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BY EMAIL AND RESS

March 29, 2021

Ms. Christine E. Long, Registrar
Ontario Energy Board
Suite 2700, 2300 Yonge Street
P.O. Box 2319
Toronto, ON M4P 1E4

Dear Ms. Long:

EB-2020-0150 – Upper Canada Transmission (NextBridge Infrastructure LP) - 2022-2031 Custom Incentive Rate-setting Application – Hydro One Networks Inc. Compendium

Please find attached Hydro One Networks Inc. Compendium, which will be referenced at the virtual transcribed oral hearing on March 29, 2021.

An electronic copy of the Compendium has been submitted using the OEB's Regulatory Electronic Submission System.

Sincerely,

Joanne Richardson

Upper Canada Transmission Inc. (NextBridge Infrastructure LP)

Hydro One Networks Inc. Compendium

EB-2020-0150

March 29, 2021

TAB 1

7.0 BENCHMARKING STUDY

7.1 Construction Costs

1. Independent third-party consultant, Charles River Associates, was engaged by NextBridge to prepare a benchmarking study of transmission projects comparable to that of the East-West Tie line. A copy of the CRA report can be found at Exhibit B, Tab 1, Schedule 7, Attachment 1.

2. To complete this study, CRA reviewed publicly available data from transmission solicitations, public documents, regulatory filings, and benchmarking reports in an effort to present benchmarks against which to assess the reasonableness of the proposed costs of the East-West Tie line. Wherever possible when choosing benchmarks, CRA considered the specifics related to the East-West Tie line's construction including project requirements, terrain, and technology:

    - Hydro One's 2007 Bruce to Milton application and relevant transmission rate filings
    - BC Hydro's information on the Northwest Transmission Line project
    - Black & Veatch's 2014 transmission expansion planning report for the Western Electricity Coordinating Council
    - Alberta Electric System Operator's (AESO) transmission cost benchmarking database
    - Hydro One's Niagara Reinforcement Limited Partnership's 2020-2024 Transmission Revenue Cap IR Application and Evidence Filing

3. The CRA study concludes that costs per km for the East-West Tie line remain lower than the benchmarks even under forecasting sensitivity tests, as follows:

    > *"The estimated average project capital cost per km for the New EWT Line in 2022 CAD is approximately $1.65 million/km which is calculated by*

discounting annual Construction project costs by 10-year CAGR for CPI, annual Materials costs by the 10-year CAGR of the Handy-Whitman Plateau Indices, and by discounting Other costs again, by CPI. Construction costs, however, can be very weather-dependent, and the Plateau region has some critical differences compared to Northwestern Ontario, and thus our estimates may be conservative.

This calculation results in New EWT Line total 2022 project costs of $741 million, and at $1.65 million/km makes it a lower cost project compared to the benchmarks presented in Figure 11. Costs per km for the New EWT Line remain lower than the benchmarks even under forecasting sensitivity tests.

Table 1. Figure 11 – Benchmarking Base Results

	NextBridge EWT (Designation Proceeding)	New EWT	Bruce to Milton	BC NTL	2014 WECC	AESO Project 1	AESO Project 2	Niagara
Voltage (kV)	230 kV	230 kV	500 kV	287 kV	230 kV	240 kV	240 kV	230 kV
Length (km)	400	450	180	344	450	450	450	76
Costs reported in $	2012	2017	2012	2014	2014	2013	2013	2019
Total Cost Line Only ($M)	**419**	**711**	**327**	**664**	**653**	**1468**	**1333**	**119**
Line Cost (adjusted to 2022 $M)	**489**	**741**	**430**	**871**	**866**	**1748**	**1590**	**126**
2022 Cost M/km	**1.22**	**1.65**	**2.39**	**2.53**	**1.92**	**3.89**	**3.53**	**1.66**

CRA BENCHMARKING REPORT

Prepared for:

NextBridge Infrastructure

Transmission Cost Benchmarking Study

Prepared by:

Charles River Associates

401 Bay Street, Suite 600

PO Box 46

Toronto, Ontario, M5H 2Y4

Date: October 13, 2020

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1. Overview

1.1. Mandate

Charles River Associates ("CRA") was engaged by NextBridge Infrastructure ("NextBridge") to prepare a benchmarking study of transmission projects comparable to that of its East-West Tie Line ("New EWT Line") as described in detail in Ontario Energy Board ("OEB") matter EB-2017-0182.

To complete this study, CRA reviewed publicly available data from transmission solicitations, public documents, regulatory filings, and benchmarking reports in an effort to present benchmarks against which to assess the reasonableness of the proposed costs of the New EWT Line. Wherever possible when choosing benchmarks, CRA considered specifics related to the New EWT Line's construction including project requirements, terrain, and technology.

Transmission projects are unique and there are a variety of factors that can contribute to differences in cost estimates across projects. Therefore, the ultimate goal of this benchmarking study is to employ objective research and analysis in order to provide the OEB with a basis for assessing the relative reasonableness of the projected costs of the New EWT Line. CRA has applied a sensitivity analysis its benchmark results in order to account for variations that can exist across cost escalation approaches.

1.2. Approach

In order to develop a robust set of comparable benchmarks, CRA reviewed a number of publicly available sources and included the following in this study:

- Hydro One's 2007 Bruce to Milton application and relevant transmission rate filings thereafter;
- BC Hydro's information on the Northwest Transmission Line project;
- Black & Veatch's 2014 transmission expansion planning report for the Western Electricity Coordinating Council ("WECC"); and,
- Alberta Electric System Operator's ("AESO") transmission cost benchmarking database.
- Hydro One's Niagara Reinforcement Limited Partnership's 2020-2024 Transmission Revenue Cap IR Application and Evidence Filing

CRA analyzed each of these and gathered information on reported costs of comparable transmission benchmarks. We have noted some particular challenges in benchmarking the New EWT Line against existing projects. In general, the overall challenge is the number of factors that make the New EWT Line unique from an engineering standpoint. This includes the challenging terrain and weather of Northwestern Ontario and use of double circuit guyed-Y tower type structures. It was challenging to find projects that were an exact technical match so in order to incorporate the uniqueness of the New EWT Line in this benchmarking study as effectively as possible, CRA endeavored to include only those benchmarks that were as technically similar to the New EWT Line as reasonably possible. The fundamental requirement was that benchmarks be as close to 240 kilovolt ("kV") as possible (only 230 kV, 240 kV and 287 kV projects were included), double circuit (if possible), and have relatively long line lengths (greater than 100 km was preferred, with the understanding that due to lack of available public cost information, lengths as low as 80 km were accepted). The difference between 230 kV, 240 kV and 287 kV was considered immaterial to overall cost. Bruce to Milton is an exception as it is 500 kV. In order to scale the Bruce to Milton project from 500 kV to 230 kV, CRA used the WECC 2014 study by Black and Veatch which provided the base capital cost per mile for projects of both voltages. On average, this study found that the base capital cost of a 500 kV double circuit project was 1.99 times more expensive than a 230 kV double circuit project. Therefore, CRA applied the factor of 1.99 to scale the 2012 reported cost of Bruce to Milton to approximate what a 230 kV would cost and then escalated this to 2022 dollars. Again, the difference between 240 kV and 230 kV was considered immaterial. While CRA considers this factor derived from WECC is the best available, its application in Ontario adds a degree of uncertainty to the results. CRA has accordingly applied a wider, +/- 5%, sensitivity band to this project to produce a wider range of potential benchmark cost results.

In general, all historical costs have been escalated to 2022 Canadian dollars ("CAD") using the extrapolated 2017 Handy-Whitman Index for utility construction costs in the United States ("US") Plateau region[1] and the Canadian Price Index ("CPI"). The CAD to US Dollar ("USD") annual average exchange rate was taken as published by the Board of Governors of the Federal Reserve System.[2]

For the sensitivity analysis, CRA applied +2% to -2% on the base 2017 CAD millions per km ("M/km") benchmark results to account for potential variations and subjectivity that can exist in cost escalation approaches. Once again, for Bruce to Milton this was extended to +/-5% to

1 The Handy-Whitman Index is prepared by Whitman, Requardt and Associates and is representative of cost trends for different types of utility construction. Separate Indices are published for the electric, gas and water industries. These are used by regulatory bodies, operating bodies, operating utilities, service companies, valuation engineers as well as insurance companies. For example, PJM uses this index to complete its annual update of Maintenance Adder Escalation Index Numbers. Handy-Whitman Index values are widely used to trend earlier valuations and original cost records to estimate reproduction cost at prices prevailing at a certain date. (Source: https://wrallp.com/about-us/handy-whitman-index)

2 Board of Governors of the Federal Reserve System (US), Canada / U.S. Foreign Exchange Rate [AEXCAUS], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/AEXCAUS, November 30, 2017.

capture potential uncertainties inherent in using the WECC 2014 model to scale the project from 500 kV to get a cost representative of a 230 kV.

2. Assumptions and Calculations

2.1. Foreign Exchange and Cost Escalation

Two primary data sources are expressed in USD: The WECC 2014 study and the Handy-Whitman index. The exchange rates used for this purpose and for adaptation of the Handy-Whitman index were the annual average of the USD to CAD daily exchange rates for the applicable year as published by the Board of Governors of the Federal Reserve System.

In order to estimate benchmark escalation, where granular costs were available CRA grouped them into three categories: (i) Materials; (ii) Construction; and (iii) Other. CRA calculated the cost share of each of these categories as a percentage of the project's total cost.

To escalate Materials costs, CRA used a blend of Handy-Whitman's Towers & Fixtures and Overhead Conductors and Devices indices. Materials involved in transmission project costs have large commodity components, even within Canada, these material elements would be expected to track the CAD equivalent of the USD index. The index escalation was therefore compounded with the exchange rate changes to arrive at an effective CAD Handy-Whitman index.

Material costs are driven largely by the economy at the time the project's materials were tendered. Changes in the price of commodities such as steel, aluminum and to a lesser extent, copper, drive changes to the price of materials. The volatility exhibited by these commodities makes it difficult to determine an constant annual growth rate for the purposes of cost escalation. Therefore, it is prudent in this case, to use with industry-standard best practice and use the Handy-Whitman Indices for transmission material costs. The Handy-Whitman index has been used by expert economic consulting firms in total factor productivity studies presented as evidence in matters before the OEB. There is no Canadian equivalent of the Handy-Whitman index suitable for escalating transmission project costs.

For Construction costs and Other costs, CRA has used the Canadian CPI to escalate benchmark costs. The labour element (at least) of Construction and Other costs is not freely traded between Canada and the US, so is much less impacted by exchange rate changes. CRA analyzed the 10-year compound annual growth rates ("CAGR") for Transmission Project Construction related costs reported by Statistics Canada's Electric Utility Consumer Price Index ("EUCPI") and found that these costs escalated ~2.3% per year on average from 2004 to 2014.

Since the EUCPI is currently being reviewed by Statistics Canada, it was not used in this study.[3] CRA decided that CPI at a 10-year CAGR of 1.6% (“CAD CPI”) and 1.7% in the case of US CPI were appropriate and conservative escalators for Construction and Other costs.

The relative share of construction costs to total project cost varied widely across projects studied. Construction costs depend on the supply, demand and price of labour, but to a greater extent on the location of a project, its terrain, structures, geography, land use, and environmental considerations. Each of these factors influences the degree of construction and engineering complexity and ultimately, this impacts cost. Going from flat to mountainous terrain increases the cost of a transmission line, as the terrain influences where structures are located, how many structures will be required and which type (strength) of structures will be required. As terrain becomes more rugged, access to the site and construction also becomes more complex and costly. Construction costs for utility specific applications such as transmission or distribution are extremely dependent on the aforementioned factors.

Other costs include all other costs not classified as Materials or Construction. These can include but are not limited to, regulatory, engineering, development, and project management costs. For Other costs, CRA applied the CPI to escalate costs to 2022 dollars.

Handy-Whitman indices used for escalating Materials cost were taken from its Plateau Region, which includes Montana, Idaho, Wyoming, Nevada, Utah, Colorado, New Mexico, and Arizona. The Plateau region was chosen for a number of reasons. First, the population density and terrain of Montana, Wyoming, Idaho, and Colorado are generally similar to that of Northwestern Ontario with densely forested regions and mountainous terrain. Second, as depicted by Figure 1 and Figure 2, the Plateau indices for each of Towers and Fixtures and Conductors and Devices exhibit escalation generally at the lower end of the range, so that escalated cost results will be at the conservative end of the range of Handy-Whitman regions.

3 In 2014 Statistics Canada suspended the Electric Utility Construction Price Index (“EUCPI”) series which measured the price change for constructing distribution systems and transmission lines systems. The EUCPI provided users with information that could be employed in contract escalation, cost-benefit analysis, benchmarking studies and time series analysis. The EUCPI is currently under review to ensure that the models used in its future computation will take into account current practices in construction. Source: Statistics Canada. Table 327-0011 - Electric utility construction price index (EUCPI), annual (Index, 1992=100) and CRA Analysis.

Figure 1. Handy-Whitman Towers and Fixtures (All Regions, CAD)

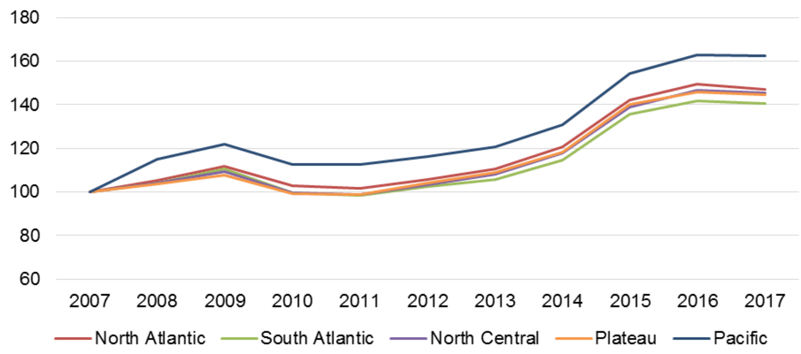
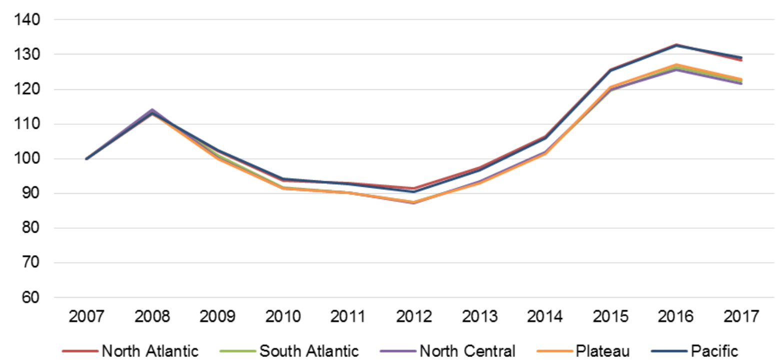


Figure 2. Handy-Whitman Overhead Conductors and Devices (All Regions, CAD)



2.2. Benchmark Calculations

2.2.1. New EWT Line

Development costs from August 2013 through July 2017, and construction costs starting in August 2017 were included to conduct the New EWT Line benchmarking. Construction costs are projected to end in 2022, with the commercial operation date anticipated by the end of March 2022.

For comparative purposes, CRA has analyzed the present value of the annual project costs for the New EWT Line so that all benchmark results could be compared in 2022 dollars. Costs as provided by NextBridge are included in Figure 3 while the costs adjusted to 2022 CAD are shown in Figure 4.

Figure 3. New EWT Line Annual Project Costs

Costs	Total	*Pre 8/1/2017*	2017	2018	2019	*2020 to COD*
Development	36,572	36,572	-	-	-	-
Construction	578,948	-	2,135	22,973	73,503	480,337
Materials*	66,870	-	-	-	11,242	55,628
Other	60,320	-	2,539	8,709	16,914	32,158
Subtotal	**742,710**	**36,572**	**4,674**	**31,682**	**101,659**	**568,123**
IDC	31,003	-	249	835	4,597	25,322
Total	**773,713**	**36,572**	**4,923**	**32,517**	**106,256**	**593,445**

*Materials outside of EPC contract; the Construction category has Materials sourced by EPC contractor

Figure 4. New EWT Costs in 2022 CAD

Discounted Costs	Disc.	*Pre 8/1/2017*	2017	2018	2019	*2020 to COD*
Development	1.6%	32,410	-	-	-	-
Construction	1.6%		1,970	21,538	70,031	465,089
Materials*	3.4%		-	-	10,134	51,910
Other	1.6%		2,342	8,165	16,115	31,137
Subtotal		**32,410**	**4,312**	**29,702**	**96,280**	**548,136**
IDC	1.6%	-	783	4,380	24,518	-
Total		**32,410**	**5,095**	**34,082**	**120,798**	**548,136**

Total Cost	**740,521**
Cost M/km	**1.65**

2.2.2. Bruce to Milton

In their initial 2007 application, Hydro One estimated that the total cost of the 500 kV Bruce to Milton project would be $635 million with $68 million, or 11%, estimated for station work.[4] However, in 2012 Hydro One submitted their 2013 - 2014 transmission rate application and cited in it that the cost of the Bruce to Milton project had increased to $732 million.[5] CRA has therefore assumed a total line cost of $651 million which is based on the updated total project cost estimate of $732 million (nominal $) included in Hydro One's rate application less 11% ($80.5 million) estimated for station work. Figure 5 provides CRA's assumptions for the Bruce to Milton project.

Figure 5. Bruce to Milton Calculations

Reported Costs	
2012 Reported Costs ($)	732,000,000
Less Station Cost ($)	(80,520,000)
2012 Line Cost ($)	651,480,000
Scaling Factor	1.99
2012 Line Cost Scaled to 230 kV ($)	327,376,884

Reporting Year	2012
Length (km)	180
Voltage	500 kV

Indices Used	2012	2022	CAGR	Growth
HW - Towers & Fixtures	494	780	4.7%	4.7%
HW - Overhead Conductors & Devices	536	853	4.8%	
Construction Costs - CPI	104	120	1.4%	1.4%
Other Costs - CPI	104	120	1.4%	1.4%

Cost Breakdown	% of total cost
Materials	38.4%
Construction	13.4%
Other	48.1%

Cost Escalation	2012 Costs	Assumed Growth	Escalation Factor	2022 Costs
Materials	$ 125,869,772	4.7%	1.59	$ 199,671,021
Construction	$ 43,881,205	1.4%	1.14	$ 50,216,640
Other	$ 157,625,907	1.4%	1.14	$ 180,383,458
Total Assumed Scaled Cost	**$ 327,376,884**		**Total Cost**	**$ 430,271,120**
			Cost M/km	**$ 2.39**

CRA then scaled the 500 kV project to a 230 kV project using the ratio between the baseline capital costs for each type of system as reported in the Black & Veatch's 2014 transmission expansion planning report for the WECC. According to this report a 500 kV system would be

4 Hydro One. *Project Cost, Economics and other Public Interest Considerations.* EB-2007-0050. Exhibit B. Tab 4. Schedule 1. March 29, 2007. pp. 1-2. This figure for Bruce-Milton does not appear to include development costs.

5 Hydro One. *In-Service Capital Additions.* EB-2012-0031. Exhibit D1, Tab 1, Schedule 2. August 15, 2012. p2.

1.99 times more costly per mile, than a 230 kV system.[6] After scaling, the 2012 total line cost is approximately $327 million.

2.2.3. BC Hydro's Northwest Transmission Line

The Northwest Transmission Line is a 344 km, 287 kV single circuit guyed lattice tower transmission line[7] between Skeena BC and Bob Quinn Lake. It was completed in 2014 at a total reported cost of $746 million.[8] This includes costs for substations but because the project was exempt from the Utilities Commission Act and a regulatory review was not undertaken, detailed cost estimates, annual project cash flows, and substation costs are not publicly available. CRA has therefore assumed 11% (or $82 million) of the total cost of the project was attributable to substations work consistent with the Bruce to Milton project. CRA also recognizes that some of the project costs would have been incurred in years prior to 2014. CRA has taken the conservative approach by escalating the total project cost from 2014 to 2022 by assuming that all costs were incurred in 2014. Figure 6 provides the calculations for the Northwest Transmission Line benchmark results under these assumptions.

Figure 6. Northwest Transmission Line Calculations

Statement of Average Rate Base ($CAD)		
2014 Reported Costs	$	746,000,000
Less Substation Cost Estimate	$	(82,060,000)
2014 Total Costs	$	663,940,000

Reporting Year	2014
Length km	344
Voltage	287kV

Indices Used	2014	2022	CAGR	Growth
HW - Towers & Fixtures	560	780	4.2%	4.1%
HW - Overhead Conductors & Devices	624	853	4.0%	
Construction Costs - CPI	107	120	1.3%	1.3%
Other Costs - CPI	107	120	1.3%	1.3%

NRLP Rate Base	2014 Amount ($ Mil per km)	Annual Growth	Escalation Factor	2022
	$ 663,940,000	2%	1.31	$ 870,506,162

2022 Total Cost (76 km	$ 870,506,161.65
2022 Total Cost M/km	**$ 2.53**

6 WECC 2014 includes new line cost 2014 (USD/mile) of $3,071,750 for a 500 kV double circuit system and $1,536,400 for a 230 kV double circuit system.

7 Burns and McDonnell. *Northwest Transmission Line.* https://www.burnsmcd.com/projects/northwest-transmission-line.

8 Correspondence with BC Hydro Stakeholder Engagement. January 2, 2018.

2.2.4. Alberta Projects

All transmission facility capital cost estimates and final costs for projects built in Alberta since 2005 are entered into the AESO cost benchmark database.[9] CRA filtered through the AESO database to display the actual costs for two 100+ km double circuit, 240 kV projects. Both projects used in this analysis as benchmarks are actual projects constructed in Alberta in 2010[10] with costs reported by the AESO in 2013 CAD. Costs included and reported by AESO were grouped into categories by CRA as follows and escalated from 2013 to 2022:

- **Materials:** Conductor, Hardware, Lattice Structures
- **Labor:** Construction, ROW Preparation Brush, Engineering, Survey
- **Others:** Contingency and Escalation, Owner Costs, Project and Construction Management, Salvage, AFUDC, and E&S

This data provided granular-enough cost categories such that CRA was able to take proportionate shares of materials, construction and other costs into consideration when escalating costs. These assumptions and calculations are shown in Figure 7.

9 AESO. Transmission Costs. <https://www.aeso.ca/grid/transmission-costs>

10 Project 1 is representative of the AESO's Line Facility ID: L10611336112 and Project 2 is representative of the AESO's Line Facility ID: L_10607745763.

Figure 7. Alberta Benchmark Calculations

Reported Costs Project 1 Line ID: L_10311336112		
2013 Reported Costs	$	3,261,617
2013 Line Cost (per km)	$	3,261,617
2013 Line Cost (450 km)	$	1,467,727,650

Reporting Year	2013
Length km	450
Voltage	240 kV

Reported Costs Project 2 Line ID: L_10607745763		
2013 Reported Cost	$	2,962,952
2013 Line Cost (per km)	$	2,962,952
Line Cost (per 450 km)	$	1,333,328,400

Reporting Year	2013
Length km	450
Voltage	240 kV

Indices Used	2013	2022	CAGR	Growth
HW - Towers & Fixtures	529	780	4.4%	4.5%
HW - Overhead Conductors & Devices	569	853	4.6%	
Construction Costs - CPI	105	120	1.4%	1.4%
Other Costs - CPI	105	120	1.4%	1.4%

Project 1: Cost Breakdown	% of total cost
Materials	**16.3%**
Construction	**33.0%**
Other	**50.7%**

Project 2: Cost Breakdown	% of total cost
Materials	**16.6%**
Construction	**33.6%**
Other	**49.8%**

Project 1 Cost Escalation	2013 Amount (per km)		Annual Growth	Escalation Factor	2022 Amounts	
Materials	$	530,346	4.5%	1.49	$	788,661
Construction	$	1,076,247	1.4%	1.13	$	1,220,183
Other	$	1,655,024	1.4%	1.13	$	1,876,366
				Total Cost	**$**	**3,885,210**
				Cost M/km	**$**	**3.89**
				Cost (450 km)	**$**	**1,748,344,517**

Project 2 Cost Escalation	2013 Amount (per km)		Annual Growth	Escalation Factor	2022 Amounts	
Materials	$	491,421	4.5%	1.49	$	730,777
Construction	$	996,451	1.4%	1.13	$	1,129,716
Other	$	1,475,080	1.4%	1.13	$	1,672,356
				Total Cost	**$**	**3,532,848**
				Cost M/km	**$**	**3.53**
				Cost (450 km)	**$**	**1,589,781,807**

Project 1 Cost Escalation	2013 Amount (per km)		Annual Growth	Escalation Factor	2017 Amounts	
Materials	$	530,346	7.5%	1.33	$	707,166
Construction	$	1,076,247	1.5%	1.06	$	1,140,619
Other	$	1,655,024	1.5%	1.06	$	1,754,013
				Total Cost	**$**	**3,601,798**
				Cost M/km	**$**	**3.60**
				Cost (450 km)	**$**	**1,620,809,051**

Project 2 Cost Escalation	2013 Amount (per km)		Annual Growth	Escalation Factor	2017 Amounts	
Materials	$	491,421	7.5%	1.33	$	655,263
Construction	$	996,451	1.5%	1.06	$	1,056,050
Other	$	1,475,080	1.5%	1.06	$	1,563,307
				Total Cost	**$**	**3,274,620**
				Cost M/km	**$**	**3.27**
				Cost (450 km)	**$**	**1,473,578,867**

2.2.5. Western Electricity Coordinating Council 2014 Study

CRA took the base capital cost for a 230 kV double circuit project from the Black & Veatch 2014 transmission expansion planning report done for the WECC in 2014 and applied cost escalation of approximately 1.4% per year to determine the 2022 base capital cost in USD per mile. CRA then applied the following multipliers and adders to this base 2022 USD capital cost:

- **Conductor Type:** ACSR, cost multiplier of 1.00
- **Transmission Structure:** Lattice, cost multiplier of 0.90
- **Transmission Length:** > 10 miles, cost multiplier of 1.00
- **Terrain:** Forested, PG&E, cost multiplier of 1.50[11]
- **Right of Way Widths:** 64m, equating to 25.44 ROW/acres per mile[12]
- **Land Cost/Acre:** BLM zone 6, equating to a land cost of $1,024 USD per acre

CRA then applied a forecasted 2022 CAN/USD exchange rate of 1.33 and converted miles to km to arrive at the total cost per km in 2022 CAD. Figure 8 provides the calculation breakdown for the WECC benchmark.

Figure 8. WECC Benchmark Calculations

11 CRA utilized the terrain cost multiplier provided by NextBridge.

12 CRA relied on a 65m ROW width provided by NextBridge. Acres/mile values were calculated in accordance with the WECC study, by multiplying the right of way width by 5,280 feet per mile and dividing by 43,560 sq. ft. per acre.

Reported Capital Costs		
Total Capital Cost (2014 USD per Mile)	$	1,536,400

Reporting Year	2014
Length km	450
Length (mile)	280
ROW Width for New EWT (miles)	64
Voltage	230 kV
miles to km	1.60934

Multipliers and Adders	Capital Cost Multiplier
Conductor: ACSR	1.0
Transmission Structure: Lattice	0.9
Length: >10 miles	1.0
Terrain: Forested	1.5
ROW/acres per mile	25.44
Land Cost/acre: BLM Zone 6	1,024

Indices Used (USD)	2014	2022	CAGR	Growth
HW - Towers & Fixtures	507	588	1.9%	1.7%
HW - Overhead Conductors & Devices	565	643	1.6%	
Construction Costs - CPI	109	120	1.2%	1.2%
Other Costs - CPI	109	120	1.2%	1.2%
CAN/USD FX	1.10	1.33	2.3%	2.3%

Average Annual Growth Rate		1.4%
Total Capital Cost (2022 USD per Mile)	$	1,707,155
Total Cost Per Mile (incl. Multipliers & Adders)	$	2,330,715
Total Cost Per Mile (2022 CAD)	$	3,092,626
Total Cost Per Km (2022 CAD)	$	1,921,673
Total Cost (M/km)	**$**	**1.92**

2.2.6. Niagara Reinforcement

- For the 2020 update, CRA reviewed the settlement agreement filed with the Ontario Energy Board in connection with the application by the Niagara Reinforcement Limited Partnership (NRLP). The 76 km double circuit 230 kV transmission line connects the Allanburg Transformer Station and the Middleport Transformer Station. The settlement agreement included the NRLP Statement of Average Rate Base for 2019. CRA used the Handy-Whitman Index and the USD/CAD exchange rate in order to calculate material and index cost growth from 2017 to 2022 (Demonstrated in Figure 14. Indices Used in Analysis)[13]. The calculations for the 2022 Total Cost of $1.66 million per kilometer are demonstrated below in Figure 9. NRLP Benchmark Calculations
- **Materials:** Conductor, Towers & Fixtures
- **Construction:** Transmission Corridor Land and Rights

Figure 9. NRLP Benchmark Calculations

[13] The Niagara region has different, and more difficult, terrain than that of Northwestern Ontario, which may lead lower construction costs compared to Northwestern Ontario.

Statement of Average Rate Base ($CAD)		
2019 Report Costs (per km)	$	1,571,447
2019 Reported Costs (76 km)	$	119,430,000
2022 Line Cost (per km)	$	1,657,500
2022 Line Cost (76 km)	$	125,970,027

Reporting Year	2019
Length km	76
Voltage	230 kV

Indices Used	2019	2022	CAGR	Growth
HW - Towers & Fixtures	741	780	1.8%	1.8%
HW - Overhead Conductors & Devices	808	853	1.8%	
Construction Costs - CPI	115	120	1.4%	1.4%
Other Costs - CPI	115	120	1.4%	1.4%

NRLP Rate Base	2019 % of total cost
Materials	99.2%
Construction	0.8%
Other	0.0%

NRLP Rate Base	2019 Amount ($ Mil per km)		Annual Growth	Escalation Factor	2022	
Materials	$	1.56	1.8%	1.05	$	1.64
Construction	$	0.01	1.4%	1.04	$	0.01
Other	$	-	1.4%	1.04	$	-

2022 Total Cost per Kn	$	1,657,500
2022 Total Cost (76 km	$125,970,026.97	
2022 Total Cost M/km	$	1.66

2.3. Operation, Maintenance & Administration Expenses

As part of the 2020 update, CRA was asked to review the Operation, Maintenance, & Administration (OM&A) benchmarking for Bruce to Milton and Niagara Reinforcement rate case filings. On page 233 of Hydro One's Niagara Reinforcement Revenue Cap IR Application they included Summary costs of OM&A for forecast year 2020 added to Figure 10. Bruce to Milton, Niagara & New EWT OM&A Benchmarking. In Hydro One's Bruce to Milton Cost of Service Application, OM&A costs were included for 2014 to 2019. The Bruce to Milton OM&A costs for 2019 can be found in Figure 10. Additionally, the final line in Figure 10 assumes a 1/1.30 exchange rate for USD/CAD.

Figure 10. Bruce to Milton, Niagara & New EWT OM&A Benchmarking

$k (CAD)	Niagara 2020	Bruce-Milton 2019	New EWT
O&M Expenses	320	600	1,275
Admin. & Corporate[14]	510	200	1,665
Regulatory			65
Total OM&A	**830**	**1,600**[15]	**3,005**[16]

14 The figure for the Niagara project includes costs associated with the Managing Director's office

15 Includes "Incremental expenses" of $800k (CAD)

16 The new EWT also includes expenses for Indigenous Participation and Compliance costs. As these are not directly comparable to the other projects, and unique to the EWT, they have been excluded from this total.

Total kilometers	76	180	450
OM&A / km (CAD)	**10.92**	**8.89**	**6.68**
OM&A / km (USD)	8.40	6.84	5.14

3. Results

CRA benchmarked the current estimated New EWT Line capital cost[17] against other projects using the approach and assumptions described above. CRA has included the indices used in cost escalation in Appendix A. Figure 11 provides an overview of the benchmarking results, which shows that the current estimated costs for the New EWT Line at $1.65 M/km are reasonable and cost-effective when compared to other similar transmission projects.

To ensure robustness of the analysis CRA has also provided results when base M/km results are scaled up and down by 2%. The results for this sensitivity analysis are shown in Figure 12. The resulting range around the base results and how they compare to the New EWT cost are shown graphically in Figure 13 where the vertical lines represent the variation around the base case, with the base case represented by the small blue diamonds. This graphic illustrates that even under the widest ranges of sensitivity on the cost escalation indices used, the New EWT Line remains reasonable compared to other similar projects.

Figure 11. Benchmarking Base Results[18]

	NextBridge EWT (Designation Proceeding)	New EWT	Bruce to Milton	BC NTL	2014 WECC	AESO Project 1	AESO Project 2	Niagara
Voltage (kV)	230 kV	230 kV	500 kV	287 kV	230 kV	240 kV	240 kV	230 kV
Length (km)	400	450	180	344	450	450	450	76
Costs reported in $	2012	2017	2012	2014	2014	2013	2013	2019
Total Cost Line Only ($M)	**419**	**711**	**327**	**664**	**653**	**1468**	**1333**	**119**
Line Cost (adjusted to 2022 $M)	**489**	**741**	**430**	**871**	**866**	**1748**	**1590**	**126**
2022 Cost M/km	**1.22**	**1.65**	**2.39**	**2.53**	**1.92**	**3.89**	**3.53**	**1.66**

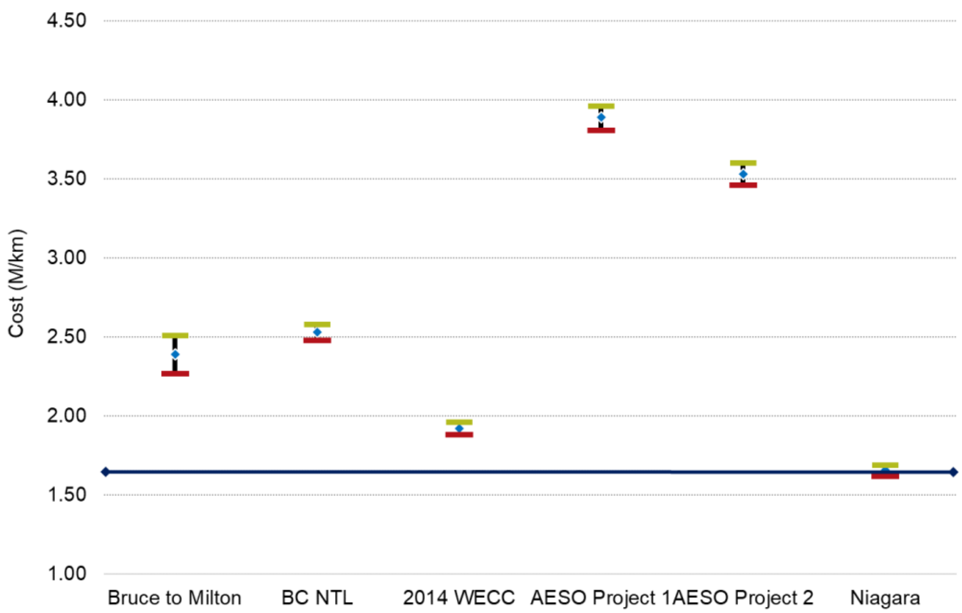
17 Capital cost is an all-in amount, including development and constructions costs.

18 Note: Bruce to Milton has been scaled to 230 kV by a factor of 1.99, consistent with the differences in base capital cost in the WECC 2014 study.

Figure 12. Sensitivity Analysis Results

Sensitivity Analysis	Bruce to Milton	BC NTL	2014 WECC	AESO Project 1	AESO Project 2	Niagara
5%	2.51					
4%	2.49					
3%	2.46					
2%	2.44	2.58	1.96	3.96	3.60	1.69
1%	2.41	2.56	1.94	3.92	3.57	1.67
-1%	2.37	2.51	1.90	3.85	3.50	1.64
-2%	2.34	2.48	1.88	3.81	3.46	1.62
-3%	2.32					
-4%	2.29					
-5%	2.27					

Figure 13. Range of Benchmark Results



The estimated average project capital cost per km for the New EWT Line in 2022 CAD is approximately $1.65 M/km which is calculated by discounting annual Construction project costs by the 10-year CAGR for CPI, annual Materials costs by the 10-year CAGR of the Handy-Whitman Plateau Indices, and by discounting Other costs again, by CPI. Construction costs, however, can be very weather-dependent, and harsher weather in Northwestern Ontario compared to the Plateau region may lead our estimates to be conservative.

This calculation results in New EWT Line total 2022 project costs of $741M, and at $1.65 M/km, it is a lower-cost project compared to the benchmarks presented in Figure 11. Costs per km for the New EWT Line remain lower than the benchmarks even under forecasting sensitivity tests.

The Bruce to Milton benchmark ranges from $2.27 M/km to $2.51 M/km. This project has been scaled down to a 230 kV using the WECC study but even under the widest sensitivity bands, the New EWT Line is still less expensive.

BC's Northern Transmission Line is estimated at $2.53 M/km in the benchmarking base case. Compared to this project in BC, the estimated New EWT cost per km is significantly lower.

The Niagara Reinforcement is estimated at $1.66 M/km. The cost for the 76 kilometer, 230kV line is relatively low compared to other projects, and similar to the new EWT Line.

A WECC study from 2014 estimated that a 230 kV transmission line located in a forested area that uses the same conductor type (ACSR) as the New EWT Line would be $1.92 M/km.

Finally, the AESO's cost benchmark database offers two technically similar project costs, one project at a cost of $3.89 M/km and another at $3.53 M/km. Both of these projects are 240 kV double circuit transmission lines larger than 100 km constructed in Alberta.

Appendix A: Benchmarking Analysis Inputs

Figure 14. Indices Used in Analysis

Handy Whitman Plateau (USD)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	*2018*	*2019*	*2020*	*2021*	*2022*		10-Year CAGR	5-Year CAGR
HW - Towers & Fixtures	424	463	471	458	474	494	514	507	523	526	539	*548*	*558*	*568*	*578*	*588*		2.4%	1.8%
HW - Poles & Fixtures	473	498	521	540	518	529	533	526	540	541	546	*549*	*553*	*556*	*560*	*564*		1.4%	0.6%
HW - Structural Steel Erected	444	509	510	469	488	497	513	511	519	495	514	*517*	*521*	*524*	*528*	*532*		1.5%	0.7%
HW - Overhead Conductors & De	559	613	678	551	543	536	552	565	582	601	587	*598*	*609*	*620*	*631*	*643*		0.5%	1.8%
																	Average	**1.5%**	**1.4%**
US CPI (2010 = 100)	94.9	98.7	98.4	100.0	103.2	105.3	106.8	108.6	108.7	110.1	112.2	*113.6*	*115.1*	*116.5*	*118.0*	*119.5*		**1.7%**	**1.3%**
CAN CPI (2010=100)	95.6	98.0	98.3	100.0	102.9	104.5	105.5	107.5	108.7	110.2	111.8	*113.3*	*114.8*	*116.4*	*118.0*	*119.6*		**1.6%**	**1.4%**
FX USD/CAD	1.07	1.07	1.14	1.03	0.99	1.00	1.03	1.10	1.28	1.32	1.30	*1.30*	*1.33*	*1.33*	*1.33*	*1.33*			

Handy Whitman Plateau (CAD)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	*2018*	*2019*	*2020*	*2021*	*2022*		10-Year CAGR	5-Year CAGR
HW - Towers & Fixtures	455	494	537	472	469	494	529	560	669	697	700	*711*	*741*	*754*	*767*	*780*		4.4%	7.2%
HW - Poles & Fixtures	508	531	595	556	512	529	549	581	691	716	709	*712*	*734*	*738*	*743*	*748*		3.4%	6.0%
HW - Structural Steel Erected	477	543	582	483	482	497	528	564	664	656	667	*670*	*691*	*696*	*701*	*705*		3.4%	6.1%
HW - Overhead Conductors & De	600	653	774	567	537	536	569	624	744	796	762	*775*	*808*	*823*	*838*	*853*		2.4%	7.3%
																	Averag	**3.4%**	**6.9%**
US CPI (2010 = 100)	94.9	98.7	98.4	100.0	103.2	105.3	106.8	108.6	108.7	110.1	112.2	*113.6*	*115.1*	*116.5*	*118.0*	*119.5*		**1.7%**	**1.3%**
CAN CPI (2010=100)	95.6	98.0	98.3	100.0	102.9	104.5	105.5	107.5	108.7	110.2	111.8	*113.3*	*114.8*	*116.4*	*118.0*	*119.6*		**1.6%**	**1.4%**

CRA Notes

1. HW Plateau (USD) for 2018-2022 is calculated based on 2012 to 2017 CAGR
2. CPI for 2018-2019 is calculated based on 2012 to 2017 CAGR
3. FX USD/CAD is added for 2018 and 2019 using Bank of Canada Annual Exchange Rates
4. HW Plateau (CAD) for 2018-2019 is calculated using the USD/CAD and HW Plateau (USD) figures

Figure 15. Electric Utility Construction Price Index (Indicative Only)[19]

Transmission Construction Price Index Components	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	10-Year CAGR	5-Year CAGR
Initial grading and clearing	136.6	149.7	160.4	176.7	194.5	191.4	191.2	195.6	198.3	186.6	189.2	3.3%	-0.2%
Installation labour	127.2	125.3	127.5	130.3	127.7	127.2	132.8	143.4	147.1	142.1	138.8	0.9%	1.8%
Installation equipment	139	142.9	144.6	144.7	154	156.1	149.3	150	153	156.7	164.4	1.7%	1.0%
Construction indirects	122.3	121.3	123.5	128.9	131	140.5	143.4	147.8	146.9	146.3	152.8	2.3%	1.7%
Engineering	130.4	130.8	133	138.9	142	154.2	158.1	164.5	166.4	164.2	172.4	2.8%	2.3%
Head office administration	129.5	130	132.2	137.8	140.9	152	155.8	161.7	163.5	161.7	169.5	2.7%	2.2%
											Average	**2.3%**	**1.5%**

19 Statistics Canada. Table 327-0011 - Electric utility construction price index, annual (index, 1992=100) which was discontinued in 2014.

TAB 2

DESCRIPTION OF LAND RIGHTS

New permanent land rights will be required to accommodate the proposed transmission facilities. Temporary land rights at specific locations along the corridor will also be required for construction purposes. Further information regarding the real estate needs to complete the New EWT Line Project are provided below.

NextBridge will require an approximately 450 km long ROW corridor with a typical width of 64 m for the New EWT Line. The approximately 28.42 km^2 of ROW land rights required consists of approximately 5.51 km^2 of permanent easement. Details in this regard are included in this schedule and in the Line List attached at Exhibit E, Tab 4, Schedule 1, Attachment 1. Temporary easements or short term leases required in support of construction activities for workspaces, access roads, laydown areas, storage yards and worker camps represent the balance. Temporary land needs are detailed in Exhibit E, Tab 2, Schedule 1.

1.0 Land Rights Required

NextBridge will require land rights for the purposes of constructing, operating, and maintaining the New EWT Line Project and related facilities. Private land, Provincial Crown land, and Federal Crown land interests are all required. NextBridge will require easement interests for the transmission line ROW and permanent access roads, and in limited instances fee simple interests outside of the transmission line ROW for the maintenance and operation of the Line Project. Temporary interests will be required in support of the construction phase of the Line Project. The types of private land rights required are listed below.

- Transmission Easement or Grant of Easement
- Road Easement
- Temporary Easement or Licence

- Short term lease
- Fee simple interest
- Building and Land Use permit (Hwy 11 & Hwy 17)
- Encroachment Permit
- Entrance Permit
- Crossing Permit

Provincial Crown Land interests include:

- Work Permit
- Land Use Permit
- Easement
- Licence of Occupation
- Consent or agreement from Crown interest holders

NextBridge will also require authorization pursuant to the *Indian Act*[1] on reserve lands from the Federal Crown.

<u>2.0 Nature and Relative Proportions of Land Ownership Along the Proposed Route</u>

The relative proportions of the three categories of land ownership along the proposed route are indicated in the table below.

[1] R.S.C., 1985, c.I-5 (“Indian Act”).

Ownership Category	Area (km^2)	Proportion of Route (%)
Private Land[1]	5.33	19%
Provincial Crown[2]	22.55	79%
Federal Crown[3]	0.54	2%

[1] Private land includes:

- Private lands owned by private property owners
- Railway lands owned by railway company
- Federal Crown Agency lands owned by the Federal government including Federal Crown, Federal Crown Agents and Federal Crown Corporations (Department of Transport)
- Provincial Crown Agency lands owned by the Provincial government including Provincial Crown, Provincial Crown Agents and Provincial Crown Corporations (Provincial Ministries, Hydro One, Infrastructure Ontario, etc.)
- Municipal lands

[2] Provincial Crown lands including unpatented Crown lands, conservations reserves, and Provincial Parks in Ontario

[3] Federal Crown lands include First Nation reserve lands

3.0 Use of Public Roads and Highways

NextBridge intends to utilize existing roads where possible for the construction, operation, and maintenance of the New EWT Line Project and related facilities. The New EWT Line project facilities in certain instances will be located over, under, or on public streets or highways as permitted by *s.41* of the *Electricity Act*. Specifically, Line Project infrastructure will be located over, under or on public streets or highways in unorganized territories; in the municipalities of Shuniah and Wawa; within the Townships of Dorion, Nipigon, Red Rock, Schreiber, and Terrace Bay; and in the Town of Marathon. NextBridge has engaged with community representatives regarding use of public roads and highways and is not aware of any disagreements related to public road crossings. NextBridge does not anticipate any impact to adjacent properties resulting in building restrictions. Public roads and highways on, under or over which New EWT Line Project infrastructure is planned to be located are identified in the maps at Exhibit C, Tab 3, Schedule 1, Attachment 1.

TAB 3

FORECAST CONSTRUCTION COSTS

1. A total of $737.1 million in construction costs is forecasted to complete the East-West Tie line, of which 57% have already been incurred as of October 31, 2020. The cost categories in table below follow the format and order used in NextBridge's quarterly reports to the OEB. As evidenced in Exhibit B and in the CRA report attached at Exhibit B, Tab 1, Schedule 7, Attachment 1, NextBridge's construction costs are in line when benchmarked with other constructed transmission lines. The table below shows the total construction costs per category, for the estimated completion of the line assuming an in-service date of March 31, 2022.

	Engineering & Construction	**614.3**
1	Engineering, Design and Procurement	8.5
2	Materials and Equipment	66.9
8	Site Clearing, Access	140.6
9	Construction	398.2
	Environmental & Remediation Activities	**31.6**
3	Environmental and Regulatory Approvals	19.1
10	Site Remediation	12.5
	Indigenous Activities	**23.7**
5	Indigenous Economic Participation	9.7
6	Indigenous Consultation	13.9
4	**Land Rights (excludes Aboriginal)**	**23.8**
7	**Other Consultation**	**2.5**
11	**Contingency**	n/a
12	**Regulatory**	**5.4**
13	**East-West Tie Project Management**	**4.9**
	Total Project Spend	**706.1**
14	**Interest During Construction (IDC)**	**31.0**
	Total Construction Cost	**737.1**

2. After a general overview of NextBridge's cost management policies, each of these cost categories are discussed in turn below.

Overview of Cost Management Practices

3. On a monthly basis the following activities are performed by the Project Management Office and cost category discipline leads to monitor, record and control costs and mitigate risks:

- Financial accounting is maintained by NextBridge's Project Management Office
- Costs are compared on a budget versus actual basis to identify any variances
- Variances are used by the Project Management Office to maintain cost tracking

4. The Project Management Office meets with the cost category discipline lead on a monthly basis to discuss cost and activity tracking and identify any variances (whether positive or negative) and any unanticipated expenditures that need to be included in the next forecast.

5. Each month this review assesses:

- Cost performance;
- Schedule performance;
- Identification of new risk factors;
- Any major changes to forecast; and
- Vendor performance.

6. The Project Management Office and the cost category discipline lead also monitor vendor costs against the contractual amounts including purchase orders ("**PO**") where a comparison of work progress and payments is performed to ensure appropriate billing.

7. The Project Management Office identifies variations and any overall cost impacts and reports these findings to the Project Director. The Project Director then uses the information to ensure all key project milestones are being completed as planned and costs are being controlled. If there are outstanding questions that need to be discussed further, the Project Director and Project Management Office schedule meetings with the affected discipline team leads to review the risks, the potential for cost changes and mitigation plans. In addition to cost monitoring, and to ensure progress and risk mitigation, the Project Director is also actively tracking and reviewing each discipline's practices including:

- Reviewing performance measures (*e.g.,* land procured, permits obtained, work fronts progression, construction milestones, etc.);
- Schedule performance;
- Risk management plans; and
- Cost management practices (detailed in OEB Quarterly Report – Q4 2019, which is Attached as Exhibit C, Tab 1, Schedule 1, Attachment 2).

8. The Project Director holds weekly meetings with discipline team leads to monitor overall progress and actively identify any cross functional discipline issues that need addressing or could introduce new risks to the East-West Tie line. During these weekly meetings the Project Director manages the team's focus to any issues that have arisen and provides direction and decisions on any outstanding matters.

9. Based on the above, any newly identified cost variances or risks will be reported in the OEB quarterly reports. This monitoring and reporting allows NextBridge to manage the expected budget as most costs are now essentially fixed for the majority of activities.

10. NextBridge's commitment to prudently manage costs is also demonstrated by its request to move the in-service date of the East-West Tie line to March 31, 2022. For example, as described in NextBridge's letter to the IESO dated July 20, 2020, NextBridge assessed

changes to the overall benefit permit ("**OBP**") that would allow for a longer construction window that could make up a potential schedule delay resulting from the COVID-19 pandemic. These changes included the building of all season roads instead of constructing only when the ground was frozen. This analysis identified $15-$20 million in additional costs that were ultimately avoided by communicating with the IESO and obtaining confirmation that an in-service date of March 31, 2022 would not create an unacceptable risk to reliability.

Overview of Procurement Practices

11. As of the date of this filing, nearly 90% of forecasted construction costs have been contracted, which reduces future volatility in pricing and ensures resource availability due to the contracts having an agreed upon price and negotiated scope of work. The scope of work has been developed by an experienced supply chain team and the NextBridge cost category discipline team lead's specific project knowledge, both of which have been applied to reduce risks and costs. A copy of NextBridge's procurement policy can be found at Exhibit C, Tab 2, Schedule 4, Exhibit 1. Examples of effective procurement processes to contain costs and mitigate risks include:

- Engineering & Construction
    - Securing a fixed price engineering, procurement, and construction ("**EPC**") contract with the general contractor that assigns the risk for certain aspects of the East-West Tie line including labor cost changes, weather impacts during construction, sub-surface risk mitigation, and material costs. NextBridge completed a competitive process for a general contractor to incorporate actual construction market data specific to the climate and terrain characteristics of the East-West Tie line. An Expression of Interest ("**EOI**") process was held in 2014 in order to pre-qualify potential EPC companies or general contractors. Twelve companies participated in the EOI process, and five were short-listed to participate in the final project RFP process. The short-listed companies were selected based on twenty

specific criteria, including, among others, a) experience with transmission projects, b) evidence of projects completed with similar complexities in terms of size, climate conditions and environmental restrictions, c) safety records; and d) contracting and employment strategies for inclusion of First Nation and Métis communities. The final RFP process was initiated in 2016. The bidders were provided with detailed project technical and constructability information, including tower design and assembly details, foundation preliminary design, construction access plans, routing based on fieldwork, environmental constraints analysis, safety requirements, and direction on NextBridge's expectation that First Nation and Métis communities would be offered economic participation opportunities.

- Indigenous Engagement
  - The majority of the expected capacity funding agreements with Indigenous groups have been executed, making previously unknown costs more certain.
- Environmental
  - The majority of environmental activities that will occur during the construction phase of the project have been contracted with the general contractor, which includes a revised work scope as a result of the approved Amended EA.
- In order to improve cost certainty, NextBridge has competitively bid the following fixed price contracts:
  - Steel pole structures;
  - Towers;
  - Conductor;
  - Overhead ground wire;
  - Optical ground wire;

- EPC; and
- Environmental activities, such as preparing detailed project plans, obtaining work permits, and obtaining a variety of environmental permits such as waterbody crossing permits and species at risk permits

12. NextBridge entered into these fixed contracts as a cost containment measure to reduce the likelihood of significant budget increase risk to the project.

13. The EPC general contractor was required to accepted certain pricing risk responsibilities, such as costs associated with the subsurface of constructing foundations, which was based on their knowledge of the region, vast experience on similar projects and ability to use their means and methods to mitigate risks as they manifest during the construction period.

14. The appropriateness and reasonableness of these cost management policies, including competitive bidding practices, as they have been applied to the cost categories that follow has been confirmed by the cost effectiveness of the East-West Tie line when compared to other similar transmission projects in the Benchmarking study conducted by CRA.

15. The following cost categories align with the quarterly OEB report order and format, and provide detail on the forecasted construction costs of $737.1 million.

Engineering & Construction Activities ($614.3 million)

16. **(1) Engineering, Design, and Procurement ($8.5 million)**

17. The engineering, design, and procurement costs entail detailed engineering, design of the line, and procurement to support these activities. As detailed in the quarterly reports to the OEB, this category has decreased since the LTC to reflect work scope shifting to the general contractor contract, for efficiencies. The scope of this activity includes,: route

surveying (LiDAR, ground surveys, topographical, as built), engineering and design (routing, alignment, structure spotting, plan & profiles, details, etc.), detailed lattice tower design/prototype fabrication and physical load testing of 10 prototypes of lattice structures, conductor selection and arrangement design, geotechnical investigation (desktop and fieldwork), foundation designs, weather studies, crossing designs (railroad, highways/roads, transmission lines, pipeline, pipeline mitigations, etc.), alternative/re-routing analysis, all contractor supervision and management staff services throughout the duration of the East-West Tie line, labour, equipment and material for contractor mobilization/demobilization, testing and commissioning of the facilities, contractor performance bonds, quality assurance/quality control of material fabrications and engineering support during construction. Generally, these activities can vary in the level of effort needed due to the characteristics and needs of a specific transmission project and in the experience of NextBridge partner organizations these costs can range from 2% to 5% of the total project costs. The resources and materials required to complete the above-mentioned tasks were procured through competitive bid processes as explained above in Exhibit B and the hourly rates of these professional services are consistent with NextBridge partner organization experience from other projects given the complexity, limited access, and difficult terrain of this project.

18. **(2) Materials and Equipment ($66.9 million)**

19. The costs for material and equipment include the major materials sourced directly from vendors, outside of the general contractor contract. This category has decreased since the LTC budget due to transferring scope to the general contractor contract, and also favorable negotiated pricing on materials. This cost category does not include the cost of spare equipment, which is in the spare strategy costs section below.

20. **Structures:** This cost includes 1,227 structures (*i.e.,* towers and poles), which were competitively sourced. The structures have been procured from two suppliers through a competitive bidding process, as per NextBridge procurement policies, to ensure the best

value to Ontario ratepayers. Both structure suppliers signed fixed price contracts that included raw material procurement, manufacturing and shipping. Using a risk analysis, NextBridge procured structures well before they were required for construction to mitigate cost fluctuations. The chosen tower supplier is located in Turkey, which allowed savings on the majority of the structures from US steel tariffs. Additionally, NextBridge chose to procure the towers at a time where commodity pricing was favourable and subsequently the cost for steel has risen substantially. The pole supplier is located in Oklahoma, USA and the number of poles was de minimis and any steel tariffs were minimal. NextBridge holds weekly conference calls with fabricators to ensure design and delivery compliance.

21. **Conductor:** This includes the cost of approximately 2,700 km of 1192 kcmil "Grackle" ACSR conductor, which was competitively sourced from the vendor General Cable and manufactured in Quebec, Canada.

22. **Overhead Ground Wire ("OHGW"):** This includes the cost of 450 km of 19#10 Alumoweld OHGW, which was competitively sourced from Conex Cable. Conex Cable has been manufacturing aluminum-clad overhead shield wire since 1988. NextEra procures a considerable amount of these types of cables every year for projects across all its affiliates through competitive solicitations. Given the high volume of procurement of these products, affiliates of NEET receive some of the most favoured pricing, terms and conditions for this supply in the industry which it has passed on to the NextBridge project.

23. **Optical Ground Wire (OPGW):** This includes the cost of approximately 450 km of 48 fiber OPGW, which was competitively sourced from Suzhou Furukawa Power Optic Cable Company. Similar to OHGW, affiliates of NEET receive some of the most favoured pricing for these materials due to its high volume of procurement.

24. **Staff / Other:** All contractor supervision and management staff services throughout the duration of the project construction. Labour, equipment and material for contractor mobilization/demobilization, testing and commissioning of the facilities, and contractor performance bonds are all contained in the fixed price EPC contract to minimize risk of cost increases.

25. **(8) Site clearing, Access ($140.6 million)**

26. The work scope below was competitively sourced through the fixed price EPC. The LTC budget was created prior to the general contractor contract execution. In the EPC contract, NextBridge was able to bundle many activities into overall EPC pricing. Therefore, the cost categories in the LTC were more granular than the contract. However, to remain consistent in reporting to the OEB against the LTC categories, NextBridge has worked to estimate the costs that would fall into each LTC category from the overall EPC contract. This cost category has increased since the LTC budget for two main reasons. First, an increase to allow a risk transfer from NextBridge to the contractor for access risk based on negotiations to protect ratepayers from any increases during construction for access. Second, an increased requirement that bridges would be needed to cross over many streams as opposed to the originally planned culverts which were less expensive. This cost includes the following activities:

27. **Civil Work**, **Access**: Upgrading, improving, or building new roads including matting installation, and waterbody crossings to facilitate the movement of construction equipment, construction material and personnel to and from the transmission line corridor in order to access each proposed tower location where towers are to be installed. It also includes the construction of temporary access roads in order to access worker camps, and storage yards and crane pads to facilitate the operation of cranes for the installation of towers. In the fall of 2019, NextBridge worked with the Ministry of Natural Resources and Forestry ("**MNRF**") to seek an amendment to the *Aggregates Act* that would allow materials to be used from the surrounding area to construct access roads. Originally,

gravel would have to be purchased and trucked in to use on hundreds of kilometers of access roads along the East-West Tie line ROW; however, with this amendment there was a substantial savings to ratepayers in avoiding this cost.

28. **Civil Work, Clearing:** Timber cutting, grubbing and stump removal, preparation, flagging and cutting or mowing of vegetation within the transmission line corridor from ground to sky as required. This work scope can only be completed in the winter months when the ground is frozen. The majority of this work was procured by the general contractor in agreements with local Indigenous-owned businesses. In adherence to NextBridge's cost management process, the general contractor used values from previous projects as a benchmark for these contract negotiations to obtain competitive pricing.

29. **Civil Work, Traffic Control:** Signage and personnel used to coordinate and control the regular traffic of vehicles and the higher volume of construction vehicles traffic during project construction to avoid accidents on the construction roads and on the existing roads and highways that will be used by construction vehicles. Utilization of local labour was used to reduce the cost of travel to the site and maximize productivity.

30. **Construction Survey:** Surveying involves identifying items, objects, or matters such as structure location, guy anchors location, and any buried or overhead utilities.

31. **Construction Environmental Compliance:** Satisfy additional environmental requirements by the MNRF to bridge over stream crossings which were initially anticipated to use culverts as a result of permit requirements. NextBridge has had extensive coordination with the MNRF regarding the use of culverts, which are less expensive, versus using bridges to span over streams and waterbodies. Each of the waterbody crossing permits has been individually investigated in order to seek the use of lower cost culverts and as part of the cost management process the Project Director approves each application.

32. **Staff / Other:** All contractor supervision and management staff services costs throughout the duration of the project construction are included in this category. Labour, equipment, and material for contractor mobilization/demobilization, testing and commissioning of the facilities, and contractor performance bonds.

33. **(9) Construction ($398.2 million)**

34. This cost relates to the assembly and construction of foundations, towers, and the line. This work is contracted to the general contractor and was procured competitively. Since the LTC budget, this category has increased to accommodate transferring risk from NextBridge to the contractor for subsurface/foundations, along with the new March 31, 2022 in-service date of the project. Additionally, there was a transfer of costs to this category from the engineering and materials category (which had lower costs than the LTC) to reflect work being covered by the general contractor. The categories below are included in the fixed price contract to reduce construction related risks to cost and schedule.

35. **Cassions / Foundations:** Construction equipment, material and labour costs required to install the tower foundations and guy anchors. This foundation work involves excavation, backfill, compaction, formwork, rebar, concrete pouring, embedment, and dewatering among others.

36. **Structure Framing and Setting:** Construction equipment (crane, flatbed trucks, fork lift, helicopters), material, and labour cost required to assemble and install the structures at every location. This also includes installation of all insulators, line arresters and hardware, attachment of guy wires from the structures to the guy anchors, and installation of signage on the structures.

37. **Insulators:** Material and labour cost for all types of insulators, arresters, and jumpers to be installed on the structures to hang the transmission line cables and avoid contact with the towers. Externally gapped lightning arresters ("**EGLAs**") are included as part of the insulator assemblies and are installed on one circuit as required. During a cost review and after an engineering analysis EGLAs were selected in place of non-gapped line arresters ("**NGLAs**") which resulted in a cost savings. This cost savings was then offset with other costs in the general contractors fixed price contract, therefore negating potential cost increases for out of scope items.

38. **Assemblies:** Materials cost for assembly of all the hardware required to attach the insulators to the towers and install. This line item also includes all equipment, material and labour to install the grounding system at the base of structures.

39. **Conductor Installation:** Construction equipment, material, labor required for conductor installation includes the use of construction equipment such as tensioners and pullers, the labour and material for the stringing of all conductors, fiber optics, overhead ground wire, and installation of hardware such as deadends, bird flight diverters, galloping mitigation. splices, and dampers.

40. **Staff / Other:** all contractor supervision and management staff services throughout the duration of the project. Labour, equipment and material for contractor mobilization/demobilization, testing and commissioning of the facilities, and contractor performance bonds.

Environmental & Remediation Activities

41. This section explains the project costs related to receiving all of the necessary environmental approvals for the project and complying with the conditions of those approvals through construction and remediation. The major services for external environmental consultants have been competitively sourced and the hourly rates of these

services are consistent with NextBridge partner organization experience and expectations for these types of services, especially given the size, complexity, limited access and difficult terrain of this project.

42. **(3) Environmental and Regulatory Approvals ($19.1 million)**

43. This cost category includes the activities to support the EA and the Amended EA. This cost category has increased since the LTC budget primarily due to additional requirements imposed by regulatory entities. Additional field studies, documentation development, site investigations, and the creation of a new permitting approach called Detailed Project Plans ("**DPP**"s) were required by the government agencies that reviewed the Amended EA and resulted in the final expanded conditions in the Amended EA. The direction of government reviewers requested additional aquatic, bat, acoustic, and avian studies and surveys, as well as multiple rounds of review during the Amended EA process.

44. Additionally, there was a compression of NextBridge's permitting timeline as a result of the revised timing for the receipt of the Amended EA, which also included new conditions. The Amended EA was originally contemplated for an approval date in 2018 as per the schedule submitted with the LTC, but was ultimately approved in 2019. The compression of the schedule, paired with the new DPP process, resulted in NextBridge amending the EPC to allow for additional resources to expeditiously complete the new DPP process and permitting requirements to meet the scheduled construction start date. After the Amended EA was approved, NextBridge continued to adjust access to the ROW to ensure optimal and efficient access and minimize potential environmental impacts.

45. Environmental construction compliance support for the duration of construction was also a condition of the Amended EA. While the LTC budget included expenditures for environmental construction compliance, the Amended EA had significantly more conditions than contemplated in the original EA (815 commitments in the original EA vs.

1061 in the Amended EA) that required additional independent environmental monitoring expenditures beyond those budgeted for NextBridge to meet those additional conditions.

46. In summary this cost category includes:

- Final EA comment and response period;
- Field surveys associated with the EA;
- Drafting and submitting an Amended EA;
- Meetings with regulators and stakeholders regarding the final and Amended EA comments;
- Execution of Detailed Project Plans;
- Execution of environmental monitoring; and
- Environmental construction compliance

47. This category is also inclusive of internal payroll to support and manage these activities, including a dedicated internal resource based in Thunder Bay during the construction of the project only. Their role is to actively manage permit applications and approvals and to ensure schedule efficiencies are found by directly communicating with local permit offices. NextBridge utilized competitive procurements, cost management processes and cost efficiencies for the benefit the ratepayers for the activities.

48. The costs in this forecast are comprised of:

49. **Environmental Assessment and Amended EA:** The EA and the Amended EA acted as overall permits and covered the entire project area. However, the long linear nature of the project crossed multiple regulatory jurisdictions. In order to make the project easier for regulators to process the numerous site specific applications, the project was segmented into eleven sections (each commonly referred to as a "**Workfront**"). Each Workfront has

different terrain and habitat requiring site specific information/data in the form reports and applications.

50. The Ministry of Environment Conservation and Parks ("**MECP**") approved the Amended EA, with Cabinet concurrence (Order-in-Council 403/2019), on March 21, 2019. Attached as Exhibit C, Tab 2, Schedule 4, Attachment 2 is the Notice of Approval to Proceed with the Undertaking issued by the MECP for the project (the "**EA Approval**"). Included in the EA Approval are the conditions NextBridge must adhere to during the construction and operations of the project. The costs associated with the EA related to years of effort conducting field surveys, preparing reports, meetings with regulators and stakeholders, and responding to multiple rounds of questions.

51. While the Amended EA was received in March 2019, the additional requirements outlined in the Amended EA required more analysis. Under the direction of government reviewers, it was requested that additional aquatic, bat, acoustic, and avian studies and surveys, as well as multiple rounds of review were required during the Amended EA process.

52. NextBridge worked through multiple rounds of questions to address government concerns and allowed the agencies to place the Amended EA conditions into practice in parallel with issuing permits. These collaborative discussions extended the review duration and increased the support activities required for achieving permit approvals.

53. **Detailed Project Plans:** Following the issuance of the Amended EA, the project was required to conduct additional studies, site investigation and generate extensive reports to support the creation of a new regulatory review approach called DPPs. NextBridge ran a competitive bid process for the DPP work scope, along with the thousands of individual permits. The environmental services division of the EPC general contractor was selected to perform the work. The integrated relationship between the construction and environmental divisions allows for efficiencies in the field and administratively, benefitting ratepayers. These DPPs took time and effort to develop and required a 30-day review

from the MECP and the MNRF prior to submitting permit applications. This effort extended the time to permit as the process was new and was an additional step prior to submitting the permit applications, which contained the detail necessary for the final approvals.

54. **Individual Permits:** Numerous federal, provincial and local approvals were required for the project from, but not limited to the following regulators: Department of Fisheries and Oceans; Transport Canada; Environment and Climate Change Canada; Indigenous and Northern Affairs Canada; Ministry of Natural Resources and Forestry; Ministry of Environment Conservation and Parks; Ministry of Tourism, Culture and Sport; Infrastructure Ontario; Ministry of Environment and Climate Change; and Lakehead Region Conservation Authority (preliminary consultation, field surveys and assessments, drafting and submitting applications, further consultation).

55. The project has received over 1,000 permits and approvals. On average, each Workfront requires more than 95 approvals. The permitting process required additional surveys and site specific information, primarily related to access roads and crossing of waterbodies and wetlands. Permits include:

- MNRF:
    - Land Use Permits - ROW and laydown yards;
    - Work Permits – Access;
    - Roads and Watercourse Crossings;
    - Memorandum of Understanding - for Access Roads and Bridges;
    - Forest Resource License;
    - Authority to Haul;
    - Approval to Commence Harvesting Operations;
    - Burn Permits;
    - Fish Scientific Collectors Permit;

    - Wildlife Scientific Collection Permit; and,
    - Private Land Clearances.
- MECP:
    - Approval of the Amended EA;
    - Provincial Parks and Conservation Reserve Act Permits; Land Use Permit ("**LUP**") for ROW and Bridges, Clearing and Access Work Permits;
    - Permit to Take Water;
    - Environmental Site Assessment permit, Section 17 for Species at Risk Permits and Authorizations including Overall Benefit Permit and Letter of Advice; and,
    - Environmental Compliance Approval for waste disposal from camps, etc.
- Federal Permits:
    - Species at Risk, Department of Fisheries and Oceans Letter of Advice;
    - Transport Canada Navigation Protection Act Canada permits.
- Municipal:
    - Building Permits for Work Camps;
    - Noise By-Law exemptions;
    - Open Air Burning Permits/Fire Permits;
    - Fire and Protection and Prevent Act-notice of camp opening;
    - Permit to Injure or Remove Trees; and,
    - Site Plan Control Approval in accordance with Planning Act.
- Others:
    - Lakehead Region Conservation Authority for water crossing permits;
    - Sustainable Forest License Overlapping Permits/Licenses;

- o Technical Standards and Safety Authority licenses for transport, storage and handling of fuels;
- o Infrastructure Ontario Class Environmental Assessment; and,
- o Ministry of Heritage, Sport, Tourism, and Cultural Industries approvals for archeology reports.

56. MNRF offices in Thunder Bay, Nipigon and Wawa were key to the many of the permits/approvals. As well as using the environmental services of the general contractor, NextBridge determined a cost efficiency during one of its weekly team meetings in hiring local staff that formed relationships with the local MNRF offices. Thus gaining efficiencies in coordination of information requests and ensuring timely issuance of permits. If a construction crew in the field does not have the required permits it will have to demobilize from that area and move to another. This can be detrimental to the project schedule and could cause increased costs.

57. MECP offices throughout the Province participated in the development and issuance of the Overall Benefits Permit.

58. **The Overall Benefits Permit:** The OBP represents the approval for the project to construct in areas where species protected under the ESA could be present – namely caribou (boreal population - Lake Superior Coastal Range) and species at risk bat species (Little Brown Myotis, Northern Myotis, and Eastern Small-footed Myotis). (See Exhibit C, Tab 2, Schedule 4, Attachment 3 for OBP Permit and Conditions)

59. **Plans and Procedures:** The project had to develop numerous plans and procedures that outline how construction and remediation would be conducted in the unique area of northwest Ontario. For example, a Construction Environmental Protection Plan, Standard Operating Procedures for construction of access roads through wetlands and water crossing selection and installation, as well as detailed alignment sheets were required to be developed as part of the Amended EA conditions.

60. **Construction Compliance:** The Amended EA mandated that third party, independent, compliance oversight was necessary on the project to ensure permit conditions were met during construction. Additionally, the Amended EA had significantly more conditions than contemplated in the original EA (815 commitments in the original EA as compared to 1061 commitments in the Amended EA), along with over 1,000 permits and associated condition to also comply with. NextBridge competitively procured an environmental monitoring firm that could assure that the conditions and requirements were being observed during construction. (See Exhibit C, Tab 2, Schedule 4, Attachment 2 for the EA Notice of Approval to Proceed and Conditions). This firm has a purchase order with a defined scope and budget and invoices are reviewed against this purchase order to ensure that work was performed in accordance with the scope as invoiced.

61. This budget item also includes environmental training for field personnel for construction, breeding bird nest sweeps and amphibian salvage prior to vegetation clearing, fish salvage prior to in-water works for water course crossings, and environmental inspection during construction.

62. These environmental monitors work though the 450 km project everyday ensuring compliance with permits during construction. Until March 2020 they also worked as liaisons with Indigenous inspectors by performing joint inspections of the ROW to observe construction.

63. **(10) Site Remediation ($12.5 million)**

64. The cost for site remediation includes the following activities below, along with the necessary internal labour to develop and manage these programs. This cost category has decreased since the LTC budget. The species at risk permit was not approved at the time of the LTC budget so the costs were estimated as closely as possible. In addition, once permits and requirements were received for laydown yards, NextBridge was able to

find cost efficiencies associated with the existing EPC to include these activities within the construction scope at a fixed price basis.

65. The site remediation costs include:

66. **Laydown Yards:** Consists of contracted cost of constructing, securing, and then remediating laydown yards. This scope of work is part of the overall EPC that was competitively bid. Yards include all areas that are to be used as laydown or storage facilities and worker camps. The terrain of these areas requires preparation (earth work, leveling and grading) before it can support the worker camp containers and towers and materials to be used in the project. In order to choose the most cost and schedule effective site for these yards, the general contractor surveys the land to ensure proper drainage, road access and proximity to water sources. At the weekly meetings with other disciplines, such as Land and Environment, the site selection of yards, access roads and worker camps is reviewed to ensure no additional costs would be incurred. This minimizes, or in some cases eliminates, the incremental cost of obtaining environmental permits and landowner agreements to construct laydown yards.

67. **Construction Compliance:** As described in the previous section (3. Environmental & Regulatory Approvals, section "Construction Compliance"), third party compliance oversight (monitors) is mandated by the Amended EA. These competitively procured monitors will oversee the remediation work covered in this section.

68. **Remediation and Mitigation**: NextBridge has made commitments for post-construction remediation and mitigation activities to satisfy the OBP, the Amended EA and other permits/licenses necessary for construction. This work is expected to begin during construction and extend up to 10 years past the March 31, 2022 in-service date as required in the permit conditions.

69. As required in the Amended EA, Post Construction Monitoring Plans (“**PCMP**”) will also have components and requirements that extend years past the in-service date. A detailed PCMP are developed for each Workfront based on permit approval conditions. The PCMP will include detailed monitoring methods and a plan to address outstanding environmental issues or areas that require further reclamation or monitoring of reclamation efforts, as identified during and following construction (See Exhibit C, Tab 2, Schedule 4, Attachment 4 for PCMP Conditions in the Amended EA).

Construction Phase Remediation and Mitigation

70. Remediation and mitigation costs expected to be incurred prior to the in service date of March 31, 2022 and up to one year after that date have been included in this cost category. NextBridge has only included costs for these activities that are fixed or contractual in nature. These activities are primarily related to meeting the conditions of the OBP and the PCMP.

71. The OBP activities during the construction of the project include, but are not limited to:

- Developing a caribou transfer strategy along with pre-transfer monitoring of caribou and predators;
- Developing and implementing bat habitat creation;
- Developing and implementing bat gate installation plan;
- Designing, building and monitoring bat rock piles;
- Purchasing and monitoring permanent survey stations (trail cameras);
- Undertaking revegetation surveys;
- Monitoring hibernacula (visual and acoustic);
- Ice condition imagery monitoring; and

- Purchasing global positioning system collars and trail cameras to monitor caribou post-transfer.

72. The PCMP activities during the construction of the project include, but are not limited to:

- Developing PCMP plans;
- Annual monitoring of terrain & soil, weeds, revegetation, wetlands, Indigenous current land and resource use;
- Biannual monitoring of fish habitats, flow rates, wildlife mortality (year one of two); and
- Overall monitoring and reporting of field expenses.

Post-Construction Phase Remediation and Mitigation

73. The remediation and mitigation costs that are not identifiable, measurable, and/or expected to take place up to ten years after the in-service date, are not part of the construction costs in this cost category. These costs are not presented for consideration in this proceeding for prudence due to their uncertainty of occurrence and timing and will be recorded in the CCVA for future disposition, if and when they occur, as described in Exhibit H.

74. The OBP activities that may occur after the in-service date include, but are not limited to:

- Implementation of caribou transfer strategy and associated monitoring;
- Winter aerial surveys along the Lake Superior coast (year five and year ten);
- Trail camera monitoring;
- Revegetation surveys;
- Monitoring of bat hibernacula, ice conditions, rock pile and bat habitat; and
- General reporting and project management.

75. The PCMP activities that may occur after the in-service date include, but are not limited to:

- Overall planning of monitoring activities,
- Biannual monitoring of fish habitats, flow rates, wildlife mortality (year one of two); and
- Overall monitoring and reporting of field expenses.

76. To further elaborate on the remediation and mitigation costs that will occur during construction, and up to ten years after, some examples are below:

77. In regards to the OBP caribou transfer requirement, there are significant conditions that are both weather and nature dependent that drive volatility. Additionally, Ministry and stakeholder review and Indigenous consultation requirements can impact the timing and potential cost of implementation. (See Exhibit C, Tab 2, Schedule 4, Attachment 3 for OBP Permit and Conditions). In order to mitigate the cost of prolonged review and consultation, NextBridge has been engaging early and often with stakeholder groups and Indigenous communities on the caribou transfer requirement.

78. Pre and post-transfer ice monitoring is required for a minimum of two years before and three years after caribou transfer to monitor the formation of ice bridges to the islands on Lake Superior. If ice bridges form, aerial surveys must be conducted monthly thereafter to detect presence of associated predator movement. The transfer area must be free of natural predators of caribou at the time of transfer. The transfer of the required minimum of eight adult females and four adult males cannot occur until the caribou population and demographics at the capture area are adequate as to not jeopardize the persistence of the remaining population.

79. Post-transfer monitoring is required for three years to monitor the population size, reproductive success, and survival of caribou by trail cameras and radio-collars on adult females. If a mortality is detected through radio-collar data, and ice bridges were present, ground studies must be conducted to determine the cause of mortality.

80. Extensive monitoring of caribou, ungulates, and predator populations is required throughout the mainland by using permanent survey stations (trail cameras) for seven years at 19 locations.

81. NextBridge engaged with Michipicoten First Nation in the development of the OBP and included in the conditions of the permit, MECP requires NextBridge to consult with Michipicoten First Nation on the development and implementation of the caribou transfer plan.

Indigenous Activities

82. **(5) Indigenous Economic Participation ($9.7 million)**

83. As previously mentioned in the TSP at Exhibit B of this Application, NextBridge is required to meet the government of Ontario's policy objectives for Indigenous economic participation as laid out in the 2013 LTEP. The First Nation and Métis economic participation costs in this Application include legal, project management, skills training, construction access fees, and labour costs to communities to ensure that the commitments made during the negotiation of various agreements are carried out. For example, included are costs for community members to liaise with NextBridge and provide general assistance and support in connection with the construction of the East-West Tie line. Community liaisons provide valuable local knowledge and have been vital in identifying Indigenous procurement opportunities and recruiting Indigenous labour to seek positions on the project. To date, approximately 60% of NextBridge's workforce are from

local Indigenous communities with training initiatives ongoing throughout the construction period.

84. Additionally, costs related to acquiring land access to traverse reserve lands for two First Nations (Pays Plat, and Michipicoten) are included. These are federal permits issued under subsection 28(2) of the Indian Act 1985 ("**Section 28(2) Permits**") that will allow NextBridge the use of reserve lands, as well as lands that are in the process of being transferred to the community, to construct the East-West Tie line. There has not been a transmission line Section 28(2) Permit in Ontario in recent years. NextBridge used the expertise of partnership organization Enbridge having experience from a gas utility perspective and factored this into the budget creation for these costs. Costs account for legal fees and capacity funding to these communities to draft and conclude the federal permit. After a monthly budget review, NextBridge identified that using external legal firms sparingly would minimize cost and has negotiated these agreements with internal counsel from the partner organizations The fees for these permits are paid to the federal government to be held in trust for the First Nations and paid during construction and annually for the life of the East-West Tie line.

85. In order for the Bamkushwada, LP to obtain equity in the project at the in-service date, legal and project management costs to support the First Nation's financing are also included in the forecasted cost of Indigenous Economic Participation.

86. **(6) Indigenous Consultation ($13.9 million)**

87. NextBridge has engaged and consulted with First Nation and Métis communities since it was first delegated procedural aspects of the duty to consult by the Crown in 2013 and remains committed to ensuring these aspects will continue to be met. NextBridge carried out a full program of interest-based consultation as required for an individual environmental assessment under Part II of the *Environmental Assessment Act*. This program included discussions regarding the transmission development and construction

process with the eighteen identified Indigenous communities from the Memorandum of Understanding between the Crown (represented by the Ministry of Energy) and NextBridge.

88. The MECP approved the Amended EA on March 21, 2019. In *Section 7: Consultation with Indigenous Communities* of the EA Approval, the Amended EA approval imposes ongoing requirements to ensure that NextBridge continues to consult with the 18 Indigenous communities throughout the construction of the East-West Tie line. Further to those requirements, NextBridge submitted, for approval by the Crown, an Indigenous Consultation Plan to the MECP in July 2019 to address NextBridge's plan for Indigenous consultation going forward (see Exhibit C, Tab 2, Schedule 4, Attachment 5). Additionally, in *Section 4: Compliance Monitoring Program* of the EA Approval an extensive monitoring program was mandated and in the Indigenous consultation section described above NextBridge must also detail opportunities for communities to be involved in environmental monitoring activities.

89. Therefore, the costs in the Indigenous consultation category include continued support to communities to facilitate meeting NextBridge's Crown duty to consult obligations and participating in the conditions for consultation in the EA Approval. For example, activities related to the development, maintenance and participation in environmental construction monitoring are included, as well as consultation activities relating to, or in connection with, project permitting during the construction period such as capacity funding for third party reviews of permits.

90. As part of the MECP's review of the Amended EA, the agency asked for a copy of NextBridge's Aboriginal Community Advisory Board ("**ACAB**") terms of reference (see Exhibit C, Tab 2, Schedule 4, Attachment 6) and requested modifications thereto. These modifications included an increase to the frequency of meetings to include the construction period, where the original terms of reference only contemplated meeting during the operations phase of the East-West Tie line. Therefore, costs are included to enable

NextBridge to meet with community members from the region to provide project updates and discuss potential issues that may arise during the construction period as part of the ACAB.

Community investment funds are provided to support First Nation and Métis events and groups in the region.

91. **(4) Land Rights ($23.8 million)**

Costs in this category include:

- acquisition of land rights by easements from property owners, government agencies along with consents, permits from all applicable interest holders in their land tenure
- title examining, clearing, and registering in connection with the acquisition of the rights
- preparation and maintenance of property owner and stakeholder line lists
- global information system mapping and data support for recording and documenting negotiations and engagements
- appraisals
- legal survey for reference plan registration
- land payments for said land rights (easement and temporary workspace, and Crown land permits)
- permitting activities including third party crossing notification, negotiation and execution of agreements, submission of Public Lands Act applications, and obtaining other provincial and federal approvals
- expropriation support

- in-field landowner and Crown interest holder related construction and post-construction site remediation activity coordination, including securing damage settlements and administering damage payments
- participation in the LTC application and Amended EA review processes.

92. An external land consultant was competitively sourced to support the acquisition of land rights and activities listed above. The hourly rates of these services are consistent with NextBridge partner organization experience and expectations for these types of services. Due to the activities in the development phase of the project (See Exhibit C "Phase Shift – Land Option Negotiation"), NextBridge had minimal expropriations and avoided long and costly processes.

93. This cost category includes the cost of rights, interests, and privileges held by NextBridge to access, construct and maintain easements and ROW for the East-West Tie line and related infrastructure. The NextBridge Project Director receives daily status updates on land acquisition activities, allowing for early issue identification and resolution to ensure the project stays on schedule. Several cost containment measures have been implemented in order to reduce the likelihood of budget increases to this cost category. These include the mitigation of risks such as delays in land acquisition, increased market value of land, and material changes to the project footprint by identifying and monitoring them on an ongoing basis, and proactively addressing them. For example, a land acquisition process and compensation policy were developed to ensure engagement was undertaken early, in an open and respectful manner, and with timely, meaningful and transparent dialogue. Fair and equitable compensation was provided to property owners based on the consistent application of the land acquisition compensation principles and supporting market-based land value appraisals. The focus was on reaching mutually acceptable agreements and avoiding costlier regulatory options such as expropriation proceedings. During the weekly project meetings, the Land team regularly coordinates with the rest of the team to review the project footprint and ensure that no more land is being acquired than needed for the project.

94. **(7) Other Consultation ($2.5 million)**

95. This cost category includes activities to engage with and keep municipal and public stakeholders informed for the project. Such costs include:

- newspaper and radio notices of project work and milestones;
- management of the project website and Facebook group;
- hosting of public open houses and project-related events;
- managing relationships with municipal leaders in ROW communities and supporting resolution of municipal issues and concerns;
- support of local needs through community investment, support for and participation in local municipal and industry conferences; and
- monitoring of the project email and phone line for inquiries and comments and documenting/tracking any formal complaints submitted under the East-West Tie line's complaint protocol which was a requirement of the Amended EA.

96. After analyzing the costs of previous engagement activities, NextBridge decided to target larger engagement activities to coincide with major project milestones, including open houses for the construction phase, thus gaining efficiencies in travel costs for project staff. Given that open houses provide the most transparent and open opportunity for stakeholders to personally engage with project staff, NextBridge considered they were important for the success of the project and an appropriate forum to satisfy community and stakeholder expectations.

97. The commencement of construction open houses took place during the week of May 6, 2019 and provided information on what people could expect in their community as workers mobilized and construction activity began. A key message at this round of open houses was how to be safe during construction. While effective, not all stakeholders could attend an open house event, so NextBridge also provided construction and safety awareness

information via notices published in local newspapers and radio, as well as through the project website and Facebook group. Construction awareness signage was also placed at key trail and road access points along the ROW.

98. **(11) Contingency (n/a)**

99. NextBridge has no contingency in the construction costs. NextBridge's Q4 2019 OEB Quarterly Report and the Response to OEB Request – February 2020 (included in Exhibit C, Tab 1, Schedule 1, Attachment 2 & 4) specifically addresses this allocation of contingency and how it is actively managing the budget in order to contain costs and mitigate risks. Contingency was allocated in a proactive manner with the understanding that known costs (both spent and contracted) would be actively managed so as to reduce risk and associated cost to the furthest extent possible. This proactive approach to the allocation of contingency also provided increased transparency of NextBridge's forecast of overall construction costs.

100. **(12) Regulatory ($5.4 million)**

101. This cost category includes activities to support regulatory and legal activities during the construction period already undertaken or anticipated to be required in advance of the East-West Tie line being able to enter into service. Ongoing regulatory support activities are limited to expenses related to project development, environmental assessment processes, and construction during the construction period. External counsel and consultant services have and will continue to be engaged to provide legal advice and support in relation to these matters, as required. Hearing costs and costs related to intervener participation in each of the LTC application and rate application, as well as any mediation and/or expropriation proceedings, are also included in this cost category.

102. Such costs include:

- LTC proceedings to determine the competing applications submitted by NextBridge and HONI, which ultimately resulted in authorization for NextBridge to construct and operate the East-West Tie line
- Application for rates and recovery of prudently incurred costs, in anticipation of a March 31, 2022 in-service date;
- Application pursuant to section 99 of the Act for authority to expropriate land rights required in order to construct the project on privately-owned lands where NextBridge was unable to reach negotiated agreements
- Application pursuant to section 101 of the Act for authority to construct the East-West Tie line over utility lines, in the event that NextBridge was unable to reach agreement with existing utility operators (including HONI)
- Legal support for any litigation that may arise, including the appeal and judicial review proceedings commenced by Biinjitiwaabik Zaaging Anishinaabek ("**BZA**") in March 2019
- General regulatory and legal support for the land team for land acquisition activities other than expropriations and crossing proceedings under the Act, including potential processes under the *Mining Act* and negotiation of land-related agreements
- General regulatory support for the project, as required

103. One of the primary risks for the potential for increased costs in the Regulatory category was the need to commence regulatory proceedings in order to obtain the land rights required to construct and operate the project. As a result of timely, ongoing, and sustained efforts to resolve issues and concerns with private landowners and other interest-holders, NextBridge was successful in reaching negotiated agreements, reducing the complexity or altogether removing the need for some of the regulatory activities anticipated to be required. In turn, this significantly reduced costs that would otherwise have been incurred.

104. As one example, building and maintaining relationships with landowners allowed NextBridge to secure option agreements with the majority of private landowners which reduced the extent of costs required to support expropriation proceedings. By the time NextBridge filed its expropriation application with the OEB on April 17, 2019 to account for those circumstances in which negotiated agreements were not obtained, it had secured access to all except 23 privately-owned parcels of land. As a result of continued engagement, by January 2020, the number of parcels that were required to be expropriated had been reduced from 23 to 5. Furthermore, none of the landowners whose land remained subject to expropriation sought intervenor status in, or opposed the expropriation proceeding. This lack of opposition allowed the OEB to set a schedule for a written expropriation proceeding, rather than an oral proceeding which would have been significantly costlier. Finally, in respect of the 5 parcels which have been expropriated, none of the landowners opposed NextBridge's proposed compensation amounts for the parcels and, as a result, NextBridge did not incur significant costs to proceed through post-expropriation compensation proceedings.

105. Additionally, NextBridge was able to reach an agreement with HONI regarding the relocation the T1M line and the costs of a Section 101 application and process with the Board has been avoided.

106. Where possible, external legal counsel expenditures were minimized by utilizing of in-house legal counsel from NextBridge partner organizations. External legal counsel services used for the majority of regulatory activities for the construction period, including the LTC, expropriation and *Mining Act* proceedings were competitively sourced through an RFP process. External counsel invoices are reviewed for accuracy and reasonableness before being submitted for payment and ultimate approval by the Project Director.

107. **(13) East-West Tie Project Management ($4.9 million)**

108. This cost category includes the overall project management activities including:

- Task/schedule management
- Internal/external reporting, including OEB reports and requests
- Management communication and directives
- Overall cost management including team lead variance discussions (as outlined in Exhibit C, Tab 2, Schedule 4 “Overview of Cost Management Practices”)
- Back office functions including accounting, financial reporting, accounts payable, vendor management/supply chain, cash management, tax, audit management, regulatory support, and financial modeling

109. The majority of these functions are performed by NextBridge partner organizations and are provided at an hourly rate ensuring a much more cost effective process than hiring external firms or incurring the costs of establishing NextBridge employees. During the monthly review of costs, the Project Director analyzes the number of hours spent on these activities. At one review, it was noticed and decided on that the number of hours could be reduced if certain internal financial reporting activities were consolidated, thus reducing costs.

110. **(14) Interest During Construction (IDC) ($31.0 million)**

111. This cost category represents the Interest During Construction (“**IDC**”) for the East-West Tie line. NextBridge records IDC at the OEB prescribed quarterly rate for CWIP on actual expenditures from August 2017 through Q3 2020. The current quarter’s rate of 2.03% (Q4 2020 rate) was used to estimate the remaining forecasted IDC, based on the forecasted construction schedule. The estimate remains approximately the same as was in the LTC budget, even with the additional months of construction due to lower rates. NextBridge will utilize the CCVA to capture any differences in revenue requirement

resulting from the actual IDC calculated at the end of the project compared to the amount of IDC included in this Application.

TAB 4

HONI INTERROGATORY #12

INTERROGATORY

Issue List Item:
#5 – Operations, Maintenance & Administration Costs

#6 – Rate base and Cost of Capital

Topic:
Indigenous Economic Participation and Indigenous Consultation

References:
Reference 1 – Exhibit C, Tab 2, Schedule 4

Reference 2 – Exhibit F, Tab 4, Schedule 2

Questions:

a) How will the $9.7 million of Indigenous Economic Participation be spent? Please categorize this spend based on the activities identified in paragraphs 83, 84 and 85 of Reference 1 above.

b) At Reference 2, please clarify why no costs have been incurred to acquire a Section 28(2) permit for Pic Mobert First Nation. What is [sic] the estimated costs of any outstanding permits?

c) Please elaborate on paragraph 20 of Reference 2. More specifically, please elaborate on how exactly the $0.89M would be utilized as an OM&A program delivery cost.

RESPONSE

a) The $9.7 million of Indigenous Economic Participation in the construction budget is broken down as follows:

Item and Paragraph Reference	Cost
Indigenous benefits (para. 83)	$6,116,033
Federal Section 28.2 Permits (para. 84)	$2,114,420
Indigenous financing support (para. 85)	$1,500,000
TOTAL	**$9,730,453**

b) The Federal Section 28.2 permit for Pic Mobert was only required for the duration of the construction period to allow for temporary access to the East-West Tie line right of way on Pic Mobert lands. As no long-term use of Pic Mobert lands is required, the costs for the temporary access are limited to the East-West Tie line construction budget.

There are no outstanding costs related to the Federal Section 28.2 permit for Pic Mobert.

c) Please see the response to Staff #31 a.

TAB 5

PHASE SHIFT COSTS

1. A total of $5.3 million in costs (as shown in Table 1 below) were also deemed eligible for consideration as construction costs in the Decision and Order dated December 20, 2018 (EB-2017-0182). These costs were incurred during the development period and are needed to construct the East-West Tie line. They were spent during the development period because these activities take longer periods of time and by working on them as early as possible it mitigated risk to the project schedule. These costs are included in opening rate base balance.

Table 1. Summary of Phase Shift Costs

Phase Shift Costs	$ Millions
EA Review Participation	$0.46
Land Optioning Negotiations	$1.44
Land Acquisition Negotiations	$0.02
Economic Participation	$3.41
Total	**$5.33**

Phase Shift: EA Review Participation

2. These costs were required for NextBridge to participate in the EA review process that was scheduled to begin in advance of the LTC filing. A draft EA Report was prepared and submitted in December 2016, with a comment period from December 2016 to March 2017. NextBridge received approximately 1,000 comments on the draft EA Report. The comments were reviewed and responded to by NextBridge, with a response to each comment set forth in Appendix 1-III in the final EA Report. The final EA Report was updated in response to many of the comments and these changes are noted in the responses provided in Appendix 1-III and in the final EA Report change log. Project

planning and consultation continued during this period and NextBridge also sourced additional data that resulted in updates to the project footprint, project description, and the final Amended EA Report, which was submitted in July 2017.

3. Also as part of the EA Review process revisions had to be made to adhere to the regulatory requirement to include comments and responses from regulators, Indigenous communities and other stakeholders. The draft EA Report needed to be revised to reflect this prior to submitting the final EA Report. NextBridge also participated in several meetings with regulators, Indigenous, and non-Indigenous communities to obtain clarification on the comments prior to drafting the responses. The filing of the Amended EA Report in July 2017, including the completed alternative route assessment, was required in order to start construction of the East-West Tie line in late 2018 and bring the line into service.

4. The work on the EA Review process was competitively bid. Three bidders were invited to competitively bid on the RFP proposal to complete the EA in Fall of 2015. One successful bidder (Golder Associates) was awarded the contract in November 2015. The major services for external environmental consultants were competitively sourced and the hourly rates of these services are consistent with NextBridge partner organization experience and expectations for these types of services, especially given the size, complexity, limited access and difficult terrain of the East-West Tie line. NextBridge worked with its environmental consultants to find efficiencies where possible.

Phase Shift: Land Option Negotiation

5. The initiation of certain land optioning and related activities to obtain consent from landowners and interest holders that initially were to be pursued in the construction phase were pulled forward into the development phase. These activities included: land ownership line list preparation; agreement preparation; and meetings with landowners regarding the project, land acquisition principles, presentation of compensation offers, and follow-up

engagement regarding the status of the project. Such activities allowed NextBridge to build respectful relationships with interest holders and to uphold transparent, meaningful dialogue regarding compensation and land rights, which, in turn, was critical in avoiding adversarial, prolonged, costly, and less certain outcomes associated with regulatory takings processes such as expropriation.

6. The land optioning negotiations and engagement resulted in a higher percentage of optioned landowners and interest holders, and a corresponding reduction in the number of parcels required to be subject to a regulatory takings process. In fact, at the time of the LTC application filing, NextBridge had reached agreements with a majority of private landowners. At the time of filing this Application, NextBridge has 191 landowner agreements and all five expropriations have been completed.

7. Further, NextBridge had an extensive route and access request management process that identified modifications prior to contacting landowners which eliminated the incurrence of unnecessary access and optioning activities which would have required more agreement and potentially more expropriations. Early and ongoing landowner engagement regarding the route and access alternatives provided essential input to finalizing the route and securing the land rights that were required to keep the project on track and on schedule.

Phase Shift: First Nation & Métis Land Acquisition Negotiation

8. These costs were incurred related to activities in relation to Federal First Nations reserve crossing permits that were identified by NextBridge and required by the Federal government as a necessary component of constructing the project. However, it was also recognized that it was not possible to estimate the costs for these activities. Specifically, at the time of designation, NextBridge was not in a position to estimate costs associated with First Nation and Métis participation and land acquisition until further engagement had been initiated with communities and the Federal government. These costs also included ongoing consultation with communities to enter into federal permits to allow the line to

cross reserve land, which were essential to the East-West Tie line's ability to use the land of Pays Plat, Pic Mobert, and Michipicoten First Nations to route the line. As a result of incurring these costs, NextBridge will able to construct the project through these reserve lands.

Phase Shift: Economic Participation

9. During the LTC proceeding, NextBridge conveyed that it was not in a position to estimate the costs associated with First Nation and Métis economic participation until further engagement had been initiated with communities. NextBridge believed to do so would be presumptuous to the needs of communities as each community is unique in its interaction with project proponents. Over the development phase, NextBridge has worked with all communities identified by the Crown and has a better understanding of the scope of potential economic participation in the East-West Tie line.

10. During the LTC proceeding, NextBridge also indicated it had signed economic participation agreements with Bamkushwada, LP (representing 6 First Nations) and the Métis Nation of Ontario (representing 3 Métis communities). The agreements contain various forms of economic participation beyond equity positions which substantially forms the costs during the development phase. Not only did NextBridge incur costs for its own legal counsel, it provided funding in a series of capacity funding agreements to these communities to facilitate their participation in negotiations and retain their own independent legal counsel. Funding of this type is a customary practice in project development to provide First Nation and Métis communities the opportunity to secure participation arrangements to ensure projects on their traditional territories and provides an economic benefit to those communities for future generations.

11. To manage costs, each of the First Nation and Métis capacity funding agreements were tied to a specific milestone in the negotiations. The milestone approach ensured that costs were associated with progress toward reaching a participation agreement. NextBridge's own external legal counsel fees were also tied to these same milestones.

12. NextBridge and the First Nation and Métis communities considered these costs essential to the development phase as participation agreements needed to be finalized as much as possible before the filing of the LTC application and well before the commencement of construction in order to (A) ensure costs in the LTC budget reflected these activities; (B) provide communities the time to train and employ community members for jobs before the commencement of the construction period; and (C) prepare Indigenous businesses to participate in procurements for construction contracts to maximize economic opportunities. For example, the results of these development period engagement efforts have enabled over 300 individuals from all the 18 communities identified in the duty to consult to be trained for employment. NextBridge's workforce at the beginning of construction was 60% from Indigenous communities and made up of trainees from this training initiative.

TAB 6

REQUIRED EXHIBITS AND TABLES

1. Since the East-West Tie line is a new asset, and in its first year of service, there is no historical or bridge year to present for continuity or variance analysis. Tables 1 and 2 below for gross property, plant and equipment and accumulated depreciation show the Test Year impact, as that is the first year of service.

Table 1. Gross Property, Plant and Equipment for Test Year

Continuity of Property, Plant and Equipment Total - Gross Balances ($ Millions)							
	Opening Balance	**Additions**	**Retirements**	**Sales**	**In/Out and Other**	**Closing Balance**	**Average**
	(a)	(b)	(c)	(d)	(e)	(f)	(g)
Test Year	774.9	0.2	-	-	-	775.2	775.1

Table 2. Accumulated Depreciation for Test Year

Continuity of Property, Plant and Equipment - Accumulated Depreciation Total - Gross Balances ($ Millions)							
	Opening Balance	**Additions**	**Retirements**	**Sales**	**In/Out and Other**	**Closing Balance**	**Average**
	(a)	(b)	(c)	(d)	(e)	(f)	(g)
Test Year	-	9.3	-	-	-	9.3	4.6

GROSS PROPERTY, PLANT AND EQUIPMENT

NextBridge
Continuity of Property, Plant and Equipment
Test Year 12 Months; Opening 4/1/22, Closing 3/31/23
Total - Gross Balances
($ Millions)

Line No.	Year	Opening Balance	Additions	Retirements	Sales	In/Out and Other	Closing Balance	Average
		(a)	(b)	(c)	(d)	(e)	(f)	(g)
Test								
1	2022	774.9	0.2	-	-	-	775.2	775.1

ACCUMULATED DEPRECIATION

NextBridge
Continuity of Property, Plant and Equipment - Accumulated Depreciation
Test Year 12 Months; Opening 4/1/22, Closing 3/31/23
Total - Gross Balances
($ millions)

Line No.	Year	Opening Balance	Additions	Retirements	Sales	In/Out and Other	Closing Balance	Average
		(a)	(b)	(c)	(d)	(e)	(f)	(g)
Test								
1	2022	-	9.3	-	-	-	9.3	4.6

FIXED ASSETS CONTINUITY SCHEDULES

Appendix 2-BA
Fixed Asset Continuity Schedule [1]

Accounting Standard USGAAP
Year 4/1/22 - 3/31/23

CCA Class [2]	OEB Account [3]	Description [3]	Cost: Opening Balance	Cost: Additions [4]	Cost: Disposals [6]	Cost: Closing Balance	Accumulated Depreciation: Opening Balance	Accumulated Depreciation: Additions	Accumulated Depreciation: Disposals [6]	Accumulated Depreciation: Closing Balance	Net Book Value
N/A	1705	Land									
14.1	1706	Land rights	$ 35,093,798			$ 35,093,798	$ -	$ 350,938		$ 350,938	$ 34,742,860
1	1708	Buildings and fixtures									
47	1715	Station equipment									
47	1720	Towers and fixtures	$ 578,241,343			$ 578,241,343	$ -	$ 6,424,904		$ 6,424,904	$ 571,816,439
47	1730	Overhead conductors and devices	$ 161,608,342	$ 230,000		$ 161,838,342	$ -	$ 2,485,075		$ 2,485,075	$ 159,353,267
47	1735	Underground conduit									
47	1740	Underground conductors and devices									
17	1745	Roads and trails									
								$ -			
		Sub-Total	**$ 774,943,482**	**$ 230,000**	**$ -**	**$ 775,173,482**	**$ -**	**$ 9,260,916**	**$ -**	**$ 9,260,916**	$ 765,912,566
		Less Socialized Renewable Energy Generation Investments (input as negative)								$ -	$ -
		Less Other Non Rate-Regulated Utility Assets (input as negative)								$ -	$ -
		Total PP&E	**$ 774,943,482**	**$ 230,000**	**$ -**	**$ 775,173,482**	**$ -**	**$ 9,260,916**	**$ -**	**$ 9,260,916**	$ 765,912,566
		Depreciation Expense adj. from gain or loss on the retirement of assets (pool of like assets), if applicable6									
		Total						**$ 9,260,916**			

10		Transportation
8		Stores Equipment

Less: *Fully Allocated Depreciation*	
Transportation	
Stores Equipment	
Net Depreciation	$ 9,260,916

Notes:

1 Tables in the format outlined above covering all fixed asset accounts should be submitted for the Test Year, Bridge Year and all relevant historical years. At a minimum , the applicant must provide data for the earlier of: 1) all historical years back to its last rebasing; or 2) at least three years of historical actuals, in addition to Bridge Year and Test Year forecasts.

2 The "CCA Class" for fixed assets should agree with the CCA Class used for tax purposes in Tax Returns. Fixed Assets sub-components may be used where the underlying asset components are classified under multiple CCA Classes for tax purposes. If an applicant uses any different classes from those shown in the table, an explanation should be provided. (also see note 3).

3 The table may need to be customized for a utility's asset categories or for any new asset accounts announced or authorized by the Board.

4 The additions in column (E) must not include construction work in progress (CWIP).

5 Effective on the date of IFRS adoption, customer contributions will no longer be recorded in Account 1995 Contributions & Grants, but will be recorded in Account 2440, Deferred Revenues.

6 The applicant must ensure that all asset disposals have been clearly identified in the Chapter 2 Appendices for all historic, bridge and test years. Where a distributor for general financial reporting purposes under IFRS has accounted for the amount of gain or loss on the retirement of assets in a pool of like assets as a charge or credit to income, for reporting and rate application filings, the distributor shall reclassify such gains and losses as depreciation expense, and disclose the amount separately.

TAB 7

Tax Year	Roll Number	Address	Municipality	Prop Code	Site Area	Owner	Legal	Mailing	Destination	Rate per acre
2017	[redacted]	[redacted]	Halton Hills	100	12.440	[redacted]	[redacted]	[redacted]	$574,000	$46,141.48
2017	[redacted]	[redacted]	Halton Hills	100	76.850	[redacted]	[redacted]	[redacted]	$5,674,000	$73,832.14
2017	[redacted]	[redacted]	Halton Hills	100	96.810	[redacted]	[redacted]	[redacted]	$6,614,000	$68,319.39
2017	[redacted]	[redacted]	Halton Hills	100	69.412	[redacted]	[redacted]	[redacted]	$5,300,000	$76,355.78
2017	[redacted]	[redacted]	Halton Hills	100	14.380	[redacted]	[redacted]	[redacted]	$1,913,000	$133,031.99
2017	[redacted]	[redacted]	Halton Hills	100	85.150	[redacted]	[redacted]	[redacted]	$1,677,000	$19,694.66
2017	[redacted]	[redacted]	Halton Hills	100	27.590	[redacted]	[redacted]	[redacted]	$820,000	$29,720.91
2017	[redacted]	[redacted]	Halton Hills	100	17.160	[redacted]	[redacted]	[redacted]	$685,000	$39,918.41
2017	[redacted]	[redacted]	Halton Hills	100	12.600	[redacted]	[redacted]	[redacted]	$575,000	$45,634.92
2017	[redacted]	[redacted]	Halton Hills	100	29.660	[redacted]	[redacted]	[redacted]	$3,025,000	$101,989.21
2017	[redacted]	[redacted]	Halton Hills	100	12.870	[redacted]	[redacted]	[redacted]	$577,000	$44,832.94
2017	[redacted]	[redacted]	Halton Hills	100	35.500	[redacted]	[redacted]	[redacted]	$863,000	$24,309.86
2017	[redacted]	[redacted]	Halton Hills	100	29.630		[redacted]	[redacted]	$775,000	$26,155.92
2017	[redacted]	[redacted]	Halton Hills	100	14.080	[redacted]	[redacted]	[redacted]	$586,000	$41,619.32
2017	[redacted]	[redacted]	Halton Hills	100	30.170	[redacted]	[redacted]	[redacted]	$768,000	$25,455.75
2017	[redacted]	[redacted]	Halton Hills	100	24.150	[redacted]	[redacted]	[redacted]	$3,117,000	$129,068.32
2017	[redacted]	[redacted]	Halton Hills	100	15.600	[redacted]	[redacted]	[redacted]	$2,012,000	$128,974.36
2017	[redacted]	[redacted]	Halton Hills	100	15.190	[redacted]	[redacted]	[redacted]	$1,979,000	$130,283.08
2017	[redacted]	[redacted]	Halton Hills	100	144.161	[redacted]	[redacted]	[redacted]	$2,480,000	$17,202.95
2017	[redacted]	[redacted]	Halton Hills	100	198.490	[redacted]	[redacted]	[redacted]	$3,159,000	$15,915.16
2017	[redacted]	[redacted]	Halton Hills	100	50.000	[redacted]	[redacted]	[redacted]	$1,057,000	$21,140.00
2017	[redacted]	[redacted]	Halton Hills	100	97.930	[redacted]	[redacted]	[redacted]	$1,792,000	$18,298.78
2017	[redacted]	[redacted]	Halton Hills	100	100.000	[redacted]	[redacted]	[redacted]	$1,817,000	$18,170.00
2017	[redacted]	[redacted]	Halton Hills	100	100.720	[redacted]	[redacted]	[redacted]	$1,834,000	$18,208.90
2017	[redacted]	[redacted]	Halton Hills	100	72.580	[redacted]	[redacted]	[redacted]	$1,424,000	$19,619.73
2017	[redacted]	[redacted]	Halton Hills	100	97.400	[redacted]	[redacted]	[redacted]	$1,713,000	$17,587.27
2017	[redacted]	[redacted]	Halton Hills	100	37.550	[redacted]	[redacted]	[redacted]	$857,000	$22,822.90
2017	[redacted]	[redacted]	Halton Hills	100	10.010	[redacted]	[redacted]	[redacted]	$533,000	$53,246.75
2017	[redacted]	[redacted]	Halton Hills	100	37.730	[redacted]	[redacted]	[redacted]	$896,000	$23,747.68
2017	[redacted]	[redacted]	Halton Hills	100	164.070	[redacted]	[redacted]	[redacted]	$2,721,000	$16,584.38
2017	[redacted]	[redacted]	Halton Hills	100	11.770	[redacted]	[redacted]	[redacted]	$557,000	$47,323.70
2017	[redacted]	[redacted]	Halton Hills	100	30.900	[redacted]	[redacted]	[redacted]	$763,000	$24,692.56
2017	[redacted]	[redacted]	Halton Hills	100	65.000	[redacted]	[redacted]	[redacted]	$1,302,000	$20,030.77
2017	[redacted]	[redacted]	Halton Hills	100	50.000	[redacted]	[redacted]	[redacted]	$1,087,000	$21,740.00
2017	[redacted]	[redacted]	Halton Hills	100	50.000		[redacted]	[redacted]	$1,057,000	$21,140.00
2017	[redacted]	[redacted]	Halton Hills	100	44.620		[redacted]	[redacted]	$522,000	$11,698.79
2017	[redacted]	[redacted]	Halton Hills	100	16.550	[redacted]	[redacted]	[redacted]	$2,087,000	$126,102.72
2017	[redacted]	[redacted]	Halton Hills	100	28.730	[redacted]	[redacted]	[redacted]	$697,000	$24,260.36
2017	[redacted]	[redacted]	Halton Hills	100	87.400	[redacted]	[redacted]	[redacted]	$1,535,000	$17,562.93
2017	[redacted]	[redacted]	Halton Hills	100	13.160		[redacted]	[redacted]	$543,000	$41,261.40
2017	[redacted]	[redacted]	Halton Hills	100	12.500	[redacted]	[redacted]	[redacted]	$538,000	$43,040.00
2017	[redacted]	[redacted]	Halton Hills	100	10.840		[redacted]	[redacted]	$442,000	$40,774.91
2017	[redacted]	[redacted]	Halton Hills	100	92.300	[redacted]	[redacted]	[redacted]	$1,672,000	$18,114.84
2017	[redacted]	[redacted]	Halton Hills	100	49.000	[redacted]	[redacted]	[redacted]	$1,028,000	$20,979.59
2017	[redacted]	[redacted]	Halton Hills	100	46.930	[redacted]	[redacted]	[redacted]	$997,000	$21,244.41
2017	[redacted]	[redacted]	Halton Hills	100	104.930	[redacted]	[redacted]	[redacted]	$1,860,000	$17,726.10
2017	[redacted]	[redacted]	Halton Hills	100	40.000	[redacted]	[redacted]	[redacted]	$894,000	$22,350.00
2017	[redacted]	[redacted]	Halton Hills	100	23.440	[redacted]	[redacted]	[redacted]	$621,000	$26,493.17
2017	[redacted]	[redacted]	Halton Hills	100	12.860	[redacted]	[redacted]	[redacted]	$541,000	$42,068.43
2017	[redacted]	[redacted]	Halton Hills	100	43.930	[redacted]	[redacted]	[redacted]	$238,000	$5,417.71
2017	[redacted]	[redacted]	Halton Hills	100	46.760	[redacted]	[redacted]	[redacted]	$957,000	$20,466.21
2017	[redacted]	[redacted]	Halton Hills	100	37.830	[redacted]	[redacted]	[redacted]	$827,000	$21,860.96
2017	[redacted]	[redacted]	Halton Hills	100	31.110	[redacted]	[redacted]	[redacted]	$72,000	$2,314.37
2017	[redacted]	[redacted]	Halton Hills	100	70.250	[redacted]	[redacted]	[redacted]	$1,235,000	$17,580.07
2017	[redacted]	[redacted]	Halton Hills	100	36.760	[redacted]	[redacted]	[redacted]	$828,000	$22,524.48
2017	[redacted]	[redacted]	Halton Hills	100	15.630	[redacted]	[redacted]	[redacted]	$545,000	$34,868.84
2017	[redacted]	[redacted]	Halton Hills	100	10.060	[redacted]	[redacted]	[redacted]	$492,000	$48,906.56
2017	[redacted]	[redacted]	Halton Hills	100	14.370	[redacted]	[redacted]	[redacted]	$525,000	$36,534.45
2017	[redacted]	[redacted]	Halton Hills	100	11.080		[redacted]	[redacted]	$500,000	$45,126.35
2017	[redacted]	[redacted]	Halton Hills	100	10.030		[redacted]	[redacted]	$482,000	$48,055.83
2017	[redacted]	[redacted]	Halton Hills	100	24.670	[redacted]	[redacted]	[redacted]	$648,000	$26,266.72
2017	[redacted]	[redacted]	Halton Hills	100	16.400		[redacted]	[redacted]	$551,000	$33,597.56
2017	[redacted]	[redacted]	Halton Hills	100	46.440		[redacted]	[redacted]	$972,000	$20,930.23
2017	[redacted]	[redacted]	Halton Hills	100	21.740	[redacted]	[redacted]	[redacted]	$604,000	$27,782.89
2017	[redacted]	[redacted]	Halton Hills	100	16.040	[redacted]	[redacted]	[redacted]	$676,000	$42,144.64
2017	[redacted]	[redacted]	Halton Hills	100	17.390	[redacted]	[redacted]	[redacted]	$687,000	$39,505.46

Median	**$25,805.84**
Average	**$38,641.98**

Tax Year	Roll Number	Address	Municipality	Prop Code	Site Area	Owner	Legal	Mailing	Destination	Rate per acre
2017	[redacted]	[redacted]	Nipigon	100	13.110	[redacted]	[redacted]	[redacted]	$33,500	$2,555.30
2017	[redacted]	[redacted]	Nipigon	100	10.200	[redacted]	[redacted]	[redacted]	$16,800	$1,647.06
2017	[redacted]	[redacted]	Nipigon	100	59.000	[redacted]	[redacted]	[redacted]	$18,600	$315.25
2017	[redacted]	[redacted]	Nipigon	100	54.520	[redacted]	[redacted]	[redacted]	$27,500	$504.40
2017	[redacted]	[redacted]	Nipigon	100	182.000	[redacted]	[redacted]	[redacted]	$23,000	$126.37
2017	[redacted]	[redacted]	Nipigon	100	80.000	[redacted]	[redacted]	[redacted]	$19,400	$242.50
2017	[redacted]	[redacted]	Nipigon	100	104.200	[redacted]	[redacted]	[redacted]	$30,500	$292.71
2017	[redacted]	[redacted]	Nipigon	100	130.060	[redacted]	[redacted]	[redacted]	$21,000	$161.46
2017	[redacted]	[redacted]	Nipigon	100	181.820		[redacted]	[redacted]	$23,000	$126.50
2017	[redacted]	[redacted]	Nipigon	100	84.000	[redacted]	[redacted]	[redacted]	$19,600	$233.33
2017	[redacted]	[redacted]	Nipigon	100	51.230	[redacted]	[redacted]	[redacted]	$36,500	$712.47
2017	[redacted]	[redacted]	Nipigon	100	30.000	[redacted]	[redacted]	[redacted]	$17,600	$586.67
2017	[redacted]	[redacted]	Nipigon	100	19.000	[redacted]	[redacted]	[redacted]	$17,100	$900.00
2017	[redacted]	[redacted]	Nipigon	100	54.620		[redacted]	[redacted]	$18,500	$338.70
2017	[redacted]	[redacted]	Nipigon	100	160.000	[redacted]	[redacted]	[redacted]	$22,000	$137.50
2017	[redacted]	[redacted]	Nipigon	100	160.000		[redacted]	[redacted]	$44,500	$278.13
2017	[redacted]	[redacted]	Nipigon	100	160.000	[redacted]	[redacted]	[redacted]	$22,000	$137.50
2017	[redacted]	[redacted]	Nipigon	100	80.000		[redacted]	[redacted]	$19,400	$242.50
2017	[redacted]	[redacted]	Nipigon	100	26.880		[redacted]	[redacted]	$34,500	$1,283.48
2017	[redacted]	[redacted]	Nipigon	100	47.550		[redacted]	[redacted]	$18,200	$382.75
2017	[redacted]	[redacted]	Nipigon	100	47.550		[redacted]	[redacted]	$18,200	$382.75
2017	[redacted]	[redacted]	Nipigon	100	42.700		[redacted]	[redacted]	$18,000	$421.55
2017	[redacted]	[redacted]	Nipigon	100	136.320	[redacted]	[redacted]	[redacted]	$21,500	$157.72
2017	[redacted]	[redacted]	Nipigon	100	23.680		[redacted]	[redacted]	$7,400	$312.50
2017	[redacted]	[redacted]	Nipigon	100	59.380		[redacted]	[redacted]	$26,000	$437.86
2017	[redacted]	[redacted]	Nipigon	100	147.000		[redacted]	[redacted]	$21,500	$146.26
2017	[redacted]	[redacted]	Nipigon	100	145.320	[redacted]	[redacted]	[redacted]	$43,500	$299.34
2017	[redacted]	[redacted]	Nipigon	100	40.990		[redacted]	[redacted]	$18,000	$439.13
2017	[redacted]	[redacted]	Nipigon	100	40.990	[redacted]	[redacted]	[redacted]	$18,000	$439.13
2017	[redacted]	[redacted]	Nipigon	100	40.990	[redacted]	[redacted]	[redacted]	$18,000	$439.13
2017	[redacted]	[redacted]	Nipigon	100	40.990	[redacted]	[redacted]	[redacted]	$18,000	$439.13
2017	[redacted]	[redacted]	Nipigon	100	81.530	[redacted]	[redacted]	[redacted]	$19,500	$239.18
2017	[redacted]	[redacted]	Nipigon	100	81.530	[redacted]	[redacted]	[redacted]	$19,500	$239.18
2017	[redacted]	[redacted]	Nipigon	100	81.450	[redacted]	[redacted]	[redacted]	$19,500	$239.41
2017	[redacted]	[redacted]	Nipigon	100	81.450	[redacted]	[redacted]	[redacted]	$19,500	$239.41
2017	[redacted]	[redacted]	Nipigon	100	158.820		[redacted]	[redacted]	$44,500	$280.19
2017	[redacted]	[redacted]	Nipigon	100	123.040	[redacted]	[redacted]	[redacted]	$42,000	$341.35
2017	[redacted]	[redacted]	Nipigon	100	131.550	[redacted]	[redacted]		$42,500	$323.07
2017	[redacted]	[redacted]	Nipigon	100	10.010		[redacted]	[redacted]	$16,800	$1,678.32
2017	[redacted]	[redacted]	Nipigon	100	29.060		[redacted]	[redacted]	$35,000	$1,204.40
2017	[redacted]	[redacted]	Nipigon	100	68.480	[redacted]	[redacted]	[redacted]	$38,000	$554.91
2017	[redacted]	[redacted]	Nipigon	100	31.110		[redacted]	[redacted]	$52,000	$1,671.49
2017	[redacted]	[redacted]	Nipigon	100	136.820		[redacted]	[redacted]	$45,000	$328.90
2017	[redacted]	[redacted]	Nipigon	100	55.780		[redacted]	[redacted]	$37,000	$663.32
2017	[redacted]	[redacted]	Nipigon	100	14.280	[redacted]	[redacted]	[redacted]	$17,000	$1,190.48
2017	[redacted]	[redacted]	Nipigon	100	78.290	[redacted]	[redacted]	[redacted]	$38,500	$491.76
2017	[redacted]	[redacted]	Nipigon	100	20.400	[redacted]	[redacted]		$34,000	$1,666.67
2017	[redacted]	[redacted]	Nipigon	100	155.840	[redacted]	[redacted]	[redacted]	$44,500	$285.55
2017	[redacted]	[redacted]	Nipigon	100	132.380		[redacted]	[redacted]	$42,500	$321.05
2017	[redacted]	[redacted]	Nipigon	100	159.340		[redacted]	[redacted]	$22,000	$138.07
2017	[redacted]	[redacted]	Nipigon	100	44.580	[redacted]	[redacted]	[redacted]	$36,000	$807.54
2017	[redacted]	[redacted]	Nipigon	100	15.160		[redacted]	[redacted]	$17,000	$1,121.37
2017	[redacted]	[redacted]	Nipigon	100	78.910	[redacted]	[redacted]	[redacted]	$19,400	$245.85
2017	[redacted]	[redacted]	Nipigon	100	147.090	[redacted]	[redacted]	[redacted]	$21,500	$146.17
2017	[redacted]	[redacted]	Nipigon	100	147.090	[redacted]	[redacted]	[redacted]	$21,500	$146.17
2017	[redacted]	[redacted]	Nipigon	100	160.000	[redacted]	[redacted]	[redacted]	$22,000	$137.50
2017	[redacted]	[redacted]	Nipigon	100	155.000	[redacted]	[redacted]	[redacted]	$22,000	$141.94
2017	[redacted]	[redacted]	Nipigon	100	150.500	[redacted]	[redacted]	[redacted]	$22,000	$146.18
2017	[redacted]	[redacted]	Nipigon	100	159.750	[redacted]	[redacted]	[redacted]	$22,000	$137.72
2017	[redacted]	[redacted]	Nipigon	100	156.000	[redacted]	[redacted]	[redacted]	$22,000	$141.03
2017	[redacted]	[redacted]	Nipigon	100	156.000	[redacted]	[redacted]		$22,000	$141.03
2017	[redacted]	[redacted]	Nipigon	100	160.500	[redacted]	[redacted]	[redacted]	$45,000	$280.37
2017	[redacted]	[redacted]	Nipigon	100	160.000	[redacted]	[redacted]	[redacted]	$22,000	$137.50
2017	[redacted]	[redacted]	Nipigon	100	162.000	[redacted]	[redacted]	[redacted]	$22,500	$138.89
2017	[redacted]	[redacted]	Nipigon	100	162.000		[redacted]	[redacted]	$22,500	$138.89
2017	[redacted]	[redacted]	Nipigon	100	160.500	[redacted]	[redacted]	[redacted]	$22,500	$140.19
2017	[redacted]	[redacted]	Nipigon	100	80.500	[redacted]	[redacted]	[redacted]	$19,500	$242.24
2017	[redacted]	[redacted]	Nipigon	100	80.000	[redacted]	[redacted]	[redacted]	$19,400	$242.50

Median	$289.13
Average	$468.37

TAB 8

STAFF INTERROGATORY #50

INTERROGATORY

Reference: (1) Exhibit B / Tab 1 / Schedule 7 / Attachment 1 / p. 5
(2) Exhibit B / Tab 1 / Schedule 7 / Attachment 1 / p. 10 / Figure 5

Preamble:
Reference 1 states that "on average [the WECC 2014 study by Black and Veatch] found that the base capital cost of a 500 kV double circuit project was 1.99 times more expensive than a 230 kV double circuit project."

Question(s):
a) Please provide the underlying data from the WECC 2014 study by Black and Veatch which resulted in an average of 1.99.
b) In Figure 5, what is the difference between the CAGR column and the Growth column? How were the values in the Growth column determined?
c) In Figure 5, cost is broken down into materials, construction and other segments, which total 100%. How were these percentages determined?
d) In Figure 5, cost is broken down into materials, construction and other segments, which total 100%. Are development costs included in these costs?
e) In Figure 5, the cost is broken down into materials, construction and other, which total 100%. Are IDC costs included in these costs?

RESPONSE
a) This report is included as an attachment to this response. The calculation was made from the data in Table 2-1 of the report.
b) The Growth column is simply an average of the CAGR column, provided for informational purposes. The 4.7% in the Growth Column for H-W costs is the average of the 4.7 and 4.8 in the CAGR column, rounded to one decimal point.
c) The Bruce-Milton application identified 38.4% of the total costs to be Materials, and 13.4% of the total costs to be Construction. The 48% is a calculation representing the remainder of the costs (subject to rounding). The source of this information is EB-2007-0050, Exhibit B, Tab 4, Schedule 2, p.3
d) As Footnote 4 indicates, the data from Hydro One's application does not appear to include development costs, though their application does not provide sufficient information to know this with certainty.
e) The Hydro One application does not specify that IDC costs are included in their figures.

CAPITAL COSTS FOR TRANSMISSION AND SUBSTATIONS

Recommendations for WECC Transmission Expansion Planning

B&V PROJECT NO. 176322

PREPARED FOR

WECC

Western Electricity Coordinating Council

OCTOBER 2012

Principal Investigators:

Tim Mason, Project Manager

Trevor Curry

Dan Wilson

BLACK & VEATCH
Building a world of difference.

Assumptions and Limitations Disclaimer

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1.0 Introduction

As part of the Western Electricity Coordinating Council (WECC) transmission planning process, Black & Veatch assisted WECC to develop updated assumptions on transmission line and substation costs, as well as to develop a process to ensure that these costs can be readily updated in the future. The effort was completed under the auspices of a peer review workgroup composed of regional transmission experts to ensure that the resulting costs and cost development methodology is robust and appropriate for WECC's current and future requirements.

This report details the transmission and substation costs and development efforts, including the assumptions, methodology, and results. Additionally, it describes the tool developed by Black & Veatch for WECC to be used to estimate transmission and substation costs that will be integrated into WECC's planning process. Finally, the report discusses the benchmarking of this methodology to several recent transmission project examples. This was completed to ensure that the theoretical costs reasonably reflect actual transmission development costs in the WECC region.

1.1 APPROACH

Black & Veatch developed capital costs for transmission lines and substations for high-voltage transmission facilities in the WECC using a "bottom-up" approach, detailing the component and land costs and then adjusting these to take into consideration potential cost variations such as location and terrain. "High-voltage" is defined as transmission facilities operating at 230 kilovolts (kV) or higher. The transmission line voltage classes and substation types included in this study are listed in Table 1-1.

Table 1-1 Transmission and Substation Facilities Included in This Study

TRANSMISSION LINE VOLTAGE CLASSES	SUBSTATION TYPES
230 kV Single Circuit	230 kV
230 kV Double Circuit	345 kV
345 kV Single Circuit	500 kV (ac)
345 kV Double Circuit	500 kV (dc)
500 kV Single Circuit	
500 kV Double Circuit	
500 kV HVDC Bi-pole	

In addition to developing a set of costs to be used by WECC for the instant planning effort, this effort also resulted in the development of a methodology for developing transmission costs in the future and a tool to develop estimates for the cost of individual lines under consideration. These are detailed in the report.

1.2 PEER REVIEW PROCESS

To ensure that the costs and cost methodology were appropriate for its purposes, WECC convened a peer review group composed of regional transmission experts to review and provide recommendations on the costs and methodology. The group provided valuable information about specific transmission line costs to assist in the validation of the methodology, and ensure the costs proposed are reasonable. The group also provided written input and discussion of assumptions during several conference calls between June and September of 2012. The peer review group members are listed in Table 1-2.

Table 1-2 Transmission Cost Peer Review Group Participants

Bill Pascoe	TransWest Express
Bill Hosie	TransCanada
Carl Zichella	Natural Resources Defense Council
Grace Anderson	California Energy Commission
James Cauchois	Western Electricity Coordinating Council
Jeff Billinton	California Independent System Operator
James Feider	City of Redding, CA
Keith White	California Public Utilities Commission
Marv Landauer	Columbia Grid
Nick Schlag	Energy & Environmental Economics (E3)
Ric Campbell	Utah Public Service Commission
Stan Holland	Western Electric Coordinating Council
Steve Ellerbecker	Western Governors Association
Brad Nickell	Western Electric Coordinating Council
Keegan Moyer	Western Electric Coordinating Council
Byron Woertz	Western Electric Coordinating Council
Arne Olson	Energy & Environmental Economics (E3)

In addition to the input from the peer review group, the draft methodology and tools were presented to the WECC Technical Advisory Subcommittee (TAS) group for review and comments in September 2012. Several comments were received on the costs, which have been incorporated into this report, as appropriate. A summary of the Stakeholder Comments is included in Section 7.0.

1.3 VARIABILITY OF COSTS

The costs included in this report are believed to reasonably represent the cost to develop transmission and substation facilities in the WECC region. It is imperative to note, however, that transmission lines and substations are all unique, and the cost of a specific line or substation may be significantly different than the costs provided here due to a variety of factors. Most new transmission and substation facilities interconnect to the existing grid, and a "typical" transmission project will include some level of new equipment and some upgrades to existing equipment.

Furthermore, transmission facilities are developed not only to transmit incremental power generation, but also to provide additional system reliability and serve load. It is often impossible to segregate "capacity costs" from the cost to provide reliability and serve load. The costs here should be used as a guide to develop approximate costs for new transmission, but should not be used to measure the cost or cost-effectiveness of any specific transmission facility.

2.0 Transmission Capital Costs

Black & Veatch developed a methodology and tool to calculate indicative capital costs for transmission infrastructure projects throughout the WECC region. This methodology begins with using the current cost of specified transmission equipment and the expected cost of land. The costs are then adjusted to identify the differential cost of developing on different land with different terrain factor adjustments. Black & Veatch identified the following categories and sub-categories to consider from a capital cost perspective:

- Voltage Class
  - Alternating Current (AC) - 230 kV, 345 kV, and 500 kV (single and double circuit)
  - High Voltage Direct Current (HVDC) 500 kV Bi-Pole
- Line Characteristics
  - Conductor Type
  - Pole Structure
  - Length of line
- New Construction or Re-conductor
- Terrain Type
- Location

Black & Veatch utilized its internal knowledge of transmission equipment component costs as a starting point for the cost assumptions. The sections below key in on each of the specific costs identified while gaining a more granular understanding of the capital costs for transmission.

2.1 NEW TRANSMISSION

Black & Veatch only considered voltages 230 kV and above, as these were indicative of the majority of transmission infrastructure projects being proposed on the bulk electric transmission network in the WECC region. In addition to AC transmission, 500 kV Bi-Pole HVDC transmission was also considered, which would be more appropriate for long, high capacity transmission projects.

For AC transmission lines, there are many components that make up the entire line cost. First, Black & Veatch identified the initial physical considerations. Without engineering a detailed design, there were many components that could be broken apart into individual cost multipliers. Three key components were determined to be the most important cost considerations for transmission line designs:

- Conductor type
- Structure
- Length of line

Starting from the transmission capital costs developed in the Western Renewable Energy Zones (WREZ) project for the Western Governors Association, Black & Veatch identified a baseline assumption for capital costs per mile based on these three key components. The initial costs per mile for transmission from the WREZ, escalated from the original 2008 values, are shown in Table 2-1.

Table 2-1 Baseline Transmission Costs

LINE DESCRIPTION	NEW LINE COST ($/MILE)
230 kV Single Circuit	$927,000
230 kV Double Circuit	$1,484,000
345 kV Single Circuit	$1,298,000
345 kV Double Circuit	$2,077,000
500 kV Single Circuit	$1,854,000
500 kV Double Circuit	$2,967,000
500 kV HVDC Bi-pole	$1,484,000

These costs were based on the following assumptions:

- Aluminum Conductor Steel Reinforced (ACSR) conductor
- Tubular (230 kV) / Lattice (345 KV and 500 kV) pole structure
- Line longer than 10 miles

Starting from these baseline costs, Black & Veatch identified various multipliers when adjusting for specific design considerations. For specific projects, it may be important to have a higher rated conductor, especially for transmission lines that are loaded heavily or may span longer distances. This decreases line power losses, and increases current carrying capability. Black & Veatch identified three common conductor types that could be used in new transmission lines: ACSR, Aluminum Conductor Steel Supported (ACSS), and High Tensile Low Sag (HTLS). Each of these conductor types increases the ampacity of the transmission line due to the relative physical properties. ACSR is used most commonly, and is the basis for most transmission lines in the WECC region.

It was important for Black & Veatch to quantify the additional cost to the entire line length if one of these higher ampacity conductors was selected, as it would affect the entire cost of the line. Table 2-2 below indicates the cost multipliers for each of these conductor types, which would be multiplied against the base transmission cost for each voltage level.

Table 2-2 Conductor Cost Multipliers

CONDUCTOR	230 KV SINGLE	230 KV DOUBLE	345 KV SINGLE	345 KV DOUBLE	500 KV SINGLE	500 KV DOUBLE	500 KV HVDC BI-POLE
ACSR	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ACSS	1.08	1.08	1.08	1.08	1.08	1.08	1.08
HTLS	3.60	3.60	3.60	3.60	3.60	3.60	3.60

Various structure types can be considered to support transmission lines. Areas that have higher population may use a tubular steel pole, whereas wide-open mountain ranges may use the lattice steel structure. Since this design constraint can have an impact on the capital cost, it was important to capture these costs as well. While most 230 kV transmission lines are typically made of steel poles, 345 kV and above transmission lines typically use lattice steel structures; however, this is not always the case. For instance, in urban areas, some 345 kV transmission lines may use steel poles, as they reduce the amount of required right of way. An example of each type of structure is shown in Figure 2-1.

Figure 2-1 Pole Structures: Steel Pole (Populus-Terminal 345 kV) vs. Lattice (Path 26)

Black & Veatch quantified the capital cost multipliers associated with each type of structure, as shown in Table 2-3.

Table 2-3 Transmission Structure Type Cost Multipliers

STRUCTURE	230 KV SINGLE	230 KV DOUBLE	345 KV SINGLE	345 KV DOUBLE	500 KV SINGLE	500 KV DOUBLE	500 KV HVDC BI-POLE
Lattice	0.90	0.90	1.00	1.00	1.00	1.00	1.00
Tubular Steel	1.00	1.00	1.30	1.30	1.50	1.50	1.50

Finally, it is important to consider the length of the transmission line. In general, the longer the transmission line, the less it costs per mile. The primary reason for this is that design and engineering, costs are non-linear—it takes almost as much to design and approve a short line as it does a long line. The capital cost multipliers associated with various transmission line lengths are indicated in Table 2-4 below.

Table 2-4 Transmission Length Cost Multipliers

LENGTH	230 KV SINGLE	230 KV DOUBLE	345 KV SINGLE	345 KV DOUBLE	500 KV SINGLE	500 KV DOUBLE	500 KV HVDC BI-POLE
> 10 miles	1.00	1.00	1.00	1.00	1.00	1.00	1.00
3-10 miles	1.20	1.20	1.20	1.20	1.20	1.20	1.20
< 3 miles	1.50	1.50	1.50	1.50	1.50	1.50	1.50

2.2 RE-CONDUCTORING

In areas where there are existing transmission lines, it may be necessary or more cost-effective to re-conductor an existing transmission rather than to build a new line. Re-conductoring can be defined many different ways, but for simplicity re-conductoring in this effort is defined as replacing an existing conductor to increase ampacity. This assumes that the new conductor would be of similar size and weight, hence no upgrading of poles or insulators is required.

To quantify the capital costs associated with re-conductoring a transmission line, Black & Veatch assumed the following:

- 230 kV Transmission Conductors
  - 2 conductors per phase
  - Conductor assumed to be 35% of total capital cost
- 345 kV Transmission Conductors
  - 3 conductors per phase
  - Conductor assumed to be 45% of total capital cost
- 500 kV Transmission Conductors

- 4 conductors per phase
- Conductor assumed to be 55% of total capital cost

- 500 kV Bi-Pole Transmission Conductors
  - 3 conductors per phase
  - Conductor assumed to be 55% of total capital cost

2.3 TERRAIN MULTIPLIER

Transmission equipment capital costs are only a portion of the overall transmission line capital costs. A substantial factor in total transmission line costs is the construction cost for developing lines in different types of terrain. Black & Veatch identified nine different terrain types and then developed cost multipliers to compensate for the difficulty of construction in each terrain type. The lowest cost of development was identified as scrub or flat terrain, and the most difficult and expensive type of terrain is forested areas. Table 2-5 identifies the different types of terrain assessed.

Black & Veatch surveyed published information to ascertain terrain cost differences. California Investor-Owned Utilities (IOUs) publish their terrain cost multipliers annually. The only other public source of terrain multipliers for Western U.S. transmission development is the WREZ. Using stakeholder input and validation, the Peer Review Group adopted a set of terrain cost multipliers that represent a mix of these factors, detailed on Table 2-5.

Table 2-5 Terrain Cost Multipliers

TERRAIN	PG&E[1]	SCE[2]	SDG&E[3]	WREZ	WECC
Desert	1.00	1.10	1.00	-	**1.05**
Scrub / Flat	1.00	1.00	1.00	1.00	**1.00**
Farmland	1.00	1.00	1.00	1.10	**1.00**
Forested	1.50	3.00	-	1.30	**2.25**
Rolling Hill (2-8% slope)	1.30	1.50	-	-	**1.40**
Mountain (>8% slope)	1.50	2.00	1.30	-	**1.75**
Wetland	-	-	1.20	1.20	**1.20**
Suburban	1.20	1.33	1.20	-	**1.27**
Urban	1.50	1.67	-	1.15	**1.59**

[1] 2012 PG&E Per Unit Cost Guide - http://www.caiso.com/Documents/PGE_2012FinalPerUnitCostGuide.xls
[2] 2012 SCE Per Unit Cost Guide - http://www.caiso.com/Documents/SCE_2012FinalPerUnitCostGuide.xls
[3] 2012 SDG&E Per Unit Cost Guide - http://www.caiso.com/Documents/SDGE_2012FinalPerUnitCostGuide.xls

2.4 RIGHT OF WAY COSTS

In addition to the capital costs for transmission line equipment and difficulty of construction based on terrain, there are costs associated with acquiring land for the transmission line. In some cases, right of way costs can come to 10% of total project costs, although this proportion varies significantly between projects. In order to estimate per-mile right of way costs for generic transmission projects, two pieces of information are needed:

- Right of way widths for each voltage class (from which one can calculate the number of acres required per mile of transmission line)
- Right of way costs per acre

With these pieces of information, one can simply multiply the acres per mile by the cost per acre to calculate the total right of way cost per mile of transmission line. Black & Veatch developed estimates for both right of way widths and right of way costs per acre which can be applied across the WECC region; the methodology and results are discussed separately below.

2.4.1 Right of Way Widths

In order to develop generic right of way width estimates for each voltage class considered in this study, Black & Veatch surveyed available information from a variety of industry sources—FERC and NERC documents, individual utility estimates, and actual project right of way widths from existing and proposed projects throughout the WECC region. This survey revealed that transmission project right of way widths vary significantly, even within the same voltage class. Table 2-6 below shows the results of a comprehensive survey that FERC conducted in 2004 to quantify right of way widths by utility (note that this survey included utilities nationwide, not just those in the WECC region).[4]

Table 2-6 FERC Nationwide Survey of Right of Way Widths (2004)

MINIMUM WIDTH	230 KV (# OF UTILITIES)	345 KV (# OF UTILITIES)	500 KV (# OF UTILITIES)
< 125 ft.	40	6	4
126 - 175 ft.	36	36	21
> 175 ft.	30	30	13
Note: This survey included utilities nationwide, not only those in the WECC region.			

However, the FERC data were only one of the many sources investigated. Table 2-7 below shows the larger set of data sources that Black & Veatch drew from (which focused on utilities and projects in the WECC region), and the right of way widths specified for each voltage class in each data source. In the "WECC Assumption" row, the right of way width assumption for each voltage class is shown; this was based on adopting the most common value from the various data sources for each voltage class, and also ensuring a logical progression so that widths increased at successively higher voltages and double circuit line widths were greater than those for single

[4] http://www.ferc.gov/industries/electric/indus-act/reliability/veg-mgmt-rpt-final.pdf

circuits. The bottom row shows the acres of right of way per mile of transmission. These "acre/mile" values were the values used in all subsequent right of way cost calculations for this study.

Table 2-7 Right of Way Widths by Voltage Class and Data Source

SOURCE	230-KV SINGLE CIRCUIT	230-KV DOUBLE CIRCUIT	345-KV SINGLE CIRCUIT	345-KV DOUBLE CIRCUIT	500-KV SINGLE CIRCUIT	500-KV DOUBLE CIRCUIT	500-KV DC BI-POLE
FERC Nation-wide Utility Survey	100 ft.	-	125 ft.	-	175 ft.	-	-
DRECP (SCE/LADWP)	100 ft.	-	-	-	200 ft.	-	-
SDG&E	-	300 ft.	-	-	200 ft.	-	-
PG&E	75 ft.	-	-	-	-	-	-
PacifiCorp	125/150 ft.	-	150 ft.	-	250/300 ft.	300	-
BPA	125/225 ft.	-	-	-	150 ft.	-	-
Idaho Power	-	-	-	-	250 ft.	-	-
Xcel Energy	-	-	-	225/250 ft.	-	-	-
WREZ	150 ft.	150 ft.	160 ft.	160 ft.	175 ft.	175 ft.	200 ft.
WECC Assumption	125 ft.	150 ft.	175 ft.	200 ft.	200 ft.	250 ft.	200 ft.
Acres/mile*	**15.14**	**18.17**	**21.20**	**24.23**	**24.23**	**30.29**	**24.23**

***Acres/mile values were calculated by multiplying the right of way width by 5,280 feet per mile and dividing by 43,560 sq. ft. per acre.**

2.4.2 Right of Way Costs Per Acre

To develop estimates of right of way costs, the Peer Review Group adopted a methodology based on the Bureau of Land Management's (BLM) Linear Right of Way Schedule for Year 2015 (taken from 43 CFR Parts 2800, 2880, 2920).[5] This document provides estimates of land rental costs in each U.S. county, developed specifically for the purpose of linear right of way uses such as transmission lines. Although these rental costs do not differentiate between different land uses (e.g. farmland, pasture land, urban or suburban land, etc.) and may not accurately predict the cost of any particular parcel of land, they do provide the following advantages:

[5] http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS__REALTY__AND_RESOURCE_PROTECTION_/cost_recovery.Par.47392.File.dat/RentLinearRentSchedule2009-2015-NoHighlight.pdf

- Consistent data across all states and counties
- Transparent, public data source
- Costs designed for the purpose of right of way leases
- Capture the relative cost differences between different regions and land uses

Because these costs are given in rental terms (dollars per acre per year) and the WECC transmission costs are expressed in capital costs it is necessary to convert the lease costs to capital costs (dollars per acre). The following formula was used for this conversion:

[6]

Black & Veatch assumed a Capitalization Rate of ten percent and assumed that Land Taxes are equal to one percent of the Land Rental Cost.

In addition to providing per-acre rental costs for each U.S. county, the BLM right of way schedule also categorizes all counties into twelve different cost "zones". For simplicity, Black & Veatch used the zone data rather than individual county-level cost data. Table 2-8 lists the BLM land rental costs by zone and the equivalent capital cost by zone.

Table 2-8 BLM Land Rental and Land Capital Costs by Zone

BLM ZONE NUMBER	LAND RENTAL COST ($/ACRE-YEAR)	LAND CAPITAL COST ($/ACRE)
1	$ 9	$ 85
2	$ 17	$ 171
3	$ 34	$ 341
4	$ 52	$ 512
5	$ 69	$ 683
6	$ 103	$ 1,024
7	$ 172	$ 1,707
8	$ 345	$ 3,414
9	$ 690	$ 6,828
10	$ 1,035	$ 10,242
11	$ 1,724	$ 17,071
12	**$ 3,449**	**$ 34,141**

[6] **Land Rental Value** is the annual fee individuals are willing to pay for the exclusive right to use a land site for a period of time. **Land Taxes** is the portion of the land rental value that is claimed for the community. **Capitalization Rate** is a market determined rate of return that would attract individuals to invest in the use of land, considering all of the risks and benefits which could be realized.

2.5 TRANSMISSION CALCULATION METHODOLOGY

Multiplying the right of way acres per mile by the land cost per acre yields the total right of way cost per mile of transmission line. This value was then added to the base transmission costs discussed in Sections 2.1, 2.2, and 2.3 to develop the total transmission line capital cost. The exact equation used to calculate the total transmission cost is explained in Section 2.5.

Total Transmission Line Cost =

[(Base Transmission Cost) x (Conductor Multiplier) x (Structure Multiplier) x (Re-conductor Multiplier) x (Terrain Multiplier) + (ROW Acres/Mile) x (Land Cost/Acre)] x (# of Miles)

3.0 Substation Capital Costs

Transmission cost estimates often only consider the conductor cost, without consideration of the requirements for new substation facilities needed to connect the transmission to the existing grid. This section quantifies the substation costs associated with transmission infrastructure development.

There are numerous considerations that go into the design of a substation that will significantly impact the cost of the facility. For the purpose of this effort, however, the Peer Review Group adopted a methodology that was simple enough to be repeatable, but granular enough to estimate a capital cost for various sized substations with different line and transformer positions, additional reactive equipment, or new transformers. Since HVDC lines were also identified in the transmission capital costs, HVDC converter station equipment and costs were also estimated. The following cost components were identified to calculate the substation cost:

- Base Substation Cost
- Line/Transformer Positions
- Transformer
- HVDC Converter Station
- Static VAR Compensator, Shunt Reactors and Series Capacitors

3.1 NEW SUBSTATION BASE COST

Black & Veatch first identified a set of base substation costs, which excludes all major equipment. Since substations can be built in very remote areas, it was important to note that the substation costs in this methodology assume flat, barren land with relatively easy site access. The new substation costs, which include land, substation fence, control building, etc are identified in Table 3-1 below.

Table 3-1 New Base Substation Capital Costs

EQUIPMENT	230 KV SUBSTATION	345 KV SUBSTATION	500 KV SUBSTATION
Base Cost (New Substation)	$1,648,000	$2,060,000	$2,472,000

3.2 LINE AND TRANSFORMER POSITIONS

In addition to the substation base cost Black & Veatch considered the cost of breaker postions necessary to interconnect lines and transformers for new and existing substations. All of these require circuit breakers and switches for isolation of equipment. This isolation can be designed in multiple configurations; however, two are most common: ring bus and breaker-and-a-half (BAAH).

A ring bus configuration assumes one breaker for each line or transformer position; whereas, a BAAH configuration assumes one and a half breakers for every line or transformer configuration (e.g. 4 lines equates to 6 breakers); see Figure 3-1 for a diagram of each configuration.

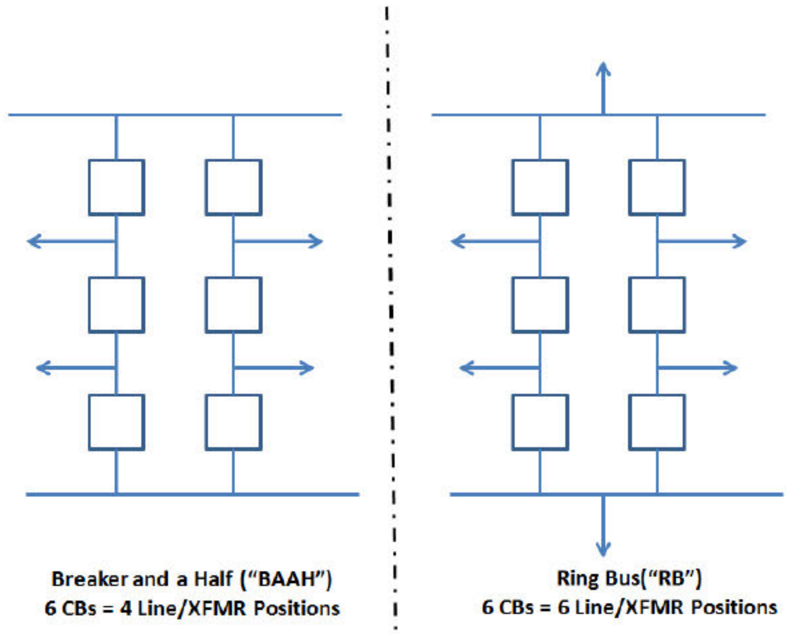

Figure 3-1 Substation Configurations

A line position is defined as a transmission line entering or exiting and terminating at the substation. For one transmission line looping into a substation, it would require two line positions. A transformer position is equal to the number of transformers added. Each of these types of configurations is used at different voltages and number of lines in and out of the substation. Smaller substations typically assume a ring bus configuration, while larger substations use a BAAH configuration. Table 3-2 identifies the basic cost per line or transformer position and the associated multipliers. These costs include the breaker, switches, structures, and protection schemes associated with these configurations.

Table 3-2 Line/Transformer Position Cost and Multipliers

EQUIPMENT	230 KV SUBSTATION	345 KV SUBSTATION	500 KV SUBSTATION
Cost Per Line/XFMR Position	$1,442,000	$2,163,000	$2,884,000
Ring Bus Multiplier	1	1	1
Breaker and a Half Multiplier	1.5	1.5	1.5

If an existing substation is expanded, in the case of connecting two existing substations with a new transmission line, no incremental base substation costs are incurred.

3.3 TRANSFORMERS

Many transmission lines connect to substations that serve load areas, typically at a lower voltage level than the bulk transmission system. To do so, transformers are needed to decrease the voltage and deliver electricity to load centers. Transformers vary by voltage, as well as by current carrying capability. Transformers can vary in cost substantially based on variables such as copper commodity prices, as well as cost of freight; however, the costs considered and vetted by the WECC stakeholders are typical in the industry. The costs considered include foundation and oil containment for the transformer.

Table 3-3 below identifies the capital costs associated with each voltage class in a cost per mega-volt ampere (MVA), which is dependent on the amount of current carrying capability necessary to deliver from the high voltage side to the low voltage side of the transformer.

Table 3-3 Transformer Capital Costs

TRANSFORMER COST ($/MVA)	230 KV SUBSTATION	345 KV SUBSTATION	500 KV SUBSTATION
115/230 kV XFMR	$7,000	-	-
115/345 kV XFMR	-	$10,000	-
115/500 kV XFMR	-	-	$10,000
138/230 kV XFMR	$7,000	-	-
138/345 kV XFMR	-	$10,000	-
138/500 kV XFMR	-	-	$10,000
230/345 kV XFMR		$10,000	-
230/500 kV XFMR	$11,000	-	$11,000
345/500 kV XFMR	-	$13,000	$13,000

3.4 REACTIVE COMPONENTS

An ideal transmission system does not require any reactive support; however, this is rarely the case. Many transmission networks are integrated in a manner that supports voltage dips across the network; however, some weaker systems may require additional reactive power support to maintain grid reliability. The amount of reactive support, and the speed with which the support needs to be transferred to the grid, will determine what type of reactive component is required at the substation.

Black & Veatch identified three key reactive components commonly used for transmission level grid support. Each piece of equipment has its own level of complexity, size, and cost.

- Shunt Reactor
- Series Capacitor
- Static VAr Compensator (SVC)

Shunt reactors are commonly used to reduce voltages due to high line charging on lightly loaded transmission networks. Series capacitors do the exact opposite – they increase voltages by providing additional reactive charging to the transmission network to maintain system voltages.

Black & Veatch worked with stakeholders to assume a "turnkey" installation, which includes with engineering, design, and construction support for a site that "has been rough-graded and has access to a source of medium voltage auxiliary power"[7]. Table 3-4 identifies the typical costs for shunt reactors and series capacitors.

Table 3-4 Shunt Reactor and Series Capacitor Capital Costs

EQUIPMENT	230 KV SUBSTATION	345 KV SUBSTATION	500 KV SUBSTATION
Shunt Reactor ($/MVAR)	$20,000	$20,000	$20,000
Series Capacitor ($/MVAR)	$30,000	$10,000	$10,000

Static VAr Compensators (SVCs) combine both technologies, while adding speed of support. SVCs are constantly connected to the grid, whereas capacitors and reactors typically have to be switched. SVCs are more expensive than their static counterparts; however, they offer more flexibility in resources. The costs for SVCs vary based on size and the assumptions made about the ease of installation. Table 3-5 below shows SVC costs identified by HydroOne, Arizona Public Service Company (APS), and the Peer Review Group adopted costs. Like Shunt Reactor and Series Capacitor capital costs, SVC costs assume a "turnkey" installation.

Table 3-5 SVC Capital Costs

VOLTAGE CLASS	HYDRO ONE[8]	APS[9]	WECC
500 kV	-	-	$85,000
345 kV	-	-	$85,000
230 kV	$94,500	$75,000	$85,000
115 kV	$141,000	-	-
Medium Voltage	$142,000	-	-
Low Voltage	$250,000	-	-

[7] Stakeholder comment from Eric John of ABB, regarding turnkey SC turnkey installation.
[8] http://www.appro.org/docs/HONIconnectionsJan2009/Naren_Pattani_%20-_Tx_presentation_at_%20APPrO-CanWEA-OWA_workshop,_Jan_22_2009.pdf
[9] http://www.wecc.biz/committees/BOD/TEPPC/020209/Lists/Agendas/1/Reactors%20%20Capacitors%20%20SVC%20%20PSS.pdf

3.5 HIGH VOLTAGE DIRECT CURRENT CONVERTER STATION

HVDC converter stations are required at both ends of a HVDC transmission line. The converter stations change the HVDC power to AC power and then interconnect it to the AC transmission network. There are benefits to using HVDC transmission lines for very long transmission segments, as line losses are substantially lower due to the lack of reactive losses, which make up the majority of AC transmission line losses. For shorter distances, HVDC lines are generally not cost-effective, as the converter substation costs are substantially higher than the cost of an AC substation.

There are various costs associated with a HVDC converter station, and the most variable cost is the reactive component. The costs on Table 3-6 are indicative of a typical transmission system, and what is needed to provide reliable power to the AC transmission network.

Table 3-6 HVDC Converter Station Costs

HVDC 500 KV CONVERTER STATION	
MW Rating	3000 MW
Cost Components	
Converter Terminal (including DC switching station equipment)	$275,000,000
Reactive Support (synchronous condensers, SVCs, etc.)	$150,000,000
AC Switchyard	$20,000,000
Total Cost	**$445,000,000**

3.6 SUBSTATION CALCULATION METHODOLOGY

Using the substation components detailed above, the total substation cost is calculated using the following equation:

Total Individual Substation Cost =

[(Substation Base Cost) + (Line/XFMR Position Base Cost) x (# of Line/XFMR Positions) x (RB or BAAH Multiplier) + (XFMR Cost/MVA) x (XFMR MVA Rating) x (# of XFMRs) + (SVC Cost/MVAR) (# MVARs) + (Series Cap. Cost/MVAR) x (# MVARs) + (Shunt Reactor Cost/MVAR) x (# MVARs) + (HVDC Converter Station Cost)]

If the substation has a high side and a low side voltage, both Line/XFMR Position costs have to be calculated; however, the Substation Base Cost does not have to be added again. The highest voltage of the substation will be the basis for the Substation Base Cost.

4.0 Summary of Capital Costs

The methodology in Sections 2.0 and 3.0 above considers multiple components to compute a complete capital cost for a transmission infrastructure project. The capital costs above are summarized in the sections below.

4.1 TRANSMISSION CAPITAL COSTS

Using the methodology discussed in Section 2.0, Black & Veatch surveyed various transmission costs as well as used internal industry knowledge to determine a typical value for transmission costs. While industry costs can vary substantially, the Peer Review Group determined that these values are reasonable for projects installed in the WECC region.

Using the numbers from tables above and the equation below, the total capital cost for a transmission line can be calculated.

Total Transmission Line Cost =
[(Base Transmission Cost) x (Conductor Multiplier) x (Structure Multiplier) x (Re-conductor Multiplier) x (Terrain Multiplier) + (ROW Acres/Mile) x (Land Cost/Acre)] x (# of Miles)

Table 4-1 Transmission Capital Cost Summary

EQUIPMENT	230 KV SINGLE CIRCUIT	230 KV DOUBLE CIRCUIT	345 KV SINGLE CIRCUIT	345 KV DOUBLE CIRCUIT	500 KV SINGLE CIRCUIT	500 KV DOUBLE CIRCUIT	500 KV HVDC BI-POLE
Base Cost	$927,000	$1,484,000	$1,298,000	$2,077,000	$1,854,000	$2,967,000	$1,484,000
Multipliers							
Conductor							
ACSR	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ACSS	1.08	1.08	1.08	1.08	1.08	1.08	1.08
HTLS	3.60	3.60	3.60	3.60	3.60	3.60	3.60
Structure							
Lattice	0.90	0.90	1.00	1.00	1.00	1.00	1.00
Tubular Steel	1.00	1.00	1.30	1.30	1.50	1.50	1.50
Length							
> 10 miles	1.00	1.00	1.00	1.00	1.00	1.00	1.00
3-10 miles	1.20	1.20	1.20	1.20	1.20	1.20	1.20
< 3 miles	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Age							
New	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Re-conductor	0.35	0.45	0.45	0.55	0.55	0.65	0.55
Terrain							
Desert	1.05	1.05	1.05	1.05	1.05	1.05	1.05
Scrub / Flat	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Farmland	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Forested	2.25	2.25	2.25	2.25	2.25	2.25	2.25
Rolling Hill (2-8% slope)	1.40	1.40	1.40	1.40	1.40	1.40	1.40
Mountain (>8% slope)	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Wetland	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Suburban	1.27	1.27	1.27	1.27	1.27	1.27	1.27
Urban	1.59	1.59	1.59	1.59	1.59	1.59	1.59

In addition to the capital cost of equipment for transmission lines, the acquisition of land for ROW was determined based on BLM land values. The land costs are detailed on Table 2-8.

4.2 SUBSTATION CAPITAL COSTS

Using the methodology discussed in Section 3.0, Black & Veatch surveyed various substation costs as well as used internal industry knowledge to determine a typical value for substation costs. While industry costs can vary substantially, the Peer Review Group determined that these values are reasonable for projects installed in the WECC region, with the key assumption that the substation would be constructed on flat, barren land.

Table 4-2 Substation Capital Cost Summary

EQUIPMENT	230 KV SUBSTATION	345 KV SUBSTATION	500 KV SUBSTATION
Base Cost (New Substation)	$1,648,000	$2,060,000	$2,472,000
Cost Per Line/XFMR Position	$1,442,000	$2,163,000	$2,884,000
Ring Bus Multiplier	1	1	1
Breaker and a Half Multiplier	1.5	1.5	1.5
500 kV HVDC Converter Station	-	-	$445,000,000
Shunt Reactor ($/MVAR)	$20,000	$20,000	$20,000
Series Capacitor ($/MVAR)	$30,000	$10,000	$10,000
SVC Cost ($/MVAR)	$85,000	$85,000	$85,000
Transformer Cost ($/MVA)			
115/230 kV XFMR	$7,000	-	-
115/345 kV XFMR	-	$10,000	-
115/500 kV XFMR	-	-	$10,000
138/230 kV XFMR	$7,000	-	-
138/345 kV XFMR	-	$10,000	-
138/500 kV XFMR	-	-	$10,000
230/345 kV XFMR		$10,000	-
230/500 kV XFMR	$11,000	-	$11,000
345/500 kV XFMR	-	$13,000	$13,000

Using the above table and the equation below, the capital cost for the substation can be calculated.

Total Individual Substation Cost =

[(Substation Base Cost) + (Line/XFMR Position Base Cost) x (# of Line/XFMR Positions) x (RB or BAAH Multiplier) + (XFMR Cost/MVA) x (XFMR MVA Rating) x (# of XFMRs) + (SVC Cost/MVAR) (# MVARs) + (Series Cap. Cost/MVAR) x (# MVARs) + (Shunt Reactor Cost/MVAR) x (# MVARs) + (HVDC Converter Station Cost)]

4.3 ALLOWANCE FOR FUNDS USED DURING CONSTRUCTION AND OVERHEAD COSTS

The transmission and substation costs described in Sections 2.0 and 3.0 above are given as "overnight" costs, i.e. the cost if the project could be engineered, procured and constructed overnight without financing or overhead costs. To address this, Black & Veatch developed estimates of Allowance for Funds Used During Construction (AFUDC) and overhead, which could be added to the transmission and substation costs to produce realistic total project cost estimates.

In general, AFUDC is defined as the cost of debt and equity funds used to finance construction projects; overhead is defined as the miscellaneous costs required to maintain an organization but are not directly tied to a specific project, e.g. administrative costs, legal costs, internal management costs, etc. AFUDC and overhead costs are usually estimated as a percentage of transmission and substation costs. It is important to note that different entities (investor-owned utilities, public utilities, independent project developers) use very different definitions of what is included in AFUDC and Overhead costs, and also have widely differing estimates of these costs. Black & Veatch surveyed a number of sources to understand the range of these estimates, and to develop a recommended value which could be used by WECC to reasonably represent all types of project ownership structures. A sampling of AFUDC and overhead costs are shown in Table 4-3 below.

Table 4-3 Survey of AFUDC and Overhead Costs and Recommended Values

	INDEPENDENT DEVELOPER	IOU	PUBLIC UTILITY
Source	B&V Estimate	NV Energy/PacifiCorp	BPA
AFUDC Cost	10.0%	8.6%	4.1%
Overhead Cost	10.0%	6.2%	23.0%
Recommended Values	7.5% (AFUDC) + 10.0% (Overhead) = 17.5%		

Based on the collected data, Black & Veatch recommended and the Peer Review Group adopted a value of 7.5% for AFUDC costs and 10.0% for overhead costs, for a total of 17.5%. This 17.5% adder for AFUDC and overhead costs was used in all calculations for this study.

Adding the cost of the transmission calculated in Section 4.1 and the substation costs calculated in Section 4.2 together will result in the total project capital costs prior to AFUDC and overhead. Using the above information, the entire cost of a project can be calculated.

Total Project Cost =

[(Total Transmission Capital Cost) + (Total Substation Capital Cost)] x [(AFUDC – 7.5%) + (Overhead – 10%)]

5.0 Cost Calculator

After developing the capital cost estimates for transmission and substations described in Section 4.0, Black & Veatch created a cost calculator which incorporated all of the cost estimates for transmission and substations cost components into a single, user-friendly Excel-based tool. The cost calculator is simple but flexible, and can be used to estimate the costs of any hypothetical transmission project and associated substations within the WECC region. The calculator employs the cost formulas for transmission and substations to calculate total project costs (for the entire line length and on a per-mile basis), and is automated to the extent possible to allow for quick estimates. The cost calculator workbook is split into three different sheets, each of which is described below:

- Transmission Cost Calculator
- Substation Cost Calculator
- Cost Totals

5.1 TRANSMISSION COST CALCULATOR

A screenshot of the Transmission Cost Calculator sheet of the cost calculator workbook is shown in Figure 5-1 below.

Black & Veatch Transmission Line Capital Cost Calculator

User Selection
Auto-calculated
Adjustable Parameter

	Selection	Multiplier	Cumulative Cost/Mile
Voltage Class	500 kV Single Circuit	1	$ 1,854,000.00
Conductor Type		1	$ 1,854,000.00
Structure		1	$ 1,854,000.00
Length Category		1	$ 1,854,000.00
New or Re-conductor?		1	$ 1,854,000.00
Terrain Multiplier		1.08	$ 1,998,533.77

230 kV Single Circuit
230 kV Double Circuit
345 kV Single Circuit
345 kV Double Circuit
500 kV Single Circuit
500 kV Double Circuit
500 kV HVDC Circuit

Terrain Type	Miles of Terrain Type	Multiplier	Weighted Miles
Forested	0.9	2.25	1.9
Scrubbed/Flat	189.0	1	189.0
Wetland	0.0	1.2	0.0
Farmland	0.0	1	0.0
Desert/Barren Land	0.9	1.05	1.0
Urban	0.0	1.59	0.0
Rolling Hills (2-8% Slope)	40.1	1.4	56.2
Mountain (>8% Slope)	1.2	1.75	2.2
Total Miles	232.1		

BLM Cost Zone Number	ROW Miles in BLM Zone	$/Acre	$/Mile of ROW	Zone ROW Costs
1	20.0	$ 85.34	$ 2,068.80	$ 41,376.00
2	50.0	$ 170.68	$ 4,137.60	$ 206,880.00
3	23.0	$ 341.45	$ 8,277.60	$ 190,384.80
4	10.0	$ 512.13	$ 12,415.20	$ 124,152.00
5	5.0	$ 682.80	$ 16,552.80	$ 82,764.00
6	5.0	$ 1,024.25	$ 24,830.40	$ 124,152.00
7	5.0	$ 1,707.06	$ 41,383.20	$ 206,916.00
8	5.0	$ 3,414.11	$ 82,766.40	$ 413,832.00
9	5.0	$ 6,828.23	$ 165,532.80	$ 827,664.00
10	5.0	$ 10,242.34	$ 248,299.20	$ 1,241,496.00
11	5.0	$ 17,070.57	$ 413,832.00	$ 2,069,160.00
12	5.0	$ 34,141.14	$ 827,664.00	$ 4,138,320.00

AFUDC/Overhead Cost: 17.5%

Project Cost Results	Per Mile	Total
Line Cost	$ 1,998,533.77	$ 463,873,675.03
ROW Cost	$ 41,649.31	$ 9,667,096.80
AFUDC Cost	$ 357,032.04	$ 82,869,635.07
All Costs	$ 2,397,215.12	$ 556,410,406.90

Figure 5-1 Transmission Cost Calculator Sheet of Cost Calculator Workbook

On this sheet, the user first selects the basic transmission line characteristics from a series of drop-down menus. The options for each follow the different equipment types and specifications described in Section 2.1. After that, the user must enter information about the line routing. This information consists of the number of miles of line which pass through each terrain type described in Section 2.3, and the number of miles of line which pass through each BLM cost zone described in Section 2.4. These line routing values are not calculated within this sheet—rather, the user must obtain these values by performing a separate Geographic Information System (GIS) analysis.

Once all selections are made and all values are entered, the transmission line, right of way, and AFUDC/overhead costs for the project are automatically calculated at the bottom of the sheet in the "Project Cost Results" section, for the entire line length and on a per-mile basis.

The calculator is also flexible. In addition to the cells highlighted in yellow, which indicate places where the user must select from a drop-down menu or enter a value, a number of cells are highlighted green, to indicate that the values in those cells are parameters that can be adjusted by the user. Adjusting these values allows the user to test the sensitivity of the project cost results to certain parameters. The following are parameters which can be adjusted on this sheet:

- Terrain type multipliers
- AFUDC/overhead cost adder
- Transmission base costs
- Conductor type multipliers
- Structure type multipliers
- Length category multipliers
- New vs. re-conductor multipliers
- Right of way width assumptions
- BLM Zone Land Rental Costs
- Land Tax Rate
- Capitalization Rate

5.2 SUBSTATION COST CALCULATOR

A screenshot of the Substation Cost Calculator sheet of the cost calculator workbook is shown in Figure 5-2 below.

Black & Veatch Substation Capital Cost Calculator		Cost Component	Cost	
				User Selection
	Selection	Cost Component	Cost	Auto-calculated
Voltage	500 kV Substation	Base Cost	$ 2,472,000	Adjustable Parameter
New or Existing Site?	New	Circuit Breakers	$ 17,304,000	
Circuit Breaker Type	Breaker and a Half	500 kV HVDC Converter	N/A	
# of Line/XFMR Positions	4	Transformer(s)	$ 11,000,000	
500-kV HVDC Converter?	No	SVC(s)	$ 10,000,000	
Transformer Type	230/500 kV XFMR	Shunt Reactor(s)	$ 10,000,000	
MVA Rating Per Transformer	115/345 kV XFMR 115/500 kV XFMR 138/230 kV XFMR 138/345 kV XFMR 138/500 kV XFMR 230/345 kV XFMR 230/500 kV XFMR 345/500 kV XFMR	Series Capacitor(s)	$ 20,000,000	
# of Transformers		AFUDC/Overhead Cost	$ 12,385,800.000	
SVC MVAR Rating				
Shunt Reactor MVAR Rating		**Total Substation Cost**	**$ 83,161,800**	
Series Capacitor MVAR Rating				
AFUDC/Overhead Cost	17.5%			

Figure 5-2 Substation Cost Calculator Sheet of Cost Calculator Workbook

On this sheet, the user selects the basic substation characteristics from a series of drop-down menus, and also enters appropriate values for certain characteristics (e.g. "# of Transformers"), according to the options described in Section 2.1. The cost for each substation component is shown on the right side, the AFUDC/overhead cost is automatically calculated, and the total substation cost is automatically summed at the bottom.

It is important to note that this sheet can be used to calculate costs for only one individual substation at a time. If a particular transmission project involves more than one substation, then information about each substation will need to be entered separately, and the total cost of each individual substation will need to be entered in the empty cells in the Cost Totals sheet of the workbook.

There are also a number of adjustable parameters in this sheet, which are:

- AFUDC/overhead cost adder
- Base substation costs
- Cost per line position
- Line position type multipliers
- HVDC converter station cost
- Shunt reactor cost
- Series capacitor cost
- SVC cost
- Transformer costs

5.3 COST TOTALS

A screenshot of the Cost Totals sheet of the cost calculator workbook is shown in Figure 5-3 below.

Black & Veatch Transmission and Substation Cost Totals

Project Cost Results	Per Mile	Total
Line Cost	$ 1,998,533.77	$ 463,873,675.03
ROW Cost	$ 41,649.31	$ 9,667,096.80
Substation #1	N/A	$ 83,161,800.00
Substation #2	N/A	$ 50,000,000.00
Substation #3	N/A	
Substation #4	N/A	
Substation #5	N/A	
AFUDC Cost	$ 357,032.04	$ 106,172,950.07
All Costs	**$ 2,397,215.12**	**$ 712,875,521.90**

User Selection
Auto-calculated

Figure 5-3 Cost Totals Sheet of Cost Calculator Workbook

On this sheet, the transmission and substation costs calculated on the other two sheets are summed to find the total project cost, for the entire line length and on a per-mile basis. The transmission line and right of way cost data are automatically transferred from the Transmission Cost Calculator sheet. Since it is anticipated that most projects will have multiple associated substations and each individual substation cost must be calculated separately, there are five empty cells in which the user can enter the cost of individual substations from the Substation Cost Calculator sheet. Once the substation costs are entered, the AFUDC and overhead cost is automatically calculated and the total project cost is automatically summed at the bottom.

6.0 Scenario Analysis

After creating the cost calculator, Black & Veatch tested it to ensure that it was user-friendly, and more importantly to ensure that the transmission and substation cost assumptions incorporated into the calculator were reasonable when compared to existing and proposed transmission projects. An initial list of over 20 projects was narrowed down to four representative projects which were used to validate Black & Veatch's cost assumptions. To perform this scenario analysis, Black & Veatch obtained the most detailed information possible within the time available about the four real transmission projects, with significant help from WECC staff and other stakeholders; sources included internal utility documents, regulatory filings, and information filed with WECC. The four projects are:

- PacifiCorp: Gateway Central Line (Populus - Terminal Segment)
- NV Energy: One Nevada Line
- Bonneville Power Administration (BPA): McNary – John Day Line
- Xcel Energy: Comanche – Daniels Park Line

The map in Figure 6-1 below shows the location of each of the four selected projects. They are spread throughout the WECC region, each in a different utility territory, and they cover the full range of terrain types as well as both the 345-kV and 500-kV voltage classes.

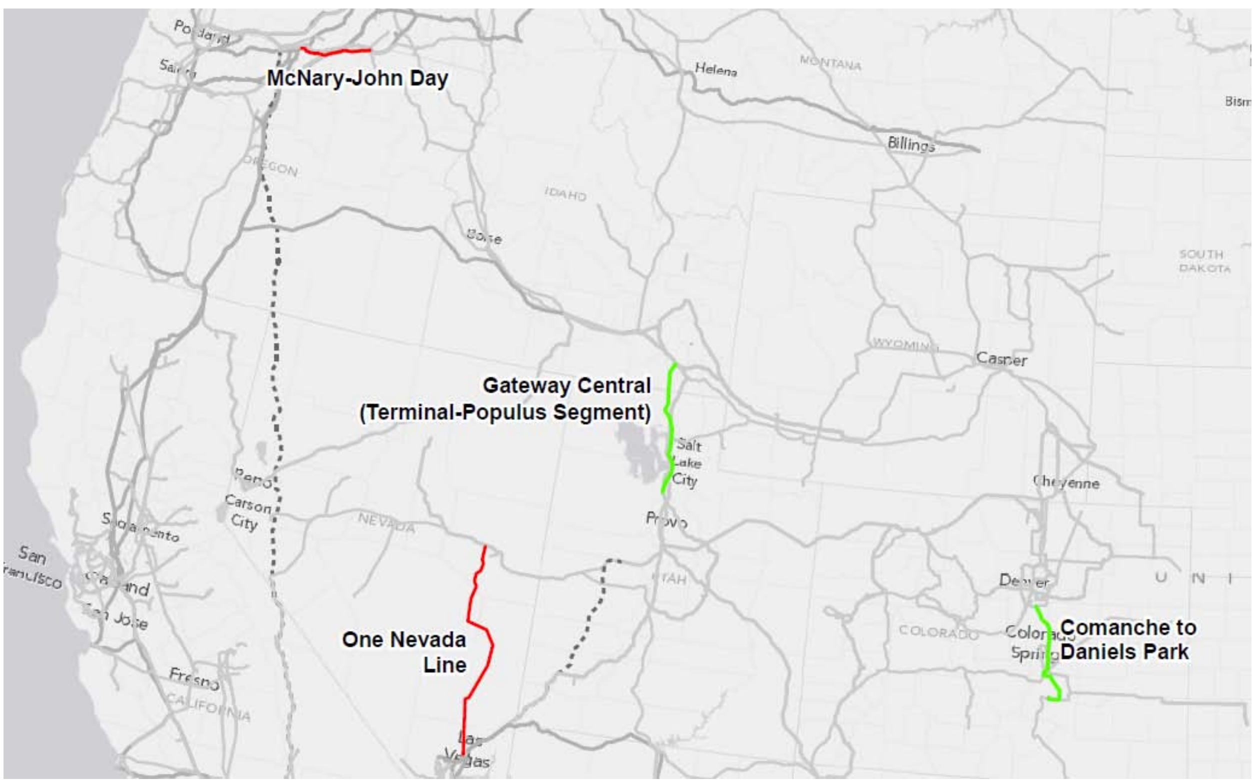

Figure 6-1 Map of the Four Transmission Projects Selected for Scenario Analysis

For each project, once detailed information had been obtained about project characteristics and project costs, Black & Veatch entered information in the cost calculator to simulate the real transmission project as closely as possible. Values were also entered for the number of miles of each terrain type, and the number of miles in each BLM cost zone, based on a separate GIS analysis performed outside of the cost calculator. Table 6-1 below shows the project characteristics used to simulate each project, and Table 6-2 shows the number of miles in each terrain type for each project.

Table 6-1 Transmission Project Characteristics Used in Scenario Analysis

PROJECT	VOLTAGE	LENGTH (MILES)	CONDUCTOR TYPE	STRUCTURE	NEW OR RE-CONDUCTOR
PacifiCorp - Gateway Central (Populus-Terminal)	345-kV Double Circuit	135	ACSR	Tubular Steel	New
NV Energy - One Nevada	500-kV Single Circuit	235	ACSR	Lattice	New
BPA – McNary-John Day	500-kV Single Circuit	79	ACSR	Lattice	New
Xcel Energy – Comanche-Daniels Park	345-kV Double Circuit	125	ACSR	Tubular Steel	Re-conductor

Note: This is based on the information available to Black & Veatch at the time of this analysis, and may not reflect actual project characteristics in all cases.

Table 6-2 Miles in Each Terrain Type for Transmission Projects in Scenario Analysis

PROJECT	FORESTED	SCRUB/ FLAT	WETLAND	FARMLAND	DESERT/ BARREN LAND	URBAN	ROLLING HILL (2-8% SLOPE)	MOUNTAIN (>8% SLOPE)
PacifiCorp - Gateway Central (Populus-Terminal)	0.3	49.3	0.6	29.8	0.5	23.7	17.7	11.7
NV Energy - One Nevada	0.9	189.0	0.0	0.0	0.9	0.0	40.1	1.2
BPA – McNary-John Day	0.0	31.5	0.0	28.1	0.0	2.4	9.1	0.7
Xcel Energy – Comanche-Daniels Park	6.1	111.6	0.0	3.1	0.0	0.2	0.0	0.0

Note: These values are based on Black & Veatch GIS analysis, and may not reflect the actual number of miles in each terrain type for each project.

For each project scenario, the analysis output from the calculator was the project transmission line costs, ROW costs, substation costs, and AFUDC/overhead costs. These costs were then summed to find the total project cost, and this estimated project cost was compared to the total cost of the actual project. Black & Veatch did not attempt to match the actual project costs component-by-component (e.g. estimated right of way costs were not intended or expected to closely match actual right of way costs)—rather, Black & Veatch attempted to match the estimated total project cost to the actual total project cost. This was because for some projects cost data was not available at this detailed level, and also because projects often differ in what is included in each cost component. Thus, the total project cost was considered the key metric for testing the cost calculator.

6.1 PACIFICORP: GATEWAY CENTRAL LINE (POPULUS – TERMINAL SEGMENT)

This 345-kV double circuit line segment is part of PacifiCorp's Gateway Central project, centered in Utah, and extends from the new Populus substation in southeastern Idaho to the existing Terminal substation in the Salt Lake City area. It was completed in 2010. The most notable characteristic of this line is that it crosses a significant amount of mountainous terrain and urban and suburban terrain around Salt Lake City, which the other three lines do not. Table 6-3 shows the results of the scenario analysis.

Table 6-3 Scenario Analysis Results for PacifiCorp: Gateway Central Line

COST COMPONENT	ACTUAL COST	B&V ESTIMATED COST	DIFFERENCE (ACTUAL – ESTIMATED COST)
Line Cost (including wires, poles, etc.)	$ 498,439,614	$ 443,071,335	11%
ROW Cost	$ 70,183,253	$ 2,774,370	96%
Substation Cost	$ 126,054,613	$ 187,689,000	- 49%
AFUDC/Overhead Cost	$ 122,152,660	$ 110,868,573	9%
Total Cost	**$ 816,830,140**	**$ 744,403,278**	**9%**

Note: These results are not meant as a comment on the actual project costs listed; they are simply meant to provide a test of the cost calculator developed by Black & Veatch.

The estimated and actual project costs match within 9%, which indicates that the cost calculator provides a relatively close approximation of actual project costs in this case. Black & Veatch was able to obtain detailed cost information for this project, which provides more confidence in the accuracy of the estimate.

6.2 NV ENERGY: ONE NEVADA LINE

This 500-kV single circuit project extends from the Robinson Summit substation in northern Nevada to the Harry Allen substation near Las Vegas in southern Nevada; its purpose is to connect the two different grids operated by NV Energy's subsidiaries Sierra Pacific Power Company and Nevada Power Company. It is currently under construction and is expected to be completed in 2013. The most notable characteristic of this line is that it crosses land that is almost entirely uninhabited and either flat or rolling hill terrain, while the other three lines cross land that is mostly inhabited. Table 6-4 shows the results of the scenario analysis.

Table 6-4 Scenario Analysis Results for NV Energy: One Nevada Line

COST COMPONENT	ACTUAL COST	B&V ESTIMATED COST	DIFFERENCE (ACTUAL – ESTIMATED COST)
Line Cost (including wires, poles, etc.)	Unknown	$ 463,873,675	N/A
ROW Cost	Unknown	$ 2,226,191	N/A
Substation Cost	Unknown	$ 131,404,000	N/A
AFUDC/Overhead Cost	Unknown	$ 104,563,176	N/A
Total Cost	**$ 509,710,592**	**$ 702,067,042**	**-38%**

Note: These results are not meant as a comment on the actual project costs listed; they are simply meant to provide a test of the cost calculator developed by Black & Veatch.

The estimated and actual project costs match within 38%. The larger difference between estimated and actual costs for this project is likely the result of the fact that Black & Veatch was not able to obtain either detailed cost data or complete information about the technical characteristics of the line. However, it was discovered that a novel type of tower structure was used, which does not match the generic type of lattice tower that was assumed in this analysis.

6.3 BONNEVILLE POWER ADMINISTRATION (BPA): MCNARY – JOHN DAY LINE

This 500-kV single circuit project is part of a series of upgrades and new lines throughout BPA's territory, and extends from the existing McNary substation to the existing John Day substation along the southern side of the Columbia River in northern Oregon. It was completed in early 2012. The most notable characteristic of this line is that it crosses a significant amount of farmland—the terrain is mostly flat. Table 6-5 shows the results of the scenario analysis.

Table 6-5 Scenario Analysis Results for BPA: McNary – John Day Line

COST COMPONENT	ACTUAL COST	B&V ESTIMATED COST	DIFFERENCE (ACTUAL – ESTIMATED COST)
Line Cost (including wires, poles, etc.)	$126,814,842	$ 143,288,287	-13%
ROW Cost	Unknown	$ 265,993	N/A
Substation Cost	$17,484,816	$ 14,420,000	18%
AFUDC/Overhead Cost	$39,105,207	$ 27,645,499	29%
Total Cost	**$183,404,865**	**$ 185,619,780**	**-1%**
Note: These results are not meant as a comment on the actual project costs listed; they are simply meant to provide a test of the cost calculator developed by Black & Veatch.			

The estimated and actual project costs match within 1%, which indicates that the cost calculator provides a very close approximation of actual project costs in this case. Black & Veatch was able to obtain detailed cost and technical information about the project, which provides confidence about the accuracy of the estimate.

6.4 XCEL ENERGY: COMANCHE – DANIELS PARK LINE

This 345-kV double circuit project extends from the substation at the Comanche coal plant near Pueblo, CO to the Daniels Park substation in the southern part of the Denver metro area. It was completed in 2009. The most notable characteristic of this project is that it mostly consisted of re-conductoring existing lines, re-energizing them at a higher voltage, and constructing some new line parallel to existing lines on existing right of way. Table 6-6 shows the results of the scenario analysis.

Table 6-6 Scenario Analysis Results for Xcel Energy: Comanche – Daniels Park Line

COST COMPONENT	ACTUAL COST	B&V ESTIMATED COST	DIFFERENCE (ACTUAL – ESTIMATED COST)
Line Cost (including wires, poles, etc.)	Unknown	$ 191,146,222	N/A
ROW Cost	Unknown	$ 1,188,954	N/A
Substation Cost	Unknown	$ 12,978,000	N/A
AFUDC/Overhead Cost	Unknown	$ 35,929,805	N/A
Total Cost	**$ 151,950,000**	**$ 241,242,982**	**-59%**
Note: These results are not meant as a comment on the actual project costs listed; they are simply meant to provide a test of the cost calculator developed by Black & Veatch.			

The estimated and actual project costs match within 59%. The larger difference between estimated and actual costs for this project is likely the result of the fact that Black & Veatch was not able to obtain either detailed cost data or complete information about the technical characteristics of the line. Specifically, the estimated cost may be higher than the actual cost because the project involved less line construction or substation construction than Black & Veatch assumed.

6.5 SUMMARY

The results of the scenario analysis for all four transmission projects are summarized in Table 6-7 below.

Table 6-7 Summary of Scenario Analysis Results for All Four Projects

COST COMPONENT	ACTUAL COST	B&V ESTIMATED COST	DIFFERENCE (ACTUAL – ESTIMATED COST)
PacifiCorp - Gateway Central (Populus-Terminal)	$ 816,830,140	$ 744,403,278	9%
NV Energy - One Nevada	$ 509,710,592	$ 702,067,042	-38%
BPA – McNary-John Day	$183,404,865	$ 185,619,780	-1%
Xcel Energy – Comanche-Daniels Park	$ 151,950,000	$ 241,242,982	-59%
Note: These results are not meant as a comment on the actual project costs listed; they are simply meant to provide a test of the cost calculator developed by Black & Veatch.			

These results show that the cost calculator provided very good estimates for the PacifiCorp and BPA projects (within 9% and 1%, respectively), and reasonable, though not perfect, estimates for the NV Energy and Xcel Energy projects (within 38% and 59%, respectively). The two projects for which Black & Veatch obtained the most detailed cost and technical information—PacifiCorp and BPA—were the ones for which the estimates most closely matched the actual costs. This increases confidence that with a sufficient level of information, the cost calculator provides a good approximation of the costs of a real transmission project. Thus, the capital cost validation exercise described in this section shows that Black & Veatch's transmission and substation cost assumptions are appropriate when compared to actual projects.

In addition, it should be noted that the cost calculator will be used by WECC to assess the relative costs of different possible transmission projects in the Western Interconnection, i.e. it will be used to compare potential projects rather than to estimate exactly how much a single actual project will cost. Given the high degree of variability in these costs, the cost calculator provides a good estimate of the relative costs of developing transmission projects throughout the WECC region, and will serve the purpose for which it was intended.

7.0 Discussion of Stakeholder Comments

Black & Veatch received a number of formal comments from stakeholders after the final presentation of its recommendations on capital costs for WECC. All comments were considered and addressed to the extent possible. The comments and responses are summarized in Table 7-1 below, and the name and affiliation of each commenter is provided.

Table 7-1 Summary of Stakeholder Comments and Responses

COMMENTER NAME AND AFFILIATION	COMMENT	BLACK & VEATCH RESPONSE
Eric John, ABB Inc.	The costs stated for series capacitors (SC) far exceed the market levels that ABB has seen as the market leader for this product. Firm prices for EPC SC banks range from $10,000/MVAr to $30,000/MVAr. The higher range applies to banks 300 MVAr and less. The lower part of the range applies in cases where for banks larger than 300 MVAr or in cases where multiple banks are to be supplied as part of a reactive compensation program.	Black & Veatch discussed this in detail with ABB, and $50,000/MVAr was found to be too high. ABB indicated that there are significant fixed costs involved in sizing a Series Capacitor, and based on their experience, the typical range indicated that the smaller SC's were around $30,000/MVAr, and larger SC's were around $10,000/MVAr, assuming turnkey installation with rough-grading complete. Black & Veatch has updated the costs to reflect this: $30,000/MVAr (230 kV), $10,000/MVAr (345 kV and 500 kV).
Eric John, ABB Inc.	Suggest an additional comment about the scope for a "Turnkey" SC installation. The above $/MVAr figures assume a site has been rough-graded and access to a source of medium voltage auxiliary power.	Black & Veatch has documented this assumption in the report.
Eric John, ABB Inc.	The costs stated for series capacitors (SVC) are reasonable. However, ABB recommends that the values be stated as a range from $60,000/MVAr to $85,000/MVAr.	Black & Veatch appreciates that there are ranges for these costs; however, for the purpose of this methodology, it was decided to use one value. As the SVC sizes are arbitrary in this methodology, Black & Veatch assumed the more conservative value of $85,000/MVAr.

Eric John, ABB Inc.	Suggest an additional comment about the scope for a "Turnkey" SVC installation. The limit of the SVC supply is the HV side of the transformer bushing. The equipment and services include design, engineering, manufacture, routine testing at factories, transportation to the site, installation supervision, commissioning, spares, tools, and training, civil works and installation labor. The estimates are based on a site that has been rough graded.	Black & Veatch has documented this assumption in the report.
Bart Miller	I am just curious as to why the base assumption for 345kV structures was lattice when everywhere I go the preferred structure for 345kV seems to be tubular steel. With the increased size and loads of population centers, more and more the 345kV voltage class is entering more heavily populated areas and lattice towers are not the solution. I see that you do have a multiplier for the tubular, I would just think that in this day, tubular structures tend to be the direction most companies are moving towards.	The Black & Veatch cost calculator allows the user to select either lattice or tubular steel tower structures. WECC will likely use lattice structures since they are used more in open range, which constitutes the majority of the line miles.
PacifiCorp	Like the idea of a calculator, but need more information on the Base Cost. Note long transmission lines can be a mix of terrain multipliers.	All assumptions used in developing the transmission base cost estimates are described in the final presentation and report. The cost calculator allows users to select a mix of terrain multipliers based on the proposed line routing.
PacifiCorp	Need to verify the equipment costs. Also installing equipment in 'green field' versus retrofit environment is big cost differential. Upgrading existing facilities often has ripple effect on related facilities such as station bus or making installation seismic compliant.	Costs are indicative of current market costs based on B&V experience, and all costs were vetted by stakeholders and agreed to be reasonable. The Black & Veatch cost calculator allows the user to select whether the project is a new line or a re-conductored line. All assumptions about re-conductoring costs are stated, but they do not include "ripple effects" as these are project-specific and stakeholders did not provide guidance on generic assumptions.
PacifiCorp	Total cost per mile seems too high for the facilities being described.	Costs are indicative of current market costs based on Black & Veatch experience, and all costs were vetted by stakeholders and agreed to be reasonable.

Bill Pascoe, Trans West Express	General comment - I support these recommendations as a package. This is a much improved data set over the WREZ numbers which TEPPC relied upon for the 2011 10-Year Plan analyses.	Black & Veatch thanks all stakeholders who participated in ensuring these recommendations were reasonable and reflected market realities.
Bill Pascoe, Trans West Express	This is a very important slide to document that the $445M DC converter cost includes the converter AND all of the supporting equipment.	Black & Veatch has documented that the HVDC converter station does include the converter equipment and all major supporting equipment.
Bill Pascoe, Trans West Express	Many (most?) counties would fall into the "other" category that is based on "double the linear ROW rental fee". I would like to see some numerical examples for these "other" counties.	Black & Veatch has documented the BLM land costs used, including the exact cost assumptions for each cost "zone".
Keith White, California Public Utilities Commission	Going beyond the hypothetical line cost calculation on slide 11, another Black & Veatch presentation "120807_BVTxCost_TAS.pdf" provides example benchmarking applications of the transmission line cost methodology (spreadsheet) to four recently completed transmission lines outside of California. CPUC Staff identified prospective versus actual transmission cost comparisons for four recent transmission projects in California: Trans-Bay Cable, Tehachapi, Eldorado-Ivanpah, and Sunrise. The last two of these should be reasonably amenable to the kind of cost benchmarking (versus the cost estimation spreadsheet) done for the four recent non-California projects, by assigning line segments to three categories: new line with new ROW, new line in existing ROW, and reconductor. (An underground section of Sunrise could be excluded.) It would be helpful to see such benchmarking.	The Eldorado-Ivanpah and Sunrise Powerlink transmission projects were considered as candidates to use in benchmarking Black & Veatch 's cost assumptions. However, sufficient information was not available for the Eldorado-Ivanpah project, and the Sunrise Powerlink project was discussed but ultimately excluded because it was considered an outlier in terms of cost.

Keith White, California Public Utilities Commission	It should be explicitly and prominently stated that these are base substation costs for the most straightforward circumstances including flat terrain without access challenges, and without needing to design for subsequent needs. For example, a 500 kV substation under construction in California in large part to support new wind generation in a hilly area, having two 500 kV, one 230 kV and one 138 KV lines, mostly breaker-and-a-half design (with additional breakers for possible future needs) and four 500 kV shunt reactors, has a publicly estimated cost of about $150-200M excluding contingency and AFUDC, whereas the standard per unit cost factors from slide 13 would give less than half this cost, even when very conservatively multiplying the "per line/XFMR Position" costs by a factor of three to account for the additional breakers included for subsequent needs.	Black & Veatch has documented all assumptions related to the base substation costs, including the fact that they apply to substations sited on flat terrain with easy access.
Keith White, California Public Utilities Commission	Generally, it will be important to attach reasonable uncertainty ranges to major infrastructure investment costs. Useful long-term planning studies will need to find some way to communicate risks and opportunities (option values), not just mid-point estimates.	Black & Veatch was asked to provide single "mid-point estimates" for all costs rather than uncertainty ranges. Uncertainty ranges could be generated by selecting different values and adjusting various parameters within the cost calculator if desired.

TAB 9

HONI INTERROGATORY #6

INTERROGATORY

Issue List Item:
#5 Operations, Maintenance and Administrative Costs

#6 Rate Base and Cost of Capital

Topic:
Transmission Cost Benchmarking Study – Capital & OM&A Comparison

References:
Reference 1 – Exhibit B, Tab 1, Schedule 7 Attachment 1, Transmission Cost Benchmarking Study

Reference 2 – Exhibit F, Tab 4, Schedule 1

Reference 3 – Exhibit C, Tab 1, Schedule 1

Questions:

a) In Reference 1, please clarify why the Figure 3 total cost for the new EWT of $773,713 was discounted to $740,521 in Figure 4. In this clarification, please take into consideration the NextBridge Statement of Average Rate Base provided at Reference 3, page 3 of 3. In the Application, NextBridge is calculating its average rate base of $770.4M, based on an April 1, 2022 gross plant cost of $774.9M. Please align the $774.9M with the discounted value utilized by Charles River Associates (CRA) for the purposes of the comparisons completed.

b) Please confirm that the values used in the EWT project in Figure 3 of Reference 1 are still forecast numbers. Please confirm that these forecast values have been compared against actual costs for all the other projects and that CRA has made no adjustment to account for the fact that the EWT costs remain forecast costs. Please comment on whether a further sensitivity analysis should be in effect when comparing the total construction costs of the EWT. In responding to this question, please keep in mind that NextBridge is requesting a construction costs variance account as part of this Application.

c) Figure 3 of Reference 1 provides the following values: (i) construction costs of $578,948 and (ii) total costs of $773,713. CRA explains in the report that the relative share of construction costs to total project cost varied widely across projects studied. Please confirm that none of the projects CRA elected to compare to EWT had construction costs representing 75% of total costs? How does this impact the comparability of the projects?

d) Please clarify why *materials* were weighted/extrapolated/discounted at significantly different rates than the other categories, including construction?

e) In section 2.1 of CRA's Benchmarking Study, CRA writes:

> *"To escalate Materials costs, CRA used a blend of Handy-Whitman's Towers & Fixtures and project costs have large commodity components, even within Canada, these material elements would be expected to track the CAD equivalent of the USD index. The index escalation was therefore compounded with the exchange rate changes to arrive at an effective CAD Handy-Whitman index.*
>
> *Material costs are driven largely by the economy at the time the project's material were tendered. Changes in the price of commodities such as steel, aluminum and to a lesser extent, copper, drive changes to the price of materials. The volatility exhibited by these commodities makes it difficult to determine a constant annual growth rate for the purposes of cost escalation. Therefore, it is prudent in this case, to use with industry-standard best practice and use the Handy-Whitman Indices for transmission material costs. The Handy-Whitman index has been used by expert economic consulting firms in total factor productivity studies presented as evidence in matters before the OEB. There is no Canadian equivalent of the Handy-Whitman index suitable for escalating transmission project costs."*

Generally, this method results in the figures provided in Figure 14. Please confirm Hydro One's understanding of the CRA evidence. The Handy-Whitman Index illustrates that in the Plateau region, the "materials" index in USD illustrates a 10-year average CAGR of 1.5% and a 5-year average CAGR of 1.4%. However, when converted to CAD, the "materials" index CAGR increases to 3.4% on a 10-year average outlook, or about 5 times more when compared on a 5-year CAGR at a compound annual growth rate of 6.9%. Please explain why the 5-year average CAGR for the Plateau region would be 6.9% in CAD dollars and 1.4% in USD?

f) CRA provides that the Handy-Whitman index has been used by expert economic consulting firms in total factor productivity studies presented as evidence in matters before the OEB. Please provide examples where the Handy-Whitman index has been converted into CAD, as done by CRA, and utilized as a price-escalating tool. In providing these examples, please state whether the Total Factor Productivity Studies have been escalated using exchange rates, as done by CRA in the Benchmarking Study used in this Application, or whether some other escalation method is used in the example, e.g., purchasing power parity. If required, please update the results of the Benchmarking Study provided in Reference 1 if the Handy-Whitman Index was converted to CAD using purchasing power parity data in lieu of foreign exchange rates.

g) Please correct the cost of the line work for the Bruce-to-Milton Project that has been incorrectly presented in the report. The line costs of the Project were actually $641,686. Total project costs were $710,173. Both values are documented in the post-construction and financial monitoring report that was submitted to the OEB on November 25, 2015, and is publicly available at the following web address: http://www.rds.oeb.ca/HPECMWebDrawer/Record/506872/File/document.

h) In section 2.2.5 of the Benchmarking Study, CRA introduces terrain multipliers and land cost/acre multipliers for the WECC Study. Given that right-of-way costs can dominate a cost analysis, it is striking that there are no localized factors applied to isolate for realty costs in the differing parts of the province. Why? As identified in the Bruce-to-Milton post-construction report, over $95M of the $641M line works are real estate costs for the 180 km 500kV Bruce-to-Milton line. Conversely, only $23.8M is attributed to the 450 km 230kV EWT line. Please opine on the impact of local realty costs on a transmission line project and how the EWT line real estate acquisition costs (non-Indigenous and Indigenous) compare to the comparables selected by NextBridge, given the difference in land acquisition cost on a per acre basis.

i) In section 2.2.3, CRA compares the EWT to the BC Northwest Transmission Line. How comparable is this project given that there is no granular data?

j) In Section 2.2.3, why does CRA believe it is reasonable to assume that the cost split between stations and lines work for the BC Northwest Transmission Line would be analogous to the Bruce-to-Milton Project split? In responding to this question, please articulate how the projects were similar enough to reach that conclusion, given that the Bruce-to-Milton Project is a 500 kV double circuit transmission line and the BC Northwest Transmission Line Project was a 287 kV single circuit guyed lattice tower transmission line with station work that included, but was not limited to, the build of a completely new substation.

k) In Section 2.2.4 CRA discusses Alberta projects. The Alberta projects are the most expensive of any of the alternatives considered by a significant margin (over $1M/km greater than the next escalated comparable and about $2M/km more expensive than the EWT costs utilized). Did CRA investigate why these costs were so much more expensive? Is it reasonable to include these projects as comparables? If so, why?

l) Under Section 2.2.6, in Note 13, CRA write that “the Niagara region has different, and more difficult, terrain than that of Northwestern Ontario, which may lead to lower construction costs compared to Northwestern Ontario.” Please explain this footnote and what is intended to be conveyed.

m) With respect to OM&A, at Exhibit F, Tab 4, Schedule 1 NextBridge's evidence is that overall, NextBridge's OM&A *spending on a per asset basis* is low in comparison to other transmitters in Ontario, as detailed in the CRA benchmarking study attached as Exhibit B, Tab 1, Schedule 7 Attachment 1. Please provide any reference in the CRA report that investigated *OM&A spending on a per asset basis* and the values of that assessment.

n) Under Section 2.3, it is unclear how the B2M LP total OM&A was calculated. The total OM&A for 2020 for B2M LP per the Settlement Agreement filed under EB-2019-0178 is $1.2M. Please update the values in Figure 10 accordingly or explain how the $1.6M total OM&A was calculated.

o) Under Section 2.3, for the development of Figure 10, CRA includes costs for NRLP and B2M LP's managing director office. Please confirm that similar costs are included for the new EWT in Figure 10. If not, please remove these costs from the comparison.

p) Under section 2.3, for the development of Figure 10, CRA excludes approximately $2M of annual OM&A costs attributed to Indigenous Participation and Indigenous Compliance costs. Please elaborate on Note 16 that suggests that these types of costs are *unique to the EWT.* In so doing, please keep in mind that both NRLP and B2M LP also encompass Indigenous partnership agreements.

q) Please include the aforementioned Indigenous Participation and Indigenous Compliance costs and update the results in Figure 10.

r) Please provide the 5- and 10-year CAGR for the Handy Whitman indices for the same time period as those provided in Figure 15, i.e., 2005-2014 and 2010 to 2014.

<u>RESPONSE</u>

a) In Reference 1, Figure 3, the total cost shown is $773,713, whereas Figure 4 total cost is $740,521. The difference is because Figure 4 is adjusted to be shown in 2022 dollars. This allows for CRA to compare all benchmark results in consistent 2022 dollars. Refer to OEB-49 (a).

   The CRA report is intended to compare total East-West Tie line project costs. The NextBridge Statement of Rate Base is intended to show test year average rate base, to be utilized in calculating the revenue requirement. The Statement of Rate Base also includes the costs of NextBridge's spare strategy, test-year in-service additions along with depreciation. Therefore, this is not comparable to the CRA report (Figure 4) which intends to compare the total gross cost to put the East-West Tie line into service.

b) The values in Figure 3 include a portion of forecasted costs. The forecasted costs are the best data available for the East-West Tie line and are therefore appropriate to compare against actual costs for other projects for the purposes of benchmarking. Additionally, the other projects were not constructed during a global pandemic. The CCVA will include COVID-19 related costs, which did not impact the other projects in the benchmarking analysis.

c) The data regarding the proportion of construction costs to overall costs is shown throughout the CRA report. There were projects with lower proportion of construction costs, however the categorization of costs was unique to each project. For instance, some projects could have included what might be considered construction costs in "other" costs. With regards to comparability, the question implies that the only projects with identical characteristics are suitable for comparison in a benchmark study. This is impractical, as the exercise was to compare the widest available set of similar projects.

d) As page 4 of the report indicates, materials costs were escalated at different rates because the costs of materials and construction vary according to different factors. As the report notes, construction costs are not as freely traded between Canada and the US, and so are less affected by exchange rates.

e) To clarify, the exchange rate should be labeled as "CAD/USD" instead of "USD/CAD." This does not affect the results of the calculations or the conclusion. An important clarifying item is that between 2012 to 2017, the period over which the 5-year CAGR is calculated, the Canadian dollar weakened significantly (by 30%), thus increasing the costs of materials when expressed in Canadian dollars. Because there are materials traded between Canada and the US, this affects the costs.

f) Handy-Whitman has been used in numerous proceedings before the OEB, and many other regulatory agencies for cost estimation and inflation. It is burdensome for CRA or NextBridge to conduct an exhaustive search of the many other filings before the OEB, as requested by HONI. As the text states, there is no Canadian equivalent for the Handy-Whitman guide. A constant exchange rate is used throughout the CRA report, meaning that the conversions are fully proportional. The use of a constant exchange rate represents a reasonable and sufficiently accurate approach to employing the Handy-Whitman guide for a Canadian application.

g) The East-West Tie line cost, excluding substations, used in the report was $651,480,000. The final actual cost, excluding substations, was $641,686,000. This has very minimal impact on the results as the $/km only changes from $2.39/km to $2.35/km. NextBridge will not be updating the report since B2M cost remains significantly more than the East-West Tie line in $/km.

h) There may be projects with lower proportion of real estate to total construction costs, however the categorization of costs is unique to each project. For instance, the East-

West Tie line crossed a significant portion of First Nations land which resulted in increased Indigenous costs whereas other projects acquire more real estate and therefore have increased real estate costs. With regards to comparability, the question implies that the only projects with identical characteristics are suitable for comparison in a benchmark study. This is impractical, as the exercise was to compare the widest available set of similar projects.

i) As section 1.2 indicates, CRA selected Canadian projects of similar voltage levels, with relatively long line-lengths, criteria which the BC line meets. Differing levels of detail were available for each project, though the available data on the BC was sufficient to permit informative comparisons to the East-West Tie line.

j) Like the Bruce-to-Milton project, the BC line is a long-distance, high voltage line of similar overall cost magnitude. There is no project identical to the BC line from which similar cost split data could be taken. In the absence of an identical project from which to draw split data, CRA applied cost split data from the B2M project in order to include the BC line as one of several benchmarking comparison points.

k) The purpose of benchmarking is to consider a spectrum of different comparable projects. In any set of comparable projects, one project will always be the most expensive. Choosing to eliminate one of these projects from the data set because it is too far from the mean would bias the results and defeat the purpose of a benchmarking exercise.

l) The point being articulated is that the geography of the Niagara region is different from that of Northwestern Ontario. Because CRA used a single regional (i.e., the Plateau) multiplier for the study, this multiplier may not account for the more difficult and expensive construction that NextBridge has factored into their costs but the comparable projects did not experience.

m) This specific question was not investigated, nor was it necessary to do so to reach the conclusion regarding benchmark of transmission costs. CRA is only aware of one asset that NextBridge will operate in Ontario, the East-West Tie line.

n) The difference is immaterial and NextBridge does not plan to update the study for this difference. Additionally, the 2020 OM&A per the B2M settlement agreement referenced by HONI, is not as comparable since the line has already been operating for several years.

o) NextBridge has costs included in OM&A in Figure 10 for a managing director office. This is described in Exhibit F, Tab 4, Schedule 2, Page 3.

p) The excluded costs are not related to the Indigenous partnerships making up the East-West Tie line ownership. The excluded costs are Indigenous agreements with Indigenous communities outside of the East-West Tie line ownership structure and are further explained in Exhibit F, Tab 4, Schedule 2, Page 7 and 8.

q) These costs are not comparable which is why they were excluded. NextBridge does not plan to update the report.

r) The data that HONI requests is not possible to calculate. The Statistics Canada are provided for illustration only. Handy-Whitman uses different categories for its costs. As section 2.1 of the report indicates, CRA used the Towers & Fixtures, and Overhead Conductors and Devices indices from the Handy-Whitman guide.

TAB 10

(Excel attached)

TAB 11

STAFF INTERROGATORY #51

INTERROGATORY

Reference: (1) Exhibit B / Tab 1 / Schedule 7 / Attachment 1 / pp. 15-16

Preamble:
Footnote 13 on page 15 of Reference 1 states that “the Niagara region has different, and more difficult, terrain than that of Northwestern Ontario, which may lead to lower construction costs compared to Northwestern Ontario.”

Question(s):
a) Please explain and/or clarify Footnote 13.
b) Section 2.2.6 on page 15 of Reference 1 states “CRA used the Handy-Whitman Index and the USD/CAD exchange rate in order to calculate material and index cost growth from 2017 to 2022[…]" Please confirm that the costs in Figure 9 were escalated from 2019 to 2022.
c) In Figure 9, cost is broken down into materials and construction, which total 100%. How were these percentages determined?
d) In Figure 9, cost is broken down into materials and construction, which total 100%. Are development costs included in these costs?
e) In Figure 9, the cost is broken down into materials and construction, which total 100%. Are IDC costs included in these costs?

RESPONSE
a) The footnote is intended to note that Northwestern Ontario has more varied and difficult terrain than the relatively flat terrain of the Niagara region. In general, construction in more mountainous terrain increases construction and material transportation costs, though neither have been quantified nor included in the cost comparison.
b) Confirmed.
c) These percentages represent the fraction of the Niagara Reinforcement project rate base costs for materials and construction as determined by the statement of average rate base shown below which did not provide much detail of separate construction costs. If it were assumed that Niagara Reinforcement project had the same materials verses construction cost split as Bruce to Milton, the $/km would change very minimally from $1.66/km to $1.64/km.

NRLP
Statement of Average Rate Base
Bridge Year (2019) and Test Year (2020)
Year Ending December 31
($ Millions)

Line No.	Particulars	2019	2020
	Electric Utility Plant		
1	**Gross plant**		
	Transmission Corridor Land and Rights	1.00	1.00
	Towers and Fixtures	78.43	78.43
	Conductors and Devices	40.00	40.00
	Roads and Trails	0.00	0.00
	Total Gross Plant	119.43	119.43
2	Accumulated Depreciation	0.79	2.38

d) The source document from HONI indicates that development costs are included.
e) The source document from HONI indicates that IDC costs are included.

TAB 12

STAFF INTERROGATORY #26

INTERROGATORY

Reference: (1) Exhibit E / Tab 1 / Schedule 1 / pp. 1-4

Preamble:
Reference 1 states that "NextBridge is proposing an RCI term for a 10-year period. Under the proposed methodology, the revenue requirement for the Test Year t+1 is equal to the revenue requirement in the Test Year t, inflated by the RCI…."

Reference 1 also states that "NextBridge proposes to adopt the OEB's calculation of the RCI "I" parameter…."

Reference 1 also states:

> NextBridge proposes a productivity factor of 0%. NextBridge does not expect to recognize OM&A efficiencies over the IR Term as it is a single new asset and most of the OM&A is contractual and essentially fixed.… Notably, there are Indigenous reserve crossing permits, within OM&A that are expected to inflate annually at the City of Toronto's annual CPI....
>
> Additionally, NextBridge plans to continue capital investments over the IR Term beginning in the Test Year, that have not been included in the revenue requirement and will not be added to rate base during the IR Term....

Question(s):
a) Please explain why it is not possible to recognize OM&A efficiencies over the IR Term.
b) Which OM&A items are not contractual or essentially fixed? Of these items, can cost efficiencies be recognized in NextBridge's view? If so, how? If not, why not?
c) NextBridge notes that OM&A costs are contractual and essentially fixed; does this mean that some contracts can be revised? If so, which contracts?
d) Please explain why a proposed productivity factor of 0% is appropriate in NextBridge's view.
e) Please explain why a proposed inflation adjustment of 100% of the annual OEB approved Inflation factor is appropriate in NextBridge's view when other transmitters have received less than this amount.
f) Please explain why Indigenous reserve crossing permits are expected to inflate at the City of Toronto's annual CPI?

g) Please provide the historical 10 year and forecast 10-year difference for the City of Toronto CPI compared to the Ontario CPI.

RESPONSE

a) NextBridge does not expect to recognize OM&A efficiencies over the IR term as it is a single new asset. Most of the OM&A is scoped and budgeted minimally which will lead to increases as materials and labour costs increase.

b) All OM&A is contractual but not completely fixed. On the personnel side, NextBridge has already utilized partner employees to provide efficiencies in the budgeted costs. NextBridge does not expect to recognize efficiencies in this area as the East-West Tie line is already benefitting from the structure that allows for shared resources and minimally budgeted costs for this support. For example, NextBridge only bears a fraction of the cost of an accountant in the current structure versus having to employ/pay for a full-time accountant. On the O&M side, while there will be a HONI SLA contract, the contract is activity and time based, it is not a fixed price but can vary based on the amount of support needed. NextBridge has budgeted for the expected amount of services but incremental services will need to be funded with the funding envelope of the Revenue Cap rate structure. Additionally, the contract is for a 3 year term with a potential to extend for 2 years while the IR term is 9 years and 9 months, leaving NextBridge exposed to managing cost increases for the difference in terms. While the Federal Section 28.2 permits required for First Nation Reserve crossings are fixed, most have inflation factors which increase the cost through time.

c) To ensure certainty for the IR Term, NextBridge negotiated contracts with longer terms. For example, the Federal Section 28.2 permits required for First Nation Reserve crossings have durations of 20 years. However, some of the contracts will require renewal during the IR period and the most financially material one is the maintenance service contract with HONI. The maintenance service contract with HONI and Supercom is for three years, with an option to renew for an additional two years. While NextBridge does have an agreement with NEET to supply labour, increases associated increasing labour costs will impact NextBridge since charges are based on actual labour costs.

d) NextBridge's proposed productivity factor of 0% is appropriate because of the length of the IR term and NextBridge's challenge to manage costs over the extended term of 9 year and 9 month term within the funding allowed under the Revenue Cap framework.

e) Other transmitters have had no capital expenditures during the IR Term, whereas East-West Tie line has planned capital expenditures that will increase reliability and decrease long term maintenance of the project. Additionally, NextBridge has offered a longer IR Term which could expose NextBridge to higher inflation

f) Some of the Indigenous Reserve crossing permits will inflate at the City of Toronto's CPI. This is based on the executed contractual agreement with the First Nation and the Federal government. For clarity, NextBridge makes payments to the Federal government in Toronto which is held in trust for the First Nation.

g) Please see tables below for historical comparison. Forecast data was not available for comparison.

CPI Summary Table (Statistics Canada. Table 18-10-0005-01 Consumer Price Index, annual average, not seasonally adjusted)			
Year	**Ontario**	**Toronto**	**Difference**
2010	2.46%	2.55%	0.09%
2011	3.09%	3.00%	-0.09%
2012	1.42%	1.50%	0.08%
2013	0.99%	1.23%	0.25%
2014	2.36%	2.51%	0.16%
2015	1.19%	1.50%	0.31%
2016	1.81%	2.10%	0.30%
2017	1.70%	2.06%	0.36%
2018	2.35%	2.54%	0.19%
2019	1.85%	2.04%	0.19%