

**ADDENDUM: ANALYSIS UPDATE BASED ON DATA AS OF OCTOBER 2018**

To reflect the time-sensitive nature of evaluating ongoing infrastructure projects, we reviewed the assumptions on go-forward costs, cost of capital and fuel prices using information as of October 2018. Using the most recently available data, LCOEs for completing Site C fell from \$100.41/MWh to \$93.44/MWh compared to updated current and deferred replacement LCOEs of \$86.67/MWh and \$83.49/MWh, respectively. Keeyask’s completion LCOE fell from \$64.89/MWh to \$56.85/MWh compared to updated current and deferred replacement LCOEs of \$80.91/MWh and \$61.40/MWh respectively. For Muskrat Falls, its completion LCOE fell from \$59.25/MWh to \$52.67/MWh. Figure 1 summarizes the changes in table form and graphs the deferred replacement scenario.

**Figure 1: Updated LCOE Comparison**

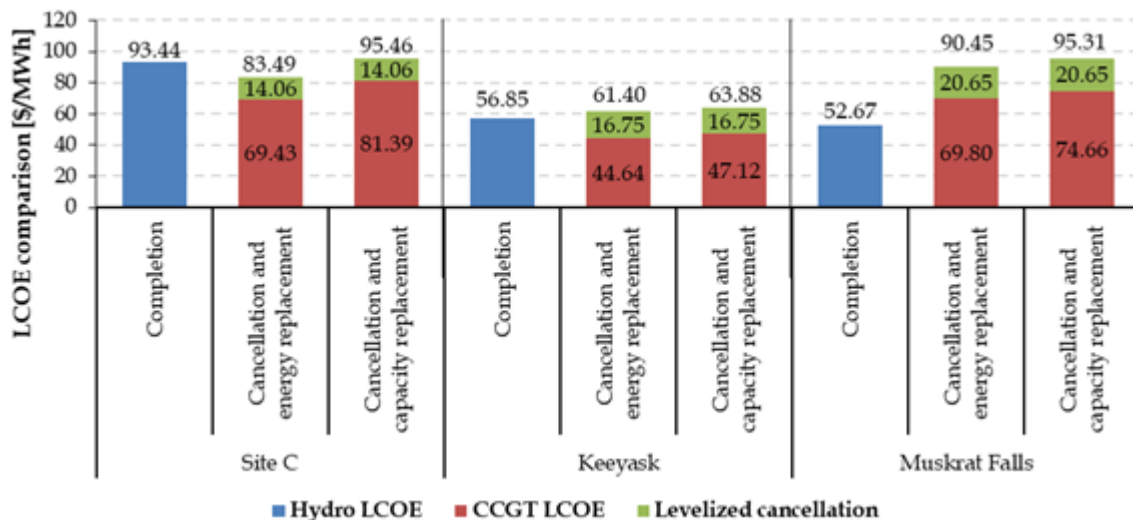
Hydro LCOE [\$/MWh]		
Project	As of May 2018	As of October 2018
Site C	100.41	93.44
Keeyask	64.89	56.85
Muskrat Falls	59.25	52.67

Current replacement CCGT LCOE + levelized cancellation [\$/MWh]		
Project	As of May 2018	As of October 2018
Site C	87.60	86.67
Keeyask	81.65	80.91
Muskrat Falls	96.09	93.59

Deferred replacement CCGT LCOE + levelized cancellation [\$/MWh]		
Project	As of May 2018	As of October 2018
Site C	81.40	83.49
Keeyask	60.13	61.40
Muskrat Falls	92.80	90.45



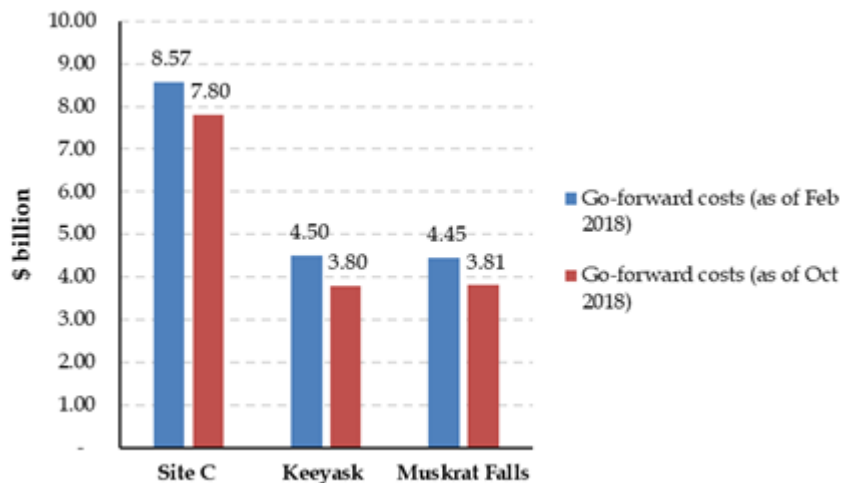
Of the three projects, proceeding with Site C remains an uneconomic course of action in the energy replacement case. While Keeyask remains a marginal project, provided there are no further cost overruns, go forwards costs to complete are economic.<sup>1</sup>

The subsequent sections describe the updates to inputs driving the final results.

**Go-forward Costs:**

For Site C, expenditures increased from \$2.13 billion as of December 2017 to \$2.90 billion as of September 2018, resulting in go-forward costs falling from \$8.57 billion to \$7.80 billion based on the maintained \$10.7 billion budget.<sup>2</sup> With respect to Keeyask, expenditures increased from \$4.20 billion as of December 2017 to \$4.9 million as of June 2018, resulting in go-forward costs falling from \$4.50 billion to \$3.80 billion based on the maintained \$8.70 billion budget.<sup>3</sup> For Muskrat Falls, expenditures increased from \$8.25 billion as of November 2017 to \$8.89 billion as of October 2018, resulting in go-forward costs falling from \$4.45 billion to \$3.81 billion based on the maintained \$12.70 billion budget.<sup>4</sup> A comparison of these updates in shown in Figure 2.

**Figure 2: Updated Go-forward Costs as of October 2018**



Sources: BC Hydro, Manitoba Hydro and Nalcor Energy.

- 1 Overruns in excess of \$570 million or 15 percent of the current go-forward costs would result in Keeyask being uneconomic. In the past, the budget has already increased by 55 percent over the original budget.
- 2 BC Hydro. Site C Clean Energy Project: Quarterly Progress Report No. 13. December 2018;
- 3 Manitoba Hydro. The Manitoba Hydro-Electric Board: Quarterly Report for the six months ended September 30, 2018. November 2018
- 4 Nalcor Energy. Muskrat Falls Project: Monthly Report. October 2018.

## Cost of Capital:

For the cost of debt, a review of long-term corporate debt issuances from Canadian A-rated energy companies over the past 24 months yields an average rate of 4.09 percent, higher than the 4.08 percent noted in the report. Figure 3 presents the underlying issuances used.

Figure 3: Updated Cost of Debt

Name	Canadian Utilities Ltd.	Enbridge Gas Distribution Inc.	FortisAlberta Inc.		FortisBC Energy Inc.	Trans Canada PipeLines Limited					Union Gas Limited
Issue date	11/22/2017	11/29/2017	9/7/2017	9/18/2018	10/30/2017	9/15/2017	5/7/2018	5/7/2018	7/3/2018	10/12/2018	11/22/2017
Maturity date	11/22/2047	11/29/2047	9/9/2047	9/18/2048	10/30/2047	9/16/2047	5/15/2038	5/15/2048	7/3/2048	3/15/2049	11/22/2047
Coupon	3.5480	3.5100	3.6720	3.7340	3.6900	4.3300	4.7500	4.8750	4.1820	5.1000	3.5900
Moody's					A3	A3	A3	A3	A3	A3	
S&P	A-	A-	A-	A-		BBB+	A-	A-	A-	A-	A-
<b>Cost of debt</b>	<b>4.09%</b>										

Source: S&P Global.

In the updated capital pricing model (“CAPM”) used to determine the appropriate cost of equity, the lower risk-free rate fell from 2.42 percent to 2.19 percent following a drop in expected returns from 30-year Canadian government bonds. While the beta remained unchanged, the equity risk premium increased from 5.50 percent to 5.96 percent, consistent with the Damougaran’s country risk premium estimates as of January 2019. These changes result in the cost of equity increasing from 7.58 percent to 7.79 percent as show in Figure 4.

Figure 4: Updated Cost of Equity

Parameter	Value
Risk-free rate: Canada 30 Year Government Bond	2.19%
Beta: Average of 6 public Canadian IPPs	0.94
Equity risk premium	5.96%
<b>Cost of equity</b>	<b>7.79%</b>

Source: MarketWatch and Damougaran.

Taken together, the weighted average cost of capital increased from 5.13 percent to 5.20 percent as shown in Figure 5.

**Figure 5: Updated Weighted Average Cost of Capital**

Parameter	Value
Cost of debt	4.09%
Leverage	70%
Cost of equity	7.79%
1 - Leverage	30%
<b>WACC</b>	<b>5.20%</b>

### Fuel Costs:

As updated natural gas projections have not been published by the AEO, the forecast 20-year levelized gas price for Henry Hub is unchanged at \$4.97. However, regional price adjustments for Kingsgate in BC, Emerson in Manitoba and Iroquois Waddington in Newfoundland and Labrador were updated from the 2015-2017 to the 2016-2018 historical Henry Hub differentials. Kingsgate prices fell from \$4.85 to \$4.68, Emerson prices fell from \$4.87 to \$4.70, and prices for Iroquois Waddington fell from \$5.69 to \$5.28. Updated gas prices are shown in Figure 6.

Figure 6: Updated Price Differential Adjustments

Date	BC		MB	NL	differentials		
	HenryHub	Kingsgate	Emerson	Iroquois Waddington	HH - BC	HH - MB	HH - NL
1/1/2016	\$2.29	\$2.10	\$2.36	\$2.86	\$0.19	-\$0.08	-\$0.57
2/1/2016	\$2.01	\$1.63	\$2.04	\$2.44	\$0.38	-\$0.04	-\$0.44
3/1/2016	\$1.71	\$1.30	\$1.79	\$1.87	\$0.41	-\$0.08	-\$0.16
4/1/2016	\$1.92	\$1.43	\$1.86	\$2.19	\$0.49	\$0.06	-\$0.26
5/1/2016	\$1.92	\$1.52	\$1.79	\$2.04	\$0.40	\$0.13	-\$0.12
6/1/2016	\$2.55	\$2.12	\$2.25	\$2.44	\$0.43	\$0.29	\$0.11
7/1/2016	\$2.81	\$2.36	\$2.51	\$2.80	\$0.45	\$0.29	\$0.01
8/1/2016	\$2.82	\$2.45	\$2.59	\$2.90	\$0.36	\$0.23	-\$0.08
9/1/2016	\$3.00	\$2.47	\$2.71	\$2.71	\$0.53	\$0.29	\$0.29
10/1/2016	\$2.98	\$2.52	\$2.79	\$2.45	\$0.46	\$0.20	\$0.53
11/1/2016	\$2.49	\$2.12	\$2.25	\$2.58	\$0.37	\$0.24	-\$0.08
12/1/2016	\$3.59	\$3.31	\$3.47	\$5.15	\$0.28	\$0.13	-\$1.56
1/1/2017	\$3.32	\$3.14	\$3.03	\$4.08	\$0.18	\$0.29	-\$0.76
2/1/2017	\$2.87	\$2.50	\$2.56	\$3.29	\$0.37	\$0.31	-\$0.42
3/1/2017	\$2.86	\$2.36	\$2.62	\$3.61	\$0.50	\$0.24	-\$0.75
4/1/2017	\$3.10	\$2.51	\$2.78	\$3.17	\$0.59	\$0.31	-\$0.07
5/1/2017	\$3.16	\$2.53	\$2.75	\$3.10	\$0.63	\$0.40	\$0.06
6/1/2017	\$2.98	\$2.29	\$2.63	\$2.58	\$0.69	\$0.34	\$0.39
7/1/2017	\$2.99	\$2.33	\$2.65	\$2.86	\$0.66	\$0.34	\$0.13
8/1/2017	\$2.90	\$2.45	\$2.46	\$2.66	\$0.45	\$0.44	\$0.24
9/1/2017	\$2.98	\$2.41	\$2.46	\$2.38	\$0.57	\$0.53	\$0.60
10/1/2017	\$2.89	\$1.93	\$2.38	\$2.84	\$0.95	\$0.51	\$0.04
11/1/2017	\$3.00	\$2.58	\$2.90	\$3.13	\$0.43	\$0.10	-\$0.13
12/1/2017	\$2.78	\$2.46	\$2.89	\$4.64	\$0.33	-\$0.10	-\$1.86
1/1/2018	\$3.90	\$2.49	\$3.97	\$6.77	\$1.40	-\$0.07	-\$2.87
2/1/2018	\$2.70	\$2.15	\$2.61	\$2.95	\$0.55	\$0.09	-\$0.25
3/1/2018	\$2.69	\$1.96	\$2.44	\$2.72	\$0.74	\$0.25	-\$0.02
4/1/2018	\$2.79	\$1.90	\$2.64	\$3.22	\$0.90	\$0.15	-\$0.43
5/1/2018	\$2.79	\$1.50	\$2.31	\$2.47	\$1.30	\$0.48	\$0.32
6/1/2018	\$2.97	\$1.86	\$2.50	\$2.74	\$1.10	\$0.47	\$0.22
7/1/2018	\$2.84	\$1.97	\$2.58	\$2.86	\$0.86	\$0.26	-\$0.03
8/1/2018	\$2.95	\$2.46	\$2.82	\$3.15	\$0.50	\$0.14	-\$0.19
9/1/2018	\$2.99	\$1.61	\$2.72	\$2.98	\$1.38	\$0.28	\$0.01
10/1/2018	\$3.26	\$2.93	\$3.23	\$3.38	\$0.33	\$0.04	-\$0.12
11/1/2018	\$4.06	\$4.32	\$4.07	\$4.43	-\$0.25	\$0.00	-\$0.37
12/1/2018	\$4.11	\$4.79	\$3.85	\$4.25	-\$0.68	\$0.25	-\$0.15
<b>AVERAGE [\$/MMBtu]</b>					<b>\$0.53</b>	<b>\$0.21</b>	<b>-\$0.24</b>
<b>AVERAGE [C\$/MMBtu] [1]</b>					<b>\$0.68</b>	<b>\$0.27</b>	<b>-\$0.31</b>
Motor Fuel Tax adder of 1.10¢ per 810.32 litres [C\$/MMBtu] [2]					\$0.38		
<b>Adjusted gas price (HH = \$4.97) [C\$/MMBtu]</b>					<b>\$4.68</b>	<b>\$4.70</b>	<b>\$5.28</b>

Source: S&amp;P Global.