios. It is impossible to accurately predict the future for 70 years. And relying on a 70-year forward view adds a lot more long-term risk.</p> <p>The simplest risks to acknowledge are interest rate risk (can we really expect 3.43% for 70 years?), performance risk (including climate change or asset deterioration), refurbishment cost risk (the Bennett Dam developed sink holes, and every turbine is being replaced, at costs today that are 30 times 1968 costs).</p>

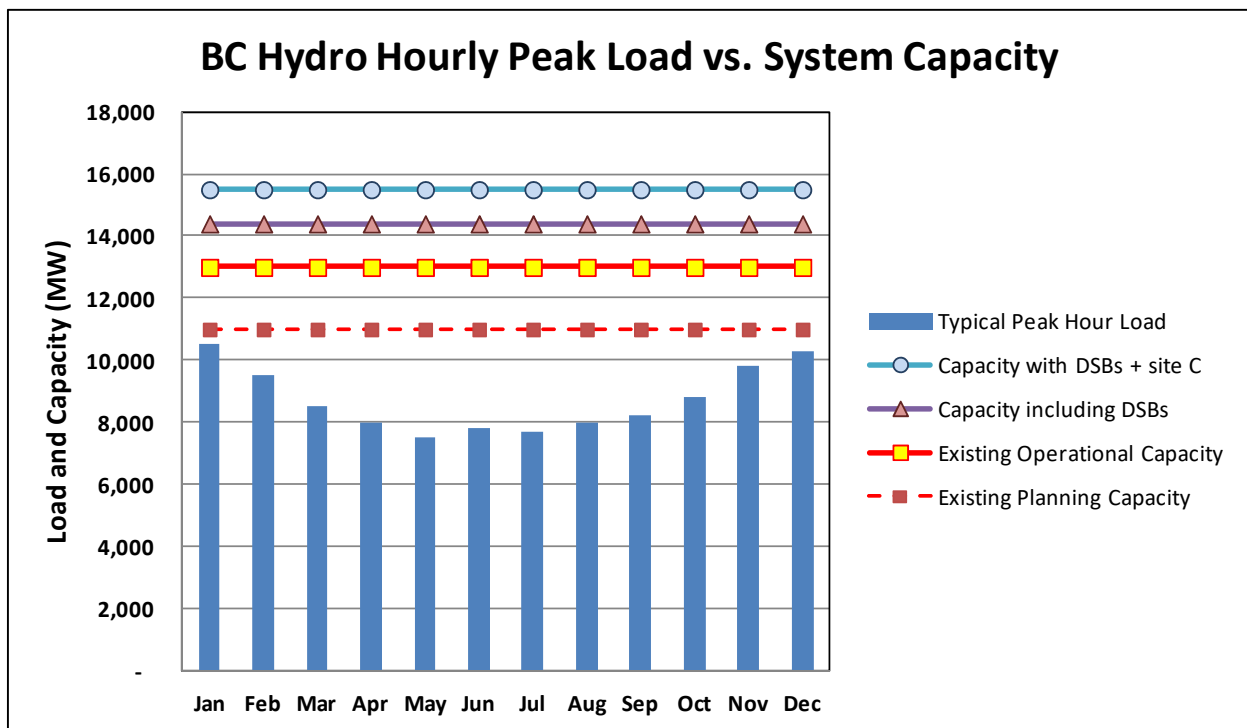
Issue / Concern / Assumption	Comments
	The entire utility industry could be altered by the advent of new technologies such as electric vehicles, roof-top solar, fast-charging high-capacity batteries -- any one of these technologies could turn a 70-year project into a 'white elephant' in 30 years.
6 The assumptions in the comparative Site C model are critically important	What NPV of Site C will the alternative portfolios be compared to and how will it be calculated? Is the plan to build a similar spreadsheet model for the Site C project? How will the assumptions in this model be kept consistent with those in alternative portfolio models? For instance, will it use the same \$25 price for sales of surplus energy, or the same value for capacity? Will it charge the Site C option for the \$1.4 billion in transmission enhancements that are required by that option? How will the risk of future construction cost overruns which have plagued the Muskrat Falls and Keeyask project be captured? These are all absolutely critical assumptions for the comparison, but the CEABC does not know whether they will be included or omitted in the Site C model.
7 Mid-C Price Forecast	Robert McCullough's evidence that the future's markets are a much better place to look for future prices than any forecast prepared by BCH or anyone else is correct. The volume of futures contracts is a much larger sample of forecasts of the future backed by cash than forecasts prepared with far fewer data points that aren't backed by cash
8 Sale of Surplus Energy	The Alternative Portfolio is assuming \$25Cdn/MWh at the plant gate. However, the Site C option has much greater amounts of surplus to sell. The key assumption is what price will the Site C NPV analysis assume. It must not assume a better price than .the price assumed for the alternative portfolios.
9 Sale of Surplus Site C Capacity and Flexibility (Value of Capacity and Flexibility)	BCH already has large amounts of surplus capacity for sale except during its peak demand. Powerex markets the Columbia River Treaty Downstream Benefits. The market for Capacity and Flexibility is in California and the intertie capacity to this market is very limited. Site C will add to BCH's already considerable portfolio of capacity to sell and there will be no corresponding expansion of the intertie capacity to California. BCH has never quantified the value of flexibility. See the graph below.
10 Alternative Portfolio sells excess Capacity for \$50/kw-yr	The alternative portfolios are given a credit of \$50/kw-yr for any capacity in excess of the Site C option. It is not at all clear what the rationale for this is. Why only the excess? Does that mean that Site C will not receive any value for its 1100 MW capacity? Or does it mean the Site C option will receive a similar credit? There is extensive evidence on the record that the value of Site C capacity is greatly overestimated. As long as capacity already exists in sufficient amounts to satisfy the domestic demand, and it has negligible value in the export market. If it is removed from the alternative portfolio NPV calculation, it must also be removed from the Site CNPV calculation.
11 Which Load Forecast to use?	OIC 244 mandates the use of the June 2016 forecast. The current state of knowledge shows considerably lower load, and accordingly more surplus to sell for a longer time period. The 2016 Mid Load Forecast is no longer the expected load forecast. The alternative portfolios should be modelled using the 2016 Forecast, but a sensitivity case should also show the expected change if updated with the latest information. There is nothing magical about the June 2016 forecast. It was not the one used at the time of Government approval, better information is now available. e.g. the removal of 50-90% of the LNG load (only 130 of the 2800 GWh has any certainty of occurring)

Issue / Concern / Assumption	Comments
12 The treatment of Sunk Costs, Termination and Remediation Costs	These must be dealt with on a basis that is fair and that also recognizes the prudence of any expenditure. For example it is not prudent to incur large expenditures for reservoir clearing or road relocation when there is plenty of time to complete them before 2022, when the reservoir would begin being filled. These expenditures were simply done to rush the project to the 'point of no return', and should be judged as imprudent by the BCUC.

5. CAPACITY AND TRANSMISSION

There seems to be some confusion about the amount of electricity that Powerex can transfer using the 2,500 megawatts of space it has reserved on the interties from the U.S. Pacific Northwest to California. The CEABC does not disagree that over 20,000 GWh of energy could be transferred annually. If there is an available market, this transfer can be around the clock for an entire year. However, most of the attractive times for sales will already be fully taken up by Powerex's existing business.

On the capacity side, Powerex can't transfer more than 2,500 megawatts of generating capacity at any time because this is the amount of transmission capacity it has reserved. The chart below shows that at most times throughout the year BC Hydro has more generating capacity than there is transmission capacity to transfer it to California (assuming there is a market for it). Adding the capacity of Site C to the existing generating capacity of the BC Hydro system (which also includes the Columbia River Treaty Downstream Benefits that Powerex is currently using its transmission to sell to California), won't increase capacity sales to California. There is already enough generating capacity to fill the reserved space especially in the summer which is the peak demand period in California. Adding another 1100 MW will have little or no value. It will simply add to the amount of unsold capacity available.



6. VARIABLE RENEWABLE BACKUP

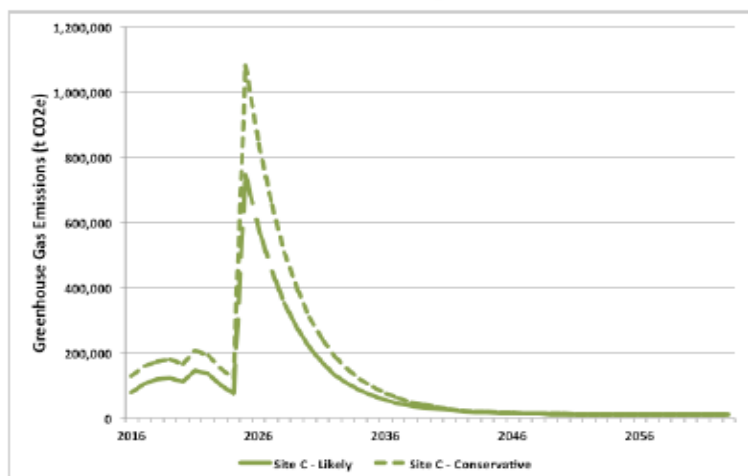
When variable renewable generation is included in the alternative portfolios, it needs to be backed by dependable capacity in order to match the dependable capacity provided by Site C. The CEABC is not in disagreement with BCH on this point. There are a variety of resources that can provide this backup capacity. The following “waterfall” of priorities illustrates some of the options but it is by no means exclusive.

1. Batteries.¹
2. If batteries prove to not be cost effective at the time they are required an increase in peak shaving DSM may be appropriate.
3. If DSM is not cost effective single cycle turbines may be the preferred alternative provided the greenhouse gas emissions are dealt with.

Assumption 21, “Greenhouse gas emissions” says that the Alternative Portfolio and Site C will have similar greenhouse gas emissions. BCH claims that if Site C electricity is exported and it displaces thermal generation in the export market, it is entitled to some sort of offsetting credit to apply against the Site C emissions. There is no basis for this claim and is very similar to the Government of B.C. claiming a carbon offset if LNG produced in B.C. is burned to replace coal fired generation in Asia. It is the jurisdiction where the carbon reduction occurs that must do the proper accounting for that reduction, in order to receive credit for the reduction. The jurisdiction that exports the product does not do any of the proper accounting, and is not entitled to the credit.

The following chart, taken from Exhibit F106-4 (page 82 of 138) shows that the greenhouse gas emissions from Site C will be extremely high in the first few years, as the methane escapes from the rotting vegetation/overburden in the reservoir.

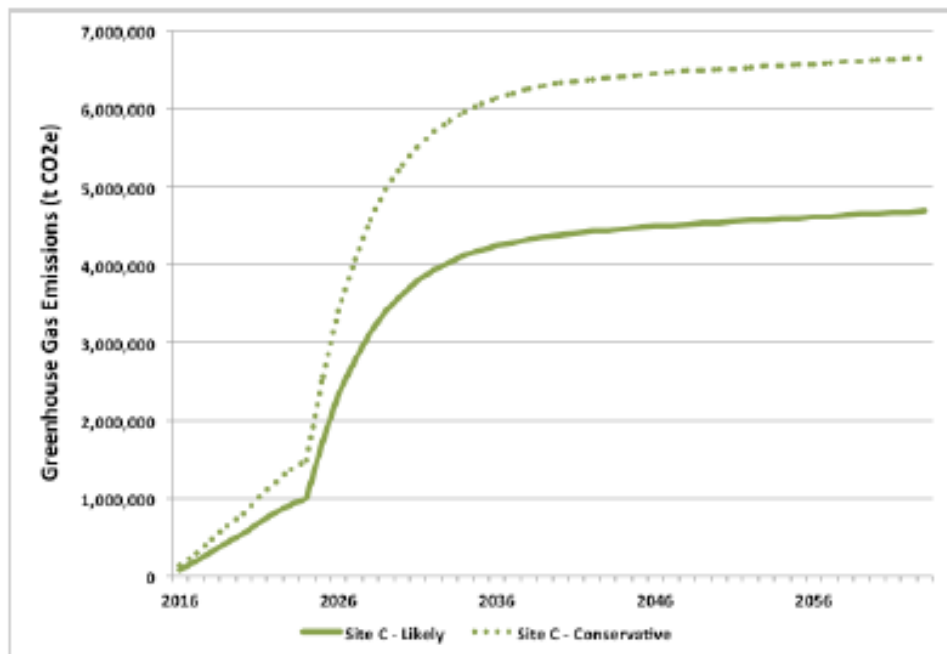
Figure 2: Annual GHG emissions of the Site C Project'



¹ See also <https://www.bloomberg.com/news/articles/2017-03-17/tesla-s-169-million-battery-play-is-just-the-beginning>

The cumulative emissions reach 4 to 6 megatonnes within the first 8 years of operation, as shown on the following chart (F106-4, page 84 of 138):

Figure 3: Cumulative GHG emissions of the Site C Project⁸



If SCGTs were to be used as the backup choice for the first 10 or 15 years, they could easily operate within the limit of emissions set by Site C. As a peaking/backup resource, they only need to operate about 3% of the year, at which rate there would only be about 50 kilotonnes/year of CO2e from 400 MW of SCGT backup. This could be carried on for up to 80 years without exceeding Site C's emissions.

If necessary, the fuel used could be, in whole or in part, bio-fuel or bio-gas which could result in zero greenhouse gas emissions, or carbon offsets could be purchased. There are various options to ensure that the greenhouse gas emissions from the portfolios will be similar to Site C. And these options will likely change over time and don't have to be operational by 2024. One of the benefits of the alternative portfolio is that it can be developed to match the load. This allows for access to advances in technology.

7. SUMMARY AND CONCLUSIONS

Overall BCUC's Alternative Portfolio analysis is reasonable. One big improvement over BC Hydro's analysis comparing Site C to alternative resources is that BCUC's analysis removes several biased assumptions and correctly applies assumptions equally to Site C and the Illustrative Alternative Portfolio.

BC Hydro's financial analysis of Site C was fatally flawed at the time of the final investment decision, primarily due to the inappropriate application of specific financial parameters and the disregard for the transfer of risk. Site C's analysis used a completely inappropriate zero rate of return on equity and 100% debt financing metric. The risk of developing Site C was shuffled over to the taxpayers of B.C. and out of the realm of rational financial analysis. Worse, taxpayers received no compensation for the blind risk thrown upon them. However, the BCUC's review is not about past decisions. The CEABC understands this. OC 244² requires a forward looking comparison of Site C versus the alternatives. The inappropriate burying of risk must not be repeated in this forward looking review. Once is enough.

Despite all the money that has been spent to date, there are alternatives to Site C that are still less expensive. The CEABC has reached this conclusion on the basis of the evidence on record including the BCUC's illustrative Alternative Portfolios. The cost overruns to date, the cautionary warning given by BC Hydro about future contracts such as the civil contract for the generating station and spillway and the comments by Deloitte about project performance all point in the same direction. Based on these and other factors and the experience IPPs have in developing their own projects, Site C will be materially over budget.

All of which is respectfully submitted,

CLEAN ENERGY ASSOCIATION OF B.C

² Section 3(b)(iv)