

**FINAL ARGUMENT ON BEHALF OF  
THE CLEAN ENERGY ASSOCIATION OF  
BRITISH COLUMBIA (“CEABC”)**

**Re: BRITISH COLUMBIA HYDRO and POWER AUTHORITY  
 (“BCH” or “BC Hydro”)**

**WANETA 2017 TRANSACTION  
 (“Transaction”)**

**Project No. 1598933**

**May 17, 2018**

## TABLE OF CONTENTS

<b>I.</b>	<b>EXECUTIVE SUMMARY</b> .....	<b>1</b>
	1. An excessively low Cost of Capital is used for both the Present Value (“Present Value” or “PV”) analysis and the Rate Impact (“Rate Impact” or “RI”) analysis.....	1
	2. An excessively high Long Run Marginal Cost (“LRMC”) is assumed, representing the avoided cost of alternative clean energy resources in the Post-Lease Period.....	1
<b>II.</b>	<b>MORE DETAIL REGARDING THE TWO PRIMARY ISSUES</b> .....	<b>2</b>
	1. An excessively low Cost of Capital is used for both the Present Value analysis and the Rate Impact analysis.....	2
	2. An excessively high cost is assumed for the avoided cost of the alternative clean energy resources in the Post-Lease Period. ....	9
<b>III.</b>	<b>MORE DETAIL RE SECONDARY ISSUES</b> .....	<b>12</b>
	1. The 40-year time horizon of the Transaction is requiring us to make impossible forecasts.....	12
	2. The likelihood that significant additional sustaining or life-extending capital will be needed .....	13
	3. The likelihood that an additional \$200 million will be required to protect against dam overtopping in the event of a Probable Maximum Flood (“PMF”) .....	14
	4. The possibility that the toxic sediment will have to be removed from the reservoir .....	15
	5. Waneta generation is heavily biased to the freshet period and there is no storage to mitigate or reshape the natural stream flows.....	16
<b>IV.</b>	<b>RESPONSES TO BC HYDRO’S FINAL ARGUMENT</b> .....	<b>18</b>
	1. Using the “LRB Gap Approach” vs the “Range of Value Approach” .....	18
	2. Dispatchability and Termination of the Canal Plant Agreement.....	19
<b>V.</b>	<b>Process</b> .....	<b>21</b>
<b>VI.</b>	<b>Conclusion</b> .....	<b>21</b>

# BC HYDRO WANETA 2017 TRANSACTION

## Final Argument by CEABC

### I. EXECUTIVE SUMMARY

CEABC is concerned that BC Hydro's evaluation of this Transaction relies on certain underlying assumptions that CEABC sees as erroneous. There are two principle assumptions, without which the economic values become very weak and even negative. There are also a series of lesser issues that either further downgrade the values or increase the risks.

**The two principle assumptions that CEABC finds most erroneous are:**

- 1. An excessively low Cost of Capital is used for both the Present Value ("Present Value" or "PV") analysis and the Rate Impact ("Rate Impact" or "RI") analysis.**

Both these analyses assume a very low borrowing rate will persist for 40 years, and the Rate Impact Analysis assumes 100% debt financing and a zero return on equity, again persisting for 40 years. These assumptions are unrealistic and they lead to a heavy bias in the valuation of the Transaction.

In general, whenever a firm is evaluating long-term investment decisions, an appropriate cost of capital should reflect the long-term capital structure of the firm, and the long-term costs of both debt and equity. This should apply just as well for BC Hydro as it does for any private-sector firm, and it should apply to both the PV or the RI analysis.

- 2. An excessively high Long Run Marginal Cost ("LRMC") is assumed, representing the avoided cost of alternative clean energy resources in the Post-Lease Period.**

This high cost assumption for alternative energy resources was developed hypothetically and theoretically without realigning the value to current market prices. It is now far out of date, and when this excessively high LRMC is used, it leads to a pronounced exaggeration of the value of any Post-Lease scenarios in which BC Hydro forecasts a deficit in its Load/Resource Balance ("LRB").

**The secondary issues that also concern CEABC are:**

1. The 40-year time horizon of the Transaction is structured with a huge cost at the outset and all the conjectured benefits deferred to the final 20 years. With no energy or capacity benefits forthcoming for 20 or possibly 30 years, a large stake of present dollars must be gambled, based on predictions of loads and

prices 20 to 40 years in the future. Such predictions go well beyond any existing forecasting capabilities.

2. The likelihood that significant additional amounts of sustaining or life-extending capital will be required, both during the Lease-Period and after.
3. The likelihood, made worse by changing climatic conditions, that an additional \$200 million (2018\$) will be required to maintain a standard of dam safety able to withstand the Probable Maximum Flood (“PMF”).
4. The possibility that the toxic sediment will have to be removed and disposed of before any work on the Waneta dam or spillway can be performed or the dam decommissioned.
5. The Waneta facility (“Waneta Facility” or “Waneta”) has minimal storage, and the natural stream flows are very heavily biased to the freshet season. This means that this facility does not contribute to the overall storage and shaping capability of BC Hydro’s system, but rather, it consumes that capability. The Canal Plant Agreement (“CPA”) can be terminated by any party to it, including BC Hydro, at any time after 2035<sup>1</sup>. Termination would relieve BCH of its obligation to provide shaping/smoothing/storage at no cost to any owner of any interest in the Waneta facility including a third party such as Fortis Inc. Unless terminated after 2035, BC Hydro will effectively be providing no-cost storage and shaping to the benefit of all the other parties to the CPA, and in particular Teck Metals Ltd. (“Teck”). This no-cost storage and shaping could represent a significant unacknowledged cost to BC Hydro.

## II. MORE DETAIL REGARDING THE TWO PRIMARY ISSUES

**With regard to the two primary assumptions of concern:**

1. **An excessively low Cost of Capital is used for both the Present Value analysis and the Rate Impact analysis**
  - Both analyses assume the current low government borrowing rate will persist for the whole of the 40 year evaluation period – the Present Value analyses assumes a long term rate of 4%, and the Rate Impact analyses assumes an even lower rate of 3.4% can be achieved for 40 years.

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<sup>1</sup>Exhibit B-8-5. November 15, 2011, CPA”, Section 13.2 “Term” states: “This Agreement will be effective on the date hereof, or such other date agreed by the parties, and will continue in force and effect, unless terminated earlier by the agreement of all parties, until the termination date, not to be less than five years after the date of the notice, set out in a notice given by any party to all of the other parties, at any time on or after December 31, 2030. Section 14.3 of the CPA provides for “Permitted Assignment by an Entitlement Party”. Generally, assignment is restricted to entire “Plants”.

- Both analyses also assume an inappropriately low return on equity will persist for 40 years – a zero return on equity is assumed for the Rate Impact analysis and an 8.75% return on equity is assumed for the Present Value analysis.

**1 A) The impact on the Present Value analysis** -- The use of a more appropriate Cost of Capital will cause a major reduction in the Present Values for all of the potential outcome scenarios calculated for the Transaction.

For the Present Value analysis, BC Hydro used a discount rate of 6%, based on a calculation of its weighted average cost of capital (“WACC”) using 60% debt at a 4% pre-tax interest rate, and 40% equity at an after-tax return on equity of 8.75%.

CEABC agrees that the 60/40 debt to equity ratio is appropriate because it reflects the expected long-term capital structure of the firm<sup>2</sup>. However, the 4% interest rate does not have an adequate premium to reflect the 40-year expected evaluation period. The 8.75% return on equity is an after-tax rate, which should be exchanged for the pre-tax equivalent rate of 11.84%.

Raising the return on equity to 11.84%, by itself will increase the WACC discount rate to 7%, which has a significant diminishing effect on the present values being calculated for the Transaction. Table 8 as originally calculated by BC Hydro’s valuation model, using the 6% discount rate, shows the Present Values for each potential outcome scenario as originally calculated:<sup>3</sup>

**Table 8 Consolidated Value of Transaction**  
(Risky present value to 2018, \$ millions)

Basis for Post-Lease Value	Value of Assets / Lease to BC Hydro					
	Un-risked Lease Period	Default Risk Adj.	Post-Lease Value	Extension Option	Total Value	Value net of purchase
LRMC (Clean)	792	107	1,482	(291)	2,090	887
LRMC (Clean + Gas)	792	64	1,206	(196)	1,865	662
Industrial Tariff	792	n/a	586	(93)	1,285	82
Market Prices (ABB)	792	1	570	(45)	1,317	114
Extrapolated Prices	792	(54)	440	(6)	1,172	(31)

Note the two highlighted values of 887 and 662 which appear to indicate a high net present value (“NPV”) for the first two scenarios.

For comparison, a Revised Table 8 recalculates the NPVs using a 7% discount rate, based on the more appropriate 11.84% pre-tax return on equity:<sup>4</sup>

<sup>2</sup> Cumulative outcome of Orders in Council: 095, March 05, 2014; 097, March 05, 2014; 589, July 28, 2016; and 590, July 28, 2016.

<sup>3</sup> Exhibit B-1, Appendix N, page 29.

<sup>4</sup> Exhibit B-18-4, BCH response to CEABC IR 2.28.1.

Revised Table 8 Consolidated Value of Transaction with 7 per cent Discount Rate  
(Risky present value to 2018, \$ millions)

Basis for Post-Lease Value	Value of Assets / Lease to BC Hydro					
	Un-risked Lease Period	Default Risk Adj.	Post-Lease Value	Extension Option	Total Value	Value net of purchase
LRMC (Clean)	715	79	1,123	(291)	1,626	423
LRMC (Clean + Gas)	715	42	913	(196)	1,474	271
Industrial Tariff	715	(16)	441	(45)	1,096	(107)
Market Prices (ABB)	715	(1)	431	(93)	1,053	(150)
Panel Mid-C Price	715	(16)	360	(56)	1,004	(199)
Extrapolated Prices	715	(48)	330	(6)	991	(212)

Using the more appropriate pre-tax return on equity, the NPVs for first two scenarios (highlighted) have now declined by some \$400 million each, and all the other scenarios are now negative (i.e. indicating a net loss, rather than a net benefit).

This demonstrates the extent to which the assumption of after-tax vs. pre-tax for the appropriate return on equity is a critical underpinning of the over-estimated value of this Transaction.

Those first two scenarios are the ones where the benefits of the Transaction stem from avoiding the cost of purchasing alternative resources some 20 or 30 years in the future. These results are still predicated on an excessively high presumed cost of the alternative energy resources that might be required in 2039 and beyond. In Section 2 below, CEABC deals with what happens if the exaggerated assumption about the cost for those future energy alternatives is corrected.

The other four scenarios show the results in the event that the future load fails to require the full amount of Waneta's energy. In those four scenarios, the surplus energy must be sold at one of several different forecasts of market prices or at BC Hydro's Industrial Tariff. Using the more appropriate 7% discount rate, each of those four scenarios becomes negative, indicating that the Transaction would actually lose value rather than gain value.

This example illustrates how large the impact can be from a simple correction to the rate of return on equity, from the after-tax value (as is used by taxable firms like Fortis) to the more appropriate pre-tax value – the value, in fact, that the non-taxable BC Hydro has always used in the past. This simple correction has reduced the apparent net benefit from the Transaction by approximately \$400 million (by \$464 million in the case of the LRMC (Clean) alternative).

The use of the pre-tax rate of return on equity is not a new concept to BC Hydro. In fact, it is an established practice which dates back at least to 2009, when OIC 074 amended section 4(d) of Heritage Special Direction HC2 to the following:<sup>5</sup>

- (d) achieve an annual rate of return on deemed equity
- (i) for the authority's fiscal years 2009-2010, 2010-2011 and 2011-2012, that is equal to the sum of the following two percentages:
    - (A) pre-income tax annual rate of return allowed by the commission to the most comparable investor-owned energy utility regulated under the *Utilities Commission Act*;
    - (B) 1.63%, and
  - (ii) for any other fiscal year of the authority, that is equal to the pre-income tax annual rate of return allowed by the commission to the most comparable investor-owned energy utility regulated under the *Utilities Commission Act*.

And the calculation to convert the Fortis after-tax rate into BC Hydro's pre-tax rate was described in detail by BC Hydro in Appendix K of its F12/F14 RRA<sup>6</sup>:

**F12/F14 RRA - Appendix K**

1 **Calculation of BC Hydro's**  
 2 **Allowed Rate of Return on Equity (ROE)**

3 BC Hydro calculates its allowed ROE using Terasen's allowed rate of return of  
 4 9.50 per cent (approved by the BCUC Order No. G-158-09 dated  
 5 December 16, 2009) and Terasen's effective income tax rate.

6 Terasen's 2011 rates have now been approved by the BCUC and Terasen's  
 7 effective income tax rates can be calculated as follows (using Terasen's  
 8 approved F2011 income tax calculation):

9  $(\text{Income tax expense} - \text{LCT}^1) / (\text{Accounting income after tax} + \text{income tax}$   
 10  $\text{expense} - \text{LCT}^1)$

11  $(\$32,516 - \$0) / (\$95,140 + \$32,516 - \$0) = 25.47\%$

12 Terasen's allowed after rate of return on equity / (1 - Terasen's effective  
 13 income tax rate)

14  $9.50\% / (1 - 25.47\%) = 12.75\%$

15 BC Hydro's allowed rate of return on a pre-income tax basis is therefore  
 16 calculated as follows:

	(%)
Terasen's allowed ROE on a pre-income tax basis	12.75
Plus effect of OIC No. 074	1.63
BC Hydro's F2012 ROE	14.3

17 BC Hydro's allowed rate of return for F2013 and F2014 is 12.75 per cent.

There is no precedent for BC Hydro to switch from all of its previous practice and suddenly do its analysis using an after-tax return on equity.

<sup>5</sup> [www.bcuc.com/Documents/SpecialDirections/OIC\\_74-2009\\_HC2.pdf](http://www.bcuc.com/Documents/SpecialDirections/OIC_74-2009_HC2.pdf)

<sup>6</sup> [http://www.bcuc.com/Documents/Proceedings/2011/DOC\\_29146\\_B-1-3\\_BCH-Amended-F12\\_F14-RRA.pdf](http://www.bcuc.com/Documents/Proceedings/2011/DOC_29146_B-1-3_BCH-Amended-F12_F14-RRA.pdf) page 1417 of 2780.

**1 B) The consequences for the Rate Impact analysis** – In BC Hydro’s Rate Impact analysis, it presently assumes that the initial 100% debt financing will persist for 40 years, and will remain at 3.4%. Even though it assumes a return on equity for its NPV analysis, when it comes to the Rate Impact analysis BC Hydro contends that it no longer has any obligation to pay any return to the shareholder for its invested equity. This ignores the fact that BC Hydro’s Revenue Requirements does include an amount for the shareholder’s return on equity, and will continue to do so.

It may be true that under the provisions in the 10 Year Rates Plan, the calculated after-the-fact return on equity may not be exactly 11.84% every year, and the rate may be declining over time. Nonetheless, the Revenue Requirement does include an amount for that expected return<sup>7</sup>. Furthermore, it should be assumed that all assets must bear a pro-rata share of that return obligation, not merely the old assets, with new assets given a free ride.

In its response to a CEABC IR, BC Hydro provided the following table, which shows the effective return on equity predicted under the assumptions in the F2017-F2019 Revenue Requirements:<sup>8</sup>

\$ million		F2017-F2019 RRA Reference	F2017 RRA Plan	F2018 RRA Plan	F2019 RRA Plan
Forecast Average Shareholder Equity	A	Appendix A Schedule 9.0 Line 9 (average)	4,707.3	5,178.1	5,762.7
Forecast Distributable Surplus	B	Evidentiary Update (Exhibit B-2)	684.0	698.0	712.0
Forecast Distributable Surplus as a % of Average Shareholder Equity	C=B/A	Calculated	14.5%	13.5%	12.4%

As can be seen from this table, the rates for F17-F19 are actually higher than 11.84%, but they are declining. **For as long as the government continues to peg BC Hydro’s distributable surplus at \$712 million per year, the return on equity will continue to fall – in fact, it will descend to a much lower level than the BCUC has already determined to be a fair and reasonable return for a comparable private-sector investor. But, nonetheless, a return on equity will continue to exist, and it will continue to have an impact on rates.**

Under the terms of the 10 Year Rates Plan, once the target 60/40 debt to equity ratio is achieved, the payment to the Province will resume. At that time, or perhaps even sooner, the future government will be under considerable pressure from its rising burden of debt, and will very likely restore its return on its equity investment to a level judged as reasonable by the independent BCUC. In fact, the

<sup>7</sup> Cumulative outcome of Orders in Council: 095, March 05, 2014; 097, March 05, 2014; 589, July 28, 2016; and 590, July 28, 2016.

<sup>8</sup> Exhibit B-20, BCH response to CEABC IR 2.23.3

sooner this restoration is done the sooner the target 40% equity can be reached, because the annual distributable surplus and corresponding contributions to Retained Earnings will increase above \$712 million.

BC Hydro contends that it will finance the Waneta Transaction with 100% debt<sup>9</sup>:

*“...BC Hydro is assuming the purchase price will be 100 per cent financed by a mix of short and long-term debt... BC Hydro is a borrower, as a result BC Hydro is assumed to borrow 100 per cent of the funding required for the Waneta 2017 Transaction.”*

It further explains that<sup>10</sup>:

*“... it is not the case that Government committed to contribute 40% of BC Hydro’s capital expenditures in the form of equity. The Government... will receive a restricted, and then zero dividends from BC Hydro until it achieves a debt:equity ratio of 60:40. The lower dividends will result in an increase in BC Hydro’s forecast equity (and available cash) over time.*

*BC Hydro does not allocate the forecast increase in equity (and available cash) to specific past, current or future capital projects. The effect of having higher forecast equity (and available cash) is that required borrowings will be lower than they otherwise would be.”*

This last statement means that, gradually over time, BC Hydro’s capital structure will change to a 60/40 debt/equity proportion, which means that every project will be effectively financed at 60/40 in the long term. Regardless of whether it was initially financed by 100% debt, equity will gradually replace 40% of that debt.

In the same way as for the Present Value analysis, the use of the proper Cost of Capital (which includes target 40% portion of equity and the BCUC-determined reasonable return on that equity<sup>11</sup>) will eliminate the illusory benefit to ratepayers produced by the assumption of perpetual 100% debt financing.

BC Hydro’s original Rate Impact analysis is shown in Figure 6 below<sup>12</sup>. The figure shows rates declining from zero (zero being no incremental impact), with a huge reduction at the end of the Lease Period in 2039, due to the excessively high assumption about the avoided cost of alternatives at that time.

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<sup>9</sup> Exhibit B-9, response to CEABC IR 1.10.3

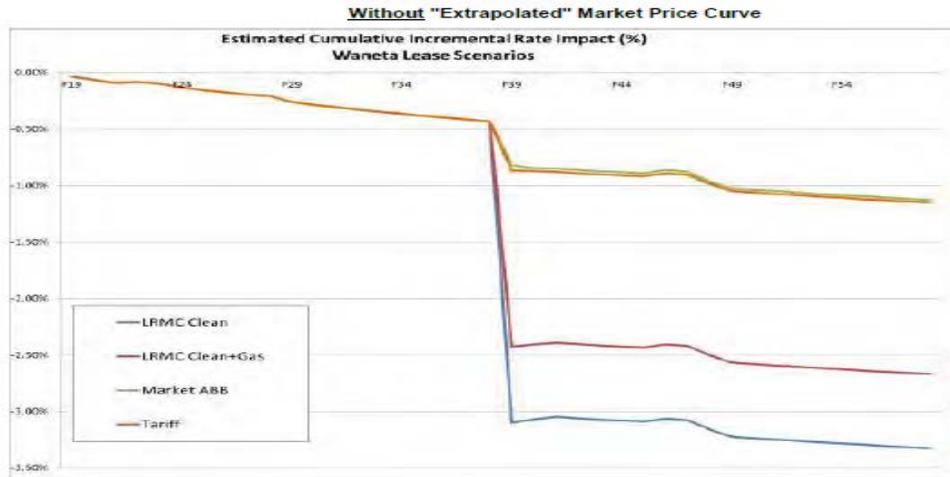
<sup>10</sup> Exhibit B-20, response to CEABC IR 2.23.6

<sup>11</sup> See Exhibit C6-8, Slide 6 where it says in part: “Exhibit B-15, BCSEA IR 2.64.1 outlines the statutory framework underlying the 2013 10 Year Rates Plan, which includes various Government Directives and Orders in Council (OIC) concerning among other matters, BC Hydro’s rate increases and dividend payments to the Province; and “The Panel is concerned that if BC Hydro does not stay on track in terms of clearing the RSRA by 2024, ratepayers will see higher rate increases than is anticipated in the 10 year rate plan and **reasonable returns to the shareholder** (emphasis added) may not be possible without affecting BC Hydro’s long term sustainability.”

<sup>12</sup> Exhibit B-1, Page 610 of 639, Appendix N, Sub-Appendix N-1, Business Case Figures

## The original Figure 6 from Appendix N

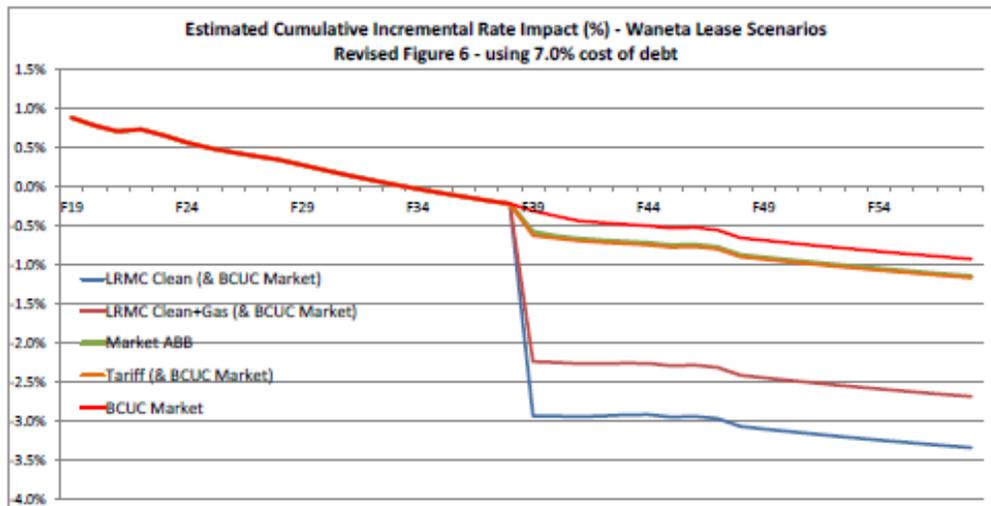
Figures 6 and 8 from Waneta 2017 Business Case:  
Cumulative Incremental Rate Impact - Core  
Scenarios



To illustrate the impact of including an appropriate return on equity in the Rate Impact analysis, CEABC requested that BC Hydro recalculate Figure 6 assuming a weighted average cost of capital of 7% in place of the 100% debt assumption at 3.4%. The revised Figure 6 below shows the result of that recalculation:

### The revised Figure 6,<sup>13</sup> reflecting a more appropriate cost of capital

Revised Figure 6



**The significant change to note in comparing these two versions of Figure 6 is that the entire incremental impact line is shifted upwards. It is now greater than zero until F2035.** This indicates that rates would be incrementally higher in the near term, in exchange for possible rate decreases 20 years in the

<sup>13</sup> Exhibit B-18-4, response to CEABC IR 2.28.2

future. However, the large projected rate decreases (shown in F2039) are entirely the result of the excessively high cost of alternatives assumed in the analysis. If a more realistic cost is assumed for those alternatives, that cost will be so close to the UEC of the Waneta facility that the above figure would show no downward step in F2039. Section 2 immediately below deals with the necessary adjustment to the cost of alternatives.

**2. An excessively high cost is assumed for the avoided cost of the alternative clean energy resources in the Post-Lease Period.**

**The impact on the Present Value analysis --** The avoided cost of the alternative resources is referred to as the Long Run Marginal Cost (“LRMC”), and BC Hydro’s analysis assumes an unrealistically high cost for those alternatives, and this artificially inflates the NPVs calculated for those scenarios where BC Hydro has a Load/Resource Balance (“LRB”) deficit in the Post-Lease period – namely, the first two scenarios listed in Table 8, “LRMC (Clean)”, and “LRMC (Clean + Gas)”.

In its evidence,<sup>14</sup> and in its responses to IRs on that evidence,<sup>15</sup> CEABC observed that the assumed LRMC values need to be realigned with current market prices, which are very much below BC Hydro’s assumed values, and trending downward into the future. When this is done, the remaining NPVs of the Transaction scenarios are greatly diminished or eliminated.

To illustrate the full impact of this change, CEABC requested that BC Hydro produce the revised version of Table 8 shown below. The NPVs in this revised Table 8 have been recalculated using a \$45 LRMC (which value was derived from the recent Alberta market prices<sup>16</sup>), in place of the original \$106 assumption<sup>17</sup>:

**Table 8 Consolidated Value of Transaction  
(Risky present value to 2018, \$ millions)**

Basis for Post-Lease Value	Value of Assets / Lease to BC Hydro					
	Un-risked Lease Period	Default Risk Adj.	Post-Lease Value	Extension Option	Total Value	Value net of purchase
LRMC (Clean)	792	107	1,482	(291)	2,090	887
LRMC (Clean + Gas)	792	64	1,206	(196)	1,865	662
Industrial Tariff	792	n/a	586	(93)	1,285	82
Market Prices (ABB)	792	1	570	(45)	1,317	114
Extrapolated Prices	792	(54)	440	(6)	1,172	(31)

<sup>14</sup> Exhibit C6-6.

<sup>15</sup> Exhibit C6-7, in particular CEABC’s response to BCUC IR 1.1.

<sup>16</sup> See Appendix B for the derivation of this market-aligned LRMC.

<sup>17</sup> Exhibit B-18-4, BCH response to CEABC IR 2.28.3.

**Revised Table 8: Consolidated Value of Transaction Using \$45/MWh Energy LRMC  
(Risky present value to 2018, \$ millions, 6% discount rate)**

Basis for Post-Lease Value	Value of Assets / Lease to BC Hydro					
	Un-risked Lease Period	Default Risk Adj.	Post-Lease Value	Extension Option	Total Value	Value net of purchase
LRMC (Clean)	792	52	807	(62)	1,587	384
LRMC (Clean + Gas)	792	9	530	10	1,341	138
Industrial Tariff	792	(17)	584	(45)	1,313	110
Market Prices (ABB)	792	1	570	(93)	1,269	66
Panel Mid-C Price	792	(17)	477	(56)	1,195	(8)
Extrapolated Prices	792	(54)	440	(6)	1,172	(31)

The significant change to note in comparing this revised Table 8 to the original version, shown previously, is that this simple adjustment of the LRMC, to bring it into alignment with current market prices and the forecast of future price trends, has reduced the apparent NPVs of the first two scenarios by \$503 million and \$524 million respectively.

CEABC cautions that all of these analyses rely on forecasts of either loads or prices or both, that are so far in the future (2039 and beyond) that no-one, including CEABC, can have any degree of confidence in those predictions. However, the \$45 Energy LRMC is more likely to be closer to reality than BC Hydro's original \$106 value, since it is based on current market prices and currently observed price trends.<sup>18</sup> Whereas the original \$106 Energy LRMC was derived theoretically and had not been realigned with rapidly declining market prices.

When these \$500 million reductions are combined with the ~\$400 million reductions that result from using the proper pre-tax return on equity, and the consequential 7% discount rate, the original Table 8 Present Values for the first two scenarios (of \$887 and \$662 million) will be effectively eliminated. That is to say, the NPVs will be reduced to negative values, i.e. the previously alleged positive benefits no longer exist.

The other four scenarios don't really depend on the LRMC adjustment, but they became negative with the simple change of the discount rate (in Section 1). Hence all of the possible outcome scenarios are now showing negative NPVs.

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<sup>18</sup> The derivation of the \$45 Energy LRMC is described in Exhibit C6-7, CEABC's response to BCUC IR 1.1. It is quite straightforward and linked to actual market prices established in the recent Alberta REP. The average Alberta Price of \$37 was converted to a levelized price of \$32, then inflated by 40% to allow for possible higher site costs in BC, then increased to \$50 to allow for transmission to the Lower Mainland. Finally, it was deflated to \$45 to reflect the downward trend of real prices, which suggest that prices may fall by 25-30% over the next 20 years.

None show a positive NPV when the proper assumptions are used for these two critical variables.

In other words, the combination of these two erroneous assumptions i.e. the after-tax rate of return on equity, and the excessively high assumed future cost of alternatives, has added more than \$900 million to the alleged value of the Transaction, that is fundamentally an illusion. It depends entirely on the use of two highly flawed assumptions, and it vanishes as soon as the more appropriate assumptions are used.

That is to say, that with the proper assumptions, the present value of the possible future benefits is not worth the initial purchase price of \$1.2 billion, no matter which potential outcome scenario should come to pass.

### III. MORE DETAIL RE SECONDARY ISSUES

#### 1. The 40-year time horizon of the Transaction is requiring us to make impossible forecasts.

The Transaction is structured with a huge cost at the outset and all the conjectured benefits deferred to the final 20 years. With no energy or capacity benefits forthcoming for 20 or possibly 30 years, a large stake of present dollars must be gambled, based on predictions of loads and prices 20 to 40 years in the future. Such predictions go well beyond any existing forecasting capabilities.

#### Forty Year Forecasts – The Problem is Accuracy

The following graph shows the difficulties BC Hydro has experienced in trying to achieve accurate load forecasts<sup>19</sup>:

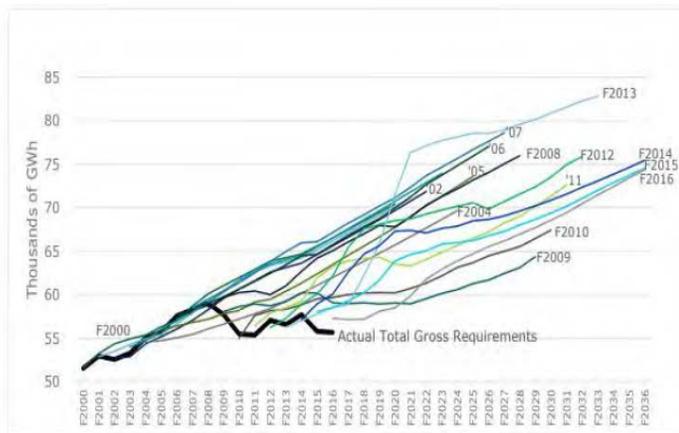


Figure 3: Total Gross Requirement Forecast Models Between 2000 and 2016 (with DSM)

The dark line shows the actual Gross Requirements, while the multitude of other lines show the forecasts by vintage year. It's painfully obvious that, beyond a very few years in the future, the accuracy of the forecasts is non-existent. When it is clear that even 5-year forecasts are beyond our current capabilities, to expect any degree of confidence in forecasts 30 or 40 years in the future is risible.

Interest rates are assumed to remain at 3.4% for 40 years<sup>20</sup> and the return on equity at 0.0% for 40 years. In reality interest rates are not fixed for 40 years.

<sup>19</sup> Exhibit B-24, BCUC Panel IR1.1.1.

<sup>20</sup> Exhibit B-8, BCH response to BCUC IR 1.23.2: "BC Hydro determines borrowing requirements on a portfolio basis and uses a mix of long and short term debt. BC Hydro does not do project-specific financing. BC Hydro's borrowing is done through the B.C. Government. BC Hydro targets 15 per cent variable and 85 per cent long term debt. The 3.4 per cent financing rate was based on forecast fiscal 2019 interest rates provided by the Ministry of Finance. The blended 3.4 per cent financing rate was calculated assuming borrowings of \$550 million at 10-year B.C. Government bond rates, \$550 million at 30-year B.C. Government bond rates and \$140 million at short term (commercial paper) rates. See also Exhibit B-24, BCH response to BCUC Panel IR 1.2.3.

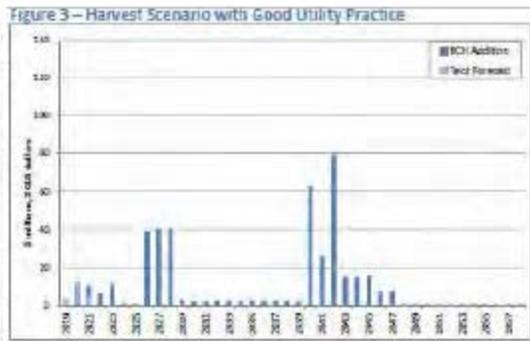
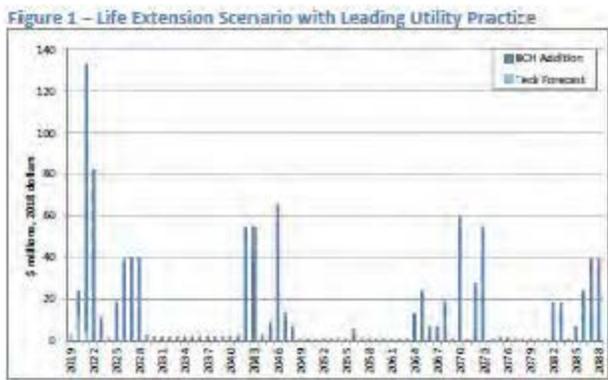
In an environment of rapid technological change, forecasts of market prices looking forward 20 and 30 years will be equally as unreliable as load forecasts.

This Transaction requires BC Hydro to make a huge wager in present dollars, based on predictions that have been shown to be notoriously unreliable even in the short term.

The Transaction is essentially calling for the pre-building of a very expensive asset 20-30 years in advance of the need, however likely that need may be<sup>21</sup>.

**2. The likelihood that significant additional sustaining or life-extending capital will be needed**

BC Hydro’s Business Case analysis<sup>22</sup> contained the following three charts showing three possible capital expenditure schedules for Waneta over the next 40 to 70 years, namely Life Extension with Leading Utility Practice, Harvest Scenario with Leading Utility Practice, and Harvest Scenario with Good Utility Practice:



In its response to a CEABC IR, BC Hydro provided the numeric data used for these charts, and a summation of those values produced the following results<sup>23</sup>:

<sup>21</sup> Section IV. 1. Using the ‘LRB Gap Approach’ vs the ‘Range of Value Approach’.

<sup>22</sup> Exhibit B-1, Appendix N, Sub-appendix B.

<sup>23</sup> Exhibit B-20, response to CEABC IR 2.19.1.

(in Real 2018\$)	20 YR	40 YR	PV@3.9%	PV@3.9%
	Sum	Sum	20 Yr	40 Yr
Harvest, Good Utility Practice	190.9	440.5	137.7	235.1
Harvest, Leading Utility Practice	351.7	440.5	276.5	308.3
Life Extension	406.4	644.2	325.0	410.4
Life Extension lifetime sums=		1,220.0		461.3

In its Final Argument, BC Hydro states that:<sup>24</sup>

*“BC Hydro’s NPV analysis already assumes a ‘leading utility practice’ approach to capital investment, and this a higher degree of capital investment than the standard ‘good utility practice’.”*

The question is, how much can Teck be expected to pay. CEABC is concerned that Teck is unlikely to agree to pay more than the estimated costs for the first 20 years of “Good Utility Practice”, which amounts to \$191 million (in 2018\$, with a present value of \$138 million). On the other hand, BC Hydro will most likely want to spend the estimates for “Life-extending Leading Utility Practice”, which amounts to \$406 million in the first 20 years (in 2018\$, with a present value of \$325 million).

The difference between these two estimates will become BC Hydro’s responsibility, which is \$216 million of additional costs (\$325 - \$138 = \$187 million in present value) during the first 20 years. If BC Hydro’s analysis has not provided for this amount of extra capital spending, then the present values of all the outcome scenarios need to be reduced by \$187 million.

### **3. The likelihood that an additional \$200 million will be required to protect against dam overtopping in the event of a Probable Maximum Flood (“PMF”)**

The Waneta spillway cannot pass the Probable Maximum Flood and an additional \$200 million<sup>25</sup> may be required to protect against dam overtopping<sup>26</sup> which would be in the order of 3.1 metres<sup>27</sup>. All the upstream dams can pass the PMF. In 2009<sup>28</sup> Klohn Krippen Berger said the following:

<sup>24</sup> BC Hydro Final Argument, paragraph 117 (b), page 47

<sup>25</sup> Exhibit B-1, Appendix N, page 32 of 90.

<sup>26</sup> Exhibit B-9, BCH response to CEABC IR 1.7.4 which states in part: “...In the case of Waneta, there is the additional risk of overtopping due to mis-operation of any of the spillways associated with the upstream dams, and this in general would make the likelihood of overtopping Waneta greater than at the other BC Hydro dams.”

<sup>27</sup> Exhibit B-9-2, BCH response to CEABC IR 1.7.1 and the attachment: “Klohn Crippen Berger report entitled Technical Due Diligence, Condition Assessment and Capital Plan Review”, page 40.

<sup>28</sup> Klohn Crippen Berger report pages iii and iv.

*“Waneta Dam is currently rated as a High Consequence dam with respect to dam safety, under the CDA dam safety guidelines, whereas Seven Mile Dam upstream of Waneta is Very High Consequence. Waneta has not undergone a dam safety review since the 2007 CDA dam safety guidelines were issued. After a proposed seismic upgrade (anchoring the dam) is implemented. Waneta Dam would just be stable under IDF conditions, implying that the dam is not stable under PMF conditions. Should Waneta be raised to a Very High (1999 CDA) or Extreme (2007 CDA) Consequence category, significant expenditures may be required to address issues associated with the PMF (additional anchorage of the dam for stability; increased spillway capacity, if overtopping of the dam is considered unacceptable).”*

Klohn Crippen Berger made comments elsewhere in its report about the PMF<sup>29</sup>.

In response to an IR<sup>30</sup>, BC Hydro said:

*“The dam currently has a High Consequence classification under the BC Dam Regulations. The regulations take precedence over any past (1999) or current (2013) Canadian Dam Association guidelines.*

*However, the recent completion of the Waneta Expansion powerhouse has increased the consequences of a Waneta Dam failure. Based on loss of life criteria, the dam remains a “high” consequence structure, however, it is unclear whether the total cost to replace all structures in the inundation zone, and the potential economic loss of the train bridge used by Teck for delivery of concentrate to their smelter, could result in the dam becoming classified as a Very High Consequence dam in future dam safety review.”*

Not much has changed since the CEABC raised the issue of the inability of the spillway to pass the PMF in its' Final Argument in the 2010 Waneta proceedings<sup>31</sup>. By acquiring an additional two third interest in Waneta, BCH would be accepting all the liability associated with the Waneta dam being overtopped by the PMF.

#### **4. The possibility that the toxic sediment will have to be removed from the reservoir**

In a response to a BCUC IR BC Hydro<sup>32</sup>, readily admits there is Site contamination and investigations are preliminary:

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<sup>29</sup> See Section 6.3, pages 50-51 of 124 and pages 52-54.

<sup>30</sup> Exhibit B-9, BCH response to BCSEA IR 1.46.3.

<sup>31</sup> Pages 24-26. CEABC also pointed out that there may be slag in the Waneta concrete, page 26, and no seismic assessment of the powerhouse has been completed, pages 26 and 27.

<sup>32</sup> Exhibit B-8-2, BCH response to BCUC IR 1.48.1.

*“The major pollution related environmental condition associated with the land/facility relates to site contamination. The overall site and surrounding area is contaminated with metals from over 100 years of major lead and zinc smelting at Trail and mining in an area naturally rich in mineral deposits. Contaminated site investigations to date are preliminary and in regard to portions of the facility. However they have identified metals in soil/sediment over applicable site standards. The reports indicate that site contamination may also have resulted from past activities within the Waneta area such as from dam construction or railway loading and unloading for industrial materials and products along sections of Highway 22A, or potentially from past offsite industrial activities within the Columbia River watershed and from metals mine formerly located upstream of Waneta Dam on the Pend d’Oreille watershed.*

*Please also refer to BC Hydro’s responses to CEABC IR 1.7.6.”*

It also admits<sup>33</sup>:

*“The Remediation Covenant does not cover contaminated sediment in the reservoir as it cannot be solely attributed to Teck.”*

Not much has changed since the CEABC raised the issue of toxic sediments in its’ Final Argument in the 2010 Waneta proceedings<sup>34</sup>. By acquiring an additional two third interest in Waneta, BCH would be accepting all the liability associated with toxic sediments not solely attributable to Teck and subject only to BC Hydro’s ability to find the original polluter. This liability would arise if work is required on the dam, spillway or if Waneta is decommissioned<sup>35</sup>.

## **5. Waneta generation is heavily biased to the freshet period and there is minimal storage to mitigate or reshape the natural stream flows**

BC Hydro is using other system resources to smooth and reshape the natural generation profile. Waneta is not contributing to system storage or shaping capabilities.

The following graph<sup>36</sup> clearly shows that the natural unshaped Waneta generation is heavily biased to the freshet period and there is no storage to mitigate or reshape the natural stream flow:

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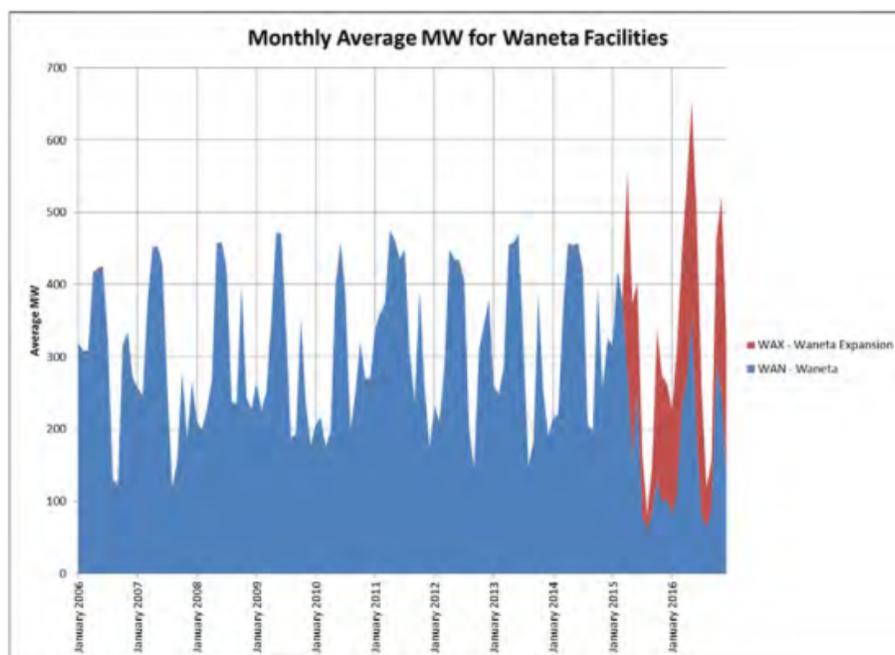
<sup>33</sup> Exhibit B-8-4, page 3 of 4, heading “3 Errata”.

<sup>34</sup> Pages 18-23.

<sup>35</sup> Exhibit B-1, pages 4-19 and 20, Business Case, pages 33-48; Appendix K, page 2.

<sup>36</sup> Exhibit B-8-2, BCH response to BCUC IR1.43.3.

**Figure 2 Monthly Average MW for Waneta Facilities**



**Figure 2 shows the average MW for the Waneta Facilities over each month. This chart shows the seasonality of the generation with a peak typically occurring in the spring and summer due to the spring runoff, and the lowest average generation occurring during the winter. The monthly average ranges from 119 aMW to 475 aMW. After the Waneta Expansion Project start-up the average range is lower from 59 aMW to 356 aMW.**

Freshet dominated generation consumes system shaping capability as evidenced by BC Hydro's response to a CEABC IR<sup>37</sup>:

*“The wide variations in the physical generation arise from the coordinated dispatch of Waneta and the Waneta Expansion Project. They are greatly reduced from Teck’s load perspective by the terms of the CPA which provide a fixed monthly entitlement. The entitlement energy can be further smoothed through the use of the CPA seasonal exchange accounts and +/-7 per cent flexibility, to the point where in a normal year with no outages Teck is able to meet their smelter load without market purchases.”*

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<sup>37</sup> Exhibit B-20, BCH response to CEABC IR 2.26.

## IV. RESPONSES TO BC HYDRO'S FINAL ARGUMENT

CEABC will not be replying to all the matters raised in BCH's Final Argument ("Final Argument") but the absence of a response does not indicate that CEABC is in agreement with any particular matter.

### 1. Using the "LRB Gap Approach" vs the "Range of Value Approach"

In its Final Argument BCH takes the position that if the Commission Panel were to place reliance on the LRB Gap Approach, then that would obligate it to use a specific previously "approved" load forecast. BC Hydro states:<sup>38</sup>

*"In light of the foregoing, BC Hydro submits that if the Commission were to analyze the Waneta 2017 Transaction on the basis of the LRB Gap Approach, it would be obliged to define the gap in terms of BC Hydro's mid-level load forecast to lawfully account for BC Hydro's self-sufficiency obligations. Whether the load forecast is the one of the 2013 IRP, or the RRA Forecast based on the 2013 IRP, the need for Waneta would be made out."*

CEABC does not agree with this position. Both of these referenced forecasts are for a period of 20 years. Their end dates fall far short of the date when the initial term of the Lease Period expires in 2038. Or, if Teck exercises its right to extend the Lease, it would be 2048 before the remaining two thirds of the electricity would be available for sale by BC Hydro to its customers.

The BCUC is not bound to use the "authority's mid-level forecasts of its energy requirements and peak load" because these forecasts do not extend to 2038 and beyond. The BCUC is free to make whatever determinations it judges to be appropriate with respect to energy and peak load requirements after 2038.

As noted elsewhere in CEABC's Final Argument, any forecast of loads or prices 20 or 30 years hence will have an incredibly low degree of accuracy.

Nonetheless, the Commission has shown an interest in understanding what possible loads might materialize within a 20 to 30 year time frame, and which could possibly be served by the Waneta energy and capacity.

In CEABC's view, there are many new loads that could possibly materialize over the next 20 to 30 years. In fact there are many new loads that should materialize, if B.C. is to meet our Provincial and Federal climate change policy commitments. These potential new loads will likely include:

- New LNG plants on the north coast
- The electrification of the north-east gas fields

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<sup>38</sup> BC Hydro's Final Argument, page 39, paragraph 98.

- Massive new data-centres to serve internet-based industries
- The electrification of mines and mineral processing plants
- The electrification of transportation
- The electrification of heating

However, even if these loads do materialize, they will still be largely irrelevant to the evaluation of this Transaction. The reason is quite simple. Any new loads that do materialize will already be better served by other resources.

If, for example, a new LNG plant should come on line in 2026, and it requires 10,000 GWh per year, that load cannot wait around until 2039 to find out if it can be served by Waneta's energy. In fact, it could not be reliably served by energy from Waneta or Site C without the twinning of the transmission line from Williston substation to the coast. It will, therefore, need to be served by other resources – resources that can be more quickly developed in response to the loads that arise, which might include wind, solar and battery resources in northern B.C., located more proximally to those loads to minimize the need for major transmission expansions.

Even if a new load is scheduled to arise in 2038, exactly when Waneta's energy might be available, BC Hydro cannot commit to serving that load with Waneta's energy, because it cannot control whether Teck may extend the Lease Period, and Waneta's energy may not be available for another 10 years. BC Hydro will have no choice but to plan on serving that load with other, more flexible resources.

The same would apply to any new loads arising any time between now and 2049, which is why it is a totally fruitless task to devote a lot of time and effort to forecasting the countless possibilities. The vastly better solution will lie in developing a portfolio of flexible resources, which can be brought on line more quickly and located more appropriately, to respond to the needs that do arise.

## **2. Dispatchability and Termination of the Canal Plant Agreement**

In its Oral Presentation, CEABC observed that the CPA might only extend to 2035. It noted that in the preamble to this agreement the following reference can be found:

*“G. The Province entered into an agreement with Teck made as of May 18, 1994 (the “Benefit Extension Agreement”) whereby the Province agreed that Teck would continue to receive the benefits of the Original Canal Plant Agreement until December 31, 2036.”*

This suggested that the benefits available under the CPA to Teck were of limited duration but there was no such limiting provision in the body of the CPA. On

further investigation CEABC discovered that any party to the CPA can terminate it by providing 5 years advance notice which would not be effective until after December 31, 2035<sup>39</sup>. As set out elsewhere in this Final Argument<sup>40</sup> BC Hydro will effectively be providing no-cost storage and shaping to Teck after 2035 if it does not exercise its option to terminate.

Although BC Hydro did not explicitly disclose this termination right in its Application or responses to IRs, it did confirm it in its Final Argument<sup>41</sup>. BC Hydro went on to assert that if CPA was terminated and then not replaced that the benefits of co-ordinated operation of the hydro developments in the region would be lost. It provides no evidence of these benefits with respect to the Waneta facility and given the generation profile of Waneta and the absence of storage, it is extremely unlikely it can. To end its current obligation under the CPA to Teck, BC Hydro can terminate the CPA and then enter into a new agreement with the other parties provided it can prove to the BCUC that these benefits actually exist.

BC Hydro claims that the BCUC does not have any regulatory oversight over the CPA. Assuming this is true, this does not mean that the BCUC would not have any oversight over any replacement agreement amongst the owners of the hydro developments in the region.

BC Hydro further asserts that:

*“But even if one makes that assumption, BC Hydro’s CPA obligations in the case of Teck, effectively back-stopped by the COA. Under Section 17 of that agreement BC Hydro and Teck are obliged to negotiate a new arrangement that continues the basic concept of the CPA, namely an entitlement obligation in exchange for actual output (including the incremental benefits of coordinated operation). Importantly the term of the COA is 900 years. It follows that by entering into the 2017 transaction BC Hydro, “buys back” its CPA entitlement obligations regardless of the continued existence of the CPA.”*

BC Hydro would have to seek regulatory approval from the BCUC for any regulated services it provides e.g. shaping and storage pursuant to any agreement made pursuant to Section 17 of the Co-Ownership and Operating Agreement or COA. At which point the assumption is that it would have to prove that there are incremental benefits of coordinated operation. The receipt of this approval is not a given. Section 17 becomes operable on the provision of notice to terminate the CPA.

In relation to the Co-Possessors and Operating Agreement or COPOA, the proposed successor to the COA, the Application says:

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<sup>39</sup> See footnote 1 of this Final Argument.

<sup>40</sup> Executive Summary, sub-heading: “The secondary issues that also concern CEABC are – #5”.

<sup>41</sup> Page 49.

*“Key elements of the COA, whereby BC Hydro and Teck are co-owners, will be carried forward in new agreements reflecting the new co-possessors” relationship;”*

Appendix N of the Application is the draft COPOA and Section 17 contains extensive provisions with respect to termination of the CPA including arbitration. According to BC Hydro, they are essentially the same provisions as in the COA<sup>42</sup> but CEABC has not done a direct comparison. If the BCUC approves the Waneta Transaction and directly or indirectly the COPOA, it should make it clear that the COPOA and in particular Section 17 is subject to continued regulatory oversight, including any agreement with respect to Teck’s entitlement to capacity and storage and any decision of an arbitrator.

Clearly the cost to BC Hydro of continuing shaping and storage to Teck beyond 2035 has not been included in the financial analysis of the Waneta Transaction.

## **V. Process**

In its Final Argument, BC Hydro says<sup>43</sup>:

*“In this final argument, BC Hydro provides a high-level response to the main points of the CEABC oral argument; it will provide a more fulsome written reply argument on May 24, 2018 pursuant to Appendix A of Commission Order No. G-70-18.”*

CEABC has no objections to the above provided BC Hydro specifically replies to CEABC’s Final Argument and does not take the liberty of introducing any new argument. CEABC has no opportunity to reply to any new argument introduced by BC Hydro.

## **VI. Conclusion**

CEABC supported, with caveats, BC Hydro’s application to the BCUC for approval of the 2010 Waneta transaction. It does not support its application for approval of the 2017 Transaction and urges the BCUC to reject it.

BC Hydro’s financial analysis is fundamentally flawed because it does not consistently include a reasonable return on equity. The cost of equity is used to account for risk. When the cost of equity is given a value of zero, it is equivalent to saying there is no risk associated with the Waneta Transaction.

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<sup>42</sup> Exhibit B-1, Appendix G, Comparison Table: Co-Possessors and Operating Agreement.

<sup>43</sup> BC Hydro Final Argument, page 4, paragraph 8 (b).

Despite the BCUC's findings in the Site C process, BC Hydro uses an inordinately high cost for other renewable generation such as wind and solar. And storage technology such as batteries is constantly improving.

In its Application, BC Hydro fails to recognize the rapid changes in price and technology of the alternatives.

Waneta can best be characterized as another old hydro project that BC Hydro already has many of in its portfolio. They are expensive to upkeep and in the case of Waneta there are the added problems such as a spillway that cannot pass the PMF and toxic sediments in the reservoir. CEABC identified these problems in 2010 but in the interim, BC Hydro has done very little to properly quantify the associated risks. Instead it wants to increase its exposure to these risks.

BC Hydro's financial analysis is predicated on forecasts that are so distant as to be almost meaningless. BC Hydro would be far better off if it took advantage of the flexibility associated with the new and cost effective alternatives to match increases in load instead of acquiring an ageing asset 20-30 years in advance of projected demand.

All of which is respectfully submitted.