

EB-2017-0182
EB-2017-0194
EB-2017-0364

ONTARIO ENERGY BOARD

Upper Canada Transmission Inc. (on behalf of
NextBridge Infrastructure) Application for leave to construct an electricity
transmission line between Thunder Bay and Wawa, Ontario

-and-

Hydro One Networks Inc.
Application to upgrade existing transmission station facilities
in the Districts of Thunder Bay and Algoma, Ontario

-and-

Hydro One Networks, Inc.
Application for leave to construct and electricity transmission line between Thunder Bay and Wawa,
Ontario

NEXTBRIDGE COMPENDIUM FOR CROSS-EXAMINATION OF HYDRO ONE

VOLUME 1

Brian J. Murphy
390 Bay Street, Suite 1720
Toronto, ON, M5H 2Y2
561-694-3814

Counsel for NextBridge Infrastructure

INDEX

NextBridge Volume 1 Compendium

Tab	Citation
1	Filed: 2018-05-25 EB-2017-0364 JT 2.17 Attachments 1, 2, 7 and 12 (Letters from Hydro One CEO)
2	Filed: 2018-05-25 EB-2017-0364 JT 2.17 Attachment 3, just pages 6 (construction methods) and 9 of the proposal entitled Project Schedule (Hydro One proposal sent to IESO)
3	Filed: 2018-05-25 EB-2017-0364 Exhibit: JT 2.19 Attachment 2, pages 1-2 (Briefing Note to Board of Directors)
4	Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 6 Schedule 4 Page 2 of 2 (Hydro One response to Power Workers' 1 Union IR #4) Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 2 Schedule 5 Pages 1 and 2 (Hydro One response to NextBridge IR #5)
5	Filed: 2018-05-25 EB-2017-0364 Exhibit: JT 2.19 Attachment 3, pages 2, 5, 6, 11, 23, 24 and 25 of the Hydro One December 8, 2017 Board of Directors Deck
6	Filed: 2018-09-24 EB-2017-0364 Exhibit I-2-3 Attachment 1 Pages 1-3 (January 15, 2018 Briefing Note)
7	Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 1 Schedule 18 (Hydro One response to Staff IR #18)

	<p>Filed: 2018-09-24 EB-2017-0364</p> <p>Exhibit I</p> <p>Tab 2</p> <p>Schedule 4 (Hydro One response to NextBridge IR # 4)</p>
8	<p>Hydro One Application</p> <p>EB-2017-0364, Exhibit B, Tab 7, Schedule 1, page 1</p> <p>Phase 2 Decision and Order page 43 (August 7, 2013)</p>
9	<p>Filed: 2018-09-24</p> <p>EB-2017-0364</p> <p>Exhibit I</p> <p>Tab 2</p> <p>Schedule 13 (Hydro One response to NextBridge IR 13 (a))</p>
10	<p>Filed: 2018-09-24</p> <p>EB-2017-0364</p> <p>Exhibit I</p> <p>Tab 1</p> <p>Schedule 11</p> <p>Pages 1 through 8 (Hydro One response to Staff IR #11)</p>
11	<p>Filed: 2018-09-24 EB-2017-0364</p> <p>Exhibit I Tab 4</p> <p>Schedule 5</p> <p>Page 2 (Hydro One response to VECC IR # 5)</p>
12	<p>Filed: 2018-09-24</p> <p>EB-2017-0364</p> <p>Exhibit I-2-3</p> <p>Attachment 3 Page 1 (Hydro CFO's chart)</p>
13	<p>Filed: 2018-09-24</p> <p>EB-2017-0364</p> <p>Exhibit I-2-3</p> <p>Attachment 1</p> <p>Pages 1-3</p> <p>OEB #19</p> <p>OEB #39</p>
14	<p>EB-2017-0364 May 17, 2018 Transcript, page 183</p> <p>Filed: 2018-09-24</p> <p>EB-2017-0364</p> <p>Exhibit I</p> <p>Tab 4</p> <p>Schedule 6, page 2 (Hydro One response to VECC IR # 4)</p>
15	<p>Filed: 2018-09-24 EB-2017-0364</p> <p>Exhibit I</p>

	Tab 1 Schedule 13 Attachment 1 all pages (Hydro One response to Staff IR 13)
16	Hydro One Application EB-2017-0364, Exhibit B, Tab 7, Schedule 1, page 10
17	Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 1 Schedule 7 Page 2 of 2 (table) (Hydro One response to Staff IR # 7)
18	Filed: 2018-09-24 EB-2017-0182/EB-2017-0194/EB-2017-0364 Exhibit I.NextBridge.STAFF.56 Attachment, Page 26 (Table 5 – Timber and MNRF) (NextBridge response to Staff # 56)
19	Hydro One Application EB-2017-0364 EXHIBIT B, TAB 1, SCHEDULE 1, page 6 February 15, 2018
20	Filed: 2018-04-30 EB-2017-0364 NextBridge’s Evidence Motion to Dismiss Attachment B Page 6 (April 30, 2018) (Bob Nickerson’s memo) EB-2017-0364 Hydro One Additional Evidence (filed May 7 and correct May 11, 2018), page 38 of memorandum
21	Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 1 Schedule 2 (Hydro One response to Staff IR # 2) Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 2 Schedule 28 Page 3 (Hydro One response to NextBridge IR # 28) Filed: 2018-04-30 EB-2017-0364 Attachment B Page 7 (Nickerson memo) Filed: 2018-09-24 EB-2017-0364 Exhibit I

	<p>Tab 2</p> <p>Schedule 25</p> <p>Page 3 (Hydro One response to NextBridge IR # 25)</p> <p>OEB #68</p>
22	<p>Filed: 2018-04-30 EB-2017-0364 NextBridge's Evidence Motion to Dismiss Attachment B Page 5 (Bob Nickerson's memorandum)</p> <p>Filed: 2017-07-31 EB-2017-0182 NextBridge LTC Application Exhibit C Tab 2 Schedule 1 Page 7</p>
23	Tr. page 184, lines 15-17 EB-2017-0364 (May 17, 2018)
24	<p>Hydro One Application EB-2017-0364</p> <p>EXHIBIT C, TAB 2, SCHEDULE 1, pages 1 and 3 February 15, 2018</p>
25	<p>Filed: 2018-09-24</p> <p>EB-2017-0364</p> <p>Exhibit I</p> <p>Tab 2</p> <p>Schedule 49 Page 1 (Hydro One response to NextBridge IR #49)</p> <p>OEB technical requirements section 3.6.4</p> <p>Lilein and Havard presentation</p>
26	<p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 2 Schedule 66 (Hydro One's response to NextBridge IR # 66)</p> <p>EB-2017-0364, May 7, 2018 Additional Evidence, Attachment 16 (Resume of Hathout, p 2 and 3 of the resume, page 9 and 19 of the Attachment 16)</p> <p>(Resume of Roman Mukuch, page 2 of his resume and page 17 of the Attachment 16)</p> <p>Hydro One Application EB-2017-0364 EXHIBIT B, TAB 1, SCHEDULE 1 page 6 (filed February 15, 2018)</p>
27	<p>Filed: 2018-09-24</p> <p>EB-2017-0364 Exhibit I Tab 2 Schedule 65 Pages 2 and 3 (Hydro One response to NextBridge IR # 65)</p>
28	<p>Filed: 2018-09-24</p> <p>EB-2017-0364 Exhibit I Tab 1 Schedule 8</p> <p>Page 1 (Hydro One response to Staff # 8)</p>
29	<p>March 29, 2018</p> <p>EB-2017-0364</p>

	<p>Exhibit F-01-01 Attachment 3 (Hydro one SIA) Pages 2-3</p> <p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 1 Schedule 5 (Hydro One response to Staff IR #5)</p> <p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 2 Schedule 65 Pages 2, 4 (Hydro One response to NextBridge IR 65)</p>
30	<p>March 29, 2018 EB-2017-0364 Exhibit F-01-01 Attachment 3 Pages 2 and 3 of the SIS</p> <p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 1 Schedule 2 Page 5, lines 1-2 and Attachment 2</p> <p>Filed: 2018-09-24 EB-2017-0364 Exhibit I-1-2 Attachment 4 Page 1 of 1</p> <p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 1 Schedule 13 Attachment 1</p> <p>May 7, 2018 Additional Evidence submitted by HONI in EB-2017-0364, pages 6 and 44-45</p>

	<p>Tr. page 266, lines 7-12 of EB-2017-0364 (May 17, 2018)</p> <p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 1 Schedule 2 Page 4, lines 18-20</p>
31	<p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 2 Schedule 43 Page 2</p> <p>Filed: 2018-09-24 EB-2017-0364 Exhibit I-1-5, Attachment 1 (Gant Chart) (This is Tab 1, after Schedule 5)</p> <p>Hydro One Application EB-2017-0364 EXHIBIT B, TAB 7, SCHEDULE 1 February 15, 2018</p> <p>Filed: 2018-09-24 EB-2017-0182/EB-2017-0194/EB-2017-0364 Exhibit I.NextBridge.STAFF.56 Attachment, Page 26 (Table 5 – Timber and MNRF)</p> <p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 2 Schedule 49 Page 1 (answer b)</p>
32	JT 2.22 – Hydro One EPC Contract
33	<p>Tr. page 178, lines 12-17, 20-21 of EB-2017-0364 (May 17, 2018)</p> <p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 5 Schedule 6</p> <p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 1</p>

	<p>Schedule 6 Page 1 of 1 Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 1 Schedule 10 Page 6, lines 30-31.</p>
34	<p>EB-2017-0364 JT 2.19 Attachment 3, page 8 Board Presentation (Dec 8, 2017)</p>
35	<p>EB-2017-0364 JT 2.19 Attachment 3, Page 9 Board Presentation (Dec 8, 2017)</p> <p>Tr. page 184, lines 4-8 of EB-2017-0364 (May 17, 2018)</p> <p>Hydro One Application EB-2017-0364, Exhibit B, Tab 7, Schedule 1, page 9</p> <p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 1 Schedule 10 Page 7, lines 3-4 and then 4-5</p> <p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 1 Schedule 11 Pages 7</p> <p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 4 Schedule 8</p>
36	<p>Tr. page 178, lines EB-2017-0364 (May 17, 2018)</p> <p>Filed: 2018-09-24 EB-2017-0364 Exhibit I</p>

	<p>Tab 1 Schedule 2 Page 2, lines 32-34</p> <p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 2 Schedule 42 Page 2</p>
37	SNC Lavalin Q2 ending June 30, 2018
38	SNC press release on Settlement
39	<p>Hydro One Application EB-2017-0364 EXHIBIT C, TAB 1, SCHEDULE 1, Page 7, lines 4-7 February 15, 2018</p> <p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 2 Schedule 59 Answers b and c</p>
40	<p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 5 Schedule 26 Page 1</p> <p>EB-2017-0364 JT 2.20</p> <p>EB-2017-0364 JT 2.23</p> <p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 2 Schedule 44 Page 4</p> <p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 5 Schedule 18</p>

	Page 1
41	<p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 5 Schedule 5 Table</p> <p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 5 Schedule 18 Page 1</p>
42	<p>EB-2017-0364 JT 2.17 Attachment 3 (Indicative proposal to IESO Oct 13, 2017) P. 9</p>
43	<p>Application EB-2017-0364 EXHIBIT B, TAB 11, SCHEDULE 1, page 1 February 15, 2018</p>
44	<p>EB-2017-0364, May 7, 2018 Additional Evidence, Attachment 7 (Construction Execution Plan dated Feb 9, 2018), page 9</p>
45	<p>Tr. page 158, lines 4-7 and 12-16 of EB-2017-0364 (May 17, 2018)</p> <p>JT 2.29 of EB-2017-0364 (May 25, 2018)</p>
46	<p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 1 Schedule 5 Page 2 of 2</p> <p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 1 Schedule 7 Page 1 of 2</p>

	<p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 1 Schedule 13 Attachment 1</p>
47	<p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 1 Schedule 20, answer to b</p> <p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 6 Schedule 3 Page 1 of 1</p>
48	<p>Filed: 2018-09-24, EB-2017-0182/EB 2017-0194/EB-2017-0364, Exhibit, I.NextBridge.STAFF.51, Attachment 3, Page 19 (Project schedule for Station)</p> <p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 1 Schedule 14 Page 4</p>
49	<p>Filed: 2018-01-25 EB-2017-0194 Exhibit I-01-04, Attachment 2 (Risk Review Board Meeting)</p>
50	<p>Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 1 Schedule 2 Page 4, lines 18-20</p>
51	<p>Filed: 2018-09-24 EB-2017-0364 Exhibit I</p>

	Tab 2 Schedule 16 Page 2
52	Filed: 2018-01-25 EB-2017-0182 Exhibit I.B.NextBridge.SEC.12 and SEC.16
53	Filed: 2013-03-28 EB-2011-0140 Board #32 (All Applicants) Page 1 of 6
54	<p> Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 5 Schedule 6 </p> <p> Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 1 Schedule 6 Page 1 of 1 </p> <p> Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 1 Schedule 10 Page 6, lines 30-31. </p> <p> Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 2 Schedule 5 Page 1, lines 33-25 </p> <p> Filed: 2018-09-24 EB-2017-0364 Exhibit I Tab 2 Schedule 16 Page 3 </p>

TAB 1

September 14, 2017

Peter Gregg
President and CEO
IESO
1600-120 Adelaide St W
Toronto, Ontario
Canada M5H 1T1

Mr. Gregg,

Re: Implementation of East-West Tie (EWT)

Thank you again for taking the time to talk with me in August about your leadership of the East West Tie review. I am sending you this letter to formally make you aware of Hydro One's interest in the East West Tie project. We firmly believe that Hydro One can bring substantial value to all aspects of this important project and that our efforts will result in a timely and cost-effective transmission solution; for the Province, the electricity system and the homes and businesses of Northern Ontario.

As you are aware, there is a new leadership team at Hydro One and, while driving change and efficiencies across all lines of business at the Company, we have spent considerable time assessing how we approach major capital projects such as our transmission lines and stations. Over the last few months, we have engaged in an extensive process, together with our construction partner, to systematically review all aspects of the East-West Tie transmission line development and construction including our existing scope at the affected transmission stations. Based on the work conducted, we are confident that we can provide a solution that meets the technical requirements at a significantly lower cost both in terms of capital and ongoing operating and maintenance costs; a project that respects Ontario's rate payers while representing the best opportunity to provide an in-service transmission line in time to meet the provinces electricity needs.

Hydro One is planning to provide you and your organization with our proposal by October 15 which will provide an overview of the key elements of the proposal and why we believe they are not just achievable, but a preferred option. Hydro One would like to meet with you and your team to present this proposal at your convenience after that date.

Subject to discussions at that meeting, Hydro One is also prepared to submit a Leave to Construct application for our proposal with a "not-to-exceed" price guarantee by December of this year. We believe we are uniquely positioned to provide a more cost-effective alternative East-West Tie transmission line that will substantively meet Northern Ontario's timeline and electricity needs.

I look forward to working further with the IESO on this important project. I should also note that a similar letter has been sent to both the Minister and to Rosemarie Leclair.

My best,



Mayo Schmidt



Connecting Today.
Powering Tomorrow.

Independent Electricity System Operator

1600-120 Adelaide Street West

Toronto, ON M5H 1T1

t 416.967.7474

www.ieso.ca

September 28, 2017

Mayo Schmidt
President & CEO
Hydro One Inc
483 Bay Street
8th Floor South Tower
Toronto, Ontario M5G 2P5

Dear Mr. Schmidt,

I am writing in response to your letter dated September 14, 2017 regarding Hydro One's proposal to implement the East-West Tie (EWT) Project. I am also aware of Hydro One Networks' recent Letter of Intent to the OEB to file a Leave to Construct Application for the EWT line.

As you know, at the request of the Minister of Energy, the IESO is updating its assessment of the need for the EWT based on the latest costs and system needs. Similar to the scope of previous need assessments, this assessment involves developing a load forecast for the northwest, identifying the need for additional capacity in the northwest to supply the forecasted load, and determining if a new 230 kV EWT line is the most economical solution to meet that need. The report will be delivered to the Ministry by December 1, 2017.

As the IESO is focused on this report, we have decided to decline the invitation to meet with you on your proposal.

I look forward to meeting with you in the near future to discuss the many other issues of mutual interest to our two organizations.

Regards,

Peter Gregg
President & CEO, IESO

September 14, 2017

Rosemarie Leclair
Chair and CEO
Ontario Energy Board
Suite 2700, 2300 Yonge Street
P.O. Box 2319
Toronto, ON, M4P 1E4

Ms Leclair,

Re: Implementation of East-West Tie (EWT)

Thank you again for taking the time to talk with me in August about your role in the East West Tie review. I am sending you this letter to formally make you aware of Hydro One's interest in the East West Tie project. We firmly believe that Hydro One can bring substantial value to all aspects of this important project and that our efforts will result in a timely and cost-effective transmission solution; for the Province, the electricity system and the homes and businesses of Northern Ontario.

As you are aware, there is a new leadership team at Hydro One and, while driving change and efficiencies across all lines of business at the Company, we have spent considerable time assessing how we approach major capital projects such as our transmission lines and stations. Over the last few months, we have engaged in an extensive process, together with our construction partner, to systematically review all aspects of the East-West Tie transmission line development and construction including our existing scope at the affected transmission stations. Based on the work conducted, we are confident that we can provide a solution that meets the technical requirements at a significantly lower cost both in terms of capital and ongoing operating and maintenance costs; a project that respects Ontario's rate payers while representing the best opportunity to provide an in-service transmission line in time to meet the provinces electricity needs.

Hydro One is planning to deliver to the IESO our proposal by October 15 which will provide an overview of the key elements of the proposal and why we believe they are not just achievable, but a preferred option. Hydro One would like to meet with you and your team to present this proposal at your convenience after that date.

Subject to discussions at that meeting, Hydro One is also prepared to submit a Leave to Construct application for our proposal with a "not-to-exceed" price guarantee by December of this year. We believe we are uniquely positioned to provide a more cost-effective alternative East-West Tie transmission line that will substantively meet Northern Ontario's timeline and electricity needs.

I look forward to working further with the OEB on this important project. I should also note that a similar letter has been sent to both the Minister and to Peter Gregg at the IESO.

My best,



Mayo Schmidt

September 14, 2017

The Hon. Glenn Thibeault
Minister of Energy
900 Bay St
4th Floor, Hearst Block
Toronto, ON M7A 2E1

Minister,

Re: Implementation of East-West Tie (EWT)

I am sending you this letter to formally make you aware of Hydro One's interest in the East West Tie project. We firmly believe that Hydro One can bring substantial value to all aspects of this important project and that our efforts will result in a timely and cost-effective transmission solution; for the Province, the electricity system and the homes and businesses of Northern Ontario.

As you are aware, there is a new leadership team at Hydro One and, while driving change and efficiencies across all lines of business at the Company, we have spent considerable time assessing how we approach major capital projects such as our transmission lines and stations. Over the last few months, we have engaged in an extensive process, together with our construction partner, to systematically review all aspects of the East-West Tie transmission line development and construction including our existing scope at the affected transmission stations. Based on the work conducted, we are confident that we can provide a solution that meets the technical requirements at a significantly lower cost both in terms of capital and ongoing operating and maintenance costs; a project that respects Ontario's rate payers while representing the best opportunity to provide an in-service transmission line in time to meet the provinces electricity needs.

Hydro One is planning to deliver to the IESO our proposal by October 15 which will provide an overview of the key elements of the proposal and why we believe they are not just achievable, but a preferred option. Hydro One would like to meet with you and your team to present this proposal at your convenience after that date.

Subject to discussions at that meeting, Hydro One is also prepared to submit a Leave to Construct application for our proposal with a "not-to-exceed" price guarantee by December of this year. We believe we are uniquely positioned to provide a more cost-effective alternative East-West Tie transmission line that will substantively meet Northern Ontario's timeline and electricity needs.

I look forward to working further with the Province on this important project. I should also note that a similar letter has been sent to both Peter Gregg and to Rosemarie Leclair.

My best,

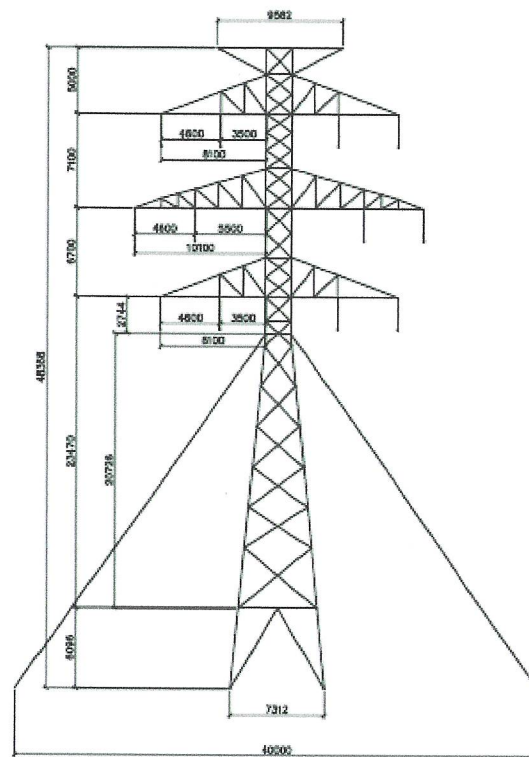


Mayo Schmidt

TAB 2

Within the Pukaskwa National Park, our solution is to utilize our existing right-of-way (ROW) and upgrade the existing 230kV double-circuit steel lattice towers with 230kV quad-circuit steel lattice towers as shown to the right.

This tower can be erected within the corridor without any additional widening. Hydro One has completed a preliminary assessment of the circuit outages that would be required to enable this solution and believes they are achievable if executed in accordance with existing outage planning practices. Further discussions with the IESO would be beneficial to further build out the preliminary outage plans.



Construction Methods

Brushing and clearance of the ROW, along with the establishment of access roads for all areas outside the Pukaskwa National Park, will be conducted to facilitate the commencement of structure staking and foundation installation. Once survey teams have completed staking activities for a section of the line, foundation crews will commence the installation of anchors for the guy wires and centre pin bearings for the structure base. The towers will be pre-assembled at local staging areas located along the ROW and then flown by helicopter to each structure location for erection. They will be landed directly on a new foundation, the guys tensioned on new guy anchor foundations and then dressed and left ready for stringing.

Within the Pukaskwa National Park, the construction staging will be performed on the existing ROW. Foundation crews will commence installation of anchors for the guy wires at each structure location. Bundled steel will be delivered onto the ROW for assembly, adjacent to the existing transmission line. The towers have a mass of approximately 17 tonnes in weight in total, therefore to allow them to be lifted by helicopter they will be assembled in two pieces. The bottom section will consist of the main tower body and the guys will be assembled in one piece, and the top section including all cross arms and shield wire peak will be assembled in a second.

Under double-circuit outage conditions, the conductors will be lowered to the ground from a number of towers on the existing East-West Tie. The towers will then be removed, leaving the existing foundation in situ. The new main tower body will be lifted by sky-crane helicopter and landed on the existing foundations for the existing circuits, and the guys will be anchored and tensioned. Secondly, the top section of the tower will be lifted and landed by sky-crane on the body. The existing conductors will be raised and clipped-in allowing the line to be energized on one side of the new towers, leaving the other side ready for stringing activities.

Helicopters will be used to pull in conductor and shield wire as required.

Project Schedule – Transmission Lines

Hydro One has been working to the following high-level schedule and is confident in the ability to complete the project by year-end 2021, which is a one-year extension to the current need date of 2020. This work would be completed in parallel and in coordination with the terminal station work at Lakehead TS, Marathon TS, and Wawa TS.

Activity	Start	Finish
Refine project assumptions and cost Estimate to Inform Indicative Offer to IESO	August 2017	October 2017
Refine project assumptions and cost estimate in development of LTC Filing	September 2017	December 2017
Leave to Construct Submission to OEB		December 15, 2017
Leave to Construct Review & Decision by OEB	December 15, 2017	October 2018
Detailed Engineering	October 2018	May 2019
Procurement	November 2018	September 2019
Construction	March 2019	December 2021

Cost Estimate

Substantial engineering and other project definition work has been completed by Hydro One and SNC-Lavalin for the proposed solution. Based on the amount of work completed to-date, the total project cost for the transmission lines is **estimated to be less than \$650m**, including:

- All EPC costs (engineering, procurement, construction, project management, project controls, quality assurance),
- Project contingency
- Costs to amend the draft environmental assessment prepared by NextBridge
- Real estate acquisition and licensing fees,
- Interest during construction, and
- Project setup and governance costs.

Hydro One and SNC-Lavalin are committed to completing further design work prior to submission of the Leave to Construct application in December, and are **targeting an all-in price of less than \$600m, including a guaranteed “not-to-exceed” provision.**

At time of writing, the largest cost uncertainties remain with access and contracted construction costs. Further data will soon be available from detailed helicopter inspections and laser scanning which will be used to refine assumptions into design packages for materials and construction labour. Firm bid pricing will be obtained for all material and construction labour prior to submission of the LTC.

In addition to lower upfront capital costs, Hydro One can add substantial value on an on-going basis through lower operations & maintenance (O&M) expenses. By leveraging Hydro One’s existing

TAB 3

BriefingNote



Date: November 10, 2017

Presented by: Greg Kiraly

Confidential - East-West Tie Transmission Line Project Update

The East-West Tie (EWT) is a proposed double-circuit 230kV line approximately 450 km in length, paralleling the existing Hydro One tie between Thunder Bay to Marathon to Wawa in Northern Ontario. The new infrastructure is functionally intended to increase total transfer capacity of the existing interface from 200 MW to 450MW.

Background

In 2013, NextBridge (a partnership of 50% NextEra Canada, 25% Enbridge and 25% Borealis) was designated by the OEB through a competitive process to execute the development phase of this project largely to complete preliminary design and environmental assessment work necessary to construct the project. Nextbridge submitted their Section 92 Leave to Construct (LTC) application to the OEB on July 31, 2017 seeking approval to build and operate the line. The total estimated construction cost of the line was \$737M, 80% higher than their 2013 forecast of \$409M. At the same time Hydro One submitted an LTC for the necessary station connection facilities at our three existing stations Lakehead TS, Marathon TS, and Wawa TS for a total of \$157M. With the increase in Nextbridge's proposed costs for the transmission line, the Minister of Energy asked the Independent Electricity System Operator (IESO) to reassess the project need and to consider alternatives by December 1, 2017.

Approach

In anticipation of this situation, Hydro One has been working with our Engineer, Procure and Construct (EPC) partner SNC-Lavalin (SNCL) on a cost-shared basis, to assess the opportunity and develop a competitive proposal for the transmission line construction and ownership that could benefit Ontario customers, First Nations communities, and shareholders alike.

Our approach is anchored on innovation and capitalizes extensively on the use of our existing transmission corridor and assets, thereby minimizing new construction and environmental disruption. Hydro One is confident that we can deliver a robust and more cost-competitive solution to Ontario customers, and is aiming to file an LTC application to the OEB in December 2017 with an approximate value of \$600M. In addition to the lower capital costs, Hydro One is also able to achieve lower operating and maintenance costs for the benefit of customers, by leveraging existing maintenance programs and infrastructure. With the LTC application, we will be seeking the OEB's approval for the design/build, on-going operations, and ownership of the EWT transmission line. Hydro One plans to

Greg Kiraly / November 2, 2017 10:15pm

Privileged and Confidential – Internal Use Only

Page 2

include a “not-to-exceed price”, and as such will be seeking the Hydro One board’s approval of the strategic content of the application in December.

Proposed Solution

Based on our extensive project development work, the Hydro One & SNCL team is proposing a technically compliant solution that will produce capital costs approximately \$140M lower than Nextbridge’s submission of \$737M, and will provide cost assurance to customers with a not-to-exceed price.

Key aspects of the solution include:

- A 10% shorter route as compared to Nextbridge by utilizing our existing right-of-ways and modifying existing structures through the Pukaskwa National Park, reducing environmental impacts and allowing for significant construction savings.
- Lower design/build costs achievable through an optimized design solution for the portion of the route outside Pukaskwa National Park.
- Lower operating and maintenance costs, leveraging Hydro One’s existing maintenance programs and infrastructure. Hydro One’s incremental costs for the additional EWT circuits will be a fraction of any other parties, with an estimated incremental cost of less than \$3M per year, 60% lower than what has been presented by NextBridge.
- A superior First Nations partnership involving construction and ownership benefits that are shared with communities, modeled after industry leading practices and other recent successful transactions such as the Bruce to Milton LP with Saugeen Ojibway Nation in 2012.
- Cost certainty through a “not-to-exceed” construction price to be confirmed in our LTC submission in December with appropriate performance guarantees from our EPC partner.

An overview of the proposed solution, along with an initial “not to exceed” price of \$650M, was submitted to the IESO on October 14, 2017 to ensure they understand our commitment and plan for this project, and how it provides a more cost-effective wires solution as they conduct the needs assessment.

The largest uncertainty for the proposed approach is centred on the ability for Hydro One to utilize the Environmental Assessment work that has been completed by NextBridge, and we are discussing details with the Ministry of Environment and Climate Change around options.

Regulatory/Finance Considerations

This project is accretive, with net income and EPS attributable to Hydro One of [REDACTED] attributable to Hydro One shareholders (assuming a 66-34% partnership with First Nations and including impact of convertible debentures) once completed and added to

Greg Kiraly / November 2, 2017 10:15pm

Privileged and Confidential – Internal Use Only

TAB 4

1 c) Please explain the reason why the "Not to exceed \$650 million" capital cost estimate that was
2 sent to the IESO in October 2017 (Ref 2) was reduced to "Not to exceed \$636.1 million"
3 cost estimate that was approved by Board of Directors one month later, i.e., December 2017
4 (Ref 3)

5
6 **Response:**

7 a) The cost estimate in Reference 1 is based on the assumptions in Exhibit C, Tab 1, Schedule
8 2, page 2, lines 1-6. Please refer to Exhibit I, Tab 1, Schedules 7 and 14 for schedule and
9 cost implications.

10
11 b) Please refer to Exhibit I, Tab 1, Schedule 14.

12
13 c) Reference 2 was a project briefing shared with the Board of Directors on November 10,
14 2017, based on information available at that time. Reference 3 was a submission to the
15 Board of Directors on December 8, 2017, requesting approval to submit the Leave to
16 Construct application.

17
18 Over that month, Hydro One completed additional work on the project and received updated
19 information, including the fixed-price EPC estimate from SNC-Lavalin, which allowed the
20 cost estimate to be lowered to \$636.1 million.

21
22 For clarification purposes, the Hydro One Board of Directors did not approve a not-to-exceed
23 cost estimate of \$636.1 million. Thus, the cost estimate provided in Exhibit B, Tab 7,
24 Schedule 1 is \$636.1 million without a not-to-exceed condition.

25
26 Please refer to Exhibit I, Tab 1, Schedule 18 for further information on the not-to-exceed
27 price.

NextBridge Interrogatory # 5

Reference:

EB-2017-0364 - February 15, 2018 HONI Lake Superior Link Application.

Interrogatory:

- a) Explain in detail why HONI decided to file its Application in February 2018 and not sooner?
- b) Explain in detail when HONI first decided to file the Application?
- c) Explain in detail when HONI first decided to attempt to route through Pukaskwa National Park.
- d) Confirm that HONI never worked towards developing a leave to construct application in order to meet a 2020 in-service date for the Lake Superior Link project. If not confirmed, explain your answer in detail.

Response:

- a) Hydro One and SNC-Lavalin formed a confidential project team in early 2017, and undertook feasibility studies to determine if a technically compliant and cost-effective solution could be developed. It was determined in the coming months that the joint experience was potentially beneficial, although against an unknown cost and project plan from NextBridge. When NextBridge filed their Leave to Construct on July 31, 2017 with a total construction price of \$777 million, Hydro One realized there was a significant cost savings opportunity based on feasibility studies.

While the IESO was updating the Needs Assessment at the Minister of Energy's direction given the updated cost filed by NextBridge, Hydro One commenced full project development efforts. Further work was undertaken with SNC-Lavalin on scope development, engineering, engagement with suppliers and construction partners, estimation of costs, schedule development, risk assessments, external engagement, etc.

A fully-costed EPC proposal was delivered by SNC-Lavalin in late November which underpinned the project review with the Board in December, and ultimately their approval on February 13, 2018 to submit the Application, which was filed on February 15, 2018.

- 1 b) On July 31, 2017, it was decided Hydro One had a cost-competitive alternative, and
2 reaffirmed what was suspected during feasibility studies in the preceding months.
3
- 4 c) Hydro One Networks first decided to attempt to route through Pukaskwa National Park in
5 2012 during the designation hearing as a member of EWT LP, when the reference route went
6 through the Park. Hydro One re-engaged on the project independent of EWT LP in early
7 2017 including assessment of routing through the Park.
8
- 9 d) No, due to the failure of NextBridge not disclosing the higher construction costs prior to July
10 31, 2017, Hydro One, nor any other transmitter, would not have reasonably commenced in-
11 depth development activities to achieve a 2020 in-service date.

TAB 5

Recommendation

Recommend Board of Directors Approval for Hydro One to submit a Leave to Construct (LTC) to the OEB to build, operate, and own the new East West Tie transmission line as follows based on the following key terms:

Key Item	Details
Capital Cost	Not to exceed \$636.1 million subject to exclusions and conditions mentioned herein, including with regards to environmental approval of its route, and with final project cost to be adjusted following LTC approval by OEB, subject to any change or conditions imposed by OEB
Operations, Maintenance & Administration	\$1.5 million/year indexed thereafter
Schedule	Target project completion date by December 2021 , based on October 2018 LTC approval
Ownership	Hydro One Networks Inc. to file the LTC as Owner and Operator, and to transfer its ownership interest and control to Special Purpose Entity prior to line being energized
Financing Strategy	Corporate Financing for transaction costs, other than First Nations equity, similar to other capital expenditures within the Hydro One Business Plan
First Nations Financial Participation	34% equity offering to six impacted First nations communities through Bamkushwada LP, to be subscribed at the end of construction

East-West Tie Project Background ¹

What is the East West Tie (EWT) Line Project?

- Construction of a new 400km double-circuit 230 kV transmission line
- The new line parallels Hydro One's existing tie between Lakehead and Wawa Transformer Stations
- The goal is to increase capacity and reliability of electrical transmission between Northeastern and Northwestern Ontario

What is the current status of the EWT project?

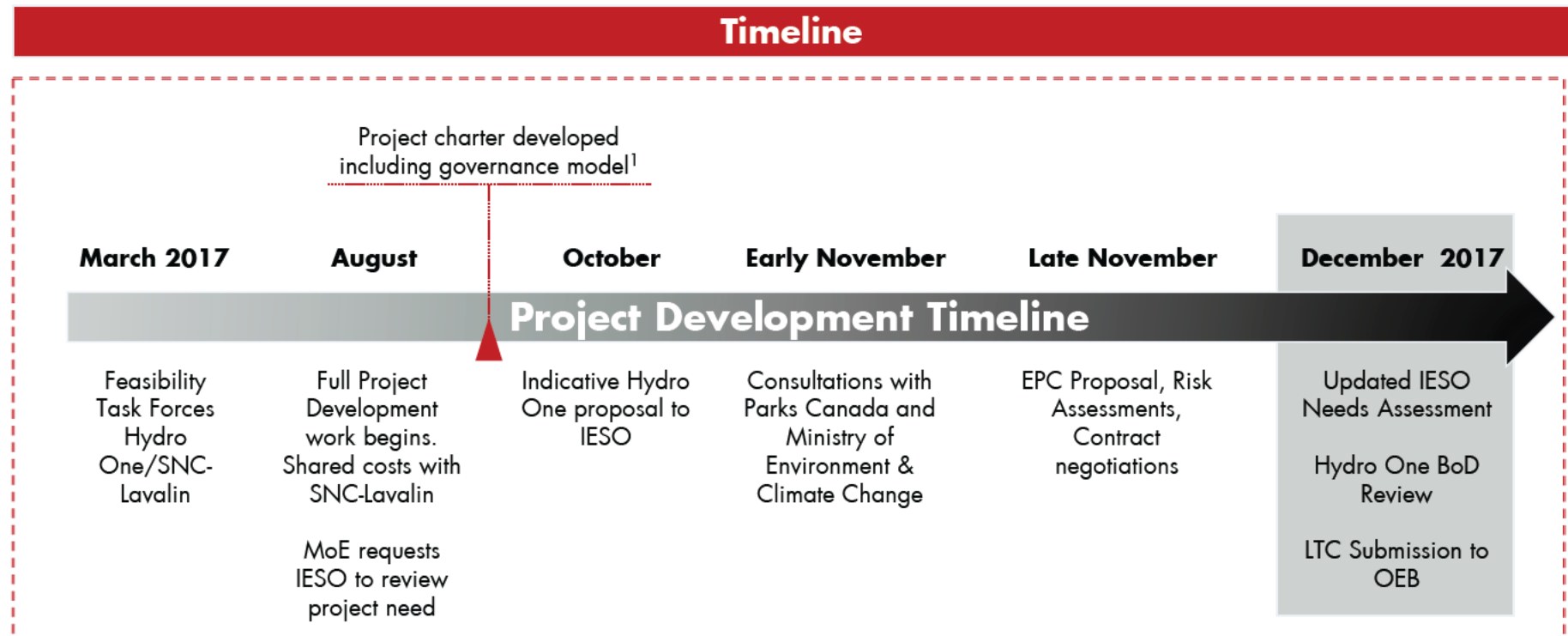
- NextBridge, selected by OEB in 2013 to carry the EWT development phase, filed its LTC Application to own and build the project in July 2017
 - Total estimated construction cost of the line was \$737 million, 80% higher than their 2013 forecast
- Independent Electricity System Operator (IESO) requested by Minister of Energy (MOE) to reconfirm need for the Project given high construction costs submitted by NextBridge
- IESO and OEB are both aware of Hydro One's renewed interest in the project and plan to submit competing LTC (MoE, Ministry of the Environment and Climate Change (MOECC) and NextBridge are also aware)
- Potential for other challengers interested to own and build EWT

What is Hydro One's involvement?

- In July 2017, Hydro One filed a LTC to upgrade its Transformer Stations to connect the new line aligned with NextBridge's LTC
- Hydro One is preparing a competitive LTC to own and build EWT transmission line, seeking Board approval prior to filing with OEB

1. Additional background information available in November 10, 2017 board briefing note

Project Development Timeline



1. See Appendix for project development governance

Executive Summary (1 of 2)

What have we done?

The company has analyzed new ways to approach this undertaking, and developed, together with a private-sector partner in SNC-Lavalin, an innovative solution with very substantial cost savings to customers when compared with the NextBridge submission.

Hydro One can bring together substantial value-add on all aspects of the East-West Tie: Construction, Operations, and compelling First Nations & Métis Benefits, including accretion to shareholders.

Benefits



Significant Savings for Customers: We are able to submit a LTC to the OEB with over **\$100 million of savings** in capital construction costs and over **\$5 million of annual OM&A savings** on an on-going basis.¹



Lower Environmental Impact: Our proposal has significantly lower environmental impacts primarily electing to **utilize our existing corridors**, widening where required to accommodate the new transmission line, and eliminating 184km of new corridor 60m wide as compared to NextBridge.



Cost Certainty: We are prepared to **offer cost certainty to customers with a guaranteed not-to-exceed price**; a first in Ontario.



Partnerships with First Nations: Hydro One is prepared to offer an attractive equity position consistent with the Bruce to Milton Limited Partnership (LP).

Partner



SNC-Lavalin: Construction and operation of transmission facilities is part of Hydro One's core business. To complement our existing resources and expertise for this project, we have teamed with SNC-Lavalin, a leading Canadian company with prior involvement in the EWT process, and large-scale transmission projects across the world.

1. See Appendix for cost comparison table

Executive Summary (2 of 2)

What do we need?

We are seeking the Board's approval to submit an LTC to the OEB including a not-to-exceed price based on information contained within this presentation.

- Typically, LTCs are filed with the OEB in advance, and approval of the business case by the Board or management follows. This project is unique, and not part of Hydro One's current or proposed investment plan because of the uncertainty around the outcome.
- Consistent with normal practice, if we receive the OEB's approval of Hydro One's LTC submission, the Hydro One Board will be presented with a business case for review and approval.

Project Requirements

One Year Extension: To be able to deliver on this important project, we require a one-year extension to YE 2021 as compared to NextBridge's proposal of YE2020.

Project Risks

Inability to Use NextBridge's EA Work: The largest risk to project success is an uncertainty around Hydro One's ability to utilize EA work completed by NextBridge and undertake an approved regulatory process to meet EA obligations associated with route modifications expected to lessen environmental impacts including route alterations to shorten route by 10%.

- Ability to utilize EA report/work done by NextBridge.
- This extension assumes that Environmental Assessment (EA) obligations can be met in 18 months.
- This requires use of NextBridge's EA and ability for Hydro One to undertake regulatory process to meet additional EA obligations associated with Hydro One route modifications.
- This is the largest risk to project success; both in terms of cost (not-to-exceed price) and schedule.
- Other significant risks include litigation process initiated by NextBridge; NextBridge's potential request to use Hydro One's corridor structures; and reputational risk with Hydro One's proposed route passing through resistant communities whereas NextBridge's does not.

Project Costs

Capital Construction Costs: Not-to-exceed \$636.1 million, with limited exclusions

- \$537.8 million turnkey EPC by SNC-Lavalin.
- \$98.3 million for Hydro One for financing, real estate, environment approval amendments, corporate functions (project oversight, communications, community relations, legal, regulatory, First Nations engagement) and associated contingency.
- Pricing exclusions to OEB will include: *force majeure* events, changes driven by government or regulatory policy, archaeological discovery, changes to import duties on finished goods, commodity pricing and foreign exchange risk beyond November 2018 (see appendix for further details).
- Multiple project level risk workshops held with participation from Hydro One and SNC-Lavalin used to define project risks and articulate project contingency.
- Continued open-book basis with SNC-Lavalin to define further savings until award of LTC. Flow to customers.
- Financial Protection: Constructor security including 50% Performance Bond and 50% Labour & Material Bond; Letter of Credit for 5% advanced payment; up to 10% liquidated damages; parental guarantee from SNC-Lavalin Group Inc.

Operations, Maintenance and Administration (OM&A) Costs: \$1.5 million per year¹

- Incremental costs to operate supported by detailed analyses from our Hydro One Systems Operations and Finance groups.
- Performed by Hydro One Networks, under agreements complying with the Affiliate Relationship Code.

1. Expressed in 2017 dollars, to increase with indexing for future years

Project Schedule & In-Service

Project Schedule and Key Milestones		
Activity	Start	Finish
External Communications	February 2018	On-going through 2021
LTC Review and Decision	December 2017	October 2018
EA Studies, Review, Approval	February 2018	June 2019
Detailed Engineering	November 2017	October 2018
Procurement	January 2019	On-going through 2021
Construction	July 2019	November 2021
Project Substantial Completion		December 2021

Details

- Project schedule developed to date, outlining all major tasks, durations, and dependencies. Further detail to be built out in later stages of project.
- Minimal float available in EPC schedule, but comfortable to target Substantial Completion by Dec 31, 2021, with liquidated damages of up to \$53 million at 180 days late.
- Key dependencies to Project Substantial Completion by Dec 31, 2021:
 - Start of construction dependent on receiving approved EA by June 30th, 2019.
 - Receiving a continuous 2 week double circuit outage in August of 2020 and additional single circuit outages in summer of 2021 to complete the stringing activities.

Project Risks

Details

- Hydro One and SNC-Lavalin utilized consistent project risk assessment methodologies, including development of risk registry and probabilistic modeling to inform appropriate project contingencies. Project Risk Assessments were completed jointly for all project elements, regardless of accountability between the two companies.
 - Hydro One has contingency at \$14 million, and
 - SNC-Lavalin Contingency & Risk funded at approximately \$50 million.
- An allocation of risks matrix and summary of key risks are presented in appendix materials.
- The most critical project risk to cost, schedule, and reputation is whether or not Hydro One will be able to utilize the NextBridge EA work, as well as undertake an approved regulatory process to meet EA obligations associated with route modifications to lessen environmental impacts.

Key Project Risks

- Ability to utilize EA report/work done by NextBridge.
- This extension assumes that Environmental Assessment (EA) obligations can be met in 18 months.
- This requires use of NextBridge's EA and ability for Hydro One to undertake regulatory process to meet additional EA obligations associated with Hydro One route modifications.
- This is the largest risk to project success; both in terms of cost (not-to-exceed price) and schedule.
- Other significant risks include litigation process initiated by NextBridge; NextBridge's potential request to use Hydro One's corridor structures; and reputational risk with Hydro One's proposed route passing through resistant communities whereas NextBridge's does not.

Environmental Approvals (1 of 3)

Details

- NextBridge has been working towards EA approvals for the transmission line since the 2013 designation for the development work. Their EA Report was submitted to the MOECC in July 2017. They are forecasting to spend \$42 million against OEB-approved budget of \$22 million.
- Despite being funded by rate payers, there is significant uncertainty of Hydro One's ability to utilize the EA work completed by NextBridge, and transfer of proponentcy is not envisioned in the legislation for individual EAs for transmission assets. Inability of Hydro One to be given permission to utilize the EA work would mean a 2.5 - 3 year delay, and cost in the order of \$30 million to duplicate studies, neither of which are in the interest of customers.
- Hydro One's schedule and cost assumptions are based on Hydro One being able to utilize the NextBridge EA work, as well as go through an approved regulatory process to meet EA obligations associated with route modifications expected to lessen environmental impacts.
- Hydro One has had on-going dialogue with the MOECC, but they have limited ability to provide advice and make decisions with the NextBridge EA before them for review.
- Hydro One's environmental impacts are substantially less than those of NextBridge by eliminating cutting new corridor approximately 184km long and 60m wide, much of which is through undisturbed lands (map on next slide).
- Hydro One plans to constructively state in the LTC submission a condition that the not-to-exceed price and the committed timeline is entirely dependent upon being able to utilize the EA work completed by NextBridge for approximately 80% of the line length AND our ability to undertake an approved regulatory process to meet EA obligations associated with alteration of the route to result in shorter line length and the fewer environmental impacts.
- November 27 letter from Parks Canada confirms no objection to our route through the National Park and modifications to our line from 2-circuit to 4-circuit, subject notably to Detailed impact EA approval.

Environmental Approvals (2 of 3)

- One of Hydro One's competitive advantages is a 10% shorter route than NextBridge (approx. 42km less), that would follow the existing Hydro One corridor through Pukaskwa National Park. Existing corridor shown in red lines below, with NextBridge's proposed route in white and white-overlaid-on-red.
- Elsewhere along the route, existing corridors would be widened to accommodate the new towers, however through Pukaskwa National Park, existing 2-circuit towers would be converted to 4-circuit towers. Existing foundations would be re-used with new 4-circuit structures erected throughout the Park.



Environmental Approvals (3 of 3)

- Following public consultation and incorporation of feedback from communities as part of their EA work, NextBridge has planned a 53km bypass around the township of Dorion and Loon Lake west of Nipigon, shown in white on below map.
- Ministry of Natural Resources and Forestry (MNRF) has indicated that they feel NextBridge's EA placed too much weight on community feedback, and not enough weight on impact to the natural environment.
- Hydro One feels confident in the merits of an EA amendment basis of reduced environmental impacts, however it is understood that this will not be welcomed by residents around Loon Lake who were sensitive to additional corridor widening. Similar to the tower modifications being made through the Park, Hydro One's proposal makes provision for modification towers over a 5km section of line without any corridor widening to help mitigate concerns from residents.



Regulatory and Legal

Details

- With support of the Board's strategic elements outlined within this presentation, Hydro One plans to submit LTC to OEB in December, aligned with the IESO's updated Needs Assessment, received on December 1st.
- Will articulate the necessary condition for Hydro One to utilize the NextBridge EA and ability to undertake an approved regulatory process to meet EA obligations associated with route alterations with reduced environmental impacts.
- Exclusions to capital cost guarantee will be clearly articulated in Hydro One submission.
- Completion by Year End 2021 will be a project commitment.
- NextBridge's discontent with competition for the LTC will likely result in litigation of some form.
- Proactive measures taken by Hydro One earlier in 2017 to eliminate exchange of confidential and commercially sensitive information with NextBridge.
- November correspondence from NextBridge's counsel to OEB requesting limitations of Hydro One's requested intervener status. Hydro One Law Division engaged, and feels there is no basis for request.
- Notice from NextBridge received regarding perceived unfair competitive discussions with First Nations Communities and NextBridge contractors. Hydro One Law Division engaged, with no concern of wrongdoing.

Financing and Financial Impacts

Details

- Funding (Hydro One Equity + 60% of rate base or full debt component) through Hydro One Inc. corporate debt financing platforms
- Stand-alone project finance considered but no benefits and not effective in lowering costs and corporate guarantees required
- Transaction is not included in the Consolidated Business Plan, 2018 - 2023, however Treasury and Finance have identified the risks of increased debt financing for such projects and their impacts on credit metrics and ratings, along with potential remedies to address adverse outcomes
- Financial model details available in appendix, but in summary:
 - [REDACTED]
- Assumes 66%-34% partnership with First Nations
- Based on \$636.1 million transaction costs, under our 60/40 debt/equity regulatory model
- \$381.7 million debt and \$254.4 million equity (\$167.9 million equity for Hydro One and \$86.5 million First Nations)

First Nations and Métis Considerations

Hydro One Plans to do the following regarding First Nations and Métis involvement:



Welcome Partnerships: Hydro One Networks Inc. will file the LTC with the OEB indicating that we welcome First Nations partnerships, but are precluded from discussing specifics of Transmission Line and benefits with FN communities due to their current exclusivity agreement with NextBridge.



Special Purpose Entity: If awarded the LTC, Hydro One will establish a special purpose entity with majority equity interest of Hydro One and minority equity interest of the affected First Nations partners. Prior to the line being energized, the project assets will be transferred to this entity.



Equity Position: Hydro One is prepared to offer an attractive equity position to Bamkushwada LP, the partnership formed by six directly impacted communities¹, similar to that with the Bruce-to-Milton LP formed in 2012 with the Saugeen Ojibway Nation.

- 34% of equity ownership, transfer post construction
- Equity to be provided by communities; debt financing for the project (60% rate base) to be provided by Hydro One



Collaborative Approach: Based on existing discussions for our LTC for Transformer Station Upgrades, we are expecting collaborative approach for consultations and negotiations.



Employment Benefits: SNC-Lavalin aims to provide attractive employment benefits to First Nations and Métis contractors. A portion of budget has been allocated for premiums and set-asides for Indigenous Procurement activities.

1. Communities include: Pic Mobert FN, Biigtigong Nishnaabeg, Fort William FN, Michipicoten FN, Pays Plat FN, Red Rock Indian Band

Appendix

Appendix **A:** **Project Development Governance**

Appendix **B:** **Cost Comparison Table**

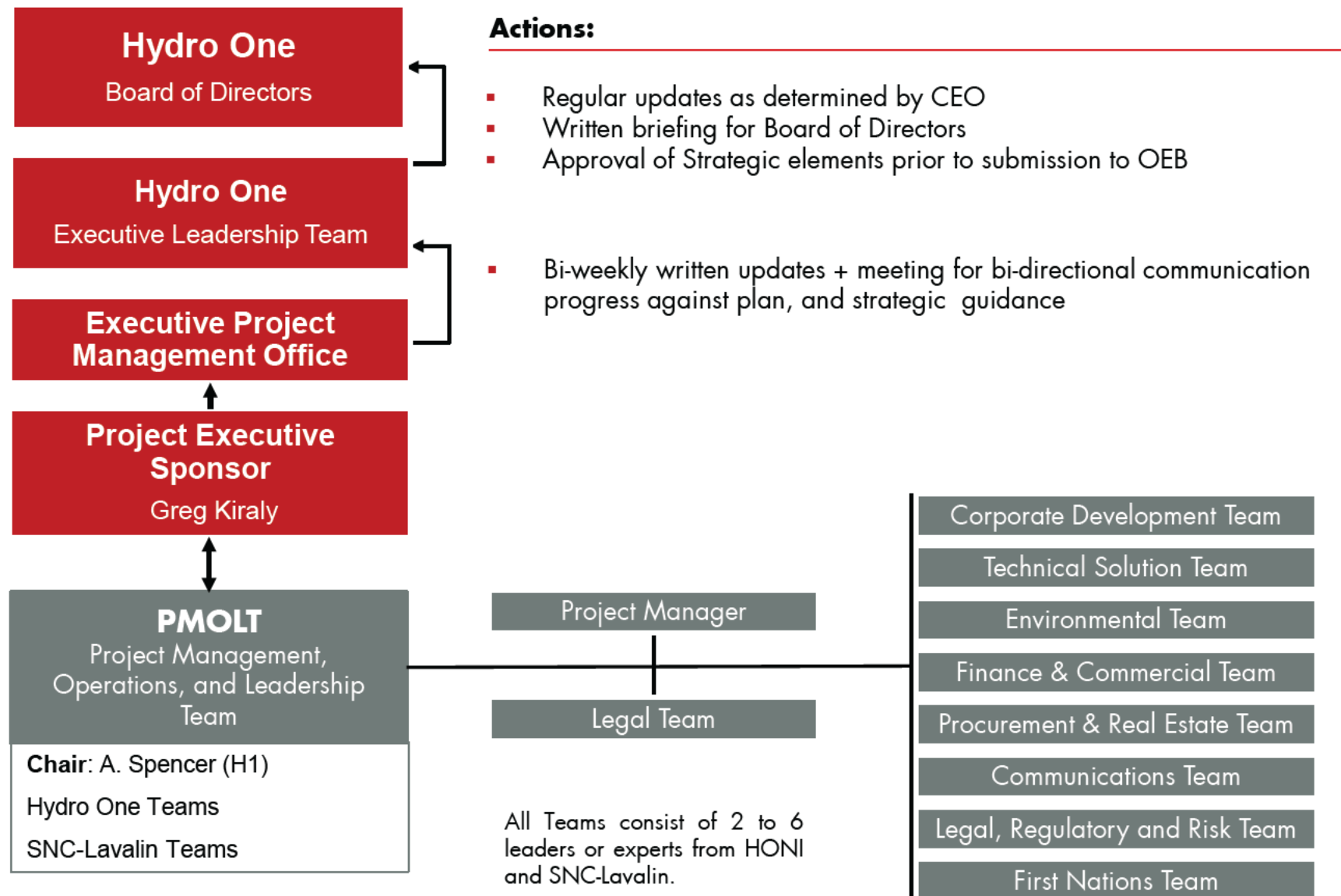
Appendix **C:** **Capital Construction Cost Breakdown**

Appendix **D:** **Financial Forecasts (2 pages)**

Appendix **E:** **Key Risks – Allocation of Risks**

Appendix **F:** **Project Risks and Mitigation (3 pages)**

Appendix A: Project Development Governance



Appendix B: Cost Comparison Table

Entity	NextBridge 2013	EWT LP 2013	NextBridge 2017	Hydro One 2017	Hydro One vs. NextBridge 2017
Development Cost (\$ million)	\$22.2	\$22.1	\$42 (forecast)	TBD	TBD
Construction Cost (\$ million)	\$409	\$490	\$737	\$636	(\$101)
Operations & Maintenance/year (\$ million)	\$4.4	\$7.1	\$7.1	\$1.5	(\$5.6 million / year) \$110 million capex equiv.
Completion Date	YE '17	YE '18	YE '20 (extended by IESO/OEB)	YE '21	1 Year Extension
					Equivalent \$211 million Hydro One advantage over NextBridge

- 6 qualified groupings in 2013 Designated Transmitter Process for East-West Line
 - **UCT "NextBridge"** selected by OEB in 2013 for Development Phase with recovery of \$22.2 million Development Budget
 - Tied second place: **AltaLink** (then SNC-Lavalin owned) and **EWT LP (33.3% Hydro One, 33.3% Great Lakes Power Transmission and 33.3% First Nations through Bamkushwada LP)**



Appendix C: Capital Construction Cost Breakdown

Description of Cost	Hydro One (\$ million) (in-service 2021)	NextBridge (\$ million) (in-service 2020)
Project Management, Engineering, Design, and Procurement	\$19.9	\$26.0
Materials	\$57.8	\$95.8
Site Clearing, Preparation and Site Restoration	\$100.1	\$130.1
Construction	\$350.5	\$382.2
Other – Insurance and Bonding	\$9.5	-
EPC Cost Subtotal	\$537.8	\$634.1
Environmental and Regulatory Approvals	\$3.0	\$14.0
Land Rights	\$14.9	\$25.5
FN & Métis Participation	Included in EPC	\$7.5
FN & Métis Consultation	\$2.2	\$14.2
Other Consultation	-	\$2.7
Interest During Construction	\$45.8	\$33.2
Regulatory	-	\$5.8
Corporate Allocations: Legal, Regulatory, Finance, Communications, H1 Engineering & PM, etc.	\$18.5	-
Contingency & Management Reserve	\$14.0	-
Total Project Construction Cost	\$636.1	\$737.0



Appendix D: Financial Forecasts (1 of 2)



Line items	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
OPERATING STATEMENT (\$M)										
Revenues										
Revenue Requirement										
AFUDC										
Total revenue										
Costs										
OM&A										
Initial costs										
Depreciation										
Total costs										
Earnings before interest and income tax										
Interest expense										
Earnings before income tax										
Income Tax										
Net Income										
Less:										
Dividends paid to H1										
Dividends paid to Six Nations Devco										
Change in Retained Earnings										

Appendix D: Financial Forecasts (2 of 2)



Line items	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
CASH FLOW FROM OPERATIONS (\$M)										
Net income (before write-offs)										
Depreciation (net of asset removal costs)										
Change in working capital										
Less:										
Capital expenditures										
Dividends paid to H1										
Dividends paid to Six Nations Devco										
Net Cash Flow										
RETURN ON RATE BASE (\$M)										
Rate Base										
Equity Portion (%)										
Return on Rate Base										
RETURN ON EQUITY (%)										
Net Income										
Deemed Equity (Return on Rate Base)										
Return On Equity										

Appendix E: Key Risks - Allocation of Risks

Key Risks	SNC-Lavalin	Hydro One	Ontario Energy Board (on filing of LTC)
Archeology		✓	✓
Geology/Site conditions		✓	
Force Majeure			✓
Regulatory or government-led Change			✓
Permanent Real Estate Rights		✓	
Temporary Real Estate Rights		✓	
Environmental Assessment		✓	✓ Regulatory means for EA approval
Parks Canada Approval		✓	✓ Regulatory means for EA approval
First Nations		✓	
Project Delay/Liquidated Damages	✓		
Security/Financial Guarantees	✓		
Design and Construction	✓		
"Not to exceed price" & schedule	✓ (Subject to exclusions as per above until contract start)	✓	
Legal risks		✓	
Foreign exchange on Materials*	✓ (until November 2018)		
Commodity Prices	✓ (until November 2018)		

Appendix F: Project Risks and Mitigation (1 of 3)

Risk	Additional Info	Likelihood of Risk	Project Impact	Mitigation	Party Carrying Risk
Inability to use EA work done by NextBridge	NextBridge has spent roughly 2.5 years on EA activities, and submitted to MOECC for review in July 2017. No clear ability to transfer proponentcy from NextBridge to Hydro One. No clear precedent for MOECC or OEB to follow.	Medium to High (50% - 75%)	Catastrophic. Would require Hydro One to start fresh on EA work, 2.5-3 year delay and approx. \$30 million of cost to be incurred without assurance of recovery, or alternatively not proceed with project. Reputational risks with stakeholders and communities.	Continue discussions with MOECC on benefits of Hydro One proposal and potential alternatives for consideration.	Hydro One. Only mitigated once received clarity from MOECC on mechanisms, which does not have defined timeline.
Inability to amend NextBridge EA to account for changes, including Pukaskwa National Park Route	Hydro One proposal is substantially less impactful to environment (i.e. reduced corridor clearing), but all changes to submitted EA by NextBridge require approval of changes by MOECC	Medium to High (50% - 75%)	Very High. Cost & Schedule: Would have to design & build to NextBridge EA, with longer route, more expensive tower design	Have received support in principle from Parks Canada. Continue discussions with MOECC on benefits of Hydro One proposal and potential alternatives for consideration.	Hydro One. Only mitigated once received clarity from MOECC on mechanisms, which does not have defined timeline.



Appendix F: Project Risks and Mitigation (2 of 3)

Risk	Additional Info	Likelihood of Risk	Impact	Mitigation	Party Carrying Risk
Inability to amend NextBridge EA to account for changes, including elimination of Loon Lake by-pass west of Nipigon	Hydro One proposal is substantially less impactful to environment (i.e. reduced corridor clearing), and addresses concerns raised by MNRF on NextBridge's EA, however is a change from the modified route committed to local communities concerned about nearby infrastructure expansion. All changes require MOECC approval.	High (75%)	<p>High.</p> <p>Cost & Schedule: Would have to design & build to NextBridge EA, with longer route, specifically clearing 53km of additional corridor.</p> <p>Reputational: Challenging conversations with local landowner associations.</p>	Plan to engage with MNRF and MOECC regarding lesser environmental impacts, as well as consult with communities regarding potential mitigating measures to eliminate corridor clearing around Look Lake. \$4 million within contingency.	Hydro One Only mitigated once received clarity from MOECC on mechanisms, which does not have defined timeline AND consultation with communities (Q2-Q3 2018)
EPC Partner unable to deliver against committed Construction Budget and Schedule	Project overruns and delays due to a number of modelled risks associated with land clearing and transmission line construction.	Low to Medium (25-50 %)	<p>Medium.</p> <p>Cost & Schedule: Would be subject to penalties and litigation for failing to fulfil contractual obligations.</p> <p>Reputational: Damage impacting relations with Hydro One and Canadian T&D sector</p>	<p>Substantial engineering work completed to clearly understand project risks.</p> <p>Probabilistic risk assessment utilized to define project contingency.</p>	SNC-Lavalin Hydro One risks guarded by EPC Contract financial security (bonding, liquidated damages up 180 days/\$53 million, parental guarantee)



Appendix F: Project Risks and Mitigation (3 of 3)

Risk	Additional Info	Likelihood of Risk	Impact	Mitigation	Party Carrying Risk
EPC Partner unable to deliver against committed Construction Budget and Schedule	Project overruns and delays due to a number of modelled risks associated with land clearing and transmission line construction.	Low to Medium (25-50 %)	Medium. Cost: Would not have ability to seek rate recovery on cost overruns, given not-to-exceed price.	Substantial work completed with SNC-Lavalin to understand project risks. Probabilistic assessment utilized to define project contingency. Instruments with EPC Contract to guard against cost and schedule overruns. Bonding for 100% of contract and Liquidated Damages of up to \$53 million.	Hydro One
Delays to construction start due to inability to obtain real estate rights	Hydro One accountable for obtaining real estate rights for widening of existing corridors. Standby charges of \$300 thousand/month once EPC contract is signed after LTC approval.	Medium (50%)	Medium Cost & Schedule: Standby charges of \$300 thousand/month once EPC contract is signed after LTC approval.	Begin community meetings and discussions early 2018. Modelled and allocated contingency.	Hydro One



Hydro One Limited/ Hydro One Inc.
Submission to the Board of Directors



Date: February 13, 2018

Re: East West Tie; approval to apply for Leave to Construct

We submit updated information regarding the proposed East West Tie project, and are seeking the Board's approval to apply to the OEB for Leave to Construct based on the updated strategic content.

Designing, building, and operating transmission infrastructure has been a core competency of Hydro One for many decades, with on-going delivery of approximately a one billion dollar annual capital portfolio. We are best positioned to do so for the East West Tie project in terms of both skill and experience.

We have been monitoring the project and proactively working on project development activities since early 2017, including innovative solutions with significant cost savings for Customers when compared with the NextBridge submission.

Management reflected upon the Board's comments at the December 8th, 2017 meeting, and has updated the proposed application. The Board discussed the risk profile of the investment, primarily the potential for unrecovered costs given the proposed price cap. The team has assessed a number of alternatives and completed a further review of the risks and uncertainties. On the balance of our review, we intend to proceed without the price-cap component.

The proposed Hydro One application to the OEB provides substantial benefits to customers as compared to the NextBridge LTC application in the form of both lower capital costs of over \$100 million, and substantially lower on-going annual operating costs equivalent to \$55 million of capital expenditure on a present value basis. Hydro One's submission also provides additional benefits in terms of reduced environmental impacts, and what we believe to be additional long-term benefits to First Nations partners.

Yours sincerely,

A handwritten signature in black ink, appearing to read "Greg Kiraly".

Greg Kiraly
Chief Operating Officer

TAB 6

Date: January 15, 2018
Topic: Follow-up to December 8th Board Meeting, re: East West Tie
Submitted by: Greg Kiraly, Chief Operating Officer

Background

At the December 8, 2017 meeting, the Board discussed the strategic content of the proposed application for Leave to Construct (LTC) to the OEB. The Board did not approve at the meeting, and asked Management to consider alternatives based on the Board's feedback and questions and return with additional information and recommendation for consideration. The team has assessed a number of alternatives to mitigate the negative effect of the risk and associated uncertainties. All alternatives all have both risk and reward to be considered. This briefing touches on three key areas as follows:

1. Risk exposure to Hydro One regarding the Not-to-Exceed price;
2. Risk of Environmental Assessment approvals, and what that means to the not-to-exceed price;
3. Project commitment with uncertainty of First Nations partnerships.

This briefing provides information and recommended path-forward around these three key areas, and will be complemented by materials to be presented at the February meeting.

Not-to-Exceed Capital Cost

Management recommended a not-to-exceed price as a strategic differentiator to the NextBridge LTC submission, and strongly believes it would de-risk our bid being rejected by the OEB. Although Nextbridge's application is significantly higher cost, they are further advanced on the underlying project work and can offer an earlier completion date, having been selected for the development phase in 2013. A price-cap from Hydro One would likely be seen as a very attractive bid component for the regulator.

The Board expressed concern regarding the risk profile of the investment, particularly the potential for unrecovered costs given the number of uncertainties and the fixed price stipulation. The team has assessed a number of alternatives to mitigate the negative effect of the risk and associated uncertainties taking into account the fact that as the risk profile for unrecovered costs increases with the inclusion of price cap, but the risk of being rejected by the OEB also decreases. On the balance of our review, we intend to withdraw the price-cap component of our proposal. We will be returning to the Board in February to request the approval to submit the application for leave to construct, which will include our final assessment of risks and mitigation.

The proposed Hydro One LTC application to the OEB provides substantial benefits to customers as compared to the NextBridge LTC application in the form of both lower capital costs of over \$100million and lower on-going annual operation costs. The annual OM&A savings of \$5.6million, translates into an equivalent \$110million of capital savings when expressed on an NPV basis over a 30-year study period.

In the absence of the price-cap, Hydro One will continue to manage to a well-defined and tightly controlled project plan, targeting a delivery price of \$636 million utilizing fixed price lump-sum turn-key (LSTK) Engineer-Procure-Construct (EPC) contract with SNC-Lavalin.

Project Cost Comparison

During the December 8th board meeting, a number of large-scale transmission projects were referenced to demonstrate the potential for cost increase from initial approved amounts. A total project cost and variance analysis of the several referenced large scale transmission projects with cost variances has been completed and summarized below, with additional details in Appendix 1.

- Each project has its own set of circumstances and variance explanation, but on average they are at a 22% variance between the Initial Cost and Final Cost.
- Note that Final Cost in below table accounts for changes such as approved scope-change notices during project execution, as well as more impactful changes like re-routing, changes to contracting strategy, and in-flight design changes.

Project Name	<u>East West Tie</u> (Hydro One)	<u>East West Tie</u> (NextBridge)	<u>NTL Northwest BC Transmission Line</u> (BC Hydro)	<u>ILM Interior Lower Mainland Transmission</u> (BC Hydro)	<u>WATL Western Alberta Trans. Line</u> (AltaLink)	<u>EATL Eastern Alberta Trans. Line</u> (ATCO)	<u>Fort McMurray West Transmission</u> (Alberta Powerline)	<u>Bipole III</u> (Manitoba Hydro) <i>On-going</i>
INITIAL COSTS (\$M)	\$636 Target	\$737 target	\$561	\$602	\$1,499	\$1,665	\$1,430	\$3,300
FINAL COSTS (\$M)			\$736	\$743	\$1,699	\$1,900	\$1,600	\$4,600+
Variance (\$M)			\$175	\$141	\$200	\$235	\$170	\$1,300
Variance (%)			31%	23%	13%	14%	12%	39%+

Northwest BC Transmission Line (NTL) and Interior Lower Mainland (ILM) Projects had similar challenges that substantially drove project variances:

- Both contracts were initially planned under the BC Transmission Company (BCTC) entity and the concept was to utilise functional specifications and award as EPC contracts.
- During the course of the project, BCTC was re-integrated back into BC Hydro.
- The contracting strategy was changed mid-project in that BC Hydro introduced their own prescriptive standards and requirements which resulted in delay in the design period due to re-design, and changes to material and equipment to be procured
- BC Hydro introduced a requirement of live-line maintenance after the initial project budget was set. This modified the clearances and impacted the tower design, steel procurement, foundation design, line hardware. Equitable adjustments (schedule and cost) were claimed by the EPC contractor.
- On NTL, 76 structures had to be changed from lattice to monopole to fit within the revised route alignment.
- On NTL, the contracting strategy with corridor vegetation clearing was not done in a manner that drove efficient budget and schedule alignment. The clearing work was contracted directly to the FN Contractors by BC Hydro, with the contract between BC Hydro and FN Contractors. The work was project managed by the EPC contractor (Valard), but there was no tie-back to the EPC Contract. Hence corridor and access clearing requested by Valard to the FN Contractors was to BC Hydro account and wasn't being managed in an integrated cost-manner. Valard were also able to claim delays resulting from delays in the execution of the works by the FN Contractors.
- Specific to the ILM project, the general contractor (Graham-Flatiron JV) had no prior transmission line construction experience

Final cost variances on the **WATL, EATL and Fort McMurray West** projects were largely a result of changes in project evolution between the initially approved project amount, including routing changes following Environmental Assessment approvals and out-of-scope change notices approved by the utility.

The Manitoba Hydro Bipole III project has been a project with extensive changes driven largely by political forces, and has been the subject of multiple critical reviews.

- The transmission line routing was altered by the NDP government in power at the time, and resulted in a substantially longer to the west of Lake Winnipeg as opposed the original lower cost route to the east
- The Conservatives won a majority government in the spring 2016 election and immediately made substantial changes to the Manitoba Hydro board and executive. Boston Consulting Group was retained by the new Board to complete an independent review of contentious major capital projects, which is publically available.
- The incoming chair of the Manitoba Hydro board is on record as saying "Rerouting the Bipole III transmission line down the west side of the province was obviously a wrong decision, one forced on [Manitoba] Hydro by the previous government, and has cost Manitobans an additional \$900 million."
- In-flight alternatives were assessed in 2016, but it was determined the lowest-cost option was to complete construction along the updated route. The project is still on-going and forecast to be completed in late 2018.

With respect to East West Tie, Hydro One and SNC-Lavalin have taken into account the lessons learned regarding other projects in developing the proposal for the EWT. The parties have been working together in a cost-shared collaborative and open-book manner throughout the entire project development phase, which has resulted in the following differences with some of the above referenced projects:

1. Clear engineering and construction solution built on a mature and stable project specification
2. Up-front clarity and agreement on design standards, material standards, and maintenance standards to minimize extension of design cycle and re-work
3. Clarity and commitment on contracting strategy with accountability and risk management clearly defined between SNC-Lavalin and Hydro One
4. Utilization of construction contractors who are experienced with transmission line construction
5. Hydro One's solution is a generally widening of existing corridor, which is inherently less risky than creating new corridor as was the case in several of the comparator projects.
6. A contingency of \$68 million (10.7%) is included within the project total, and built upon industry best-practice of risk definition and probabilistic modeling.
7. SNC-Lavalin has extensive experience in delivering LSTK EPC projects on a fixed-price basis. A letter from the President of their Power division is attached as Appendix 4, outlining their commitment.

In the event that a designated transmitter was to incur costs beyond their approved LTC, they may elect to seek cost recovery for the incremental amount from the OEB as per established regulatory process. Hydro One would plan to seek recovery for costs prudently incurred outside of our control including such things as force majeure events; scope changes driven by government or regulatory policy; archeological discovery; changes to import duties; commodity pricing & foreign exchange risk beyond November 2018. These will be articulated in our LTC application.

Cost Benchmarking Comparison

The project team has undertaken a benchmarking and comparison review of other large-scale 230kV transmission projects in Canada which are similar to the EWT. Supporting details are contained within Appendix 2, and the following key excerpts of the benchmarking review:

- The Hydro One EWT proposal has an EPC cost of \$1.34 million per kilometer
- Similar completed comparison projects, when normalized for such factors as material and labour costs, range from \$1.27 million to \$1.37 million per kilometer. The NextBridge submission is \$1.41 million per kilometer.
- After normalizing the other projects to a unitized basis, making index adjustments for material and labour costs, and applying these factors to the 400km length of the Hydro One proposed solution, the variance across the similar projects sits in a range of -\$31 million to +\$25 million, or a -6% to +5% spread compared to Hydro One. This is a tight range and gives confidence that our unitized EPC price is appropriate.

TAB 7

OEB Staff Interrogatory # 18

Reference:

EB-2011-0140, UCT's Application for Designation to Develop the East-West Tie Line, Section 5, Pages 72-74 (filed January 4, 2013)

According to section 96(2) of the Ontario Energy Board Act, in an application under section 92, the OEB shall consider the interests of consumers with respect to prices, and the reliability and quality of electricity service, and the promotion of the use of renewable energy sources in a manner consistent with the policies of the Government of Ontario.

Given the public interest mandate that is engaged in LTC applications, OEB staff is interested in exploring potential options with respect to prices and cost certainty.

Hydro One stated in its September 22, 2017 letter to the OEB that "Hydro One is prepared to submit a Leave to Construct application, which will include a not-to-exceed price...".

NextBridge indicated in its designation application that it would assume some risk for the construction cost forecast through performance-based ratemaking. At the time of the designation application, NextBridge planned to present this proposal as part of the LTC process.

Interrogatory:

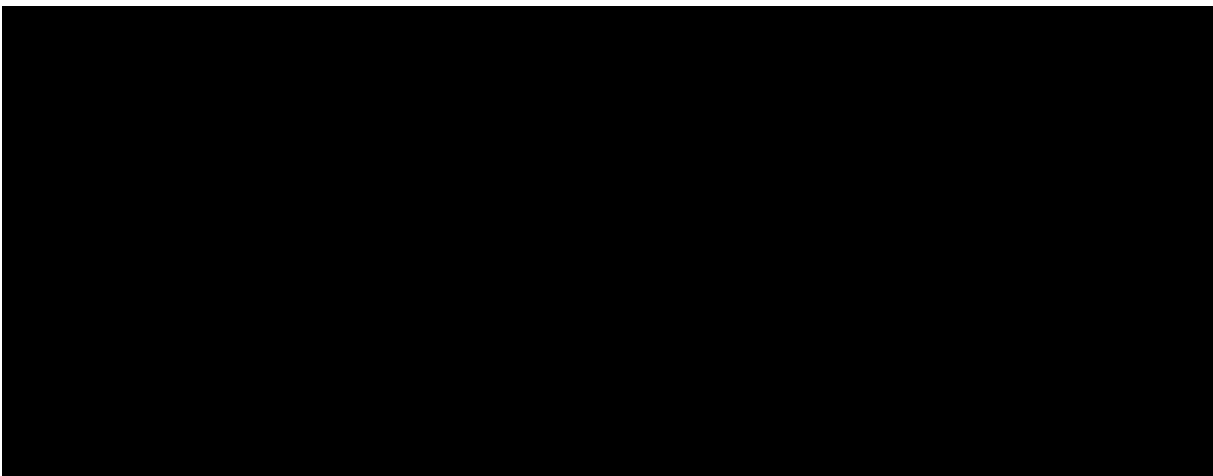
- a) Is Hydro One willing to provide the OEB with a not-to-exceed price for the project? If so, what is that price? If not, please explain.
- b) Would Hydro One consider providing the OEB with varying capital costs for the project that reflect different risk sharing proposals between itself and ratepayers? For example, would Hydro One consider having certain specific risks shared between ratepayers and the utility, other risks absorbed by the utility, and other risks absorbed by the ratepayers, all of which would result in a specific project cost? If yes, please fill in Table 2 with the scenarios Hydro One is willing to provide. If not, please explain.

Table 2 (Please add or remove rows in the table below, as needed)					
Scenario #	Risks borne by the utility	Risks borne by the ratepayer	Risks shared between the utility and ratepayers	Project Cost (\$)	Comments
1				\$M	
2				\$M	
3				\$M	
4				\$M	

c) Does Hydro One have any other proposals that the OEB might consider implementing in order to ensure the successful proponent brings its project into service in the timeline and cost established in this proceeding?

Response:

a)



1 b) Should the OEB wish to further explore additional alternatives, Hydro One would be happy
2 to further discuss in-camera, however at this point in time Hydro One believes the
3 Application [REDACTED] provide good
4 optionality for consideration.

5
6 c) Hydro One strongly believes a number of innovative solutions have been proposed in the
7 Application [REDACTED]
8 [REDACTED]
9

10 Another potential consideration could be to have a performance-based incentive provided to
11 the successful proponent if they are able to bring the project in-service close to or below
12 budget, with sliding benefits the further away from approved budget. For example, should
13 the project be delivered on-time and for say 2% under budget (i.e. \$629 million actual with
14 2% below updated forecast of \$641.8 million), an appropriate incentive could be paid to the
15 transmitter as a rider to future revenue requirements with reasonable consideration to sharing
16 between the proponent and customers.

NextBridge Interrogatory # 4

Reference:

EB-2017-0364 - February 15, 2018 HONI Lake Superior Link Application.

Interrogatory:

- a) Explain in detail whether the recent change in HONI's executive and its Board of Directors requires any additional or new corporate approvals from new executives and/or its new Board of Directors for the Lake Superior Link project. If so, please provide all documents that address the need for additional or new corporate approval(s) for the Lake Superior Link project.
- b) If additional or new approvals are required, provide all documents related to the approval or denial of approval.
- c) If additional or new approval is required, but has not yet been granted, provide the plan and timeframe to receive the approval or be denied the approval.

Response:

- a) The change in Hydro One's executive and Board of Directors does not necessitate the need to obtain any new approvals to pursue the construction of the Lake Superior Link Project. Hydro One's new board, effective as of August 14, 2018, has been briefed on the Lake Superior Link Project.

Should the OEB indicate that Hydro One is the preferred proponent to construct the project, Hydro One would seek final approval from the Board of Directors regarding the pricing alternatives outlined in Staff 18 in Exhibit I, Tab 1, Schedule 18.

- b) Not applicable.
- c) Not applicable.

TAB 8

Appportioning Project Costs & Risks

The capital cost to complete the Lake Superior Link Project is \$636.2 million. The cost of the work detailed through Section 1.0 below allows for the schedule provided in **Exhibit B, Tab 11, Schedule 1**.

This Application results in significant benefits for Ontario customers. These include:

- i) substantially lower costs to complete the Project
 - capital savings of \$120 million ¹
 - ongoing annual OM&A savings of \$3.2 million – the equivalent of approximately \$55 million of capital expenditures from a net present value perspective²;
- ii) a narrower corridor along the route of the line,
- iii) reduced environmental impact and physical disturbance; and
- iv) reduced risk to ratepayers by Hydro One assuming certain risks on the delivery of the Project.

1.0 PROJECT COST

The Lake Superior Link Project's cost is summarized as follows:

Table 1: Total Project Costs (\$000s)	
Development Cost ³	12,215
Construction Cost ⁴	623,946
Total Project Cost	\$636,161

¹ Hydro One's total costs of \$636,161 as provided in Table 1 of Exhibit B, Tab 7, Schedule 1 relative to the NextBridge construction costs of \$736,971 as provided in EB-2017-0182 Exhibit B, Tab 9, Schedule 1 Table 1 plus the incremental development costs incurred since designation as provided EB-2015-0216 NextBridge EWT Monthly Report – October 23, 2017 – Page 8, Table 1.

² Please refer to Exhibit B, Tab 9, Schedule 1 for further details.

³ Based on forecast cost until October 2018 - OEB forecast approval date.

⁴ Forecast construction cost contingent upon an October 2018 OEB approval of this Application.

out to a leave to construct application. A description of the reasons for any projected variances and mitigating measures should be provided. The report must also indicate the percentage of budgeted development costs spent as at the time of the report.

- iii. Schedule: The milestones completed and the status of milestones in-progress. For milestones that are overdue or delayed, the reasons for the delay, the magnitude and impact of the delay on the broader development schedule and cost, and any mitigating steps that have or will be taken to complete the task.
 - iv. Risks and Issues Log: An assessment of the risks and issues, potential impact on schedule, cost or scope, as well as potential options for mitigating or eliminating the risk or issue.
- b) UCT shall advise the Board immediately of any change to its governance, or any change in its financial status, that adversely affects or is likely to adversely affect the completion of the East-West Tie line.
3. UCT shall, within 21 days of the date of this decision, file for review and approval of the Board a revised development schedule, identifying milestones, proposed proofs of completion and target completion dates as described above. The time span for the activities in the schedule must be consistent with the schedule filed in UCT's application, taking into account the actual date of this decision.
4. A deferral account is established for UCT in which the actual costs of development of the East-West Tie line are to be recorded, from the date of this decision up to the filing of a leave to construct application, or such other time as the Board may order. The account shall include sub-accounts for the development activities listed in Attachment 1 to UCT's response to interrogatory 26 in this proceeding.
5. UCT shall, within 21 days of the date of this decision, file for review and approval of the Board a draft accounting order for the account and sub-accounts described

TAB 9

NextBridge Interrogatory # 13

Reference:

EB-2017-0364 - February 15, 2018 HONI Lake Superior Link Application, EXHIBIT B, TAB 1, SCHEDULE 1, page 2, lines 11-12.

Interrogatory:

- a) To the extent possible, breakdown the Lake Superior Link development costs and activities with the same level of detail included in NextBridge's March 14, 2018 Additional Evidence filing, Exhibit B Tab 16 Schedule 1, Attachments 1-10.
- b) Identify whether HONI conducted or continues to conduct these activities since the filing of its Application. For any identified activity, add columns that show (i) the current amount spent for each activity from the date of filing its Application to present; (ii) the projected spend to the projected in-service date; (iii) the projected spend if the in-service date is December 2022; and (iv) the projected spend if the in-service date is December 2023.
 - i. Provide the same information for a scenario in which the Lake Superior Link routes around Pukaskwa National Park.

Response:

- a) Hydro One does not track development cost with the level of detail included in NextBridge's March 14, 2018 Additional Evidence filing, Exhibit B Tab 16 Schedule 1, Attachments 1-10. Please refer to Exhibit I, Tab 1, Schedule 11.
- b) Hydro One continues to conduct development activities since the filing of its Application. Refer to Table 3 in Exhibit I, Tab 1, Schedule 11 for current amount spent and projected spend until the assumed LTC approval, currently forecast for January 2019. Receipt of LTC approval marks the end of development phase; after which construction phase starts. Therefore, questions (ii), (iii) and (iv) cannot be answered.
 - i. There is no development cost differential between going around or through the Park.

TAB 10

OEB Staff Interrogatory # 11

Reference:

EB-2017-0364 Evidence, Hydro One's Application filed on February 15, 2018, Exhibit B, Tab 7, Schedule 1, Page 1 and 3
Hydro One's Development Cost Estimates

Hydro One stated that the development costs are estimated at approximately \$12.2 million and that the forecast is based on an October 2018 approval date.

Interrogatory:

- a) Please provide an updated development cost estimate in the event that OEB approval is received by end of November, or December 2018, respectively.
- b) Please elaborate how the response in part (a) would change Hydro One's overall project budget and completion date.
- c) Does Hydro One have monthly or quarterly development cost estimates including major components? If so, please provide those current estimates.

Response:

Prior to responding to these interrogatories, Hydro One would like to inform the OEB that the Project cost estimate has been updated to reflect current information. Please also note that Hydro One's updated development costs include costs up to the OEB's decision on Hydro One's Leave to Construct application projected for January 2019, whereas in the original application in February, there was a projection of an October 2018 decision on the application.

DEVELOPMENT COSTS

The Project development costs provided at Exhibit B, Tab 7, Schedule 1, have been amended in as follows in Table 1 below:

Table 1 – Development Cost (\$ thousand)		
	February 2018	September Update
Real Estate	\$3,813	\$3,442
Engineering & Design	\$2,034	\$4,317
Environmental Approvals	\$1,949	\$4,328
Regulatory & Legal	\$1,782	\$528
First Nations & Métis Consultation	\$983	\$1,990
Project Management	\$138	\$264
Other Consultations	\$217	\$423
Interest	\$100	\$195
Overhead	\$1,200	\$1,485
Total Development	\$12,215	\$16,972

These development cost have been updated to account for various changes that have occurred since Hydro One filed its leave to construct application in February of 2018.

Real Estate Costs – Development Phase

Real Estate activities have been progressing favourably, generally in accordance with plan, but slightly behind schedule. The development costs have decreased by (\$0.37 million). At the outset, there was an approximate 8 week delay in contracting for field property agent services. In addition there was an approximate 4 week delay in establishing meaningful property owner contacts to launch direct field activities. These delays have contributed to the under expenditures to plan through a delayed offer process.

Engineering & Design Costs – Development Phase

Engineering and Design Development cost have increased by \$2.30M due to the Development phase being shifted from previously assumed LTC approval dated October 2018 to the now assumed approval in January 2019. The total Engineering and Design cost, including both Development and Construction phase costs, has increased by (\$0.75M). Consequently Construction Management, Engineering, Design and Procurement costs have been decreased in the Construction phase.

The extra work to be done in Development phase encompasses:

- Engineering survey of tower and foundation in Pukaskwa Nation Park
- Engineering work required to initiate geotechnical work in the field
- Engineering work required to define extent of construction permits
- Engineering work required so that firm offers can be obtained for fabrication and testing of tower prototypes.

Environmental Approvals Costs – Development Phase

The increase in Environmental Approvals development costs of approximately \$2.4M can be attributed predominately to the following:

- inclusion of some contingency costs in the updated cost, as the risk has been realized, (\$150K); and,
- increases in approach to environmental approvals and scope of studies and consultation (\$2.2 million).

Contingency costs realized of \$150K in the updated cost included additional activities identified as potentially being required based on a very narrow scope of an EA amendment.

Additional costs attributed to changes in approach to environmental approvals and scope of studies and consultation include:

- additional Stage 2 archaeology costs as differences in tower locations between NextBridge and Hydro One designs became evident after additional studies were completed along the route for tower siting
- a portion of the cost of the Parks Canada Detail Impact Assessment. Although either a basic or detailed impact assessment is expected under CEAA, no additional cost was originally included in the budget for this, as Parks Canada indicated they would allow use of Hydro One's provincial EA documentation for review. However, this is now not the case (as conveyed in July 2018 communication letter provided in Exhibit I, Tab 1, Schedule 14) due to the more complicated scope and the addition of the Dorion route in the Hydro One IEA, as outlined in the ToR
- a portion of the cost of the Dorion Route Alternatives. There were changes in the scope of the Declaration Order/EA that resulted from the addition of the Dorion route alternative. This increased costs for consulting, additional meetings, stakeholder consultation, reporting, travel, and various studies (eg., additional visual assessment and

simulation around Dorion, biological, human health, cultural heritage, socio economic etc.)

- a portion of about the cost of conducting an Individual EA Process concurrently with the Declaration Order approach. Based on MECP feedback, the Individual IEA Process has been undertaken in parallel with the Declaration order process. This results in additional costs to cover the IEA process, the ToR, the increased scope and study area and different processes. These cost include additional labour, consulting costs (studies for biological, human health, cultural heritage, socio-economic etc.), disbursements for meetings, consultations, documentation, reporting, travel.

Regulatory & Legal Costs – Development Phase

Regulatory and legal costs have decreased (-\$1.3M) as the original budget was based on the assumption that the OEB hearings were going to be held in Thunder Bay, increasing both internal, regulator, and intervenor funding costs. Additionally, with the combined hearing, Hydro One now assumes that the OEB will follow a similar cost sharing approach that was utilized in the NextBridge Motion to Dismiss Hearing where both transmitters will be responsible for funding the procedural costs of the hearing.

Indigenous Consultation Costs – Development Phase

The Indigenous consultation estimate has increased by (\$1 million), which is a function of increased consultation given the Environmental Assessment scope has changed from the Declaration order to an Individual EA, as well as risks that have materialized and hence been removed from project contingency. Although the preferred option remains the Declaration order, the additional studies and resources required for an Individual EA have led to an increase in the Indigenous Consultation budget to allow for the Indigenous communities to be meaningfully consulted on the Project, including the EA. Also related to the change in the EA scope, Hydro One is required to meet with 18 Indigenous communities and the Métis on a more frequent basis than originally budgeted for. In addition, the following four Indigenous communities have expressed an interest in the project and Hydro One has engaged them. Métis Nation of Ontario - North Channel Métis Council, Métis Nation of Ontario – Historic Sault St. Marie Council, Jackfish Métis Association, and the Ontario Coalition of Indigenous Peoples. Hydro One is required to consult with any Indigenous community that expresses an interest on the Project, hence the need for additional resources to accommodate the interest of these additional four communities.

1 Additional costs are also associated with the need for further consultation with two of the First
2 Nations who have a real estate permit interest in the Project. Pays Plat and Michipicoten First
3 Nation have existing on reserve real estate permits that require negotiations which leads to
4 additional costs.

5
6 Hydro One's Indigenous Consultation project costs were developed in absence of the delegation
7 letter from the Crown (Hydro One requested it in November 2017 but did not receive until
8 March 2018) with regards to consultation and therefore had to be amended to reflect delegation
9 from the Crown. Hydro One anticipated that the Ministry of Energy would identify the depth of
10 consultation required for each of the 18 Indigenous communities and assumed that the 6 BLP
11 communities would be identified as requiring deeper consultation. Although this is something
12 the Ministry of Energy is required to provide as part of its MOU with Hydro One regarding
13 consultation on projects, the March 2, 2018 delegation letter identified all 18 Indigenous
14 communities as "rights-based" and therefore Hydro One was not provided with depth of
15 consultation required for each community but instead was directed to consult with all Indigenous
16 communities equally. This leads to additional time and costs than what was included in the
17 original Indigenous Consultation estimate.

18
19 *Project Management Costs – Development Phase*

20
21 Project Management cost have increased (\$0.1M) due to Development phase being shifted from
22 previously assumed LTC approval in October of 2018 to now assumed approval in January of
23 2019.

24
25 *Other Consultation Costs – Development Phase*

26
27 Other consultation costs have increased by \$0.2M due to the requirement to consult on the
28 Dorion Route alternative.

29
30 *Interest During Construction & Overhead Capitalization – Development Phase*

31
32 Interest during construction and overhead capitalization costs were initially budgeted and spread
33 among the various cost items provided in Table 2 of Exhibit B, Tab 7, Schedule 1. Hydro One
34 has a standard methodology for allocation of interest and applies an overhead capitalization rate
35 to all its projects to account for non-direct staff's time working on capital projects. This
36 overhead rate is determined by spreading a portion of overhead staff across budgeted capital
37 projects. In this update, we have shown both of these numbers as separate line items. The

increase in costs (\$0.4M) are a function of timing and the increase in the cost update as provided above.

CONSTRUCTION COSTS

The Project costs provided at Table 3 of Exhibit B, Tab 7, Schedule 1 for Project Costs have been amended as follows in Table 2.

Table 2 – Construction Costs (\$ thousand)		
	February 2018	Sept. Update
Construction	354,030	355,530
Site Clearing, Preparation & Site Remediation	104,339	104,339
Material	58,713	58,713
Project Management	5,802	6,085
Other Costs	9,451	9,451
Construction Management, Engineering, Design & Procurement	17,828	16,304
Real Estate	9,798	10,558
First Nations & Métis Consultations	1,133	3,615
Environmental Approval	819	2,423
Other Consultations	160	30
Contingency	10,775	5,401
Interest During Construction("IDC")	42,596	43,845
Overhead	8,502	8,506
Total Construction Cost	623,946	624,800

EPC Construction Costs: (Construction; Site Clearing; Material; Other costs; Construction Management, Engineering Design & Procurement)

Construction Management, Engineering, Design & Procurement cost has decreased (-\$1.5M) due to Construction phase being shifted from assumed November 2018 to now assumed February 2019 and associated planned costs being allocated to the Development phase.

The overall cost for the fixed-price EPC contract has not changed, across the development and construction phases. Through further development work on the project, it was identified by Hydro One that some relocation costs for the T1M section of line were not included in the total project estimate although they are included in the scope of EA activities. They have since been added into the Construction phase of the project at \$1.5 million. Of note, these costs are also not

1 included in the NextBridge application, and should be borne by the transmitter selected to
2 construct the project.

3 *Real Estate Costs – Construction Phase*

4
5 The cost increase for Construction of \$0.8M to the Original Application Estimated is attributable
6 to the delays outlined in the Development Costs rationale for Real Estate above.

7
8 *Project Management Costs – Construction Phase*

9
10 Project Management cost in Construction phase have increased slightly (\$0.3M) through this
11 phase.

12
13 *Indigenous Consultation Costs – Construction Phase*

14
15 Certain costs during the construction phase of the Project have been identified to have increased,
16 such as First Nations and Métis costs and Environmental Approval costs. However, these costs
17 have been off-set by the reduction in Hydro One's contingency costs. The rationale for these
18 increased costs are explained in the section above that deals with development costs.

19
20 *Environmental Approval Costs – Construction Phase*

21
22 The increase in Environmental Approval costs during the Construction phase of approximately
23 \$1.6 million can be attributed to a number of factors including:

- 24 • \$890K in contingency costs expected to be realized during the construction phase for
25 post-EA work such as permitting and additional approvals;
- 26 • changes in the approach to environmental approvals, scope of studies and consultation as
27 a result of these activities continuing past the LTC date (approximately \$714K). These
28 items include: Parks Canada Detail Impact Assessment, Dorion Route Alternatives
29 studies, and conducting the Individual EA Process concurrently with the Declaration
30 Order approach. These additional scope activities are all described in the Development
31 Phase Environmental Approval cost increases above.

32
33 *Contingency – Construction Phase*

34
35 Estimated contingency has been reduced (-\$5.4M) due to a number of risks being materialized,
36 mostly related to Environmental Approval and Indigenous Consultation. Interest during

construction and contingency cost have been updated to reflect the changes in the updated construction costs provided above.

Hydro One's total Project costs are now approximately \$642M, an increase of less than 1% from the original filing and still considerably less than the original NextBridge estimate of \$777M.

a) An updated development cost estimate is provided as Table 3 of this response. Hydro One now expects that LTC approval will be obtained by the end of January, 2019. If approval is received by end of November or end of December, refer to Figure below for expected development costs.

Table 3 - Life to Date & Forecast Development Cost (\$000s)							
	Feb 15, 2018 (S.92)¹	Life to Date (31/08/2018)	End of Sept 2018	End of Oct 2018	End of Nov 2018	End of Dec 2018	End of Jan 2019
Real Estate	3,813	1,235	1,735	2,235	2,735	3,035	3,442
Engineering and Design	2,034	1,277	1,523	2,234	2,798	3,202	4,317
Environmental Approval	1,949	727	1,527	2,327	3,137	3,528	4,328
Regulatory & Legal	1,782	253	303	353	403	453	528
First Nations and Metis Consultations	983	57	357	657	1,157	1,490	1,990
Project Management	138	110	125	161	197	228	264
Other Consultations	217	223	273	323	373	402	423
Interest	100	18	16	25	35	46	195
Overhead	1,200	512	110	235	258	153	1,485
Total Development Cost	12,215	4,412	5,969	8,550	11,093	12,537	16,972

b) There would be no change to the overall project costs. Refer to Exhibit I, Tab 4, Schedule 3 for a scenario analysis that assesses the impact of regulatory approval delays will have on total project costs.

c) Please refer to a) above.

¹ Updated to identify interest and overheads separately

TAB 11

Response:

The requested information is provided below:

Development Costs	Total Costs	Incurred to date
Engineering, Design and Procurement	2,277	1,277
Permitting and Licensing		
Environmental Approvals	2,181	727
Regulatory Approvals	1,995	253
Land Acquisition	4,267	1,235
First Nation and Metis Consultation	1,101	57
Other Consultations	240	223
Interconnection Studies		
Project Management	154	110
Contingency		
Other (Describe)		520
Total Development Costs	12,215	4,412

The other category is interest and overhead costs incurred to date. On a budgetary basis, the interest and overhead is included in the individual line items.

TAB 12

SUMMARY OF TOPIC / ISSUE

SITUATION OVERVIEW	<ul style="list-style-type: none">▪ The East-West Tie is a 400km long 230kV transmission line project initiated in 2012 as Ontario’s first competitive process for transmission development. Hydro One submitted a Leave to Construct (LTC) application to the Ontario Energy Board (OEB) in February 2018 to design/build/own, which Hydro One renamed the Lake Superior Link (LSL).▪ Our LTC application is in competition with NextBridge, whose costs have escalated over \$300M from 2013 submission.▪ Hydro One’s proposal to develop and build the LSL is projected to cost \$636M, which, if successful, would add approx. \$15M to net income.▪ Hydro One LTC application provides Ontario rate payers with over \$100 M savings in capital costs plus \$3M reduction in annual operating costs, as compared to the NextBridge submission. Our projected completion is up to 12 months later than NextBridge.▪ Hydro One is engaging with Indigenous Communities (ICs) as part of delegated authority to consult and accommodate; in time, economic participation conversations are anticipated to enable equity partnership with ICs in the order of 34%.▪ On July 19th, the OEB dismissed a motion filed by NextBridge to have OEB reject Hydro One’s LTC application.▪ The regulatory process is on-going with the OEB. Additional evidentiary discovery and hearings are anticipated to carry through Q4 2018.								
RISKS & CONSIDERATIONS	<ul style="list-style-type: none">▪ Uncertain process through OEB review, as this project is the first with two competing LTC applications.▪ OEB has requested IESO to assess and monetize impact to power system and customers of a delay in project completion to 2021 as per Hydro One submission, and also as far out as to 2024. Potentially beneficial to Hydro One.▪ NextBridge has been consulting with Indigenous Communities for several years, and has established economic participation agreements with many. This is adding stress to relationships with some communities given their concern around losing momentum and committed benefits. Potential for continued delays re engagement and accommodation, may affect project viability & schedule however good progress has been made in past several weeks.▪ Approved expenditure to-date: \$12.2M; incurred and committed: \$4M; pursuit costs will be write-off if not successful.								
DECISIONS & NEXT STEPS	KEY DECISIONS REQUIRED	NEXT STEPS / UPCOMING MILESTONES							
	<ul style="list-style-type: none">• Environmental Assessment (EA) approval from the provincial Ministry of Environment, Conservation and Parks anticipated July 2019. Two parallel processes underway for EA submission and approval to minimize risk.	<ul style="list-style-type: none">• In midst of consultation with 18 Indigenous Communities as part of delegated duty to consult and accommodate.• EA studies on-going with plan to submit to Ministry of Environment, Conservation and Parks.• Engineering and procurement activities on-going. <table><tr><td>Anticipated OEB decision</td><td>Q4 2018</td></tr><tr><td>Planned EA approval</td><td>July 2019</td></tr><tr><td>Planned construction start</td><td>July 2019</td></tr><tr><td>Planned in-service</td><td>Dec. 2021</td></tr></table>	Anticipated OEB decision	Q4 2018	Planned EA approval	July 2019	Planned construction start	July 2019	Planned in-service
Anticipated OEB decision	Q4 2018								
Planned EA approval	July 2019								
Planned construction start	July 2019								
Planned in-service	Dec. 2021								

TAB 13

Date: January 15, 2018
Topic: Follow-up to December 8th Board Meeting, re: East West Tie
Submitted by: Greg Kiraly, Chief Operating Officer

Background

At the December 8, 2017 meeting, the Board discussed the strategic content of the proposed application for Leave to Construct (LTC) to the OEB. The Board did not approve at the meeting, and asked Management to consider alternatives based on the Board's feedback and questions and return with additional information and recommendation for consideration. The team has assessed a number of alternatives to mitigate the negative effect of the risk and associated uncertainties. All alternatives all have both risk and reward to be considered. This briefing touches on three key areas as follows:

1. Risk exposure to Hydro One regarding the Not-to-Exceed price;
2. Risk of Environmental Assessment approvals, and what that means to the not-to-exceed price;
3. Project commitment with uncertainty of First Nations partnerships.

This briefing provides information and recommended path-forward around these three key areas, and will be complemented by materials to be presented at the February meeting.

Not-to-Exceed Capital Cost

Management recommended a not-to-exceed price as a strategic differentiator to the NextBridge LTC submission, and strongly believes it would de-risk our bid being rejected by the OEB. Although Nextbridge's application is significantly higher cost, they are further advanced on the underlying project work and can offer an earlier completion date, having been selected for the development phase in 2013. A price-cap from Hydro One would likely be seen as a very attractive bid component for the regulator.

The Board expressed concern regarding the risk profile of the investment, particularly the potential for unrecovered costs given the number of uncertainties and the fixed price stipulation. The team has assessed a number of alternatives to mitigate the negative effect of the risk and associated uncertainties taking into account the fact that as the risk profile for unrecovered costs increases with the inclusion of price cap, but the risk of being rejected by the OEB also decreases. On the balance of our review, we intend to withdraw the price-cap component of our proposal. We will be returning to the Board in February to request the approval to submit the application for leave to construct, which will include our final assessment of risks and mitigation.

The proposed Hydro One LTC application to the OEB provides substantial benefits to customers as compared to the NextBridge LTC application in the form of both lower capital costs of over \$100million and lower on-going annual operation costs. The annual OM&A savings of \$5.6million, translates into an equivalent \$110million of capital savings when expressed on an NPV basis over a 30-year study period.

In the absence of the price-cap, Hydro One will continue to manage to a well-defined and tightly controlled project plan, targeting a delivery price of \$636 million utilizing fixed price lump-sum turn-key (LSTK) Engineer-Procure-Construct (EPC) contract with SNC-Lavalin.

Project Cost Comparison

During the December 8th board meeting, a number of large-scale transmission projects were referenced to demonstrate the potential for cost increase from initial approved amounts. A total project cost and variance analysis of the several referenced large scale transmission projects with cost variances has been completed and summarized below, with additional details in Appendix 1.

- Each project has its own set of circumstances and variance explanation, but on average they are at a 22% variance between the Initial Cost and Final Cost.
- Note that Final Cost in below table accounts for changes such as approved scope-change notices during project execution, as well as more impactful changes like re-routing, changes to contracting strategy, and in-flight design changes.

Project Name	<u>East West Tie</u> (Hydro One)	<u>East West Tie</u> (NextBridge)	<u>NTL Northwest BC Transmission Line</u> (BC Hydro)	<u>ILM Interior Lower Mainland Transmission</u> (BC Hydro)	<u>WATL Western Alberta Trans. Line</u> (AltaLink)	<u>EATL Eastern Alberta Trans. Line</u> (ATCO)	<u>Fort McMurray West Transmission</u> (Alberta Powerline)	<u>Bipole III</u> (Manitoba Hydro) <i>On-going</i>
INITIAL COSTS (\$M)	\$636 Target	\$737 target	\$561	\$602	\$1,499	\$1,665	\$1,430	\$3,300
FINAL COSTS (\$M)			\$736	\$743	\$1,699	\$1,900	\$1,600	\$4,600+
Variance (\$M)			\$175	\$141	\$200	\$235	\$170	\$1,300
Variance (%)			31%	23%	13%	14%	12%	39%+

Northwest BC Transmission Line (NTL) and Interior Lower Mainland (ILM) Projects had similar challenges that substantially drove project variances:

- Both contracts were initially planned under the BC Transmission Company (BCTC) entity and the concept was to utilise functional specifications and award as EPC contracts.
- During the course of the project, BCTC was re-integrated back into BC Hydro.
- The contracting strategy was changed mid-project in that BC Hydro introduced their own prescriptive standards and requirements which resulted in delay in the design period due to re-design, and changes to material and equipment to be procured
- BC Hydro introduced a requirement of live-line maintenance after the initial project budget was set. This modified the clearances and impacted the tower design, steel procurement, foundation design, line hardware. Equitable adjustments (schedule and cost) were claimed by the EPC contractor.
- On NTL, 76 structures had to be changed from lattice to monopole to fit within the revised route alignment.
- On NTL, the contracting strategy with corridor vegetation clearing was not done in a manner that drove efficient budget and schedule alignment. The clearing work was contracted directly to the FN Contractors by BC Hydro, with the contract between BC Hydro and FN Contractors. The work was project managed by the EPC contractor (Valard), but there was no tie-back to the EPC Contract. Hence corridor and access clearing requested by Valard to the FN Contractors was to BC Hydro account and wasn't being managed in an integrated cost-manner. Valard were also able to claim delays resulting from delays in the execution of the works by the FN Contractors.
- Specific to the ILM project, the general contractor (Graham-Flatiron JV) had no prior transmission line construction experience

Final cost variances on the **WATL, EATL and Fort McMurray West** projects were largely a result of changes in project evolution between the initially approved project amount, including routing changes following Environmental Assessment approvals and out-of-scope change notices approved by the utility.

The Manitoba Hydro Bipole III project has been a project with extensive changes driven largely by political forces, and has been the subject of multiple critical reviews.

- The transmission line routing was altered by the NDP government in power at the time, and resulted in a substantially longer to the west of Lake Winnipeg as opposed the original lower cost route to the east
- The Conservatives won a majority government in the spring 2016 election and immediately made substantial changes to the Manitoba Hydro board and executive. Boston Consulting Group was retained by the new Board to complete an independent review of contentious major capital projects, which is publically available.
- The incoming chair of the Manitoba Hydro board is on record as saying "Rerouting the Bipole III transmission line down the west side of the province was obviously a wrong decision, one forced on [Manitoba] Hydro by the previous government, and has cost Manitobans an additional \$900 million."
- In-flight alternatives were assessed in 2016, but it was determined the lowest-cost option was to complete construction along the updated route. The project is still on-going and forecast to be completed in late 2018.

With respect to East West Tie, Hydro One and SNC-Lavalin have taken into account the lessons learned regarding other projects in developing the proposal for the EWT. The parties have been working together in a cost-shared collaborative and open-book manner throughout the entire project development phase, which has resulted in the following differences with some of the above referenced projects:

1. Clear engineering and construction solution built on a mature and stable project specification
2. Up-front clarity and agreement on design standards, material standards, and maintenance standards to minimize extension of design cycle and re-work
3. Clarity and commitment on contracting strategy with accountability and risk management clearly defined between SNC-Lavalin and Hydro One
4. Utilization of construction contractors who are experienced with transmission line construction
5. Hydro One's solution is a generally widening of existing corridor, which is inherently less risky than creating new corridor as was the case in several of the comparator projects.
6. A contingency of \$68 million (10.7%) is included within the project total, and built upon industry best-practice of risk definition and probabilistic modeling.
7. SNC-Lavalin has extensive experience in delivering LSTK EPC projects on a fixed-price basis. A letter from the President of their Power division is attached as Appendix 4, outlining their commitment.

In the event that a designated transmitter was to incur costs beyond their approved LTC, they may elect to seek cost recovery for the incremental amount from the OEB as per established regulatory process. Hydro One would plan to seek recovery for costs prudently incurred outside of our control including such things as force majeure events; scope changes driven by government or regulatory policy; archeological discovery; changes to import duties; commodity pricing & foreign exchange risk beyond November 2018. These will be articulated in our LTC application.

Cost Benchmarking Comparison

The project team has undertaken a benchmarking and comparison review of other large-scale 230kV transmission projects in Canada which are similar to the EWT. Supporting details are contained within Appendix 2, and the following key excerpts of the benchmarking review:

- The Hydro One EWT proposal has an EPC cost of \$1.34 million per kilometer
- Similar completed comparison projects, when normalized for such factors as material and labour costs, range from \$1.27 million to \$1.37 million per kilometer. The NextBridge submission is \$1.41 million per kilometer.
- After normalizing the other projects to a unitized basis, making index adjustments for material and labour costs, and applying these factors to the 400km length of the Hydro One proposed solution, the variance across the similar projects sits in a range of -\$31 million to +\$25 million, or a -6% to +5% spread compared to Hydro One. This is a tight range and gives confidence that our unitized EPC price is appropriate.

NextBridge Interrogatory # 39

Reference:

EB-2017-0364 - February 15, 2018 HONI Lake Superior Link Application, EXHIBIT B, TAB 7, SCHEDULE 1, Page 4, lines 3-8.

Interrogatory:

- a) Explain in detail the process HONI undertook to select an Engineering, Procurement and Construction(EPC) contractor, including the firms it contacted, timing of the contacts and when the final EPC contractor was selected.
- b) Confirm that a competitive bidding process was not used. If not confirmed, provide the results of the competitive bidding process, whether SNC-Lavalin was the lowest cost bidder and the selection criteria used.

Response:

- a) Hydro One and SNC-Lavalin formed a confidential project team in early 2017, and undertook feasibility studies to determine if a technically compliant and cost-effective solution could be developed. Both Hydro One Networks and SNC-Lavalin had familiarity with the project from the EB-2011-0140 proceeding, although working with different parties at the time.

SNC-Lavalin was already one of Hydro One's vendors of record, selected through a competitive qualification process in 2015, and has been engaged primarily as an engineering vendor since then. Around the same period in 2017, Hydro One also discussed the project informally with Burns & McDonnell, another vendor of record, to determine if they had an interest or ability to work with Hydro One. Burns & McDonnell was an engineering vendor for NextBridge application, and as such were conflicted and unable to work with Hydro One.

Following initial feasibility conversations, the commercial arrangement between Hydro One and SNC-Lavalin to develop the Application was finalized between June and September 2017.

- b) Although it is confirmed a bidding process was not used for the development of the Lake Superior Link project, a competitive process was used to qualify SNC-Lavalin as an engineering vendor of record. Of note, all elements of the EPC contract are competitively sourced and subject to full open-book review between Hydro One and SNC-Lavalin.

NextBridge Interrogatory # 19

Reference:

EB-2017-0364 - February 15, 2018 HONI Lake Superior Link Application, EXHIBIT B, TAB 7, SCHEDULE 1 pages 5-9, Table 4.

Interrogatory:

- a) Provide any Monte Carlo simulation conducted by or for SNC-Lavalin to determine its contingency.
- b) Identify the amount of contingency to be carried by SNC-Lavalin.
 - i. Explain whether SNC-Lavalin contingency is a contractual obligation, and, if so, provide a copy of the contract that requires SNC-Lavalin to carry contingency, and identify the provision in the contract that obligates SNC-Lavalin.
 - ii. Identify whether HONI's construction cost estimates in Table 3 of its Application capture SNC-Lavalin's contingency cost. If yes, identify where these costs are captured in Table 3. If the costs are not captured in Table 3, explain your answer in detail.
- c) Explain the purpose of HONI carrying contingency, including what the contingency covers and does not cover.
 - i. Explain what could cause HONI to exceed its contingency.
- d) Explain the purpose of SNC-Lavalin carrying contingency, including what the contingency covers and does not cover.
 - i. Explain what could cause SNC-Lavalin to exceed its contingency.
- e) Confirm that if all other things are equal, if HONI exceeds its contingency any exceedance increases HONI's construction cost estimate. If not confirmed, explain your answer in detail.
- f) Confirm that if all other things are equal, if SNC-Lavalin exceeds its contingency any exceedance increases the HONI construction cost estimate. If not confirmed, explain your answer in detail.

Response:

- a) SNC-Lavalin confirms that a Monte Carlo analysis has been done on its Fixed Price estimate. This Monte Carlo has been done to a P-85 probabilistic simulation and was the basis of determining its contingency. The Monte Carlo will not be provided.
- b) Please refer to Exhibit I, Tab 1, Schedule 10, for the amount of contingency SNC-Lavalin is carrying in its Fixed Price estimate.
- i. Carrying contingency is not a contractual obligation, but is a prudent and necessary measure to provide a fixed price for the EPC works on the Project.
 - ii. Hydro One's construction cost estimate in Table 3 does include this contingency and is embedded in the various categories handled by the EPC fixed Price amount specifically: Construction, Site Clearing, Material and Construction Management.
- c) Please refer to Exhibit I, Tab 1, Schedule 13. Please also refer to Exhibit B, Tab 7, Schedule 1, Section V.
- d) Please refer to Exhibit I, Tab 1, Schedule 10.
- i. The SNC-Lavalin contingency is part of the Fixed Price estimate. The Fixed Price will only vary per the terms of the EPC contract which is further answered in Exhibit I, Tab 5, Schedule 7.
- e) Confirmed. As with all capital projects, including NextBridge's, if Hydro One or NextBridge exceeds its contingency the cost of the Project will increase. However, since over 85% of Hydro One's Project is defined through a fixed-price contract, the impact on ratepayers is significantly reduced should Hydro One exceed its contingency. Please refer to Exhibit I, Tab 1, Schedule 18.
- f) Please refer to part d) above.

TAB 14

1 MR. KARUNAKARAN: It's -- subject to check, it will be
2 an AACE Class 3 estimate.

3 MR. RUBENSTEIN: And based on your current schedule,
4 when would you expect to be a Class 2?

5 MR. KARUNAKARAN: Around October of this year.

6 MR. RUBENSTEIN: Thank you very much.

7 So you've obviously had an opportunity to look at the
8 NextBridge application, and you participated in their
9 technical conference, you've reviewed their application. I
10 believe at a high level I understand the position -- you
11 will be providing a variance analysis, but can you help us
12 understand why are you guys able to do it so much more
13 cost-effectively?

14 MR. SPENCER: Sure, we can speak to it, and some of
15 the details will follow in the undertaking we spoke of
16 earlier.

17 A portion of the savings are no doubt a function of
18 our optimized route through Pukaskwa, taking approximately
19 50 kilometres off the overall line length, but actually,
20 the largest differences -- I'll bucket them as follows, and
21 just to have an understanding of the NextBridge costs,
22 these are as reflected in CCC 8. But the largest portion
23 of the difference is about \$40 million of contingency, and
24 the way the Lake Superior link project is built, most of
25 our contingency is, in fact, managed within the fixed-price
26 EPC contract where, in the NextBridge case, they've moved
27 that up.

28 Now, there may as well be some contingency that is

Response:

Updated Table 3: Construction Cost ¹ is provided down below.

Table 3: Construction Costs (\$000s)				
	Original Application Estimate	Current Estimate	ACCE Estimate Level	Expenditures as at July 31, 2018
Construction	354,030	355,530	3	NA ¹
Site Clearing, Preparation & Site Remediation	104,339	104,339	3	NA ¹
Material	58,713	58,713	3	NA ¹
Project Management	5,802	6,055	3	NA ¹
Other Costs	9,451	9,451	3	NA ¹
Construction Management, Engineering, Design & Procurement	17,828	16,304	3	NA ¹
Real Estate	9,798	10,558	3	NA ¹
First Nations & Métis Consultations	1,133	3,615	3	NA ¹
Environmental Approval	819	2,423	3	NA ¹
Other Consultations	160	30	3	NA ¹
Contingency	10,775	5,401	3	NA ¹
Interest During Construction("IDC")	42,596	43,845	3	NA ¹
Overhead	8,502	8,506	3	NA ¹
Total Construction Cost	623,946	624,852	3	NA ¹

¹ Construction Cost is defined as all cost after receiving LTC approval (Jan 2019)

TAB 15

Risk Counter	Risk Title	Risk Status	Probability Ranking	Cost Impact Estimate	Schedule Impact	Additional Comments on Cost and Schedule
1	Because this EA Amendment procedure is unprecedented with the MOECC it is unclear at this time if it will be accepted by the MOECC. MOECC may require HONI to begin at a different stage gate in the IEA process (ie new TOR, or new EA). A condition required to proceed; Note risk updated in September 2018 to reduce probability ranking as more clarity around process is now available	ACTIVE	UNLIKELY 25% - 49%		Order of magnitude 2+ years for EA approval	Cost impact initially not carried as would greatly alter working assumptions; now additional cost included in LSL cost update, based on current knowledge of regulatory approval process - assuming Declaration Order or Individual EA using publicly available work from NextBridge; if NextBridge approval/work cannot be referenced then order of magnitude cost is increased by approximately \$20M
2	Additional studies, reports and/or consultation, including open houses. September 2018 update: Initially intended for EA Amendment scope. This contingency is now included in the cost, however, approach of Declaration Order and IEA for entire route add additional scope and cost which is now also included in the updated cost.	CLOSED	LIKELY 75% - 94%			Cost incorporated into updated base cost for Environmental Approvals
3	Construction delays due to above risk #2; cost included in EPC cost impact due to delays	ACTIVE	LIKELY 75% - 94%			If EA Approval granted later then Aug 2019; need to re-base schedule and cost
4	Additional cost to explore other routing alternatives for Park section. September 2018 update: Initially intended for EA Amendment scope. This contingency is now included in the cost, however, approach of Declaration Order and IEA for entire route add additional scope and cost which is now also included in the updated cost.	CLOSED	VERY LIKELY 95% - 100%			Cost incorporated into updated base cost for Environmental Approvals
5	EPC Contractor has to use four circuit towers around Loon Lake / Dorion, refer to above risk #4	Inactive	REMOTE 0% - 24%			
6	EPC Contractor has to make a bypass around Loon Lake / Dorion, refer to above risk #4	CLOSED	VERY LIKELY 95% - 100%			
7	If there is a separate commercial entity (including Hydro One as well as other entities) which will be the owner of the infrastructure within PNP will this affect the license agreement and the ability to consider this as existing infrastructure (ie not a new development)?	ACTIVE	REMOTE 0% - 24%			Potential delays to agreements; not likely cost implications; refer to schedule delay scenarios
8	A large portion of the EA document needs to be rewritten to reflect the design, construction, maintenance and operation practices of Hydro One.	CLOSED	VERY LIKELY 95% - 100%		Incorporated into updated Sept 2018 schedule	Cost incorporated into updated base cost for Environmental Approvals
9	Nextbridge IEA was intended to meet the MNRF Class EA requirements for both the disposition of Crown land and works in Provincial Parks. We will need to follow up with the MNRF to confirm that this EA and the subsequent Amendment meet their Class EA requirements. MNRF may require further information or time to conduct further Class EA work of their own.	ACTIVE	EVEN ODDS 50% - 74%		2-3 months delay to start of construction	Risk cost impact combined with risk 10
10	Nextbridge IEA was intended to meet the Ministry of Infrastructures Class EA requirements for the disposition or modification of IO/ORC lands. Nextbridge was to submit additional information to MOI under a separate cover that is not currently in the public realm. There may be no trigger for the Class EA or if there is the MOI may deem the current IEA and additional information provided by Nextbridge inadequate to meet their Class EA requirements.	ACTIVE	LIKELY 75% - 94%	\$ 1,000,000	2-3 months delay to start of construction	
11	Schedule impact due to delays under S. 35. (expropriation delaying construction)	ACTIVE	UNLIKELY 25% - 49%	\$ 1,000,000	6 month delay	
12	A written plan for construction will need to be submitted per article 8.01 of the current licence agreement. Parks Canada will not approve the modification of the route. A condition required to proceed with base scenario.	ACTIVE	REMOTE 0% - 24%			Risk would result in route around Pukaskwa National Park; development costs same
13	Parks Canada Detail Impact Assessment; September 2018 update: Although basic or detailed impact assessment expected under CEAA - no additional cost originally included in budget as Parks Canada indicated they would allow use of existing IEA document. This is not the case, as conveyed in July 2018, due to the more complicated scope and addition of Dorion route in IEA ToR.	CLOSED	LIKELY 75% - 94%		Not a Risk	Cost incorporated into updated base cost for Environmental Approvals
14	Analyses, Studies and reports within the EA will need to be amended to reflect the changes in routing and construction practices (such as ROW width, access). Many of these studies are time sensitive and seasons specific. We may need 4 seasons to complete all of the necessary studies. There is also the risk that early access agreements will not be in place to allow for conducting the studies at the appropriate time.	ACTIVE	UNLIKELY 25% - 49%		6 month delay to start of construction	Cost captured in Risk 20
15	Delay in coordinating Indigenous monitors which may be required for various studies including Archaeology and Natural Heritage.	ACTIVE	UNLIKELY 25% - 49%		6 months delay to construction start	Not likely a significant additional cost, only affects schedule and any resulting costs from schedule delay

Risk Counter	Risk Title	Risk Status	Probability Ranking	Cost Impact Estimate	Schedule Impact	Additional Comments on Cost and Schedule
16	The reaction by Indigenous communities to additional consultation from Hydro One is uncertain. Indigenous communities may be limited in the extent they can share information with Hydro One given existing agreements with Nx. (Cost Incorporates risks 26-29)	ACTIVE	EVEN ODDS 50% - 74%	\$ 1,000,000	6-12 month delay to construction start	
17	If leave to construct is awarded to Hydro One and Nx EA is not complete there is a risk of Nx not completing the EA.	ACTIVE	EVEN ODDS 50% - 74%		6 months delay to construction start	Cost implications difficult to determine, as it is not clear if portions of NextBridge work may be utilized by Hydro One; refer to Risk 1
18	Indigenous monitors may need to be present for Geotechnical studies.	ACTIVE	VERY LIKELY 95% - 100%		3-6 month delay to construction start	Cost risk captured in Risk 15
19	Permits for such things as water crossings, roads, tree clearing etc. may run into delays or added costs depending on availability and requirements of Regulatory staff and other stakeholders (ie Sustainable Forest Licences).	ACTIVE	EVEN ODDS 50% - 74%	\$ 1,200,000	(3-6 month delay)	
20	There is a risk that various environmental features may delay, post-pone or constrain construction activities by imposing timing restrictions. Eg. Species at Risk, nesting birds, water crossings, wet terrain. May also result in unplanned studies or mitigation.	ACTIVE	LIKELY 75% - 94%		SNCL Risk	
21	Stage 2 Archaeology, Cultural Heritage Evaluation Report and Heritage Impact Assessment may have findings that could result in additional studies (such as Stage 3 or 4 archaeological investigations) if mitigation or avoidance is not possible.	ACTIVE	EVEN ODDS 50% - 74%		Exclude from risk model and capture in S92 conditions	
22	Archaeological findings may cause delays to construction and modification to construction access routes or structure locations. Archaeology may not be fully complete before construction begins and may result in the adjustment to construction staging. May cause delays which may result in CCN's.	ACTIVE	EVEN ODDS 50% - 74%		Exclude from risk model and capture in S92 conditions	
23	Requirement for clearance letters from MTCS can cause delays by slow turn around.	ACTIVE	REMOTE 0% - 24%	\$ 600,000	1-2 month delay in construction start	
24	Environmental Monitoring commitments made in the IEA and required by Regulator Permits may result in added analysis, studies and reports (ie Turbidity and Total Suspended Solids at water crossings).	ACTIVE	LIKELY 75% - 94%		SNCL to take on risk of construction delays	
25	POST EA Work During and Post Construction may be higher than anticipated	CLOSED	VERY LIKELY 95% - 100%			Cost incorporated into updated base cost for Environmental Approvals
26	Indigenous communities may decide to remove themselves from the consultation process, which can affect the consultation budget.	ACTIVE	REMOTE 0% - 24%		combine with 15	Risk cost captured in Risk 15
27	Indigenous communities may request additional meetings in order to conclude the consultation process which can delay necessary approvals and affect the consultation budget	ACTIVE	REMOTE 0% - 24%		combine with 15	Risk cost captured in Risk 15
28	Indigenous communities may raise issues that Hydro One cannot respond to and must be addressed by the Crown, which can delay necessary approvals and affect the consultation budget.	ACTIVE	REMOTE 0% - 24%		combine with 15	Risk cost captured in Risk 15
29	Additional Indigenous communities may assert rights in the Project area and request to be consulted which can delay necessary approvals and affect the consultation budget.	ACTIVE	REMOTE 0% - 24%		combine with 15	Risk cost captured in Risk 15
30	The risk of the regulatory approval taking longer than anticipated and not having visibility on when the EA approval will be received	ACTIVE	LIKELY 75% - 94%			If EA Approval granted later then Aug 2019; need to re-base schedule and cost
31	Land Value Study results lower than individual full narrative property appraisals.	CLOSED	UNLIKELY 25% - 49%			Risk materialized; cost impact (\$500K) reflected in revised base budget
32	Property owner delayed authorisation or refusal to grant access for studies and assessments prior to s.92 approval.	ACTIVE	REMOTE 0% - 24%		minimal schedule impact	
33	Refusal to grant option for permanent lands rights, necessitating e	ACTIVE	EVEN ODDS 50% - 74%	\$ 2,400,000	nil	Construction can be managed around the 14-18 months expropriation process, without impacting I/S
34	Compensation for Business Disruption/Loss associated in the grant of permanent land rights.	ACTIVE	UNLIKELY 25% - 49%	\$ 800,000		

Risk Counter	Risk Title	Risk Status	Probability Ranking	Cost Impact Estimate	Schedule Impact	Additional Comments on Cost and Schedule
35	Underlying rights within Provincial Crown lands, e.g. minerals (consent approval).	ACTIVE	EVEN ODDS 50% - 74%	\$ 500,000		
36	Project requirements for route result in impact to primary residence or major out building (Buyout/Relocation).	CLOSED	UNLIKELY 25% - 49%			Risk materialized; cost impact reflected in revised base budget
37	Obtaining agreement and associated permits from FN (Pays Platt and Michipicoten) to accept current rental formula with other FN (annual amount).	ACTIVE	LIKELY 75% - 94%			Cost impact, if materialized is on OM&A
38	Undefined access road for temporary requirements (relying on preliminary information).	ACTIVE	LIKELY 75% - 94%	\$ 525,000		
39	Unable to procure necessary Land Agent resources in a timely manner (substitute with internal staff).	ACTIVE	REMOTE 0% - 24%	\$ 260,000		
40	Real Estate Buyouts found in the last moment (already addressed within Risk 36).	CLOSED	VERY LIKELY 95% - 100%			Risk materialized; cost impact reflected in revised base budget
41	IESO may reject the 15 days double circuit outage as it does not consider it as a valid plan	CLOSED	REMOTE 0% - 24%			
42	15 days double circuit outage cancelled two weeks before scheduled start date. New start date moved to following year.	ACTIVE	REMOTE 0% - 24%	\$ 5,000,000		
43	15 days double circuit outage delayed for one week, 1 day before original scheduled start date.	ACTIVE	REMOTE 0% - 24%			
44	Single circuit outage(s) start delayed four hours in the morning of starting daily outage (\$100k per instance)	ACTIVE	EVEN ODDS 50% - 74%	\$ 600,000		
45	Communication cost due to POST EA Work During and Post Construction may be higher than anticipated	ACTIVE	VERY LIKELY 95% - 100%	\$ 300,000		
46	Risk that Indigenous Communities request more than industry-typical study scopes	ACTIVE	EVEN ODDS 50% - 74%			Cost risk captured in Risk 15
47	MECP does not approve NxB EA by end of Q4 2018 as anticipated	ACTIVE	VERY LIKELY 95% - 100%			Result is delay and associated cost as described in Risk 30
48	MECP does not approve NxB at all and transfers all issues to H1	ACTIVE	EVEN ODDS 50% - 74%			Similar implications to Risk 17: Cost implications difficult to determine, as it is not clear if portions of NextBridge work may be utilized by Hydro One; refer to Risk 1
49	HONI is not granted Dec order, CEAA approval by August 15/19	ACTIVE	EVEN ODDS 50% - 74%			Result is delay and associated cost as described in Risk 30
50	Delay to project due to MECP tying Station EA approval to Dec order/IEA approval for LSL	ACTIVE	EVEN ODDS 50% - 74%		Current Jan 2019 EA approval as expected maintains in-service date of Dec 2021	Delay beyond that in assumptions will result in delay and associated cost as described in Risk 30

TAB 16

v. RISKS ELEMENTS NOT INCLUDED IN THE HYDRO ONE PRICE

No contingencies have been made for the following unlikely events and reasonable price adjustments would be submitted to OEB for prudency review only after all other recourses have been exhausted:

- Labour disputes;
- Safety or environmental incidents not covered by the insurance program of Hydro One;
- Significant changes in costs of materials, commodity rates and/or exchange rates post-October 2018) (NB: the dollar amount subject to these risks is less than 8 percent of total project costs);
- Any conditions imposed by regulatory bodies or Governmental agencies;
- Force Majeure events.

vi. COSTS OF COMPARABLE PROJECTS

A comparable project constructed by Hydro One would be the Niagara Reinforcement Project as it will also be a new 230 kV line upon completion. Due to the unique construction arrangement for the Lake Superior Link, two similar high-voltage projects completed by SNC-Lavalin have also been included in **Table 5**. Lastly, for ease of reference, Hydro One has also included the NextBridge East West Tie Line Project submission for comparative purposes.

TAB 17

Table 1 – EA Approval Date Scenario Analysis					
		EA Delay			
Schedule - Preferred Route	Baseline	1 Month	3 Month	5 Month	12 Month
Submit Section 92 Application to OEB	Feb-2018	Feb-2018	Feb-2018	Feb-2018	Feb-2018
Projected Section 92 Approval	Jan-2019	Jan-2019	Jan-2019	Jan-2019	Jan-2019
Finalize EPC Contract with SNCL	Feb-2019	Feb-2019	Feb-2019	Feb-2019	Feb-2019
Environment Assessment and Consultation					
Obtain EA Approval from MOECC	Aug-2019	Sep-2019	Nov-2019	Jan-2020	Aug-2020
Ongoing Stakeholder Consultations	Dec-2021	Dec-2021	Dec-2021	Dec-2022	Dec-2022
Lines Construction Work					
Real Estate Land Acquisition	Mar-2020	Mar-2020	Mar-2020	Mar-2020	Mar-2020
Detailed Engineering	Feb-2019	Feb-2019	Feb-2019	Feb-2019	Feb-2019
Material Deliveries	Jul-2020	Jul-2020	Oct-2020	Dec-2020	Jul-2021
Construction Completion	Sep-2021	Oct-2021	Dec-2021	Nov-2021	Sep-2022
Commissioning Completion	Dec-2021	Dec-2021	Dec-2021	Dec-2021	Dec-2022
In Service Date	Dec-2021	Dec-2021	Dec-2021	Dec-2021	Dec-2022
Cost Impact (\$000s)	\$0	\$0	+\$1,359	+\$4,472	+\$14,761

TAB 18

DRAFT - PRIVILEGED AND CONFIDENTIAL - PREPARED IN ANTICIPATION OF LITIGATION

Table 5: Cost Estimate Change

<u>Line</u> (a)	<u>Reference</u> (b)	<u>Description</u> (c)	<u>Amount</u> (d)	<u>% of Total</u> (e)
1		<u>Unbudgeted at Designation</u>		
2		First Nation and Metis Participation		
3	B-2	Development Phase	\$ 3,291,082	
4	E-20	Construction Phase	7,000,000	
5	B-2	Pic River Appeal	230,163	
6		Financing		
7	B-2	Carrying Charges (Development Phase)	813,432	
8	E-20	Interest During Construction (Construction Phase)	31,003,000	
9		Total Unbudgeted at Designation	\$ 42,337,677	11.9%
10		<u>New Scope Requirements</u>		
11	E-2	Route Alterations	\$ 66,919,593	
12		Weather Adjusted Structures		
13	E-3	50 to 100 Year Structure	7,786,399	
14	E-4	Additional Structures	806,964	
15		Total Weather Adjusted Structures	8,593,363	
16	E-5	Hydro One Line Crossings	5,473,580	
17	E-6	MNRF Conservation Reserve Requirement	1,526,344	
18	E-7	Timber Stacking and Loading	20,997,947	
19		Total New Scope Requirements	\$ 103,510,828	29.0%
20		<u>Other Unforeseeable Factors</u>		
21		Project Delay		
22	B-3	Development Phase	\$ 11,917,552	
23	E-8	Construction Phase	57,190,900	
24		Total Project Delay	69,108,452	
25	E-9	Cost of Imported Materials	19,136,691	
26		Total Other Unforeseeable Factors	\$ 88,245,143	24.8%
27		<u>Development Phase Refinements</u>		
28	E-10	Self-Supported Structure Utilization	\$ 30,652,205	
29	E-11	Foundation Cost	45,566,957	
30	E-12	Grounding Cost	4,628,083	
31	E-13	Access Road Optimization	4,202,523	
32	E-20	Environmental	8,084,955	
33	E-20	Land Rights	5,518,265	
34	E-20	First Nation and Metis Consultation	6,333,693	
35	E-20	Other Consultation	1,392,201	
36	E-20	Regulatory	1,452,465	
37	E-20	Project Management	1,403,411	
38	E-20	Site Remediation	3,551,775	
39	E-20	Contingency - Non_E&C	757,274	
40	E-14	Contingency - E&C	11,109,314	
41		Other	(2,185,640)	
42		Total Development Phase Refinements	\$ 122,467,482	34.3%
43		Total Project Cost	\$ 356,561,130	100.0%

TAB 19

1 to construct application requests approval for costs to construct the East-West Tie Line
2 that substantially exceed the costs submitted by NextBridge in the designation
3 proceeding. NextBridge's Application and quarterly reporting also indicates that
4 development costs are expected to increase by an additional \$20.4⁹ million over the
5 \$22.4 million allowed in the designation process. As a result of what the Minister of
6 Energy described as a "significantly higher" cost estimate filed with the OEB by
7 NextBridge, the Ministry of Energy asked the IESO to update the Needs Assessment of
8 the Project¹⁰ and confirm whether the Project is still needed. In light of the disclosure of
9 NextBridge's substantially higher cost to construct the designated line, Hydro One felt
10 compelled, on behalf of Ontario's ratepayers, to assess its own ability to construct a
11 more cost-effective solution. On December 1, 2017 the IESO reconfirmed the need for
12 the East West Tie line¹¹.

13
14 As the line is still required, Hydro One believes it can construct it in a more economically
15 efficient manner. Hydro One is confident in its ability to deliver the Project for \$120
16 million less than NextBridge's submitted price primarily due to a more efficient route
17 which is 10% shorter, traversing through the Pukaskwa National Park parallel to existing
18 Hydro One infrastructure as well as an optimized tower design to reduce material and
19 construction costs. In addition to the forecast cost savings, the Lake Superior Link is
20 expected to have significantly less impact on land use and environmental conditions in
21 northwestern Ontario than the alternative, consistent with government policies.

⁹ EB-2015-0216 NextBridge EWT Monthly Report – October 23, 2017 – Page 8, Table 1: Development costs are now estimated at \$42,768,001

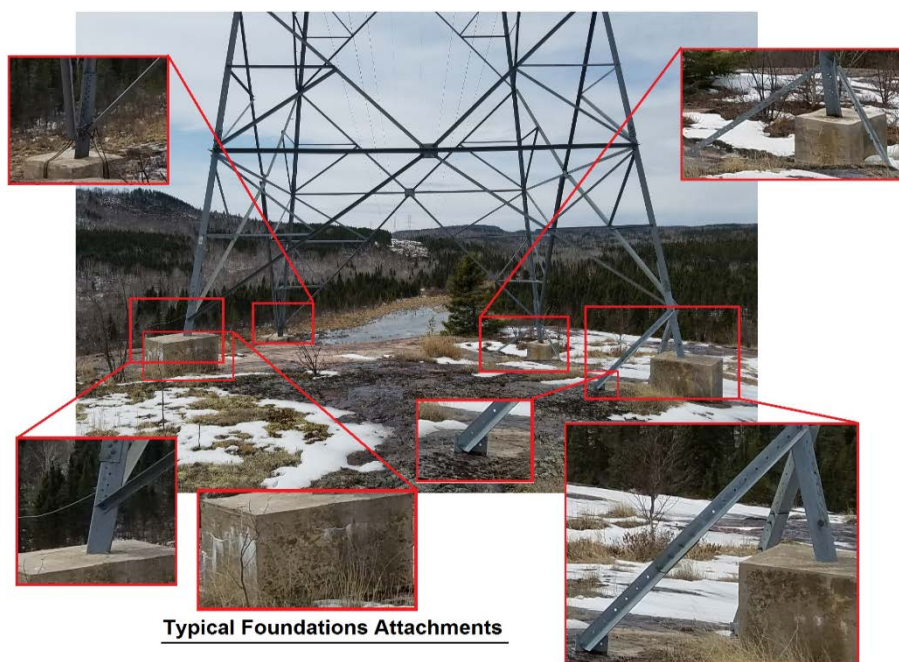
¹⁰ Exhibit B, Tab 3, Schedule 1, Attachment 1

¹¹ Exhibit B, Tab 2, Schedule 1, Attachment 2

TAB 20

Existing Foundation to Structure Connections:

The existing foundations need to be inspected. As indicated in the photo below of a typical structure on this line, the original design provided some flexibility for installation of the tower, but, also, resulted in large unbraced lengths of the stub angle. For example, as seen in the left front foundation, the stub angle is unsupported from the diagonal bracing to the top of foundation (about 41cm (16") assuming a 20cm (8") leg width). This section must resist combined axial load and shear and it is very unlikely even the original tower leg load with combined shear is sufficient under current design codes. As seen on the right front and back leg, the stub angle is braced below the diagonal and secured to the ground with a clip angle and one bolt. To assume adequate support, this diagonal member, bolts, and anchor bolt need to be inspected to assure the integrity of this support system. Based on this limited information (one photo) and no original design drawings, a complete review of the existing foundation capacity must be undertaken. A new guyed tower will develop much higher axial loads and likely the existing stub angles will be inadequate as currently braced. In addition, the concrete is starting to develop cracks that are propagating as seen in the lower left corner detailed view below. Without a more thorough investigation it is not clear if the stub angle or reinforcement is compromised. Below grade conditions are also unknown.



Additional Considerations

The attached configuration presented by Hydro One at the open house does not meet the following requirements: (1) the OEB's shielding requirement of 15° (shown as 32°); (2) the OEB's galloping clearances of 1.02M between phases; and (3) the horizontal phase to phase separation between circuits as required by CSA 22.3 No. 1. Also, the conductor blow out will exceed the ROW limits under high wind conditions.

would be impacted. The installing of at least two failure containment structures would require additional effort, and, at this time, it does not appear that Hydro One has considered, analyzed, or will include containment structures in this section.

Refer to items F, G and H above.

P. Existing Foundation to Structure Connections:

The existing foundations need to be inspected. As indicated in the photo below of a typical structure on this line, the original design provided some flexibility for installation of the tower, but, also, resulted in large unbraced lengths of the stub angle.

During the design phase, a thorough engineering review of the as-built drawings of the existing foundation types was completed to assess their suitability for supporting the new quad circuit structures. It has been determined that the existing types of foundations utilized on the structures within the Park are suitable to support these new quad circuit structures provided that guy wires are added to the new structures. Following a detailed site survey, the existing foundations will be refurbished and reinforced to the new conditions, as required.

Q. *A new guyed tower will develop much higher axial loads and likely the existing stub angles will be inadequate as currently braced. In addition, the concrete is starting to develop cracks that are propagating as seen in the lower left corner detailed view below. Without a more thorough investigation it is not clear if the stub angle or reinforcement is compromised. Below grade conditions are also unknown.*

Hydro One will be conducting an extensive on site investigation to survey the existing foundations and their stub angles. The final quad circuit tower structure will be designed taking into account the results of this survey to ensure that the new structures are compatible with the existing foundation stubs. Further, as part of this investigation, any potential issues relating to the foundations can be found at the design stage and therefore engineered and implemented during the project scope within the project schedule.

Hydro One periodically inspects the existing EWT, including the section through the Park. These inspections consist of visual surveys of the line including condition of the visible foundation structures. If foundations are seen to be in need of repair, the appropriate maintenance is performed to ensure continued integrity. To date no foundations have required any major repair.

R. The attached configuration presented by Hydro One at the open house does not meet the following requirements: (1) the OEB's shielding requirement of 15° (shown as 32°); (2) the OEB's galloping clearances of 1.02M between phases; and (3) the horizontal phase to phase separation between circuits as required by CSA 22.3 No. 1. Also, the conductor blow out will exceed the ROW limits under high wind conditions.

The memorandum refers to a picture of a sketch meant only to visually demonstrate the profile of the quad circuit towers through the Park. All the structures will be designed to meet the OEB requirement of 15°. In addition the phase separation between circuits is 5.7 meters which exceeds the requirements of CSA 22.3. Figure N° 1 below of the quad circuit towers below demonstrates the proper geometry.

All the structures will be designed to meet the following galloping clearances:

TAB 21

OEB Staff Interrogatory # 2

Reference:

EB-2017-0364 Evidence, Technical Conference on Nextbridge's Motion on Hydro One's Lake Superior Link Application, Transcript Pages 254-255.

MR. ZACHER: Fair enough. The second question I wanted to ask -- I'm not sure if this is for you, but I wanted to ask about the two week outage that Hydro One forecasts taking in August of 2020, and this is to replace the 87 towers in the park. And so the first is how did Hydro One forecast two weeks to get that work done?

MR. KARUNAKARAN: So it was done through consultation with us and SNC-Lavalin and their construction methodologies that we were going to use for the replacement of those towers.

MR. ZACHER: I'm going to betray my ignorance of construction, but 87 towers in two weeks, and you are also upgrading the foundations at the same time; is that right?

MR. KARUNAKARAN: So there is a lot of preparatory work that gets done prior to the actual outage being taken, right. The anchors and so forth for the guy wires and so on are all installed. The assembly works of the actual structures and so forth are done in off-site fly yards, and so hence I said there's a lot of preparatory work that gets done in advance, right. Under the actual outage itself, the activities are really to drop the conductor, for lack of better terms, fill the old towers, remove them with the helicopter, install the new towers in location, prep up on the guys and wait them within the existing conductors.

MR. ZACHER: And I think Mr. Henderson had asked questions earlier, and indicated there is no road access. So this is all access by helicopter.

MR. KARUNAKARAN: That is correct.

MR. ZACHER: So is there any sort of reference points or historic examples that you can sort of point to doing this sort of work in the -- over the course of two weeks?

MR. KARUNAKARAN: We've engaged with a number of the actual field construction staff that we would be utilizing for this in determining the schedule, and they have direct experience of -- when we've done projects, say, in Alberta and the like where comparable construction rates have been utilized with respect to production rates.

1 **Interrogatory:**

- 2 a) Has Hydro One ever constructed 87 230 kV quad (or double circuit) towers of similar design
3 within a span of two weeks in the province of Ontario? If yes, please provide the examples.
4
- 5 b) Will all the required construction work (removal of all existing towers and lines,
6 reinforcement of existing foundations, replacement of existing foundations as required, and
7 erection of new quad towers and stringing of the four transmission circuits and associated
8 communication cables) be completed in the two-week window within the Pukaskwa National
9 Park? Please provide Hydro One's construction and resourcing plans that outline the details
10 of how this aggressive timeline will be met.
11
- 12 c) Has Hydro One taken into account potential weather-related delays for the two-week
13 schedule considering it plans to use helicopters to install the new quad towers? What
14 mitigation plans does Hydro One have to correct for weather-related delays to ensure the
15 overall project remains on schedule?
16
- 17 d) Is the geographical location for the proposed quad towers within the Pukaskwa National Park
18 a major risk factor in Hydro One's ability to meet the in-service timeline? Please explain.
19
- 20 e) If the outage window that Hydro One is proposing to take in August 2020 to install the quad
21 towers within Pukaskwa is missed, when is the next two-week window? What impact would
22 this type of delay have on Hydro One's ability to meet its proposed in-service date in 2021?
23
- 24 f) Have there been any communications between the IESO and Hydro One regarding the
25 proposed two-week outage? If so, has the IESO agreed to Hydro One's proposed two-week
26 outage, in principal? Please provide details of any discussions/communications and copies of
27 all correspondence between Hydro One and the IESO with respect to this matter.
28
- 29 g) What happens if Hydro One's proposed work takes longer than two weeks?
30

31 **Response:**

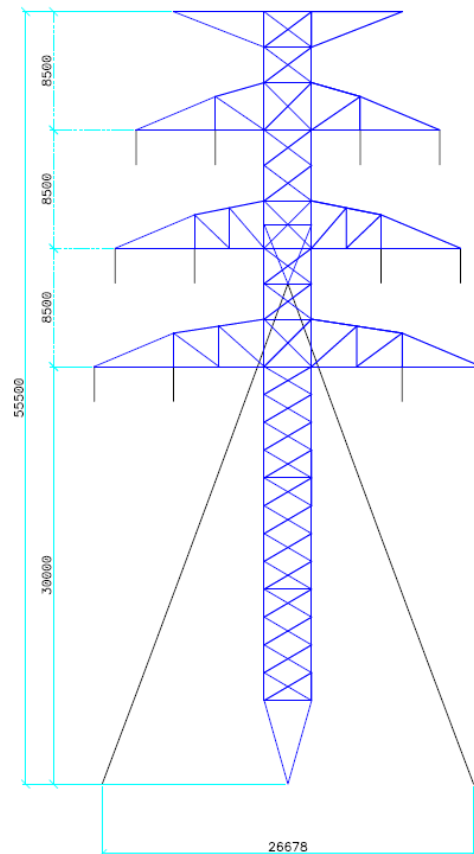
- 32 a) No, Hydro One has not had the need to construct 87, 230 kV quad circuit towers in a span of
33 two weeks. The construction of the LSL Project will be undertaken by SNC-Lavalin through
34 an EPC contract.

TAB 22

b) The self-imposed mandate for the construction within the Pukaskwa National Park (“the Park”) is to:

- (1) utilize the existing 150’ ROW
- (2) complete the necessary scope in a single two-week outage, and
- (3) minimize the ground disturbances within the Park.

Hydro One has recently determined that the number of foundations requiring replacement is significant enough that it would be preferable to adopt a different design for the new quad structures. Hydro One and SNC’s engineering and outage planning teams have now proposed and adopted an alternative design to the Quad Circuit structures which has been discussed with Park staff. The alternative design consists of a single mast structure offset linearly (front or back) from the existing location. These alternate structures require only a single foundation, installed prior to the outage, and will enable the decommissioning of the old foundations, as well as other advantages.



1 Prior to the outage, work will commence to install all foundations and the four guy
2 anchors for the 87 guyed structures under the still-energized line. All 87 structures will
3 be assembled in three flight yards located on either side of the Park. The guy wire,
4 insulators and travelers will be attached to the assembled structures.

5
6 During the two-week outage, the heavy lift helicopters, with a capacity of 24,000 lbs, will
7 be engaged for the installation of the new structures and the decommissioning of the
8 existing structures. For every new structure, two helicopter lifts are required, while for
9 every existing structure removal, one lift is required. Each helicopter crew is capable of
10 achieving on average seven structures per day.

11
12 c) Yes, weather delays are accounted for in the production rate. The following contingency
13 mitigations will be implemented:

- 14 • The new offset locations allow the existing structures to remain in place until the new
15 structures are fully erected. This provides flexibility to manage the risks, if
16 necessary, by allowing the 15-day outage to be extended, with the ability to recall the
17 EWT line when required during the extension period.
- 18 • If an outage extension in 2020 becomes necessary due to unexpected interruptions
19 and is not permitted, the existing transmission line will remain in-service and a
20 second outage would be required in 2021 to complete the Project.

21
22 d) No.

23
24 e) Hydro One is not currently aware of the next available window. However, Hydro One will
25 work with the IESO to arrange another suitable window to accommodate the required outage
26 to maintain the schedule.

27
28 f) Hydro One has met with the IESO and discussed the Lake Superior Link's baseline outage
29 requirements. The IESO has agreed in principle to this request. Additional conversations
30 have occurred with Ontario Power Generation (OPG), Manitoba Hydro Electric Board
31 (MHEB) and Minnesota Power (MP), as these entities' participation will also be instrumental
32 in supporting the outage posture. Hydro One will continue the discussions with the IESO and
33 additional stakeholders on a regular basis in preparation for the two-week outage, currently
34 scheduled for the period of August 10 – 24, 2020.

- 1 • Hydro One has submitted the outage request to the IESO (Exhibit I, Tab 1, Schedule
- 2 2, Attachment 1).
- 3 • Exhibit I, Tab 1, Schedule 2, Attachment 2 reflects the discussions between Hydro
- 4 One and the IESO regarding this outage.
- 5 • Exhibit I, Tab 1, Schedule 2, Attachment 3 is Hydro One's request from the IESO to
- 6 acknowledge the discussions and the plan for this outage.
- 7 • Exhibit I, Tab 1, Schedule 2, Attachment 4 is the IESO's acknowledgement of the
- 8 discussions and the plan for this outage.
- 9

10 g) Hydro One does not anticipate any need for an outage beyond two weeks. The outage plan
11 has been developed to maximize all possible work (mobilization, yard preparation,
12 foundations, tower assembly, etc.), before starting the outage. This will ensure that the outage
13 time can be optimized to replace the towers. However, should the need arise due to an
14 unexpected delay, please refer to contingency mitigations provided in response to sub-part c)
15 of this interrogatory.

1 **Response:**

2 a) All the foundation will be new. For more information, please refer to Exhibit I, Tab 2,
3 Schedule 24, Attachment 1. The existing foundations will be decommissioned. The impact
4 to the environmental footprint for upgrading the existing foundations for the four circuit
5 towers will be a net benefit. Through additional engineering design and consultation with
6 Parks Canada, Hydro One has optimized the tower design to reduce the foundation footprint.
7 The proposed tower design will require only one footing. The previous four footings for
8 each tower will be cut off at grade and the areas allowed to re-naturalize, thus reducing the
9 environmental footprint through the Park. This optimized design is the basis for current
10 consultation with Indigenous Communities, Parks Canada and other interested parties.

11
12 b) – e) Please refer to part a) above.

Conclusion

In conclusion, using the Hydro One existing line section in the Park with guyed quad circuit structures and existing foundations poses high risks. For example, a thorough review of all foundations above and below grade is critical. The stub angle design needs to be reviewed since, as detailed herein, it likely will not support the existing design loads, and with greater axial loads it would need to be modified. While it may appear expedient to use the existing line and foundations to reduce initial costs, future maintenance efforts and costs will likely be greater with forty year old foundations and existing conductors and insulators. Also, without a full understanding that the new quad circuit tower designs have been fully tested, it is questionable whether Hydro One has accurately accounted for the costs of the design, as it appears the design is far from final. New guy anchor installation may require additional ROW. Acquisition of new ROW would impact the project by potentially delaying the installation of the guy anchors. Installation and testing of the guy anchors will also impact the Park. Further, the potential impact to the Park could be significant if a major failure such as a longitudinal cascade occurs. Without a failure containment structure, there is a significant risk associated with Hydro One's proposal. Since the guy system is critical to the support of the proposed quad tower, a failure of one guy could result in a transverse failure under high wind loading. A failure containment structure would not prevent this type of tower failure.

As mentioned, the IESO recognizes the significant impact of the loss of only one structure on the 35km section and states "[e]xtreme contingencies that result in the loss of the four 230 kV circuits of the East-West Tie such as failure of a quadruple circuit tower can result in separation between the Northwest transmission zone and the rest of the IESO-controlled grid." The IESO acknowledges the risks of failure in the 35km section in the Park which would affect four circuits (two important lines) yet Hydro One is proposing to build a new quad structure on forty year old foundations. Hydro One has not provided information and evidence demonstrating that it has conducted industry accepted steps and tasks related to the consideration of a new tower design. As explained herein, there are fundamental processes, including industry accepted testing, that need to be completed prior to understanding the implications of Hydro One's proposal on the ability of the designs to be constructed and operated reliably.

viii. If not in these documents, explain if any ground based access will be required in the Park and will any roads be constructed in Pukaskwa National Park. If roads will be constructed, explain whether all roads will be within the existing East West Tie Line right of way.

Response:

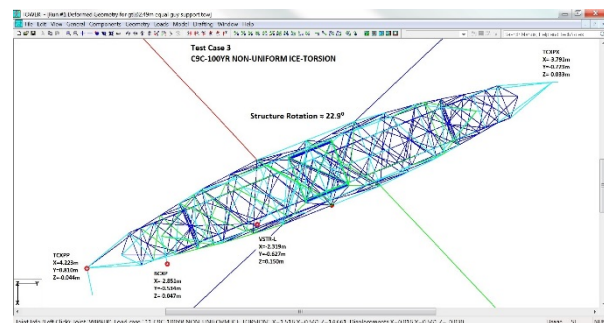
a) Documents will not be provided due to proprietary reasons.

- i. The existing conductor through the Park will be reused. While component replacements, specifically insulators, are planned by Hydro One in the next 10 years, we do not expect to replace the conductors. In addition, condition assessments are also planned at the same time and based on the current age, the conductors should remain in use for another 30-40 years. As a result, the existing conductor will not be replaced as the outage scope is focused on adding the new required infrastructure for the Lake Superior Link Project. The alternate quad circuit towers are such that they can be erected before the removal of the existing dual circuit towers. In doing so the existing EWT conductors can be installed in temporary wood structures or protected on the ground as deemed necessary in order to provide enough working space for the structure installation. The conductors will be transferred to the quad circuit towers without them touching any obstacle or stressing the conductors. The cost of transferring and protecting the conductor during the transfer is included in the construction costs of Table 3
- ii. Tower steel for this section of the line will be delivered to lay down areas outside of the park. All towers will be pre-assembled inside the lay down yard and flown to their final location during the two week outage. Refer to Exhibit I, Tab 2, Schedule 53 and Exhibit I, Tab 1, Schedule 2, for further details.
- iii. Verification is ongoing and planned to complete by October 2018.
- iv. See ii. Above
- v. We do not envisage use of lands outside of the ROW within the PNP.
- vi. See ii. Above
- vii. Temporary structures are not required for this work

at this time, thus it is unlikely Hydro One can accomplish full-scale testing in less than 8-9 months. If the testing shows design flaws, redesign of the tower and re-testing can take up to 2-3 months. Without a full-scale test of this new quad structure, Hydro One is not meeting an industry accepted approach for ensuring its tower design is safe and reliable.

Location and Installation of “new” Guy Anchors: It is likely that contrary to Hydro One’s plans, the newly installed guy anchors on the quad towers will require additional construction within the Park. There is no basis in Hydro One’s evidence (Exhibit C, Tab 1, Schedule 1, page 8), that the use of guy anchors will not result in a widening of the transmission corridor. Hydro One must provide fully designed and tested quad towers for each of the 87 locations to know whether it can implement its proposed design without widening the transmission corridor. If the anchors are installed outside of the right-of-way (ROW), land acquisition and additional clearing may be necessary. Sidehill variations can result in long guy leads and further clearing in the Park and a greater widening of the ROW. Of additional concern is impact to a guy from a tree falling which could result in a failure to the tower. To illustrate this point, attached to this memorandum is a depiction of how far from the tower the anchor guys will need to be placed because of the terrain in the Park.

Second-order Effects on the Freestanding “Guyed” Structure with Regards to Structure Displacement: The interaction of the structure and guys are unknown without a review of the proposed structure model. However, as shown in the figure, the amount of torsional displacement for a pinned guyed structure shows the torsional effect on the structure.



The rotational movement reduces the longitudinal loading with a “pinned” mast, but it must be resisted by a freestanding structure. Guy pre-tension in guyed pinned structures allows some variability as the structure is free to move until equilibrium is met. For freestanding guyed structures, it is critical that the guy pretension is maintained. If the pretension slacks off, the support at the guy location will not be effective, and, thus, it will not support the structure. Maintaining a proper pretension in the guy for freestanding towers requires an additional level of maintenance. Hydro One has not provided the information necessary to understand whether it has addressed these issues in its tower design.

The Lack of Any Failure Containment Structures Within the 35km (~22 mile) Corridor:

Utilizing the existing foundations and ROW limits the ability to install a containment structure in this line segment. Thus, if a cascade occurs, it is possible the entire section would be impacted. The installing of at least two failure containment structures would require additional effort, and, at this time, it does not appear that Hydro One has considered, analyzed, or will include containment structures in this section.

5.0 Tower Testing

To ensure the suitability of the tower structures for use in the New EWT Line, each of the 10 lattice towers proposed for use in the project were subjected to full-scale tower testing starting in the fall of 2014. A full-scale lattice tower prototype of each tower type was constructed, erected at a test facility and subjected to loading that simulated events that the tower has been designed to withstand. These tests were conducted in accordance with the *International Electrotechnical Commission Standard 60652 "Loading Tests on Overhead Line Structures", Second Edition (2002 06)* and based on the test results, detailed specifications were developed by NextBridge specific to the Line Project. The test procedures and protocol, test materials, test tower assembly, and tower tests were verified by an independent and qualified third party. All 10 tower types successfully passed the tests withstanding over 100% of the calculated loads.

6.0 Security and Containment Structures

Structures have been designed considering the security requirements of CSA Design Criteria Standard. In addition, containment structures have been integrated into the transmission line design and will be installed consistent with recommendations of the ASCE Structural Loading Manual.

NextBridge has designed efficient and technically sound containment structures consisting of Guyed-Y structures with additional longitudinal guy wires. Since cascades occur in the longitudinal direction, longitudinal guy wires on strategically placed containment structures serve to inhibit the propagation of a cascade.

7.0 Foundation and Anchor Types

NextBridge has developed preliminary foundation designs and anchor options based on the results of preliminary geotechnical investigation. With this information, NextBridge has developed a range of foundation options that can be used specific to each structure

TAB 23

1 embedded within the construction, the clearing, and other
2 elements, but we can't see the details. Perhaps those who
3 have access to the confidential information would be able
4 to, but we have a total of -- they have a total of
5 \$50 million contingency within their leave to construct and
6 Hydro One has 10 that's managed at the same level of detail
7 and about 55 which is managed within the EPC contract with
8 fixed-price terms.

9 The other substantial difference is in material cost.
10 And so this is where the route optimization through
11 Pukaskwa delivers significant benefit, and we've done the
12 approximation. It is approximately \$17 million worth of
13 reduced material costs, steel, conductor, shield, wire,
14 those types of materials.

15 The route length, just in terms of -- sorry, the
16 optimized tower design -- sorry, we'll retrace. The
17 optimized tower design that SNC-Lavalin and Hydro One have
18 designed here is substantially more efficient from an
19 engineering perspective, and that reduced steel weight,
20 without compromising reliability in any way, is effectively
21 a \$17 million savings. The shorter route length through
22 Pukaskwa is approximately \$10 million of savings, and our
23 approach to procurement of materials, specifically steel,
24 for the lattice towers, we will be procuring this on a
25 global purchasing basis, where our understanding is
26 NextBridge is most likely, although we're not certain, most
27 likely sourcing within North American markets, which are
28 potentially subject to other costs and tariffs and the

TAB 24

Physical Design

1.0 OVERVIEW

The design of the Lake Superior Link satisfies the functional requirements of the OEB¹ and meets the IESO bulk power transfer requirements and all industry specifications. The Lake Superior Link will parallel the existing Hydro One EWT line circuits W21M and W22M, M23L and M24L for a large portion of the route, and share four circuit structures with W21M and W22M through Pukaskwa National Park. The Lake Superior Link, as described in **Exhibit B, Tab 1, Schedule 1**, will comprise two main sections: section one, approximately 235 km, from Lakehead to Marathon TS; and section two, approximately 168 km, from Marathon TS to Wawa TS through Pukaskwa National Park. The Lake Superior Link will begin and terminate on dead-end structures outside the Lakehead, Marathon and Wawa substations, with slack spans to new A-Frames within the substation. The new line does not cross the existing Hydro One EWT line between Lakehead TS and Wawa TS, thereby minimizing the chance of a single point of failure within the corridor and improving the reliability of the transmission line.

2.0 LINE DETAILS, CONDUCTOR TYPE AND RATINGS

The Lake Superior Link is a 230 kV, double-circuit, three-phase transmission line comprising one 1192.5 kcmil Aluminum Conductor Steel Reinforced (“ACSR”) “Grackle” conductor per phase, one 7#5 Alumoweld shield wire, and one 48 fibre optical ground wire (“OPGW”), primarily supported on guyed-mast and self-supporting lattice towers. Further, the Lake Superior Link will have the following attributes:

¹ Minimum Design Criteria & Minimum Technical Requirements for the Reference Option of the E-W Tie Line (230kV Wawa to Thunder Bay Transmission Line)”, dated November 9, 2011

- 1 • Continuous operating temperature of 93°C, resulting in continuous thermal
2 rating of 466 MVA (at 240 kV operating voltage), and short-term (<50 hours per
3 year) maximum operating temperature of 127°C, resulting in short-term thermal
4 rating of 599 MVA (at 240 kV operating voltage), in accordance with the OEB
5 *“Minimum Design Criteria for the Reference Option of the E-W Tie Line (230kV*
6 *Wawa to Thunder Bay Transmission Line)”*, dated November 9, 2011;
- 7 • Glass or porcelain insulators will be used for both suspension and tension
8 applications in accordance with OEB Minimum Technical Requirements for the
9 Reference Option of the EWT Line dated November 9, 2011;
- 10 • Stockbridge-type vibration dampers to dampen the conductor in accordance
11 with OEB Minimum Technical Requirements, based on the final line
12 configuration and per the manufacturers design;
- 13 • Spiral vibration dampers to dampen shield wires, which are more effective than
14 Stockbridge-type vibration dampers on small diameter conductors.

15
16 Typical structure foundations will be of rock anchor, steel grillage or drilled concrete
17 pier type. Other foundation types may be used as soil conditions dictate. Typical anchors
18 are expected to be grouted rod anchors. Other anchor types may be used as soil
19 conditions dictate. Foundation and anchor designs are discussed further below.

20 21 **3.0 STRUCTURE DESCRIPTION, LINE DESIGN, AND LINE CROSSINGS**

22
23 Hydro One has developed a structure family consisting of five different double-circuit,
24 230 kV lattice-steel towers and one four circuit 230kV structure. The design of the
25 towers is a mixture of guyed masts, guyed towers and self-supporting structures.

1 The tangent structures will be a mixture of guyed mast and light self-supporting type
2 structures. Whilst the guyed mast structure will be used for about 70% of the tangent
3 structures, light self-supporting towers will be utilized for the remaining 30% as they are
4 better able to cope with the large uplift forces the local topography forces upon them.
5 All of the dead end structures are of a self-supporting steel lattice tower design as they
6 demonstrate the most efficient way of carrying the loads imposed on them.

7
8 Within the Pukaskwa National Park, the existing Hydro One, double-circuit X7S
9 structures will be replaced with new guyed, four circuit lattice-steel towers. The towers
10 have been designed to support the existing Drake 795 conductor and the new Grackle
11 1192 conductors and also cause minimal impact to the National Park. The new four
12 circuit structures have been designed to stand on the existing foundations utilized by
13 the current double-circuit structures, while the tower guys will restrain the higher
14 overturning moment caused by the four circuits on the longer crossarms.

15
16 The guyed-mast type structures that Hydro One intends to employ for the majority of
17 the tangent structures have been designed to be lighter and have smaller foundation
18 systems than Guyed-Y and self-supporting structures, thus facilitating easier delivery,
19 erection, and installation in challenging climate, soil conditions, and terrain. Conceptual
20 drawings are attached to this schedule as **Attachment 1²**.

21
22 The Lake Superior Link route crosses existing 230 kV and 115 kV transmission
23 infrastructures. Hydro One's design adequately accounts for the structure spacing for
24 live-line maintenance and the required electrical clearances. Also, Hydro One's design
25 meets the clearance requirements for galloping and blowout inside the right-of-way
26 under high wind conditions. All guy wires (typically four per guyed tower) will be marked
27 with high-visibility plastic markers.

² Please note that this Attachment is considered the proprietary intellectual property of SNC-Lavalin and, as such, has been filed in confidence with the Ontario Energy Board.

TAB 25

NextBridge Interrogatory # 49

Reference:

EB-2017-0364 - February 15, 2018 HONI Lake Superior Link Application, EXHIBIT B, TAB 7, SCHEDULE 1, Page 5 Table 3 (Construction Costs); EXHIBIT C, TAB 2, SCHEDULE 1.

Interrogatory:

- a) Confirm that HONI's galloping analysis considered single loop galloping, regardless of span length, with a primary axis limited to a maximum of 12m. If not confirmed, explain your answer in detail and explain its potential impact to the construction cost estimate.
- b) Explain in detail whether HONI or its contractor has performed any geotechnical work on the project, including how the conducting or lack of conducting of geotechnical impacts its construction cost estimate.
- c) Confirm that the information provided in to this interrogatory does not change the construction cost estimate in Table 3 of the Application. If not confirmed, please reproduce Table 3 for routing through Pukaskwa National Park and around Pukaskwa National Park with the new cost estimate. If confirmed, explain in detail why the information in the tables does not change the cost estimate.

Response:

- a) Hydro One considered single loop galloping until 700 feet as per article 6.5.1 of Bulletin 1724 E-200, please see extract of the mentioned bulletin in the Annexes. Hydor One does not foresee any impact because single loops are very rare on longer spans.
- b) The geotechnical risk has been included in SNC-Lavalin's fixed price estimate to Hydro One and changes to it will not impact the construction cost estimate. SNC-Lavalin has based its estimate on an extensive geomorphological study for the area of the Lake Superior Link Project. Based on the this study various foundation designs were developed and formed the basis of the EPC estimate. Further geotechnical work is planned in the first quarter of 2019 to confirm the study results which will update the EPC execution plan but will not impact the fixed price costs.
- c) Information provided does not change the construction cost estimate of the preferred route. The same geomorphological study has not been done for the route around the Pukaskwa

E-W TIE LINE REFERENCE OPTION: Minimum Technical Requirements

rated tensile strength under a winter design temperature of minus thirty (-30) degrees Celsius; and

- the final tension of the conductor must not exceed twenty percent (20%) of the conductor's rated tensile strength under the temperature of fifteen (15) degrees Celsius.

3.5.2 Stockbridge-type vibration dampers are to be used on single conductor configurations. Vibration control on bundled conductors is to be achieved with spacer dampers. The design and location of stockbridge dampers and spacer dampers must account for conductor tension, span length, and terrain exposure.

3.5.3 Stockbridge-type vibration dampers are to be used for overhead shield wire.

3.5.4 Use of spacer dampers with two-part metal conductor clamps bearing directly on aluminum conductor is not acceptable. Use of elastomer lined clamps is preferred.

3.5.5 Use of damping devices which significantly restrict heat dissipation and reduce thermal capacity of the line are not acceptable.

3.6 TRANSMISSION STRUCTURE DESIGN

3.6.1 Structure designs will be latticed steel tower, steel pole, or wood pole design unless an alternate structure is demonstrated to be equivalent or superior for use by an applicant for designation.

3.6.2 Structures are to be designed suitable for live line maintenance. Phase to phase, phase to structure, phase to ground, and phase to ground wire shall be determined with consideration for live line work.

3.6.3 Structures are to be designed to meet the load combination requirements specified in Appendix A, with the specified load and strength factors, without permanent set in any member.

3.6.4 Galloping clearances are to be considered in development of the general structure configuration for voltages at or above 230kV. This analysis shall consider single loop galloping, regardless of span length, with a primary axis limited to a maximum of 12m (Lilien & Havard, Cigre TF B2.11.06).

3.6.5 For wood pole structures:

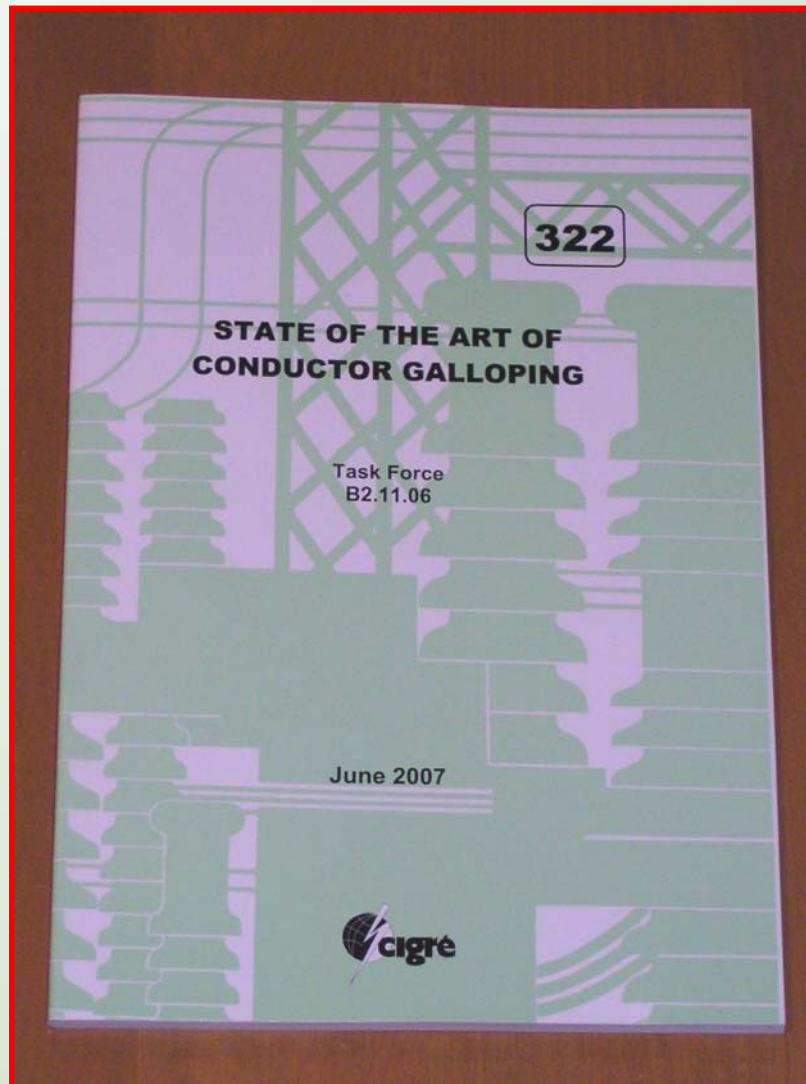
CONDUCTOR GALLOPING

**A TUTORIAL PRESENTED AT THE
IEEE ESMOL and TP&C MEETING
LAS VEGAS, JANUARY 2008**

by D.G. HAVARD

**EXPANDED VERSION OF A TUTORIAL
ORIGINALLY PRESENTED
AT CIGRÉ B2 MEETING
HELSINKI, FINLAND, JULY 2007
by J-L. LILIEN & D.G. HAVARD**

© CIGRÉ 2007



**TUTORIAL IS BASED
ON CIGRÉ TECHNICAL
BROCHURE NO. 322**

**“STATE OF THE ART
OF CONDUCTOR
GALLOPING”**

**OBTAINABLE FROM CIGRÉ
(www.cigre.org)**

146 PAGES

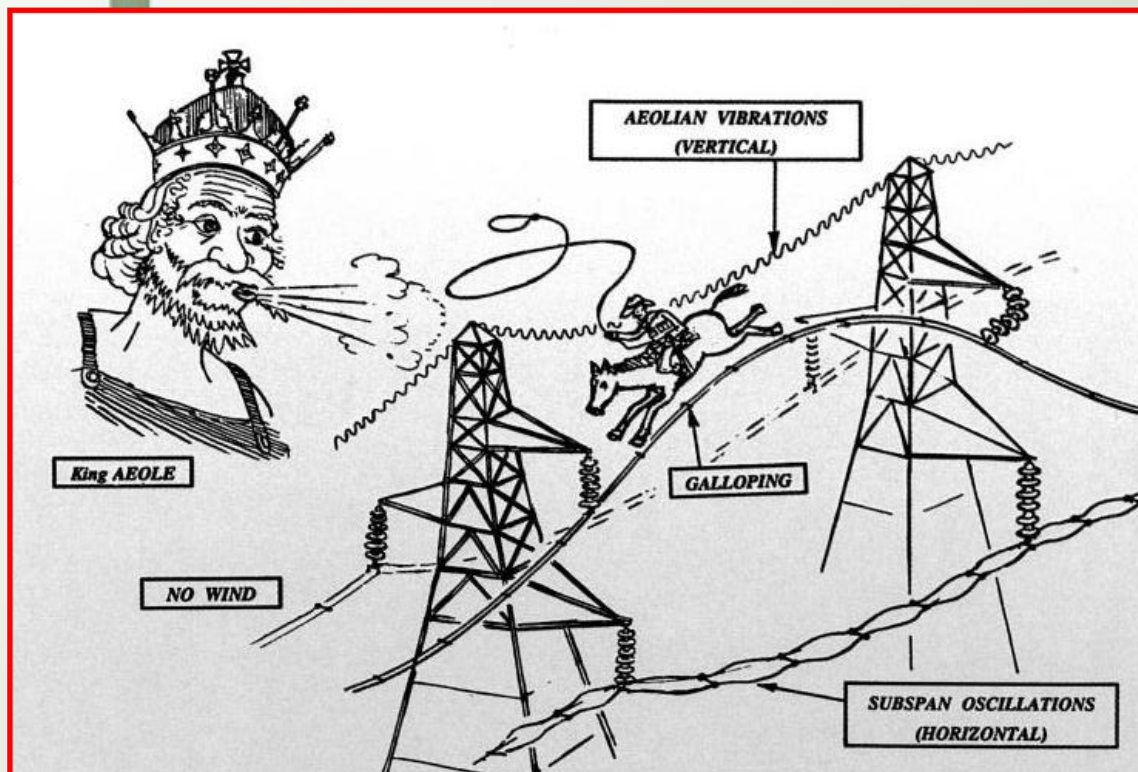
MEMBERS €70

NON MEMBERS €140

OUTLINE OF THE TUTORIAL

- *WHAT IS GALLOPING?*
- *CONDITIONS FOR GALLOPING*
- *VIDEOS OF GALLOPING*
- *MECHANICS OF GALLOPING*
- *DAMAGE DUE TO GALLOPING DYNAMIC LOADS DUE TO GALLOPING*
- *CONTROL OF GALLOPING*
- *FIELD DATA ON EFFECTIVENESS OF CONTROLS*
- *DESIGN CLEARANCES TO AVOID CLASHING DURING GALLOPING*
- *CONCLUSIONS*

WHAT IS GALLOPING?



GALLOPING IS:

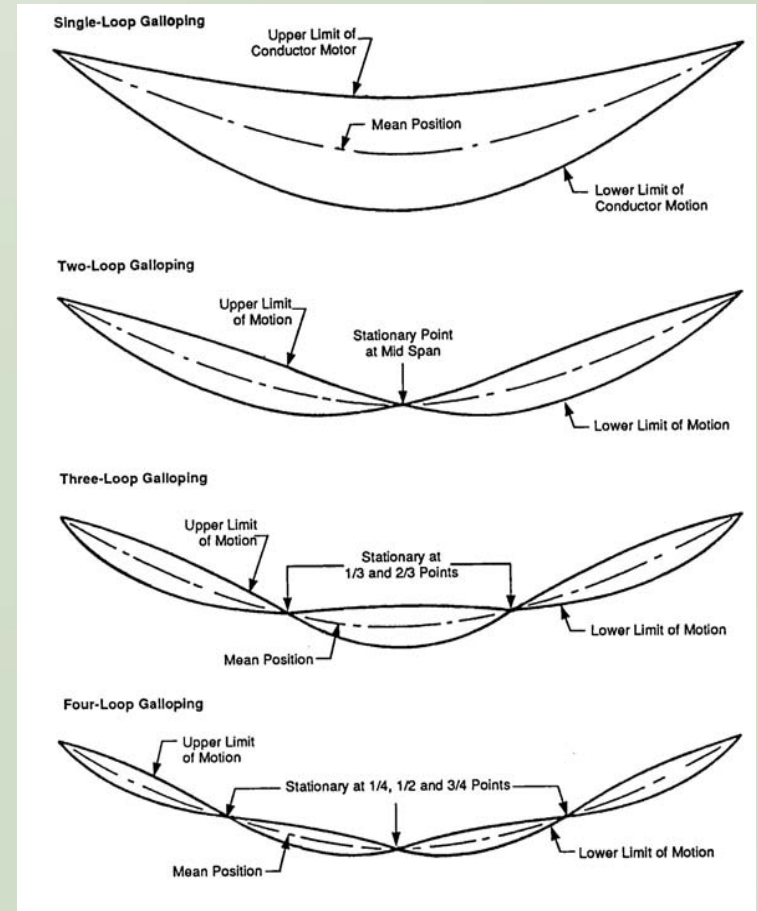
- A WIND-INDUCED VIBRATION OF BOTH SINGLE AND BUNDLE CONDUCTORS
- DIFFERENT FROM AEOLIAN VIBRATION AND WAKE INDUCED OSCILLATION
- LOW-FREQUENCY (FROM 0.1 TO 1 HZ)
- LARGE VERTICAL AMPLITUDE (FROM ± 0.1 TO $< \pm 1$ TIMES THE SAG)

- UP TO 4 TIMES THE SAG ON DISTRIBUTION LINES
- A SINGLE OR A FEW LOOPS OF STANDING WAVES PER SPAN
- IT APPLIES VERY LARGE DYNAMIC LOADS TO THE STRUCTURES
- IT IS A SELF-EXCITED PHENOMENON

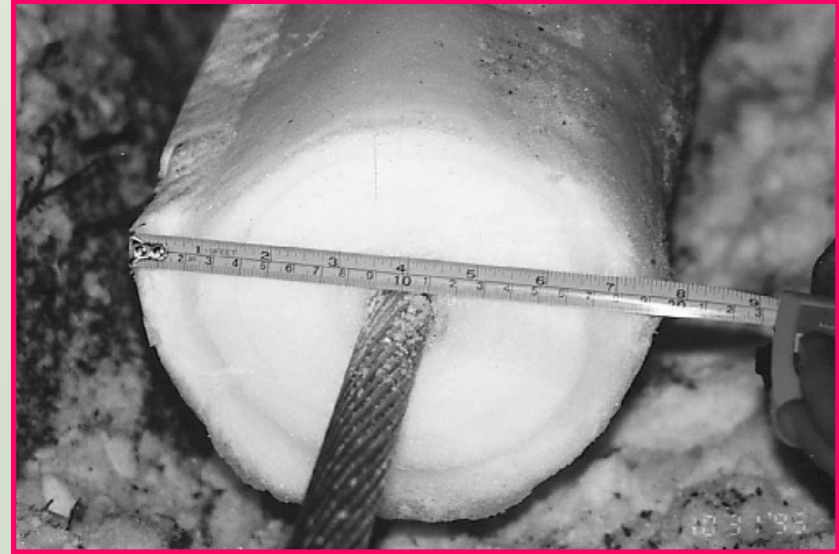
CONDITIONS FOR GALLOPING - ICE



- **GLAZE ICE, RIME ICE OR WET SNOW ON THE CONDUCTORS (THE ICE LAYER NEED NOT BE THICK)**
- **GALLOPING CAN OCCUR WITHOUT ICE ON RARE OCCASIONS**
- **GALLOPING APPEARANCE (NUMBER OF LOOPS, AND PEAK TO PEAK AMPLITUDE)**
- **CAN BE DIFFERENT ON APPARENTLY SIMILAR CONDUCTORS WITHIN THE SAME SPAN**



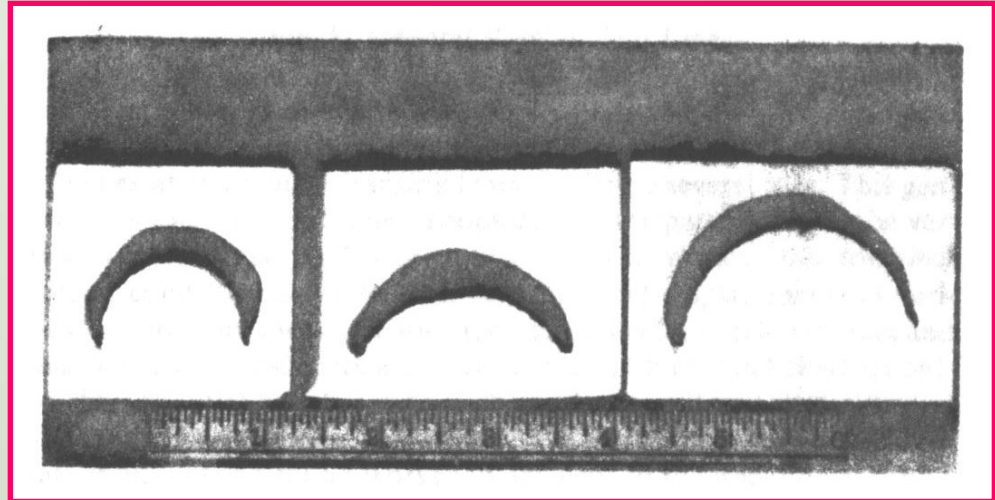
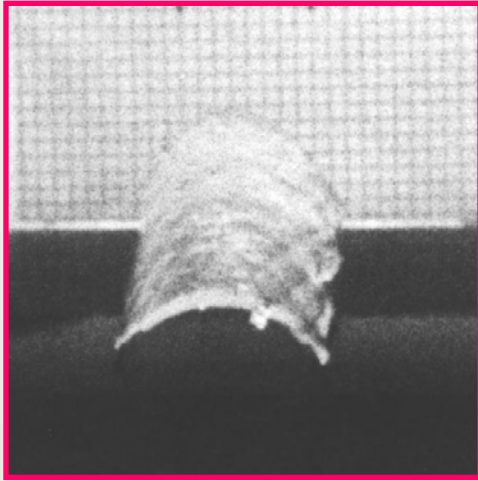
ICE ACCRETION



WET SNOW SHAPES

- *SHOWING NORMAL ROUGH TEXTURE*
- *ROUNDED PROFILE ON SMALL CONDUCTOR DUE TO CONTINUOUS ROTATION*

ICE ACCRETION


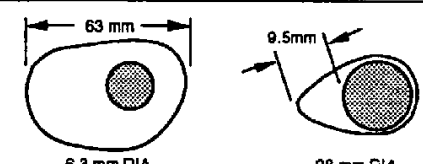
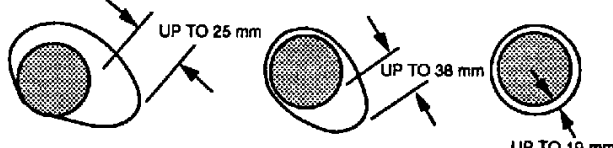
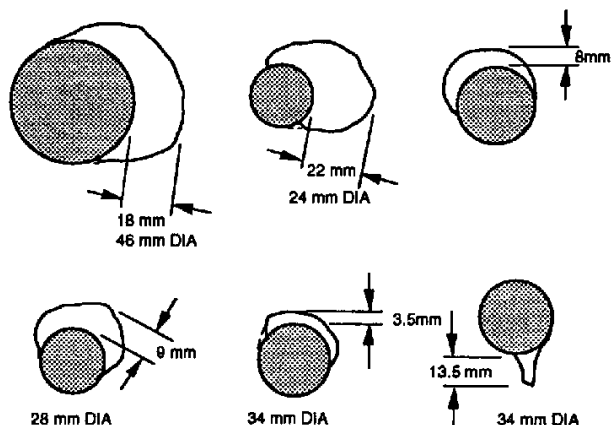



**GLAZE ICE SHAPES FROM SINGLE
CONDUCTORS AFTER GALLOPING EVENTS**
SHOWING THINNESS OF ICE LAYERS

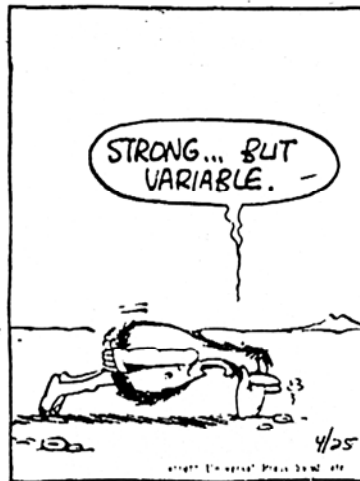
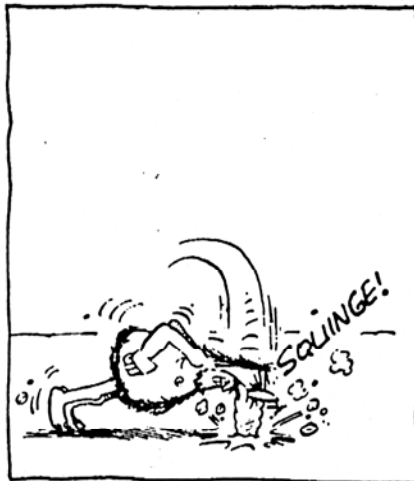
SHAPES OF ICE ACCRETION ON CONDUCTORS DURING GALLOPING

•REPORTED IN SURVEY OF CANADIAN ELECTRICAL UTILITIES

•NOTE WIDE VARIATION IN AMOUNT OF ICE AND SEVERAL CASES WITH VERY THIN ICE LAYERS

CALGARY POWER	 <p>dimensions not available</p>
SASK POWER CORP	 <p>63 mm 6.3 mm DIA 9.5 mm 28 mm DIA</p>
MANITOBA HYDRO	 <p>UP TO 25 mm UP TO 38 mm UP TO 19 mm</p>
ONTARIO HYDRO	 <p>18 mm 46 mm DIA 22 mm 24 mm DIA 8 mm 9 mm 28 mm DIA 34 mm DIA 3.5 mm 13.5 mm 34 mm DIA</p>
HYDRO-QUEBEC	 <p>dimensions not available</p>

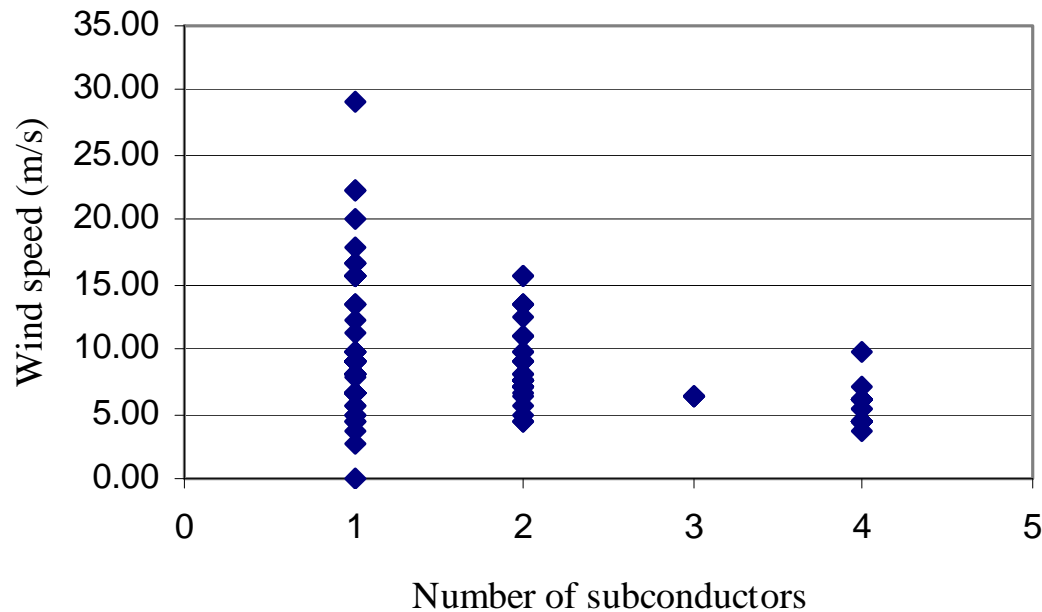
STANLEY



CONDITIONS FOR GALLOPING - WIND

- MODERATE TO HIGH WIND SPEEDS
- STEADY WINDS
- WIND TRANSVERSE TO THE LINE
- OPEN EXPOSURE OF THE LINE (LOW TURBULENCE)
- RIVER CROSSINGS AND LINES ALONG LAKE FRONTS ARE PARTICULARLY SUSCEPTIBLE
- CAN LAST FOR A FEW HOURS OR SEVERAL DAYS

WIND SPEEDS FOR GALLOPING



**WIND SPEEDS REPORTED DURING GALLOPING
FOR SINGLE, TWIN, TRIPLE, AND QUAD BUNDLES**

***MOST GALLOPING OCCURS AT WINDS SPEEDS
ABOVE 5 m/s ON SINGLE AND BUNDLE CONDUCTORS***

VIDEO OF GALLOPING - SINGLE CONDUCTOR LINE IN NORWAY



Lilien and Havard, TF B2.11.06

VIDEO OF GALLOPING – TWIN BUNDLE IN ENGLAND

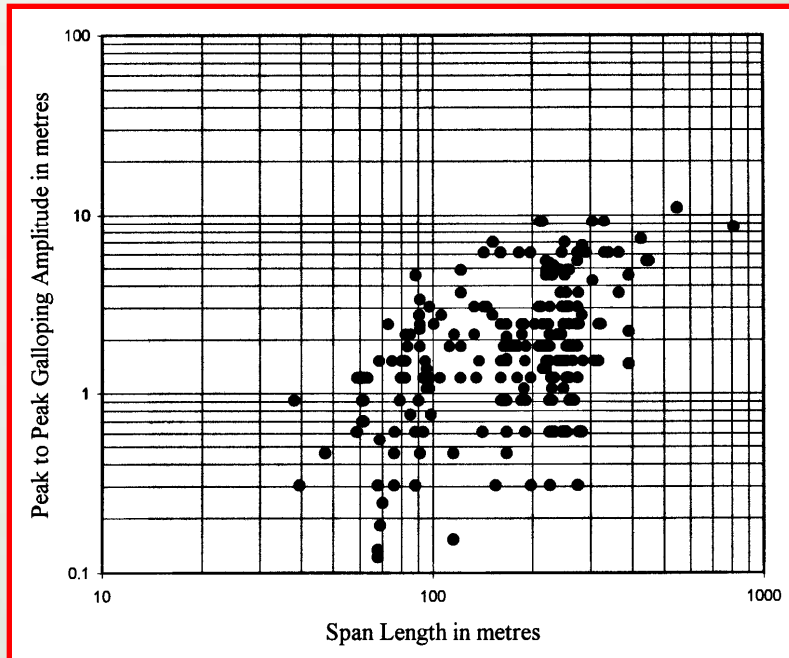


VIDEO OF GALLOPING – QUAD BUNDLE IN JAPAN



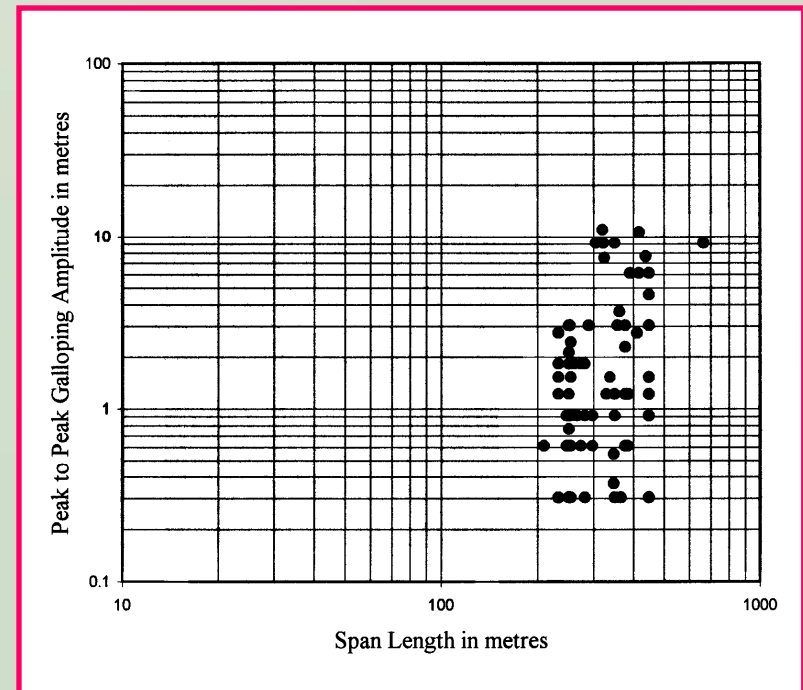
Lilien and Havard, TF B2.11.06

GALLOPING AMPLITUDES

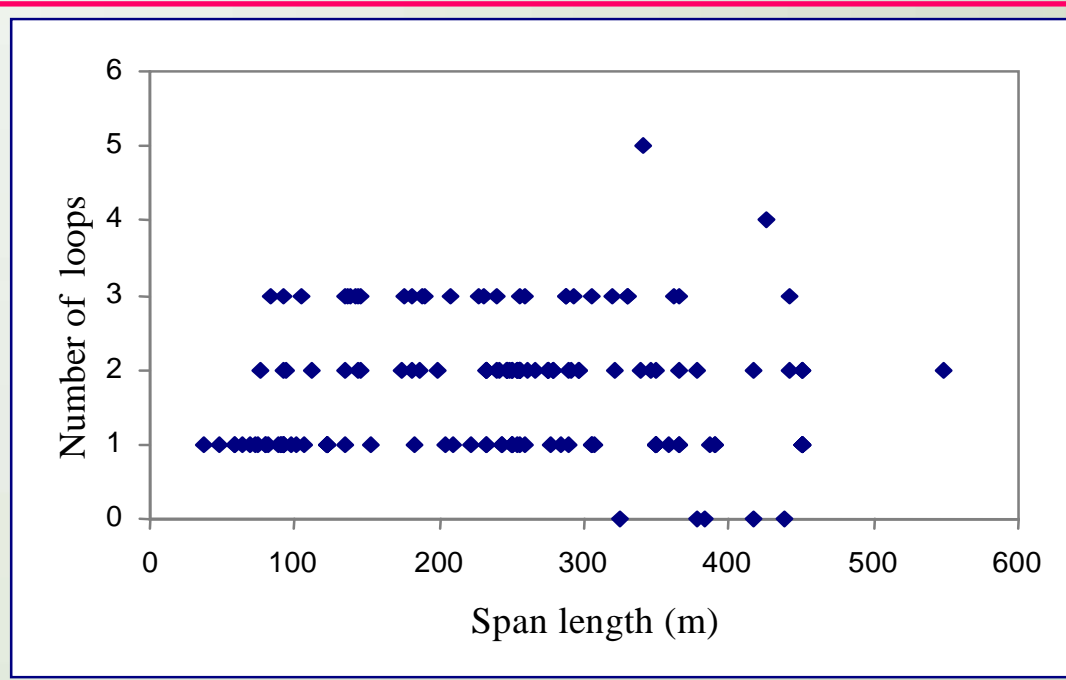


ABOVE: SINGLE CONDUCTORS
RIGHT: BUNDLE CONDUCTORS
(FROM FIELD STUDIES IN USA
AND CANADA)

PEAK TO PEAK GALLOPING
AMPLITUDES VERSUS SPAN
LENGTH OBSERVED IN THE FIELD



NUMBER OF GALLOPING LOOPS



NUMBER OF LOOPS OBSERVED DURING GALLOPING
VERSUS SPAN LENGTH

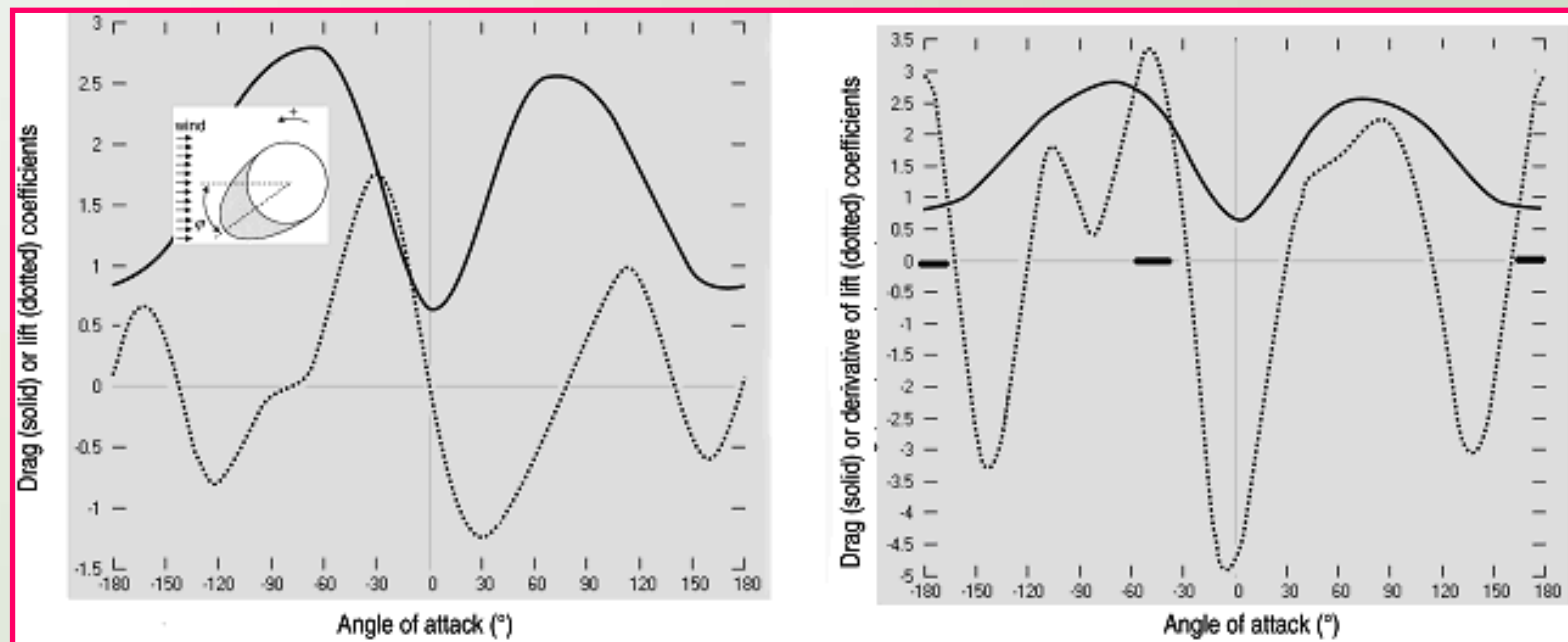
- **BASED ON ANALYSIS OF FIELD DATA FROM ALL GALLOPING OBSERVATIONS**
- **DATA FROM SINGLE AND BUNDLE CONDUCTOR SITES**
- **SHOWS THAT SINGLE LOOP GALLOPING CAN OCCUR ON LONG SPANS**
- **GALLOPING CAN INCLUDE TRAVELING WAVES**

DEN HARTOG MECHANISM



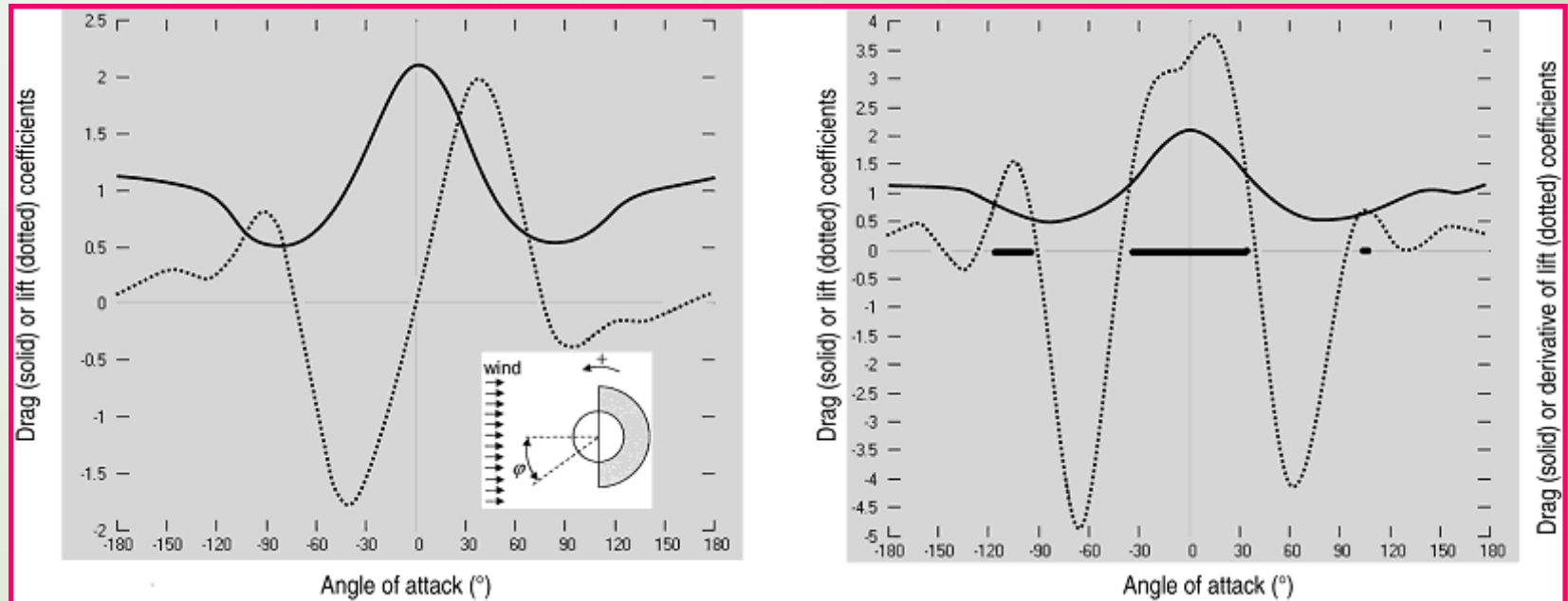
- ONLY AERODYNAMIC FORCES ARE IMPORTANT
- PREDICTS GALLOPING WHEN SLOPE OF THE LIFT COEFFICIENT CURVE (DOTTED) IS GREATER THAN THE DRAG COEFFICIENT (SOLID)

$$C_D - C_{L\alpha} < 0$$



- TORSION IS EITHER NEGLIGIBLE OR FORCED BY VERTICAL MOVEMENT
- TORSIONAL FREQUENCY AND DAMPING NOT IMPORTANT
- PROBABLY RARE, EXCEPT FOR REVERSE WIND

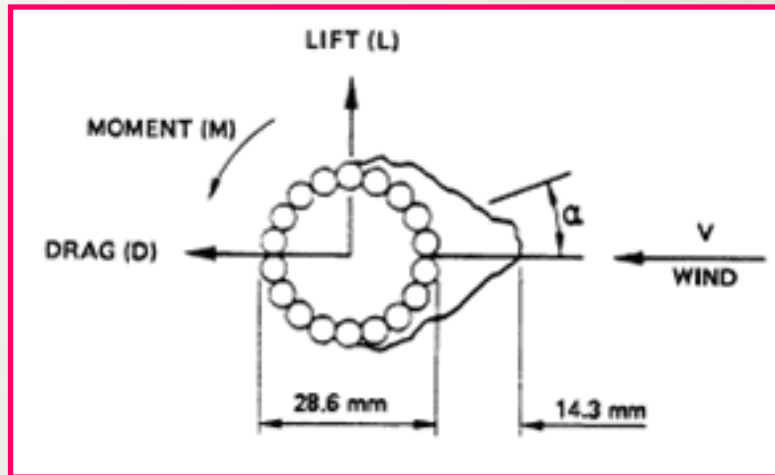
AERODYNAMIC PROPERTIES OF “D” SECTION



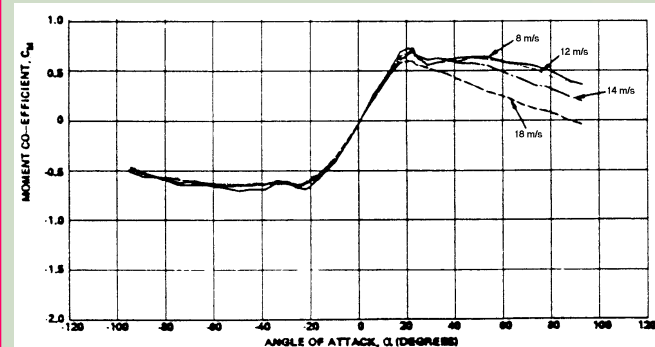
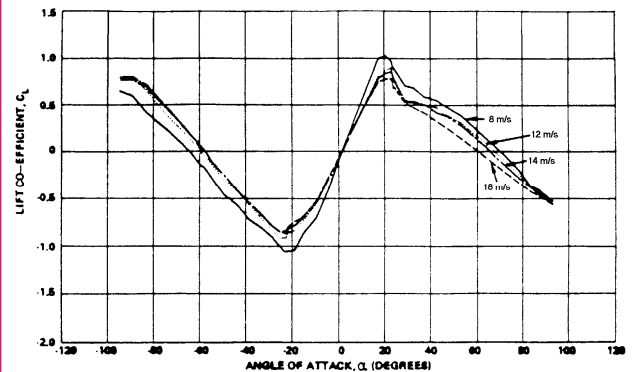
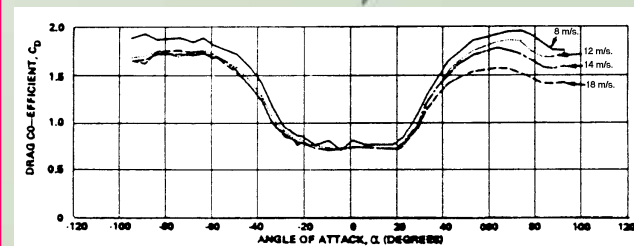
LEFT: LIFT AND DRAG COEFFICIENTS VERSUS ANGLE OF ATTACK, INSET SHOWS “D” PROFILE USED ON HYDRO QUÉBEC TEST LINE

RIGHT: RATE OF CHANGE OF LIFT AND DRAG COEFFICIENTS WITH DEN HARTOG INSTABILITY REGIONS

AERODYNAMICS OF ICE SHAPES



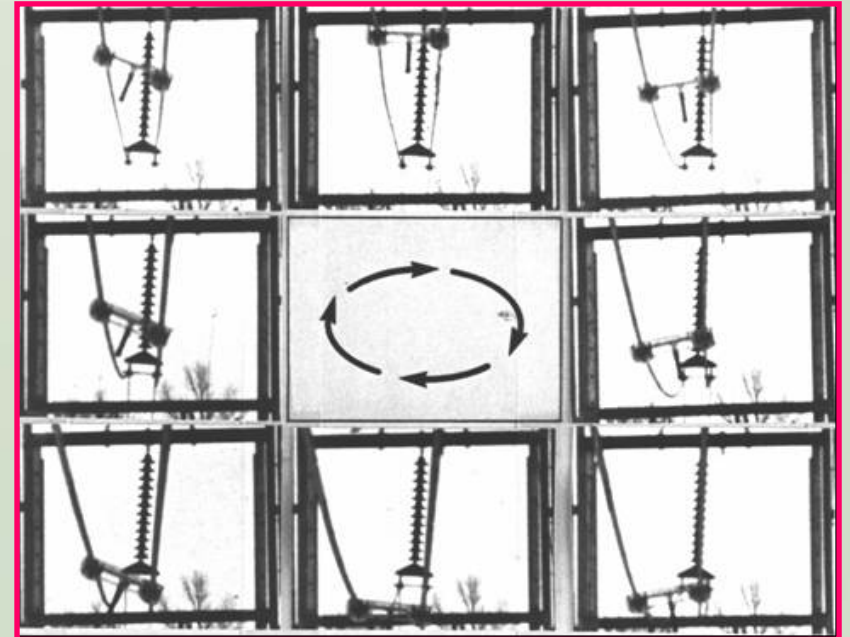
- WET SNOW SHAPE FROM TEST FRAME IN ENGLAND
- AERODYNAMIC DRAG, LIFT AND MOMENT VERSUS ANGLE OF ATTACK DRIVE THE INSTABILITY (REVERSED SIGN OF ANGLE OF ATTACK)
- NEGATIVE SLOPE OF THE LIFT CURVE INDICATES SELF EXCITED OSCILLATIONS OF THE PROFILE
- ROTATION OF THE SECTION INCREASES THE RANGE OF UNSTABLE POSITIONS OF THE ICE



FLUTTER MECHANISM



- COUPLING BETWEEN VERTICAL AND TORSIONAL MOVEMENT IS CENTRAL TO THE MECHANISM
- TORSION IS ESSENTIAL FOR ENERGY TRANSFER TO VERTICAL MOVEMENT
- STRUCTURAL DATA AND AERODYNAMICS IMPORTANT
- RATIO VERTICAL TO TORSIONAL FREQUENCY IMPORTANT
- CONTROL OF TORSION BY DAMPING OR DETUNING IS ESSENTIAL FOR CONTROL
- PROBABLY THE MOST COMMON MECHANISM, PARTICULARLY ON BUNDLE CONDUCTOR LINES

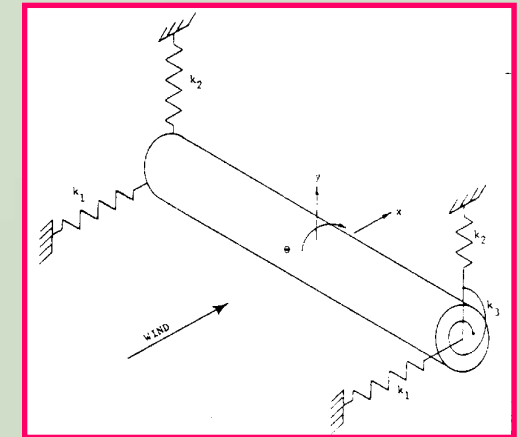


$$(C_D - C_{L\alpha}) \frac{\omega y_{\max}}{V} < C_{L\alpha} \cdot g_{\max} \cdot \sin \phi$$

PREDICTION OF GALLOPING MOTIONS



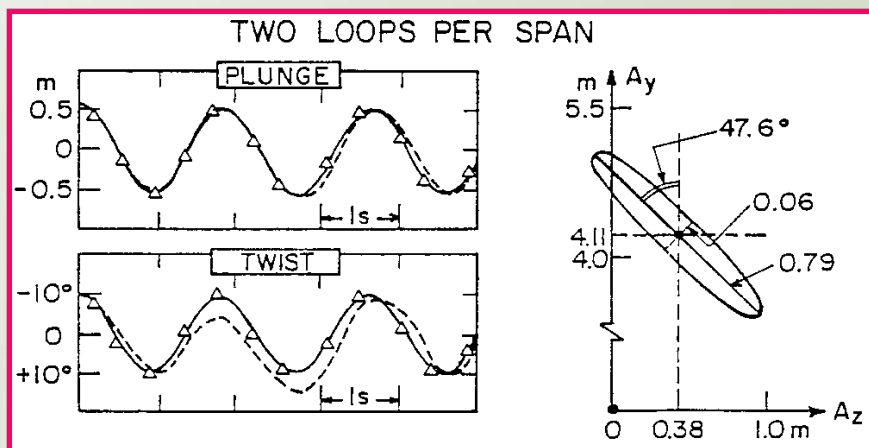
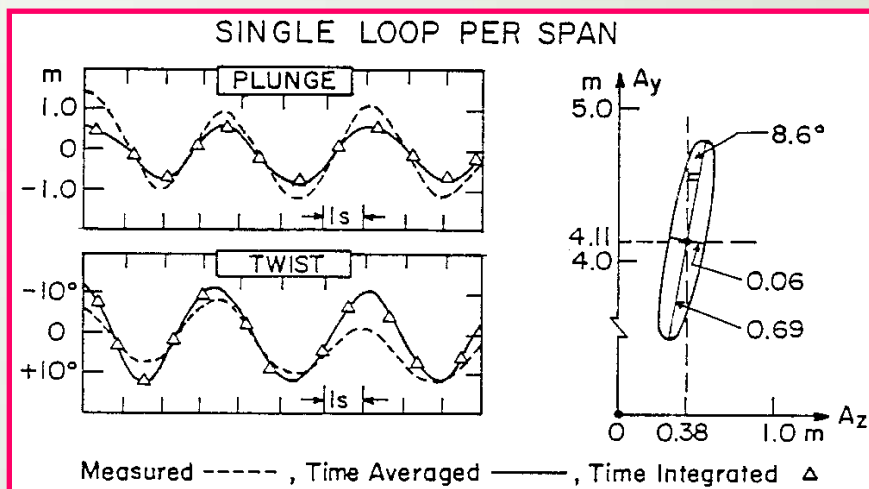
$$\begin{aligned}
 & \begin{bmatrix} m & m e_y & \\ & m & m e_x \\ m e_y & m e_x & I \end{bmatrix} \begin{Bmatrix} \ddot{x} \\ \ddot{y} \\ \ddot{\theta} \end{Bmatrix} + \begin{bmatrix} k_{xx} & k_{xy} & \\ k_{yx} & k_{yy} & \\ & & K_{\theta\theta} \end{bmatrix} \begin{Bmatrix} x \\ y \\ \theta \end{Bmatrix} \\
 & + \begin{bmatrix} R_x & & \\ & R_y & \\ & & R_{\theta} \end{bmatrix} \begin{Bmatrix} \dot{x} \\ \dot{y} \\ \dot{\theta} \end{Bmatrix} - \begin{bmatrix} 0 & & \\ & 0 & \\ & & W e_y \end{bmatrix} \begin{Bmatrix} x \\ y \\ \theta \end{Bmatrix} \\
 & - \frac{\rho d V^2}{2} \begin{bmatrix} 0 & & C_{D\alpha} \\ & 0 & C_{L\alpha} \\ \text{AERO-ELASTIC} & d C_{M\alpha} & \end{bmatrix} \begin{Bmatrix} x \\ y \\ \theta \end{Bmatrix} + \frac{\rho d V}{2} \begin{bmatrix} \text{AERODYNAMIC DAMPING} \\ V C_{Dv} + 2 C_{D\alpha} & C_{D\alpha} - C_L \\ V C_{Lv} + 2 C_{L\alpha} & C_{L\alpha} + C_D \\ d(V C_{Mv} + 2 C_{M\alpha}) & d C_{M\alpha} & d V C_{M\dot{\alpha}} \end{bmatrix} \begin{Bmatrix} \dot{x} \\ \dot{y} \\ \dot{\theta} \end{Bmatrix} \\
 & = \begin{Bmatrix} 0 \\ 0 \\ 0 \end{Bmatrix}
 \end{aligned}$$



**LUMPED MASS MODEL
OF GALLOPING
CONDUCTOR**

- **EQUATIONS REPRESENTING LINEARIZED GALLOPING INCLUDING HORIZONTAL, VERTICAL AND TORSIONAL MOTIONS, BUT NOT LONGITUDINAL MOTIONS**
- **THIS PRESENTATION IDENTIFIES THE INERTIA EFFECTS, SPRING FORCES, DAMPING, AND WEIGHT AND AERODYNAMIC FACTORS (RAWLINS 1979)**

PREDICTION OF GALLOPING MOTIONS



- COMPARISONS OF FINITE ELEMENT PREDICTION AND MEASURED SINGLE AND TWO-LOOP GALLOPING MOTIONS OF A SECTION OF ICED CONDUCTOR MODEL IN A WIND TUNNEL
- ICE WAS REPRESENTED BY A SMOOTH ELLIPTICAL PLASTIC FOIL ON THE WINDWARD SIDE OF THE CONDUCTOR
- SIMULATION OF ACTUAL LINES REQUIRES MODELING OF SEVERAL SPANS TOGETHER AND DATA ON THE ICE OR WET SNOW SHAPE AND DENSITY

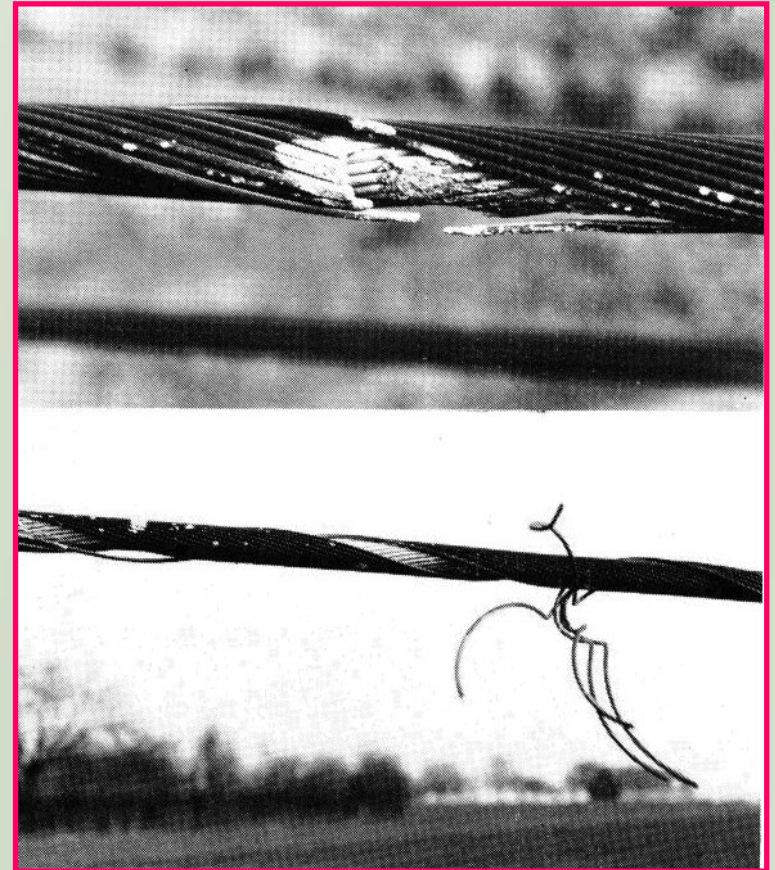
DAMAGE DUE TO GALLOPING



MANY GALLOPING EVENTS CAUSE NO DAMAGE, BUT SEVERE AND PROLONGED GALLOPING APPLIES MANY REPETITIONS OF HIGH LOADS WHICH MUST BE COMPARED TO THE FATIGUE STRENGTH OF THE STRUCTURES AND COMPONENTS

EFFECTS OF MODEST GALLOPING:

- **FLASHOVERS BETWEEN VERTICALLY ALIGNED PHASES**
- **CIRCUIT OUTAGES AND**
- **BURNS OF CONDUCTORS**
- **DAMAGE TO BREAKERS IF THE CIRCUIT IS NOT ISOLATED**



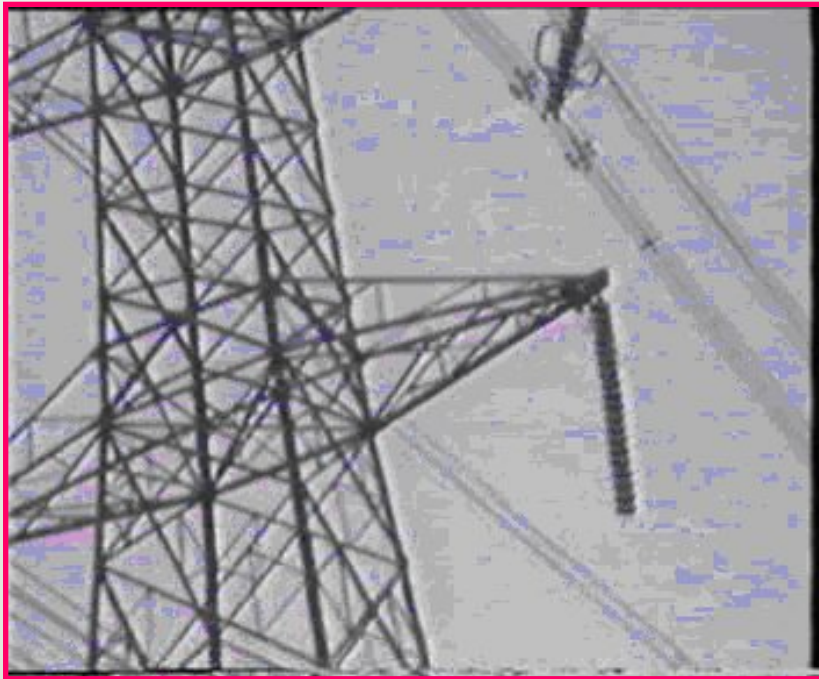
**CONDUCTOR BURNS
DUE TO GALLOPING**

DAMAGE DUE TO GALLOPING

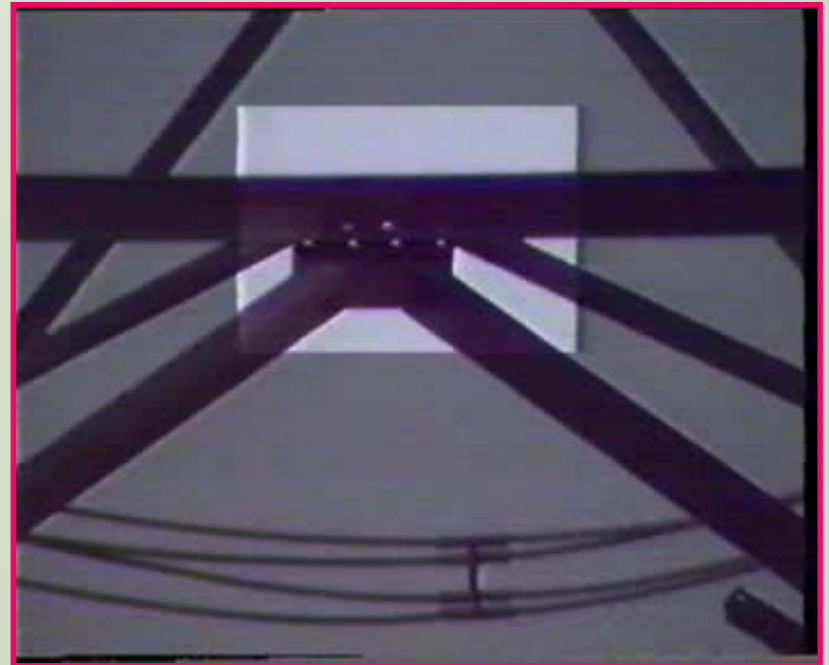


EFFECTS OF MODEST GALLOPING:

- **LOOSENED BOLTS**
- **SEPARATED INSULATOR STRINGS**



**INSULATOR STRING SEPARATED
DURING GALLOPING**



**TOWER GUSSET PLATE WITH ALL
BOLTS FATIGUED DUE TO
DYNAMIC LOADS ON A STRAIN
TOWER DURING GALLOPING**

DAMAGE DUE TO GALLOPING

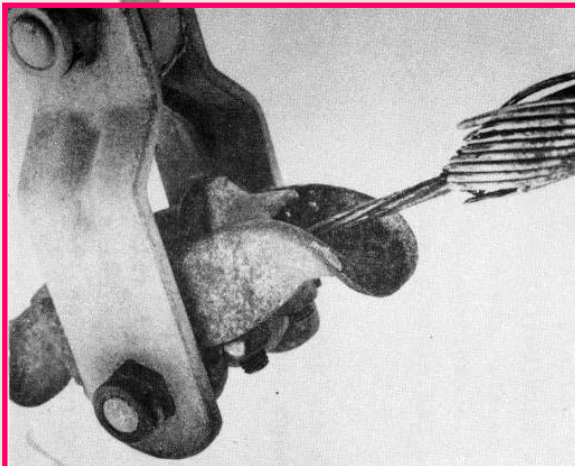


EFFECTS OF MODEST GALLOPING:

- *BROKEN HARDWARE*
- *FATIGUED CONDUCTOR STRANDS*



**SPACER DAMPER BROKEN
DUE TO GALLOPING**



**CONDUCTOR FATIGUE
DAMAGE DUE TO GALLOPING**



**JUMPER LOOPS OF QUAD BUNDLE
BROKEN DUE TO GALLOPING**

DAMAGE DUE TO GALLOPING



EFFECTS OF SEVERE AND PROLONGED GALLOPING:

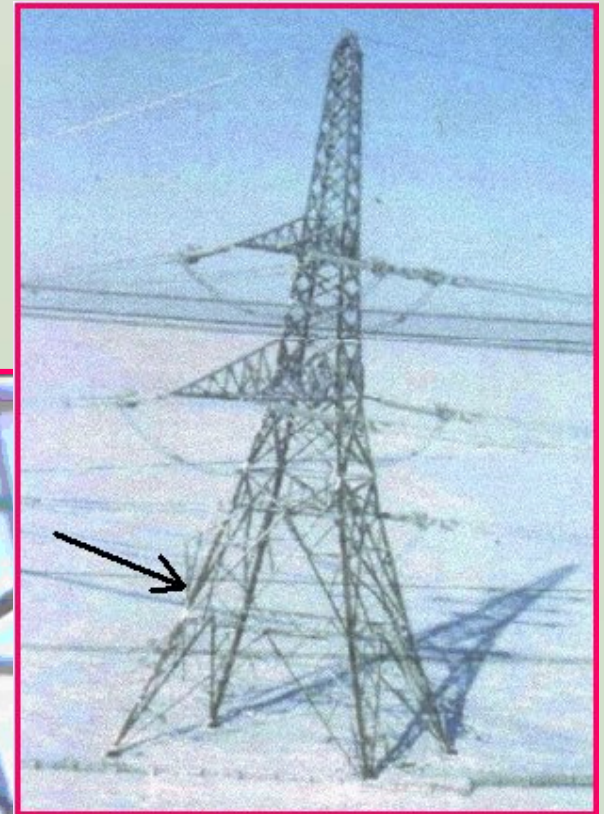
- *FRACTURED TOWER MEMBERS*
- *COLLAPSED TOWER ARMS*
- *CASCADES OF LINE SECTIONS*



**TOWER ARM BRACING MEMBERS
BROKEN DUE TO GALLOPING**



**TOWER MAIN LEG BROKEN
DURING GALLOPING**



**TOWER WITH LOWER ARM
FAILED DUE TO GALLOPING**

DYNAMIC LOADS DURING GALLOPING



MEASURED VERTICAL LOADS

SOURCE	CONDUCTOR	SPAN LENGTHS	STATIC LOAD kg	DYNAMIC LOAD kg	RATIO
ANJO et al. 1974	4 x 410 mm ²	312 m, 319 m	2100	3500	1.7
	4 x 950 mm ²	312 m, 319 m	4070	2500	0.6
KRISHNASAMY 1984	34 mm DIAM	459 m	1046	1990	1.9
	28 mm DIAM	418 m	677	810	1.2
	41 mm DIAM	216 m	626	1250	2.0
BROKENSHIRE 1979	2 x 30.4 mm DIAM	312 m, 308 m	1387	375	0.2
	2 x 30.4 mm DIAM	291 m, 242 m	1431	466	0.3
	2 x 30.4 mm DIAM	259 m, 251 m	1067	245	0.2
	2 x 36.2 mm DIAM	232 m, 256 m	1226	1364	1.1

DYNAMIC LOADS DURING GALLOPING



MEASURED HORIZONTAL LOADS

SOURCE	CONDUCTOR	SPAN LENGTHS	STATIC LOAD kg	DYNAMIC LOAD kg	RATIO
ANJO et al. 1974	4 x 410 mm ²	312 m, 319 m	6150	7400	1.2
	4 x 950 mm ²	312 m, 319 m	9300	7800	0.8
ESCARMELLE et al. 1997	2 X 620 mm ²	308 m	3600	4000	1.1
	2 X 620 mm ²	308 m	3600	7500	2.1
MORISHITA et al. 1984	4 X 410 mm ²	363 m, 247 m	2400	3120	1.3
	8 X 810 mm ²	230 m, 190 m	3000	3180	1.1
	6 X 410 mm ²	363 m, 247 m	2400	1920	0.8
	8 X 410 mm ²	353 m, 230 m, 350 m	2300	1470	0.6
	10 X 810 mm ²	230 m, 190 m	3000	1200	0.4
ELIASON 2002	28.1 mm DIAM	80 m	840	1870	2.2
	28.1 mm DIAM	80 m	800	2150	2.7
	28.1 mm DIAM	80 m	780	2160	2.8
	28.1 mm DIAM	80 m	800	1040	1.3

CONTROL OF GALLOPING



ICE MELTING

- *USED WHERE THE POWER TO CUSTOMERS CAN BE CUT OFF AND TAPS ARE PROVIDED TO CONNECT HIGHER THAN NORMAL CURRENT THROUGH THE LINES*

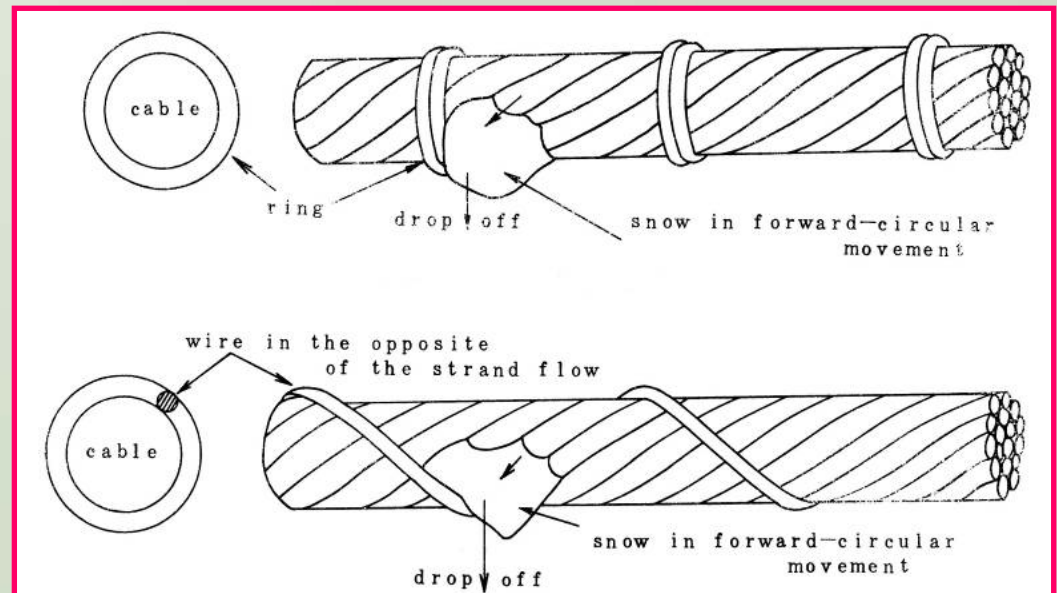
ICE REMOVAL

- *MECHANICAL ICE REMOVAL USING A ROLLER*

ICE PREVENTION

- *NO SUCCESSFUL ICE-PHOBIC COATING HAS BEEN DEVELOPED*

- *WET SNOW ACCRETIONS ARE BEING REDUCED THROUGH RINGS AND SPIRALLY WRAPPED WIRES IN JAPAN*



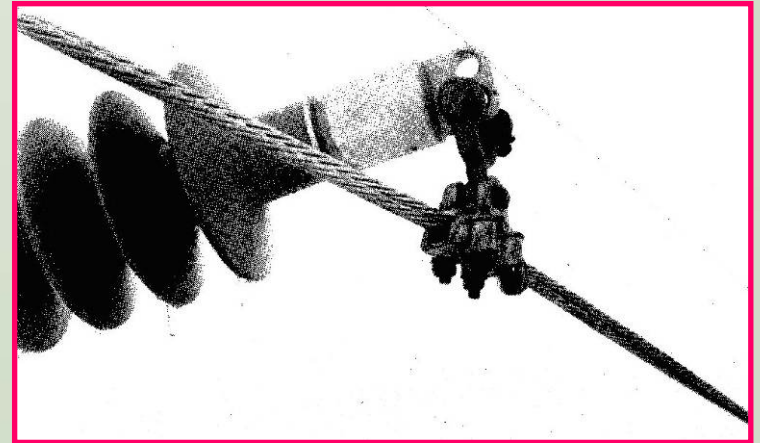
RINGS AND SPIRALS TO REMOVE WET SNOW

CONTROL OF GALLOPING



MODIFIED CONDUCTOR PROFILES

- **AERODYNAMICALLY MORE STABLE PROFILES SUCH AS THE TWISTED PAIR (T2 OR VR) AND ADDED PLASTIC SPIRALS SHOW REDUCTIONS IN GALLOPING OCCURRENCES AND SEVERITY**



TWISTED PAIR CONDUCTOR

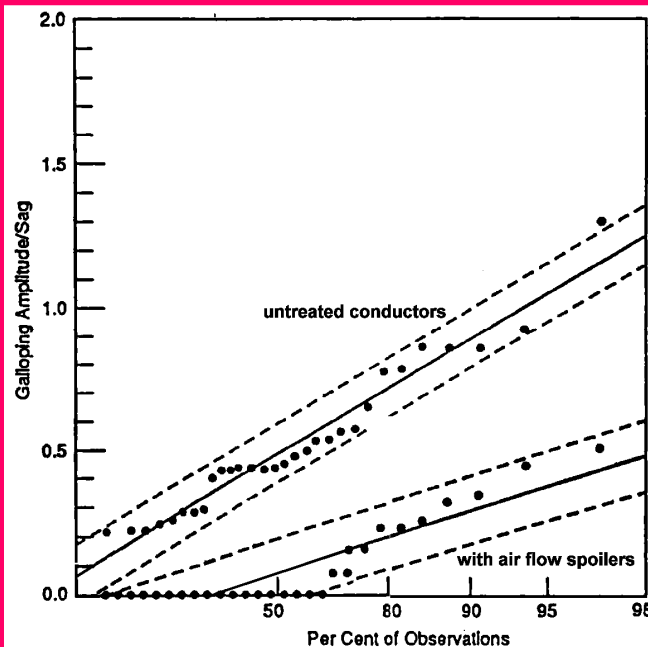
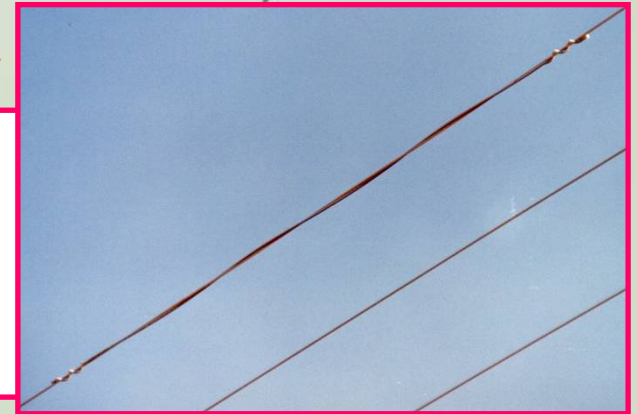
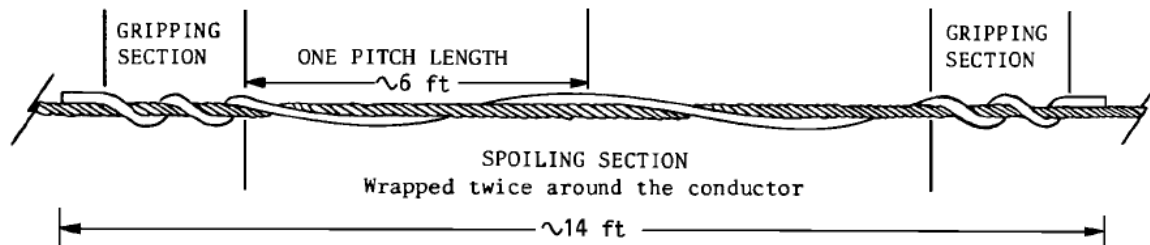


THE VARYING PROFILE ACROSS THE SPAN CREATES ALTERNATELY UPWARD AND DOWNWARD WIND FORCES WITH A NET REDUCTION IN TOTAL LIFT FORCE, UNLESS THE ICE LAYER THICKNESS OBSCURES THE SHAPE EFFECT

CONTROL OF GALLOPING



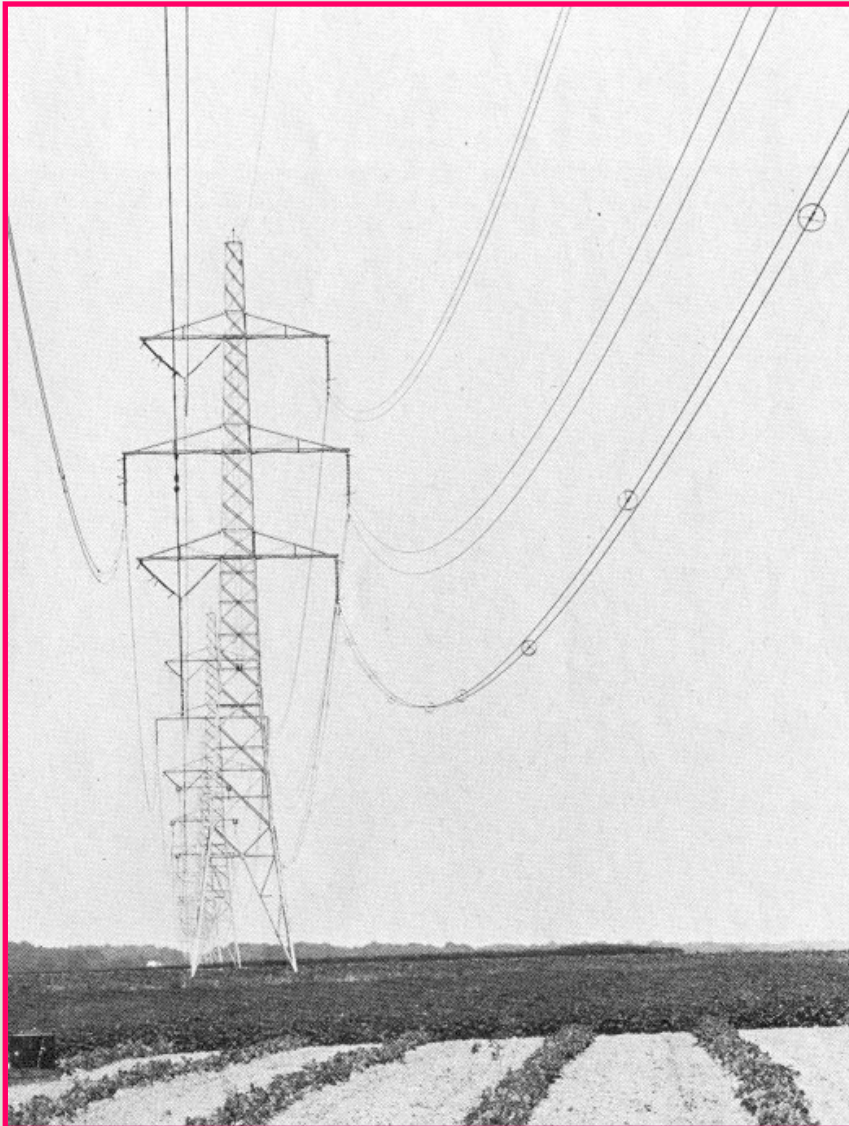
MODIFIED CONDUCTOR PROFILES AIR FLOW SPOILERS FOR LOW VOLTAGE LINES



DATA FROM 31 FIELD OBSERVATIONS ON DISTRIBUTION LINES

- COMPARISON OF GALLOPING AMPLITUDES ON UNTREATED CONDUCTORS AND CONDUCTORS WITH AIR FLOW SPOILERS
- AMPLITUDES SHOWN DIVIDED BY SAG TO NORMALIZE DATA FROM DIFFERENT SPAN LENGTHS
- MAXIMUM GALLOPING AMPLITUDE REDUCED TO ABOUT 1/4 BY AIR FLOW SPOILERS
- FORCES APPROX. EQUAL TO AMPLITUDE SQUARED

CONTROL OF GALLOPING



BUNDLE MODIFICATION

- *ROTATE BUNDLE TO VERTICAL*
- *SEPARATE SUBCONDUCTORS WITH HOOP SPACERS*
- *REDUCES TORSIONAL STIFFNESS OF THE SPAN AND ALLOWS WET SNOW TO FALL OFF AS THE CONDUCTORS ROLL UNDER THE ADDED WEIGHT*
- *NEED TO DISTINGUISH BETWEEN GLAZE ICE AND WET SNOW*

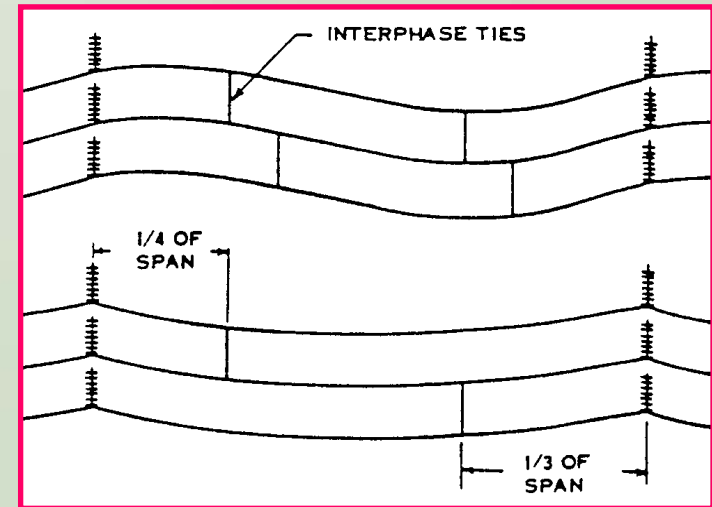
CONTROL OF GALLOPING



RIGID AND FLEXIBLE INTERPHASE SPACERS



- POLYMERIC MATERIALS COMMONLY USED
- CORONA RINGS AT HIGH VOLTAGES



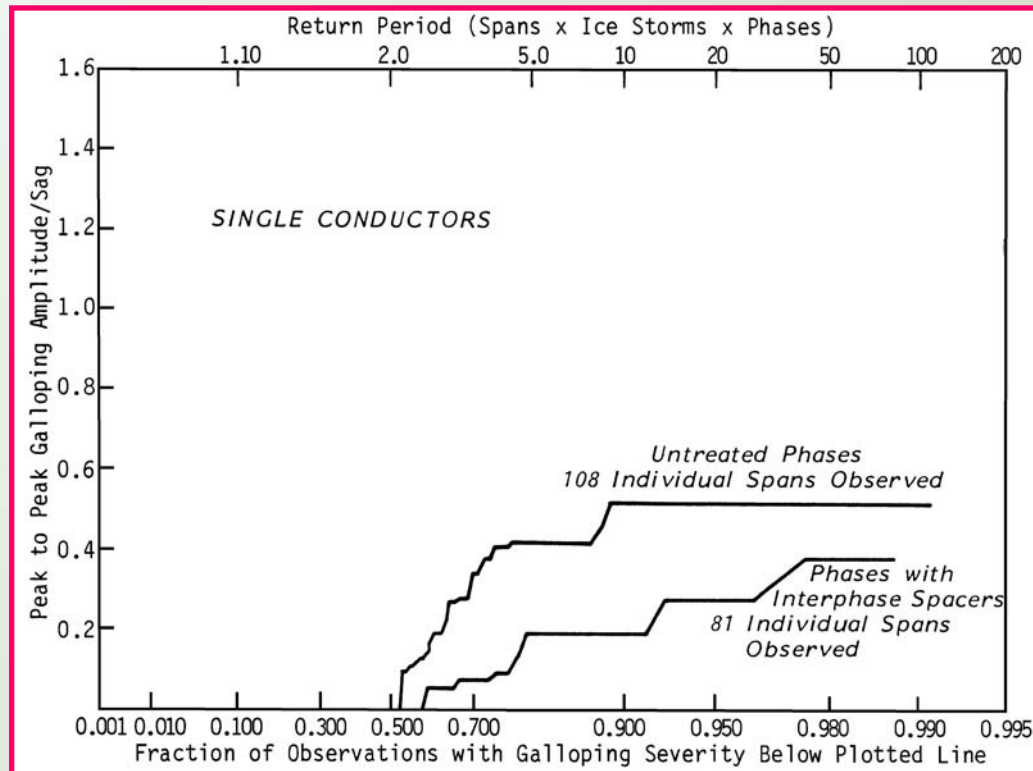
IN SPAN LOCATIONS

- NEED TO AVOID MID-POINT
- TWO INTERPHASE SPACERS PER SPAN ON SHORT SPANS
- FOUR INTERPHASE SPACERS PER SPAN ON LONG SPANS
- POSSIBLE CLASHING WHEN TWO INTERPHASE SPACERS ARE USED

CONTROL OF GALLOPING



INTERPHASE SPACERS



DATA FROM 10 FIELD OBSERVATIONS

- **COMPARISON OF GALLOPING AMPLITUDES ON UNTREATED CONDUCTORS AND CONDUCTORS WITH INTERPHASE SPACERS**
- **AMPLITUDES SHOWN DIVIDED BY SAG TO NORMALIZE DATA FROM DIFFERENT SPAN LENGTHS**
- **MAXIMUM GALLOPING AMPLITUDE REDUCED TO ~1/2**

VIDEO OF TWIN BUNDLE TEST LINE WITH “D” SECTION AIRFOILS AND INTERPHASE SPACERS (IREQ)

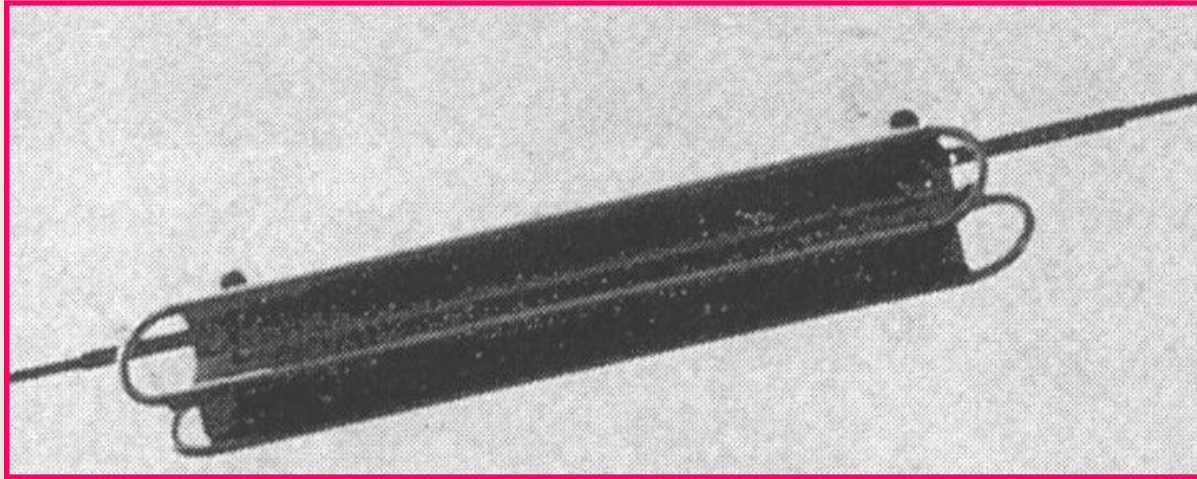


Lilien and Havard, TF B2.11.06

CONTROL OF GALLOPING



AERODYNAMIC DRAG DAMPER

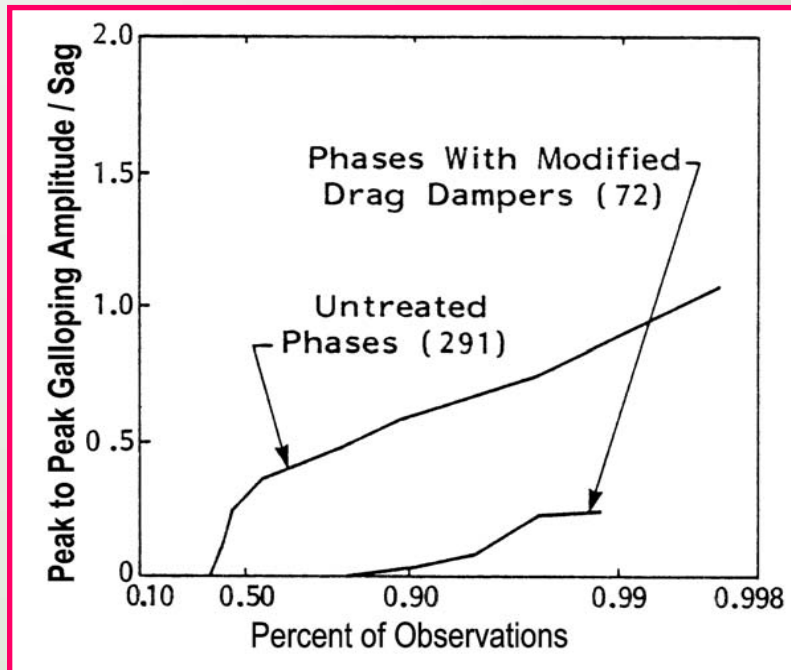


- GENERATES TORSIONAL MOTION TO SMOOTH THE ICE PROFILE
- VANES INCREASE BOTH AERODYNAMIC DRAG AND THE AERODYNAMIC DAMPING OF THE CONDUCTOR FOR GALLOPING CONTROL.
- MODIFIED DESIGN TESTED HAS A SLIGHT CHANGE OF ANGLE OF THE TWO CONCAVE SURFACES TO OPTIMIZE THE AERODYNAMIC CHARACTERISTICS
- MODIFIED VERSION WAS INSTALLED WITH BOTH HEAVY (45 kg, 100 lb) AND LIGHT (14 kg, 30 lb) DESIGNS IN EACH SPAN

CONTROL OF GALLOPING



AERODYNAMIC DRAG DAMPER



DATA FROM 8 FIELD OBSERVATIONS ON SINGLE CONDUCTORS

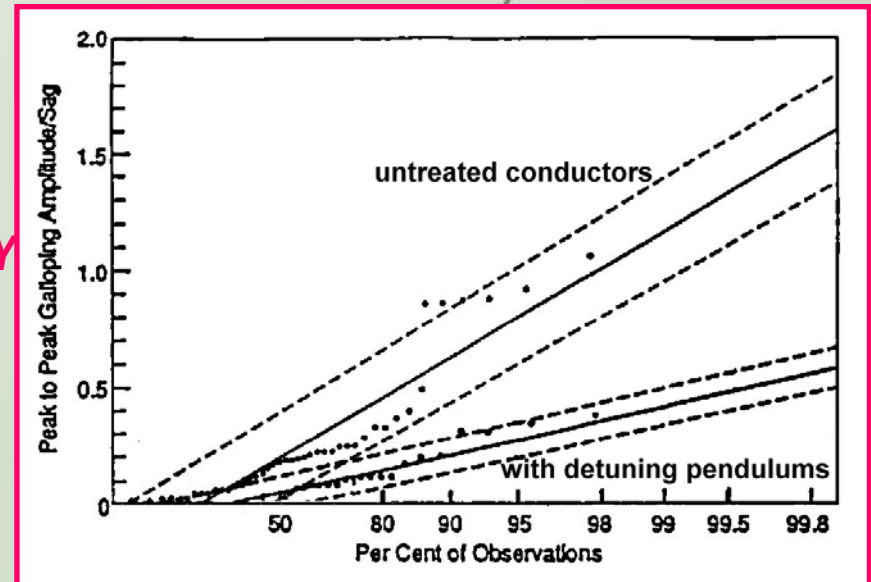
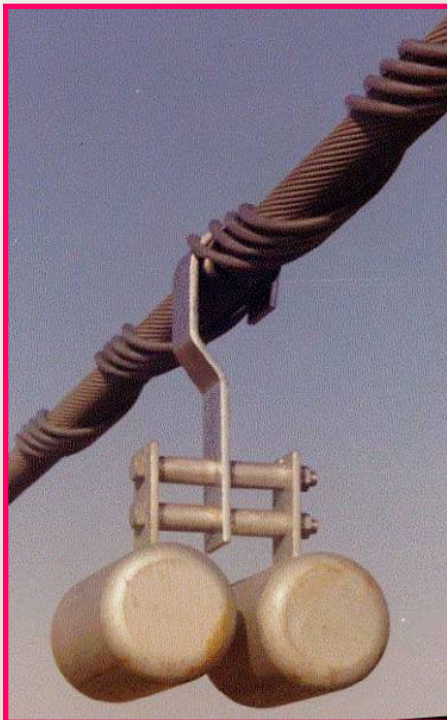
- **COMPARISON OF GALLOPING AMPLITUDES ON UNTREATED CONDUCTORS AND CONDUCTORS WITH MODIFIED DRAG DAMPERS**
- **AMPLITUDES SHOWN DIVIDED BY SAG TO NORMALIZE DATA FROM DIFFERENT SPAN LENGTHS**
- **MAXIMUM GALLOPING AMPLITUDE REDUCED TO ~1/3**

CONTROL OF GALLOPING



TORSIONAL DEVICES

- **DETUNING PENDULUM FOR SINGLE CONDUCTORS**
- **THREE OR FOUR PER SPAN**
- **ARM LENGTH CONTROLS FREQUENCY**
- **WEIGHT CONTROLS AMOUNT OF ICE**



DATA FROM 43 FIELD OBSERVATIONS ON SINGLE CONDUCTORS (25 – 50 mm DIAM, 120 – 480 m SPANS)

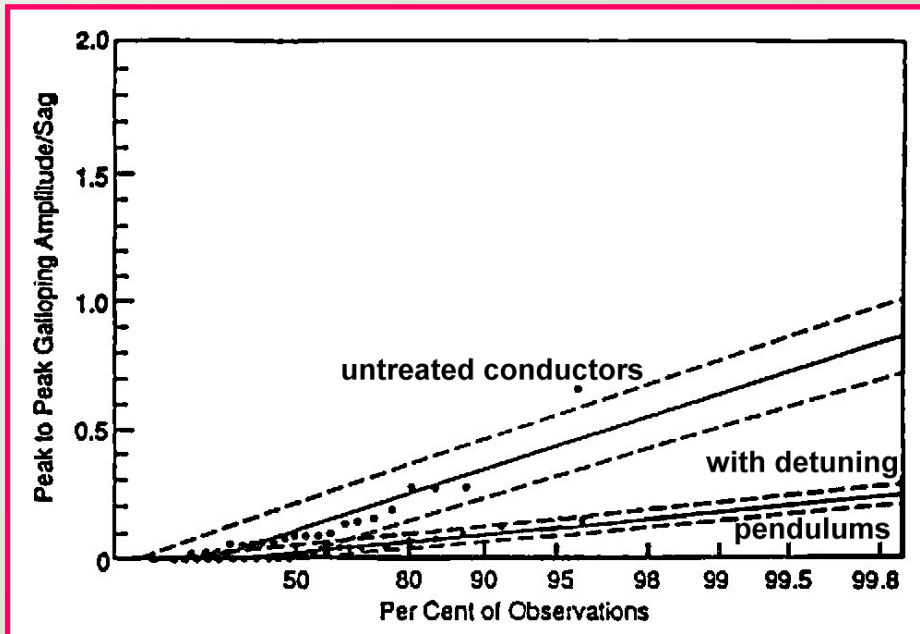
- **COMPARISON OF GALLOPING AMPLITUDES ON UNTREATED CONDUCTORS AND CONDUCTORS WITH DETUNING PENDULUMS**
- **AMPLITUDES SHOWN DIVIDED BY SAG TO NORMALIZE DATA FROM DIFFERENT SPAN LENGTHS**
- **MAXIMUM GALLOPING AMPLITUDE REDUCED TO ~1/3**

CONTROL OF GALLOPING



TORSIONAL DEVICES

- *DETUNING PENDULUMS FOR TWIN BUNDLES*
- *THREE OR FOUR PER SPAN (AT 1/5, 1/3, 7/12, 3/4 POINTS)*
- *UNITS MOUNTED ON A RIGID SPACER*
- *PREFORMED ROD AND ELASTOMER LINING ATTACHMENTS TO REDUCE LOCAL STRESSES IN CONDUCTOR*



DATA FROM 24 FIELD OBSERVATIONS ON TWIN BUNDLES

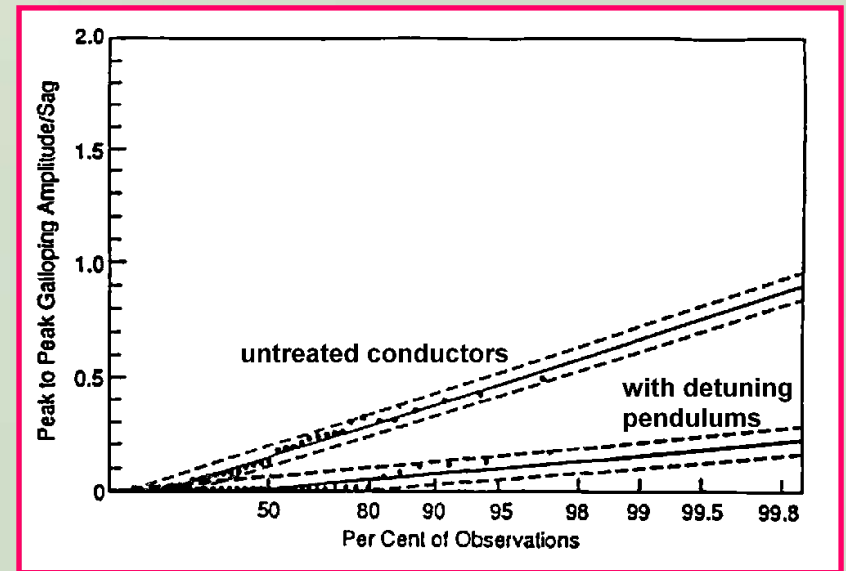
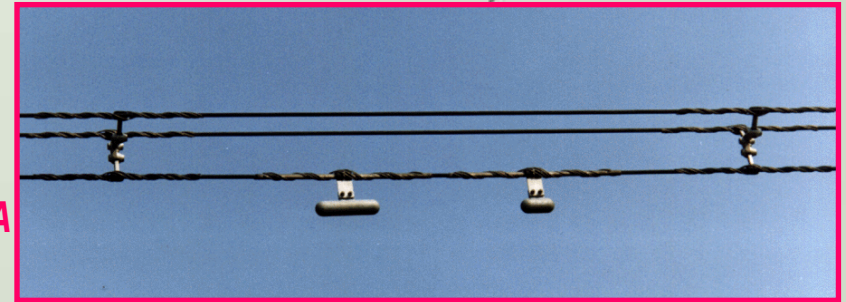
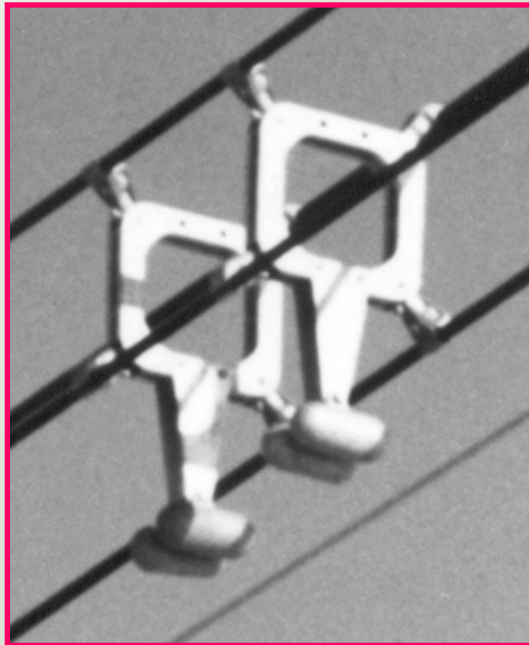
- *MAXIMUM GALLOPING AMPLITUDE REDUCED TO ~1/4*

CONTROL OF GALLOPING



TORSIONAL DEVICES

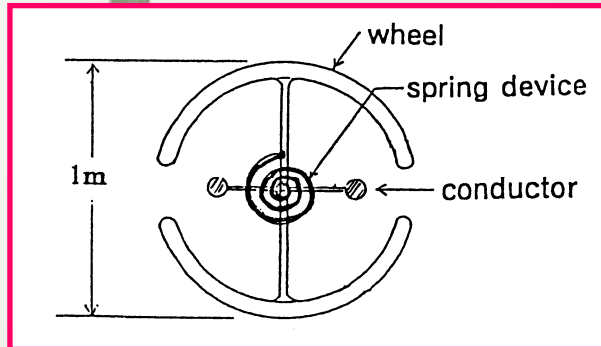
- *DETUNING PENDULUMS FOR TRIPLE AND QUAD BUNDLES*
- *UNITS MOUNTED ON A SPACER DAMPER OR ON LOWER SUBCONDUCTOR WITH EXTRA SPACERS TO MAINTAIN BUNDLE GEOMETRY*
- *ARM LENGTH LIMITED BY CORONA PERFORMANCE*



DATA FROM 32 FIELD OBSERVATIONS ON QUAD BUNDLES

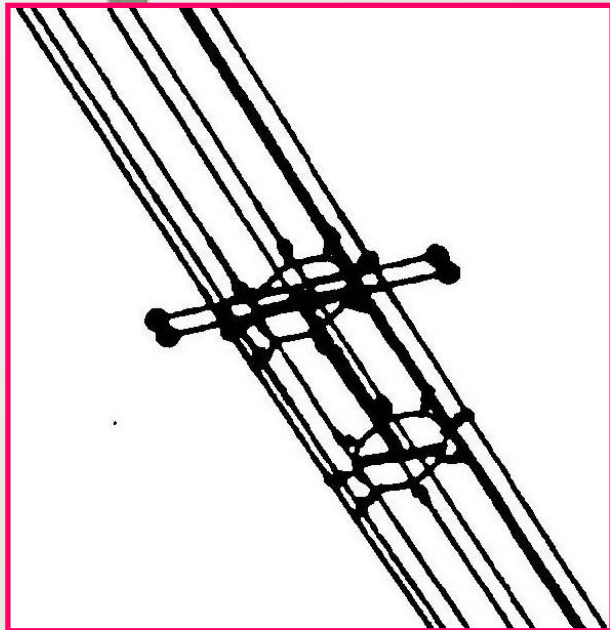
- *MAXIMUM GALLOPING AMPLITUDE REDUCED TO ~1/4*

CONTROL OF GALLOPING



TORSIONAL DEVICES WITH DAMPING

- *TCD (Japan)*
- *TORSIONAL TUNER AND DAMPER (GCD, JAPAN)*
- *TORSIONAL DAMPER AND DETUNER (TDD, BELGIUM)*
- *USUALLY TWO UNITS PER SPAN - DESIGNED TO MATCH SINGLE LOOP AND TWO LOOP GALLOPING FREQUENCIES*
- *ALL TORSIONAL DEVICES ARE DESIGNED SPECIFICALLY FOR THE CONDUCTOR SIZE, SPAN LENGTH AND TENSION OF THE PARTICULAR SPANS TO WHICH THEY ARE ATTACHED*

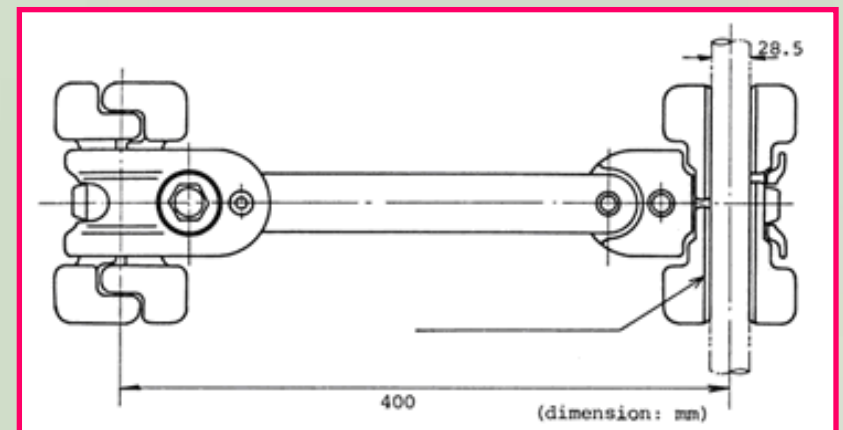
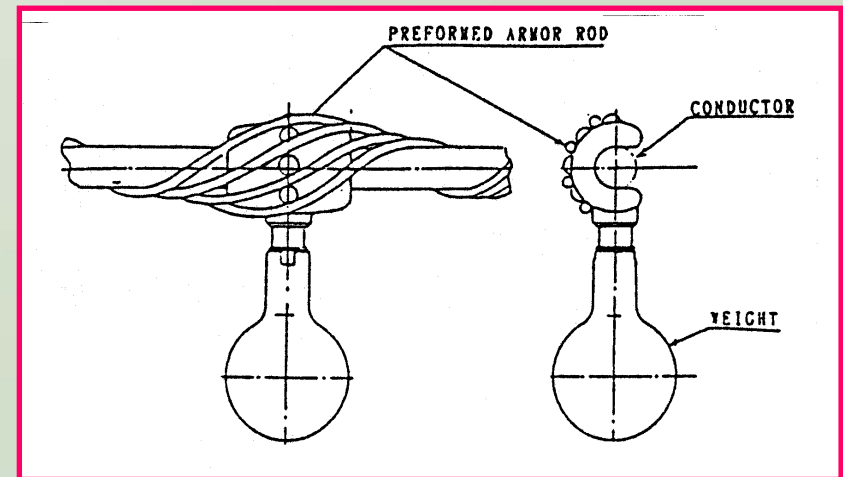


CONTROL OF GALLOPING



ECCENTRIC WEIGHTS (GCD) AND ROTATING CLAMP SPACERS (JAPAN)

- GALLOPING IS REDUCED WHEN THE ICE PROFILE IS SMOOTH AND LESS ECCENTRIC
- DEVICES ENCOURAGE CONDUCTOR OSCILLATION DURING ICE STORMS
- USED FOR WET SNOW EXPOSURE
- THE ECCENTRIC WEIGHTS ARE ABOUT 20 KG, AND ARE MOUNTED HORIZONTALLY IN ALTERNATING DIRECTIONS ON THE SUBCONDUCTORS
- SYSTEM APPLIED TO SINGLE CONDUCTORS AND TWIN AND QUAD BUNDLES

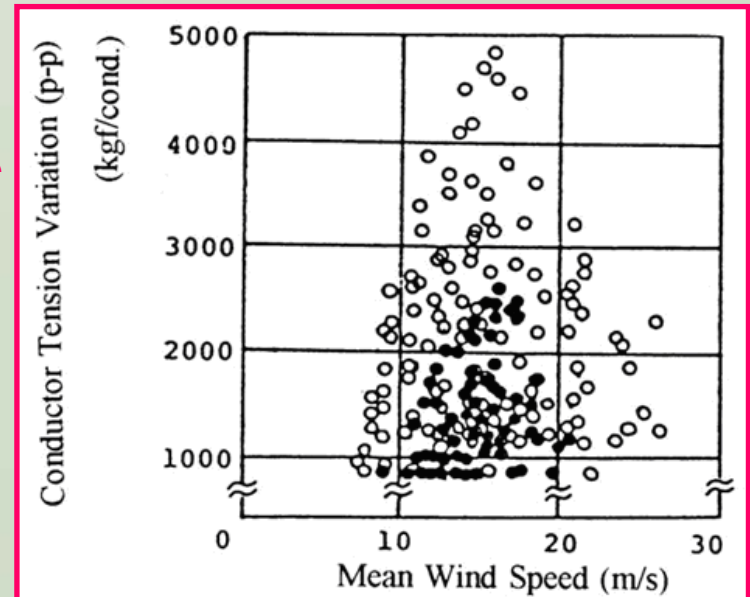
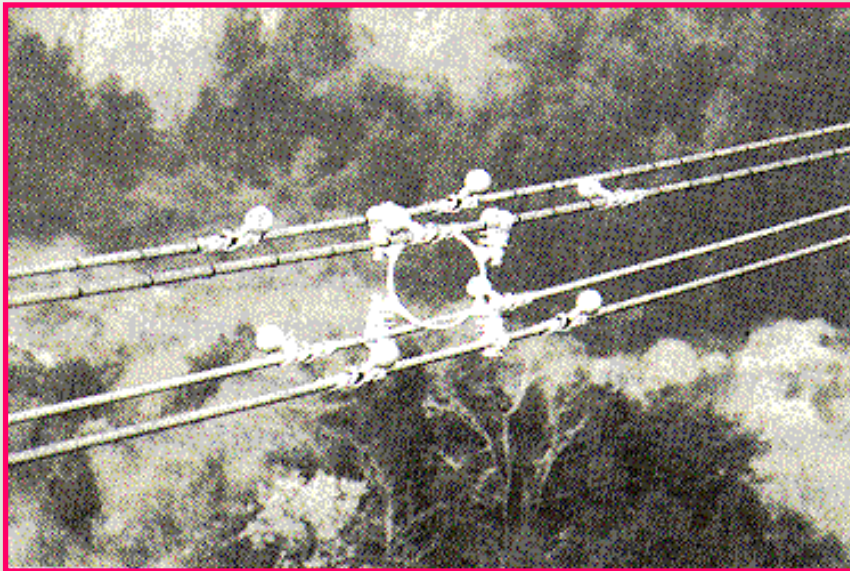


CONTROL OF GALLOPING



ECENTRIC WEIGHTS (GCD) AND ROTATING CLAMP SPACERS (JAPAN)

- *FIELD TRIALS SHOW REDUCED TENSIONS WITH GCD*
- *SYSTEM APPLIED TO SINGLE CONDUCTORS AND TWIN AND QUAD BUNDLES*

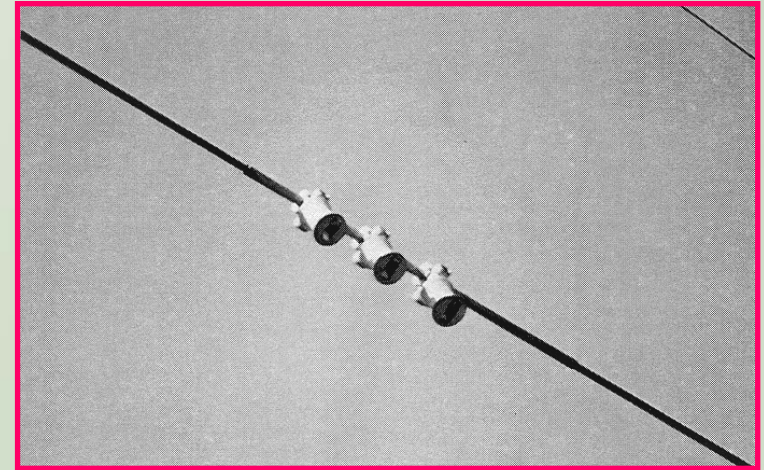


CONTROL OF GALLOPING



AR TWISTER (USA)

- **AR TWISTER IS DESIGNED TO CREATE A SMOOTH ICE PROFILE ON SINGLE CONDUCTORS**
- **THIS DEVICE IS A WEIGHT ATTACHED RIGIDLY TO THE CONDUCTOR BY A STANDARD CONDUCTOR CLAMP**
- **THE INDIVIDUAL WEIGHTS ARE ABOUT 3.6 KG (8 LB)**
- **THEY ARE INSTALLED VERTICALLY ABOVE THE CONDUCTOR AT MID-SPAN, AND THE TOTAL WEIGHT AND NUMBER OF DEVICES IS CHOSEN TO ROTATE THE CONDUCTOR BETWEEN 90 AND 140 DEGREES**
- **DURING GALLOPING THE ROTATIONAL OSCILLATIONS ARE ENHANCED, AND THE ICE DEPOSIT IS SMOOTHER AND THINNER**
- **THE AERODYNAMIC LIFT IS THEREBY REDUCED AND GALLOPING IS LESS LIKELY TO OCCUR.**



CONTROL OF GALLOPING



SUMMARY OF GALLOPING CONTROL DEVICES (1/3)

DEVICE NAME	APPL'N	WEATHER CONDITION		LINE CONSTRUCTION			COMMENTS
		GLAZE	WET SNOW	DIST'N	SINGLE TRANS'N	BUNDLE	
RIGID AND FLEXIBLE INTERPHASE SPACERS	WIDELY USED	YES	YES		YES	YES	PREVENTS FLASHOVERS, NOT GALLOPING MOTIONS
AIR FLOW SPOILER	WIDELY USED	YES		YES	YES	YES	COVERS 25% OF SPAN LIMITED BY VOLTAGE EXTENSIVE FIELD EVALUATION
ECCENTRIC WEIGHTS & ROTATING CLAMP SPACERS	USED IN JAPAN		YES		YES	YES	THREE PER SINGLE SPAN ONE PER SPACER PER SUB-CONDUCTOR

CONTROL OF GALLOPING



SUMMARY OF GALLOPING CONTROL DEVICES (2/3)

DEVICE NAME	APPL'N	WEATHER CONDITION		LINE CONSTRUCTION			COMMENTS
		GLAZE	WET SNOW	DIST'N	SINGLE TRANS'N	BUNDLE	
AR TWISTER	USED IN USA	YES			YES	YES	TWO PER SPAN
AR WINDAMPER	USED IN USA	YES			YES	YES	TWO PER SPAN
TORSIONAL CONTROL DEVICE (TCD)	USED IN JAPAN		YES			YES	TWO PER SPAN

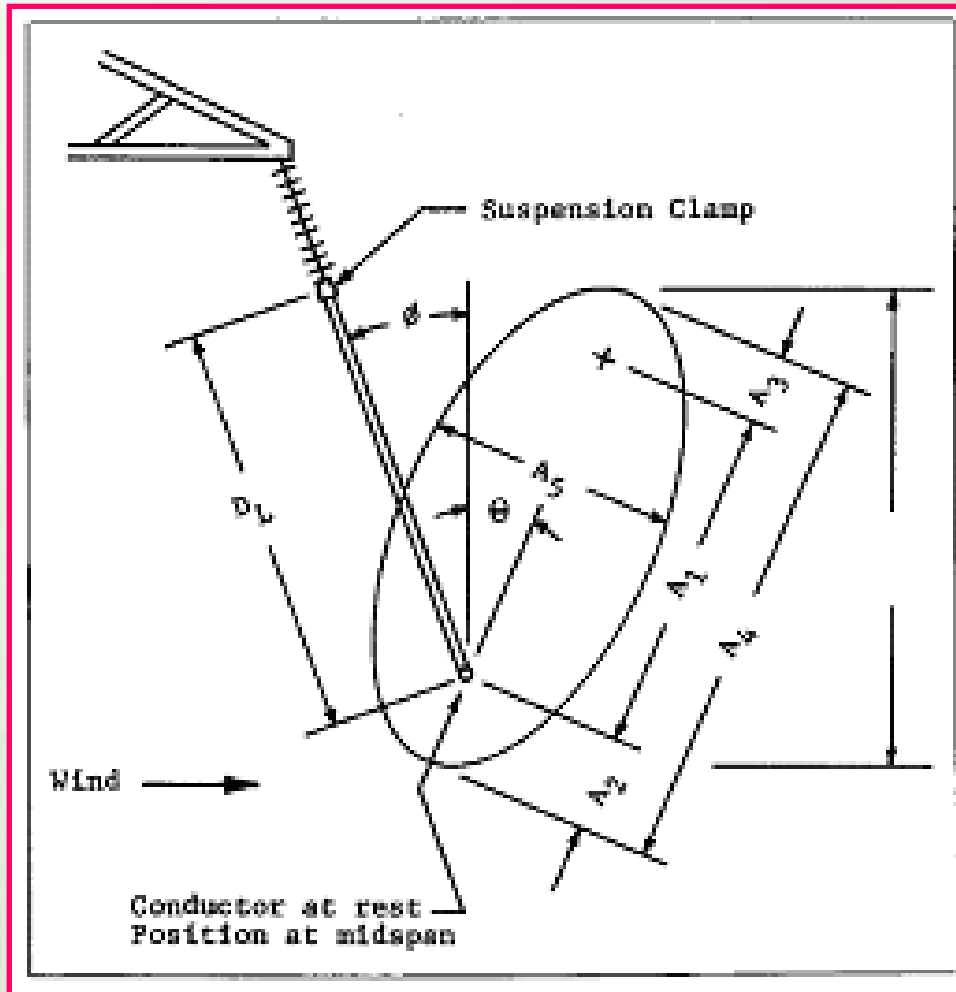
CONTROL OF GALLOPING



SUMMARY OF GALLOPING CONTROL DEVICES (3/3)

DEVICE NAME	APPL'N	WEATHER CONDITION		LINE CONSTRUCTION			COMMENTS
		GLAZE	WET SNOW	DIST'N	SINGLE TRANS'N	BUNDLE	
GALLOPING CONTROL DEVICE (GCD)	USED IN JAPAN		YES			YES	TWO PER SPAN
DETUNING PENDULUM	WIDELY USED	YES		YES	YES	YES	3 OR 4 PER SPAN. USES ARMOR RODS IF TENSION IS HIGH. MOST EXTENSIVE FIELD EVALUATIONS
TORSIONAL DAMPER AND DETUNER (TDD)	EXPER-IMENTAL	YES				YES	2 OR 3 PER SPAN

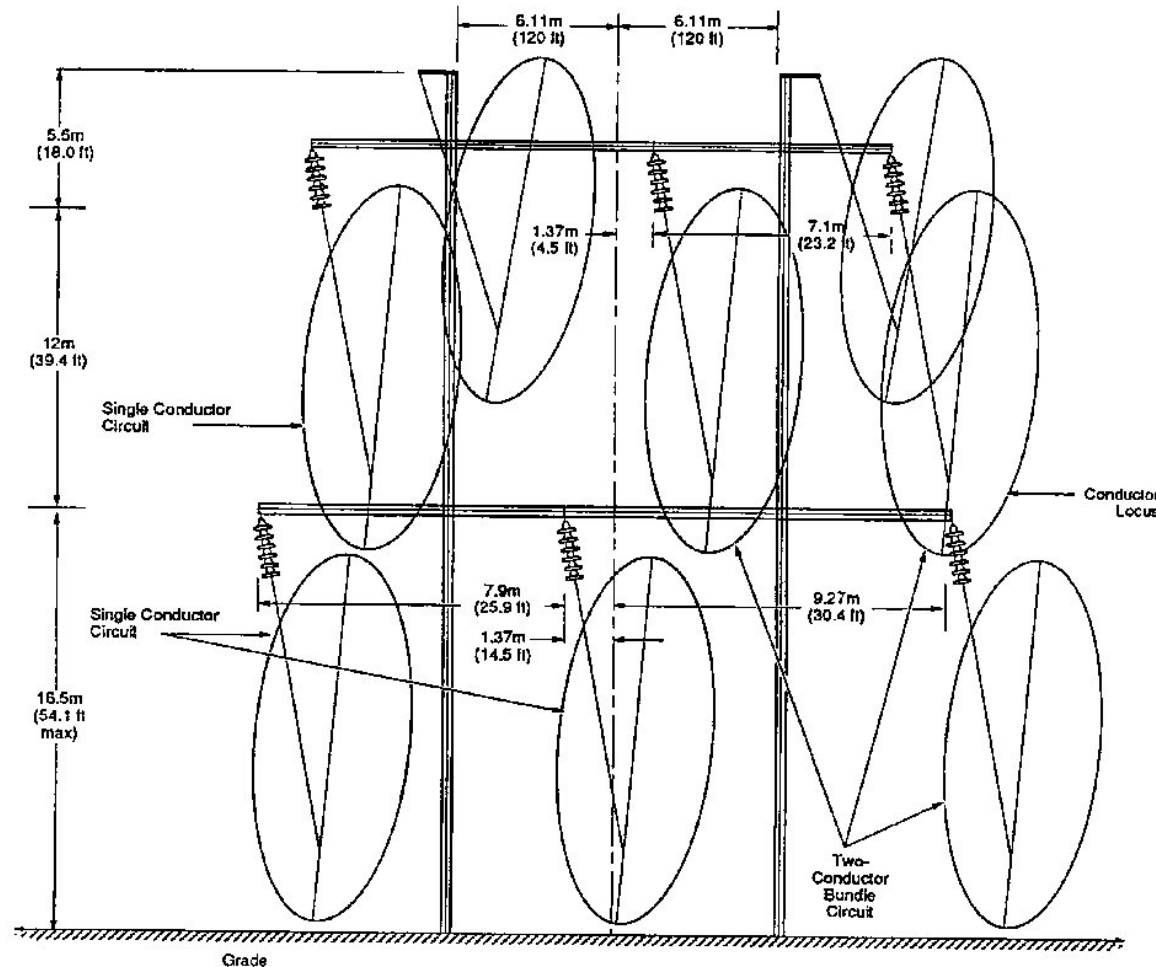
DESIGN AGAINST GALLOPING



RURAL ELECTRIFICATION ADMINISTRATION (REA) GUIDE

- COMMON DESIGN METHOD IS ELLIPTICAL CLEARANCE ENVELOPE - BASED ON 1930S TECHNOLOGY
- ANGLE OF ELLIPSE RELATED TO SWING ANGLE OF CONDUCTOR
- ASSUMES MOTIONS LIMITED TO $\sim 1.3 \times$ SAG ON SPANS SHORTER THAN 230 m
- VERTICAL HEIGHT BASED ON MULTIPLE LOOP GALLOPING ON SPANS LONGER THAN 230m

DESIGN AGAINST GALLOPING



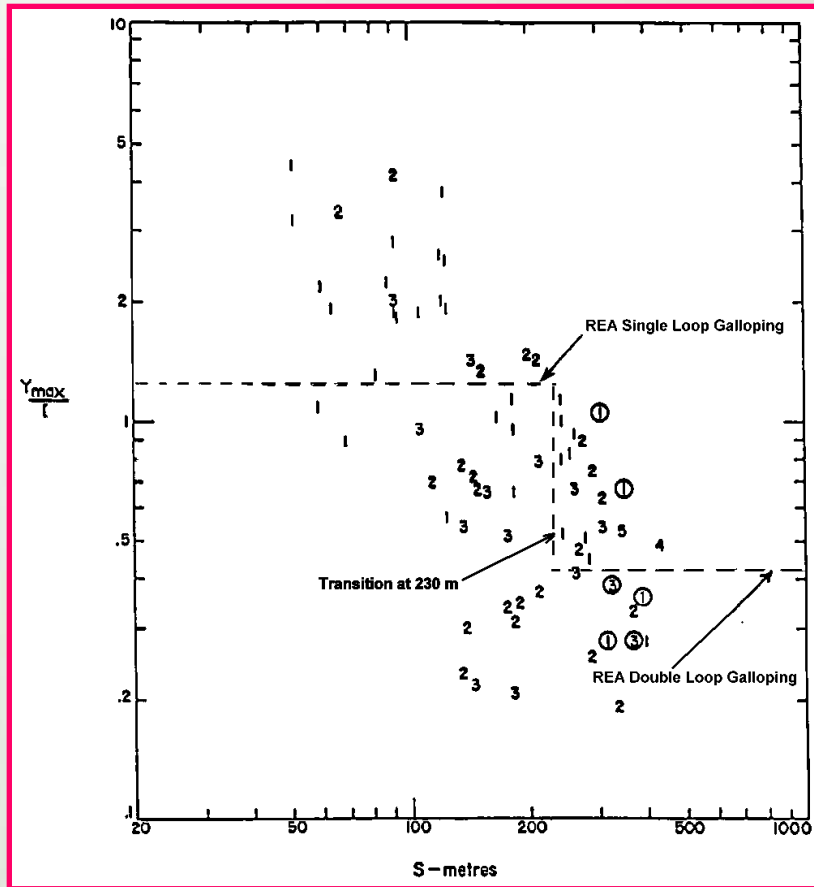
- **STRUCTURE HAS TWO CIRCUITS AND TWO OVERHEAD GROUND WIRES**
- **ELLIPSE OVERLAPS SHOW FLASHOVER POINTS DURING GALLOPING**
- **AIR GAP REQUIRED BETWEEN ELLIPSES BASED ON VOLTAGE OF LINE**

GALLOPING CLEARANCE ELLIPSES FOR A STRUCTURE

PHASE TO PHASE AND PHASE TO GROUND CLEARANCES REQUIRED BETWEEN GALLOPING CLEARANCE ELLIPSES

<i>Voltage</i>	<i>115 kV</i>	<i>138 kV</i>	<i>230 kV</i>	<i>345 kV</i>	<i>500 kV</i>
<i>Phase- Phase</i>	<i>0.46 m (1.5 ft)</i>	<i>0.46 m (1.5 ft)</i>	<i>0.76 m (2.5 ft)</i>	<i>1.07 m (3.5 ft)</i>	<i>1.83 m (6.0 ft)</i>
<i>Phase- Ground</i>	<i>0.30 m (1.0 ft)</i>	<i>0.30 m (1.0 ft)</i>	<i>0.61 m (2.0 ft)</i>	<i>0.76 m (2.5 ft)</i>	<i>1.22 m (4.0 ft)</i>

DESIGN AGAINST GALLOPING



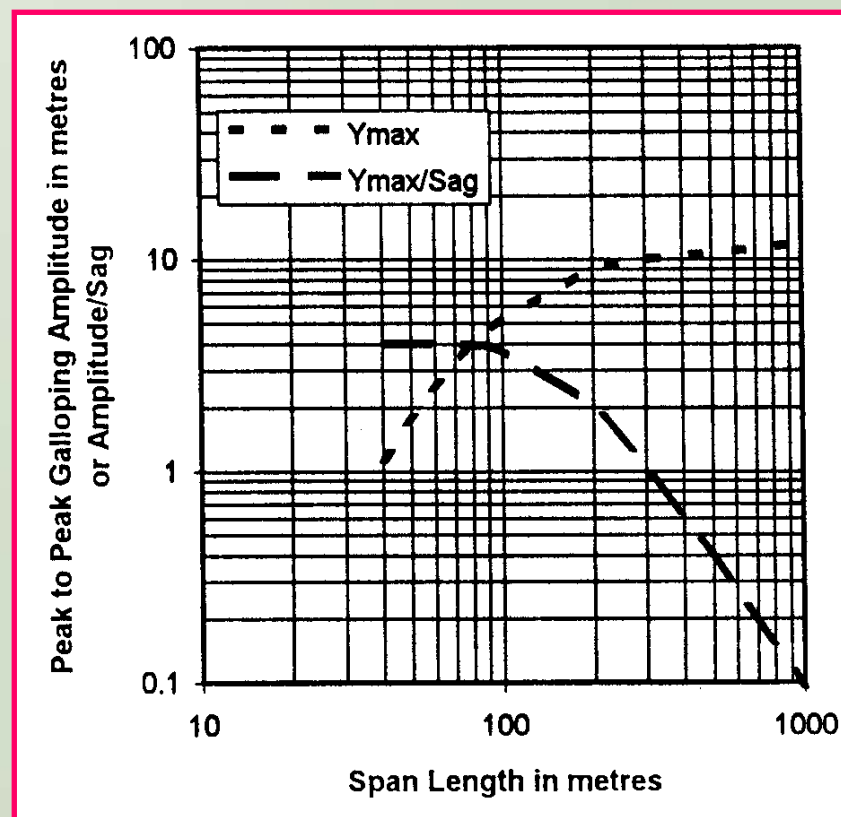
PEAK TO PEAK GALLOPING AMPLITUDE /
SAG vs SPAN LENGTH FROM FIELD DATA
AND CORRESPONDING REA GUIDE

- **FIELD DATA ON GALLOPING SHOW DEFICIENCIES IN ASSUMED GALLOPING MOTIONS**
- **DIFFERENCE BETWEEN GALLOPING DUE TO GLAZE ICE AND WET SNOW NEEDS TO BE RECOGNIZED**
- **DYNAMIC LOADS DUE TO GALLOPING ARE NOT EXPLICITLY INCLUDED**
- **DESIGN APPROACH NEEDS UPDATING BASED ON PRESENT KNOWLEDGE**

DESIGN AGAINST GALLOPING



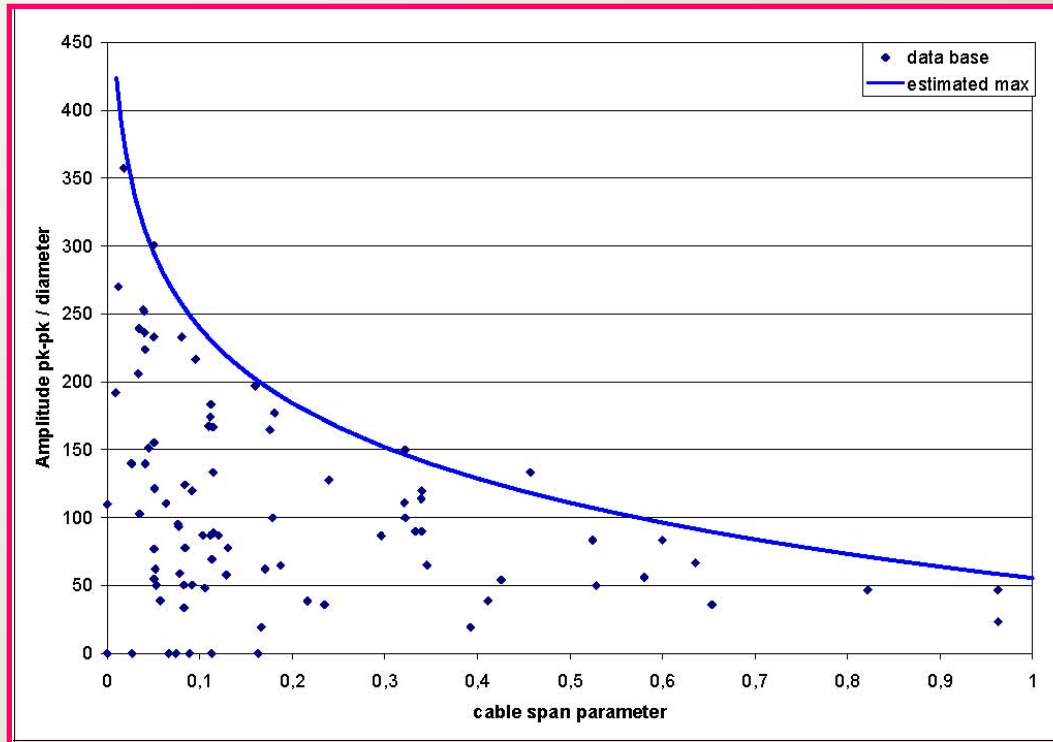
- **BASED ON ANALYSIS OF FIELD DATA FROM ALL GALLOPING OBSERVATIONS**
- **DATA FROM SINGLE CONDUCTOR SITES ONLY**
- **BUNDLE DATA IS FOR LONGER SPANS LENGTHS ONLY**
- **SIMILAR ENVELOPES OF MAXIMUM AMPLITUDE AND AMPLITUDE/SAG FOR BUNDLE CONDUCTORS**



MAXIMUM GALLOPING AMPLITUDE AND AMPLITUDE/SAG VERSUS SPAN LENGTH

- **ENVELOPES OF FIELD DATA**

DESIGN AGAINST GALLOPING



CABLE SPAN PARAMETER = $100 \times \text{DIAM} / 8 \times \text{SAG}$

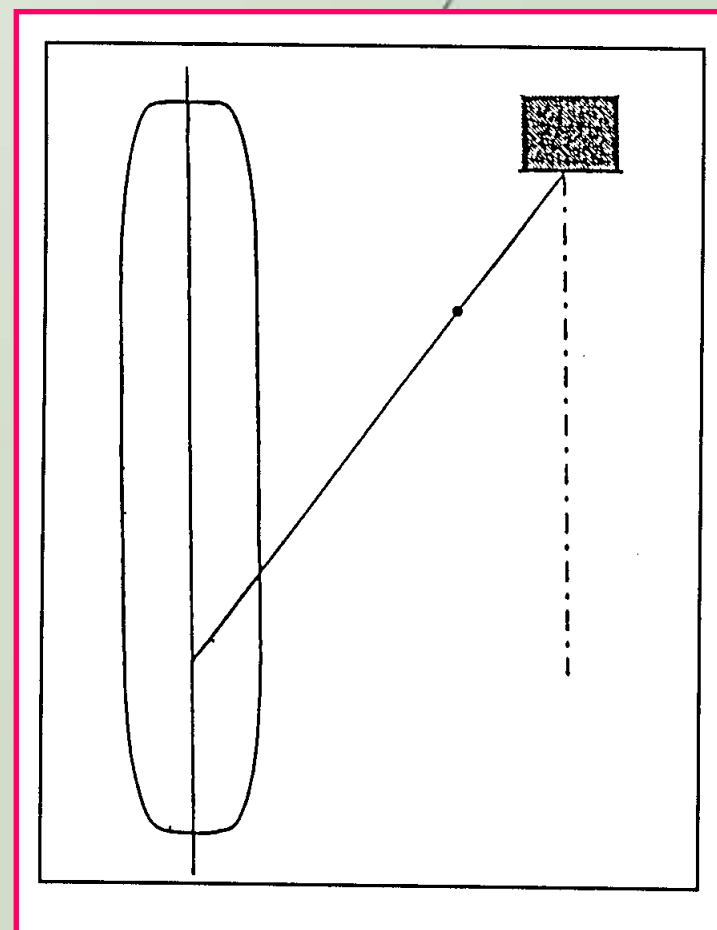
FITTED CURVE: $A/D = 80 \ln(8 \times \text{SAG} / 50 \times \text{DIAM})$

- **ALTERNATIVE CURVE OF MAXIMUM GALLOPING AMPLITUDES WITH BETTER FIT TO THE DATA**
- **AMPLITUDE/DIAMETER VS CABLE SPAN PARAMETER**
- **SAME CURVE FOR SINGLE AND BUNDLE CONDUCTORS**
- **DATA ARE FOR GLAZE ICE CONDITONS**
- **MORE DATA ARE NEEDED FOR GALLOPING DUE TO WET SNOW**

ALTERNATIVE GALLOPING ENVELOPE



- **BASED ON FRAME BY FRAME ANALYSIS OF 44 MOVIE FILMS OF GALLOPING FROM SINGLE AND TWIN, TRIPLE, AND QUAD BUNDLE LINES**
- **ALL GALLOPING EVENTS FILMED WERE DUE TO GLAZE ICE**
- **MOTIONS ARE ALMOST ENTIRELY VERTICAL**
- **WIDTH OF ENVELOPE IS 20 PERCENT OF HEIGHT**
- **UPWARD MOVEMENT IS 3 TIMES AS LARGE AS DOWNWARD MOVEMENT FROM STATIC POSITION**



**ENVELOPE OF GALLOPING MOTIONS
BASED ON FILM ANALYSIS**



CONCLUSIONS (1 OF 2)

- **GALLOPING ON POWER LINES MAY INDUCE SERIOUS DAMAGE ON ALL PARTS**
- **OCCURRENCES ARE DIFFICULT TO PREDICT BECAUSE THEY DEPEND ON THE ICE SHAPE AND DENSITY, WIND SPEED AND DIRECTION, AND DYNAMIC STRUCTURAL PROPERTIES, SUCH AS NATURAL FREQUENCY AND STIFFNESS OF THE CONDUCTOR UNDER THE ICE AND WIND CONDITIONS**
- **GALLOPING IS A COMPLEX AEROELASTIC INSTABILITY**
- **CONTROLS FOR PREVENTING GALLOPING ARE MAKING PROGRESS**

CONCLUSIONS (2 OF 2)

- ***THE TWO MECHANISMS OF GALLOPING NEED DIFFERENT MEANS OF PREVENTION***
- ***DIFFERENT ICE AND WET SNOW CONDITIONS NEED DIFFERENT TREATMENT***
- ***SINGLE AND BUNDLE CONDUCTORS NEED DIFFERENT TREATMENT***
- ***DESIGN ELLIPSES CAN BE USED FOR CLEARANCES AND TOWER CAN BE DESIGNED TO RESIST THESE EXCEPTIONAL EVENTS***
- ***NEW INFORMATION IS AVAILABLE TO UPDATE DESIGN CLEARANCES FOR SOME CONDITIONS***



AUTHOR: DR. DAVID G. HAVARD
PRESIDENT, HAVARD ENGINEERING INC.
TEL: 1-905-273-3076
FAX: 1-905-273-5402
E-MAIL: dhavard@rogers.com
WEB PAGE: www.havardengineering.com
ADDRESS:
3142 LINDENLEA DRIVE,
MISSISSAUGA, ONTARIO,
CANADA, L5C 2C2

TAB 26

NextBridge Interrogatory # 66

Reference:

EB-2017- HONI Lake Superior Link Application - March 29, 2018 Additional Evidence, System Impact Assessment Page 2:

Interrogatory:

Preamble: "Extreme contingencies that result in the loss of the four 230 kV circuits of the East-West Tie such as failure of a quadruple circuit tower can result in separation between the Northwest transmission zone and the rest of the IESO-controlled grid. Following such events, timely system restoration is critical to avoid the risk of supply shortages to the customers in the zone".

For each HONI transmission tower failure or collapse over the past 10 years provide the following data and information:

- a) The voltage, number of towers involved, number of circuits on the towers and location indicated by urban or rural;
- b) The days of the outage of the transmission circuit (from substation to substation);
- c) Whether there was a loss of load; if yes, the duration of the loss of load;
- d) Was a root cause analysis conducted? If no, why not. If yes, provide a copy of the root cause analysis.
- e) Were any remedial measures or procedures implemented? If not, why not. If yes, provide a copy.

Response:

In the past 10 years, tower failures impacting the connection between the Northwest transmission zone and the rest of the IESO-controlled grid, include:

1. M23L-M24L, March 25, 2009, Ice Storm
 - a) 230 kV, ten towers failed, two circuits (M23L-M24L), close to Terrace Bay
 - b) 16 days

- c) No loss of load for the initial fault. However, on the reclosure attempt following the initial fault, a circuit breaker failed, resulting in the loss of radial circuit M2W and its 38.5 MW load by configuration. This radial load was restored within 3.5 hours according to the Operation logs. It must be noted that this load loss is not directly attributed to the EWT tower failure; it was a result of a circuit breaker malfunction.
- d) There was no formal root cause investigation as the ice accretion was significantly higher than the design loading. It was estimated that the failed section of the transmission line was subjected to a combination of 1.5 inches of ice and 60 mph winds as compared to the design loading of 1 inch of ice with no wind and 0.5 inch of ice with 50 mph wind.
- e) Based on the above observation, failed towers were replaced with stronger towers to withstand a higher level of ice and wind load for the area than what was required by the standard for Northern Ontario.

2. W21M-W22M, September 12, 2011

- a) 230 kV, one (1) tower failed, 2 circuits (W21M-W22M), about 16 km west of Wawa (about 36 km west of Wawa TS)
- b) 9 days
- c) No loss of load.
- d) There was no formal root cause investigation since the indications were that the tower collapse was caused by a microburst.
- e) No remedial action was recommended as the towers meet the design security criteria.



- › Responsible for all aspects of the structural discipline including gantries and equipment supports for two 230 kV substations in Newfoundland / Labrador (Bottom Brook and Granite Canal) and Woodbine 345/230 kV in Nova-Scotia.

Blackspring Ridge, Steel Tubular structures 240 kV TL, Altalink, Alberta, Canada (2013)

- › Design criteria review, scope of work preparation for all types of foundation works, coordination and drawings preparation for various foundation types.

Underwood 138 kV wood pole TL, Altalink, Alberta, Canada (2013)

- › Verification of wood pole structures, foundation loads, anchor types selection, preparation of foundation scope of work.

Dawson Creek Area 230 kV TL, BC Hydro, British Columbia, Canada (2013)

- › Design criteria review, new tower head configuration, tower loading, coordination and verification of work for towers types D and KG.

Hansman Lake 240 kV Latticed Tower TL, Altalink, Alberta, Canada (2013)

- › Verification of design criteria, clearances, tensioning, tower loads, hardware, spotting, obstacles.

St-Césaire/Bedford QP1A project, Hydro-Québec, Quebec, Canada (2012 - 2013)

- › Design of steel grillage foundation for towers DQA & DQB.

Lower Matagani Hydroelectric project, Ontario Power Generation, Ontario, Canada (2011 - 2012)

- › Design of the 230 kV gantries for the Smoky Falls Substation as well as the gantries for the line between the powerhouse and the substation. Preparation and finalization of suppliers specs and structures drawings.

240 kV single circuit towers, Altalink, Alberta, Canada (2011)

- › Finalizing design criteria and design requirement drawings.

Navigation aide, Fisheries and oceans Canada, Quebec, Canada (2010)

- › Design of special foundation for Navigation Aide signs on the Saint-Lawrence River, Navigable ways shores.

138 kV single circuit wood pole transmission line, Altalink, Alberta, Canada (2010)

- › Finalizing design criteria, hardware, pole selection, pole spotting, stringing etc.

240kV Tower development Tubular, Altalink, Alberta, Canada (2009)

Site Experience

- › Canada
- › India
- › Oman

Computer Applications

- › PLS-CADD
- › STAAD III
- › TOWER
- › Sframe
- › Wframe
- › Wpole
- › Pframe
- › Caisson
- › Visual Design

- › Finalizing various loading zone's ruling spans and tensioning criteria, Preliminary caisson foundation analysis and cost estimation.

500 kV Double Delta Transmission line, Altalink, Alberta, Canada (2009)

- › Finalizing various loading zone's design criteria; Tensioning criteria, Galloping analysis; tower outline definition, unbalanced and general tower loads establishment; Design requirements drawings (DRD) finalization.

Hadjret en Nouss 1227 MW Thermal Combined Cycle Plant - SKH Project, Shariket Kahraba Hadjret en Nouss SPA (SKH SPA), Algeria (2006 - 2007)

- › Responsible for the design of the substation's structures, equipment supports and their foundations.

Areva De-icer at Lévis Substation, Areva T&D Canada Inc., Canada (2005 - 2006)

Responsible for substation structural works, including the design of latticed structures and equipment supports and their foundations.

Gulf Cooperation Council Interconnection Project Tendering Process for Phase I, Gulf Cooperation Council Interconnection Authority, Bahrain (2004 - 2005)

- › Responsible for the preparation and finalization of the tender documents civil/structural aspects for a 830 km overhead transmission line along the east coast of the Arabian peninsula.

Bécancour Combined Cycle Cogeneration Power Plant 230 kV Switchyard, TransCanada Energy Ltd., Quebec, Canada (2004 - 2005)

- › Responsible for the design of the substation's structures and equipment supports and their foundations.

Skikda Combined Cycle Power Plant 400 kV Switchyard, Shariket Kahraba Skikda SKS SPA, Algeria (2004)

- › Responsible for the design of the substation's structures, equipment supports and their foundations.

Hydro-Québec Network, Hydro-Québec, Quebec, Canada (1995 - 2001)

- › Lines: Design and verification of various types of tubular and lattice tower foundations (on pile, grillage, reinforced concrete, rock). Responsible for the verification, reinforcement and design of new brackets for the stringing of the optical fiber guard wires to be installed on various tower types in Hydro-Québec's network.
- › Substations: Design of a large number of equipment supports and foundations for various substation in Hydro-Québec's network.

Oumshkego Ishkotayo, Five Nations Energy Inc., Canada (2000)

138 kV Transmission Line on wood poles in Western James Bay area.

- › Responsible for establishing design criteria for the 270 km long transmission line and all four substations structures and foundations, design of substations and transmission line, and finalization of drawings.

PROFILE

Over 35 years of broad industrial, research, and teaching experiences. Have extensive experience in managing large projects and leading large group of professionals. Have extensive experience in transmission lines designs; failure investigations of lines, towers, hardware, and conductors. Vast experience in refurbishment, upgrades, and damage assessment of existing transmission structures and foundations. Have Strong experience in finite element analysis, stress analysis, design, maintenance, rehabilitation and reliability analysis of structures. A pioneer in area of damage assessment of existing transmission structures using expert systems, fuzzy logic, neural networks, and hybrid intelligent systems.

SKILLS

- Effective Management
- Expertise in Troubleshooting
- Creative Problem Solving
- Performance Optimization
- Transmission lines design
- Structural analysis and design
- Damage assessment and failure investigations
- Software Expertise: PLS-CADD, PLS-POLE, PLS-Tower, LPile, Caisson, Shaft, etc.
- Finite Element Analyses (RISA 3D, SAP 2000, Ansys, etc.)

ACCOMPLISHMENTS

Published over 60 technical papers in the general area of structural engineering and wrote two chapters in two reference books. Is the recipient of many prestigious scholarships and awards and is serving on several IEEE and CSA committees and working groups.

AWARDS:

- 1979 1981 Transport Canada Research and Development Centre (TCRDC) Ph.D. Fellowship
1977 1981 University of Waterloo Graduate Scholarship
1977 1979 National Research Council of Canada, Postgraduate Scholarship (NRC)

Other awards including, Egyptian government award for distinguished under graduate students (4-years), University of Windsor graduate scholarship, Ontario Graduate scholarship (declined due to obtaining other major scholarships), etc.

Subject matter expert on CEATI conferences (2016 and 2017)

Invited to give a lecture to University of Windsor graduate students - 2017

The recipient of 2012 and 2017 Hydro One President award for innovation.

PROFESSIONAL EXPERIENCE

MANAGER/SENIOR MANAGER, TRANSMISSION ENGINEERING

May 2013 – Present

Hydro One Network Inc.

Manage lines engineering projects, standards, emergency break-fix, etc. Ensure highly-engage and motivated staff. In addition, plan training and short and medium term resources, organize workforce to meet growing work program, direct resources to meet customer's need and emergency and break-fix works, and control the work flow and work quality.

TEAM LEAD, LINES ENGINEERING

January 2006 – 2013

Hydro One Network Inc.

Supervise/Manage a group of approximately 30 lines engineering staff (18 engineers, 12 Draftspersons, and a technical clerk). The accountability includes:

- Implement engineering goals, objectives, and strategies by providing effective team leadership and direction in establishing and maintaining an effective engineering design and analysis service.
- Plan, organize, schedule, and coordinate lines work and assign tasks providing instruction, as required to ensure that lines projects achieve their deliverables.
- Develop and obtain approval for and maintain lines engineering policies, standards, templates, and products.
- Support senior management by providing consolidated information on the engineering portion of projects with respect to standards requirements, failure and root cause analyses of transmission lines components, design alternatives, etc.
- Prepare and monitor the projects budget.

DESIGN SPECIALIST and SENIOR DESIGN SPICIAIALIST

1986-2000 and 2000-2006

Ontario Hydro/Hydro One Networks Inc.

- Designed many new transmission lines and refurbished/upgraded many existing lines using PLS-CADD programs.
- Conducted Failure investigations and root cause analyses, most recently, K2Z towers/conductor failures in 2018, the B3N River crossing tower failure in 2003, failure of two 500 kV guyed towers supporting circuit X503E in 2006, conductor failure of the new

Hydro Quebec interconnection transmission line in 2008, failures of several towers supporting circuits N21W/N22W in 2002 and 2011, etc.

- Designed new transmission structures (such as the twin circuits 500kV towers type V9S and V10L, tapping structures type BPD and BPE, twin circuits, twin bundle conductors, 230 kV towers type X29 and X30, single circuit 115 kV HAT1 type, and three circuits 115kV type HAT3 families of towers). Modified numerous structures for security or loading upgrades.
- Designed new families of light duty steel-pole structures (115 kV and 230 kV) for replacement of wood-pole-structures.
- Designed all type of foundations such as caisson, spread, mat, raft, pile etc. for all types of structures such as towers, wind turbines, etc. under all types of soil conditions (cohesive, granular, rock, weak etc.).
- Conducted Damage assessment of numerous steel structures.
- Provide technical consultations to construction, asset management, Work Methods, and Provincial Lines concerning the repair, maintenance, work safety of existing-transmission structures. Also provide technical consultations for special projects such as the Revenue Metering projects and other station projects.
- Development of probabilistic models for reliability assessment and remaining life of existing transmission lines' components.
- Development of new diagnostic models for the safety evaluation of existing transmission structures using fuzzy logic and hybrid intelligent expert systems.
- Analysis of transmission structures for possible installation on communication antennas. Design various types of brackets for installation of these antennas on transmission towers and steel poles (over 200 sites have been completed generating over ≈\$6 million dollar of annual revenue to Hydro One).
- Analysis of numerous communications towers (self-supporting, guyed, monopole, etc.)
- Provided technical consultations to OHT (Ontario Hydro Technology – now Kinectrics) and OHI (Ontario Hydro International) on external projects and proposals. Projects with OHT include analysis and design structures to support wind turbines (10 kW to 600 kW) for remote installations in Ontario.

DESIGN ENGINEER,

1982-1986

Ontario Hydro (Nuclear Division)

- Seismic and finite element analyses of components in the nuclear power plant systems.
- Conducted analytical study on the effects of local impact of crushable missile on the concrete containment structure at Darlington Nuclear Power plant.

SPECIAL STUDIES:

- Development of a non-linear Finite Element Constitutive Model for pre and post crack behaviour of Reinforced Concrete Systems.
- Local Response of Reinforced Concrete Barriers to Missile Impact (pipe-whip). Computer program for missile impact was developed.

EDUCATION AND TRAINING

University of Waterloo, 1982

Waterloo, Ontario, Canada

Ph. D., Civil Engineering

Many management courses and workshops

PROFESSIONAL AFFILIATIONS/REGISTRATION

- Association of Professional Engineers of Ontario, Canada (PEO).
- Institution of Electrical and Electronic Engineers (IEEE) member of several working groups
- CSA Technical Committee on Overhead Systems C22.3 No. 1

ADDITIONAL INFORMATION

OTHER ACTIVITIES AND INTERESTS:

- Judge many engineering competitions; the latest is the HATCH Ontario Engineering Competition, University of Toronto (2012)
- Soccer, Tennis, and Classical Music

PUBLICATIONS:

(Selected Publications Related to Power Transmission Engineering)

- Ibrahim Hathout, Karen Callery, Jessica Trac, and Tariq Hathout, "Impact of Thermal Stresses on the End of Life of Overhead Transmission Conductors"; accepted for presentation and publication at 2018 IEEE Power & Energy Society General Meeting, 2018 in Portland, OR, USA.
- Karen Callery and Ibrahim Hathout, "Intelligent Corrosion Monitoring System for the Management of Existing Steel Transmission Structures"; Proceedings of the 2018-NACE International Corrosion Conference & Expo, Phoenix, Arizona, April 15-19, 2018.
- Ibrahim Hathout; Karen Callery; Tariq Hathout; Ugan Sivagnanenthirarajah "Digital image expert system for corrosion analysis of steel transmission structures"; 2017 IEEE Power & Energy Society General Meeting, 2017 IEEE, 978-1-5386-22124/17/\$31.00 ©2017 IEEE
- Ibrahim Hathout , Karen Callery, Tariq Hathout, and Yu Chen Xu , "Condition Assessment and Failure Probability of Existing Transmission Lines", proceedings of the Power & Energy Society General Meeting, 2017 IEEE, 978-1-5386-22124/17/\$31.00 ©2017 IEEE
- Ibrahim Hathout, Karen Callery-Broomfield, and Tony Tsz-Tung Tang, "Fuzzy probabilistic expert system for overhead conductor assessment and replacement", **proceedings of the Power & Energy Society General Meeting**, 2015 IEEE, 978-1-4673-8040-9/15/\$31.00 ©2015 IEEE
- Karen Callery and Ibrahim Hathout, "New Approach for Upgrading an Existing 115 kV Transmission Line", proceedings of the ASCE Electrical Transmission & Substation Structures, Branson, Missouri, 2015.
- Ibrahim Hathout and Karen Callery, "Impact of Extreme Weather on Transmission lines' Structures", proceedings of the ASCE Electrical Transmission & Substation Structures, Branson, Missouri, 2015.
- Ibrahim Hathout and K. Juraschka, "Improved Digital Image Analysis of Corroded Steel Transmission Towers", 2014 CIGRÉ Canada Conference, International Center, Toronto, Ontario, September 22-24, 2014.
- K. Callery-Broomfield, R. Davis, I. Hathout, M. O'Reilly, "Extreme Weather Impacts on Transmission and Distribution Systems", 2014 CIGRÉ Canada Conference, International Center, Toronto, Ontario, September 22-24, 2014.
- Ibrahim Hathout and Karen Callery-Broomfield, "Novel Approach for Digital Image Analysis of Corroded Steel Transmission Structures, International Conference on Overhead Lines- Design, Construction, Inspection & Maintenance, Fort Collins, Colorado USA, March 31 – April 3, 2014.

- Ibrahim Hathout, Harmeet Cheema, and Karen Callery-Broomfield, "Damage Assessment of Existing Transmission Structures Using ANFIS (Adaptive Neuro-Fuzzy Inference) Model, Journal of Energy and Power Engineering 7 (2013) 2363-2372.
- Ibrahim Hathout and Harmeet Cheema, "Damage Assessment of Existing Transmission Towers Using Sugeno Model", proceedings of CIGRE Canada Conference on Power Systems, CIGRE-149, Montreal, September 24-26, 2012.
- Hathout and F. Al-Amin, "Fuzzy Probabilistic Approach for Overhead Shield Wires Assessment and Replacement", proceedings of CIGRE Canada Conference on Power Systems, CIGRE-116, Vancouver, October 17-19, 2010.
- Hathout, Ibrahim and Vu, Linda, "Failure Probabilities of Existing Overhead Shield Wires", proceedings of the 10th International Symposium on Probability Methods Applied to Power Systems (PMAPS 2008), May 25-29, 2008, Rincon, Puerto Rico USA.
- Hathout, Ibrahim, "Maintenance Prioritization of Existing Transmission Lines Using Priority Risk Indices (PRI)", proceedings of the 9th International Symposium on Probability Methods Applied to Power Systems (PMAPS 2006), June 11-15, 2006, KTH, Stockholm, Sweden.
- Hathout, Ibrahim, "Damage Assessment and Soft Reliability Evaluation of Existing Transmission Lines", proceedings of the 8th International Symposium on Probability Methods Applied to Power Systems (PMAPS 2004), September 13-16, 2004, Ames, Iowa, USA.
- Hathout, Ibrahim, and Goel, Anand, "Failure Investigation of a 230 kV, River Crossing Transmission Tower", proceedings of the 8th International Conference on Utility Line Structures", March 29-31, 2004, Fort Collins, Colorado, USA.
- Hathout, Ibrahim, Krishnasamy, Samy, Goel, Anand "Application of Fuzzy Logic to Condition Assessment and Reliability Evaluation of Utility Wood Poles", proceedings of the 7th International Symposium on Probability Methods Applied to Power Systems (PMAPS 2002), September 22-26, 2002, Naples, Italy.
- Hathout, Ibrahim, "Applications of Fuzzy Weighted Averages in Damage Assessment of Transmission Structures", proceedings of the 6th International Symposium on Probability Methods Applied to Power Systems, September 25-28, 2000, Funchal, Madeira, Portugal.
- Hathout, Ibrahim, "Reliability of Existing Transmission Lines", proceedings of the 5th International Symposium on Probability Methods Applied to Power Systems, September 21-25, 1997, Vancouver, British Columbia.
- Hathout, Ibrahim, "Soft Reliability Assessment of Existing Transmission Lines", Proceedings of ISUMA-NAFIPS'95, University of Maryland, College Park, September 17-20, IEEE Computer Society Press, 1995.

- Hathout, Ibrahim, "Expert system for Damage assessment and reliability evaluation of existing transmission structures", proceedings of the 4th International Symposium on Probability Methods Applied to Power Systems, September 26-29, 1994, Rio de Janeiro, BRAZIL.
- Hathout, Ibrahim, "Treatment of uncertainty in a fuzzy logic expert system for damage assessment of transmission structures", A chapter in the reference book "Uncertainty Modelling and Analysis: Theory and Applications", edited by B.M. Ayyub and M.M. Gupta, Machine Intelligence and Pattern Recognition, Elsevier Science Publishers B.V., North-Holland, 1994.
- Hathout, Ibrahim, "A new approach for damage assessment and reliability evaluation of existing transmission structures", CEA spring meeting, Toronto, March 1994.
- Hathout, Ibrahim, " Damage Assessment of Existing Transmission Towers Using Fuzzy Weighted Averages", proceedings of the 2nd International Symposium on Uncertainty Modelling and Analysis, ISUMA'93, University of Maryland, College Park, April 25-28, 1993, pp. 573-580.
- Hathout, Ibrahim, "Safety and Reliability Evaluations of Existing Transmission Lines Using Fuzzy Set Theory", A chapter in the reference book "Analysis and Management of Uncertainty: Theory and Applications", edited by B.M. Ayyub, M.M. Gupta and L.N. Kanal in the series Machine Intelligence and Pattern Recognition, Volume 13, Published by Elsevier Science Publishers B.V., North-Holland, 1992.
- Hathout, Ibrahim, " Reliability and Security Evaluation of Existing Transmission lines Using Fuzzy Set Theory", proceedings of the 3rd International Symposium on Probability Methods Applied to Power Systems, July 3-5, 1991, London, UK, pp. 92-96.
- Krishnasamy, S.G., Hathout, I. and Tabatabai, M., "Reliability Based Design of Transmission Lines - A Critical Review", proceedings of the 3rd International Symposium on Probability Methods Applied to Power Systems, July 3-5, 1991, London, UK, pp. 86-91.
- Hathout, Ibrahim, " Safety Evaluation of Existing Transmission Lines", proceedings of the 1st International Symposium on Uncertainty Modelling and Analysis, ISUMA'90, University of Maryland, College Park, Dec. 3-5, 1990, pp. 244-248.
- Hathout, Ibrahim, "Reliability of Transmission Structures Using non-linear Finite Element Analysis", proceedings of the 2nd International Symposium on Probability Methods Applied to Power Systems, September 20-23, 1988, Oakland, California, pp. 19.1 - 19.12.
- Krishnasamy, S.G., Tabatabai, M. and Hathout, Ibrahim, "Wind and Ice Loads Data Base for Probability-Based Design of Transmission Lines", proceedings of the 2nd International symposium on Probability Methods Applied to Power Systems, September 20-23, 1988, Oakland, California, pp. 31.1 - 31.14.

TECHNICAL REPORTS:

Numerous technical internal and external reports range from missile impact on containment structure (nuclear) to failure analysis of towers due to tornadoes and microbursts.

Mr. Makuch is a Structural Engineer with twenty-seven years of experience. He is an expert in design of transmission line towers and their foundations (in overburden, rock and on piles). He has witnessed several tower tests and line accessories. He also worked in the design of steel and concrete structures (e.g. heavy industrial buildings, concrete foundations (spread footings and pile caps), concrete slabs and retaining walls, and steel connections). He presented a seminar on the design of transmission line towers for the Ethiopian Electric Power Corporation (EEPCo) in Addis Ababa, Ethiopia and gave training for Power Grid Corporation of India Engineers in Montreal on EHV substation design with reference to the 765 kV Seoni substation Project – Structure and Foundation Design

SECTORS OF EXPERTISE

Infrastructure & Buildings

- › Industrial Buildings

Power

- › Transmission Lines in Alternating Current; Transmission Lines in Direct Current; Distribution Systems

EDUCATION

2000	Intensive training in project management, University of Quebec in Montreal, Montreal, Quebec, Canada
1986	B. Eng. Civil Engineering, McGill University, Montreal, Quebec, Canada
1985	Graduate Courses in Pre-stressed Concrete, Advanced Design in Metals, Earthquake Resistance Design of Structures, McGill University, Montreal, Quebec, Canada
1981	Combined B. Eng. and M. Eng. Program – Specialization in Design of Bridges and Highways, Technical University of Wroclaw, Wroclaw, Poland

EXPERIENCE

SINCE 2016

SNC-LAVALIN INC., QUEBEC, CANADA

Senior Foundation and Structural Engineer

Hydro and Power Delivery, Power

Tower type FCG, Hydro-Quebec, Quebec, Canada (2017 - present)

- › Design and detailing of a rigid 735 kV suspension tower (0°-20°) type FCG.

TL266 Gantry -Hardwoods Terminal Substation, Nalcor, Newfoundland and Labrador, Canada (2016 - present)

- › Design and detailing of 230kV gantry and foundation design.
- › Preparation of technical specifications (Construction& Procurement).

TL267 (BDE-WAV) Bay d'Espoir to Western Avalon, Western Avalon (WAV) Terminal Substation, Nalcor, Newfoundland and Labrador, Canada (2016 - present)

- › Design and detailing of 230kV gantry and foundation design.
- › Preparation of technical specifications (Construction& Procurement).

Maritime Link Project -345/230kV Substation, ABB, Quebec, Canada (2017)

Years of Experience

- › 32 years

Years with SNC-Lavalin

- › 12 years

Key Positions

- › Design Supervisor/Manager - Structural
- › Engineering Design Lead
- › Engineering Specialist - Structural

Languages

- › English
- › French
- › Polish
- › Russian
- › Ukrainian

Site Experience

- › Canada
- › India

- › Design of Pull Box for Telecom Cable to Radio Tower.

Tower Failure Investigation (L20D/H22D), Hydro One, Ontario, Canada (2016)

- › Review of TOWER models (structures 5 to 9) within the scope of work of the failure investigation for circuit L20D/H22D between Harmon Junction and Kipling GS in Northern Ontario, to determine the cause of towers failure.
- › Preparation of a report.

2014 - 2016

WSP, QUEBEC, CANADA

Senior Project Engineer

Tower and Foundation Design

Design Workshop, Pepco Holdings Inc, United States (2014 - 2016)

Preparation of Design Workshop including the following modulus

- › Module 5: Weather and Structural Load Design Criteria
- › Module 6: Clearance
- › Module 7: Transmission Line Structures

86,4 MVAR, capacitor project, BL England, Maryland, United States (2014 - 2016)

- › Design verification of BL England substation.
- › Design verification of High Street substation

FEM type tower. 735 kV Single Circuit Transmission Line, circuit 7027, Hydro-Quebec, Canada (2014 - 2016)

- › Determination of foundation loads (manual calculations).
- › Grillage foundation for monopod FEM type tower. 735 kV Single Circuit Transmission Line, circuit 7027, Micoua Substation.
- › Determination of foundation loads (manual calculations).
- › Validation of existing grillage foundations (200kPa soil capacity) to accommodate new loads and soil capacity of 120 kPa.

Design of a New Long Lake 138 kV Transmission Line, Long Lake Hydro Inc./Regional Power, Canada (2014 - 2016)

- › Preparation of the Design Basis Memorandum for the design of a new transmission line.
- › Preparation of technical specifications and scope of work documents.
- › Preparation of Design Requirement Drawings for the design and fabrication of steel tubular structures.
- › Design of stub extensions to resist severe snow creep and glide loads Comparison of foundations loads of tubular steel structures having horizontal and vertical configurations, as well as latticed monopode towers of horizontal and vertical configurations. Structure weight and cost evaluation in order to choose the best tower configuration and type for the new transmission line.

Finavera Renewables Inc. Meikle Creek Wind Energy Project, 230 kV Transmission Line Peace River Regional District, Boreas Construction, British Columbia, Canada (2014 - 2016)

- › Preparation of the preliminary design basis for the design and construction of a 230 kV transmission line (wooden structures) in British Columbia.
- › Verification of PLS-Pole structure models.

Okikendawt Hydroelectric Project 44 kV Distribution Line, Hydromega Services inc, Dokis Bay, Ontario, Canada (2014 - 2016)

- › Product review for wooden poles damaged by woodpeckers.
- › Woodpecker pole damage assessment.

Independent Review of the Long Lake 138 kV Transmission Line, Long Lake Hydro Inc./Regional Power, Mississauga, Ontario, Canada (2014)

Near Steward

- › Preparation of an Assessment Report of the Transmission Line.
- › Site inspection and line evaluation.
- › Verification of conceptual design including tubular steel structures, sag and tension calculations, loadings, design criteria and ground electrical clearances, snow creep loads as well as structural failures evaluation.
- › Preparation of arbitration documentation.

Update of Line Route Study and Environmental and Social Impact Assessment (ESIA) on the 330 kV WAPP North Core, Client: West African Power Pool (WAPP), Benin (2014)

- › Participation in the Kick-off meeting in Cotonou, Benin (November 27 & 28, 2014) .
- › Presentation on the line route methodology.

2009 - 2014

SNC-LAVALIN INC., MONTREAL, QUEBEC, CANADA

Power Transmission & Distribution - Montreal

Senior Project Engineer

Tower and transmission line design; supervision and distribution of work.

Dawson Creek Area 230kV Transmission Line Project, BC Hydro, British Columbia, Canada

- › Verification and re-design of tower types D & KG.

SC Black Spring Ridge Tubular Pole Transmission Line, Altalink, Alberta, Canada

- › Design of concrete pile foundations (caissons) for 240 kV transmission line.

D.C. Transmission Line for Rumaila 150 MW Early Power Plant Project, BP Iraq NV, Iraq

- › Involved in preparation of the technical proposal for 132kV D.C. transmission line.

220kV Line Kamanyola (Ruzizi III) - Bujumbura, Régie de Production et Distribution d'Eau et d'Électricité (REGIDESO), Burundi, CA \$2 286 315

Feasibility study, detailed engineering and preparation of tender documents.

- › Involved in a feasibility study for 220kV Kamanyola (Ruzizi III) - Bujumbura (220kV, S.C. and 110kV, D.C. Lines).

St-Césaire / Bedford QP1EA Project, Hydro-Quebec, Canada

- › Structural verification of Tower #1 (circuit 1424) at 120kV;
- › Structural verification of the 230kV DQB tower;
- › Design of special +4.0 m Body Extension for tower DQB;
- › Structural verification of 230kV DQA tower.

Charlesbourg Substation Looping Project, Hydro-Quebec, Canada

- › Structural verification of DPK tower of future transmission line no. 2325;

- › Special foundation design in overburden (MT140kPa) for the DPK tower.

Special Hydro-Quebec Project, Hydro-Quebec, Canada

- › Design of a temporary pole base.

Les Boules / Copper Mountain ORBDR Existing 161kV Line Project, Hydro Quebec, Canada

- › Verification, design and production of foundation drawings in overburden (MT100-kPa) for Les Boules-Gaspé and the Lévis-Les-Boules tangent towers.

Relocation of circuits 3058 and 3058 of the Chenier Substation Projects, Hydro-Quebec, Canada

- › Replacement of damaged tower members of the Tower no. 74.

Bécancour-Nicolet-Gentily 2 Project, Modified DQB Towers (Transpositions) Project, Hydro-Quebec, Canada

- › Design of transposition towers H10 and H18.

315kV D.C. North-East Network Upgrade for the Metropolitan Region Project, Hydro-Quebec, Canada

- › 315kV D.C. EPM type tower foundations design in overburden (MT100 and MT150); roc foundations with and without knee-brace and foundations on-piles; Types P1 and P2;
- › Participation in the 315kV D.C. rigid, angle & dead-end 10° to 90° tower type EPM testing at Gammon India Ltd. in Deoli, Wardha, Maharashtra - India;
- › Detailed design of 315kV D.C. rigid, angle & dead-end tower 10° to 90° type EPM.

Montagnais Normand (Blomlake Mine) EGD Tower Design Load Study Project, Hydro-Quebec, Canada

- › Detailed design of 345kV S.C. (EGD) - Bloomlake Mine guyed lattice suspension tower of 0° - 5° line angle.

Muskrat Falls Hydroelectric Development, Nalcor Energy, Canada, CA \$6 000 000 000, 824 MW

The 824 MW development will comprise a 35 m high roller-compacted concrete dam, a spillway discharge capacity of 25,000 m³/s, 1,200 km of HVDC overhead transmission lines as well as HVAC overhead transmission lines.

- › Involved in Towers and foundations design review of the 315kV HVAC Muskrat Falls to Churchill Falls transmission line.

Nicolet-Bécancour-Gentily 2 Line Project, Hydro-Quebec, Canada

- › Detailed design of two (2) 230kV D.C. DQA and DQB latticed towers.

315kV S.C. (EGD) guyed latticed suspension 0° to 5° tower, Hydro-Quebec, Canada

- › Design and detailing of 315 kV S.C. (EGP) guyed latticed tower.
- › Participation in tower testing at Gammon India Ltd at Deoli, Wardha, Maharashtra, India.

Project Lower Mattagami River; Smoky Falls 2GS, KAP and Ontario Power Generation, Canada

- › Responsible for the design of substation frameworks and foundations and for a 4km, 230kV D.C. transmission line allowing connection to the HONI (Hydro-One) network.

Foundation Verification and Design for Site Using Navigational Assistance, Pêches et Océans Canada, Garde Côtière, Quebec, Canada

- › Longue Pointe Route, FP; concrete foundation verification;
- › Île Ste-Thérèse, FA, downstream; metallic foundation verification;
- › Île Ste-Thérèse, FP, downstream; metallic foundation design;
- › Nicolet, FP Crossing; concrete foundation design;
- › Nicolet, FA Crossing; concrete foundation design.

Existing 500kV KA Tower, Altalink Management Ltd., Alberta, Canada

- › Design of a new +6.0m Body Extension.

Nicolet-Bécancourt-Gentilly 2, 230kV D.C. Line, Hydro-Quebec, Quebec, Canada

- › Detailed design of two (2) latticed towers (type DQA and DQB);
- › Design was stopped by Hydro-Quebec after having finished design work for the DQA tower.

Miscellaneous Hydro-Quebec Projects, Hydro-Quebec, Canada

- › Detailed preliminary design of a 735kV, S.C. guyed angle (0° to 45°) Tower (FHH), and a 735kV, S.C. guyed latticed suspension Tower (FHA).

CB-5 Tower, Hydro-Quebec, Canada

- › Complete structural verification of foundation in overburden and on-rock for the CB-5 Type Tower.

Expansion of 220/22kV Grid in Dhabiya Area for Interconnection with ADCO / Lot 2 Overhead Lines, Abu Dhabi Water & Electricity Authority, United Arab Emirates

- › Preliminary study for existing conductor replacement for a new conductor with better electrical capacity;
- › Existing portal frame verification for durability to avoid replacement and/or reinforcement.

Rimouski Les Boules-Baie des Sables Rigid Suspension Tower for 161kV Line, Hydro-Quebec, Canada

- › Verification of Tower No. 38, for a 23m of horizontal displacement on-site.

500kV D.T. Steel Straight-Line Tower (tubular), SNC Lavalin ATP, Alberta, Canada

- › Preliminary design verification of caisson foundations (in order to determine cost), with loadings corresponding to 200, 225, 250, 275, 300, 325, 350 and 375m ruling spans.

240kV D.C. Tangent Steel Tower, Tubular Version, SNC Lavalin, Alberta, Canada

- › Verification of preliminary caisson design for tubular poles with loadings corresponding to 200, 225, 250, 275 and 300m ruling spans.

Monopod Angle Tower (FEJ), 1st Line Chamouchouane-Jacques-Cartier, Hydro-Quebec, Canada

- › Design verification of foundations in overburden (100kPa).

230kV D.C. Rigid Angle (0° to 60°) Tower (DPK), Hydro-Quebec, Canada

- › Design of stringing beam for ground wire.

Reconstruction of Tower 328 circuits 3011/3020, Hydro-Quebec, Canada

- › Modification of three (3) 315kV Towers of the Bersimis 2 family:
 - Analysis and reinforcement of towers, number 327, 329 and 330 to withstand climatic loads of the zone of 40mm of radial ice and 105km/h wind;
 - Preparation of tower outline, calculation sheets, utilization criteria and foundation loading drawings for each tower;
 - Verification of detail drawings showing the reinforcements.

Lac Otehluk Iron Ore, Feasibility Study, 735 kV S. C. Transmission Line, Exploitation Minière Lac Otehluk Ltée, Quebec, Canada

- › Corridor selection and determination of the most economical line route.
- › Preparation of design criteria.
- › Preliminary design of 735 kV S.C. tangent guyed tower in order to determine total tower weights and foundation reactions.

Fort St. John transformer upgrade project, Fort St. John substation, BC Hydro , British Columbia, Canada

- › Design criteria review.

Fort. St-James green energy project, 60L 344 line tap modification at substation FM2, BC Hydro, British Columbia, Canada

- › Design basis verification and approval.

115 kV Hearn switching section project, ABB, Quebec, Canada

- › Design of G1, G2 & G3 type towers.

2005 - 2009

RSW INC., MONTREAL, QUEBEC, CANADA **Senior Project Engineer**

315kV Existing Circuits 3006-3068, Hydro-Quebec, Canada

- › Structural verification of four rigid towers, Bersimis type, of existing circuits.

115kV Transmission Line, Victor Project, De Beers Canada Inc., Canada

- › Preparation of bid - preliminary design of wooden structures.

Foundation Design for towers BFA and BFC, Line Nemiscau - Washaganish, Hydro-Quebec, Canada

- › Foundation design verifications.

Training Workshop in Ethiopia for EEP Co Engineering Staff, Ethiopian Electric Power Corporation (EEPCo), Addis Ababa, Ethiopia

- › Mechanical & Civil Design of Transmission Line Towers;
- › Structural Analysis of EPPCo Towers.

Replacement of existing earth wire, Ethiopian Electric Power Corporation (EEPCo) and Canadian International Development Agency (CIDA), Ethiopia

- › Feasibility study for the replacement of an earth wire by a telecommunication cable on the Ethiopian 230/132kV line network.

XACBAL Hydroelectric Project, 230/34 kV Substations, Hidro XACBAL. S.A., Quiché, Guatemala

- › Foundations design for steel structures, equipment supports and poles.

Design of 230kV SC (DGQ) angle guyed (0° to 42.5°) tower, Hydro-Quebec, Canada

- › Modification of an existing 735kV (FGJ) guyed tower to suite the 230kV line river crossings with 315kV electrical clearance requirements.

Design of 230kV SC (DAE) tangent rigid (0° to 1.5°) tower, Hydro-Quebec, Canada

- › Assistance in the tower testing at DAMP ELECTRIC site in Sabara, Brazil.

Design of 230kV SC (DAI) angle and dead-end (0° to 50°) tower, Hydro-Quebec, Canada

- › Design of 230kV SC (DAI) angle and dead-end (0° to 50°) tower, as well as its foundations in overburden (100kPa) and on rock.

Foundations design (in overburden and on rock) for Hydro-Quebec's towers, Hydro-Quebec, Canada

- › 315kV D.C. rigid tangent tower (EPA);
- › 315kV D.C. rigid angle (0° to 5°) tower (EPD);
- › 315kV D.C. rigid angle and dead-end (0° to 60°) tower (EPK);
- › 315kV D.C. rigid angle (0° to 60°) and crossing (0° to 90°) tower (EAY) (foundation in overburden only).

315kV DC (EOU) rigid tangent river crossing tower, Hydro-Quebec, Canada

- › Design of 16.67m Leg Extension;
- › Design of foundation in overburden; 150kPa.

230kV SC (DAM) angle rigid (90°) tower, Hydro-Quebec, Canada

- › Assistance in the tower testing at Kalpantaru Power Transmission Ltd. site near Ahmedabad, India.

Foundation design for 230kV SC (DAM) angle rigid (90 °) towers, Hydro-Quebec, Canada

- › Foundations in overburden; 100kPa and 150kPa;
- › Rock foundations; 2000kPa;
- › Pile foundations.

402S Scotford Expansion Substation, 138kV Scotford Transmission Line, ATCO Utility Services, Alberta, Canada

- › Responsible for the design of the new line as well as for the modification of the existing 138kV ALCO3L Line (wooden poles) due to a tapping to the new line;
- › Load calculations for new steel poles as well as for the existing 138kV wooden poles ALCO3L line to be modified for a tap to be connected to a new line;
- › Design of caissons;
- › Preparation of all line drawings.

220kV DC Transmission Line (Snow and Non Snow Zones), Allain Duhangan Hydroelectric Project (192 MW), Indo Canadian Consultancy Services, Delhi, India

- › Evaluation of bids for Snow and Non Snow Zones, 220kV Transmission Lines;
- › Responsible for verification of all structures;
- › Site visits to Himalayas for line route assessment.

Modification of a rigid 161kV DC (B7M) tower, Peribonka-Simard Line, Hydro-Quebec, Canada

- › Calculation of wind and ice loads on the tower;
- › Modeling and analysis of maximum height tower;
- › Design of a new 3.0m Body Extension;
- › Preparation of tower outline, calculation sheets, utilization criteria and foundation loadings drawings;
- › Verification of tower construction drawings;
- › Design for stringing beam for the optical groundwire.

Design and testing of 161kV DC (CSK) angle and dead-end (0° to 60°) guyed tower, Peribonka - Simard Line, Hydro-Quebec, Canada

- › Calculation of wind and ice loads on the tower;
- › Modeling and analysis of tower, including different body extensions and guy dispositions;
- › Preparation of tower outline, calculation sheets, utilization criteria and foundation loadings drawings;
- › Tower analysis taking into consideration vertical uplift of 150mm or more of the foundation;
- › Verification of tower construction drawings;
- › Design of stringing beams for the conductor and optical groundwire;
- › Assistance in the tower testing at the Jyoti Structures site in Nsahik, India.

Design and testing of 161kV DC (CSA) tangent guyed tower, Peribonka-Simard Line, Hydro-Quebec, Canada

- › Calculation of wind and ice loads on the tower;
- › Modeling and analysis of tower, including different body extensions and guy dispositions;
- › Preparation of tower outline, calculation sheets, utilization criteria and foundation loadings drawings.
- › Tower analysis taking into consideration 15% slope of the terrain, four guys with one 25m longer than others, tolerance of 5% to 7% in the location of guys, broken guy and vertical uplift of 150mm or more of the foundation;
- › Verification of tower construction drawings;
- › Assistance in the tower testing at the ABB site in Betim, Brazil.

Repair of the tower #16 of the Quebec –Stadcom Line, Hydro-Quebec, Canada

- › Verification of tower for the hourly annual wind loading, the minimum temperature of the region and winter loadings;
- › Verification of tower with temporary guys.

315kV SC (ROK) angle and dead-end guyed tower, complex Romaine, line Romaine 1 – Romaine 2, Hydro-Quebec, Canada

- › Preliminary design of 315kV SC (ROK) angle and dead-end guyed tower.

315kV SC (ROO) tangent guyed tower, Complex Romaine, Romaine 1 – Romaine 2 Line, Hydro-Quebec, Canada

- › Preliminary design of 315kV SC (ROO) tangent guyed tower.

315kV DC (ETI) tangent guyed tower, Complex Romaine, Romaine 1 – Romaine 2 Line, Hydro-Quebec, Canada

- › Preliminary design of 315kV DC (ETI) tangent guyed tower.

Training for Power Grid Corporation of India (POWERGRID) Engineers, Power Grid Corporation of India, Quebec, Canada

- › EHV Substation Design with Reference to the 765kV Seoni Substation Project - Structure and Foundation Design.

735kV SC tower (FHH), Complex Romaine, Arnaud-Romaine 1 (150 years) Line, Hydro-Quebec, Canada

- › Preliminary study of a guyed angle and dead-end (0° to 45°) 735kV SC tower (FHH).

2003 - 2005

BRETTON BLAINVILLE & ASSOCIÉS, MONT SAINT-HILAIRE, QUEBEC, CANADA
Senior Project Engineer

Modification of the Levis substation due to thermal deicing, Hydro-Quebec, Canada

- › Load calculations for various new structures for 22kV and 735kV lines;
- › Verification of electrical clearances for 22kV, 230kV and 735kV lines.

Modification of the Pandora substation, Hydro-Quebec, Canada

- › Stringing sag and tension calculations for 25kV and 120kV lines.

Sault Ste-Marie, Ontario Anjigami and Sault 230kV Line Reconstruction, Great Lakes Power Ltd., Canada

- › Acting as the Owner's representative performs a complete design verification of a new 230kV overhead line (wooden structures).

Iron Ore Company of Canada Mine loading pocket no. 3, Iron Ore Company of Canada, Canada

- › Design of wooden structures for 4.16kV line.

Energie Eolien du Mont Copper, Vestas-Canada Wind Technology Inc., Quebec, Canada

- › Build and design project of 34.5kV and 69kV lines. Verification of wooden poles and H-frame wooden structures, including the calculations of sag and tension, plan and profile and loading calculations.

Alcoa Plant at Baie-Comeau, Hatch and Associates Inc., Canada

- › Feasibility study of the exploitation of the line no.12 at 95° C, including verification of electrical clearances, plan and profile and preparation of a report.

1998 - 2003

DESSAU-SOPRIN INC., MONTREAL, QUEBEC, CANADA
Senior Design Engineer

Reinforcement of towers at the Levis substation, Hydro-Quebec, Canada

- › Reinforcement of towers at the Levis substation due to thermal deicing and replacement of ground wires for the following lines:
 - Ligne Lévis-Kamouraska Circuits 3078 & 3079 - 315kV, D.T. rigid suspension towers, types I et II;
 - Ligne Laurentides-Lévis Circuit 7010 - 735kV, S.T. rigid 15° angle tower;
 - Ligne Lévis-Manicouagan Circuit 7007 - 735kV, S.T. rigid 15° angle tower;
 - Ligne Lévis-Appalaches Circuit 7097 - 735kV, S.T. rigid 30° to 60° angle tower (FBJ).

Verification of existing Hydro-Quebec towers, Telus Mobility, Canada

- › Verification of existing Hydro-Quebec towers, against the Hydro-Quebec specifications, due to the installation of

telecommunication antennas.

Standardization of 330/132kV Transmission Line Towers, Electric Power Authority, Abuja, Nigeria

- › Standardization of 330/132kV Transmission Line Towers.

Preliminary design of 315kV guyed suspension tower, Hydro-Quebec, Canada

- › Preliminary design of 315kV guyed suspension tower.

Design of caisson foundations for 120kV Lanaudiere – St.-Sulpice transmission line, Hydro-Quebec, Canada

- › Design of caisson foundations for 120kV Lanaudiere – St.-Sulpice transmission line.

315kV Manicouagan 5 – Micoua 2nd Line, Hydro-Quebec, Canada

- › Modeling, analysis and detailing of suspension, double suspension, 15°, 30°, 45°, 60° angle lines and transposition towers due to new loads and replacement of a ground wire by a new optical ground wire.

Design of caisson foundations for 120kV Sherbrooke – St.-François transmission line, Hydro-Quebec, Canada

- › Design of caisson foundations for 120kV Sherbrooke – St.-François transmission line.

Consorcio Trans Mantaro SA., Peru, Line Mantaro-Socabaya, Hydro-Quebec, Canada

- › Design of special foundations for tower type DD No. 990, including tower verification, design of inverse body extensions and steel connections.

Analysis of 375 feet high River Crossing Suspension Towers, Hydro-Quebec, Quebec, Canada

- › Analysis of 375 feet high River Crossing Suspension Towers.

New 230kV suspension/rigid 0° to 90° angle "D9M" tower, Hydro-Quebec, Canada

- › Complete modeling, design and detailing of a new 230kV suspension/rigid 0° to 90° angle "D9M" tower.

Structural analysis of telecommunication tower located at St-Phillipe de Neri, Bell Canada, Canada

- › Structural analysis of telecommunication tower located at St-Phillipe de Neri due to the addition of two new antennas.

Mantaro-Socabaya Line, Hydro-Quebec, Canada

- › Design of reinforced concrete columns and rock foundations, including verification for stability and overturning of foundations.

Towers Modification including the design of a new 6.0 m body extension, Hydro-Quebec, Canada

Modification to the following towers including the design of a new 6,0 m body extension for each tower, for Hydro-Quebec:

- › 315kV D.T. rigid 0° to 5° angle "EOD" type tower with optical ground wire;
- › S.T. rigid 30° to 60° angle "FBJ" type tower with optical ground wire;
- › S.T. rigid 60° to 90° angle "FBL" type tower with optical ground wire;
- › 120kV D.T. rigid 10° angle "B6F" and 30° angle "B6G" type towers.

Various Towers Modifications, Hydro-Quebec, Canada

Participation in the modification of the following towers, for Hydro-Quebec:

- › 120kV D.T. rigid suspension Type I (B6A) tower;
- › 120kV D.T. rigid suspension Type II (B6B) tower;
- › 120kV D.T. rigid suspension Type III (B6C) tower;
- › 120kV D.T. rigid suspension Type III (B7C) tower;
- › 120kV D.T. rigid 90° angle (B7M) tower;
- › 315kV D.T. suspension (EOA) tower.

1996 - 1998

HATCH AND ASSOCIATES INC., MONTREAL, QUEBEC, CANADA

Senior Project Engineer

Thin Copper Foil Plant, Société Générale de Financement du Québec (SGF-CFL), Canada

- › Feasibility study and cost estimate of the entire plant.

Preparation of General Specifications, Hatch and Associates inc., Quebec, Canada

- › Preparation of Hatch general specifications (steel and concrete) for English and French Canada, as well as the U.S.A.

ALP Building, QIT Fer et Titane Inc., Quebec, Canada

- › Verification of the validity of a claim for additional works on the ALP building claimed by the contractor;
- › Preparation of documents for arbitration.

Verification, Reinforcement and Design, QIT Fer et Titane Inc., Quebec, Canada

- › Verification and/or reinforcement of existing structures for new fume-capture hoods (moving loads);
- › Design of built-up beam sections (including moment capacities determination) and detail engineering of various steel and concrete connections.

Canada Rod Mill Modernization – Phase II, IVACO Rolling Mills, L'Original, Ontario, Canada

- › Preliminary design of reducing size mill foundations (both spread footings and foundations on piles);
- › Recuperator and stack foundation designs;
- › Verification of casting machine cooling bed's rakes and beams for a full capacity (42 billets) load;
- › Preliminary design of breakdown mill electrical room.

Mileage 1.4 to 2.2 Vaudreuil Subdivision, Canadian Pacific Railway, Quebec, Canada

- › Stilling basin cover design;
- › Light pole foundation design.

Caribou Mine, Caribou Mine, New Brunswick, Canada

- › Steel tank design verification.

UGS Project, QIT Fer et Titane Inc., Quebec, Canada

- › Preliminary design verification of Acid Leaching and Utilities Buildings;
- › Design of runway for 15 MT crane and 2 T monorails;
- › Determination of wind and snow loads on 14.5 m and 43 m long conveyor trusses;
- › Design of tubular truss connections;
- › Geometry establishment of 41 m high bent for the support of five conveyor galleries;
- › Complete design of 21 m high Transfer Tower, including structural steel and concrete foundations;
- › Determination of pile quantities for preliminary design of a Cooling Tower;
- › Design of special connections (e.g. sliding connections on FABREEKA pads supported on steel and concrete beams,

- with and without a pin at truss leg ends, pin connections for truss supports taking into account settlement of opposite supports);
- › Design of steel beams taking into account torsion due to sliding of truss legs and horizontal forces on pin connections;
- › Design of concrete pilasters and pile caps for various structures, including a pile quantity determination per pile cap;
- › Design of steel base plates, including those with significant tensile loads;
- › Design of shear lugs and verification of concrete column shear capacities and design of anchor bolts with significant tension;
- › Verification of shop drawings;
- › Responsible for the coordination and design of pipe supports for 36" CO gas and 14" slurry pipe lines.

1991 - 1995

SNC-LAVALIN INC. - SNC SHAWINIGAN INC., MONTREAL, QUEBEC, CANADA
Senior Project Engineer

Modification to 735kV Transmission line due to New Optical Ground Wire, Hydro-Quebec, Canada

- › Involved in tower verification due to a new OPGW loads.

Vindhyachal Project, Phase II, Power Grid Corporation of India Limited, India

- › Involved in preparation of a proposal.

Alumysa Hydroelectric Project, The Alumysa Construction Consortium/Noranda Aluminum Inc., Chile, CA \$600 000 000, 1 097 MW

Study of three developments : Rio Cuervo, Rio Blanco and Lago Condor, comprising three concrete-face rockfill dams, a concrete gravity overflow dam, two underground powerhouses and an above-ground one.

- › Involved in preparation of a proposal.

230kV Guasquitas – Panama II Transmission Lines and Panama Channel Crossing, Guasquitas - Panama, Panama

- › Involved in a preparation of a proposal.

345kV Yulgu Transmission Line, Samsung Engineering & Construction Co., Ltd., South Korea, CA \$16 500 000

Two strain towers and two high suspension towers, 180 m high, with conductors and hardware, to cross the Yulgu Bay. The total length of the crossing is 2,626 meters, at an altitude of 100 m from sea level.

- › Preparation of a proposal for Yulgu Bay Crossing Towers (suspension and anchor).

Bakreswar Thermal Power Project, and proposal for Bakreswar – Armbag 400kV S/C Line, Bakreswar, West Bengal, India

- › Involved in preparation of a proposal.

132kV Interconnection Nigeria-Niger, Société nigérienne d'électricité (NIGELEC), Nigeria, CA \$50 000 000, 132kV

Addition of a 132kV switch bay in the Katsina substation in Nigeria, and construction of 280 km of 132kV transmission line and three 132-20kV substations in Maradi, Gazaoua and Zinder in Niger.

- › Complete design verification and participation in tower tests in Lecco Italy, as well as insulators (in U.K.), conductors (at cableries de Lens, France) and line accessories in Italy.

ATANASIO GIRARDOT Stadium's Illumination Towers, Atanasio Girardot, Colombia

- › Failure investigation of Atanasio Girardot stadium's illumination towers.

Transmission Pole Towers, Syncrude Canada Ltd., Alberta, Canada

- › Involved in the design of steel pole structures.

1988 - 1990

MONENCO CONSULTANTS LTD., MONTREAL, QUEBEC, CANADA
Residence Structural designer

Design, checking and redesign of steel and concrete structures:

- › Design of single storey buildings;
- › Checking of concrete slabs and beams for new openings;
- › Design of footings and retaining walls;
- › Reinforcement of roof trusses;
- › Design of steel platforms;
- › Responding to site queries;
- › Checking of steel beams and columns for additional loads;
- › Design of canopies and slabs on ground.

1988

MICHELIN TIRES CANADA LTD., NEW GLASGOW, NOVA SCOTIA, CANADA
Structural Designer

Involved in the design of concrete structures, project supervision and work with contractors, updating of Michelin plant drawings by using VERSACAD and preparation of drawings for major office changes and new additions.

1988

MIL SYSTEM ENGINEERING INC., OTTAWA, ONTARIO, CANADA
Structural Designer

Weight calculation of ship structural and miscellaneous outfitting.

1986 - 1987

TRI STEEL INC., MONTREAL, QUEBEC, CANADA
Structural Designer

Involved in the following aspects of transmission line tower design:

- › Design and detailing;
- › Checking electrical clearances;
- › Development of a computer program for checking electrical clearances.

PROFESSIONAL ASSOCIATIONS

SINCE 2015

Engineers & Geoscientists British Columbia , Membership no. 42449

SINCE 2011

Professional Engineers & Geoscientists of Newfoundland & Labrador (PEGNL), Membership no. 06198

SINCE 2010

Professional Engineers Ontario (PEO), Membership no. 1001662624

SINCE 1991

Ordre des ingénieurs du Québec (OIQ), Membership no. 88974

ACADEMIC POSTS

1985

Research Assistant to R.D. Redwood, Ph. D, involved in laboratory work, testing of structural offshore joints, drafting, programming in FORTRAN language and calculations, McGill University, Montreal, Quebec, Canada

1 to construct application requests approval for costs to construct the East-West Tie Line
2 that substantially exceed the costs submitted by NextBridge in the designation
3 proceeding. NextBridge's Application and quarterly reporting also indicates that
4 development costs are expected to increase by an additional \$20.4⁹ million over the
5 \$22.4 million allowed in the designation process. As a result of what the Minister of
6 Energy described as a "significantly higher" cost estimate filed with the OEB by
7 NextBridge, the Ministry of Energy asked the IESO to update the Needs Assessment of
8 the Project¹⁰ and confirm whether the Project is still needed. In light of the disclosure of
9 NextBridge's substantially higher cost to construct the designated line, Hydro One felt
10 compelled, on behalf of Ontario's ratepayers, to assess its own ability to construct a
11 more cost-effective solution. On December 1, 2017 the IESO reconfirmed the need for
12 the East West Tie line¹¹.

13
14 As the line is still required, Hydro One believes it can construct it in a more economically
15 efficient manner. Hydro One is confident in its ability to deliver the Project for \$120
16 million less than NextBridge's submitted price primarily due to a more efficient route
17 which is 10% shorter, traversing through the Pukaskwa National Park parallel to existing
18 Hydro One infrastructure as well as an optimized tower design to reduce material and
19 construction costs. In addition to the forecast cost savings, the Lake Superior Link is
20 expected to have significantly less impact on land use and environmental conditions in
21 northwestern Ontario than the alternative, consistent with government policies.

⁹ EB-2015-0216 NextBridge EWT Monthly Report – October 23, 2017 – Page 8, Table 1: Development costs are now estimated at \$42,768,001

¹⁰ Exhibit B, Tab 3, Schedule 1, Attachment 1

¹¹ Exhibit B, Tab 2, Schedule 1, Attachment 2

TAB 27

the spare towers are included. If not confirmed, explain whether HONI will seek recovery of these spare tower costs and how it will seek recovery of them cost.

d) Explain in detail how the anti-cascading criteria of installing an anti-cascade tower every 10km has been considered in the restoration plans?

e) Explain in detail whether HONI has performed a residual static load analysis or an acceptable damage limit analysis to confirm that the 10km spacing is appropriate for the Lake Superior Link. If yes, provide the analysis. If no, explain in detail how HONI will determine that in the event of a failure that 10km of line would not also collapse.

f) Provide a map showing the placement of anti-cascading structures in as much detail as possible.

Response:

a) The question is unrelated to the “outage plan” during the construction. Instead, bullets i to v seem to be related to the restoration plan in the case of tower failures. Hydro One is developing the restoration plan and,

i. Depending on the conditions and logistics at the time, it is expected that one failed tower inside the Pukaskwa National Park would be fully restored within 8 days, by replacing it with a spare tower from Thunder Bay and using similar installation method and tools as those used in the construction in 2020. If the conditions are not favourable to allow timely replacement of the failed tower, at first two temporary bypass circuits are expected to be installed within 6 days to allow more time for the restoration of the tower and connection of all four circuits.

ii. Hydro One will assess the system conditions and its capacity to meet the customer demand. The restoration becomes high priority if there is capacity shortfall. It should be noted that except during the draught season, there will be sufficient hydroelectric generation in the Northwest, as well as potential for import from Manitoba and Minnesota, to avoid customer interruptions during most of the restoration time. Additionally, the risk of customer interruptions and restoration time are similar if a storm inside the park causes failure of a quad-circuit tower or a similar storm outside the park causes failure of both towers of the new and existing East-West Tie lines.

Hydro One will follow its “Erecting an Emergency Restoration Structure” document in response to the event. The decision on whether to construct a temporary bypass line

- 1 using emergency repair structures or to make permanent repairs immediately will be
2 made by Hydro One's Transmission Lines in consultation with the Grid Operations.
3
- 4 iii. Restoration time of a failed tower outside the park will be similar to the restoration of
5 a tower inside the park. If only one double-circuit tower fails (the second double-
6 circuit transmission line remains in-service), depending on the system conditions at
7 expected time for the replacement of the failed tower, it may not be necessary to
8 install temporary bypass circuits. Otherwise, temporary bypass is expected to be
9 installed within 6 days to allow more time for the restoration of the tower.
- 10 iv. See response to ii above.
- 11 v. Hydro One is currently considering keeping two four-circuit spare towers in Thunder
12 Bay. Since the four-circuit section of the LSL inside the park is mostly sheltered and
13 the spans are long, it is unlikely that more than two towers would collapse in one
14 incident (except for a storm more severe than what is expected once in hundred
15 years). The cost of two spare towers is estimated at about \$150,000.
16
- 17 b) Hydro One, in consultation with the IESO, will assess the system conditions and its capacity
18 to meet the customer demand. The restoration of the LSL becomes high priority if its failure
19 causes capacity shortfall in the northwest and the situation cannot be managed by available
20 operational measures.
21
- 22 c) The cost of spare equipment for the LSL was not included in Table 3 of the Application. In
23 addition to the four-circuit spare towers, Hydro One will be carrying the poles for the
24 temporary bypass circuits, spare conductors, insulators, skywires and fibers, and other
25 hardware, which are applicable to restoration of any section of the LSL as well as the
26 existing 230 kV transmission circuits. The cost of these and other spares will be included in
27 the overall Hydro One plans for the spares.
28
- 29 d) Hydro One designs its transmission lines to limit cascading by providing suspension towers
30 with longitudinal resistance. The 1998 ice storm shows that the Hydro One design criteria
31 prevented cascading failures.
- 32 • In any event, as a result of these and other events the Canadian Standards have
33 been updated which are reflected in the most recent standards which are being
34 adhered to in the Hydro One designs. The tower design prevents the cascading
35 effects using the following loading conditions:
 - 36 • Broken Wires at 75% unloaded tension (two ground wires or two conductors, one
37 on each side of structure in opposite directions).

TAB 28

OEB Staff Interrogatory # 8

Reference:

EB-2017-0364 Evidence, Hydro One's Application filed on February 15, 2018, Exhibit B, Tab 7, Schedule 2, Page 2

Incremental Maintenance Costs

Hydro One provides that its existing maintenance programs will be leveraged to perform maintenance on the Lake Superior Link line. The expected maintenance costs of both Hydro One's existing corridor widened to accommodate the Lake Superior Link and new Dorion corridor have been compared and are provided below for reference purposes.

Table 1		
Right-of-Way (ROW) Type	Maintenance Program	Average Annual Cost (\$000s)
Hydro One's Existing EWT	Vegetation Maintenance	\$442
	Overhead Lines Maintenance	\$285
	Average Annual Cost	\$727
Widened EWT and Dorion ROW – Inclusive of LSL	Vegetation Maintenance	\$782
	Overhead Lines Maintenance	\$562
	Average Annual Cost	\$1,344
Incremental Annual Maintenance Cost-Widened Corridor for Lake Superior Link		\$617

Maintenance activities, such as patrols on the existing East-West Tie line and the new Lake Superior Link line, will be bundled to improve productivity and reduce mobilization costs. Additionally, the new line will be designed and constructed to meet Hydro One's standards, which will minimize total life cycle cost. All components of the Lake Superior Link project are expected to last more than 50 years. As such, this line does not require component condition assessments for the first 50 years.

TAB 29

Findings

The SIA identified the following:

1. The project will have no material adverse impact on the reliability of the integrated power system. The proposed modifications are expected to be adequate for the targeted westward transfer level of 450 MW across the East-West Tie;
2. The modifications proposed by the connection applicant for the terminal transformer stations are acceptable to the IESO;
3. The proposed reactive control devices are appropriate to control voltages within applicable ranges under all foreseeable conditions. Since the voltages near the project are strongly dependent on the flows across the East-West Tie that vary significantly throughout the day, these reactive control devices will likely be switched multiple times a day;
4. The existing parallel 115 kV circuits A5A, A1B and T1M between Alexander SS and Marathon TS are adequate to support a westward transfer capability across the East-West Tie of 450 MW, while respecting normal contingencies;
5. Under the North American Electric Reliability Corporation's (NERC) definition of the Bulk Electric System (BES), all the 230 kV transmission equipment installed for this project will be categorized as BES elements;
6. At the westward transfer levels of about 450 MW studied in this report, the project's equipment will not fall within the Northeast Power Coordinating Council (NPCC) definition of the Bulk Power System (BPS). As stated in the final SIA report under [CAA ID 2016-568](#), it is expected that, once the new SVC is installed at Marathon TS, the East-West Tie transfer capability can be increased to 650 MW westward. At this increased transfer level, Marathon TS, together with all of the 230 kV circuits that terminate at that station (existing: M23L, M24L, W21M and W22M, and new: M37L, M38L, W35M and W36M) are expected to fall within the NPCC's BPS definition. Additional tests will be required to determine the future status of the terminal transformer stations, once the model for the Marathon SVC becomes available;
7. Extreme contingencies that result in the loss of the four 230 kV circuits of the East-West Tie such as failure of a quadruple circuit tower can result in separation between the Northwest transmission zone and the rest of the IESO-controlled grid. Following such events, timely system restoration is critical to avoid the risk of supply shortages to the customers in the zone; and
8. Outages to the existing East-West Tie circuits will be required to install the project, especially the 35 km section between Wawa TS and Marathon TS where the existing double circuit towers of W21M and W22M will be replaced with quadruple circuit towers to accommodate the new W35M and W36M circuits. An outage plan that contains the details of this replacement has not been presented to the IESO at the time of this report.

Connection Requirements

1. To avoid any possible conflict between the operation of the updated NW SPS 2 and the local voltage based capacitor and reactor switching schemes, the connection applicant must initiate in a timely manner a review of the voltage settings of all the local schemes by the IESO, participate as the equipment owner in the review and implement the new settings, once agreed upon, in a timely manner.
Note: the connection applicant initiated this process with the IESO in February, 2018.
2. After finalizing the engineering design, the connection applicant shall submit a restoration plan acceptable to the IESO that documents the restoration options for the East-West Tie corridor and

describes how the circuits will be restored following extreme contingencies such as the loss of towers.

3. At least twenty four months before the commencement of system-impactive project related outages, the connection applicant shall submit an outage plan acceptable to the IESO for the installation of the 35 km section between Wawa TS and Marathon TS where the existing double circuit towers of W21M and W22M will be replaced with quadruple circuit towers.
4. The connection applicant shall satisfy all general requirements listed in section 2 of this report.

Recommendations

As previously recommended in CAA_ID 2016-568, when the existing synchronous condenser, C8, at Lakehead TS reaches its end-of-life, the connection applicant is recommended to consider replacing it with an SVC that has a rating of at least ± 100 Mvar.

– End of Section –

OEB Staff Interrogatory # 5

Reference:

EB-2017-0364 Evidence, Hydro One's Application filed on February 15, 2018, Exhibit B, Tab 1, Schedule 1, Page 12

Hydro One requests that a decision on this its application be rendered by October 2018.

Interrogatory:

- a) Does Hydro One need a decision by October 2018 to meet its proposed December 2021 in-service date? If not, when does Hydro One need a decision from the OEB? Please explain and identify critical path items in Hydro One's project scheduling and planning.
- b) What requirements (approvals, permits etc.) does Hydro One need to satisfy before it can start construction, if Hydro One is selected to build the new East-West Tie line?

Response:

- a) In order to meet the December 2021 Hydro One will require:
 - leave to construct approval no later than January, 2019, to initiate procurement activities associated with long lead time items; and
 - EA approval by August, 2019, so that construction can commence.

See the Table below for an updated construction schedule that assumes Leave to Construct approval in January of 2019. Additionally, a scenario analysis is provided at Exhibit I, Tab 1, Schedule 7, to illustrate the impact to the schedule and cost should an EA approval not be received by August of 2019.

1 The current schedule is provided in the Table below:

TASK	START	FINISH
Submit Section 92 Application to OEB		February 2018
Projected Section 92 Approval	February 2018	January 2019
Execute EPC Contract with SNCL		January 2019
Environment Assessment and Consultation		
Obtain EA Approval from MOECC	January 2018	August 2019 ¹
Ongoing First Nations & Métis Consultation and Consultation with Stakeholders	February 2018	December 2021
Lines Construction Work		
Real Estate Land Acquisition	March 2018	May 2020
Detailed Engineering	March 2018	Oct 2019
Tender and Award Procurement	January 2019	July 2020
Construction	September 2019	November 2021
Commissioning	September 2021	December 2021
In Service		December 2021

2
3 ¹ Assumption: Declaration Order approved by MECP Minister

4 Please refer to Attachment 1 for Gantt Chart

5
6 b) Final requirements for approvals and permits will be outlined in EA approval
7 documents. Studies and consultation conducted as part of the EA will inform this final
8 determination.

Lake Superior Link Project Schedule - Preferred Route_2018.08.30 R02				Classic WBS Layout_1												20-Sep-18																																												
Activity ID		Activity Name	Duration	Start	Finish	2018												2019												2020												2021												22						
						J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D		J	F	M	A	M	J
		Section 3		475	02-Sep-19	25-Jun-21																									25-Jun-21, Section 3																													
		Clearing and Access		226	02-Sep-19	13-Jul-20																									13-Jul-20, Clearing and Access																													
		Tower Foundation & Tie wire Foundation		196	06-Jan-20	05-Oct-20																									05-Oct-20, Tower Foundation & Tie wire Found																													
		Tower Assembly		173	02-Apr-20	30-Nov-20																									30-Nov-20, Tower Assembly																													
		Tower Erection		98	17-Sep-20	11-Feb-21																									11-Feb-21, Tower Erection																													
		Stringing		166	27-Oct-20	25-Jun-21																									25-Jun-21, Stringing																													
		Section 4		440	02-Sep-19	07-May-21																									07-May-21, Section 4																													
		Clearing and Access		195	02-Sep-19	29-May-20																									29-May-20, Clearing and Access																													
		Tower Foundation & Tie wire Foundation		204	13-Dec-19	05-Oct-20																									05-Oct-20, Tower Foundation & Tie wire Found																													
		Tower Assembly		147	09-Apr-20	30-Oct-20																									30-Oct-20, Tower Assembly																													
		Tower Erection		111	11-Sep-20	24-Feb-21																									24-Feb-21, Tower Erection																													
		Stringing		101	08-Dec-20	07-May-21																									07-May-21, Stringing																													
		Commissioning & Close Out		77	07-Sep-21	22-Dec-21																									22-Dec-21, Commissioning & Close Out																													

the spare towers are included. If not confirmed, explain whether HONI will seek recovery of these spare tower costs and how it will seek recovery of them cost.

d) Explain in detail how the anti-cascading criteria of installing an anti-cascade tower every 10km has been considered in the restoration plans?

e) Explain in detail whether HONI has performed a residual static load analysis or an acceptable damage limit analysis to confirm that the 10km spacing is appropriate for the Lake Superior Link. If yes, provide the analysis. If no, explain in detail how HONI will determine that in the event of a failure that 10km of line would not also collapse.

f) Provide a map showing the placement of anti-cascading structures in as much detail as possible.

Response:

a) The question is unrelated to the “outage plan” during the construction. Instead, bullets i to v seem to be related to the restoration plan in the case of tower failures. Hydro One is developing the restoration plan and,

i. Depending on the conditions and logistics at the time, it is expected that one failed tower inside the Pukaskwa National Park would be fully restored within 8 days, by replacing it with a spare tower from Thunder Bay and using similar installation method and tools as those used in the construction in 2020. If the conditions are not favourable to allow timely replacement of the failed tower, at first two temporary bypass circuits are expected to be installed within 6 days to allow more time for the restoration of the tower and connection of all four circuits.

ii. Hydro One will assess the system conditions and its capacity to meet the customer demand. The restoration becomes high priority if there is capacity shortfall. It should be noted that except during the draught season, there will be sufficient hydroelectric generation in the Northwest, as well as potential for import from Manitoba and Minnesota, to avoid customer interruptions during most of the restoration time. Additionally, the risk of customer interruptions and restoration time are similar if a storm inside the park causes failure of a quad-circuit tower or a similar storm outside the park causes failure of both towers of the new and existing East-West Tie lines.

Hydro One will follow its “Erecting an Emergency Restoration Structure” document in response to the event. The decision on whether to construct a temporary bypass line

- 1 using emergency repair structures or to make permanent repairs immediately will be
2 made by Hydro One's Transmission Lines in consultation with the Grid Operations.
3
- 4 iii. Restoration time of a failed tower outside the park will be similar to the restoration of
5 a tower inside the park. If only one double-circuit tower fails (the second double-
6 circuit transmission line remains in-service), depending on the system conditions at
7 expected time for the replacement of the failed tower, it may not be necessary to
8 install temporary bypass circuits. Otherwise, temporary bypass is expected to be
9 installed within 6 days to allow more time for the restoration of the tower.
- 10 iv. See response to ii above.
- 11 v. Hydro One is currently considering keeping two four-circuit spare towers in Thunder
12 Bay. Since the four-circuit section of the LSL inside the park is mostly sheltered and
13 the spans are long, it is unlikely that more than two towers would collapse in one
14 incident (except for a storm more severe than what is expected once in hundred
15 years). The cost of two spare towers is estimated at about \$150,000.
16
- 17 b) Hydro One, in consultation with the IESO, will assess the system conditions and its capacity
18 to meet the customer demand. The restoration of the LSL becomes high priority if its failure
19 causes capacity shortfall in the northwest and the situation cannot be managed by available
20 operational measures.
21
- 22 c) The cost of spare equipment for the LSL was not included in Table 3 of the Application. In
23 addition to the four-circuit spare towers, Hydro One will be carrying the poles for the
24 temporary bypass circuits, spare conductors, insulators, skywires and fibers, and other
25 hardware, which are applicable to restoration of any section of the LSL as well as the
26 existing 230 kV transmission circuits. The cost of these and other spares will be included in
27 the overall Hydro One plans for the spares.
28
- 29 d) Hydro One designs its transmission lines to limit cascading by providing suspension towers
30 with longitudinal resistance. The 1998 ice storm shows that the Hydro One design criteria
31 prevented cascading failures.
- 32 • In any event, as a result of these and other events the Canadian Standards have
33 been updated which are reflected in the most recent standards which are being
34 adhered to in the Hydro One designs. The tower design prevents the cascading
35 effects using the following loading conditions:
 - 36 • Broken Wires at 75% unloaded tension (two ground wires or two conductors, one
37 on each side of structure in opposite directions).

- 1 • Non-uniform ice loading conditions as per CSA 60826 – Wawa and Thunder Bay
- 2 using 100% of ice on one side and 70% of ice on the other.
- 3 • For the above, the 10km anti-cascading criteria is an extra contingency that
- 4 improves the installation time and ensures the line reliability.
- 5
- 6 e) Structure analysis have been performed and in the event of one tower collapses, the results
- 7 shown that only a couple of structures ahead and back will be affected.
- 8
- 9 f) Please refer to the overview map in Attachment 1 of Exhibit I, Tab 2, Schedule 24.

TAB 30

Findings

The SIA identified the following:

1. The project will have no material adverse impact on the reliability of the integrated power system. The proposed modifications are expected to be adequate for the targeted westward transfer level of 450 MW across the East-West Tie;
2. The modifications proposed by the connection applicant for the terminal transformer stations are acceptable to the IESO;
3. The proposed reactive control devices are appropriate to control voltages within applicable ranges under all foreseeable conditions. Since the voltages near the project are strongly dependent on the flows across the East-West Tie that vary significantly throughout the day, these reactive control devices will likely be switched multiple times a day;
4. The existing parallel 115 kV circuits A5A, A1B and T1M between Alexander SS and Marathon TS are adequate to support a westward transfer capability across the East-West Tie of 450 MW, while respecting normal contingencies;
5. Under the North American Electric Reliability Corporation's (NERC) definition of the Bulk Electric System (BES), all the 230 kV transmission equipment installed for this project will be categorized as BES elements;
6. At the westward transfer levels of about 450 MW studied in this report, the project's equipment will not fall within the Northeast Power Coordinating Council (NPCC) definition of the Bulk Power System (BPS). As stated in the final SIA report under [CAA ID 2016-568](#), it is expected that, once the new SVC is installed at Marathon TS, the East-West Tie transfer capability can be increased to 650 MW westward. At this increased transfer level, Marathon TS, together with all of the 230 kV circuits that terminate at that station (existing: M23L, M24L, W21M and W22M, and new: M37L, M38L, W35M and W36M) are expected to fall within the NPCC's BPS definition. Additional tests will be required to determine the future status of the terminal transformer stations, once the model for the Marathon SVC becomes available;
7. Extreme contingencies that result in the loss of the four 230 kV circuits of the East-West Tie such as failure of a quadruple circuit tower can result in separation between the Northwest transmission zone and the rest of the IESO-controlled grid. Following such events, timely system restoration is critical to avoid the risk of supply shortages to the customers in the zone; and
8. Outages to the existing East-West Tie circuits will be required to install the project, especially the 35 km section between Wawa TS and Marathon TS where the existing double circuit towers of W21M and W22M will be replaced with quadruple circuit towers to accommodate the new W35M and W36M circuits. An outage plan that contains the details of this replacement has not been presented to the IESO at the time of this report.

Connection Requirements

1. To avoid any possible conflict between the operation of the updated NW SPS 2 and the local voltage based capacitor and reactor switching schemes, the connection applicant must initiate in a timely manner a review of the voltage settings of all the local schemes by the IESO, participate as the equipment owner in the review and implement the new settings, once agreed upon, in a timely manner.
Note: the connection applicant initiated this process with the IESO in February, 2018.
2. After finalizing the engineering design, the connection applicant shall submit a restoration plan acceptable to the IESO that documents the restoration options for the East-West Tie corridor and

describes how the circuits will be restored following extreme contingencies such as the loss of towers.

3. At least twenty four months before the commencement of system-impactive project related outages, the connection applicant shall submit an outage plan acceptable to the IESO for the installation of the 35 km section between Wawa TS and Marathon TS where the existing double circuit towers of W21M and W22M will be replaced with quadruple circuit towers.
4. The connection applicant shall satisfy all general requirements listed in section 2 of this report.

Recommendations

As previously recommended in CAA_ID 2016-568, when the existing synchronous condenser, C8, at Lakehead TS reaches its end-of-life, the connection applicant is recommended to consider replacing it with an SVC that has a rating of at least ± 100 Mvar.

– End of Section –

- 1 • Hydro One has submitted the outage request to the IESO (Exhibit I, Tab 1, Schedule
2 2, Attachment 1).
- 3 • Exhibit I, Tab 1, Schedule 2, Attachment 2 reflects the discussions between Hydro
4 One and the IESO regarding this outage.
- 5 • Exhibit I, Tab 1, Schedule 2, Attachment 3 is Hydro One's request from the IESO to
6 acknowledge the discussions and the plan for this outage.
- 7 • Exhibit I, Tab 1, Schedule 2, Attachment 4 is the IESO's acknowledgement of the
8 discussions and the plan for this outage.
- 9

10 g) Hydro One does not anticipate any need for an outage beyond two weeks. The outage plan
11 has been developed to maximize all possible work (mobilization, yard preparation,
12 foundations, tower assembly, etc.), before starting the outage. This will ensure that the outage
13 time can be optimized to replace the towers. However, should the need arise due to an
14 unexpected delay, please refer to contingency mitigations provided in response to sub-part c)
15 of this interrogatory.

From: CHAYKA Darin
Sent: Thursday, July 12, 2018 11:24 PM
To: David Devereaux (david.devereaux@ieso.ca); Udayan.Nair@ieso.ca; Fred Ipwanshek (fred.ipwanshek@ieso.ca)
Cc: Rebellon, Pedro (pedro.rebellon@ieso.ca); frank.peng@ieso.ca; NOBLE Brian (brian.noble@HydroOne.com); Ahmed Rashwan (Ahmed.Rashwan@ieso.ca); Adam Tschirhart; Boris Vujasinovic
Subject: Hydro One EW Tie Additions

Dave/Udayan/Fred,

Thanks for taking the time last week, and previous, to discuss Hydro One's proposed double W21/22M outage to facilitate stringing the two new additional EW Tie circuits on the existing structures through the Pukaskwa National Park.

A NOMS Slip #20-00493 with corresponding IESO #1-00090519 has been submitted for the time period August 10th thru August 24th 2020 to reflect the double circuit outage. The outage will be Continuous and for now we'll work with a sliding 15 day Recall.

Although between the major Ontario stakeholders, namely the IESO, OPG and Hydro One, this will be an ongoing discussion involving respective studies, applicable System Limit determinations and production values, among other items leading towards execution, the following will hopefully serve in meeting the IESO requirement for an outage plan two years in advance of the actual outage as per instructions via the OEB hearings.

Below are some notes we discussed, plus some additional default comments we'll continue to discuss moving forward.

- For the planned 2020 outage period, our expectation is to have all Hydro One elements in the Northwest (NW) available. There will be no other major planned work and/or minor outages to impactive elements during the WxM outage.
- Priority will be placed upon this particular EW outage set.
- Any planned NW outages preceding the EW outage will be scheduled to return to service 4 weeks in advance of the August 10th start date to allow for any planned or forced extensions on elements impactive to the overall posture.
- The Northeast will be similarly postured with respect to impactive BES elements deemed supportive of the EW outage, including the Hanmer x Claireville 500 corridor thru Essa.
- We'll need to have further conversations once you've conducted your studies, specifically with OPG, Minnesota, Manitoba and MISO.
- Generation requirements and Limits specifically concerning Bowater, Thunder Bay and the Atikokan unit will also need consideration.

Below is a briefing summary I produced a few months ago and should serve as bulk requirements on our forward conversations.

Background

Hydro One has undertaken a detailed assessment to develop a competitive tender to design, build and operate the proposed East-West Tie transmission line enhancement. The project is a double-circuit

230kV transmission line, spanning approximately 450km from Lakehead TS to Marathon TS to Wawa TS, and is intended to increase the total transfer capability of the Interface from its current 300MW to 450MW by 2021, and further to 650MW by 2024.

The current East-West Tie is comprised of two 230kV circuits from Lakehead to Marathon – this overture would increase the circuit number to a total of four circuits, thereby increasing the transfer capability.

Project History

- In 2012 the Ontario Energy Board released a Request for Proposal (RFP) requesting bids for the development, construction, ownership and operation of a high voltage transmission line to increase the transmission capacity between Lakehead, Marathon and Wawa TS's in Northern Ontario.
- In 2013 NextEra and Enbridge partnered to submit a bid as Upper Canada Transmission (UCT), further referred to in this Briefing as NextBridge, and subsequently selected as the preferred bidder. Both Hydro One and SNC-Lavalin, via its subsidiary Altalink, bid the RFP independently and were deemed runners-up.
- NextBridge proceeded with the preparation and completion of an individual Environmental Assessment (EA) under the Ontario Environmental Assessment Act with the EA currently undergoing governmental review.
- In parallel, NextBridge has applied for Leave to Construct pursuant to Section 92 of the Ontario Energy Board Act.
- Upon receipt of the NextBridge Section 92 application, the Ontario Minister of Energy directed the Independent Electricity System Operator (IESO) to conduct a review of the project needs assessment and cost estimate.

Recent Developments

- In anticipation of an opportunity to submit a competing application for Leave to Construct (LTC), Hydro One and SNC-Lavalin Inc. have formed a partnership to jointly pursue the LTC with a modified corridor routing.
- The key difference between the 2 competing bids, is that the Hydro One/SNC-Lavalin proposed corridor will be shorter in length; 400km as opposed to 450km, with the route reduction to be constructed on, and take advantage of, the existing EW Tie Marathon by Wawa section right-of-way (ROW) through the Pukaskwa National Park. NextBridge's proposal is to route outside of the Park boundary.
- The proposal is also expected to have less environmental impacts and be lower in construction capital costs.

Proposal

- The map below shows the existing NextBridge route around the Pukaskwa National Park.



- The Hydro One/SNC-Lavalin proposal through the Park involves adding the 2 new circuits to modified towers on the existing Marathon by Wawa ROW.
- There is no requirement to widen the existing ROW resulting in significantly less impacts during construction.
- The steel for the tower modifications would be delivered by helicopter and lowered to the ground.
- If required, foundation modifications and guy anchors will be installed by drilling into local rock. These will anchor the tower body to the ground, increasing the towers structural capacity. The machinery is tracked and lightweight ensuring minimal impact to the ground.
- Any material(s) to be removed from the existing towers would be bundled on the ground within the existing ROW and then flown out by helicopter to off-site recycling yards.
- The conductor for the two new circuits will be installed by helicopter.

Proposal Benefits

- A 10% shorter route by utilizing the existing ROW and modifying existing towers in the Pukaskwa National Park, reducing environmental impacts and allowing for significant construction savings.
- Lower design and build cost are achievable through an optimized design solution for the portion of the route outside the Park.
- Lower Operating and maintenance costs by leveraging Hydro One's existing maintenance and infrastructure programs
- Superior First Nations partnership involving construction and ownership benefits that are shared with communities and modeled after industry leading practices and recent successful transactions.
- Cost certainty through a "not to exceed" construction price to be confirmed in the Hydro One Leave to Construct submission.

Operational Comments

- System Operations has studied the proposed work scope considering a 15 day, No Recall double WxM circuit outage would be required to facilitate the proposal.
- Both circuits out of service constitute an Ontario East West separation.
- This posture would require a very high degree of coordination between H1, the IESO, Ontario Power Generation (OPG), Manitoba Hydro Electric Board (MHEB), Minnesota Power and Light (MPL), the Mid-West Independent System Operator (MISO) and other Stakeholders.

- This scenario would require scheduling other planned Hydro One and Customer work in the Northwest (NW) as the West system is placed in the most secure posture possible while separated from the East, including 115kV generation sources.
- There will be a heavy reliance on generation in the West from an OPG hydraulic perspective. An EW Separation bottles their NW generation, so water levels and flows would need to be managed in advance to meet forecasted BES conditions.
- There will be reliance on the Minnesota and Manitoba Ties and limit constraints are expected to manage transient stability of the NW generators.
- The K21W and K22W may be required to operate free flowing to support a contingency NW. The IESO and MHEB will have to agree to the Phase Shifters set to neutral tap.
- Both MHEB and MPL will have to agree to keep critical elements in service within their system to maintain stability. Both entities have no major work scheduled for 2020 or 2021 that would affect the Interfaces.
- The Hydro One 230V system will have to be fully in service along with all 230/115kV Auto Transformers and all Reactors available.

Operational Summary

Although not normally desirable, at this point, System Operations studies with multiple parameters indicate the proposed plan is achievable. The main issues will be controlling high voltage and OPG's ability to plan and manage hydraulic components, but again, this planned posture would require a very high degree of coordination between H1, the IESO, OPG, MHEB, MPL, MISO and other Stakeholders.

Operational Specifics

The following internal requirements are necessary for the posture to be executed.

Kenora Area

Kenora T1 and the attached Reactor must be available for voltage support and the 115 kV area bounded by Circuits K3D, K6F and the Kenora TS 230/115 kV Autotransformer T1 must also be in service.

In order to maintain support and stability in the Kenora area, production and water management can be split between Whitedog Falls and Caribou Falls.

Dryden Area

Dryden T21 and T22 with Reactors to be available.

Fort Frances Area

Fort T1 and T2 with Reactor to be available.

Moose Lake Area

Mackenzie T3 and the Reactor to be available.

Lakehead Area

Lakehead Auto Transformers T7 and T8, B6M and A5A to be in service.

Lakehead C8 available.

Birch TS 115kV yard fully in service.

Q9B to remain in service in order to have the Thunder Bay GS units available to the system.

Marathon Area

Marathon T11 and T12 with Reactors available for voltage control.

T1M/A5A to be in service.

Algoma Area

Algoma T5 and T6 to remain in service for voltage support to the 115kV system.

Thanks again for your time, and please let me know if I've missed or misstated anything in our discussions and/or additional requirements you feel are needed on our path forward. Once you guys have some further information, let's meet again and discuss – I can arrange such when needed. **As stated above, it is important the IESO acknowledges our plan and timestamp wrt the two year advanced outage plan requirement, so if I could ask that a formal response be sent, it would be greatly appreciated.**

As always, any questions, comments and/or concerns, please reach out.

Talk soon.

Darin

Darin Chayka

Manager, Grid Operations

Operating Planning, System Operations

Ontario Grid Control Centre

Hydro One Networks Inc.

Cell: 705 828 0150

Email: Darin.Chayka@HydroOne.com

From: Maia Chase [\[mailto:maia.chase@ieso.ca\]](mailto:maia.chase@ieso.ca)
Sent: Friday, September 07, 2018 3:24 PM
To: CHAYKA Darin
Cc: David Devereaux; Pedro Rebellon
Subject: RE: Hydro One EW Tie Additions - IESO response

*** Exercise caution. This is an EXTERNAL email. DO NOT open attachments or click links from unknown senders or unexpected email. ***

Darin

Here is the IESO response for OEB staff IR 2 (f)

“The IESO has met with Hydro One to discuss the East West tie line addition and the related outage requirement. Hydro One provided the IESO with an overview of the work that will be performed during the outage and informed the IESO that the tentative timeline for the W21M + W22M outage is Aug 2020. The IESO and Hydro One will continue to have these discussions.

Could you please confirm with your Reg Affairs group if they will be providing any of the written correspondence between the IESO and Hydro One on this issue. Also, let me know if you need anything else from us.

Thanks.

Maia

Maia Chase | Senior Advisor - Regulatory Affairs, IESO | Station A, Box 4474, Toronto, Ontario, M5W 4E5 | T: 905.403.6906 C: 905.301.6179 | Email: maia.chase@ieso.ca | Web: www.ieso.ca

Risk Counter	Risk Title	Risk Status	Probability Ranking	Cost Impact Estimate	Schedule Impact	Additional Comments on Cost and Schedule
1	Because this EA Amendment procedure is unprecedented with the MOECC it is unclear at this time if it will be accepted by the MOECC. MOECC may require HONI to begin at a different stage gate in the IEA process (ie new TOR, or new EA). A condition required to proceed; Note risk updated in September 2018 to reduce probability ranking as more clarity around process is now available	ACTIVE	UNLIKELY 25% - 49%		Order of magnitude 2+ years for EA approval	Cost impact initially not carried as would greatly alter working assumptions; now additional cost included in LSL cost update, based on current knowledge of regulatory approval process - assuming Declaration Order or Individual EA using publicly available work from NextBridge; if NextBridge approval/work cannot be referenced then order of magnitude cost is increased by approximately \$20M
2	Additional studies, reports and/or consultation, including open houses. September 2018 update: Initially intended for EA Amendment scope. This contingency is now included in the cost, however, approach of Declaration Order and IEA for entire route add additional scope and cost which is now also included in the updated cost.	CLOSED	LIKELY 75% - 94%			Cost incorporated into updated base cost for Environmental Approvals
3	Construction delays due to above risk #2; cost included in EPC cost impact due to delays	ACTIVE	LIKELY 75% - 94%			If EA Approval granted later then Aug 2019; need to re-base schedule and cost
4	Additional cost to explore other routing alternatives for Park section. September 2018 update: Initially intended for EA Amendment scope. This contingency is now included in the cost, however, approach of Declaration Order and IEA for entire route add additional scope and cost which is now also included in the updated cost.	CLOSED	VERY LIKELY 95% - 100%			Cost incorporated into updated base cost for Environmental Approvals
5	EPC Contractor has to use four circuit towers around Loon Lake / Dorion, refer to above risk #4	Inactive	REMOTE 0% - 24%			
6	EPC Contractor has to make a bypass around Loon Lake / Dorion, refer to above risk #4	CLOSED	VERY LIKELY 95% - 100%			
7	If there is a separate commercial entity (including Hydro One as well as other entities) which will be the owner of the infrastructure within PNP will this affect the license agreement and the ability to consider this as existing infrastructure (ie not a new development)?	ACTIVE	REMOTE 0% - 24%			Potential delays to agreements; not likely cost implications; refer to schedule delay scenarios
8	A large portion of the EA document needs to be rewritten to reflect the design, construction, maintenance and operation practices of Hydro One.	CLOSED	VERY LIKELY 95% - 100%		Incorporated into updated Sept 2018 schedule	Cost incorporated into updated base cost for Environmental Approvals
9	Nextbridge IEA was intended to meet the MNRF Class EA requirements for both the disposition of Crown land and works in Provincial Parks. We will need to follow up with the MNRF to confirm that this EA and the subsequent Amendment meet their Class EA requirements. MNRF may require further information or time to conduct further Class EA work of their own.	ACTIVE	EVEN ODDS 50% - 74%		2-3 months delay to start of construction	Risk cost impact combined with risk 10
10	Nextbridge IEA was intended to meet the Ministry of Infrastructures Class EA requirements for the disposition or modification of IO/ORC lands. Nextbridge was to submit additional information to MOI under a separate cover that is not currently in the public realm. There may be no trigger for the Class EA or if there is the MOI may deem the current IEA and additional information provided by Nextbridge inadequate to meet their Class EA requirements.	ACTIVE	LIKELY 75% - 94%	\$ 1,000,000	2-3 months delay to start of construction	
11	Schedule impact due to delays under S. 35. (expropriation delaying construction)	ACTIVE	UNLIKELY 25% - 49%	\$ 1,000,000	6 month delay	
12	A written plan for construction will need to be submitted per article 8.01 of the current licence agreement. Parks Canada will not approve the modification of the route. A condition required to proceed with base scenario.	ACTIVE	REMOTE 0% - 24%			Risk would result in route around Pukaskwa National Park; development costs same
13	Parks Canada Detail Impact Assessment; September 2018 update: Although basic or detailed impact assessment expected under CEAA - no additional cost originally included in budget as Parks Canada indicated they would allow use of existing IEA document. This is not the case, as conveyed in July 2018, due to the more complicated scope and addition of Dorion route in IEA ToR.	CLOSED	LIKELY 75% - 94%		Not a Risk	Cost incorporated into updated base cost for Environmental Approvals
14	Analyses, Studies and reports within the EA will need to be amended to reflect the changes in routing and construction practices (such as ROW width, access). Many of these studies are time sensitive and seasons specific. We may need 4 seasons to complete all of the necessary studies. There is also the risk that early access agreements will not be in place to allow for conducting the studies at the appropriate time.	ACTIVE	UNLIKELY 25% - 49%		6 month delay to start of construction	Cost captured in Risk 20
15	Delay in coordinating Indigenous monitors which may be required for various studies including Archaeology and Natural Heritage.	ACTIVE	UNLIKELY 25% - 49%		6 months delay to construction start	Not likely a significant additional cost, only affects schedule and any resulting costs from schedule delay

Risk Counter	Risk Title	Risk Status	Probability Ranking	Cost Impact Estimate	Schedule Impact	Additional Comments on Cost and Schedule
16	The reaction by Indigenous communities to additional consultation from Hydro One is uncertain. Indigenous communities may be limited in the extent they can share information with Hydro One given existing agreements with Nx. (Cost Incorporates risks 26-29)	ACTIVE	EVEN ODDS 50% - 74%	\$ 1,000,000	6-12 month delay to construction start	
17	If leave to construct is awarded to Hydro One and Nx EA is not complete there is a risk of Nx not completing the EA.	ACTIVE	EVEN ODDS 50% - 74%		6 months delay to construction start	Cost implications difficult to determine, as it is not clear if portions of NextBridge work may be utilized by Hydro One; refer to Risk 1
18	Indigenous monitors may need to be present for Geotechnical studies.	ACTIVE	VERY LIKELY 95% - 100%		3-6 month delay to construction start	Cost risk captured in Risk 15
19	Permits for such things as water crossings, roads, tree clearing etc. may run into delays or added costs depending on availability and requirements of Regulatory staff and other stakeholders (ie Sustainable Forest Licences).	ACTIVE	EVEN ODDS 50% - 74%	\$ 1,200,000	(3-6 month delay)	
20	There is a risk that various environmental features may delay, post-pone or constrain construction activities by imposing timing restrictions. Eg. Species at Risk, nesting birds, water crossings, wet terrain. May also result in unplanned studies or mitigation.	ACTIVE	LIKELY 75% - 94%		SNCL Risk	
21	Stage 2 Archaeology, Cultural Heritage Evaluation Report and Heritage Impact Assessment may have findings that could result in additional studies (such as Stage 3 or 4 archaeological investigations) if mitigation or avoidance is not possible.	ACTIVE	EVEN ODDS 50% - 74%		Exclude from risk model and capture in S92 conditions	
22	Archaeological findings may cause delays to construction and modification to construction access routes or structure locations. Archaeology may not be fully complete before construction begins and may result in the adjustment to construction staging. May cause delays which may result in CCN's.	ACTIVE	EVEN ODDS 50% - 74%		Exclude from risk model and capture in S92 conditions	
23	Requirement for clearance letters from MTCS can cause delays by slow turn around.	ACTIVE	REMOTE 0% - 24%	\$ 600,000	1-2 month delay in construction start	
24	Environmental Monitoring commitments made in the IEA and required by Regulator Permits may result in added analysis, studies and reports (ie Turbidity and Total Suspended Solids at water crossings).	ACTIVE	LIKELY 75% - 94%		SNCL to take on risk of construction delays	
25	POST EA Work During and Post Construction may be higher than anticipated	CLOSED	VERY LIKELY 95% - 100%			Cost incorporated into updated base cost for Environmental Approvals
26	Indigenous communities may decide to remove themselves from the consultation process, which can affect the consultation budget.	ACTIVE	REMOTE 0% - 24%		combine with 15	Risk cost captured in Risk 15
27	Indigenous communities may request additional meetings in order to conclude the consultation process which can delay necessary approvals and affect the consultation budget	ACTIVE	REMOTE 0% - 24%		combine with 15	Risk cost captured in Risk 15
28	Indigenous communities may raise issues that Hydro One cannot respond to and must be addressed by the Crown, which can delay necessary approvals and affect the consultation budget.	ACTIVE	REMOTE 0% - 24%		combine with 15	Risk cost captured in Risk 15
29	Additional Indigenous communities may assert rights in the Project area and request to be consulted which can delay necessary approvals and affect the consultation budget.	ACTIVE	REMOTE 0% - 24%		combine with 15	Risk cost captured in Risk 15
30	The risk of the regulatory approval taking longer than anticipated and not having visibility on when the EA approval will be received	ACTIVE	LIKELY 75% - 94%			If EA Approval granted later then Aug 2019; need to re-base schedule and cost
31	Land Value Study results lower than individual full narrative property appraisals.	CLOSED	UNLIKELY 25% - 49%			Risk materialized; cost impact (\$500K) reflected in revised base budget
32	Property owner delayed authorisation or refusal to grant access for studies and assessments prior to s.92 approval.	ACTIVE	REMOTE 0% - 24%		minimal schedule impact	
33	Refusal to grant option for permanent lands rights, necessitating e	ACTIVE	EVEN ODDS 50% - 74%	\$ 2,400,000	nil	Construction can be managed around the 14-18 months expropriation process, without impacting I/S
34	Compensation for Business Disruption/Loss associated in the grant of permanent land rights.	ACTIVE	UNLIKELY 25% - 49%	\$ 800,000		

Risk Counter	Risk Title	Risk Status	Probability Ranking	Cost Impact Estimate	Schedule Impact	Additional Comments on Cost and Schedule
35	Underlying rights within Provincial Crown lands, e.g. minerals (consent approval).	ACTIVE	EVEN ODDS 50% - 74%	\$ 500,000		
36	Project requirements for route result in impact to primary residence or major out building (Buyout/Relocation).	CLOSED	UNLIKELY 25% - 49%			Risk materialized; cost impact reflected in revised base budget
37	Obtaining agreement and associated permits from FN (Pays Platt and Michipicoten) to accept current rental formula with other FN (annual amount).	ACTIVE	LIKELY 75% - 94%			Cost impact, if materialized is on OM&A
38	Undefined access road for temporary requirements (relying on preliminary information).	ACTIVE	LIKELY 75% - 94%	\$ 525,000		
39	Unable to procure necessary Land Agent resources in a timely manner (substitute with internal staff).	ACTIVE	REMOTE 0% - 24%	\$ 260,000		
40	Real Estate Buyouts found in the last moment (already addressed within Risk 36).	CLOSED	VERY LIKELY 95% - 100%			Risk materialized; cost impact reflected in revised base budget
41	IESO may reject the 15 days double circuit outage as it does not consider it as a valid plan	CLOSED	REMOTE 0% - 24%			
42	15 days double circuit outage cancelled two weeks before scheduled start date. New start date moved to following year.	ACTIVE	REMOTE 0% - 24%	\$ 5,000,000		
43	15 days double circuit outage delayed for one week, 1 day before original scheduled start date.	ACTIVE	REMOTE 0% - 24%			
44	Single circuit outage(s) start delayed four hours in the morning of starting daily outage (\$100k per instance)	ACTIVE	EVEN ODDS 50% - 74%	\$ 600,000		
45	Communication cost due to POST EA Work During and Post Construction may be higher than anticipated	ACTIVE	VERY LIKELY 95% - 100%	\$ 300,000		
46	Risk that Indigenous Communities request more than industry-typical study scopes	ACTIVE	EVEN ODDS 50% - 74%			Cost risk captured in Risk 15
47	MECP does not approve NxB EA by end of Q4 2018 as anticipated	ACTIVE	VERY LIKELY 95% - 100%			Result is delay and associated cost as described in Risk 30
48	MECP does not approve NxB at all and transfers all issues to H1	ACTIVE	EVEN ODDS 50% - 74%			Similar implications to Risk 17: Cost implications difficult to determine, as it is not clear if portions of NextBridge work may be utilized by Hydro One; refer to Risk 1
49	HONI is not granted Dec order, CEAA approval by August 15/19	ACTIVE	EVEN ODDS 50% - 74%			Result is delay and associated cost as described in Risk 30
50	Delay to project due to MECP tying Station EA approval to Dec order/IEA approval for LSL	ACTIVE	EVEN ODDS 50% - 74%		Current Jan 2019 EA approval as expected maintains in-service date of Dec 2021	Delay beyond that in assumptions will result in delay and associated cost as described in Risk 30

underway for the project will also encompass the potential to follow the existing NextBridge route as a potential alternative for the LSL should the Board decide that this is the best alternative for Ontario ratepayers.

e. What reliability impacts to transmission service might arise from the reinforcement of the existing transmission towers in Pukaskwa National Park, both during construction and in the long-term operation of the line?

Hydro One has proposed to replace around 90 towers that support approximately 35 km of the existing double-circuit EWT line in the Park, with new four-circuit towers to accommodate both the existing and new line within the existing right-of-way.

During construction, for two weeks in 2020, the existing EWT line between Wawa and Marathon will be outaged to remove and replace the existing towers and reinstall the existing line on the new towers. Hydro One has had initial discussions with the IESO and will satisfy the SIA requirement that Hydro One submit plans and schedules for the outage two years in advance. This will allow the IESO and Hydro One to assess the impact of the outage, coordinate other impactive outages in the area to reduce the risk to system reliability, and prepare action plans and communication plans with neighbouring transmission operators. Initial reviews and discussions show that the risk of a two-week outage of the existing line is manageable.

Hydro One's plan is to install the new line in the Park in 2021, on the four-circuit towers, with outages to one of the two existing EWT circuits at a time. As these outages are required only to ensure stringing safety, emergency restoration to service of the outaged line can be done in hours. Hydro One and SNC-Lavalin have extensive experience and knowledge of construction in proximity to live and existing transmission lines and are confident that the work can be carried out safely and without significant risk to system reliability.

For the long-term operation of the lines, Hydro One states that installation of the four-circuit line in the Park will not have a more adverse impact on overall reliability of the power system than the other alternative of having two separate double-circuit EWT lines. The reasons for this assessment are as follows:

- i. For over 90 years, Hydro One has installed hundreds of three-circuit and four-circuit towers that carry a combination of 500 kV, 230 kV and 115 kV circuits. Examples include Longwood TS to Macksville Jct and Burlington TS to Beach Rd Jct four-circuit installations. There have been no incidents of failures of any four-circuit installation (towers and their foundations). In addition, Hydro One and SNC-Lavalin have a wealth of knowledge and experience in designing and operating four-circuit lines that provide safe and reliable electricity worldwide.
- ii. The exiting EWT line is approximately 50 years old and was designed to withstand "one-in-50-year" storms. The new four-circuit line in the Park will be stronger and designed for "one-in-100-year" storms. This means that the likelihood of a severe storm in the future damaging the existing line (and leaving east-west connected only by the new EWT line) will be less as a result of using the new stronger towers to replace the existing line in the Park.
- iii. In the unlikely event of failure of the four-circuit towers, Hydro One has extensive knowledge and experience in outage restoration. Hydro One has response teams in Thunder Bay, Marathon, and Sault Ste. Marie, a fleet of helicopters at Thunder Bay and other locations in the North, and close to 265 trades staff which provide Hydro One with a unique capability for timely restoration of any potentially damaged facilities. This applies not only to the long-

- G. The IESO System Impact Assessment (“SIA”) report, (filed by Hydro One on 2018-03-29, Additional Evidence, EB-2017-0364, Exhibit F-01-01, Attachment 3) has, in my opinion, only marginally endorsed the interconnection of the LSL project.**

This is incorrect. There is no “marginal” endorsement in SIA and associated *Notification of Conditional Approval for Connection* (COLA). For both Hydro One’s and NextBridge’s proposed solutions, the SIA stated the very same following approval:

The project will not have a material adverse impact on the reliability of the integrated power system. It is therefore recommended that a *Notification of Conditional Approval for Connection* be issued for the project subject to the requirements listed in this report.

And in each transmitter’s SIA, the Executive Summary said:

The proposed modifications are expected to be adequate for the targeted westward transfer level of 450 MW across the East-West Tie.

- H. For example, the IESO indicates that the quadruple circuits on common towers creates single failure point as an extreme contingency that can result in the Northwest system shedding a minimum of 100MW load to keep the rest of the system reliable. Also, in the Additional Evidence at page 2, the IESO findings include concerns and suggest mitigation measures**

Extreme contingencies that result in the loss of the four 230 kV circuits of the East-West Tie such as failure of a quadruple circuit tower can result in separation between the Northwest transmission zone and the rest of the IESO-controlled grid. Following such events, timely system restoration is critical to avoid the risk of supply shortages to the customers in the zone;

NERC requires a deterministic assessment (rather than probabilistic) of contingencies, including extreme contingencies. Extreme contingencies are not limited to four circuits on a common tower. A contingency involving two double circuit towers on the same corridor, resulting in the loss of the same four circuits, has to be assessed equally from an extreme contingency perspective as required by the NERC standard. Hydro One will address the IESO SIA recommendation to consider integrating features for detecting and mitigation extreme contingencies within the NW Special Protection Scheme (“SPS”) 2.

The IESO’s LSL SIA suggested that for the extreme contingency event of the loss of four circuits the NW SPS 2 should be modified to include this contingency. This is applicable to both Hydro One’s and Nextbridge’s solutions to mitigate the impact of this extreme event.

- I. Outages to the existing East-West Tie circuits will be required to install the project, especially the 35 km section between Wawa TS and Marathon TS where the existing double circuit towers of W21M and W22M will be replaced with quadruple circuit towers to accommodate the new W35M and W36M circuits. An outage plan that contains the details of this replacement has not been presented to the IESO at the time of this report.**

The reference above is incomplete. In the same SIA, the IESO stated clearly, “At least twenty-four months before the commencement of any project related outages, the connection applicant

shall submit an outage plan acceptable to the IESO for the installation of the project”. (Requirement #3 of the SIA on Page 3) Hydro One plans to meet this requirement.

- J. The SIA at page 13 further discussed the possible frequency of the loss of the quadruple circuits, stating that “The Northwest zone is prone to thunderstorms from April 1st to October 31st.” Therefore, the IESO on this same page states that during this seven month period in a year it will have to prepare the system to withstand the loss of all four 230 kV circuits “either reducing the transfer pre-contingency or by arming load rejection”. The listing of these concerns shows that the IESO views the quad circuit design as one that presents additional reliability risks. This discussion in the SIA is also indicating that Hydro One has not presented the requisite plans for the IESO to understand if the risks can be adequately mitigated.**

This is an incorrect interpretation. Firstly, the IESO does not posture the system for storm conditions for seven months continuously: this additional posture is applied only during approaching storm conditions over specific areas and for short periods of time. Secondly, the IESO is referring to the loss of four circuits in the context of an extreme contingency. As noted in Paragraph H, Hydro One will adopt the IESO’s SIA recommendation to include features for detecting and mitigating extreme contingencies within the NW SPS 2. The modification of the NW SPS 2 to include the four circuit extreme contingency will eliminate the need for transfer reductions pre-contingency.

- K. In addition, as explained by the IESO on page 13, at the time of the SIA study, the load rejection scheme, referred to as NW SPS 2, did not provide features for detecting extreme contingencies involving more than 2 circuits – which is clearly an issue for a quad circuit configuration.**

Failure of a 4-cct tower (in a 35 km span) has the same consequence as the loss of two 2-cct tower (that are adjacent to each other over ~200 km).

The IESO’s SIA suggested that for the extreme contingency event, the loss of four circuits, the NW SPS 2 should be modified to include this contingency. This is applicable to both Hydro One’s and Nextbridge’s solutions to mitigate the impact of this extreme event.

- L. The feasibility and implementation of such a load shedding scheme notwithstanding, the arming for two double-contingencies in preparation for the loss of the four circuits can and will result in unnecessary load disconnection if this extreme contingency occurs.**

See paragraph K above. This applies to both the Hydro One and Nextbridge solutions.

- M. Further, the NW SPS 2 is already a very complex scheme. It becomes more complex with the modifications needed to accommodate the loss of a quad tower and its operation becomes more likely.**

The Ontario system has SPS’s that are more complex than the NW SPS 2, and the addition of two contingencies for extreme events does not add to the complexity of the scheme. As stated above, this SPS addition will be recommended for both Hydro One’s and NextBridge’s solutions.

- N. These schemes are usually employed only when there are no other reasonable options. Thus, from an operational perspective, proceeding with quad circuit design without a**

1 overview of how you intend to construct the towers within
2 the park. One of the questions is will there be any --
3 because of certain complications that you may encounter as
4 you're constructing within the park, will there be any type
5 of bypass that will be required, temporary bypasses?

6 [Witness panel confers]

7 MR. KARUNAKARAN: It's not intended to have temporary
8 bypasses, because otherwise, the sequence of the work is
9 that you are effectively putting in the structures and
10 reinstating the existing circuits, and then it's a later
11 activity to actually install the conductor for the new
12 circuits.

13 MR. LESYCHYN: Thank you. What happens if in the
14 field Hydro One encounters some issues during this two week
15 outage period? For example, what happens if some of the
16 foundations need to be replaced? Or is it possible to
17 build 2.5 kilometres of that transmission line per day,
18 because that is kind of like the schedule that you're going
19 to have to follow, eh?

20 MR. KARUNAKARAN: As I said, there is a lot of
21 preparatory work that occurs prior to the actual outage
22 being taken, and part of that is actual assessment of the
23 foundation works, any adjustment to the design that is
24 necessary on that front. A lot of strengthening and
25 reinforcing works can still be done prior to the actual
26 outage being taken.

27 So from that perspective, we've got a high degree of
28 confidence in the methodology being put forward.

1 Prior to the outage, work will commence to install all foundations and the four guy
2 anchors for the 87 guyed structures under the still-energized line. All 87 structures will
3 be assembled in three flight yards located on either side of the Park. The guy wire,
4 insulators and travelers will be attached to the assembled structures.

5
6 During the two-week outage, the heavy lift helicopters, with a capacity of 24,000 lbs, will
7 be engaged for the installation of the new structures and the decommissioning of the
8 existing structures. For every new structure, two helicopter lifts are required, while for
9 every existing structure removal, one lift is required. Each helicopter crew is capable of
10 achieving on average seven structures per day.

11
12 c) Yes, weather delays are accounted for in the production rate. The following contingency
13 mitigations will be implemented:

- 14 • The new offset locations allow the existing structures to remain in place until the new
15 structures are fully erected. This provides flexibility to manage the risks, if
16 necessary, by allowing the 15-day outage to be extended, with the ability to recall the
17 EWT line when required during the extension period.
- 18 • If an outage extension in 2020 becomes necessary due to unexpected interruptions
19 and is not permitted, the existing transmission line will remain in-service and a
20 second outage would be required in 2021 to complete the Project.

21
22 d) No.

23
24 e) Hydro One is not currently aware of the next available window. However, Hydro One will
25 work with the IESO to arrange another suitable window to accommodate the required outage
26 to maintain the schedule.

27
28 f) Hydro One has met with the IESO and discussed the Lake Superior Link's baseline outage
29 requirements. The IESO has agreed in principle to this request. Additional conversations
30 have occurred with Ontario Power Generation (OPG), Manitoba Hydro Electric Board
31 (MHEB) and Minnesota Power (MP), as these entities' participation will also be instrumental
32 in supporting the outage posture. Hydro One will continue the discussions with the IESO and
33 additional stakeholders on a regular basis in preparation for the two-week outage, currently
34 scheduled for the period of August 10 – 24, 2020.

TAB 31

- 1 ii. Identify each allocation of cost risk between SNC-Lavalin and HONI.
- 2 iii. For each risk identified, explain in detail how it potentially can impact the actual cost
- 3 of the Lake Superior Link project, and the ability for those costs to increase the total
- 4 project costs for either the current plan to route through Pukaskwa National Park
- 5 and/or the alternative to route around the Park. For example, who bears the risk of
- 6 unconcealed subsurface condition costs – HONI or SNC-Lavalin, and how is the
- 7 overall construction costs impacted by that allocation of cost risk.
- 8

9 **Response:**

- 10 a) There are no changes to the fixed price contract since what was filed in response to JT2.22.
- 11
- 12 b) The delivery price as per the reference is intended to inclusively speak to the project's
- 13 construction costs, however the comment is made in the context that "Hydro One and SNC-
- 14 Lavalin have agreed to enter into a fixed price contract, providing further assurance on
- 15 meeting the delivery price and mitigating the risk to ratepayers". The fixed price contract
- 16 scope and cost estimate from SNC-Lavalin was reviewed by Hydro One under
- 17 confidentiality, and covers the following rows from Table 3 of reference: Construction; Site
- 18 Clearing, Preparation & Site Remediation; Material; Other Costs; Construction Management,
- 19 Engineering, Design & Procurement.
- 20
- 21 c) Confirmed. The EPC contract is execution-ready for the route through Pukaskwa National
- 22 Park and will be executed upon being granted leave to construct.
- 23
- 24 i. The EPC contract terms would be applicable to a route around Pukaskwa National
- 25 Park, however with an adjustment to contract price and schedule elements prior to
- 26 execution.
- 27
- 28 d) ii) From JT2.22, refer to *Article 19 – Changes* regarding contractual provisions and
- 29 mechanism regarding changes. The fixed-price EPC remains at \$546 million based on the
- 30 current scope of work as defined at the time of Application. Should there be no authorized
- 31 changes due to things outside the control of SNC-Lavalin, the EPC portion of the project will
- 32 be delivered for \$546 million. However changes to the scope of work, schedule, etc. due to
- 33 things beyond SNC-Lavalin's control may be subject to contract changes for review and
- 34 potential approval by Hydro One (eg., adaptations to account for unforeseen imposed
- 35 conditions on environmental assessment approvals).

Lake Superior Link Project Schedule - Preferred Route_2018.08.30 R02				Classic WBS Layout_1												20-Sep-18																																						
Activity ID		Activity Name	Duration	Start	Finish	2018												2019												2020												2021												22
						J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J												
		Section 3		475	02-Sep-19	25-Jun-21																																					25-Jun-21, Section 3											
		Clearing and Access		226	02-Sep-19	13-Jul-20																									13-Jul-20, Clearing and Access																							
		Tower Foundation & Tie wire Foundation		196	06-Jan-20	05-Oct-20																									05-Oct-20, Tower Foundation & Tie wire Found																							
		Tower Assembly		173	02-Apr-20	30-Nov-20																									30-Nov-20, Tower Assembly																							
		Tower Erection		98	17-Sep-20	11-Feb-21																									11-Feb-21, Tower Erection																							
		Stringing		166	27-Oct-20	25-Jun-21																									25-Jun-21, Stringing																							
		Section 4		440	02-Sep-19	07-May-21																									07-May-21, Section 4																							
		Clearing and Access		195	02-Sep-19	29-May-20																									29-May-20, Clearing and Access																							
		Tower Foundation & Tie wire Foundation		204	13-Dec-19	05-Oct-20																									05-Oct-20, Tower Foundation & Tie wire Found																							
		Tower Assembly		147	09-Apr-20	30-Oct-20																									30-Oct-20, Tower Assembly																							
		Tower Erection		111	11-Sep-20	24-Feb-21																									24-Feb-21, Tower Erection																							
		Stringing		101	08-Dec-20	07-May-21																									07-May-21, Stringing																							
		Commissioning & Close Out		77	07-Sep-21	22-Dec-21																									22-Dec-21, Commissioning & Close Out																							

Appportioning Project Costs & Risks

The capital cost to complete the Lake Superior Link Project is \$636.2 million. The cost of the work detailed through Section 1.0 below allows for the schedule provided in **Exhibit B, Tab 11, Schedule 1**.

This Application results in significant benefits for Ontario customers. These include:

- i) substantially lower costs to complete the Project
 - capital savings of \$120 million ¹
 - ongoing annual OM&A savings of \$3.2 million – the equivalent of approximately \$55 million of capital expenditures from a net present value perspective²;
- ii) a narrower corridor along the route of the line,
- iii) reduced environmental impact and physical disturbance; and
- iv) reduced risk to ratepayers by Hydro One assuming certain risks on the delivery of the Project.

1.0 PROJECT COST

The Lake Superior Link Project's cost is summarized as follows:

Table 1: Total Project Costs (\$000s)	
Development Cost ³	12,215
Construction Cost ⁴	623,946
Total Project Cost	\$636,161

¹ Hydro One's total costs of \$636,161 as provided in Table 1 of Exhibit B, Tab 7, Schedule 1 relative to the NextBridge construction costs of \$736,971 as provided in EB-2017-0182 Exhibit B, Tab 9, Schedule 1 Table 1 plus the incremental development costs incurred since designation as provided EB-2015-0216 NextBridge EWT Monthly Report – October 23, 2017 – Page 8, Table 1.

² Please refer to Exhibit B, Tab 9, Schedule 1 for further details.

³ Based on forecast cost until October 2018 - OEB forecast approval date.

⁴ Forecast construction cost contingent upon an October 2018 OEB approval of this Application.

1.1 Development Costs

As mentioned previously, once this Application is filed with the OEB, Hydro One will commence its consultation process with impacted parties.

Hydro One understands that the OEB's designation policy, *OEB Policy: Framework for Transmission Project Development Plans*, contemplates development cost recovery from ratepayers by the designated transmitter only. However, the policy also says that if customer benefits outweigh costs, the cost should be allowed for recovery.

The Board agrees with stakeholders that designation of two transmitters should be an exceptional circumstance where the Board is persuaded that:

- *Two proposed projects to meet the same need cannot be directly compared since they are so significantly different
 - *as to route, or*
 - *as to technology to be employed; or**
- *The amount saved on construction cost could be more than the cost added by the funding of a second development project.*⁵

Both Hydro One's capital and OM&A costs are significantly less than those proposed by NextBridge. In comparing the two leave to construct applications currently before the Board, Hydro One's proposal **will save ratepayers approximately \$175 million** in capital equivalency (representing approximately \$120 million in capital costs⁶ and \$3.2 million lower ongoing annual OM&A costs⁷). As discussed in **Exhibit B, Tab 9, Schedule 1**, this is expected to have a ratepayer benefit of approximately \$13 million annually in reduced revenue requirement.

⁵ EB-2010-0059 - OEB Policy: Framework for Transmission Project Development Plans – August 26, 2010 – Page 16

⁶ EB-2017-0182 – Exhibit B, Tab 9, Schedule 1 – Table 4 – NextBridge Construction Costs of \$736,971K plus incremental Development Costs of \$17,812K relative to Hydro One's Construction Costs of \$636.2M (not including the \$22.8 million approved as part of the designation process)

⁷ The difference in annual ongoing OM&A expenditures carries a capital equivalency NPV of over \$50 million as described in Exhibit B, Tab 9, Schedule 1.

The significant ongoing savings to ratepayers outweighs the projected one-time \$12 million development costs to be incurred prior to OEB approval. Hydro One submits that, as contemplated by the aforementioned policy, the development costs documented in **Table 2** of this Exhibit should be eligible for recovery in rate base if Hydro One is selected to construct this Project.

Table 2: Development Costs (\$000s)

Real Estate	4,267
Engineering and Design	2,277
Environmental Approval ⁸	2,181
Regulatory & Legal	1,995
First Nations & Métis Consultations	1,101
Project Management	154
Other Consultations	240
Total Development Cost	\$ 12,215

These development costs include consultation activities (with affected Indigenous Communities and impacted stakeholders), preliminary engineering and design work, real estate acquisition, plus other costs expected to be incurred prior to OEB approval.

In order to complete the Project at the cost and schedule provided in this Application, Hydro One will utilize the existing development work as contemplated and already approved in the Designation Proceeding⁹.

⁸ Requires use of NextBridge's EA and ability for Hydro One to undertake regulatory process to meet additional EA obligations associated with Hydro One route modifications as discussed in Exhibit C, Tab 1, Schedule 2.

⁹ EB-2011-0140

1 **1.2 Construction Costs**

2

3 Hydro One's construction cost to complete this Project is \$623 million. Hydro One has
4 partnered with SNC-Lavalin, one of the leading engineering and construction groups in
5 the world, and has brought forward innovative project management to construct the
6 Lake Superior Link Project resulting in the significant cost savings as shown herein.
7 Hydro One and SNC-Lavalin have agreed to enter into a fixed price contract, providing
8 further assurance on meeting the delivery price and mitigating the risk to ratepayers.

9

Table 3: Construction Costs (\$000s)	
Construction	354,030
Site Clearing, Preparation & Site Remediation ¹⁰	104,339
Material ¹¹	58,713
Project Management	5,802
Other Costs ¹²	9,451
Construction Management, Engineering, Design & Procurement	17,828
Real Estate	9,798
First Nations & Métis Consultations	1,133
Environmental Approval	819
Other Consultations	160
Contingency ¹³	10,775
Interest During Construction("IDC") ¹⁴	42,596
Overhead ¹⁵	8,502
Total Construction Cost	\$623,946

1

¹⁰ Includes an allowance for labour cost unit rate increases until Dec 2021.

¹¹ Includes an allowance for cost increases in commodities (steel, zinc, aluminum) and Foreign Exchange until November 2018.

¹² Other Costs include insurance, contract securities, other approval costs (various crossings, dewatering, etc.)

¹³ In addition to contingency carried by SNC-L

¹⁴ IDC is calculated using the OEB's approved interest rate methodology (EB-2006-0117) to the projects' forecast monthly cash flow and carrying forward closing balance from the preceding month.

¹⁵ Overhead costs allocated to the project are for corporate services costs. These costs are charged to capital projects through an overhead capitalization rate in compliance with the Affiliate Relationship Code. As such they are considered "Indirect Overheads". Hydro One does not allocate any project activity to "Direct Overheads" but rather charges all other costs directly to the project.

2.0 KEY ASSUMPTIONS, RISKS AND CONTINGENCIES

2.1 Key Assumptions

These key assumptions are critical to the completion of the Project, both with respect to schedule and overall costs. If these assumptions do not materialize, Hydro One will not be able to complete the Project as proposed in this Application.

- i. **CO-OPERATION WITH MINISTRY OF ENVIRONMENT AND CLIMATE CHANGE:** It will be necessary that the MOECC work collaboratively with Hydro One to implement a regulatory measure, such as a Cabinet exemption to typical EA requirements. This regulatory measure would allow Hydro One to utilize the EA-specific development work already completed by NextBridge, and address changes in the proposed route through additional study, consultation and regulatory approval. Hydro One will ensure the Project is conducted in accordance with any relevant conditions and mitigation measures proposed in the NextBridge EA as well as incorporate any additional considerations from the studies associated with the route changes.
- ii. **UTILIZATION BY HYDRO ONE OF EXISTING EA:** Given that the competitive process established by the OEB clearly states the ability for any transmitter to submit a Leave to construct to build the project, Hydro One has assumed that the EA-specific development work will be made available to the transmitter designated to ultimately construct the Project. This is a necessary measure to foster optimal competition in any open process. It aligns with the intent of the Policy that established that the development transmitter and constructing transmitter was not necessarily going to be the same transmitter¹⁶, and is critical

¹⁶ Phase 2 Decision and Order (EB-2011-0140 – page 4), “Designation does not carry with it an exclusive right to build the line or an exclusive right to apply for leave to construct the line. A transmitter may apply for leave to construct the East-West Tie line, designated or not.”

1 to mitigate ratepayer costs and ensure a timely in-service date for the Project.
2 Additionally, in the context of an open, fair and on-going competitive process,
3 the development work (inclusive of the EA) is intended for the benefit of
4 ratepayers through the ultimate construction of the line.

5 iii. **DISCLOSURE OF THE NEXTBRIDGE EA:** The effects of the EA Amendment
6 currently being prepared by NextBridge will need to be made available to Hydro
7 One prior to the end of the third quarter of 2018 in order to ensure changes are
8 addressed. Approval of NextBridge's EA must be received by the end of the third
9 quarter of 2018 and Hydro One must receive EA approval of the route changes
10 by June 2019 in order to meet both the in-service date and the costs as outlined
11 in this Application.

12 iv. **AGREEMENT WITH IMPACTED INDIGENOUS COMMUNITIES:** This leave to
13 construct application is conditional upon Hydro One finalizing agreements with
14 directly impacted Indigenous communities to be established on mutually
15 agreeable terms within a short period of time (in order of 45 days) from receipt
16 of OEB approval.

17 18 **Risks and Contingencies**

19 20 **2.2 HYDRO ONE MONTE CARLO SIMULATION**

21
22 Hydro One utilized a Monte Carlo risk simulation to assess the probability of possible
23 outcomes to determine the amount of the risk contingency. This sophisticated risk
24 simulation method enables Hydro One to derive a reasonable and probable contingency
25 allowance based on the analysis of a multitude of scenarios. A similar process was also
26 followed by our construction partner.

27
28 The key risks that were included in the Monte Carlo simulation are identified in the table
29 below.

Table 4			
Description	Likelihood	Impact	Mitigation
Ability to reach agreement with First Nations and Métis in a timely manner	Medium	Delay in construction start Potential Cost Increase	<ul style="list-style-type: none"> Hydro One has engaged with all impacted communities Hydro One has terms of agreement from other projects that are fair, equitable and tested (e.g., B2M LP) SNC-L also has extensive experience working with Indigenous communities Consultation activities will start in February 2018
Community consultation for approval of route results in delays to completing EA	Medium	Schedule Delay Potential Cost Increase	<ul style="list-style-type: none"> Commence consultations in February 2018 Route differences limited to use of existing corridor through Park; significant reduction in environmental impact should be favourably viewed by public
Land acquisition and expropriation (if required) not completed in time for construction	Medium	Schedule Delay Potential Cost Increase	<ul style="list-style-type: none"> Hydro One's experienced team with voluntary agreements Land Acquisition Compensations Principles that encourage voluntary settlement through incentives Early notification and proactive discussions with land owners commencing March 2018 Early identification of the need for expropriation through an accelerated land acquisition program in conjunction with the opportunity to stage construction pending final results of expropriation
Scheduled 15-days continuous double-circuit outage to replace towers in Pukaskwa National Park delayed	Low	Potential Cost Increase	<ul style="list-style-type: none"> Obtain outage plan approval from all stakeholders early in the process

Inability to undertake an approved regulatory process to meet EA obligations in a timely manner	Medium-High	Schedule Delay Potential Cost Increase	<ul style="list-style-type: none"> Consultations with MOECC began in late 2017; regulatory measure is possible if Project is compelling to Province
Substantive unforeseen conditions imposed on EA Approvals	Low-Medium	Potential Schedule Delay Potential Cost Increase	<ul style="list-style-type: none"> Any conditions imposed would be the same for Hydro One and NextBridge in shared route areas; Hydro One's route changes expected to result in reduced environmental impacts and therefore reduced mitigation measures
OEB approval not received by October 2018	Medium	Potential Schedule Delay Potential Cost Increase	<ul style="list-style-type: none"> Respond timely to all scheduled timelines
Archaeology findings delaying construction work more than 2 weeks/per instance	Medium	Potential Schedule Delay Potential Cost Increase	<ul style="list-style-type: none"> Accelerate work schedules Parallel existing route and only 10% of the route is greenfield.

1

2 Based on the Monte Carlo results, and given the terms of the fixed-price contract
3 between Hydro One and SNC-Lavalin, SNC-Lavalin carrying its own contingency, and
4 Hydro One's past experience, Hydro One is carrying a much smaller contingency (\$10.8
5 million) than is typical for a capital project of this size.

6

7 The contingency includes allowances to cover the following potential risks which will not
8 impact rate payers:

- 9 • Commodity price fluctuations and foreign exchange variations (until November
10 2018)
- 11 • Accumulated funds used during construction interest rate variations (other than
12 those required by OEB through the statutory regulatory process)
- 13 • Material delivery delay due to procurement or vendor issues.

14

v. RISKS ELEMENTS NOT INCLUDED IN THE HYDRO ONE PRICE

No contingencies have been made for the following unlikely events and reasonable price adjustments would be submitted to OEB for prudency review only after all other recourses have been exhausted:

- Labour disputes;
- Safety or environmental incidents not covered by the insurance program of Hydro One;
- Significant changes in costs of materials, commodity rates and/or exchange rates post-October 2018) (NB: the dollar amount subject to these risks is less than 8 percent of total project costs);
- Any conditions imposed by regulatory bodies or Governmental agencies;
- Force Majeure events.

vi. COSTS OF COMPARABLE PROJECTS

A comparable project constructed by Hydro One would be the Niagara Reinforcement Project as it will also be a new 230 kV line upon completion. Due to the unique construction arrangement for the Lake Superior Link, two similar high-voltage projects completed by SNC-Lavalin have also been included in **Table 5**. Lastly, for ease of reference, Hydro One has also included the NextBridge East West Tie Line Project submission for comparative purposes.

1

Table 5: Costs of Comparable Line Projects

Project	Niagara Reinforcement Project*	Foothills Area Transmission Development	Southern Alberta Transmission Reinforcement	Lake Superior Link	Nextbridge Ewt Line
Location	<u>Southern Ontario</u>	<u>Southern Alberta</u>	<u>Southern Alberta</u>	<u>Northwestern Ontario</u>	<u>Northwestern Ontario</u>
Constructor	<u>Hydro One</u>	<u>SNC-Lavalin (AltaLink)</u>	<u>SNC-Lavalin (AltaLink)</u>	<u>SNC-Lavalin (Hydro One)</u>	<u>NextBridge</u>
Technical	<u>New D/C 230 kV O/H Line between Allanburg TS and Middleport TS</u>	<u>New D/C 240 kV O/H Line between Foothills TS and Windy Flats TS</u>	<u>New D/C 240 kV O/H Line between Cassils TS and Whitla TS</u>	<u>New D/C 230 kV O/H Line between Lakehead TS and Wawa TS</u>	<u>New D/C 230 kV O/H Line between Lakehead TS and Wawa TS</u>
Length (km)	76km	123km	240km	403km	450km
Project Surroundings	Mixed urban residential and rural	Rural	Rural	Mostly rural	Mostly rural
Environmental / Indigenous Consultation Concerns	Yes, Caledonia Protest	Yes, prairie grass conservation	Yes, prairie grass conservation	Yes – transfer of proponency and Pukaskwa Nation Park	Yes – amendment is ongoing
In-Service Date	June 2006	November 2015	March 2014	December 2021	December 2020
Total Project Cost (\$000s)	\$106,000K	\$168,500K	\$305,000K	\$636,161K	\$779,700K**
Add: Non-Comparable Costs				N/A	N/A
Escalation Adjustment (1.5%/year to 2021)	\$27,519K	\$10,340K	\$18,716K	N/A	\$11,695K
Non-EPC costs, i.e., regulatory and real estate acquisition costs (Estimate of 15% increase)	N/A	\$25,275K	\$45,750K	N/A	N/A
Total Comparable Project Costs	\$133,519K	\$204,115K	\$369,466K	\$636,200K	\$797,395K
Total Cost/Circuit km	\$1,757K	\$1,659K	\$1,539K	\$1,579K	\$1,772K

- 1 *Note that the Project was 92% completed and then placed on hold in June 2006 due to a First Nations land claim. Actual cost incurred to date is approximately \$99
2 million. Expected Cost at completion in June 2006 was \$106 million. Foothill and Southern Alberta costs are in 2017 dollars and NextBridge EWT Line costs are
3 assumed to be in 2020 dollars.
- 4 **This figure has been updated to reflect the revised development costs of \$42,768K provided in the October 23, 2017 Report -EB-2015-0216 – Page 8. This figure is
5 added to the construction costs of \$736,971K provided at Exhibit B, Tab 9, Schedule 1 of EB-2017-0182 for the total Project Cost estimate of the NextBridge EWT Line.

DRAFT - PRIVILEGED AND CONFIDENTIAL - PREPARED IN ANTICIPATION OF LITIGATION

Table 5: Cost Estimate Change

<u>Line</u> (a)	<u>Reference</u> (b)	<u>Description</u> (c)	<u>Amount</u> (d)	<u>% of Total</u> (e)
1		<u>Unbudgeted at Designation</u>		
2		First Nation and Metis Participation		
3	B-2	Development Phase	\$ 3,291,082	
4	E-20	Construction Phase	7,000,000	
5	B-2	Pic River Appeal	230,163	
6		Financing		
7	B-2	Carrying Charges (Development Phase)	813,432	
8	E-20	Interest During Construction (Construction Phase)	31,003,000	
9		Total Unbudgeted at Designation	\$ 42,337,677	11.9%
10		<u>New Scope Requirements</u>		
11	E-2	Route Alterations	\$ 66,919,593	
12		Weather Adjusted Structures		
13	E-3	50 to 100 Year Structure	7,786,399	
14	E-4	Additional Structures	806,964	
15		Total Weather Adjusted Structures	8,593,363	
16	E-5	Hydro One Line Crossings	5,473,580	
17	E-6	MNRF Conservation Reserve Requirement	1,526,344	
18	E-7	Timber Stacking and Loading	20,997,947	
19		Total New Scope Requirements	\$ 103,510,828	29.0%
20		<u>Other Unforeseeable Factors</u>		
21		Project Delay		
22	B-3	Development Phase	\$ 11,917,552	
23	E-8	Construction Phase	57,190,900	
24		Total Project Delay	69,108,452	
25	E-9	Cost of Imported Materials	19,136,691	
26		Total Other Unforeseeable Factors	\$ 88,245,143	24.8%
27		<u>Development Phase Refinements</u>		
28	E-10	Self-Supported Structure Utilization	\$ 30,652,205	
29	E-11	Foundation Cost	45,566,957	
30	E-12	Grounding Cost	4,628,083	
31	E-13	Access Road Optimization	4,202,523	
32	E-20	Environmental	8,084,955	
33	E-20	Land Rights	5,518,265	
34	E-20	First Nation and Metis Consultation	6,333,693	
35	E-20	Other Consultation	1,392,201	
36	E-20	Regulatory	1,452,465	
37	E-20	Project Management	1,403,411	
38	E-20	Site Remediation	3,551,775	
39	E-20	Contingency - Non_E&C	757,274	
40	E-14	Contingency - E&C	11,109,314	
41		Other	(2,185,640)	
42		Total Development Phase Refinements	\$ 122,467,482	34.3%
43		Total Project Cost	\$ 356,561,130	100.0%

NextBridge Interrogatory # 49

Reference:

EB-2017-0364 - February 15, 2018 HONI Lake Superior Link Application, EXHIBIT B, TAB 7, SCHEDULE 1, Page 5 Table 3 (Construction Costs); EXHIBIT C, TAB 2, SCHEDULE 1.

Interrogatory:

- a) Confirm that HONI's galloping analysis considered single loop galloping, regardless of span length, with a primary axis limited to a maximum of 12m. If not confirmed, explain your answer in detail and explain its potential impact to the construction cost estimate.
- b) Explain in detail whether HONI or its contractor has performed any geotechnical work on the project, including how the conducting or lack of conducting of geotechnical impacts its construction cost estimate.
- c) Confirm that the information provided in to this interrogatory does not change the construction cost estimate in Table 3 of the Application. If not confirmed, please reproduce Table 3 for routing through Pukaskwa National Park and around Pukaskwa National Park with the new cost estimate. If confirmed, explain in detail why the information in the tables does not change the cost estimate.

Response:

- a) Hydro One considered single loop galloping until 700 feet as per article 6.5.1 of Bulletin 1724 E-200, please see extract of the mentioned bulletin in the Annexes. Hydro One does not foresee any impact because single loops are very rare on longer spans.
- b) The geotechnical risk has been included in SNC-Lavalin's fixed price estimate to Hydro One and changes to it will not impact the construction cost estimate. SNC-Lavalin has based its estimate on an extensive geomorphological study for the area of the Lake Superior Link Project. Based on this study various foundation designs were developed and formed the basis of the EPC estimate. Further geotechnical work is planned in the first quarter of 2019 to confirm the study results which will update the EPC execution plan but will not impact the fixed price costs.
- c) Information provided does not change the construction cost estimate of the preferred route. The same geomorphological study has not been done for the route around the Pukaskwa

TAB 32

ENGINEERING, PROCUREMENT AND CONSTRUCTION AGREEMENT

BETWEEN
HYDRO ONE NETWORKS INC.
(“Owner” or “Hydro One”)
- AND -
SNC-LAVALIN INC.
(“Contractor”)

EFFECTIVE DATE:

Contractor Address	
Contractor Jurisdiction of Incorporation	
Commencement Date	
Project	Lake Superior Link
Scheduled Substantial Performance Date	31 December 2021
Base Warranty Period	24 Months
Extended Warranty Period	N/A
Additional Clarification Documents	
Limit of Liability	
Automotive Liability Insurance Minimum	
Commercial General Liability Insurance Minimum	
Professional Errors & Omissions Insurance Minimum	
All Risk Builders Risk Insurance Deductible	
Owner Contact for Insurance Notices	
Labour and Material bond	of the <i>Contract Price</i>
Performance bond	of the <i>Contract Price</i>
Owner’s Representative	Name: Email Address:

COMMITMENT PAGES

[illegible]

TO EVIDENCE THEIR AGREEMENT, the parties have executed and delivered this *Contract*, by their duly authorized officers, as of the effective date above.

Owner: **HYDRO ONE
NETWORKS INC.**

Contractor: SNC-LAVALIN INC.

Per: _____
Name: _____
Title: _____

Per: _____

Name: _____

Title: _____

Per: _____

Name: _____

Title: _____

“I have authority to bind the corporation”

“I / We have authority to bind the corporation”

TABLE OF CONTENTS

Introduction:.....	5
Article 1 - Definitions and Appendices	5
Article 2 - Interpretation and Order of Precedence.....	16
Article 3 - Owner's Requirements	17
Article 4 - General Requirements of the Work.....	18
Article 5 - Engineering Services	24
Article 6 - Owner's Specified Materials and Subcontractors	25
Article 7 - Procurement Services	26
Article 8 - Construction Work	28
Article 9 - Commissioning.....	31
Article 10 - Work Protection.....	31
Article 11 - Contractor's Representations.....	33
Article 12 - Contract Time	34
Article 13 - Payment	35
Article 14 - Payment of Holdback Upon Substantial Performance of the Work.....	37
Article 15 - Payment Upon Total Performance of the Work	38
Article 16 - Invoicing.....	40
Article 17 - Withholding of Payment.....	41
Article 18 - Non-Conforming Work	41
Article 19 - Changes	42
Article 20 - Contractor Personnel	45
Article 21 - Key Personnel.....	46
Article 22 - Subcontracts and Assignment.....	47
Article 23 - Inspection and Testing.....	48
Article 24 - Performance Tests	50
Article 25 - Substantial Performance	52
Article 26 - Warranty	54
Article 27 - Artefacts and Fossils.....	56
Article 28 - Liquidated Damages for Delay.....	56
Article 29 - Health and Safety Reporting	57
Article 30 - Compliance with Law.....	58
Article 31 - Safety and Loss Management.....	58

Article 32 - Toxic and Hazardous Substances and Materials	62
Article 33 - Work Area and Clean Up	63
Article 34 - Site Access / Security	64
Article 35 - Title, Responsibility and Proprietary Information.....	66
Article 36 - Patents and Licenses.....	68
Article 37 - Confidential Information and Publicity	70
Article 38 - Force Majeure.....	71
Article 39 - Delays Caused by the Contractor	72
Article 40 - Delays not Caused by the Contractor	72
Article 41 - Suspension.....	73
Article 42 - Termination for Convenience.....	74
Article 43 - Termination for Cause.....	75
Article 44 - Taxes.....	77
Article 45 - Workers' Compensation.....	78
Article 46 - Liens	79
Article 47 - Survival.....	80
Article 48 - Liability and Indemnity for Third Party Claims.....	80
Article 49 - Liability and Indemnity	81
Article 50 - Insurance Provided by Contractor	82
Article 51 - Security, Bonds and Guarantees.....	87
Article 52 - Independent Contractor	87
Article 53 - Conflict of Interest.....	88
Article 54 - Audit Access.....	89
Article 55 - Representatives and Notices.....	90
Article 56 - General	90

ENGINEERING, PROCUREMENT AND CONSTRUCTION AGREEMENT

This *Contract* is made effective as of the *Effective Date*

Between

HYDRO ONE NETWORKS INC.

- and -

SNC-LAVALIN INC.

Introduction:

The *Contractor* has agreed to perform the *Work* for the *Owner* as set out in this *Contract*, on the terms and conditions set forth in this *Contract*;

IN CONSIDERATION of the mutual covenants and conditions contained herein, the parties agree as follows:

Article 1 - Definitions and Appendices

1.1 The following terms, wherever capitalised and italicised in the *Contract*, or in any document produced pursuant to the terms of the *Contract*, shall have the following meanings:

- (a) *Appendix* or *Appendices*, as the case may be, means one or more of the schedules attached to and incorporated in this *Contract* as set forth in Section 1.2;
- (b) *As-Built Drawings* means the controlled and complete set of documents upon which the *Contractor* records each and every instance of differences between the *Work* as executed and the *Work* as designed and depicted in the documents issued by the *Contractor* for *Construction Work*;
- (c) *Certificate of Substantial Performance* means that notice, in the form attached hereto as Appendix E - Forms, issued by the *Owner* to the *Contractor* pursuant to Section 25.3, certifying achievement of *Substantial Performance* and identifying the date that the *Owner* takes over the *Work*;
- (d) *Change* means any change in, addition to, or deletion from the *Owner's Requirements*, *Owner's Specified Materials and Subcontractors*, the *Milestones*, or the *Contract Time*, including a *Change* as a result of a change in *Law* that affects the *Project* or the *Owner's* business that the *Owner* requires to be addressed in the *Contractor's* performance of the *Work*;
- (e) *Change Directive* means a written instruction from the *Owner*, signed by the *Owner* with original signatures in paper form (and not electronic form), directing a *Change*. The *Change Directive* may only be issued and signed by the

Owner's Representative, and any other document purporting to be a *Change Directive* will be considered invalid;

- (f) *Change Order* means a written order signed, with original signatures in paper form (and not electronic form), by both the *Contractor* and the *Owner* authorizing a *Change*. The *Change Order* may only be issued and signed on behalf of the *Owner* by the *Owner's* Supply Chain Services department representative, and any other document purporting to be a *Change Order* will be considered invalid;
- (g) *Change Quotation* means a written quotation from the *Contractor* for an adjustment in the *Contract Time*, *Milestones* or the *Contract Price*, or both for the proposed change;
- (h) *Commencement Date* means the date that the *Work* is to commence, which, at the effective date of this *Contract*, is the date set out above, unless otherwise agreed in writing by the *Parties*;
- (i) *Commissioning after Substantial Performance* means those commissioning duties of the *Owner* and of the *Contractor* that shall take place after *Substantial Performance* and which are described in the *Owner's Requirements* and allocated to either the *Owner* or the *Contractor*;
- (j) *Commissioning before Substantial Performance* means those commissioning duties of the *Owner* and of the *Contractor* that shall take place before *Substantial Performance* and which are described in the *Owner's Requirements* and allocated to either the *Owner* or the *Contractor*;
- (k) *Commitment Pages* means the paged entitled "Commitment Pages" of this *Contract*;
- (l) *Confidential Information* means all information relating to the *Work* and any process or technology relating thereto (including *Proprietary Information*), and information relating to the nature of the *Contractor's* and the *Owner's* business and affairs, which either party directly or indirectly receives or acquires from the other party, or the other party's representative, either in writing or verbally, including information in the *Contract*, or through observation of the *Owner's Site*, the *Work Site*, the *Work* or work performed by *Other Contractors*, except information falling into any one or more of the following categories:
 - (i) information which the disclosing party can show was in its possession on a non-confidential basis before receipt or acquisition of the information from the other party;
 - (ii) information which is lawfully in the public domain at the time of the disclosing party's receipt or acquisition of the information from the other party, other than from the *Owner's Requirements* or through the process of proposal calls or performing the *Work*;

- (iii) information which, after the disclosing party's receipt or acquisition of the information from the other party, becomes part of the public domain through no act of the disclosing party or of any third party under an obligation of confidence with respect to such information, but only after such information becomes part of the public domain; or
- (iv) information which, after receipt or acquisition of the information from the other party, is lawfully obtained by the disclosing party from a third party, but only after such information is so received or acquired, and provided such third party is under no obligation of confidence with respect to such information.
- (m) *Construction Agreement* means this Engineering, Procurement and Construction Agreement;
- (n) *Construction Work* means delivery, fabrication, assembly, installation, construction, demolition, dismantling, re-locating, land-clearing, earth moving, grading, testing, commissioning and correction, including professional and technical personnel, labour, supervision, administration, materials, transportation, supplies, tools, equipment, and such other work and materials necessary to be performed or supplied to meet the requirements of the *Contract*, including any work which is not expressly described in the *Contract* but which is nevertheless necessary for the proper execution of the *Work*, but does not include *Engineering Services* or *Procurement Services*;
- (o) *Contemplated Change Notice* means a written notice from the *Owner* advising the *Contractor* that the *Owner* is contemplating a *Change*;
- (p) *Contract* means:
 - (i) this Construction Agreement;
 - (ii) the documents listed in Section 2.3; and
 - (iii) other documents which come into existence and are incorporated into the *Contract* pursuant to the terms of this Construction Agreement;
- (q) *Contract Price* means the compensation which the *Owner* shall pay for performance of the *Work* in accordance with Appendix B - Contract Price;
- (r) *Contract Time* means the period of time from the *Commencement Date* to the *Substantial Performance Date*;
- (s) *Contractor* has the meaning set out above;
- (t) *Contractor Execution Plan* means the programme developed by the *Contractor* for the *Work* in accordance with Section 4.2 and the *Owner's Requirements* which shall be updated from time to time as may be required by the *Owner* and which shall include as applicable, but not be limited to:

- (i) the organization to be established by the *Contractor* for carrying out the *Work*, including, but not limited to, the identities and curriculum vitae of *Key Personnel*, or if not yet identified, then the titles of the positions that will be held by *Key Personnel*;
- (ii) limits of authority of the *Contractor*;
- (iii) the sequences and methods for the performance of the *Work*; and
- (iv) a detailed schedule with dates for the completion of the *Work*, including how the schedule is able to achieve performance milestones under Appendix B – Contract Price;
- (v) *Health and Safety Plan*;
- (vi) *Quality Plan* (including the *Inspection and Test Plan*);
- (vii) *Public Relations and Communications Plan*;
- (viii) *Real Estate Plan*.
- (u) *Contractor Personnel* includes any director, officer, employee, supplier or agent of the *Contractor*, its respective *Subcontractors*, and affiliates;
- (v) *Contractor's Representative* means that person identified as such in Section 55.2, or an approved replacement;
- (w) *Contractor Software* means the software owned by *Contractor* prior to, or created independent of, this *Contract* that is licenced to *Owner* under this *Contract*, including as may be embedded in any equipment;
- (x) *Critical Activity* means each of those critical activities identified in the *Owner's Requirements* and/or the *Contractor Execution Plan*, as amended from time to time in accordance with the provisions of this *Contract*, and without limitation and for greater certainty includes *Major Milestones*;
- (y) *Deficiency* means any portion of the *Work* that has not been performed in accordance with the *Owner's Requirements*, the *Contract* or the *Law*;
- (z) *Electrical Utility Safety Rules* means the rules published by the Infrastructure Health and Safety Association (formerly known as the Electrical and Utilities Safety Association) required to be followed for compliance with the regulations under the Ontario *Occupational Health and Safety Act*.
- (aa) *Engineering Services* means those services described in the *Owner's Requirements* and provided by the *Contractor* for the design, planning and engineering of the *Project*, but does not include *Construction Work* or *Procurement Services*;

- (bb) *EPA* means the Ontario *Environmental Protection Act*, R.S.O. 1990, c. E.19, as amended;
- (cc) *Event of Force Majeure* means any occurrence, other than the financial capability of a party or an event constituting a delay under Article 39 - Delays Caused by the Contractor or Article 40 - Delays not Caused by the Contractor, which prevents or delays a party from performing its obligations under the *Contract* (except an obligation to pay any amount) within the time required for the performance of such obligation and which is beyond the control and without the fault or negligence of the party relying on such occurrence, and which by the exercise of reasonable diligence that party could not, at the time the *Contract* was executed, have reasonably contemplated happening and which at the time of such occurrence, is beyond the reasonable control of the party required by the *Contract* to perform such obligation and such party is unable to reasonably prevent or provide against such occurrence. For purposes of this *Contract*, without limitation, an *Event of Force Majeure* does not include delays or stoppages due to refusals by *Contractor's* work forces or *Subcontractor's* work forces to cross picket lines or similar labour demonstrations to access the *Work* site, or any other site where *Work* is being performed, where such work forces are not direct parties to such strike, lockout, or other labour dispute, unless crossing such picket line, or access to the *Work Site*, or other site where *Work* is being performed would present a threat to a person's health or safety. The *Owner* may claim an event of *Event of Force Majeure* where it suffers any delays or stoppages due to strikes, lockouts, labour demonstrations or disturbances that affect the *Owner*, the *Owner's Site*, or the *Work Site*. For purposes of this *Contract*, without limitation, an *Event of Force Majeure* includes any delay or refusal of a public or regulatory body in issuing consents, approvals, permission, orders, judgments, orders, permits, and similar (and includes rescissions thereof), including, without limitation those issued or given by the Ontario Energy Board, or a ministry, department, board, commission, council, authority, agency, crown corporation, cabinet, minister, or similar bodies or persons, of the Government of Ontario, the Government of Canada, or a municipal or regional government, as the case may be, or any direction, order, decision, ruling, or judgment of a court of competent jurisdiction that has the effect of restricting or preventing the performance of the *Work* or a portion thereof.
- (dd) *Facilities* means the physical works engineered, procured and constructed as a result of the *Work* being performed;
- (ee) *Free Issue Goods* means any goods, supplies, materials, or equipment that are issued free of charge by the *Owner* to the *Contractor* and required as part of the *Work*, or to perform the *Work*, as may be more particularly described in the *Owner's Requirements*, and as the *Owner* may subsequently, from time to time, advise the *Contractor*.
- (ff) *Goods* means any goods, supplies, software, *Contractor Software*, materials or equipment required as part of the *Work*, or to perform the *Work*, and which are

supplied, created or fabricated by the *Contractor*, but do not include *Procured Goods*;

- (gg) *Goods and Services Tax* or *GST* means the federal Goods and Services Tax chargeable in accordance with Part IX of the *Excise Tax Act* (Canada), as amended (the “*Excise Tax Act*”), and includes the additional tax payable under sub-section 165(2) of the *Excise Tax Act* in respect of a supply made in a participating province;
- (hh) *Harmonized Sales Tax* or *HST* means GST payable for a supply made in a participating province. Ontario is a participating province;
- (ii) *Hazardous Material* means any substances which are hazardous to persons, animals, property or the environment and includes hazardous substances, hazardous waste, ozone depleting substances and dangerous goods, all as identified or defined under applicable law, as well as any prescribed product under the *Nuclear Safety and Control Act* (Canada);
- (jj) *Health and Safety Plan* means the plan, as specified in the *Owner’s Requirements*, which shall be submitted by the *Contractor* pursuant to Article 31 - Safety and Loss Management and includes, but is not limited to, safety performance requirements, mitigation plans, training and orientation requirements, site safety and access rules, reporting and safety meeting frequency, site cleanliness requirements and other occupation health and safety requirements and compliance issues;
- (kk) *In-service* means the date when the *Owner* declares that the *Work* has been fully incorporated into its operations;
- (ll) *Inspection and Test Plan* means the plan for inspection and testing, which shall be prepared by either the *Owner* or the *Contractor* as specified in the *Owner’s Requirements*;
- (mm) *Instruction Notice* means a document issued by the *Owner* to amend the *Purchase Order*, and agreed to by the *Contractor* through its acknowledgement, supporting this *Contract*, by facilitating the invoicing and payment process between the *Owner* and the *Contractor*;
- (nn) *Key Personnel* means the *Contractor’s* key *Contractor Personnel* for the *Work* identified in Appendix G - Key Personnel if not determined before the execution of this *Contract*, identified in an organizational chart in accordance with Article 21 - Key Personnel and approved by the *Owner*;
- (oo) *Labour Requirements* means the labour requirements and conditions contained in the *Procurement Documents*, including the *Owner’s Requirements*;
- (pp) *Law* means the common law, the law of equity and all federal or provincial statutes or municipal by-laws and all regulations, orders, directives, permits and

licenses thereunder, which apply to or otherwise affect the *Work*, the *Owner* or the *Contractor* with respect to the *Work*, or the property of the *Owner* or the *Contractor*, real or personal, including, but not limited to, all environmental, occupational, health and safety laws, all regulations, orders, directives, permits and licenses of the Ontario Energy Board, the Independent Electricity System Operator, the *Electrical Utility Safety Rules* and the *Utility Work Protection Code*;

- (qq) *Licensed Software* means *Contractor Software* and *Third Party Software*, and includes all fixes, updates, upgrades and new releases thereto;
- (rr) *Limit of Liability* means the limit of liability set out in this *Contract*;
- (ss) *Liquidated Damages for Delay* means those damages which are set out in Appendix D - Liquidated Damages for Delay;



- (uu) *Major Milestone* means, one or more *Milestones* indicated as major as set forth in the *Owner's Requirements* and/or the *Contractor's Execution Plan*;
- (vv) *Major Subcontractor* has the meaning given to it in Section 22.1;
- (ww) *Milestone* or *Milestones* means, as the case may be, one or more milestones that the *Contractor* must meet as set forth in the *Owner's Requirements* and/or the *Contractor's Execution Plan*;
- (xx) *Minor Milestone* means, one or more *Milestones* indicated as minor as set forth in the *Owner's Requirements* and/or the *Contractor's Execution Plan*;
- (yy) *OHSA* means the Ontario *Occupational Health and Safety Act*, R.S.O. 1990, c. O.1, as amended;
- (zz) *Operations Manuals* means supply of all Equipment, Operating Instructions and Parts and Service Manuals containing complete operating instructions, maintenance and servicing instructions (including the names of recommended lubricants and routine lubrication procedures), and parts catalogue(s), together with any drawings in reduced size which are necessary to aid in the understanding of the instructions.
- (aaa) *Other Contractors* means the contractors, consultants, or engineers retained by the *Owner*, to perform any work or services at, or related to, the *Owner's Site*, other than the *Contractor*;
- (bbb) *Owner* has the meaning set out above;

- (ccc) *Owner's Engineer* means that person identified by the *Owner* as the engineer, which may include a consultant hired by the *Owner*, if so designated, or that person's designated replacement;
- (ddd) *Owner's Legal Address* means the address for legal notices under the Contract;
- (eee) *Owner's Representative* means that person identified for the purposes of Section 55.1 which may include a consultant hired by the *Owner*, if so designated, or that person's designated replacement;
- (fff) *Owner's Requirements* means the description of the scope, standards, design criteria, Terms of Reference, *Milestones* and the programme of work set out in the *Owner's Procurement Documents*, including Appendix A - *Owner's Requirements*, as amended by any *Changes*;
- (ggg) *Owner's Site* means the *Owner's* land, including, without limitation any land upon which the *Owner* has the right to have the *Work* performed, upon which the *Work Site* is located and which may have on it other projects by *Other Contractors* or existing facilities, activities or operations;
- (hhh) *Owner's Specified Materials and Subcontractors* means those materials, goods, products, processes, equipment and subcontractors specified in the *Owner Requirements* to be used in, or to be incorporated into, the *Work* by the *Contractor*;
- (iii) *Party* means either of the *Owner* or the *Contractor*, and *Parties* means both of them.
- (jjj) *Performance Tests* means the performance tests set out in the *Owner's Requirements* for the purpose of determining achievement of the completion of the *Work*;
- (kkk) *Personnel Risk Assessment* means a documented background check that includes, at a minimum, a confirmation of identity and a seven year criminal history records check that includes current residence and all other locations the individual resided for six consecutive months during the previous seven (7) years, as well as any other verification or reviews as set out in the *Owner's Requirements* or as deemed necessary by the *Owner*;
- (lll) *Policies* means the policies of the *Owner* as attached in Appendix C - Policy and Guidelines, and as may be added to or updated from time to time;
- (mmm) *Procured Goods* means those goods, supplies, *Third Party Software*, materials or equipment obtained by the *Contractor* for or incorporated in, or to perform, the *Construction Work*, and procured by the *Contractor* as part of its *Procurement Services*;
- (nnn) *Procurement Documents* means the *Owner's* technical requirements provided to the *Contractor*, for the supply of goods and services;

- (ooo) *Procurement Services* means the procurement of *Procured Goods* including *Owner Specified Materials and Subcontractors* performed by the *Contractor*, which may be performed as agent of the *Owner*, or for the *Contractor* on its own account, as stipulated in the *Owner's Requirements*;
- (ppp) *Project* has the meaning set out above;
- (qqq) *Proprietary Information* means all inventions, discoveries, improvements and technical information not in the public domain, which the *Contractor*, *Subcontractors*, or their respective employees or agents who are performing the *Work*, may conceive of, reduce to practice or develop in accordance with the *Contract* or as a result of *Owner's* proprietary or *Confidential Information*;
- (rrr) *Public Relations and Communications Plan* means the public relations and communications plan for the *Project* that meets the requirements of the *Owner's Public Relations and Communications Program*, prepared by the *Contractor* as further set out in the *Contractor Execution Plan*;
- (sss) *Public Relations and Communications Program* means the public relations and communications program and requirements for the public, media, municipalities, townships, government officials and agencies, and First Nations and Metis, as further set out in the *Owner's Requirements*.
- (ttt) *Purchase Order* means a document issued by the *Owner*, and agreed to by the *Contractor* through its acknowledgement in respect thereof, for the purpose of supporting this *Contract* by facilitating the invoicing and payment process between the *Owner* and the *Contractor*;
- (uuu) *Purchase Order Revision* means a document issued by the *Owner* to amend the *Purchase Order*, and agreed to by the *Contractor* through its acknowledgement in respect thereof, supporting this *Contract* by facilitating the invoicing and payment process between the *Owner* and the *Contractor*.
- (vvv) *Quality Plan* means the plan, including as applicable, the *Inspection and Test Plan*, as specified in the *Owner's Requirements*, which shall be submitted by the *Contractor* pursuant to Section 23.3;
- (www) *Real Estate Plan* means the plan prepared by the *Contractor* for the *Project* that meets the requirements of the *Owner* as specified in the *Owner's Requirements*;
- (xxx) *Records* means the books, statements, records and accounts pertaining to the *Contract* and the performance of the *Work*, whether in paper or electronic form;
- (yyy) *Proposal* means a description of goods and/or services available as put forth by the *Contractor*, in response to the *Owner's Procurement Documents*;
- (zzz) *Scheduled Substantial Performance Date* means the date on which the *Work* is scheduled to achieve *Substantial Performance*, which, at the effective date of this *Contract* is set out above;

- (aaaa) *Subcontractors* means any subcontractors, consultants, suppliers or vendors hired by the *Contractor* to perform any portion of the *Work* or supply any *Goods*;
- (bbbb) *Substantial Performance* means that date when the *Work* meets the requirements of being “substantially performed” as it is defined under the *Construction Lien Act*, R.S.O. 1990, Chapter C.30, as amended.
- (cccc) *Suspended Work* means any *Work*, or portion thereof, which the *Owner* has suspended pursuant to Article 41 - Suspension;
- (dddd) *Third Party Software* means any and all third party software (including any firmware, open source software, shareware or freeware or operating system software) provided by *Contractor* to *Owner*, including where applicable, to operate (or assist in the operation of) the *Licensed Software* and/or embedded in the *Licensed Software* or in any equipment;
- (eeee) *Total Performance of the Work, Totally Perform the Work, Totally Performing the Work* or words of similar import means when the entire *Work*, except those items arising from the provisions of Article 26 - Warranty, have been performed to the requirements of the *Contract* and the *Owner* has certified that the *Contract* has been completed in accordance with Section 2(3) of the *Construction Lien Act* of Ontario;
- (ffff) *Utility Work Protection Code (“UWPC”)* means the written procedures to establish an isolated tagged and/or locked out condition for *Work* that has been approved and adopted by the Infrastructure Health and Safety Association of Ontario and required to be followed under the *Electrical Utility Safety Rules*.
- (gggg) *UWPC Competent* means any person who is qualified in the Utility Work Protection Code, has demonstrated familiarity with the *Owner’s* processes for administering work protection, and has been deemed competent by an authorized signing officer of the *Contractor* and has been registered with the OGCC;
- (hhhh) *Value Added Taxes* means such sum as shall be levied upon the *Contract Price* by the federal or any provincial government, and is computed as a percentage of the *Contract Price*, and includes the *Goods and Services Tax* (or the *Harmonized Sales Tax*), the Quebec Sales Tax and any similar tax, the payment or collection of which is by the legislation imposing such tax an obligation of the *Contractor*;
- (iiii) *Warranty Item* means any *Deficiency* that is identified after the *Certificate of Substantial Performance* is issued or is incorporated into the *Certificate of Substantial Performance* to be remedied after *Substantial Performance*;
- (jjjj) *Warranty Period* is the aggregate of the *Base Warranty Period* plus *Extended Warranty Period*, each defined as follows:

- (i) *Base Warranty Period* covers all *Work* and commences upon *Substantial Performance*, and continues for the period stated above from *Substantial Performance* as stated in the *Certificate of Substantial Performance*, with the exception of *Deficiencies* identified under Section 25.2(b) that are subsequently corrected, for which the *Base Warranty Period* commences upon *Total Performance of the Work*.
- (ii) *Extended Warranty Period* covers *Work* identified in the *Contract* and begins immediately upon the expiration of the *Base Warranty Period* and continues for the time period set out above.
- (kkkk) *Work* means all *Engineering Services*, project management, *Procurement Services*, *Goods*, *Procured Goods*, *Construction Work* and those duties allocated to the *Contractor* in the *Commissioning before Substantial Performance* and *Commissioning after Substantial Performance*, as may be necessary to fulfill the *Owner's Requirements* and includes anything that is ancillary or necessary by implication to fulfill the *Owner's Requirements*;
- (llll) *Work Day* means any day, except for a Saturday, Sunday, a general holiday or a holiday which is observed in the construction industry in Ontario, or defined as a holiday in a collective agreement pertaining to the *Work Site*;
- (mmmm) *Work Permit* means a work permit issued in accordance with the *Utility Work Protection Code*;
- (nnnn) *Work Site* means those lands where the *Project* is located and which are legally and/or municipally described, or otherwise described, as such in the *Owner's Requirements*
- (oooo) *WSIA* means the Ontario *Workplace Safety and Insurance Act*, S.O. 1997, c. 16, as amended.

1.2 The following exhibits and schedules attached hereto shall form part of and are incorporated in this *Contract*:

- (a) Exhibit A - Safety Courses
- (b) Exhibit B - Safeguards and Personal Protective Equipment
- (c) Appendix A – Owner's Requirements
- (d) Appendix B – Contract Price
- (e) Appendix C – Policy and Guidelines
- (f) Appendix D – Liquidated Damages for Delay
- (g) Appendix E – Forms
 - Key Employee Confidentiality, Proprietary Information and Consent Agreement
 - Change Order
 - Contractor Safety & Environment Pre - Job Meeting Checklist
 - Application for Payment
 - Change Quotation

- Release and Certificate of Final Payment
 - Statutory Declaration
- (h) Appendix F – Dispute Resolution Procedure
- (i) Appendix G – Key Personnel

Article 2 - Interpretation and Order of Precedence

- 2.1 Unless the context otherwise requires, words importing the singular shall include the plural and vice-versa and words importing gender shall include the masculine, feminine and neuter genders.
- 2.2 The headings and sub-headings of the *Contract* are used for convenience and ease of reference only and in no way define, limit, describe or interpret the scope or intent of the *Contract*.
- 2.3 If there is a conflict in the *Contract*, the order of precedence of documents, from highest to lowest, shall be:
- (a) *Change Orders, Change Directives, or Purchase Order Revisions* (sometimes issued as *Instruction Notice*);
 - (b) *Purchase Order* (“PO”);
 - (c) Agreed to clarification documents:
 - (i) Special Terms and Conditions of the Contract;
 - (ii) *Additional Clarification Documents* as set out above;
 - (d) this Construction Agreement, including Exhibits excluding the *Appendices*;
 - (e) Addenda to the *Owner’s Procurement Documents* as set out above;
 - (f) The *Appendices* to the Construction Agreement in the following order:
 - (i) Exhibit A - Safety Courses
 - (ii) Exhibit B - Safeguards and Personal Protective Equipment
 - (iii) Appendix A - Owner’s Requirements;
 - (iv) Appendix B - Contract Price;
 - (v) Appendix C – Policy and Guidelines Appendix C - Policy and Guidelines; and
 - (vi) all other *Appendices*
 - (g) Any Site Rules, such as Station Access Agreement (which details specific station requirements), including without limitation those of third parties;

- (h) The *Procurement Documents* (excluding those documents listed above); and
- (i) *Proposal* from *Contractor*.

2.4 The following shall, in all instances, apply:

- (a) for documents revised by either party and approved by the *Owner*, the latest revision shall govern;
- (b) figured dimensions on drawings shall govern, even though they may differ from scaled dimensions;
- (c) drawings of larger scale shall govern over those of smaller scale of the same date;
- (d) in case of discrepancy between the drawings and the specifications, figured dimensions on the drawings shall govern except where the dimensions depend on the dimensions of a specified product, in which case the dimensions of the product shall govern. In the case of discrepancy in the description of materials and methods, the specification shall govern; and,
- (e) unless expressly stated otherwise, appendices shall govern over the document from which the appendix was referred.

2.5 Wherever this *Contract* requires an action to be performed or an obligation to be undertaken, such action or obligation shall be performed in a reasonable and effective manner by the party taking the action or fulfilling its obligation.

2.6 No agent or contractor of the *Owner* has the right to waive any compliance by the *Contractor* with the terms of the *Contract*, and none shall be binding on the *Owner*. Any changes to the *Contract* that require waiver of compliance by the *Contractor* must be in the form of a *Change Order*.

Article 3 - Owner's Requirements

3.1 The *Owner's Requirements* shall describe the scope of the *Work*.

3.2 Where applicable, the *Owner's Requirements* shall specify the requirements of the *Health and Safety Plan* and the *Health and Safety Plan* will be provided by the *Contractor* within such time period as set out in the *Owner's Requirements*.

3.3 Where applicable, the *Owner's Requirements* shall specify the requirements of the *Quality Plan* and the *Quality Plan* will be provided by the *Contractor* within such time period as set out in the *Owner's Requirements*.

3.4 The *Contractor* shall identify and provide in writing to the *Owner* the *Contractor's* requirements for land access rights including, but not limited to, the location, period of time of access, timing, temporary construction and deconstruction, access and use of real estate it proposes and requires for the *Work*, including temporary access roads, work

headquarters, construction laydown areas, such other information in respect of real estate as further set in the *Owner's Requirements* and any other land rights access or use that the *Contractor* requires for the *Work*, acting reasonably.

- 3.5 The *Owner* is responsible for management of land rights acquisition for permanent land rights in relation to the *Work*, including for access to and construction, maintenance and operation of the *Project*. The *Owner* is responsible for management of land rights acquisition for temporary land access rights for the *Work*.
- 3.6 The *Owner* shall endeavor, using commercially reasonable efforts, to obtain such land access rights as requested by the *Contractor* pursuant to Section 3.4 and will advise the *Contractor* as applicable. Where *Owner* is not able to obtain such land access rights as requested by the *Contractor* pursuant to Section 3.4, the parties shall, in good faith, discuss alternatives to mitigate, and which could involve the relief as described in Section 40.2 or could involve the *Contractor* making an request for an adjustment under Section 19.9, or such other resolution as the *Parties* may agree.
- 3.7 The *Contractor* shall prepare and provide to *Owner* a *Real Estate Plan* for *Owner's* approval that will meet the real estate requirements in the *Owner's Requirements* and that will identify and include, but is not limited to, the location, timing, temporary construction and deconstruction, access and use of real estate based on the rights in the possession of or acquired by the *Owner* that have been made available to the *Contractor*, and will cooperate with the *Owner*, act consistent with and follow any restrictions regarding the real estate rights acquired by the *Owner*.
- 3.8 After submission to the *Owner*, the *Contractor* shall not make any material changes to the *Health and Safety Plan*, *Quality Plan* (including the *Inspection and Test Plan*), *Public Relations and Communications Plan* or *Real Estate Plan* without providing reasonable prior written notice containing details of the change to the *Owner*, and provided that all such changes must continue to be in compliance with the *Owner's Requirements*. Subject to Section 19.9, all conflicts with respect to the interpretation of the *Owner's Requirements* shall be resolved by the *Owner's Representative*.

Article 4 - General Requirements of the Work

- 4.1 The scope of the *Work* includes correction of defects and deficiencies by the *Contractor* in accordance with the *Contract*.
- 4.2 By the date or dates specified in the *Owner's Requirements*, the *Contractor* shall prepare and submit to the *Owner* a detailed *Contractor Execution Plan* for the performance of all or any part of the *Work* required under the *Contract*. The *Contractor* shall control the progress of the *Work* to achieve compliance with the *Contractor Execution Plan*.
- 4.3 In the execution of the *Work* the *Contractor* shall comply with, and the completed *Work* shall comply with, the *Law*, including, without limitation, applicable building codes, technical standards, building construction and environmental regulations and the standards specified in the *Contract*.

- 4.4 References in the *Contract* to applicable codes, standards or regulations shall be understood to be references to the edition applicable on the date of the *Contract*, unless stated otherwise. If substantially changed or new applicable codes, standards or regulations come into force after the date of the *Contract*, the result of which requires a *Change* to the *Work*, *Contract Time* or *Contract Price*, the *Contractor* shall submit a *Change Quotation* for compliance to those new codes, standards or regulations to the *Owner's Representative*. Any *Change* in the *Work*, the *Contract Time* or the *Contract Price* as a result shall be dealt with under Article 19 - Changes.
- 4.5 The *Contractor* accepts the *Owner's Site*, the *Work Site* and the obligation to perform the *Work* in the condition existing at the effective date of this *Contract* and acknowledges that it has investigated and satisfied itself to the fullest extent through the exercise of due diligence as to:
- (a) the nature and location of the *Work*;
 - (b) the nature and location of and all conditions relating to the *Owner's Site* and the *Work Site*, including, but not limited to, accessibility, general character, surface and subsurface conditions, utilities, services, soil, structures, roads, uncertainties of seasonal weather and all other physical, topographical and geographical conditions;
 - (c) all environmental risks, conditions, *Law* and restrictions applicable to the *Contractor* or the *Work* that may affect the *Work*; and
 - (d) the magnitude of the *Work*.

The *Owner* may provide in the *Owner's Requirements* or elsewhere certain information, documents, maps, drawings, pictures, etc. in relation to the *Owner's Site* and the *Work Site*, however, the *Contractor* accepts the obligations in this Section 4.5 notwithstanding the validity or invalidity, accuracy or inaccuracy, completeness or incompleteness of such documents, maps, drawings, pictures, etc. Notwithstanding the preceding sentence, the *Parties* acknowledge that the *Work*, including the *Contract Time* and *Contract Price*, is based upon the environmental assessment for the *Project* under the Ontario *Environmental Assessment Act* filed and as may be amended or as otherwise approved as of the date of execution of this *Contract*, and the *Parties* agree to follow the *Change* process in this *Contract* in respect of any *Changes* to the *Work* after the execution of this *Contract*, including *Contract Time* and *Contract Price*, if applicable, requested by the *Owner* as a result of the performance of the environmental assessment, or arising from conditions associated with the approval of the environmental assessment by the applicable governmental entity.

- 4.6 The *Contractor* accepts the obligation to perform the *Work* and acknowledges that it has investigated and accepts:
- (a) the general character, quality, quantity, accessibility, and availability of equipment, materials, utilities, services, and accommodations required to execute and complete the *Work*; and

- (b) all conditions affecting labour, including, without limitation, availability, productivity, accessibility, *Labour Requirements* and restrictions, collective agreement requirements and restrictions, requirements and restrictions by *Law*, and administrative practices, including those relating to safety, prevailing at or applicable to the *Work*.
- 4.7 Any failure by the *Contractor* to discover matters which affect, or could affect, the *Work* shall not relieve the *Contractor* from its obligations under the *Contract* or otherwise affect the *Contract Time* or the *Contract Price*. If the *Contractor* has not conducted such an investigation, it is deemed to assume all risk of conditions or circumstances now existing or arising in the course of the *Work* which could make the *Work* more expensive or more difficult to perform than was contemplated at the time the *Contract* was executed. No claim by the *Contractor* will be entertained in connection with conditions which could reasonably have been ascertained by an inspection or other due diligence prior to the execution of the *Contract*.
- 4.8 The *Owner* reserves the right to award separate contracts to *Other Contractors* for work to be performed at the *Work Site* and to perform work with its own forces at the *Work Site*. In such event, the *Contractor* shall co-ordinate and schedule the *Work* with the work of the *Other Contractors* and the *Owner's* own forces, and the *Contractor* shall share access to and use of the *Work Site* to accommodate the work of *Other Contractors*. If work performed by *Other Contractors* as directed by the *Owner* interferes with the *Work* performed by the *Contractor*, the *Contractor* may issue a *Change Quotation* in accordance with Section 19.9. However, in all cases where work at the *Work Site* is being performed by *Owner* or *Other Contractors*, where they do not have separate defined work areas or where their work overlaps with that of the *Contractor*, the *Owner* will contractually require them to comply with the *Contractor's Health and Safety Plan*, safety program and safety instructions, and the *Contractor*, as “constructor” (as “constructor is defined under the *Occupational Health and Safety Act of Ontario*) responsible for the areas of overlap, will have the right to remove the *Owner's* own forces or *Other Contractors* from the *Work Site* should they not comply with the *Contractor's Health and Safety Plan*, safety program and safety instructions.
- 4.9 The *Contractor* shall co-operate fully with the *Owner*, *Other Contractors* and all other parties with whom the *Contractor* or *Owner* may be involved during the performance of the *Work*. The *Contractor* shall supervise its employees and *Subcontractors* and inspect their work to ensure that the *Work* conforms in each and every respect to the *Owner's Requirements* and in accordance with Section 11.1.
- 4.10 Approval of the *Engineering Services*, acceptance of any part of the *Goods*, *Procured Goods* or the *Construction Work* by the *Owner*, or payment to the *Contractor*, or any one or more of them, shall not relieve the *Contractor* from its responsibilities under the *Contract*, whether pursuant to any of the warranties or guarantees expressed or implied herein, or otherwise.
- 4.11 Unless as otherwise specified by the *Owner's Requirements*, the *Contractor* shall:

- (a) provide the *Owner* with written monthly reports detailing the status of the *Work*, updated schedules, all issues relating to the *Work*, any solutions and actions taken for those issues, and all risks and associated mitigation measures taken on the *Project*. *Contractor* shall attend meetings as required by the *Contract* including as set out in the *Owner's Requirements*, or as otherwise requested by the *Owner's Representative*. In addition, the *Contractor* shall cause its Field Supervisor, or such competent person as he or she may delegate, to prepare a daily log or diary reporting on weather conditions, work force of the *Contractor* and *Subcontractors* and any other forces on the *Work Site* and also record the general nature of *Project* activities. Such log or diary shall also include the names of any extraordinary or emergency events that may occur and also the identities of any persons who visit the site who are not part of the day-to-day work force;
- (b) maintain records, either at its head office or at the job site, recording manpower and material resourcing on the *Project*, including records which document the activities of the *Contractor* in connection with *Contractor Execution Plan*, and comparing that to the resourcing anticipated when the most recent version of the schedule was prepared under the *Contractor Execution Plan*; and,
- (c) upon the *Owner's* request, make available for inspection and copying all of the records generated pursuant to this Section 4.11 along with any other routine *Project* records ordinarily maintained by the *Contractor*.

4.12 The *Contractor* shall have those responsibilities for managing the *Work* as stipulated in the *Owner's Requirements*, and including, but not limited to:

- (a) cost monitoring, scheduling and reporting to the *Owner*;
- (b) scheduling the *Work* and monitoring and reporting on the progress of the *Work* relative to the *Milestones* to the *Owner*;
- (c) a daily *Work* schedule for the *Construction Work* for a three-week period, provided at least two weeks in advance, with such schedule showing the daily allocation of resources;
- (d) coordination, scheduling and supervision of *Subcontractors*;
- (e) coordination and management of transportation and related services for the *Work*;
- (f) management of the *Work* to ensure the *Work* is performed in an efficient and coordinated manner; and
- (g) preparation of reports and attendance at meetings with the *Owner*.

4.13 The *Contractor* shall ensure that no activities or actions are undertaken in the performance of the *Work*, or otherwise by the *Contractor*, which would adversely affect, restrict or limit in any way the continued operation of the *Owner's* facilities which are in

operation, unless required to perform the *Work*, done in accordance with the *Contractor Execution Plan* and authorized in writing by the *Owner's Representative*.

- 4.14 In the performance of the *Work*, the *Contractor* shall give due consideration to the interest and property of others wherever involved, and shall carry out and perform the *Work* in a manner which shall cause the minimum of inconvenience, injury, and damage to others.
- 4.15 The *Contractor* shall keep one copy of current *Contract Documents*, submittals, reports, and records of meetings at the *Work Site*, in good order and available to the *Owner* and *Other Contractors*.
- 4.16 The *Owner* shall provide, and the *Contractor* shall abide by, all documents provided by the *Owner* relating to the *Owner's Site*, including, but not limited to, any special restrictions and conditions contained in any easement, regulatory board order, crossing agreement, or other permit relating to the *Work Site*.
- 4.17 The *Contractor* shall restore, at its expense, all property altered or damaged in the performance of the *Work* including, without limitation, buildings, fences, hedges, roads, railroads, bridges, culverts, drainage ditches, irrigation ditches and levees, unless such restoration is specifically identified in the *Owner's Requirements* and, in which case, the restoration shall be performed in accordance with the *Owner's Requirements*.
- 4.18 Each of the parties shall promptly and fully inform each other of any errors, omissions or inconsistencies in the *Contract*, defects or deficiencies in the *Work* and of any inconsistencies between the *Contract* and the *Law*, of which they become aware. The *Contractor* shall exercise reasonable care and diligence to prevent any actions or conditions which could result in any such inconsistencies, defect or deficiencies. If the *Contractor* discovers any inconsistencies in the *Contract*, or between the *Contract* and the *Law*, or discovers any defects or deficiencies in the *Work*, it shall resolve all such inconsistencies with the *Owner* before proceeding with the affected portion of the *Work*. If the *Contractor* discovers any inconsistencies in the *Contract*, or between the *Contract* and the *Law*, or discovers any defects or deficiencies in the *Work*, and proceeds without resolution with the *Owner*, the *Contractor* shall proceed at the *Contractor's* own risk and expense and waives all rights to claim against the *Owner* for the same.
- 4.19 All documents and drawings prepared as part of the *Work* shall be in English.
- 4.20 (a) Any part of the *Work* to be performed in accordance with any drawings and data, whether prepared by the *Contractor* or the *Owner*, shall not be commenced until such drawings and data have been reviewed and accepted by the *Owner's Representative* or *Owner's Engineer*, as applicable unless otherwise authorized by the *Owner's Representative* or *Owner's Engineer*, as applicable. Review or acceptance by the *Owner's Representative* or *Owner's Engineer* of the *Contractor's* drawings and data shall in no way be construed to imply relief of the *Contractor* from responsibility for any errors or omissions contained therein or relief from any of its obligations or liabilities under the *Contract* or otherwise.

- (b) The *Contractor* grants to the *Owner* the perpetual, paid-up, irrevocable right to use the *Contractor's* drawings and data for the purpose of operation, maintenance, and refurbishment of the Equipment. Unless otherwise authorized in writing by the *Owner's Representative* or *Owner's Engineer*, as applicable, any part of the Work to be performed in accordance with any drawings and data, whether prepared by the *Contractor* or the *Owner*, shall not be commenced until the *Owner's Representative* or *Owner's Engineer*, as applicable has approved the use of such drawings and data (including schedules, procedures and other pertinent information). Approval or acceptance by the *Owner's Representative* or *Owner's Engineer* of the *Contractor's* drawings and data shall in no way construe or imply relief of the *Contractor* from its responsibility for any error or omission therein or from any obligation under the *Contract* or implied by law.
- (c) The *Owner's* drawings and specifications shall be deemed to be complementary so that if anything is shown on the drawing but not mentioned in the specifications, or vice versa, it shall be furnished and built as though specifically set forth in both. In case of conflict between the specifications and the drawings, the specifications shall govern.
- (d) All of the drawings and data prepared by the *Contractor* under the *Contract* shall be prepared in accordance with the *Owner's* drawing standards, copies of which are available upon request.
- (e) Within such time as stated elsewhere in the *Contract*, the *Contractor* shall supply all drawings and data necessary for a thorough understanding of the Equipment, including the following:

Design Drawings - all shop detail and general arrangement drawings.

Additional Drawings - where Equipment is supplied to a performance specification, detail and general arrangement drawings shall be provided by the *Contractor*. If catalogue pages or data sheets are available in printed form giving the required information, such may be submitted in lieu of the foregoing drawings, subject to the prior approval or acceptance of the *Owner's Representative* or *Owner's Engineer*, as applicable.

Installation Details - drawings showing overall dimensions, support requirements, details of terminal points, and other data pertinent to installation.

- (f) In addition to electronic copies of drawings compatible with AutoCAD latest version, on *Contractor's* engineered portion of the *Work*, the *Contractor* shall provide four legible full-size white paper prints of drawings and four paper copies of all other data to the *Owner*. The print of each drawing shall have a maximum contrast with a white background. Prints with an "off-white" background are not acceptable. A space of 200 mm vertically by 110 mm horizontally, in the lower right hand corner above the *Contractor's* title block, shall be reserved for the *Owner's* title block and revisions. To facilitate the handling and storage of

reproducible drawings submitted for the *Owner's* use, overall sheet sizes shall be ISO series sizes A1 through A4 and B series size B1.

- (g) For the purposes of ready identification, each drawing and item of data shall show the name of the project, Units involved over-all title of the *Work*, *Owner's* order number, and the title of the drawing or item.
- (h) One copy of each drawing and data item will be returned to the *Contractor* with the *Owner's Engineer's* comments and/or approval for use. When requested, drawings and data requiring revision shall be promptly dealt with by the *Contractor* and the specified copies resubmitted.

Article 5 - Engineering Services

- 5.1 The *Contractor* shall perform the *Engineering Services* and be responsible for the design and engineering necessary to execute the *Work*. The *Engineering Services* shall be prepared under the supervision of the *Contractor's* qualified professional engineers licensed by the Association of Professional Engineers Ontario. All final plans, specifications, reports or documents of a professional nature shall be signed by and stamped or sealed with the stamp or seal of:
 - (a) the professional member or licensee who prepared them or under whose supervision and control they were prepared; or
 - (b) the professional member or licensee who thoroughly reviewed and accepted professional responsibility for them.
- 5.2 The professional members referred to in Section 5.1 shall be available to meet with the *Owner's Representative* at all reasonable times during the *Contract Time* and *Warranty Period*.
- 5.3 The *Owner* shall have the right of inspection and review of the design drawings and specifications at all reasonable times. The *Contractor* shall not be relieved of any of the *Contractor's* obligations under the *Contract* notwithstanding any inspection or review, or failure to inspect or review.
- 5.4 Unless as otherwise specified in the *Owner's Requirements*, prior to commencement of the *Performance Tests*, the *Contractor* shall prepare, and submit to the *Owner's Representative*, operation and maintenance manuals. The *Work* shall not be considered to be completed for the purposes of achieving *Substantial Performance* until such operation and maintenance manuals have been submitted to the *Owner's Representative*.
- 5.5 The *Contractor* shall:
 - (a) prepare, and keep up-to-date, the *As-Built Drawings*;
 - (b) record the exact locations of each of these differences, sizes and details of the *Construction Work* as executed, with cross-references to relevant specifications and other requirements on the *As-Built Drawings*;

- (c) keep the *As-Built Drawings* on the *Work Site*;
- (d) during the *Contract Time*, provide the *Owner* with access to the *As-Built Drawings*;
- (e) upon completion of the *Work*, or at such other time as may be determined by the *Owner*, submit the *As-Built Drawings* and copies to the *Owner's Representative* as may be further specified in the *Owner's Requirements*;
- (f) report on each invoice the number of person hours directly involved in the preparation of drawings in respect of *Engineering Services*.
- (g) provide the reports under applicable collective agreements as described in Section 8.6.

Article 6 - Owner's Specified Materials and Subcontractors

- 6.1 Where the *Owner's Requirements* specify the use of *Owner's Specified Materials and Subcontractors*, or where the *Owner's Requirements* are modified by a *Change Order* or a *Change Directive* directing the *Contractor* to use the *Owner's Specified Materials and Subcontractors*, the *Contractor* shall review the *Owner's Specified Materials and Subcontractors* to determine whether such materials are acceptable to meet the *Engineering Services* and *Construction Work* and can be made available for procurement without interfering with the achievement of the *Milestones*.
- 6.2 If the *Contractor* determines that the *Owner's Specified Materials and Subcontractors* are acceptable for the *Work*, then the *Owner's Specified Materials and Subcontractors* shall be used and incorporated in the *Work* in the same manner as those materials and pieces of equipment proposed by the *Contractor* and the *Contractor* shall take responsibility for the *Owner's Specified Materials and Subcontractors* and all warranty provisions that apply thereto.
- 6.3 If the *Contractor* determines that the *Owner's Specified Materials and Subcontractors* are not acceptable for the *Work*, then the *Contractor* shall give written notice to the *Owner* that the *Owner's Specified Materials and Subcontractors* are not suitable for the *Work*, which notice will provide details of the reasons why the *Owner's Specified Materials and Subcontractors* are not acceptable for use or incorporation into the *Work*.
- 6.4 Where the *Contractor* has provided written notice to the *Owner* that the *Owner's Specified Materials and Subcontractors* are not acceptable for the *Work*, the *Owner* shall promptly notify the *Contractor* of the *Owner's* decision as to whether or not to include the *Owner's Specified Materials and Subcontractors* in the *Work*.
- 6.5 If the *Owner* chooses to direct the *Contractor* to use the *Owner's Specified Materials and Subcontractors* after the *Contractor* has notified the *Owner* that the *Owner's Specified Materials and Subcontractors* are not acceptable for the *Work*, then the *Owner* shall take full responsibility for the *Owner's Specified Materials and Subcontractors*, including any

warranty claims and damages that may occur from the use or incorporation of the *Owner's Specified Materials* and *Subcontractors*.

- 6.6 Where the *Contractor* is supplying, as part of this *Contract*, equipment that requires sulphur hexafluoride (SF₆) gas and the *Contractor* holds the Notice of Project under the *OHSA*, the *Contractor* is required to purchase and manage the sulphur hexafluoride (SF₆) gas according to industry best practices. The *Contractor* will ensure that the sulphur hexafluoride (SF₆) gas is weighted in and out at *Owner's Site* and the *Contractor* will notify the *Owner* of the amount used in the *Work*.
- 6.7 The *Contractor* will perform such tasks and take such responsibilities as may be described in the *Owner's Requirements* in respect of the *Procured Goods* and *Free Issue Goods*. The *Procured Goods* and *Free Issue Goods* shall be used exclusively for incorporation into the *Work*. Title to the *Procured Goods* obtained by *Contractor* in its capacity as agent for *Owner* (if applicable), and *Free Issue Goods* shall remain with the *Owner*. Unless otherwise directed by the *Owner*, all excess *Procured Goods* obtained by *Contractor* in its capacity as agent for *Owner* (if applicable), and *Free Issue Goods* shall be returned to the *Owner* following completion of the *Work*. However, the *Contractor* shall be liable for the repair or replacement of any *Procured Goods* and *Free Issue Goods*, which become damaged or lost while in the custody or control of the *Contractor*.
- 6.8 The *Contractor* agrees to participate in any *Owner* consultation as requested with, and facilitate the provision of benefits such as training to, First Nations and Métis communities in relation to the *Project*. The *Contractor* shall endeavour to provide subcontracting opportunities for the *Work* to qualified community members of, and businesses owned or controlled by First Nation and Métis communities where reasonable, and report such subcontracting to *Owner*.

Article 7 - Procurement Services

- 7.1 As specified in the *Owner's Requirements*, the *Contractor* shall perform the *Procurement Services* either as agent for the *Owner*, or for its own account, or both, as applicable.
- 7.2 Where specified in the *Owner's Requirements*, the *Contractor* shall provide *Procurement Services* using such selected vendor lists and *Owner's Specified Materials and Subcontractors* as directed by the *Owner*.
- 7.3 Payment of invoices for *Procured Goods* shall be made in accordance with the *Owner's Requirements*.
- 7.4 To the extent the Parties have agreed that the *Contractor* is to perform *Procurement Services* as agent of the *Owner*, the *Contractor* shall carry out the *Owner's* instructions and shall act:
- (a) in good faith and in the best interests of the *Owner* and the *Project*,
 - (b) within the scope of the agency specified in this Article 7 - Procurement and the *Owner's Requirements*.

7.5 To the extent the Parties have agreed that the *Contractor* is to perform the *Procurement Services* as agent of the *Owner*, the appointment of the *Contractor* as the *Owner's* agent shall be limited as follows:

- (a) to the specifications contained in the *Owner's Requirements*;
- (b) the *Contractor* shall not enter into any agreement, contract, settlement or arrangement with any person, firm or corporation, or other enterprise imposing any compromise, legal obligation or liability of any kind whatsoever on the *Owner*, unless such is in accordance with this *Contract* or unless it has prior specific written authority to do so from the *Owner*;
- (c) the *Procurement Services* performed by the *Contractor* shall only relate to the *Project* and the *Contractor* shall not act as agent for the *Owner* in any other respect;
- (d) the *Procurement Services* shall be on commercial terms and conditions previously approved by the *Owner* and the *Contractor* shall not modify or change any of the terms and conditions approved by the *Owner* without the *Owner's* prior written consent, which consent may be withheld at the *Owner's* sole discretion;
- (e) the *Procurement Services* by the *Contractor* shall be in accordance with the *Contractor's* internal approval process, but subject always to the final written approval of the *Owner's Representative*;
- (f) the *Procurement Services* by the *Contractor* shall be in accordance with the *Law*, and without limiting the generality of the foregoing, those laws that pertain to competitive procurement, and any other procurement requirements that the *Owner* may state from time to time;
- (g) title to all *Procured Goods* shall be in the *Owner's* name; and
- (h) all warranties and guarantees relating to the *Procured Goods* shall be made to the *Owner* and shall be enforceable by the *Owner*.

7.6 To the extent the Parties have agreed that the *Contractor* is to perform *Procurement Services* as agent of the *Owner*, the *Owner* shall:

- (a) provide to the *Contractor* sufficient instructions and guidelines to enable the *Contractor* to effect delivery, receiving and handling into and within the *Owner's* system of materials handling and warehousing; and
- (b) provide to the *Contractor* instructions and guidelines that identify the levels of review and approval required by the *Owner* in relation to the *Procured Goods*.

7.7 In accordance with the *Owner's Requirements*, the *Contractor* shall submit any required samples for the *Owner's Representative's* approval, together with any relevant information. The *Contractor* shall also submit for the *Owner's Representative's*

approval, manufacturer's standard samples of materials (with relevant information) and any additional samples instructed by the *Owner's Representative*. All samples shall be labelled as to origin and intended use in the *Work*. For each part of the *Work*, construction shall not commence prior to receipt of such approval to the relevant samples.

Article 8 - Construction Work

- 8.1 The *Contractor* shall perform the *Construction Work* in accordance with the *Contract*.
- 8.2 The *Contractor* shall provide as part of its *Proposal*, unless otherwise set out in the *Procurement Documents*, unit prices together with delivery times for recommended spare parts for the *Goods*, *Procured Goods*, and *Free Issue Goods*. Spare parts will be identical to the corresponding parts in the *Goods*, *Procured Goods*, and *Free Issue Goods*. The *Contractor* will provide, upon request by the *Owner*, a complete list of all spare parts which the *Contractor* would normally purchase from outside sources, showing the company's part number and the true manufacturer's name and part number for each item.
- 8.3 Except for Exhibit A - Safety Courses and those materials, services and equipment to be provided by the *Owner* and described in Appendix A - Owner's Requirements, the *Contractor* shall supply or cause to be supplied all services, equipment and materials required for the proper execution and completion of the *Construction Work*.
- 8.4 The *Contractor* shall take full responsibility for the adequacy, stability and safety of the *Work* and the *Work Site* operations under its control, of all methods of construction and of all of the *Construction Work*, unless the *Contractor* has received written instructions from the *Owner's Representative* absolving the *Contractor* of responsibility.
- 8.5 The *Contractor* shall not perform any blasting work unless expressly permitted to do so in the *Owner's Requirements*, and any such blasting work will be limited to the express permission so provided.
- 8.6 At the *Owner's* request, report on a monthly basis the number of person hours worked, in respect of the *Construction Work*, under each of the various collective labour agreements.
- 8.7 It is the *Contractor's* responsibility to identify and locate hidden structures, and infrastructure from other utilities above, on and below the surface (including the existence, location and elevation) as may be in the vicinity of the *Work*, prior to the performance of the *Work*, and to contact and arrange for and obtain protection for, and from, such infrastructure for the conduct of the *Work*.
- 8.8 Should any part of the *Work* be connected to any *Work Site* facilities or services, the *Contractor* must perform a feasibility study of the existing installation (eg. storm sewers, sanitary drainage, water supply, piping, etc.) and the consequences and effect of the *Work* on such facilities or services, and provide a written copy of such study to the *Owner*, for the *Owner's* approval.

8.9 In respect of above, on and below surface infrastructure as relates to the temporary construction access and performance of the Work, the responsibilities of the Contractor include:

- (a) prior to commencing any excavation, demolition, removal, refurbishment, replacement or construction activities:
 - (1) performing an on-site inspection of the entire *Work Site* to identify all surface and above surface infrastructure;
 - (2) obtaining a locate and locate report for all utilities of all underground infrastructure in the vicinity of the *Work*;
 - (3) obtaining the identity and ownership of all utilities with above, on and below surface infrastructure in the vicinity of the *Work Site*;
 - (4) obtaining or creating drawings and records of above, on and below surface infrastructure found;
 - (5) notifying all utilities with above, on and below surface infrastructure in the vicinity of the *Work Site* of the proposed *Work*, including nature of the *Work*, proposed installations, and *Work* schedule of when *Work* is to be performed in the vicinity of such utility's infrastructure;
 - (6) obtaining any necessary hold-offs from the applicable utilities for protection to conduct the *Work*;
 - (7) keeping a copy of such drawings and records of above, on and below surface infrastructure and all locate reports of underground infrastructure at the *Work Site*;
 - (8) providing a copy of such drawings and records of above, on and below surface infrastructure, and such locate reports of underground infrastructure, to the *Owner's Representative*, upon request.
- (b) In the performance of the *Work*, the *Contractor* shall:
 - (1) obtain and follow all instructions of such utilities for protection of such utilities' infrastructure including all instructions and orders on such locate report of underground infrastructure;
 - (2) protect each utilities' infrastructure in the performance of the *Work*;
 - (3) update drawings and records of new infrastructure found, and of changes to, and new infrastructure constructed in association with the *Work*, and provide such records to the *Owner*, and to the respective utilities.

8.10 In respect of any Work to which the Utility Work Protection Code applies, the Contractor shall:

- (a) determine and verify the requirements, including isolation, for protection with the applicable utility;
 - (b) request a Network Outage Management System (NOMS) slip from the *Owner's Representative* stating the requirements, including isolation, indicated by the applicable utility;
 - (c) prepare and submit the application for a *UWPC Work Permit* (PC1) to the OGCC/Work Protection representative, identifying the located infrastructure, nature of the *Work* to be performed and any hazards, in relation to the *Work*;
 - (d) apply for isolation or hold-offs from the applicable utility that has control of the located infrastructure prior to conduct of the *Work*;
- (e) Only conduct the *Work* in environments and on applicable assets when the appropriate *Work Permit* has been obtained from the applicable utility controlling authority.
- 8.11 The *Contractor* shall prepare the Power Outage Schedule for various electrical circuits and lines as required to perform the *Work*. This schedule must be submitted to the *Owner's* Ontario Grid Control Center ("OGCC") no more than thirty (30) days after the date of this *Contract*. OGCC endeavours to provide the outages, as requested by the *Contractor*, wherever possible; however, changes such as system configuration and requirements may result in the postponement of the planned outage. The *Contractor* will relocate its forces to perform other *Work* should these postponements occur. The OGCC will provide as much notice as possible in the event of such occurrences. Outages approved by the OGCC adhere to the time constraints set out on the (Ontario) Independent Electricity System Operator's ("IESO") website.
- 8.12 The *Contractor* should provide outage dates to the OGCC, through the *Owner*, at least six weeks in advance of the outage date sought. Due to system restrictions and other considerations, OGCC approvals for outages are provided no sooner than forty-eight (48) hours prior to the requested outage time. The *Contractor* shall prepare for the outages as scheduled and subsequently approved. Should the outage be cancelled or postponed by the OGCC or *Owner* before the time of the planned outage and require postponement of the work activity as scheduled by the *Contractor* by more than a reasonable time, the *Contractor* shall be entitled to reasonable compensation for the mobilization/demobilization of his staff and equipment according to such compensation table as mutually agreed in writing by the Parties.
- 8.13 All *Work Permits* related to power outages required for the *Work* shall be held by an employee of the *Contractor* who is qualified to hold the said *Work Permits*.
- 8.14 The *Contractor* shall name a single employee as the point of contact for coordination and scheduling of outages with the OGCC.

Article 9 - Commissioning

- 9.1 The duties of the *Owner* and of the *Contractor* in relation to *Commissioning before Substantial Performance and Commissioning after Substantial Performance*, together with the *Milestones* to be reached for commissioning, are as set out in the *Owner's Requirements*.

Article 10 - Work Protection

- 10.1 All *Contractor Personnel* that will be working in areas covered by a *UWPC Work Permit* are required, at *Contractor's* expense, to have taken "Work Protection Overview" training from the Infrastructure Health and Safety Association.
- 10.2 Any person who is required to prepare, check, apply for, hold, issue or establish a *Work Permit*, or supervise a crew working under such a *Work Permit*, shall be *UWPC Competent* and all such *Work Permits* required for the *Work* shall be held by an employee of the *Contractor*.
- 10.3 It is the accountability of the *Contractor* to have available sufficient *UWPC Competent* employees for the *Work* to be executed under this *Contract*. Unless otherwise set out in the *Owner's Requirements*, the *Contractor* must identify and propose in writing to the *Owner* at least three (3) candidates to be *UWPC Competent*.
- 10.4 At *Work Sites* where a *Work Permit* is required, a *Contractor* employee who has been determined to be *UWPC Competent* must be present during all *Work* and is responsible for all *Work* activities at the *Work Site*. Any person who is an immediate supervisor of a crew performing *Work* for which a *Work Permit* has been issued must be *UWPC Competent* irrespective of whether or not he holds the *Work Permit*.
- 10.5 The following process shall determine whether or not a person is *UWPC Competent*:
- (a) The *Contractor* shall propose as candidates only persons who have had previously or have currently an equivalent designation from Infrastructure Health and Safety Association (formerly, Electrical & Utilities Safety Association or EUSA) or an equivalent out-of-province agency and who meet the following requirements:
 - (i) Have education (eg. Electrical Engineering Degree, Technologist Diploma, or Valid Journeyman Certificate as an Electrician or Power Linesperson recognized in the Province of Ontario) or has already held work permits on work of a similar type to the *Work* of this *Contract* in a jurisdiction having requirements similar to the *UWPC*, or equivalent experience appropriate for the type of *Work* for which he or she will be responsible and provide a copy of same to *Owner* (the evaluation of whether the candidate's education or work permits held in other jurisdictions are similar or whether the candidate has equivalent experience shall be at the *Owner's* sole discretion).

- (ii) Have a minimum of eight years of experience related to the type of *Work* for which he or she will be responsible and provide a resume demonstrating such.
 - (iii) Be able to communicate fluently in English (both written and oral) on all matters related to the *Work* and any emergency situations that could arise.
 - (b) Candidates who meet the requirements stated in Section 10.5(a) shall successfully complete the following training offered by Hydro One Work Methods & Training (“WM&T”):
 - (i) Orientation and *UWPC* Overview training
 - (ii) The Code Explained
 - (iii) *UWPC* “Core” training
 - (iv) *UWPC* “Field Check-out”.
 - (c) *Contractor* must submit a request for training to the *Owner* with a list of all candidates no less than two (2) months prior to the date *UWPC Competent* employees and work permits are required, unless otherwise set out in the *Owner’s Requirements*.
 - (d) The training offered by Hydro One WM&T make take up to 14 days, nonconsecutively, at one or more locations as determined by the *Owner*. The *Contractor* is responsible for all costs and expenses of its employees to attend such training.
 - (e) Upon successful completion of the *Owner’s* training the *Contractor* shall determine whether or not a candidate is to be deemed *UWPC Competent*. The decision of the *Contractor* shall be communicated to the *Owner* by means of a letter addressed to the *Owner’s Representative* stating that the *Contractor* has deemed the candidate *UWPC Competent*. This letter shall be signed by an authorized signing officer of the *Contractor* and have attached to it documentation demonstrating compliance with Sections 10.5(a) and 10.5(b).
 - (f) Upon receipt of the documentation described in Section 10.5(d) the *Owner’s Representative* shall provide copies to WM&T and to OGCC. OGCC will add the name of the person deemed to be *UWPC Competent* to the Contractor List of Persons who are authorized to apply for and receive *Work Permits* under the *UWPC* from OGCC.
- 10.6 The designation as *UWPC Competent* shall expire on the earlier of twelve months after designation or six months after last having held a *Work Permit*.
- 10.7 The *Contractor* understands and agrees that it is their responsibility alone to determine the competency of any candidate that it proposes and it may eventually designate to be *UWPC Competent*. Nothing in this *Contract* or any other documentation from the *Owner*,

including but not limited to, that provided by WM&T with respect to the Hydro One training courses creates any responsibility or liability on the part of the *Owner* for such a person's designation to be *UWPC Competent* or for any aspect of that person's performance.

- 10.8 The *Owner* reserves the right, but is not obligated, to audit the Work Protection process, records, audit reports and incident reports of the *Contractor* for the purpose of continuous improvement.
- 10.9 The *Owner* reserves the right, at its sole and absolute discretion, to remove a person from the Contractor List at OGCC, whose performance is below the standard expected of a person holding a *Work Permit*, on the *Owner's* system components. This may result from a single serious incident or a pattern of minor incidents observed by OGCC staff with respect to *Work Permits*, by the Contract Monitor or Site Inspector with respect to *Work Site*, or otherwise discovered by the *Owner's* auditor. A person whose designation is revoked may not be proposed again as a candidate by the *Contractor*.

Article 11 - Contractor's Representations

11.1 The *Contractor* shall:

- (a) perform the *Work* in a professional, efficient, and workmanlike manner, using only qualified, skilful and careful workers, in strict accordance with the *Contract* and in accordance with sound and currently accepted design, engineering, procurement, construction and commissioning practices normally employed by leading organizations in industrial construction in the electricity utilities sector similar to the *Work*;
- (b) perform the *Work* in a safe and environmentally sound manner and in compliance with the *Law*;
- (c) ensure that the title to any and all *Goods* and those *Procured Goods* supplied by the *Contractor* shall, upon delivery to the *Work Site*, be free from any and all claims, liens, charges, encumbrances or security interests of any kind whatsoever;
- (d) ensure equipment and materials furnished, manufactured or fabricated by the *Contractor*, or its *Subcontractors*, for incorporation into the *Work*, shall:
 - (i) be free from all defects or deficiencies;
 - (ii) meet the specifications in the *Contract*, if so specified, and if not specified then be of the quality best suited for the required operating conditions and intended use and purpose of the materials and services; and
 - (iii) shall be fit for the purpose for which the equipment and materials have been manufactured or fabricated;

- (e) perform the *Work* to meet the *Owner's Requirements*;
- (f) comply with the *Contract*, including, but not limited to, all time schedules set out in, or called for by, the *Contract* or the *Contractor Execution Plan*; and
- (g) ensure the *Work* shall be fit for its intended purpose as specified in the *Owner's Requirements*.

11.2 The *Contractor* represents and warrants to the *Owner* that:

- (a) it has the experience, resources, personnel and capability to perform the *Work* in a competent, efficient, skilful, and first-class manner;
- (b) it is duly incorporated and validly existing under the laws of the jurisdiction(s) of its incorporation and is registered to carry on business in the Province of Ontario, and it has the corporate power, capacity, and authority to enter into, and to perform its obligations under the *Contract* and to any other agreement or document delivered pursuant thereto;
- (c) it has duly taken, or has caused to be taken, all action required to be taken by it to authorize the execution and delivery of this *Contract* and any other agreement or document to be delivered pursuant thereto by it and the performance of its obligations under this *Contract* and any other agreement or document to be delivered pursuant thereto;
- (d) it has all required permits, licenses and authorizations necessary to carry on its business; and
- (e) the *Contractor* has the right to use, employ, sublicense and incorporate in the *Work* those things, ideas and intellectual property to which the *Contractor* gives the *Owner* a license under Section 36.3.

Article 12 - Contract Time

- 12.1 Subject to any *Change Order* or *Change Directive*, the *Contractor* shall commence the *Work* on the *Commencement Date* and shall achieve *Substantial Performance* of all of the *Work* by the *Scheduled Substantial Performance Date*. Time is of the essence for this *Contract*.
- 12.2 The *Contractor* shall not make any changes to any *Critical Activities*, including *Major Milestones* in the *Contractor's Execution Plan* without the prior written approval of the *Owner* as documented in accordance with the terms of this *Contract*. The *Contractor* shall not make any changes to any *Minor Milestones* without prior written notice to the *Owner* in accordance with the terms of this *Contract*.
- 12.3 If a party fails to meet its obligations set out in this *Contract* in a timely manner, the other party may raise the failure of a timely action as provided for in Appendix F - Dispute Resolution Procedure; however, in such case the parties shall continue to perform the

Work and their respective obligations under this *Contract* while the matter is being resolved.

Article 13 - Payment

- 13.1 As full and complete compensation for the *Work*, the *Owner* shall pay the *Contractor* the *Contract Price* pursuant to the terms of Appendix B - Contract Price which shall in no event exceed the *Contract Price* payable in accordance with the *Contract*, as adjusted by any *Change Order*, as well as any *Change Directive* under Section 19.8.
- 13.2 The *Contractor* shall prepare and submit invoices for all *Work* performed in accordance with the Milestone Performance Payment Schedule under Appendix B - Contract Price. Any reference in the *Contract* to progress payments shall mean the milestone payments.
- 13.3 As a condition precedent to each milestone payment to the *Contractor* by the *Owner*, the *Contractor* shall deliver to the *Owner*:
- (a) a Workplace Safety and Insurance Board Certificate of Clearance; and
 - (b) a Statutory Declaration, in the form set out in Appendix E - Forms.
- 13.4 The *Owner* shall retain from all payments due and payable to the *Contractor* an amount equal to 10% of the value of the *Work* actually done and materials furnished by the *Contractor* in accordance with the *Construction Lien Act*, R.S.O. 1990 c. C.30, as amended ("*Construction Lien Act*").
- 13.5 Subject to Appendix B - Contract Price and when the *Contractor* considers that it has successfully completed a milestone under the Milestone Performance Payment Schedule, the *Contractor* shall prepare a written certification of the completion of the performance milestone for which the payment is requested ("*Application for Milestone Payment*") for the *Owner's* review and verification.
- 13.6 In addition to any other information that the *Owner* may request, the *Application for Milestone Payment* shall include the following:
- (a) the milestone reached;
 - (b) the value of Work performed for that milestone as forth in the Milestone Performance Payment Schedule under Appendix B - Contract Price;
 - (c) any advance payment for *Goods*;
 - (d) the amount of statutory holdback, liens;
 - (e) the amount of GST/HST as applicable; and
 - (f) the amount due to the *Contractor*.

- 13.7 No later than ■ *Work Days* after the receipt of the *Contractor's Application for Milestone Payment*, , and provided the *Contractor* has provided all necessary supporting information and documentation, and participated in any review requested by the *Owner*, the *Owner* will verify the validity of the application and notify the *Contractor* whether the *Contractor* has reached the milestone for which payment is sought as set out in Section 13.8. The *Contractor* shall provide full cooperation and assistance to the *Owner*, as the *Owner* may reasonably request in this process.
- 13.8 If the *Owner* believes the *Contractor* has completed the milestone that is the subject of the *Application for Milestone Payment*, the *Owner* shall issue a certificate for payment for the milestone (“*Certificate for Payment of Milestone*”). The *Certificate for Payment of Milestone* shall provide the following minimum information:
- (a) the milestone reached;
 - (b) the value of *Work* performed for that milestone as set forth in the Milestone Performance Payment Schedule under Appendix B - Contract Price;
 - (c) any advance payment for *Goods*;
 - (d) the amount of statutory holdback, liens, and any amounts for *Owner's* set-off;
 - (e) the amount of GST/HST as applicable; and
 - (f) the amount due to the *Contractor*.
- 13.9 If the *Owner* does not issue a *Certificate for Payment of Milestone*, it shall provide reasons therefor.
- 13.10 The *Owner* may review the *Work* to verify completion of a milestone, but is not required to do so, and in either case, the review and verification and payment of a milestone does not relieve or otherwise diminish the *Contractor's* proper performance of the *Work* in accordance with the *Contract*, and payment of the milestone does not mean acceptance of any *Work*, nor does it waive compliance with any of the *Owner's Requirements* or otherwise constitute waiver of any other *Owner's* rights and remedies pursuant to the *Contract*.
- 13.11 The *Contractor* shall promptly submit an invoice to the *Owner* in accordance with the *Certificate for Payment of Milestone*. Every invoice pursuant to this *Contract* shall show the applicable GST/HST as a separate amount, and also show the *Contractor's* GST/HST registration number.
- 13.12 Forthwith upon receipt by the *Contractor* of each milestone payment as the *Work* progresses the *Contractor* shall pay all of its *Subcontractors* in full on account of *Work* performed and *Goods* and *Procured Goods* delivered to which each payment applies, subject to compliance with the *Construction Lien Act*, and upon the request of the *Owner*, promptly provide evidence of all such payments.

- 13.13 For greater certainty, the *Contractor* hereby agrees to reasonably substantiate to the *Owner*, the amounts of all accounts representing any portion of the *Contract Price*, including without limitation, back-up documents evidencing accounts or payments due to *Subcontractors*.
- 13.14 Subject to prior notice being provided to the *Contractor*, the *Owner* reserves the right to issue joint cheques at any time to the *Contractor* and any of its *Subcontractors* or other parties and including for the supply of labour furnished on this *Project*, or to issue cheques directly to a *Subcontractor* or another party and including for the supply of labour furnished on this *Project* whether or not sums owed by the *Contractor* are then delinquent.

Article 14 - Payment of Holdback Upon Substantial Performance of the Work

- 14.1 After the issuance of the certificate of *Substantial Performance*, the *Contractor* shall:
- (a) submit an application for payment of the holdback amount;
 - (b) submit a sworn statement in the form of the Statutory Declaration in Appendix E - Forms; and
 - (c) submit the documents required to demonstrate compliance with Article 45 - Workers' Compensation.
- 14.2 After the receipt of an application for payment from the *Contractor* and the other documents as provided in Section 14.1, the *Owner* will issue a certificate for payment of the holdback amount.
- 14.3 Subject to Article 18 - Non-Conforming Work the holdback amount authorized by the certificate for payment of the holdback amount is due and payable on the last day of the month in which expiration of the holdback period as stipulated in the lien legislation applicable to the *Work Site* occurs. Notwithstanding the foregoing, if any payment due date falls upon a day other than a *Work Day* then the *Owner* shall make payment to the *Contractor* on the second *Work Day* following the payment due date. The *Owner* may retain out of the holdback amount any sums required by law to satisfy any liens against the *Work* or, if permitted by the lien legislation applicable to the *Work Site*, other third party monetary claims against the *Contractor* which are enforceable against the *Owner*.
- 14.4 Upon application by the *Contractor* for release of a *Subcontractor's* holdback, the *Contractor* shall provide the *Owner* with:
- (a) the extent of all additions to, or deductions from, the *Work* of the *Subcontractor* as a result of *Change Orders* or *Change Directives*;
 - (b) a letter or certificate from the Workplace Safety and Insurance Board (WSIB) stating that the *Subcontractor* has paid all assessments to the WSIB up to the date of application for partial release of holdback covering the *Work* of the *Subcontractor*; and

- (c) a statutory declaration made by the *Subcontractor* in the form of the Statutory Declaration in Appendix E - Forms.
- 14.5 Where legislation permits and where, upon application by the *Contractor*, the *Owner* has certified that the work of a *Subcontractor* has been performed prior to *Substantial Performance*, the *Owner* may, at its sole discretion, pay the *Contractor* the holdback amount retained for such subcontract work, or the *Goods* or *Procured Goods* supplied by such *Subcontractor*, on the first calendar day following the expiration of the holdback period for such work stipulated in the lien legislation applicable to the *Work Site*. The *Owner* may retain out of the holdback amount any sums required by law to satisfy any liens against the *Work* and *Procured Goods* or, if permitted by the lien legislation applicable to the *Work Site*, other third party monetary claims against the *Contractor* which are enforceable against the *Owner*. The *Owner* shall not be obligated to release any holdback for the *Work* of a *Subcontractor* prior to *Substantial Performance* as a whole unless expressly stated in the *Purchase Order* that it will do so.
- 14.6 When the *Owner* agrees to release the holdback amount retained for subcontracted work, or for *Goods* or *Procured Goods*, the *Contractor* shall, within 15 calendar days of receipt of such payment, submit to the *Owner* written confirmation of payment of such holdback to the applicable *Subcontractor* or *Supplier*. If the *Contractor* fails to submit such written confirmation, the *Owner* shall retain the right to withhold from any amount due or which may become due to the *Contractor* the amount of the released holdback until such written confirmation is received or until payment becomes due for the holdback on the *Work* as a whole, whichever is earlier.
- 14.7 Notwithstanding the provisions of the preceding paragraphs, and notwithstanding the wording of such certificates, the *Contractor* shall ensure that such subcontract work or *Goods* or *Procured Goods* are protected pending the issuance of a final certificate for payment and be responsible for the correction of defects or work not performed regardless of whether or not such was apparent when such certificates were issued.

Article 15 - Payment Upon Total Performance of the Work

- 15.1 When the *Contractor* considers that the *Work* is *Totally Performed*, the *Contractor* shall submit an application for payment upon *Total Performance of the Work*.
- 15.2 It is a condition precedent to the issuance of certificate that *Total Performance of the Work* has been achieved that the *Contractor* satisfy each of the following requirements:
 - (a) the *Work* has been fully completed in accordance with the terms and conditions of this *Contract*;
 - (b) all *Deficiencies* with respect to the *Work* have been remedied to meet the requirements of the *Contract*;
 - (c) remove from the *Work Site* all *Contractor* products, tools, equipment, waste products and debris;

- (d) all obligations of the *Contractor* to other parties, including any third parties, in relation to the *Work*, for which the *Owner* could in any way be held responsible, have been fully satisfied; and
 - (e) the *Contractor* has delivered to the *Owner* the following:
 - (i) a statutory declaration in the form included in Appendix E - Forms and modified as required to include the following, as well as any other matter that the *Owner* may reasonably require:
 - (a) the amount of final sums payable;
 - (b) the date the *Contractor* completed the *Work*, to evidence the expiration of the term for filing liens; and
 - (c) the full payment of all payrolls and other similar indebtedness, and all other sums and obligations whatsoever incurred by the *Contractor* in carrying out the *Work*, including, without limitation, payments to contractors or for materials or equipment;
 - (ii) a Workplace Safety and Insurance Board certificate of clearance;
 - (iii) any *As-Built Drawings* and operations manuals for which the *Contractor* is responsible;
 - (iv) assignments of any warranties guarantees and indemnities provided by manufacturers or suppliers of materials;
 - (v) written evidence of good standing from union representatives and/or labour organizations, if any; and
 - (vi) a Release and Certificate of Final Payment, in the form provided in Appendix E - Forms, releasing all of the *Contractor's* claims against the *Work* and the *Owner* arising under or by virtue of this *Contract*, other than such claims, if any, as may be expressly identified by their nature and amount by the *Contractor* in the Release and Certificate of Final Payment, or as attached as an attachment thereto.
- 15.3 The *Owner* will, no later than 30 days after the receipt of an application from the *Contractor* for payment upon *Total Performance of the Work*, and provided the *Contractor* has provided all necessary supporting information and documentation, and participated in any review requested by the *Owner*, verify the validity of the application and notify the *Contractor* that the application is valid or give reasons why it is not valid.
- 15.4 When the *Owner* finds the *Contractor's* application for payment upon *Total Performance of the Work* valid, the *Owner* will issue a certificate that *Total Performance of the Work* has been achieved and certify for payment the remaining monies due to the *Contractor*

under the *Contract*. The date of *Total Performance of the Work* shall be as stated in this certificate.

- 15.5 Subject to the provision of Article 45 - Workers' Compensation and any lien legislation applicable to the *Work Site*, and the terms and conditions of the *Contract*, the *Owner* shall pay the *Contractor* as provided in Appendix B - Contract Price.

Article 16 - Invoicing

- 16.1 Each invoice submitted by the *Contractor* shall be in such detail and format as specified by *Owner* and as a minimum unless otherwise specified, include: *Owner's* purchase order number and purchase order release number, purchase order release line number(s), service master number and/or material master number if provided, invoice number and date, the *Contractor's* business name, address, invoice contact name and invoice contact phone number, location of the *Work* and a short description of the *Work* the charges relate to, quantity, part or reference numbers, description of suppliers and *Subcontractors*, time worked (eg. number of hours or days), rate, invoice payment amount, currency (if not Canadian dollars), terms of payment as per this *Contract*, remittance address, applicable tax treatment, *GST/HST* amount, and *Contractor's* *GST/HST* number. Invoices must match the purchase order and purchase order release in price and quantity. *Contractor* must not include fees and charges from more than one purchase order or purchase order release on an invoice.
- 16.2 The *GST/HST*, and other provincial or state sales tax, if applicable, together with the registration number for same, shall be shown separately on all invoices. The *Contractor* shall advise the *Owner* whether it has registered for *GST/HST* and provide such number upon request. The *Contractor* shall deduct all recoverable *GST/HST* paid from reimbursable expenses before adding *GST/HST* to amounts to be invoiced to the *Owner*. If the *Contractor* incorrectly charges *GST/HST* or other tax to the *Owner*, the *Owner* shall not reimburse the *Contractor* for interest or penalties arising from the incorrect application of such tax.
- 16.3 The *Owner* has implemented an on-line portal ("Portal") for submitting invoices and enabling dynamic discounted payment and the *Owner* expects the *Contractor* to adopt and use the Portal for determining purchase order status, invoice submission, invoice status and questions related to purchase orders, invoices, and payment details. The *Owner* will make available information about the Portal and for *Contractor's* enrolment on the Portal upon *Contractor's* request. If *Contractor* is already enrolled on the Portal, then *Contractor* will submit all invoices in respect of the *Contract* through the Portal.
- 16.4 In the event that the Portal cannot be used, all original invoices and all supporting documentation must be submitted to the Address for Invoicing to Owner set out on the *Commitment Pages* and payment will be made from an original invoice only and fax copies will not be processed.

- 16.5 An electronic copy of all invoices and all supporting documentation shall also be sent to the *Owner's Representative*.
- 16.6 Subject to applicable legislation, the *Contract*, as well as whether *Contractor* chooses dynamic discounted payment terms made available on the Portal, undisputed invoices will be paid within [REDACTED] days after receipt. Notwithstanding the foregoing, if any payment due date falls upon a day that is not a *Work Day*, then the *Owner* shall make payment to the *Contractor* on the second *Work Day* following the payment due date.
- 16.7 The *Owner* is entitled to review invoices. The *Owner* is not required to pay any invoice unless such invoice is accurate, correctly submitted, not disputed and includes the required information. In the event the *Owner*, in good faith, disputes the accuracy or applicability of any fee, charge, amount, credit or other financial arrangement described in an invoice, the *Owner* shall notify *Contractor* of such dispute in writing in accordance with Appendix F - Dispute Resolution Procedure; with a reasonably detailed explanation of the basis of the dispute as soon as practicable after the alleged discrepancy has been discovered. The *Owner* is under no obligation to pay any part of the invoice until the resolution of the dispute.

Article 17 - Withholding of Payment

- 17.1 If because of climatic or other conditions reasonably beyond the control of the *Contractor*, there are items of *Work* that cannot be performed, and the said non-performance does not materially affect the *Facilities* for their intended purpose, payment in full for that portion of the *Work* which has been performed shall not be withheld or delayed by the *Owner* on account thereof, but the *Owner* may withhold, until the remaining portion of the *Work* is finished, only such an amount that the *Owner* determines is sufficient and reasonable to cover the cost of performing such remaining *Work*.

Article 18 - Non-Conforming Work

- 18.1 No payment by the *Owner* under the *Contract* nor partial or entire use or occupancy of the *Work* by the *Owner* shall constitute an acceptance of any portion of the *Work* or *Procured Goods* which are not in accordance with the requirements of the *Contract*.
- 18.2 Notwithstanding any other provision in the *Contract*, upon notice to the *Contractor*, the *Owner* may withhold or retain all or any portion of any payment due to the *Contractor* under this *Contract* as reasonably necessary to ensure the performance of the *Work* or to protect the *Owner's* rights. The *Owner* may make such withholding or retention upon the occurrence and continuance of any of the following events:
- (a) The *Contractor* is in default of any of its material obligations under this *Contract*;
 - (b) All or any part of such payment is attributable to *Work* that is defective or not performed in accordance with the *Contract* documents;

- (c) The *Contractor* has failed to make prompt payments to its *Subcontractors* respecting *Work* for which the *Owner* has made payment to the *Contractor*;
 - (d) Any lien has been registered against the *Project*, the *Work*, the *Work Site* or any portion of it or against any *Goods* or *Procured Goods* and such lien has not been vacated or released and discharged by the *Contractor* pursuant to Section 46.1;
 - (e) Any sums that may be required by *Law*;
 - (f) Third party monetary claims against the *Contractor* which are enforceable against the *Owner*; or
 - (g) The *Contractor* has fallen behind the construction schedule and, in the opinion of the *Owner* acting reasonably, deduction from amounts otherwise payable to the *Contractor* is required to protect the *Owner* from liability under this *Contract*, including liquidated damages, if any, provided under this *Contract*.
- 18.3 Should either party fail to make payments as they become due under the terms of the *Contract* or in an award of arbitration or judgment of a court, interest at the rate of 1% (one percent) per annum above the prime rate of interest quoted by The Toronto-Dominion Bank in Toronto, Ontario for prime business loans as it may change from time to time, on any unpaid amounts shall also become due and be payable.

Article 19 - Changes

- 19.1 The *Owner* shall have the right, at any time, to make a *Change*.
- 19.2 When a *Change* is proposed by the *Owner*, then the *Owner* shall provide a *Contemplated Change Notice* to the *Contractor* describing the proposed *Change*.
- 19.3 The *Contractor*, upon receipt of a *Contemplated Change Notice*, shall within ■ Work Days (or such longer time as agreed between *Owner* and *Contractor*) provide the *Owner's Representative* with a *Change Quotation* which shall include a method of adjustment or an amount of adjustment to the *Contract Price*, if any (unless such adjustment is not permitted under the *Contract*), and any adjustment in the *Contract Time* for the proposed *Change*.
- 19.4 Where a proposed *Change* impacts the *Contract Price* and unless such adjustment is not permitted under the *Contract*, the *Owner* and the *Contractor* shall in good faith negotiate an equitable adjustment of the *Contract Price* summarized as a total cost and also including reasonable breakdown of such total cost of the adjustment, subject to the following limitations:
- (a) Where the *Contract* defines unit prices or hourly rates, the adjustment shall not exceed the applicable unit prices or hourly rates, and,
 - (b) Where the *Owner* and the *Contractor* are unable to agree on an adjustment beforehand, the value of the *Change* shall be based on the auditable true costs of

the *Change* and provided the allowable mark-up will not exceed ■■■ of the true costs.

- 19.5 Following receipt of a *Change Quotation*, the *Owner* shall within ■ *Work Days* either agree to the adjustments in the *Contract Time* and the *Contract Price* (unless such adjustment is not permitted under the *Contract*) or to the method to be used to determine the adjustments, or give the *Contractor* notice that the *Change Quotation* is not acceptable.
- 19.6 If the *Change Quotation* is agreed to, then the *Owner* shall issue a *Change Order* recording the *Change*, which shall be signed by the *Owner* and the *Contractor*. The value of the *Work* performed as a result of a *Change Order* shall be included in invoices for payment given by the *Contractor* in accordance with the terms of payment in Appendix B - *Contract Price*, if permitted, and shall identify those portions of the invoice charged for the *Change Order*, if permitted.
- 19.7 If the *Owner* requires the *Contractor* to proceed with the *Change* before the *Owner* and the *Contractor* agree, or, if the *Owner* and the *Contractor* have failed to agree upon the adjustment in *Contract Time* and the *Contract Price*, then the *Owner* shall issue a *Change Directive* directing the *Contractor* to proceed with the *Work*.
- 19.8 Upon receipt of a *Change Directive*, the *Contractor* shall proceed promptly with the *Change* and:
- (a) keep daily records of the time, materials and equipment employed in the *Change* and shall submit such records to the *Owner's Representative* on a daily basis, or such other longer basis as the *Owner's Representative* may direct in writing;
 - (b) the *Contract Price* shall be adjusted in accordance with the rates set forth in Appendix B - *Contract Price*; if applicable (unless such adjustment is not permitted under the *Contract*), unless and except as negotiated and agreed to in writing by the parties, or failing such resolution, shall be settled in accordance with Appendix F - *Dispute Resolution Procedure*; and
 - (c) the *Contract Time* shall be adjusted by written agreement between the *Owner* and the *Contractor*, or shall be settled in accordance with Appendix F - *Dispute Resolution Procedure*.
- 19.9 If, during the performance of the *Work*, the *Contractor* is of the opinion that any instruction, interpretation, decision or direction from the *Owner* should have, but has not, resulted in a *Contemplated Change Notice* or *Change Directive* being issued (including as a result of events described in Sections 27.3, 32.6, 38.1, 38.1 40.1 or 40.2), the *Contractor* shall, within 10 *Work Days* of the said instruction, interpretation, decision or direction, give the *Owner* notice with a *Change Quotation* requesting an adjustment in *Contract Time* and the *Contract Price* required. If the *Contractor* does not issue a *Change Quotation* within the specified time, then the *Contractor* shall have no claim for

any claim against the *Owner* attributable to that instruction, interpretation, decision or direction.

- 19.10 If the *Owner* receives a *Change Quotation* from the *Contractor* pursuant to Section 19.9, the *Owner* shall promptly consider the *Change Quotation* and immediately issue a *Change Order*, *Change Directive* or advise the *Contractor* in writing that the *Contractor's* request is denied. If the *Contractor* disputes the *Owner's* decision, the *Contractor* shall, before proceeding with the *Work*, provide notice to the *Owner* disputing the *Owner's* decision, but in all cases, the *Contractor* shall proceed with the *Work*. In such event, the *Contractor* shall keep daily records in accordance with Section 19.8(a), in respect of the disputed work. The *Contractor's* entitlement to an adjustment in the *Contract Time* and the *Contract Price* shall then be resolved in accordance with Appendix F - Dispute Resolution Procedure.
- 19.11 No modification, addition, deletion or other revision to the *Owner's Requirements* shall be binding on either party unless set out in a *Change Order*, required by a *Change Directive* or determined by Appendix F - Dispute Resolution Procedure. This requirement is of the essence and it is the express intention of the parties that any claims by the *Contractor* for modification, addition, deletion or other revision to the *Owner's Requirements* shall be barred unless there has been strict compliance with the requirements herein. No course of conduct or dealing between the parties, no express or implied acceptance of alterations or additions to the *Owner's Requirements*, and no claims that the *Owner* has been unjustly enriched by any alteration or addition to the *Owner's Requirements*, shall not be the basis of a claim for additional payment under this *Contract* or a claim for any extension in the *Contract Time*. Neither the keeping of daily records in respect of disputed work nor the signing of those records by the *Owner's Representative* shall be considered an admission of entitlement to payment by the *Owner*. Such records, if signed by the *Owner*, shall only constitute the *Owner's* agreement that the time, materials and equipment were spent or employed in respect of the *Work* for which a *Change Directive* has been issued, or in respect of the *Work* in relation to which the *Contractor* has given notice of a dispute pursuant to Section 19.10.
- 19.12 The *Contractor* shall include in its *Change Quotation* all costs and changes in *Contract Time* reasonably expected to result from a *Change* including any impact costs or costs of acceleration (unless such adjustment is not permitted under the *Contract*).
- 19.13 If the *Contractor* encounters actual subsurface or other concealed physical conditions at the *Work Site* which are substantially different from the conditions the *Contractor* knows about or could have known about if the *Contractor* had conducted investigations through the fullest exercise of due diligence, then the *Contractor* shall provide notice to the *Owner* within ■ *Work Days* of encountering the conditions and shall allow the *Owner* the opportunity for inspection before the conditions are further disturbed. If the *Contractor* fails to provide such notice to the *Owner* within the specified time then the *Contractor* shall have no claim for any additional costs or delays attributable to such subsurface or concealed physical conditions.
- 19.14 The *Owner* shall promptly investigate the conditions described by the *Contractor* pursuant to Section 19.13 and if *Owner* agrees that the actual conditions encountered by

the *Contractor* at the *Work Site* differ substantially from the conditions the *Contractor* knows about or could have known about if *Contractor* had conducted investigations through the exercise of due diligence, and such conditions adversely impact the *Contract Time*, then the *Owner* shall issue a *Change Order* to cover the increased *Contract Time*. However, under no case shall there be a claim for any additional costs.

- 19.15 Notwithstanding Sections 19.13 and 19.14, the *Contractor* shall also have no claim for any additional time for delays attributable to actual subsurface or concealed physical conditions at the *Work Site* inherent with construction activities of the character provided for in the *Owner's Requirements* or otherwise in the *Contract*, or conditions that the *Contractor* knows about or could have known about if *Contractor* had conducted investigations through the fullest exercise of due diligence .
- 19.16 The parties will assist and co-operate with each of the preparation of the *Change Order*. Each party shall bear their own administrative costs in relation to the *Change Order*.

Article 20 - Contractor Personnel

- 20.1 All communications between the *Owner* and the *Contractor* and all documents of whatever kind submitted to the *Owner* by the *Contractor* and its *Subcontractors* shall be in the English language. All of the *Contractor Personnel* that deal with or communicate with the *Owner* shall be fluent in the English language. All training and supervision of the *Owner's* operating personnel shall be in the English language.
- 20.2 The *Contractor* shall employ, or cause to be employed, only supervisory *Contractor Personnel* who are appropriately qualified, trained and experienced in safety, efficiency and quality of work supervision, and if requested by the *Owner*, accredited or enrolled in a program for accreditation, in the manner specified by the *Owner* in the *Owner's Requirements*. Supervisory *Contractor Personnel* must possess clear and effective oral and written communication skills, and be fluent in the English language and any other language that may be used at the *Work Site*.
- 20.3 At the *Owner's* request, the *Contractor* shall reassign, replace or remove *Contractor Personnel* who, in the *Owner's* opinion, acting in good faith, negatively affect the efficiency, safety or *Scheduled Substantial Performance Date* of the *Work* or who have committed a violation of the *Policies*.
- 20.4 The *Contractor* shall not employ, or continue to employ, non-Canadian workers in Canada, except in compliance with the *Immigration Act* (Canada) and regulations, as amended from time to time. The *Contractor* shall obtain and produce to the *Owner's Representative* valid and subsisting employment authorizations with respect to all non-Canadian workers to be used to perform the *Work*.
- 20.5 The *Contractor* shall provide and pay for labour and *Goods*, water, heat, light, power, transportation, incidentals, and other facilities and services necessary for the performance of the *Work* in accordance with the *Contract*.

- 20.6 Where the *Contractor* is employing labour on the *Work Site* or performing trades work under the *Contract*, it agrees to adhere to all articles contained in the applicable collective agreements and associated wage schedules relating to such *Work*, including as set out in the *Labour Requirements* identified in the *Procurement Documents*, including the *Owner's Requirements*, and as otherwise identified to *Contractor*. The *Contractor* undertakes to obtain similar acknowledgements from each *Subcontractor* prior to its commencement of *Work* at each place where the *Work* is performed.
- 20.7 The *Contractor* shall maintain good order and discipline among the *Contractor Personnel*, employees, agents, *Subcontractors* engaged, and shall promote and maintain a good relationship with all personnel engaged in the *Work*, comply with all applicable trade union agreements and act promptly on all problems of labour relations, including grievances, jurisdictional disputes, and interpretations of any applicable trade union agreements concerning the *Work*.
- 20.8 The *Contractor* shall not employ in the *Work* anyone not qualified and skilled in the tasks assigned to him/her and shall adopt and enforce regulations with respect to safety, fire prevention, the use of alcoholic beverages, illegal drugs and other controlled substances and other activities that will, or may constitute a danger to life, health or property.
- 20.9 Without in any way limiting the generality of the foregoing, the *Contractor* shall prepare and implement the job site rules incorporating those described in the *Owner's Requirements*. Any such job site rules prepared by the *Contractor* shall be consistent with the *Contractor's* duties and obligations under the *Occupational Health and Safety Act* (Ontario).
- 20.10 The *Contractor* agrees that, unless prior written consent of the *Owner* is obtained, not to hire or approach any person employed by the *Owner* with regard to offers of employment during the period that *Work* is to be performed under the *Contract*, and for a period of twelve (12) months following the date of *Total Performance of the Work*.

Article 21 - Key Personnel

- 21.1 If not agreed to before the execution of the *Contract*, the *Contractor* shall submit a proposed organisational chart for the *Owner's* approval, as part of the *Contractor Execution Plan*. The organisational chart shall show the *Key Personnel* and other supervisory and *Contractor Personnel* who shall be executing the *Work*, together with their respective job titles.
- 21.2 The *Owner* shall identify any of the *Key Personnel* to which the *Owner* objects within 14 *Work Days* and if the *Owner* does not provide the *Contractor* with its objections to the *Key Personnel*, the *Owner* shall be deemed to have accepted the *Key Personnel*.
- 21.3 If the *Owner* objects to any of the *Key Personnel* in accordance with Section 21.2, then the *Contractor* will promptly prepare a new organisational chart identifying the *Key Personnel* for the *Owner's* approval. This process shall be repeated until the *Owner* approves the *Key Personnel*.

- 21.4 Once the *Owner* has approved the organizational chart identifying the *Key Personnel*, where requested by the *Owner*, the *Contractor* shall within ten (10) *Work Days* arrange for each of the *Key Personnel* to complete and execute an agreement in the form of the Key Employee Confidentiality Proprietary Information and Consent Agreement, attached as part of Appendix E - Forms.
- 21.5 Subject to Section 21.6, the *Contractor* shall not, without the *Owner's* consent, make any changes to the *Key Personnel* or an organisational chart that has been approved by the *Owner*.
- 21.6 If any *Key Personnel* leave the *Contractor's* workforce, the *Contractor* shall forthwith replace such *Key Personnel* with *Contractor Personnel* possessing those qualifications necessary for the proper performance of the functions to which assigned. The *Contractor* will present the proposed replacement of the *Key Personnel* to the *Owner* for approval, and the *Owner* shall have the right to determine if the replacement *Contractor Personnel* is suitable to the *Owner*, and if not suitable, the *Contractor* shall provide further replacement *Contractor Personnel* until the *Owner* determines that the replacement person is suitable to the *Owner*.

Article 22 - Subcontracts and Assignment

- 22.1 The *Contractor* shall provide notice to the *Owner* at least ■ *Work Days* in advance of its intention to subcontract the performance of any right of way clearing, foundation installation, or transmission line construction *Work*, or the supply of any *Goods* (as may be further identified in the *Owner's Requirements*) incorporated into the *Work* (each *Subcontractor* for such *Work* or supply being considered a "*Major Subcontractor*") and of the intended *Major Subcontractor* before entering into any subcontract. The *Owner* may for reasonable cause, and acting in good faith, object to the use of a proposed *Major Subcontractor* and require the *Contractor* to obtain another *Major Subcontractor*. Any reviews or approvals by the *Owner* pursuant to the provisions of this Article or elsewhere in this *Contract* shall not release or relieve the *Contractor* of any of its obligations under this *Contract* or create any contractual relations between the *Owner* and any *Major Subcontractor*. The *Contractor* shall require any *Major Subcontractor* to agree to be bound by this *Contract*. The *Contractor* will endeavor to provide *Work* to qualified *Subcontractors* with First Nation or Metis participation and advise *Owner* of its plan and use of such *Subcontractors*.
- 22.2 Prior to the *Commencement Date*, the *Contractor* shall provide the *Owner's Representative* with a list of the names and addresses of all *Major Subcontractors*. The *Contractor* shall provide the *Owner's Representative* with any proposed changes to this list during the *Contract Time*.
- 22.3 Subject to Article 6 - *Owner's Specified Materials and Subcontractors*, the *Contractor* shall be fully responsible for any part of the *Work* performed by *Subcontractors* and for the acts or omissions of *Subcontractors* and all persons either directly or indirectly employed by them, to the same extent as the *Contractor* is for its own acts or omissions. Without in any way limiting the *Contractor's* obligations pursuant to the provisions of this Article or elsewhere under this *Contract*, the *Contractor* shall secure compliance

with and enforce, at its own expense, for the benefit of the *Owner*, each of the contracts concluded by the *Contractor* with *Subcontractors*.

- 22.4 The *Contractor* shall not assign the *Contract*, or any part thereof, without the prior approval of the *Owner*, which approval may be withheld for any reason.
- 22.5 Without limiting any of the *Owner's* rights at law and for greater clarification, the *Owner* may, without the *Contractor's* consent, assign this *Contract* or any portion thereof to: any holding body corporate, subsidiary body corporate and/or affiliate, as “holding body corporate”, “subsidiary body corporate” and “affiliate” are defined under the Canada Business Corporations Act, R.S.C. 1985, c. C-44, as amended; any entity formed by corporate reorganization, amalgamation, divestiture or merger of the *Owner*; and/or any entity that acquires the assets or business of the *Owner*.
- 22.6 The *Contractor* shall enforce the warranty obligations of its *Subcontractors*, and upon the request of the *Owner*, shall assign any warranty to the *Owner*. All contracts between the *Contractor* and its *Subcontractors* shall provide that warranties given by the *Subcontractor* shall be given to both the *Contractor* and the *Owner* and the warranties may be enforced by either the *Contractor* or the *Owner*.
- 22.7 The *Contractor* shall request and use its best efforts to obtain for the benefit of the *Owner*, the best warranties and guarantees that it is possible to secure from its *Subcontractors* without impact to cost and, as a minimum, shall obtain and provide to the *Owner* the warranties required by the *Contract*. The *Contractor* shall do all things and provide all assistance reasonably necessary to enable the *Owner* to enforce warranties and guarantees provided by its *Subcontractors*.

Article 23 - Inspection and Testing

- 23.1 Where the *Owner's Requirements* specify that the *Contractor* shall prepare, or the *Owner's Requirements* are silent on the point, then the *Contractor* shall develop and provide to the *Owner*, for the *Owner's* review and approval, an *Inspection and Test Plan* in time to allow the *Owner* to perform the inspections contemplated by this Article 22 - Inspection and Testing. The *Inspection and Test Plan* shall include all tests indicated in the *Owner's Requirements*.
- 23.2 The *Contractor* shall be solely responsible for, and shall execute the *Inspection and Test Plan*, including the testing and inspection of all engineering, design, workmanship, materials and equipment furnished by itself or its *Subcontractors* in respect of the *Work*, to ensure conformity in each and every respect to the *Contract* and the *Law* and to ensure that good and proper construction practices are followed and that the *Work* is performed in a safe and environmentally sound manner. The *Contractor* shall provide to the *Owner* copies of the test results all tests performed, and shall furnish promptly to the *Owner* two copies of certificates and testing and inspection reports relating to the *Work*.
- 23.3 The *Contractor* shall maintain a quality program that will assure the *Owner* that the engineering, design, workmanship, materials and equipment used in the *Work* fully meet the *Contract* requirements. The program shall conform to the ISO or CSA Z299 Quality

Program Standard and requirements specified in the *Owner's Requirements*. Any proposed alternatives to the specified ISO or CSA Z299 Quality Program shall be subject to evaluation by the *Owner* for its equivalency to specified requirements. The *Contractor* shall have available a list of all materials and equipment being supplied by the *Contractor* and its *Subcontractors*, giving complete information, including the specifications (noting any ISO or CSA Z299 Quality Program Requirements, if applicable), and the name of the manufacturer in each instance. If *Contractor* requires any exemption from the requirements in this Section 23.3, such request shall proceed through a *Change Quotation*.

- 23.4 If the *Law* requires testing of any part of the *Work*, the *Contractor* shall provide the *Owner* with sufficient advance notice of the arrangements for the test.
- 23.5 If the *Owner's Requirements* require any test to be performed or witnessed by the *Owner*, the *Contractor* shall provide the *Owner's Representative* with sufficient advance notice of its readiness for the test and the *Owner* shall then promptly perform or witness the test. If the *Owner* fails to witness the test when scheduled, any re-testing required by the *Owner* shall constitute a *Change*.
- 23.6 If any portion of the *Work* is closed or covered by the *Contractor* without the *Owner's* permission and before the *Owner* has been given the opportunity to perform or witness a required inspection or test, then, if required by the *Owner*, that portion of the *Work* shall be opened or uncovered for inspection or testing and re-closed or recovered, all at the *Contractor's* expense and without increasing the *Contract Time*.
- 23.7 Any *Work* which must be inspected shall not be considered ready for inspection by the *Owner* until the *Contractor* has satisfied itself and notified the *Owner's Representative* that, in the *Contractor's* opinion, that portion of the *Work* is ready for inspection.
- 23.8 If the *Work*, or part thereof, fails one or more of inspections or tests in the *Inspection and Test Plan*, then the *Contractor* shall, at *Contractor's* sole cost:
- (a) prepare a report to the *Owner*, for the *Owner's* approval, proposing the alterations the *Contractor* will make to the *Work*, or part thereof, to bring the *Work* to a condition which the *Contractor* considers will pass the inspections and tests in the *Inspection and Test Plan*; and
 - (b) promptly redo or repair the *Work*, or part thereof, and repair any damage caused in failing to meet the tests in the *Inspection and Test Plan*, as required without impacting the *Contract Time*, to make such *Work*, or part thereof, meet the requirements in the *Inspection and Test Plan*, provided that any faulty, damaged or defective component or part of the *Work* shall be replaced with a new component or part at the *Contractor's* sole cost, unless expressly agreed in writing by the *Owner*.
- 23.9 Any review, verification, inspection, testing or witnessing of any of the *Work* or tests by the *Owner*, or omission or failure on the part of the *Owner* to perform same shall not be

construed to be an acceptance of any such *Work*, or as relieving the *Contractor* of its responsibilities pursuant to the *Contract* or the *Law*.

- 23.10 The *Contractor* shall ensure that all tools, equipment, temporary facilities and other items used in accomplishing the *Work*, whether purchased, rented, manufactured or fabricated by, or under the direction of the *Contractor*, or otherwise provided by the *Contractor* or *Subcontractors*, are safe, environmentally sound and maintained in good condition, capable of performing their required functions. Equipment certificates where identified, may be required for audit by the *Owner*. In the case of tools, meters and other devices which require calibration, the *Contractor* shall ensure that such calibration is performed on the frequency recommended by the manufacturer and in accordance with normal industry practice. Materials and equipment used in the *Work* by the *Contractor* shall conform to the *Contract*, *Owner's Requirements*, and *Law*, and shall be new unless otherwise approved by the *Owner's Representative* in writing.
- 23.11 The *Owner* reserves the right to inspect all tools and equipment brought on to the *Work Site* at any time during the progress of the *Work*. The *Owner's Representative* may require the *Contractor* to supply a qualified, independent engineering evaluation or certification that any item in question is suitable for its intended purpose, or to reject any item and require replacement with a proper and suitable item which is satisfactory to the *Owner's Representative*. If any tool or item of equipment is deemed by the *Owner* to be unsafe, environmentally unsound or incapable of doing the work for which it is intended, then the *Contractor* shall repair or replace it with a safe, environmentally sound and suitable tool or item of equipment at the *Contractor's* expense.
- 23.12 The *Owner* may, at any time during the progress of the *Work*, observe, conduct inspections or tests on any part thereof, to determine whether the *Work* is in accordance with the *Owner's Requirements*. Such observation, tests and inspections shall be at the sole expense of the *Owner*, unless the result of an observation, test or inspection determines that the *Work* is not in accordance with the *Owner's Requirements*, in which case the *Contractor* shall reimburse the *Owner* for such observation, test or inspection and redo or repair the *Work* and make ready for a further observation, or test or inspection to be performed by the *Owner*.
- .

Article 24 - Performance Tests

- 24.1 If *Performance Tests* are specified in the *Owner's Requirements*, this Article shall apply.
- 24.2 *Performance Tests* may be stipulated in the *Owner's Requirements* to be performed before, after, or both before and after *Substantial Performance* and shall be performed by that party specified in the *Owner's Requirements*.
- 24.3 Where the *Owner's Requirements* stipulate that one or more of the *Performance Tests* shall be performed after *Substantial Performance*, the *Owner* shall pay the *Contractor* for the *Work*, in accordance with this *Contract*, and may, as stipulated in the *Owner's Requirements*, hold back security until the *Work* passes the *Performance Tests*.

24.4 Unless otherwise stipulated in the *Owner's Requirements*:

- (a) the *Owner* shall provide the necessary labour, materials, electricity, fuel, heat, chemicals, disposal of fluids and materials and water only for the *Performance Tests* identified in Section 22.3 above;
- (b) the *Contractor* shall carry out the *Performance Tests* in accordance with the manuals provided by the *Contractor* under Section 5.4; and,
- (c) the *Contractor* shall provide such guidance as specified in the *Owner's Requirements* during the course of such *Performance Tests*.

24.5 When the *Contractor* considers that the *Work* will pass the *Performance Tests*, the *Contractor* shall notify the *Owner* that the *Contractor* may perform the *Performance Tests* on, or to, the *Work*.

24.6 If the *Work* or part thereof, passes one or more *Performance Tests*, the *Owner* shall promptly give notice acknowledging the success of the same to the *Contractor*.

24.7 If the *Work* or part thereof, fails to meet one or more *Performance Tests*, the *Owner* shall promptly provide a notice of such failure to the *Contractor* and the *Owner* may:

- (a) reject such *Work*, or part thereof, which has failed to pass a *Performance Test*; or
- (b) conditionally accept such *Work*, or part thereof, on conditions which shall be stated in the notice to the *Contractor*.

24.8 If the *Work*, or part thereof, fails one or more of the *Performance Tests*, then the *Contractor* shall at *Contractor's* sole cost:

- (a) reimburse the *Owner* for all the *Owner's* direct costs in performing such failed *Performance Tests*;
- (b) prepare a report to the *Owner*, for the *Owner's* approval, proposing the alterations the *Contractor* will make to the *Work*, or part thereof, to bring the *Work* to a condition which the *Contractor* considers will pass the *Performance Tests*; and
- (c) redo or repair the *Work*, or part thereof, and repair any damage to the *Work* caused by the same in failing to meet the *Performance Test*, as required without impacting the *Contract Time*, to make such *Work*, or part thereof, ready for a repeat of the failed *Performance Tests*, provided that any faulty, damaged or defective component or part of the *Work* shall be replaced with a new component or part at the *Contractor's* sole cost, unless expressly agreed in writing by the *Owner*.

24.9 If the *Work*, or part thereof, fails to pass one or more *Performance Tests* as a result of the fault of the *Owner*, the *Owner* shall promptly issue a *Change Order* providing a *Change*

in the *Contract Time* or the *Contract Price*, or both, as the case may be, to the *Contractor* for such *Performance Tests* and the *Contractor* shall proceed with its obligations relating to the *Performance Tests* as set out in the *Owner's Requirements*.

- 24.10 If any revenue is generated from any of the *Performance Tests*, such revenue shall be to the account of the *Owner*.

Article 25 - Substantial Performance

- 25.1 Subject to Appendix B - Contract Price and when the *Contractor* considers that the *Work* is substantially performed, or if permitted by the lien legislation applicable to the *Work Site* a designated portion thereof which the *Owner* agrees to accept separately is substantially performed, the *Contractor* may apply by notice to the *Owner's Representative* for a *Certificate of Substantial Performance* not earlier than 14 days before the *Work* will, in the *Contractor's* opinion, be complete and ready for taking over by the *Owner*. Such notice shall include: a copy of all applicable test reports, inspection reports, and certifications, the warranties required by the *Contract* documents, manufacturers' guarantees or warranties without limiting the *Contractor's* warranty under Article 26 - Warranty, any necessary assignments thereof for the benefit of the *Owner*, operation and maintenance instructions for *Work* furnished under the *Contract*, all as-built record drawings required by the *Contract* documents, a comprehensive list of items remaining to be completed, and a comprehensive list of the *Deficiencies*, which are acknowledged by the *Contractor*, *Deficiency* completion dates, and for items remaining to be completed, a revised *Project* schedule. Notwithstanding any issuance of a *Certificate of Substantial Performance*, failure to include any of the items above does not alter the responsibility of the *Contractor* to complete the *Contract*.
- 25.2 After receipt of the *Contractor's* application for a *Certificate of Substantial Performance*, the *Owner's Representative* shall, no later than 10 *Work Days* after the receipt of the *Contractor's* notice, including related documentation and provided the *Contractor* has provided all necessary supporting information and documentation, and participated in any review requested by the *Owner*, the *Owner* will verify the validity of the application for the *Certificate of Substantial Performance*, and:
- (a) reject the application, giving reasons and specifying the work required to be done by the *Contractor*, which reasons shall include any Category "A" *Deficiencies*, related to the *Work* for which the application is made, and which, if not remedied, will prevent the *Owner* from making use of the *Work* for the purposes intended, and the Category "B" *Deficiencies*, related to the *Work* for which the application is made, which will not prevent the *Owner* from making use of the *Work* for the purposes intended; or
 - (b) issue the *Certificate of Substantial Performance* to the *Contractor*, stating the date on which the *Work* was substantially completed in accordance with the *Contract*, attaching a list of Category "B" *Deficiencies*, related to the *Work* for which the application is made, and which if not remedied will not prevent the *Owner* from making use of the *Work* for the purposes intended, and the *Contractor* shall cease to be liable for, and shall relinquish care, custody and

control of, such *Work* from the date of the *Certificate of Substantial Performance* and responsibility shall pass to the *Owner*.

- 25.3 If the *Owner* determines that the *Work* does not meet *Substantial Performance*, as may be further set out in the *Owner's Requirements*, the *Owner* shall provide a notice to the *Contractor* as specified in Section 25.2(a) and the *Owner's Representative* may:
- (a) order further repetition of test or inspection specified to be performed before *Substantial Performance* in the *Owner's Requirements*, or other tests or inspections necessary to determine *Substantial Performance*; or
 - (b) issue a *Certificate of Substantial Performance*, in which case, if the *Owner* so requires, the *Contract Price* shall then be reduced by such amount as may be agreed by the *Owner* and the *Contractor* (in full satisfaction of such failure only), and the *Contractor* shall then proceed in accordance with the *Contractor's* other obligations under the *Contract*.
- 25.4 If the *Owner's Representative* fails either to issue the *Certificate of Substantial Performance* or to reject the *Contractor's* application within a reasonable time, the *Contractor* shall give final notice to the *Owner's Representative* specifying that if the *Owner's Representative* fails to issue the *Certificate of Substantial Performance* or to reject the *Contractor's* application within a reasonable time, the *Contractor* may apply to the court for a declaration that the *Contract* has been substantially performed.
- 25.5 Where the *Contractor's* application for a *Certificate of Substantial Performance* is rejected by the *Owner* in accordance with 25.2(a), the *Contractor* shall not re-apply for a *Certificate of Substantial Performance* under Section 25.1 until the Category "A" *Deficiencies* are remedied.
- 25.6 If the *Contractor* is prevented from carrying out a test or inspection by a cause for which the *Owner* or one or more *Other Contractors* are responsible, the *Contractor* shall notify the *Owner* within ■ hours of such delay and if the *Contractor* is further prevented during the next ■ hours from doing so, the *Owner* shall issue a *Change Order* to compensate the *Contractor* for a change in *Contract Price* or *Contract Time*, as may be applicable.
- 25.7 Immediately following the issuance of the *Certificate of Substantial Performance* of the *Work*, the *Contractor*, will continually provide updates, no less than weekly, to the *Owner* in writing with the date for correcting *Deficiencies* and finishing the *Work*. Immediately following the issuance of a *Certificate of Substantial Performance* or the designated portion of the *Work*, the *Contractor* shall publish the certificate in the manner provided in the *Construction Lien Act*, failing which publication, the *Owner* shall be at liberty to publish and back charge the *Contractor* its reasonable costs for doing so. The *Contractor* must supply evidence to the *Owner* that the advertisement for *Substantial Performance* of the *Work* has been carried out as per the *Construction Lien Act*.
- 25.8 After a *Certificate of Substantial Performance* is issued, the *Owner* may continue to identify *Deficiencies*. Where *Deficiencies* are identified after issuance of a *Certificate of*

Substantial Performance, the Contractor shall remedy such Deficiencies pursuant to Article 26 - Warranty.

Article 26 - Warranty

- 26.1 The *Contractor* warrants that the *Work* and the *Facilities* shall be new, of good quality material, of merchantable quality and fit for its intended purpose, as described in the *Contract*, and free of any *Deficiencies*.
- 26.2 If a defect in the *Facilities* or the *Work* is discovered during the *Warranty Period* the *Contractor* shall, at its own risk and expense:
- (a) remedy without delay, and in a manner satisfactory to the *Owner*, such defects at the *Contractor's* expense, subject to, without limitation, the following:
 - (i) comply with the *Labour Requirements* and any other labour and working conditions prevailing on the *Work Site* and, if applicable, shall compensate the *Owner* for the value of labour and materials furnished by the *Owner* for the purposes of correcting any defects and for dismantling and reinstallation of any equipment, such costs and expenses to be billed to the *Contractor* by the *Owner*;
 - (ii) perform the remedy work at times convenient to the *Owner*, which may entail work outside normal working hours, and in a manner that keeps disruptions to the *Owner's* continued or contemplated operations at a minimum;
 - (iii) undertake such commercially reasonable measures required to complete the work, as directed by the *Owner* to accommodate the operations of the *Owner* or other aspects of the *Project*;
 - (iv) make such tests, inspections, excavations, examinations, or other investigations in, through, of or in the vicinity of the *Facilities* as directed and shall, if required, make good again, to the satisfaction of the *Owner*, acting reasonably, any excavations or disturbances of any property, real or personal, resulting therefrom. If, in the opinion of the *Owner* or *Other Contractors*, any imperfect work for which the *Contractor* is responsible is found in the *Work* by such investigations, the cost of such investigations and such making good shall be borne by the *Contractor*; but if, in the opinion of the *Owner* or *Other Contractors*, no such imperfect work is found by such investigations, the said cost shall be borne by the *Owner*.
 - (b) repair or replace any portion of the *Facilities* damaged as a result of such defect or damaged by the remedy of such defect;
 - (c) repair or replace all equipment, materials, supplies, or work performed by *Other Contractors*, damaged as a result of such defect, or damaged by the remedy of such defect;

- (d) repair or replace any property, including but not limited to land belonging to the *Owner*, or others, which is damaged as a result of the defect or damaged by the remedy of such defect; and
- (e) repair and restore all damage caused by the defect or to repair the defect at no extra cost to the *Owner*, unless the *Contractor's* activities causing such damage were authorized in writing and in advance by the *Owner*. The *Contractor* is advised that when municipal roads are restricted to half loads or less, the *Contractor* shall not exceed the load limits and shall receive no additional payment for having to conform to said limits.

26.3 The warranties herein shall:

- (a) cover all labour and material, including, without limitation, the costs of removal and replacement of covering materials, any mobilization, demobilization, charges and any transportation charges both ways for any materials, parts and equipment to and from the Work Site; and,
- (b) not limit or restrict any extended or other warranties on any items of equipment or material, including anything obtained as part of the *Procurement Services*, called for elsewhere in the *Contract* or otherwise provided by any manufacturer or any services provider in connection with the *Work*;
- (c) shall be performed by qualified and competent *Contractor Personnel* that do not require additional training;

however the *Contractor's* warranty obligations will not apply to the extent of a failure caused by: any defects in the *Facilities* or the *Work* due to negligent acts or negligent omissions by the *Owner*, negligent misuse of the relevant *Facilities* or the *Work* by the *Owner* including operating the *Facilities* or the *Work* outside the recommended operating levels set forth in *Operations Manuals*, or a *Force Majeure Event*.

26.4 None of the *Work* performed by the *Contractor* under this Article 26 - Warranty shall be the basis of a claim by the *Contractor* for additional compensation or damages.

26.5 Should the *Contractor* fail to remedy a defect, or commence a remedy on a defect, in accordance with Section 26.2, within [REDACTED] days of the *Owner* providing a notice to the *Contractor* to remedy the same, the *Owner* may proceed with any activities necessary to remedy the defect and the *Contractor* shall be liable to and shall reimburse the *Owner* for any and all reasonable costs and expenses incurred by the *Owner* in doing so and the *Owner* may retain and deduct such amount from payments or other monies due, or which may become due, to the *Contractor*, howsoever arising, whether under this or any other *Contract*.

26.6 The *Contractor* further warrants any and all corrective actions it performs in respect of defects appearing during the *Warranty Period* for a period of [REDACTED] months from completion of the remedial work, or if greater, the unexpired portion of the *Warranty Period*.

- 26.7 The express warranties set forth under this *Contract* are exclusive and no other warranties of any kind, whether statutory, oral, written, express or implied, shall apply.
- 26.8 Prior to application for *Substantial Performance* of the Work, and without limiting the *Contractor's* warranty under this Article 26 - Warranty, the *Contractor* shall assign to the *Owner*, to the extent assignable, the benefit of all warranties, guarantees and indemnities relating to the Work. The assignment shall expressly reserve the right of the *Contractor* to make any claims under such warranties, guarantees and indemnities and such assignment shall in no way prejudice any rights of or benefits accruing to the *Contractor* pursuant to such warranties, guarantees and indemnities.
- 26.9 The *Contractor* shall promptly advise the *Owner's Representative* of any defects in workmanship, defects, errors, omissions or mistakes in the Work that it discovers or becomes aware of during the *Contract Time* or the *Warranty Period*.
- 26.10 Neither acceptance of the Work by the *Owner*, nor payment for performance of the Work, shall relieve the *Contractor* from any responsibility for defects in the Work.

Article 27 - Artefacts and Fossils

- 27.1 Fossils, coins, articles of value or antiquity, structures and other remains or things of scientific or historic interest discovered at the *Work Site* shall, as between the *Owner* and the *Contractor*, be deemed to be the absolute property of the *Owner*.
- 27.2 The *Contractor* shall stop the Work immediately and take all reasonable precautions to prevent removal or damage to discoveries as identified in Section 27.1, and shall advise the *Owner* immediately and upon discovery of such items.
- 27.3 If the *Contractor* is delayed in performing the Work or incurs additional costs as a result of taking steps required under Section 27.2, the *Contract Time* shall be extended for such reasonable time and the *Contractor* shall be reimbursed for necessary and reasonable costs incurred as a result of the delay and as a result of taking those steps. However, if there is delay in performing the Work, the *Contractor* shall make every effort to mitigate the effects of such delay by performing any other portions of the Work. To the fullest extent possible, reimbursement for additional costs shall be based on unit prices as provided in this *Contract*. Notwithstanding anything else, no claim for extension of *Contract Time* or reimbursement of any necessary and reasonable costs may be made by *Contractor* against the *Owner* unless notice of claim to *Owner* is made within [REDACTED] *Work Days* after the commencement of delay, with sufficient details of the claim to extend the *Contract Time* and details of costs incurred to date and the amount of such costs which may be incurred if the particular delay were to continue.

Article 28 - Liquidated Damages for Delay

- 28.1 In addition to the *Contractor's* obligations pursuant to Section 39.1, in the event that the *Contractor* does not complete the Work or reach *Substantial Performance* by the date specified under the *Contract*, then the *Contractor* shall pay the *Owner* the *Liquidated Damages for Delay* set forth in Appendix D - Liquidated Damages for Delay. The *Owner*

may alternatively deduct such *Liquidated Damages for Delay* owing to *Owner* from the milestone payment associated with reaching *Substantial Performance*.

Article 29 - Health and Safety Reporting

- 29.1 The *Contractor* shall notify the *Owner* of any event, incident, or injury that results in or has the potential to result in:
- (a) any notice to be provided to a governmental authority under the *OHSA* or *WSIB*;
 - (b) any reporting to be provided to a governmental authority with respect to the environment;
 - (c) any tickets, orders or charges by the Ontario Ministry of Labour or Ministry of Environment;
 - (d) any *Work* stoppage or *Work* refusal.
- 29.2 The *Contractor* shall immediately verbally notify the *Owner* of any events, incidents or injuries that involve a critical injury or result in a fatality. All other incidents identified in 29.1(a) require the *Contractor* to verbally notify the *Owner* within twenty-four (24) hours after the occurrence of the event, incident or injury. All verbal notifications shall be followed up by a formal written report to the *Owner* within forty-eight (48) hours after the event, incident or injury.
- 29.3 The verbal and written reports to the *Owner* shall include at minimum the following information:
- (a) If an event or incident with injury - the name of injured person, trade or normal occupation, company, injury type and part of body;
 - (b) Where the event, incident or injury occurred and date and approximate time of occurrence;
 - (c) Brief description of what happened, the work being performed at the time of the event, incident, or injury, the events leading up to the incident and any details related to size, weight and type of materials and/ or equipment involved;
 - (d) Apparent cause of the event, incident or injury and corrective actions taken; and
 - (e) *Contractor* contact for further information regarding the event, incident or injury.
- 29.4 The *Contractor* and each *Subcontractor* shall provide the *Owner* with a copy of all notices, reports and documents which it is required to submit in accordance with the *OHSA*, *WSIB* and the *EPA* in respect of any event, incident or injury.
- 29.5 The *Contractor* shall be responsible for compliance with the provisions of this Article 29 - by all its personnel and *Subcontractors*.

- 29.6 Failure to comply with any of the requirements under this Article may result in the suspension of *Work* which suspension may last until the *Owner* confirms the *Contractor's* compliance, or may result in termination for cause. Any such action shall not be grounds for an extension to the *Contract Time* or an increase in the *Contract Price*.

Article 30 - Compliance with Law

- 30.1 The *Contractor* shall act in accordance with all *Policies* and the *Law* and with a view to the timely and cost effective completion of the *Work* in accordance with the *Milestones*.
- 30.2 Where there is a change in the *Law* that affects the *Project* after the effective date of this *Contract*, the *Contractor* shall be responsible for ensuring that the *Work* complies with the *Law*. If the *Contractor* considers such change to be a *Change*, the *Contractor* may make a claim for such *Change* under Section 19.9, however the determination as to whether the *Owner* or the *Contractor* are responsible to bear the costs of the *Change* will be dependent on the nature of the change in the *Law* based on the principle that there may be an adjustment to the *Contract Price* associated with a *Change* in *Law* that is specific to the *Project*, however each *Party* shall bear its own costs in respect of a *Change* in *Law* to the extent that the change in *Law* generally affects how the *Party* would be required to conduct business regardless of the *Project*.
- 30.3 The *Contractor* shall comply with and shall ensure that its employees and agents comply with and shall contractually require its *Subcontractors* and their respective employees and agents to comply with all applicable *Law* in connection with the *Work*.
- 30.4 The *Contractor* shall obtain from governmental authorities or other third parties, and pay for, those licenses, permits and approvals required by the *Law* and the *Contract* to perform the *Work*, except those licenses, permits and approvals required to be obtained by *Owner* with respect to the land-use aspects of the *Work* to be performed on the *Work Site* under Section 3.5, and except for any licenses, permits and approvals (including approval of the environmental assessment for the *Project* under the Ontario *Environmental Assessment Act*) required by the *Contract* to be obtained by the *Owner* as stipulated in the *Owner's Requirements*.
- 30.5 Subject to Section 30.2, if the *Contractor* discovers any variance between the *Law* and any *Goods*, *Procured Goods* or materials purchased or supplied by the *Contractor* or *Subcontractors*, the *Contractor* shall promptly notify the *Owner* before proceeding with the part of the *Work* affected, and shall make the necessary revisions to the *Goods*, *Procured Goods* or materials to comply with the *Law*, at the *Contractor's* expense.

Article 31 - Safety and Loss Management

- 31.1 The *Owner* and the *Contractor* are committed to safety and the application of loss management principles in the conduct of their business. The parties recognize that excellence in safety and loss management can only be achieved through the active participation of everyone, including *Subcontractors* and their respective employees, consultants and agents.

- 31.2 The *Contractor* shall have the highest regard for safety, emergency procedures and loss management at all times during the performance of the *Work*. Accordingly, the *Contractor* shall at all times be responsible for safety and loss management in the performance of the *Work*, including, but not limited to, protecting the employees of the *Owner*, the *Contractor*, *Other Contractors*, *Subcontractors*, visitors to the *Work Site* and the general public from injury or death and protecting the *Work Site*, the *Owner's* property and the property of third parties from loss or damage. Without limiting the generality of the foregoing, the *Contractor* shall comply with all safety requirements specified in the *Contract* or required by *Law*.
- 31.3 At all material times, the *Contractor* must:
- (a) Provide and maintain a safe working environment;
 - (b) Provide and maintain work amenities and facilities for safety and health;
 - (c) Ensure that *Goods and Procured Goods* and plant are arranged and maintained so that they are safe for use;
 - (d) Ensure that no persons are unduly exposed to hazards arising out of the arrangements, disposal, manipulation, organisation, working, or use of things in the *Work Site* or near the *Work Site*;
 - (e) Develop procedures for dealing with emergencies that may arise;
 - (f) Meet the first aid requirements of the WSIB as specified in Regulation 1101;
 - (g) Follow correct procedures in respect of “notifiable works” with the *OHS*A; Ensure that all procedures and requirements under *OHS*A are followed in respect of the demolition or dismantling of buildings or structures; and,
 - (h) Keep a copy of the Designated Substances Survey, Environmental Site Inspection, and Cultural Heritage Evaluation Reports, as each may be applicable, at the *Work Site* and make available to all of the *Contractor's* employees.
- 31.4 The *Contractor* shall comply with the *Health and Safety Plan* and any *Policies* relating to safety, emergency and loss management.
- 31.5 All employees, unless otherwise specified in the *Owner's Requirements*, of the *Contractor* and *Subcontractors* and all *Work Site* visitors must successfully complete any of the *Owner's* safety orientation courses and other similar courses stipulated in the *Owner's Requirements* before being allowed access to the *Work Site*, and it shall be the *Contractor's* responsibility to ensure that they have done so.
- 31.6 All employees of the *Contractor* and *Subcontractors* working at the *Owner's Site* must demonstrate that they have successfully completed applicable Safety courses at least one week prior to arrival at the *Owner's Site*. Instructions and further information for such courses is set out in Exhibit A.

- 31.7 The *Contractor* shall be the “constructor”, as that term is defined in the *Occupational Health and Safety Act*, R.S.O. 1990, c.O.1, as amended (“*OHS*”), for the *Work*.
- 31.8 The *Contractor* and each *Subcontractor* shall ensure, at no additional cost to the *Owner*, that its workers are equipped with all safeguards and personal protective equipment (“*PPE*”) necessary for the performance of the *Work* and supply of *Procured Goods* at the *Work Site*, including such safeguards and personal protective equipment as set out in Exhibit B.
- 31.9 Metal measuring tapes, metal ladders or ladders longitudinally reinforced with wire or other metallic means shall not be used at the *Work Site* unless approved in writing by the *Owner*.
- 31.10 The *Contractor* shall be responsible for the compliance with all the provisions of this Article 31 - Safety and Loss Management by its *Subcontractors*. Failure of the *Contractor* to comply with the provisions of this clause or any instructions, written or otherwise, issued by the *Owner* hereunder, may result in immediate suspension of the *Work*, or any portion thereof, or termination under the provisions of the *Contract*. Any suspension or stop work order directed or issued by any official of the Construction Health and Safety Branch, Ontario Ministry of Labour, or the *Owner* shall not be grounds for any extension to the schedule or any claims for delay resulting therefrom. A copy of any “Order to Comply”, or stop work order, or like notices pertaining to the *Work* issued by the Construction Health and Safety Branch, or other competent authority, shall be forwarded without delay to the *Owner*.
- 31.11 The *Contractor* and each *Subcontractor* shall participate, at its expense, in any accident prevention program that may be established by the *Owner* for *Work* at the *Work Site*, including participation by all site *Contractor Personnel* in regular safety meetings. Before the *Work* commencement date, the *Contractor* shall attend a Pre-Job Safety and Environment meeting and complete a Contractor Safety and Environment Pre-Job Meeting Checklist (See Appendix E - Forms). All *Contractor Personnel* who will be engaged under the *Contract* shall attend. The *Owner* will direct this meeting to outline emergency procedures, permitted areas of travel and facilities peculiar to the *Work Site*.
- 31.12 The *Owner* considers that anyone who is within two (2) meters of an unprotected edge which is over three (3) meters high is in danger of falling and consequently shall be protected by an approved “fall prevention system” consisting of either an anchored life line and body harness, or by erecting or suspending scaffolding alongside building where roofing work is being performed. Scaffolds shall have a minimum height equal to that of the roof less one (1) meter and have fully planked top platform with approved handrails.
- 31.13 The *Contractor* is responsible for providing fall protection for its *Contractor Personnel* working at three (3) meters above grade. The fall protection system must conform to the Construction Regulations of *OHS*. Fall arrest and fall protection systems must be approved by a professional engineer certified by the Association of Professional Engineers of Ontario. If a fall arrest or a travel restrict system is installed by the *Contractor*, the *Contractor* shall within one week of the award produce drawings detailing the type and the method of attachment to the structure. These drawings must be

stamped by a professional engineer certified by the Association of Professional Engineers of Ontario. The fall protection system must be installed before any other *Work* can begin. The *Contractor* shall ensure that all workers that are working at heights successfully complete an approved working at heights training program delivered by an approved training provider that conforms with the Occupational Health and Safety Awareness and Training Regulation of the OHSA before such workers perform any *Work* at heights.

- 31.14 The *Contractor* shall submit as part of its *Contractor Execution Plan*, no less than 30 days prior to entry to the *Work Site*, or such other date as set out in the *Owner's Requirements*, a detailed *Health and Safety Plan* specific to the *Work Site*. The *Health and Safety Plan* shall identify all hazards associated with the *Work*, present details of the proposed methods of eliminating, isolating, or minimizing the hazards and/or their effects, and include all related Designated Substance Surveys, Environment Site Inspections, Cultural Heritage Evaluation reports, as each may be applicable, directions and map to nearest hospital, emergency routes, list of internal and external contacts, and any other required safety details as required to complete the *Work*. The *Health and Safety Plan* will develop and implement appropriate requirements to address all of the requirements consistent with the *Owner's Policies* and safety rules.

The *Contractor's* responsibilities shall include immediate verbal reporting (followed by reporting in writing to the *Owner* within 24 hours) all accidents and injuries in the work place during the execution of the *Work*. Furthermore, where death, serious injury, or serious damage is caused the accident shall be reported immediately (by telephone or messenger) to the *Owner*. Failure to do so or to comply with any such request may result in the *Work* being required to cease until verbal and written reports and/or records are received by the *Owner*.

- 31.15 No *Work* at the *Work Site* shall commence until the *Contractor* has submitted the *Health and Safety Plan*.
- 31.16 The *Contractor* shall indemnify the *Owner* for all losses arising directly or indirectly as a result of any breaches by the *Contractor* under this Article 31 - Safety and Loss Management.
- 31.17 Should the *Contractor* at any time fail to comply with the *Health and Safety Plan* or otherwise fails to comply with the health and safety requirements specified in the *Contract*, the *Owner* may, but is not obligated to, take emergency action or may order a suspension of the whole or part of the *Contract* until deficiencies are satisfactorily attended to. Any such action shall not be grounds for an extension to the *Contract Time* or an increase in the *Contract Price*.
- 31.18 Without the *Owner's* prior consent, the *Contractor* shall not remove any *Goods* or *Free Issue Goods* from the *Work Site*, other than minor items, or vehicles used to transport *Goods* or *Free Issue Goods* or personnel of *Work Site*.
- 31.19 Any adherence to the *Owner's* health and safety requirements herein does not diminish or otherwise alter the *Contractor's* duties and obligations as "constructor" under *OHSA*.

Article 32 - Toxic and Hazardous Substances and Materials

- 32.1 As between the *Owner* and the *Contractor*, the *Owner* shall be deemed to have control and management of the *Work Site* with respect to conditions existing prior to the *Contractor* commencing the *Work*.
- 32.2 Prior to the *Contractor* commencing the *Work*, the *Owner* shall:
- (a) take reasonable steps to determine whether any toxic or hazardous substances or materials are present at the *Work Site*, and
 - (b) provide the *Contractor* with a written list of any such substances and materials.
- 32.3 Where the *Owner* has exclusive occupancy and use of the *Work Site* prior to the *Contractor* commencing the *Work*, the *Owner* shall take all reasonable steps to ensure that no person suffers injury, sickness, or death and that no property is injured or destroyed as a result of exposure to, or the presence of, toxic or hazardous substances or materials which were at the *Work Site* prior to the *Contractor* commencing the *Work*.
- 32.4 Unless the *Contract* expressly provides otherwise, the *Owner* shall be responsible for taking all necessary steps, in accordance with legal requirements, to dispose of, store, advise of, or otherwise render harmless toxic or hazardous substances or materials which were present at the *Work Site* prior to the *Contractor* commencing the *Work*.
- 32.5 If the *Contractor*:
- (a) encounters toxic or hazardous substances or materials at the *Work Site*, or
 - (b) has reasonable grounds to believe that toxic or hazardous substances or materials are present at the *Work Site*, which were not disclosed by the *Owner*, as required under Section 32.2(b), or which were disclosed but have not been dealt with as required under Section 32.4, the *Contractor* shall
 - (i) take all reasonable steps, including stopping the *Work*, to ensure that no person suffers injury, sickness, or death and that no property is damaged or destroyed as a result of exposure to or the presence of the substances or materials; and
 - (ii) immediately report the circumstances to the *Owner* in writing; and
 - (iii) In addition to the steps described in Section 32.5(b), take any further steps it deems necessary to mitigate or stabilize any conditions resulting from the toxic or hazardous substances or materials.
- 32.6 If the *Contractor* is delayed in performing the *Work* or incurs additional costs as a result of taking steps required under Section 32.5(b), the *Contract Time* shall be extended for such reasonable time and the *Contractor* shall be reimbursed for necessary and reasonable costs incurred as a result of the delay and as a result of taking those steps. However, if there is delay in performing the *Work*, the *Contractor* shall make every effort

to mitigate the effects of such delay by performing any other portions of the *Work*. To the fullest extent possible, reimbursement for additional costs shall be based on unit prices as provided in this *Contract*. Notwithstanding anything else, no claim for extension of *Contract Time* or reimbursement of any necessary and reasonable costs may be made by *Contractor* against the *Owner* unless notice of claim to *Owner* is made within 10 (ten) *Work Days* after the commencement of delay, with sufficient details of the claim to extend the *Contract Time* and details of costs incurred to date and the amount of such costs which may be incurred if the particular delay were to continue.

- 32.7 *Owner* will liable, indemnify and defend the *Contractor* any suit brought against *Contractor* based on a claim resulting from exposure to, or the presence of, toxic or hazardous substances or materials which were at the *Work Site* prior to the *Contractor* commencing the *Work*, and will pay all damages that a court awards against *Contractor* as a result of such claim, provided that *Contractor* gives *Owner*: (a) prompt written notice of such suit within 10 calendar days of the claim being made, and furnishes *Owner* with a copy of each communication, notice or other document relating to the claim; (b) full control over the defense or settlement thereof; and, (c) all reasonable information and assistance (at *Owner's* expense excluding time spent by employees or consultants of the *Contractor*) to handle the defense and settlement thereof. The *Contractor* is, however, responsible for taking all reasonable care in handling hazardous materials that may be found.
- 32.8 The *Contractor* and *Subcontractors* shall not bring on to or remove from the *Work Site*, or use, transport, or store any toxic or *Hazardous Materials* or substances at the *Work Site* except as needed in order to perform the *Work*, and then only with the prior approval of the *Owner's Representative*. If such toxic or *Hazardous Materials* or substances are required, storage in quantities sufficient to allow *Work* to proceed to the end of any current work week only shall be permitted. All such toxic or *Hazardous Materials* or substances shall be handled, used, stored, transported, dealt with and disposed of only in accordance with, and the *Contractor* shall comply with, all *Laws*, the *Contract* and the *Policies*.

Article 33 - Work Area and Clean Up

- 33.1 The *Contractor* will only use the temporary land access rights identified by the *Owner* pursuant to Section 3.6 or as otherwise permitted in writing by the *Owner's Representative*. The *Contractor* shall be responsible for keeping all its working and storage areas clean, orderly and secure.
- 33.2 The *Owner* is not responsible for theft, loss or damage to the *Contractor's* tools, equipment or materials howsoever caused, except where caused by the negligent act or omission of the *Owner* or those for whom in *Law* it is responsible.
- 33.3 During the performance of the *Work*, the *Contractor* shall comply fully with the *Contract* and the *Owner's* safety and emergency guidelines and publications regarding clean up. The *Contractor* shall clean up, remove and dispose of all surplus materials, containers, trash and debris resulting from the *Work*. Upon completion of the *Work*, or earlier termination of the *Contract*, the *Contractor* shall promptly clean up and remove all

equipment, tools and surplus materials from the *Work Site* as specified by the *Owner*, clean up any areas *Contractor* utilized on a temporary access basis, restore property as set out in Section 4.17 and shall leave the *Work Site* clean and ready for the *Owner's* use, occupancy and operation.

Article 34 - Site Access / Security

- 34.1 The *Contractor* and all *Contractor Personnel* shall obey all policies, rules, regulations and procedures established by the *Owner* regarding the assets, information, systems, and premises to which the *Contractor* has access and the *Projects* for which the *Contractor* and *Contractor Personnel* perform the *Work*. The *Contractor* agrees to ensure that such *Contractor Personnel* complete such training as required by the *Owner* related thereto.
- 34.2 The *Contractor* shall protect *Owner's* assets, property, systems, networks and computer resources to which the *Contractor* may have access, against damage including, without limitation, (i) using appropriate authentication and other measures to permit and control access only to necessary individuals (ii) with respect to cyber assets, utilizing anti-virus and malicious software prevention tools to detect, deter, prevent and mitigate the introduction, exposure and propagation of malware, (iii) be alert to and immediately notify *Owner* of any security events or incidents, (iv) follow industry standard as well as *Owner's* procedures for protection and secure access, storage, transit, use, destruction and disposal of *Owner* information, and (v) follow all rules and requirements established by *Owner* related thereto.
- 34.3 Where any *Goods* or *Procured Goods* are provided or *Work* is to be performed regarding any of the *Owner's* assets, systems, offices, properties, or *Owner's Site*, or any *Contractor Personnel* are expected to have access to any *Confidential Information* or *Proprietary Information* of the *Owner*, the *Contractor*:
- (i) upon *Owner's* request, will provide a list of such *Contractor Personnel* that require access to any of *Owner's* assets, properties, systems or premises or *Confidential Information* or *Proprietary Information*;
 - (ii) if asked by the *Owner*, will complete and submit to *Owner*, at *Contractor's* expense, a *Personnel Risk Assessment* in respect of relevant *Contractor Personnel* as requested by the *Owner*; and
 - (iii) shall provide and shall be responsible to have *Contractor Personnel* provide to the *Owner* such personal and other information as the *Owner's* security and other authorized representatives may reasonably require for the purposes of such security and reference checks as the *Owner*, in its discretion, may deem necessary.
- 34.4 Commencement of *Work* and access to the *Owner's* assets, systems, offices, property, *Owner's Site* and/or *Proprietary Information* or *Confidential Information* is subject to the following:

Where any of the *Work* under the *Contract* involves the *Contractor* or *Contractor Personnel* having any of the following:

physical access, or electronic access as a super user (including root, administrator), or access as system support, developer, system control operator or general user access to certain critical assets, cyber assets, system or system control assets or information, or providing *Goods* or *Procured Goods*, patches or updates to such assets, systems or information;

the *Contractor*, after submitting a *Personnel Risk Assessment* to the *Owner*, must have first received written approval from the *Owner* that each such *Contractor Personnel* requiring such access has, in the *Owner's* determination, acceptable security clearance before commencing or continuing the *Work*; and, shall require such *Contractor Personnel* to present such proof of such approval prior to access to *Owner's* assets, systems, offices, properties, *Owner's Site* or any *Confidential Information* or *Proprietary Information* to the extent required by the *Owner*.

- 34.5 Notwithstanding any *Owner* approval of a *Personnel Risk Assessment* or permission provided by the *Owner* to access any of *Owner's* assets, systems, offices, property and/or any *Owner Site* or *Confidential Information* or *Proprietary Information*, the *Contractor* will remain completely responsible and liable for all actions and failures to act of all *Contractor Personnel* and will not be relieved of any of its obligations under this *Contract*.
- 34.6 If any *Contractor Personnel* cease to be employed or engaged by the *Contractor*, or is reassigned or no longer requires access to *Owner's* assets, properties, systems, premises or *Proprietary Information* or *Confidential Information* for the performance of the *Work*, or the security status of any *Contractor Personnel* changes during the term of the *Contract*, *Contractor* shall immediately notify the *Owner* and shall revoke access and immediately cease using the *Contractor Personnel* to perform the *Work* under the *Contract*.
- 34.7 Where there is a change in the security status of any *Contractor Personnel*, the *Contractor* will immediately provide an updated *Personnel Risk Assessment* and shall not allow such *Contractor Personnel* access to *Owner's* assets, properties, systems, premises or *Proprietary Information* or *Confidential Information* or utilize such *Contractor Personnel* for the performance of the *Work* until such time as the *Contractor* receives written approval from the *Owner*. In such an event, the *Contractor* shall endeavour to diligently complete the *Work* in accordance with the schedule set forth in the *Contract* and, if necessary, will increase the level of effort necessary to ensure the schedule is maintained. Any price or funding limitations shall not be exceeded without the *Owner's* prior written authorization, notwithstanding any extra efforts required to maintain the schedule.
- 34.8 In addition to any other remedy that the *Owner* may have against the *Contractor* as a result of the *Contractor's* failure to comply with all of the terms set out herein, the *Contractor* shall, to the extent that delay in providing the said *Work* occurs as a result of the non-delivery of signed and witnessed documents that are required by the *Personnel Risk Assessment*, be liable to the *Owner* for all damages arising out of the said delay.

- 34.9 The *Owner* retains the right to stop all or any part of the *Work*, remove any *Contractor Personnel*, revoke access at any time and/or terminate for cause the *Contract* should the *Owner* in its sole discretion determine that any *Contractor Personnel* is a security risk and/or the information provided in the *Personnel Risk Assessment* was misleading or incorrect.
- 34.10 Access to the *Work Site* will be on approved access routes as determined by the *Owner*. Location of the access routes may be more specifically outlined in the *Procurement Documents* and will be more fully described at the site meeting. The *Contractor* shall be liable for any and all damages and or injuries incurred should the *Contractor* deviate from such approved access routes.
- 34.11 The *Owner* shall have the right to examine or search equipment, tools, and materials brought to or removed from the *Work Site* by the *Contractor* or by any *Subcontractor*. If requested, the *Contractor* and each *Subcontractor* shall deposit with the *Owner* or its security officer an itemized list of all equipment, tools, and materials at the time they are brought to the *Work Site*. The list will be used by the *Owner* or its security staff when checking such equipment, tools, and materials into and out of the *Work Site* at any security gate.
- 34.12 The *Owner's* security staff shall also have the right to examine, inspect or search at any time, in the presence of the *Contractor's* or the *Subcontractor's* representative, any *Contractor* or *Subcontractor* enclosure on the *Work Site*, including the *Contractor's* and *Subcontractor's Goods*, storage bins, tool cribs, boxes, and vehicles.
- 34.13 The *Owner* and *Owner's Representative* may at any time and for any purpose enter upon the *Work Site* and premises used by the *Contractor* and the *Contractor* shall provide proper and safe facilities therefore. Utilities representatives may also enter upon the *Work Site* and premises used by the *Contractor* for all purposes which may be required by their contracts. The *Contractor* shall furnish proper facilities to secure convenient access to all parts of the *Work Site* as may be required by the *Owner* and *Owner's Representative*.

Article 35 - Title, Responsibility and Proprietary Information

- 35.1 Except for any proprietary processes of the *Contractor* listed in Appendix A - *Owner's Requirements* and the ownership rights in any *Licensed Software*, and subject to Section 35.2, all of the *Work* shall belong to the *Owner*, and accordingly the *Contractor* shall have no proprietary right or interest in the *Work*. The *Contractor* shall not use, copy or disclose any of the *Owner's Requirements* or the *Work* for any purpose other than performing the *Work*. Subject to the foregoing, the *Contractor* may retain solely for its own records a copy of the plans and specifications. The *Contractor* shall keep and maintain adequate and current records of all *Proprietary Information*.
- 35.2 Notwithstanding Section 35.1, and except for *Licensed Software*, where a technology, process or work method is pre-existing and belongs to, or is independently developed by the *Contractor* or *Subcontractor* and is not part of the *Work* set out to be delivered to the *Owner* in the *Owner's Requirements* nor the result of *Confidential Information* provided

by the *Owner*, the proprietary rights to that technology, process or work method shall remain with the *Contractor* or *Subcontractor*, as the case may be. Except for *Licensed Software*, where proprietary rights that relate to the *Work* remain with a party other than the *Owner*, then the *Owner* and its assignees shall, and are hereby granted, a perpetual right and irrevocable license without charge to have, retain and make copies, exercise and use such proprietary rights (including as may relate to the Engineering Services or any As-Built Drawings), for the purpose of the *Work* and the operation, repair, maintenance, re-building or renovation of the Facilities or the *Work* or any portion thereof, or otherwise for any purposes in connection with the *Owner's* operations.

35.3 Notwithstanding Section 35.1, or any other provision of the *Contract*, the *Contractor* shall be responsible for possession of the *Engineering Services* until received by the *Owner*. If the *Engineering Services*, or any part thereof is lost, damaged or destroyed prior to receipt by the *Owner*, then the *Engineering Services*, or portion thereof, as applicable, shall be promptly redone and replaced by the *Contractor*, at its expense, unless the loss, damage, or destruction was caused by the *Owner* or persons for whom at *Law* it is responsible.

35.4 Subject to the *Owner's* rights under Section 22.5, the *Owner* agrees that it shall not:

- (a) sell to third parties the *Engineering Services*, except as part of the sale of the *Project*;
- (b) use the *Engineering Services* to build other facilities, plants or structures of a similar nature or purpose, unless such use is in respect of or in connection with *Owner's* business, operations, or activities; or
- (c) distribute the *Engineering Services*, to third parties except for the purpose of operating, maintaining, repairing or replacing, re-building or renovating the *Owner's* property encompassing or relating to the *Work*, or, for the purpose of performing other work directly or indirectly related to the *Work*, or, for the purpose of performing other work in respect of or in connection with the *Owner's* business, operations, or activities.

If the *Owner* alters the *Engineering Services* in any way or uses the *Engineering Services* on work or for purposes other than the *Project* for which they were provided, the *Owner* shall, to the fullest extent of the law, release, indemnify, and hold harmless the *Contractor* from all claims against the *Contractor* arising out of such use of the *Engineering Services* and/or which are attributable to such alterations of the *Engineering Services*.

35.5 All rights, title and interest to all *Work* completed or in the course of construction at the *Work Site* and all *Goods* and *Procured Goods* (except *Licensed Software*) and all software newly created by *Contractor* for the *Project* delivered to *Owner* as part of the *Work*, except tools and equipment owned or rented by the *Contractor* or *Subcontractors* and not intended to be incorporated into or delivered as part of the *Work*, shall become the property of the *Owner* upon the earlier of payment by the *Owner* on account thereof or delivery to the *Work Site* or such other site as designated by the *Owner*.

- 35.6 Notwithstanding the provisions of Section 35.5, until the *Owner* has issued a *Certificate of Substantial Performance* or a *Final Completion Notice*, whichever is earlier, the *Contractor* shall retain all risk with respect to and be responsible for:
- (a) all items supplied by the *Contractor* or its *Subcontractors* which are to be incorporated into, provided as part of the *Work* or used in performance of the *Work*;
 - (b) all items supplied by the *Owner* to the *Contractor* for incorporation into the *Work* or for use in performing the *Work*, including the *Free Issue Goods*; and
 - (c) all temporary structures or facilities used in the performance of the *Work*; and
 - (d) any *Work* completed or in progress.
- 35.7 No materials, supplies or equipment incorporated into the *Work* shall be subject to any general security agreement, chattel mortgage, financing contract or other agreement by which an interest therein is retained by the seller, or any other party.

Article 36 - Patents and Licenses

- 36.1 The *Contractor* shall defend, indemnify and save the *Owner* harmless from all claims costs and demands, including legal fees, arising out of any patent, trademark, copyright, industrial design or other intellectual property infringement pertaining to the *Work* or any equipment, machinery, *Licensed Software*, materials, compositions, processes, methods or designs supplied by the *Contractor*, or its *Subcontractors*, in the performance of, or in connection with, the *Work*.
- 36.2 The *Contractor* shall promptly give notice to the *Owner* if the *Contractor* has or acquires knowledge of any patent, trademark, copyright, industrial design, intellectual property or similar right under which an action could reasonably be expected to be maintained because of the *Work* or use or purchase by the *Owner* of equipment, machinery, *Licensed Software*, materials, compositions, processes, methods or designs incorporated or to be incorporated by the *Contractor* as part of the *Work*. The *Contractor* shall not incorporate any such equipment, machinery, software, materials, compositions, processes, methods or designs into any plans, drawings, specification or other documents, or use the same in connection with the *Work* without the *Owner's* prior approval.
- 36.3 The *Contractor*:
- (a) grants the *Owner* a non-exclusive, worldwide, royalty-free, perpetual, irrevocable license for the purpose of operating and maintaining the Facilities and the *Owner's* other operations:
 - (i) to copy, distribute, modify and use any and all patents, *Contractor Software*, industrial designs, copyrights, drawings (including, without limitation, electronic or computer drawings), methods, designs, process and technology and any other intellectual property related to the *Work*, that the *Contractor* owns or controls; and

- (ii) to make, have made and use the equipment, machinery, materials, compositions, designs, methods and processes supplied by the *Contractor* under the *Contract*;

If the *Owner* alters any of the foregoing intellectual property in any way or uses any of the foregoing intellectual property on work or for purposes other than the *Project* for which they were provided, the *Owner* shall, to the fullest extent of the law, release, indemnify, and hold harmless the *Contractor* from all claims against the *Contractor* arising out of such use of any of the foregoing intellectual property and/or which are attributable to such alterations of any of the foregoing intellectual property.

- (b) agrees to provide to *Owner* at no additional cost such fixes, updates, upgrades and new releases to the *Contractor Software* as necessary to ensure that the *Contractor Software* operates in accordance with the specifications;
- (c) with respect to *Third Party Software*:
 - (i) represents and agrees that it has all necessary rights and is validly entitled to provide, distribute and sublicense as applicable any and all *Third Party Software* that may be provided to *Owner* pursuant to this *Contract*;
 - (ii) represents and agrees that all third party licensors of such *Third Party Software* have granted to *Owner* a non-exclusive, worldwide, royalty-free, perpetual, irrevocable license to use such *Third Party Software* for the purpose of the *Work* and the operation, repair, maintenance, re-building or renovation of the *Work* and the *Facilities* or any portion thereof;
 - (iii) represents and agrees that the *Third Party Software* shall not, and the license to the *Third Party Software* shall not create, or purport to create, obligations on the *Owner* to, provide information, deliver data, or report usage of the *Third Party Software* to any third party;
 - (iv) represents and agrees that the license to the *Third Party Software* will not subject the *Owner* to license terms more onerous than the license terms set out in this *Contract*; and
 - (v) represents and agrees that it will provide, or the owner and/or licensor of the *Third Party Software* will provide, to *Owner* at no additional cost such fixes, updates, upgrades and new releases to the *Third Party Software* as necessary to ensure that the *Third Party Software* operates in accordance with the specifications.

36.4 The rights granted to the *Owner* by the *Contractor* under Section 36.3 shall be assignable by the *Owner* to any party to whom the *Owner* may transfer all or part of title to the *Work* or the *Project* or any other *Owner's* operations.

- 36.5 The *Owner* shall be entitled, at its own expense, to participate in or conduct the defence of any claim with respect to which it is entitled to indemnity under Section 36.1 and to settle any claim for which it has accepted responsibility but the *Owner* shall not be liable to indemnify any other party for payment of any settlement unless it has consented to the settlement.

Article 37 - Confidential Information and Publicity

- 37.1 Each party shall keep all *Confidential Information* (and, subject to Section 35.1, the *Contractor*, shall keep Proprietary Information) in confidence and shall not disclose it to others without the prior approval of the other party. The *Contractor* shall not use the *Confidential Information* or, subject to Section 35.1, *Proprietary Information*, except in performance of the *Work*.
- 37.2 Notwithstanding Section 37.1 the *Contractor* may disclose *Confidential Information* to those of its affiliates, employees, *Subcontractors* and their respective employees to whom disclosure is required in order for the *Contractor* to perform the *Work*, provided the *Contractor* shall ensure that its employees and agents comply with, and shall contractually require its *Subcontractors* and their respective employees and agents to comply with Section 37.1.
- 37.3 The *Contractor* shall not disclose any of the *Owner's Requirements* or the *Work* to others without the prior approval of the *Owner's Representative*, except as necessary to perform the *Work*.
- 37.4 Notwithstanding Section 37.1 or Section 37.3, *Confidential Information* may be disclosed by a party if that party is required to disclose the *Confidential Information* by law. If disclosure is required by law, the disclosing party shall provide the other party with immediate notice, to the extent permitted by law, and shall only disclose the minimum amount of *Confidential Information* to comply with such law.
- 37.5 The *Contractor* shall not use the *Owner's* name, or the names of any of its affiliates and the registered or unregistered trademarks of the *Owner* or its affiliates, or use the project name or project description, or any information in connection with the *Contract* in any slogans or otherwise in any advertising or promotional materials or publicity releases, and shall not take, permit to be taken or use any photographs of the *Work Site*, without the prior approval of the *Owner's Representative*.
- 37.6 The *Contractor* shall not erect or permit the erection of any sign or advertising at the *Work Site* without the prior written approval of the *Owner*. The foregoing does not preclude the erection or posting of signs or notices required by *Law*, or for signs and notices in relation to health and safety at the *Work Site*, or for signs and notices necessary for the *Contractor's* operations at the *Work Site* provided that such signs and notices are generic and do not have an advertising or promotional element to them.
- 37.7 In no event shall the *Contractor* enter upon, or allow its equipment to enter upon, private property without first obtaining approval from the respective property owner in writing, and the *Contractor* shall present such written approval to the *Owner* upon request. The

Contractor will also comply with the real estate requirements as further set out in the *Owner's Requirements*.

- 37.8 The *Contractor* and all *Contractor Personnel* shall conduct themselves in a manner conducive to the maintenance of good public relations for the *Owner*.
- 37.9 The *Contractor* will also comply with the *Public Relations and Communications Program*.
- 37.10 If during the performance of the *Work*, the *Contractor* receives complaints or enquiries to which the *Contractor* is not qualified to respond, the name of the complainant or the person making the enquiry shall be recorded along with their name, address, and telephone number. The *Contractor* shall make a written report of the incident to the *Owner*.

Article 38 - Force Majeure

- 38.1 Either the *Owner* or the *Contractor* may claim that an *Event of Force Majeure* has taken place, by giving the other party verbal notice within 24 hours of the *Event of Force Majeure*, and, in addition, notice, together with a proposed plan of corrective action to resolve or minimize the effect of the *Event of Force Majeure*, within 48 hours of the *Event of Force Majeure*.
- 38.2 If the *Owner* has given a notice of an *Event of Force Majeure*, or the *Owner* agrees with a notice of an *Event of Force Majeure* issued by the *Contractor* that the *Work* or a portion thereof is affected by an *Event of Force Majeure*, then the *Owner* shall:
- (a) cause the *Contractor* to complete the *Work*, with such time adjustments to the *Contract Time* as are required by the *Event of Force Majeure*; or
 - (b) suspend the *Work* or any portion thereof in accordance with Article 41 - Suspension; or
 - (c) terminate the *Contract* or any portion thereof in accordance with Section 42.1 and Section 43.5(f).
- 38.3 If the *Owner* does not agree that the *Work* or any portion of the *Work* is affected as a result of an *Event of Force Majeure* for which the *Contractor* has given notice under Section 38.2, then the *Contractor* shall complete the *Work* in accordance with the *Contractor Execution Plan* and may request an adjustment to the *Contract Time* and the *Contract Price* in the manner provided in Section 19.9.
- 38.4 If an *Event of Force Majeure* exists and continues for a period in excess of 180 continuous *Work Days* and results in substantially all of the *Work* being stopped or suspended during that period, either the *Owner* or the *Contractor* may terminate the *Contract* upon written notice to the other party citing the *Event of Force Majeure* and the *Owner* shall pay the *Contractor* for the *Work* performed to the date of termination.

- 38.5 Any delay or failure on the part of either the *Owner* or the *Contractor* which is a result of an *Event of Force Majeure*, shall not constitute default hereunder or give rise to any claim for damages or result in any increase to the *Contract Price*.
- 38.6 An *Event of Force Majeure* can occur at any time regardless of whether or not *Work* has commenced. If *Work* has not commenced, an *Event of Force Majeure* may change the *Commencement Date*.

Article 39 - Delays Caused by the Contractor

- 39.1 If the *Contractor* is responsible for a delay in the progress of the *Work* with respect to a *Critical Activity*, or fails to complete any portion of the *Work* within the time limits set forth in the *Contractor Execution Plan* with respect to a *Critical Activity*, then the *Contractor* shall promptly notify the *Owner* upon becoming aware of the delay and, within [REDACTED] *Work Days* of becoming aware of the delay, at no additional cost to the *Owner*, provide a recovery plan and commence to perform whatever acts are required or requested by the *Owner's Representative* to make up the lost time and to avoid any further delay in the performance of the *Work*, including, without limitation, work overtime, and acquire and use any necessary additional labour and equipment.

Article 40 - Delays not Caused by the Contractor

- 40.1 If the *Contractor* is delayed in the performance of the *Work* by an act or omission of the *Owner* or *Other Contractors* contrary to the provisions of the *Contract*, then the *Contract Time* shall be extended for such reasonable time as may be necessary to allow the *Contractor* to make up the delay.
- 40.2 If the *Contractor* is delayed in the performance of the *Work* by any failure of the *Owner* to obtain licenses, permits and approvals required to be obtained by the *Owner* with respect to the land-use aspects of the *Project* set out in the approved *Real Estate Plan* necessary for the *Contractor* to perform the *Work* on the *Work Site*, then the *Contract Time* shall be extended for such reasonable time as may be necessary to allow the *Contractor* to make up the delay.
- 40.3 If the *Contractor* is delayed in the performance of the *Work* by an order issued by a court or other public authority having jurisdiction, providing that such order was not issued as the result of an act or fault of the *Contractor*, then the *Contract Time* shall be extended as agreed by the parties or as resolved under Appendix F - Dispute Resolution Procedure.
- 40.4 If the *Contractor* is forced to shut down all or a portion of its operation by reason of:
- (a) any act or omission of the *Owner* or of any *Other Contractor*;
 - (b) failure of the *Owner* to provide the *Work Site*; or
 - (c) an error or omission in the *Owner's Requirements*; then

the *Contractor* shall give to the *Owner* notice of such shut-down, within 6 hours of such shut-down, indicating the number and classification of persons and number and description of equipment affected thereby.

- 40.5 In the event of a delay pursuant to Section 40.4, the *Contractor* shall be reimbursed by the *Owner* in accordance with the rates set out in Appendix B - Contract Price or its reasonable costs incurred.
- 40.6 No claim for delay and no extension of time on account of delay shall be made by the *Contractor* unless notice of claim with a *Change Quotation* is given to the *Owner* not later than 5 *Work Days* after the commencement of delay, provided however, that in the case of a continuing cause of delay only one notice of claim shall be necessary. Notwithstanding anything else, no claim for delay or extension of time, whether reasonable or not, may be made by the *Contractor* unless notice of claim with a *Change Quotation* is made within 5 *Work Days* after the commencement of delay, with sufficient details of the alleged delay and reasonable costs incurred to date and the reasonable costs that may be incurred if such delay were to continue.

Article 41 - Suspension

- 41.1 In addition to any other right that the *Owner* may have under the *Contract* or at *Law*, the *Owner* may, at any time or times, by notice to the *Contractor* specifying the effective date of the suspension, require the *Contractor* to suspend the *Work*, or any portion thereof, and this shall also include the *Owner's* right to suspend or delay the *Commencement Date*.
- 41.2 Upon providing notice under Section 41.1, the *Owner* shall arrange to immediately discuss with the *Contractor* the specific requirements of the suspension and whether or not the *Owner* anticipates that demobilization, remobilization or idle equipment or *Contractor Personnel* will occur as a result of the suspension.
- 41.3 Upon receiving notice, the *Contractor* shall discontinue the *Work* identified in Section 41.1, being the *Suspended Work*, place no further purchase orders or subcontracts with respect to the *Suspended Work*, and promptly make reasonable efforts to obtain suspension terms satisfactory to the *Owner* with respect to all purchase orders, subcontracts, supply contracts and rental agreements related to the *Suspended Work*. The *Contractor* shall continue to perform all other portions of the *Work* which have not been suspended by the *Owner*.
- 41.4 Where requested by the *Owner*, the *Contractor* shall advise the *Owner* of:
- (a) the number of the *Contractor Personnel* made idle by the suspension;
 - (b) the labour costs resulting from the *Contractor Personnel* made idle by the suspension;
 - (c) transportation costs for the *Contractor Personnel* released during the suspension;

- (d) the equipment made idle and associated equipment costs resulting from the suspension; and
 - (e) any other costing, labour, material or equipment information relating to the suspension that the *Owner* may require.
- 41.5 The *Owner* may at any time authorize resumption of the *Suspended Work* or any part thereof, by giving the *Contractor* reasonable notice specifying the part of the *Suspended Work* to be resumed and the effective date of such resumption. The *Contractor* shall resume the *Suspended Work* on the date and to the extent specified in the notice provided that if the date for resumption is more than [REDACTED] days after the date of suspension, the *Contractor* may, by *Change Quotation* given within [REDACTED] days of receipt of the notice of resumption, request a *Change Order* deleting the *Suspended Work* from the *Contract*.
- 41.6 The *Contractor* shall use its employees, equipment and materials in such manner, and take such other steps as may be necessary or desirable to minimize the costs associated with the *Suspended Work*. During the period of *Suspended Work*, the *Contractor* shall secure and protect the *Suspended Work* and all materials and equipment to be used or incorporated therein.
- 41.7 In relation to *Suspended Work*, the *Owner* shall reimburse the *Contractor* for those out-of-pocket costs that could not be avoided, exclusive of profit or mark-up, reasonably incurred by the *Contractor* as a direct result of the suspension of the *Work* in accordance with Appendix B - Contract Price. The *Owner* shall not be liable for any damages or loss of profits on account of the *Suspended Work* or any part thereof, or the deletion of *Suspended Work* from the *Contract*.

Article 42 - Termination for Convenience

- 42.1 In addition to any other rights that the *Owner* may have under the *Contract* or in *Law*, the *Owner* may, at any time, terminate the *Contract*, the *Work* or any portion thereof by giving notice to the *Contractor* specifying the *Work* or portion thereof to be terminated and the effective date of the termination.
- 42.2 Upon receipt of a notice under Section 42.1, the *Contractor* shall discontinue the *Work* in accordance with the notice, and shall take whatever steps are necessary or desirable to terminate the *Work* in a safe, cost effective and timely manner with due consideration to environmental impacts. The *Contractor* shall continue to perform all other portions of the *Work* not terminated, if any, in accordance with the *Contract*.
- 42.3 In the event of such termination pursuant to Section 42.1, the aggregate amount to which the *Contractor* will be entitled shall not exceed:
- (a) the amounts due on account of *Work* properly performed and approved by the *Owner* as having been performed in compliance with the *Contract* prior to the date of such termination (provided the *Contractor* has paid or pays all costs comprising part of the cost of the *Work* in full and provided reasonable evidence

thereof to the *Owner*), and provided no dispute exists between or among any of the *Project* participants with respect to any such amount being due and payable; plus

- (b) *Subcontractor's* actual and reasonable cancellation costs reasonably and properly incurred by the *Contractor* as the result of such termination, provided the *Owner* has first approved such cancellation costs after having reviewed the details thereof and in making its decision to direct the *Contractor* to terminate any such *Subcontract*; plus
- (c) Subject in all cases to the *Owner* being informed of all details relating thereto and the prior written approval of the *Owner* being obtained (which approval may not be unreasonably withheld), reasonable and necessary demobilization costs defined to include, without limitation, equipment dismantling, transportation to *Contractor's* storage facility or to *Owner's* facility, non-*Contractor* owned lease or rental cancellation costs, provided that such demobilization costs shall be at the lowest actual reasonable cost available and the *Contractor* shall have reasonably substantiated that it has used its best efforts to achieve such lowest available cost; plus
- (d) The reasonable and necessary costs incurred and paid or to be paid by the *Contractor* to make the Site safe and to comply with any other obligations imposed by the relevant authorities (and the *Contractor* shall provide reasonable evidence of such costs to the *Owner*).

42.4 Except as described in Section 42.3, the *Contractor* shall not be entitled to any additional reimbursement on account of any termination pursuant to Section 42.1, notwithstanding any other provision of the *Contract*.

Article 43 - Termination for Cause

43.1 Without limiting the generality of Section 42.1, the *Owner* may immediately terminate the *Contract* by notice to the *Contractor* in any of the following circumstances:

- (a) if the *Contractor* becomes insolvent or makes a general assignment for the benefit of its creditors, enters into a plan of arrangement for the benefit of its creditors or otherwise acknowledges its insolvency or if a bankruptcy or receiving order is filed or made against the *Contractor*;
- (b) if an order is made or resolution is passed for the winding up or liquidation of the *Contractor*;
- (c) if a custodian, receiver, manager or other officer with similar powers is appointed in respect of the *Contractor* or any of the *Contractor's* property;
- (d) if the *Contractor* ceases to carry on business in the ordinary course;



- (f) if the *Contractor's* aggregate liability for *Liquidated Damages For Delay* reaches 100% of that limit of *Liquidated Damages For Delay*; or
 - (g) if a creditor takes possession of any of the *Contractor's* property or if a distress, execution or any similar process is levied or enforced against such property and remains unsatisfied by the *Contractor*.
- 43.2 Upon receipt of a notice pursuant to Section 43.1, the *Contractor* shall discontinue the *Work* in accordance with the notice, and shall take such steps as may be necessary or desirable to minimize the costs associated with the termination of the *Work*.
- 43.3 In addition to any rights the *Owner* may have at *Law*, if the *Contractor* is in default in carrying out any of the terms, conditions, covenants or obligations of the *Contract*, or has made a false representation, declaration or warranty, the *Owner* may give the *Contractor* notice of default.
- 43.4 Where the *Owner* gives the *Contractor* a notice of default pursuant to Section 43.3, the *Contractor* shall have [REDACTED] *Work Days* immediately following receipt of the notice, or such longer time as the *Owner* determines to be reasonable and has specified in the notice of default or has subsequently agreed upon in writing, to remedy such default, or commence to prosecute a remedy with diligence. If, in the *Owner's* reasonable opinion, the *Contractor* fails to remedy, or take all steps to diligently remedy, the default, the *Owner* may after an additional [REDACTED] *Work Days'* notice to the *Contractor* terminate the whole or any part of the *Contract*.
- 43.5 In the event the *Contract* or any portion of the *Work* is terminated pursuant to Section 43.1 or Section 43.4:
 - (a) the *Contractor* shall discontinue the *Work* in accordance with the notice and shall take such steps as may be necessary or desirable to minimize the costs to the *Owner* associated with the termination of the *Work* and the *Owner* shall not be liable for those costs incurred by the *Contractor* as a result of the termination of the *Work*;
 - (b) the *Owner* shall have the right to take possession of the *Goods, Procured Goods* and the *Contractor's* equipment, materials and plant and shall have the right to use the same to complete the *Work*;
 - (c) the *Contractor* shall execute and deliver to the *Owner* all documents required by the *Owner*, and shall take all steps required by the *Owner*, to assign to and fully vest in the *Owner* the rights and benefits of the *Contractor* under existing agreements with the *Contractor's Subcontractors*, which are related to the *Work*;
 - (d) the *Owner* may complete or have others complete the *Work* at the *Contractor's* expense;

- (e) the *Owner* may realize, or call upon, any security, bond, guarantee, or similar instruments or documents, furnished by the *Contractor* in connection of the *Contract*;
- (f) the *Owner* shall pay the *Contractor* for all *Work* satisfactorily performed to the date of termination, in accordance with Article 13 - Payment, less the sum of any monies already paid to the *Contractor* and any additional cost, loss or expense, including legal fees, that the *Owner* incurs, suffers or sustains, including any amount the *Owner* must pay to obtain satisfactory completion of the *Work* by others; and,
- (g) the *Owner* shall not be liable for any penalties, damages or loss of revenue or profits as a result of the termination of the *Work* or the *Contract* by the *Owner*.

43.6 The *Contractor* may immediately terminate the *Contract* by notice to the *Owner* in any of the following circumstances:

- (a) if the *Owner* becomes insolvent or makes a general assignment for the benefit of its creditors, enters into a plan of arrangement for the benefit of its creditors or otherwise acknowledges its insolvency or if a bankruptcy or receiving order is filed or made against the *Owner*;
- (b) if an order is made or resolution is passed for the winding up or liquidation of the *Owner*;
- (c) if a custodian, receiver, manager or other officer with similar powers is appointed in respect of the *Owner* or any of the *Owner's* property;
- (d) if the *Owner* ceases to carry on business in the ordinary course; or
- (e) if a creditor takes possession of any of the *Owner's* property at the *Work Site* or if a distress, execution or any similar process is levied or enforced against such property and remains unsatisfied by the *Owner*.

43.7 Subject to a legitimate dispute between the parties, or a dispute being pursued in accordance with Appendix F - Dispute Resolution Procedure, should the *Owner* be in material default of its obligations under this *Contract*, the *Contractor* may provide a written notice in [REDACTED] *Work Days* to the *Owner* that should the material default not be remedied, or the *Owner* commence to prosecute a remedy in relation to the material default, that the *Contractor* may suspend or terminate the *Contractor's* obligations under the *Contract*.

43.8 The rights and remedies provided in this Article 43 - Termination for Cause are in addition to the rights and remedies provided by the *Law*, or under any other provision of the *Contract*.

Article 44 - Taxes

44.1 The *Contractor* shall be responsible for the payment of:

- (a) all taxes imposed by reason of the performance or completion of the *Work* including but not limited to license, permit and registration fees and the *Contractor's* income, profit, franchise, business, and personal property taxes;
 - (b) all employment taxes and contributions imposed by the *Law* or required to be paid on behalf of the employees of the *Contractor* or its *Subcontractors*, including but not limited to taxes and contributions for income tax, workers' compensation, unemployment insurance, old age benefits, welfare funds, pensions and annuities and disability insurance;
 - (c) all taxes, other than property taxes, on the *Work Site* and arising out of the *Work*, to the date of *Substantial Performance*; and
 - (d) all customs, sales and excise taxes and duties owing with respect to any labour, machinery, materials and equipment to be supplied by the *Contractor* and used in performance of or incorporated into the *Work*, except for *GST/HST* payable by the *Owner* with respect to payments due to the *Contractor*.
- 44.2 Any increase in taxes and charges described in Section 44.1(a) and Section 44.1(b) shall be the sole responsibility of the *Contractor*. In the event of an increase in taxes or charges described in Section 44.1(c) and 44.1(d), the *Contractor* shall be entitled to a *Change Order* altering the *Contract Price* to account for the difference between the amount of tax that would have been payable by the *Contractor* as of the effective date of this *Contract* and the actual amount of tax that becomes payable as a result of the tax increase.
- 44.3 In the event of a decrease in taxes or charges described in Section 44.1(c) and 44.1(d), the *Owner* shall be entitled to a *Change Order* altering the *Contract Price* to account for the difference between the amount of tax that would have been payable by the *Owner* as of the effective date of this *Contract* and the actual amount of tax that becomes payable as a result of the tax decrease.
- 44.4 The *Contractor* shall indemnify and hold the *Owner* harmless from any liability resulting from the failure of the *Contractor* or its *Subcontractors* to withhold, deduct, collect or make timely payments of the items referred to in this Article 44 - Taxes or such similar items for which the *Contractor* is responsible. Any interest, penalties or other liabilities arising from such failure shall be the sole responsibility of and be paid for by the *Contractor*.

Article 45 - Workers' Compensation

- 45.1 The *Contractor* shall ensure all its employees and representatives engaged in the performance of the *Work* are registered for workers' compensation coverage in accordance with the statutory requirements of the Province of Ontario.
- 45.2 The *Contractor* shall at all times pay or cause to be paid any assessment or contribution required to be paid pursuant to the *Workplace Safety and Insurance Act, 1997, S.O. 1997, Schedule A*, as amended, and upon failure to do so, the *Owner*, in addition to any other

rights it may have at *Law* or under the *Contract*, may retain the amount of such assessment or contribution from the *Contract Price*.

- 45.3 The *Contractor* shall indemnify and save harmless the *Owner* from all workers' compensation assessments due by the *Contractor* in relation to the *Work*.
- 45.4 Prior to the performance of any *Work*, before the release of the holdback, and upon request by the *Owner* at any other time, the *Contractor* shall provide, or cause to be provided, evidence:
- (a) that it has an account with the Workplace Safety and Insurance Board by providing a WSIB "Certificate Letter";
 - (b) in the form of a WSIB "Letter of Clearance", that its account is in good standing and that it has paid any assessments made by the WSIB in relation to the *Work*; and
 - (c) of any of the above in respect of any *Subcontractor*.

Article 46 - Liens

- 46.1 The *Contractor* shall at all times reimburse, protect, indemnify and save free and harmless the *Owner*, the *Work Site* and the other lands and property of the *Owner* from and against all liens and claims made or liability incurred by the *Owner* on account of the *Work* performed or materials supplied by employees of the *Contractor* and *Subcontractors*, or on account of an improper or exaggerated lien filed by the *Contractor*, including, without limitation, legal fees on a solicitor-and-own-client (indemnity) basis. The *Contractor* shall cause any such lien or claim which may be filed or made, to be vacated or released and discharged forthwith at the expense of the *Contractor*. If the lien or claim is merely vacated, the *Contractor* shall, if requested, undertake the *Owner's* defence of any subsequent lawsuit commenced in respect of the lien, provided such lien does not arise as a result of a dispute between the *Contractor* and the *Owner*. If the *Contractor* fails to release or obtain the release and discharge of any such lien or claim, then the *Owner* may, but shall not be obliged to, discharge, release or otherwise deal with the lien or claim, and the *Contractor* shall pay any and all costs and expenses incurred by the *Owner* in so releasing, discharging or otherwise dealing with the claim or lien, including but not limited to, reasonable legal fees. If the *Owner* vacates the lien, it shall be entitled to retain all amounts it would be required to retain pursuant to the *Construction Lien Act* if the lien had not been vacated. Moreover, any amounts so paid by the *Owner* may be deducted from any amounts due the *Contractor* whether under the *Contract* or otherwise.
- 46.2 All payments to the *Contractor* shall be subject to holdback retention in accordance with the *Construction Lien Act*.

Article 47 - Survival

- 47.1 Notwithstanding whether the *Contract* or any part of the *Work* is terminated pursuant to Article 42 - Termination for Convenience or Article 43 - Termination for Cause, then Article 26 - Warranty, Article 36 - Patents and Licenses, Article 46 - Liens, Article 48 - Liability and Indemnity for Third Party Claims, Article 49 - Liability and Indemnity, Article 51 - Bonds, and Article 52 - Independent Contractor shall survive such termination, and the *Warranty Period*, with respect to the *Work* which has received a *Certificate of Substantial Performance*, shall remain in effect notwithstanding the termination of this *Contract*.
- 47.2 Any terms, covenants, provisions or conditions of the *Contract* which expressly or by their nature survive the termination of the *Contract* shall continue in full force and effect subsequent to and notwithstanding such termination, and shall not be merged with the termination, until such terms, covenants, provisions and conditions are satisfied or by their nature expire.

Article 48 - Liability and Indemnity for Third Party Claims

- 48.1 The *Contractor* shall be liable to and shall defend, indemnify, and hold harmless the *Owner*, its officers, directors, employees, consultants and agents for all losses, damages and expenses, including reasonable legal fees, which they or any of them may incur as a result of claims, demands, actions or proceedings made or taken against them by persons not party to the *Contract* for:
- (a) any acts or omissions in connection with the performance, purported performance or non-performance of the *Contract* or of the *Work* by the *Contractor* or its *Subcontractors* or their respective employees or agents;
 - (b) any acts or omissions of the *Owner*, *Other Contractors* or their respective employees or agents, or in connection with such acts or omissions, while acting under the direction and control of the *Contractor*, its *Subcontractors* or their respective employees or agents; and
 - (c) any liability, claims, damages, costs and expenses arising from the failure of the *Contractor* or its *Subcontractors*, or their respective employees or agents to comply with the *Law* or the *Contract*.
- 48.2 The *Contractor* shall, at its sole expense, if requested by the *Owner*, defend those persons entitled to be indemnified pursuant to Section 48.1. The *Owner* shall have the right, if it so elects, to participate in any such defence and the *Contractor* shall have the right to settle claims to a maximum of [REDACTED] per claim and [REDACTED] in the *Contract* aggregate upon prior notice to the *Owner* but without requiring the consent of the *Owner* and thereafter only with the prior consent of the *Owner*.
- 48.3 In the event that the *Owner* considers that the failure by the *Contractor* to settle any claim, demand, action or proceeding to which it or others are entitled to be indemnified

by the *Contractor* would be detrimental to its interests, it may so notify the *Contractor*. If, within [REDACTED] *Work Days* of the notice, the *Contractor* fails to conclude a settlement with the claimant, or fails to advise the *Owner* that a settlement would prejudice the *Contractor's* insurance coverage for such claim, demand, action or proceeding, then the *Owner* may settle the claim, demand, action or proceeding in such amount as it considers reasonable and the *Contractor* shall immediately pay to the *Owner* all or such portion of the amount so paid in settlement as the *Owner* designates as the *Contractor's* liability. However such settlement by the *Owner* shall not require the *Contractor* to repay the *Owner* where the *Contractor* notified the *Owner* that such settlement would prejudice the *Contractor's* insurance coverage for such claim, demand, action or proceeding.

- 48.4 The *Owner* shall defend, indemnify and hold harmless the *Contractor*, its *Subcontractors*, and their respective officers and directors from and against all claims, demands, losses, damages, expenses, actions and proceedings made or taken by persons not party to the *Contract* and which arise on account of and are attributable to the *Owner* for personal injury or physical property damage caused by the *Owner*, any action for which the *Owner* must indemnify the *Contractor* pursuant to Sections 32.7, 35.4 and 36.3, or for the *Owner's* negligence or wilful misconduct in respect of its obligations hereunder.
- 48.5 In the event that the *Owner* accepts the responsibility to indemnify the *Contractor*, its *Subcontractors*, officers and directors pursuant to Section 48.4, then it shall be entitled to retain and instruct counsel to act for and on behalf of those persons and to settle, compromise and pay any claim, demand, action or proceeding without first obtaining prior approval from the party in whose favour the indemnity has been provided. The *Contractor* shall and shall cause any indemnified party to co-operate in all respects in contesting any third party claim for which the *Owner* has accepted responsibility.

Article 49 - Liability and Indemnity

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Article 50 - Insurance Provided by Contractor

50.1 The *Contractor* shall, and shall ensure that its *Subcontractors* shall, without limiting any of the obligations or liabilities under the *Contract*, continuously carry during the performance of the *Work* and any time the *Contractor* or its *Subcontractors* are on the *Work Site*, at their own expense and cost, the following insurance coverage with limits where applicable not less than those shown in the respective items as set out below:

- (a) Workers' Compensation coverage for all employees engaged in the *Work* in accordance with the statutory requirements of the Province of Ontario and all other jurisdictions in which the *Work* and any portion of the *Work* is to be performed and any other applicable provisions of said laws.

[REDACTED]

- (b) Automobile Liability Insurance, covering all licensed motor vehicles owned, (non-owned auto for U.S. based companies), rented or leased and used in connection with the *Work*. Coverage shall include Bodily Injury and Property Damage Liability, mandatory Accident Benefits and if applicable attached machinery, to a combined inclusive minimum limit of the *Automotive Liability Insurance Minimum*;
- (c) Commercial General Liability Insurance with limits of the *Commercial General Liability Insurance Minimum* inclusive for both bodily injury, including death, personal injury, and damage to property, including loss of use thereof, for each

occurrence. To achieve the desired limits, excess or umbrella coverages may be used. Coverage shall specifically include but not be limited to the following:

- (i) Blanket Contractual Liability;
 - (ii) Damage to property of the *Owner* or any property to which the *Owner* has an interest, including loss of use thereof;
 - (iii) Liability arising out of unlicensed equipment;
 - (iv) Pollution Liability coverage on at least a Sudden and Accidental basis;
 - (v) Employer's Liability;
 - (vi) Non-Owned Automobile Liability; Not applicable for U.S.-based companies;
 - (vii) Broad Form Property Damage;
 - (viii) XCU endorsement (if applicable to the services being provided under the *Contract*); and,
 - (ix) Blasting (if applicable to the *Work* being provided under the *Contract*).
- (d) Property and Contractor's Equipment Insurance covering property, equipment, tools and construction machinery owned, rented or leased by and to be used for the performance of the *Work*, excluding all machinery, materials and supplies at the *Work Site* or in transit thereto and intended to become a part of the finished *Work*, for the full replacement cost value of such property on an "all risks" basis;
- (e) Professional Errors & Omissions Insurance in an amount not less than the *Professional Errors & Omissions Insurance Minimum* for each loss, damage, or claim and in the aggregate in connection with the *Work* covering the period from start of *Engineering Services* until *Substantial Performance* and for a further discovery period of [REDACTED] from the issuance of the *Certificate of Substantial Performance* for the entire *Work*. Without limiting the generality of the foregoing, the policy will not contain a design/build exclusion.
- (f) Property and Boiler and Machinery Insurance. The *Contractor* will obtain and maintain the property and boiler and machinery insurance described in this Section 50.1(f):
- (i) All Risk Builders Risk Insurance shall be in the joint names of the *Contractor*, the *Owner*, *Other Contractors*, all other consultants engaged in the performance of the *Work* and all *Subcontractors*, sub-*Subcontractors* and suppliers. The insurance coverage shall not be less than the insurance required by IBC Forms 4042 and 4047, or their equivalent replacement. The insurance coverage provided shall have limits of not less than the replacement cost of the *Work* at risk from time to time plus the replacement cost of the *Procured Goods* and *Free Issue*

Goods. The policy shall have a deductible of not more than the *All Risk Builders Risk Insurance Deductible*.

- (ii) Boiler and Machinery Insurance shall be in the joint names of the *Contractor*, the *Owner*, *Other Contractors*, all other consultants engaged in the performance of the *Work* and *Subcontractors*, Sub-*Subcontractors* and suppliers. The insurance coverage shall not be less than the insurance provided by the Comprehensive Boiler and Machinery Form. The insurance provided shall have limits of not less than the replacement value of the boilers, pressure vessels and other insurable object forming part of the *Work* and shall include testing.
- (iii) The All Risk Builders Risk and Boiler and Machinery Insurance shall:
 - (A) Name the *Owner* as an Additional Named Insured and Loss Payee as respects its property while in the custody of the *Contractor* but that any deductible shall be for the account of the *Contractor*; and
 - (B) Contain a Waiver of Subrogation in favour of *Owner* and its affiliated companies, as “affiliated” is defined under the *Business Corporations Act* (Ontario).
- (iv) The policies shall allow for partial or total use or occupancy of the *Work*. If because of such use or occupancy the *Contractor* is unable to provide coverage, the *Contractor* shall notify the *Owner* in writing. Prior to such use or occupancy, the *Owner* shall provide, maintain and pay for all risk property and boiler and machinery insurance in the amounts described in Sections 50.1(f)(i) and 50.1(f)(ii) including coverage for such use or occupancy and shall provide the *Contractor* with proof of such insurance. The policies shall be amended to include permission for completion of *Work* and shall include all insureds as specified in Sections 50.1(f)(i) and 50.1(f)(ii). The *Contractor* shall refund to the *Owner* the unearned premiums applicable to the *Contractor’s* policies upon termination of the coverage.
- (v) The policies shall provide that, in the case of a loss or damage, payment shall be made to the *Owner* and the *Contractor* as their respective interest may appear. The *Contractor* shall act on behalf of the *Owner* for the purpose of adjusting the amount of such loss or damage with the insurers. When the extent of loss or damage is determined, the *Contractor* shall proceed to restore the *Work*. Loss or damage shall not affect the rights and obligations of either party under the *Contract* except that the *Contractor* shall be entitled to a reasonable extension of the *Contract Time*.
- (g) Pollution Liability Insurance: When remediation or abatement is included in the *Owner’s Requirements* or *Work*, Contractor will purchase a policy with limits of not less than [REDACTED] per occurrence (and [REDACTED] in aggregate for

Hazardous and Subject Waste) covering bodily injury and property damage claims, including cleanup costs as a result of pollution conditions arising from *Contractor's* and/or subcontractor's operations and completed operations. Completed operations coverage will remain in effect for no less than [REDACTED] years after final completion of the *Work*. The policy will have a retroactive date before the start of the *Work*.

- (h) Aircraft Liability Insurance, with coverage to include use of fixed wing and helicopter, in an amount not less than [REDACTED] each occurrence, covering bodily injury (including to passengers) and property damage liability.

50.2 Before starting work, the *Contractor* will supply and cause its subcontractors to supply the *Owner* a certificate of insurance completed by a duly authorized representative of their respective insurers certifying that at least the minimum coverages required here are in effect and that the coverages will not be cancelled, nonrenewed, restricted or reduced without [REDACTED] advance written notice by registered mail, receipt required, to:

Hydro One Networks Inc.
c/o Contact for Insurance Notices
483 Bay St, TCA
Toronto, ON M5G 2P5

with copy to:

Hydro One Networks Inc.,
Risk & Insurance Department,
483 Bay Street, 7th Floor, South Tower,
Toronto, Ontario. M5G 2P5

- 50.3 Failure of the *Owner* to demand the certificates in Section 50.2 or other evidence of full compliance with the insurance requirements under this *Contract* or failure of the *Owner* to identify a deficiency from evidence provided will not be construed as a waiver of the *Contractors* obligation to maintain such insurance.
- 50.4 The acceptance of delivery by the *Owner* of any certificate of insurance evidencing the required coverages and limits does not constitute approval or agreement by the *Owner* that the insurance requirements have been met or that the insurance policies shown in the certificates of insurance are in compliance with the requirements.
- 50.5 If the *Contractor* fails to maintain the insurance as set forth here, the *Owner* will have the right, but not the obligation, to purchase said insurance at the *Contractors* expense. Alternatively, the *Contractors* failure to maintain the required insurance may result in termination of this contract at the *Owner's* option.
- 50.6 If any of the coverages are required to remain in force after final payment, an additional certificate evidencing continuation of such coverage will be submitted with the *Contractor's* final invoice.

- 50.7 Certificates of insurance will be provided within ■ days of issuance of the *Purchase Order*.
- 50.8 All deductibles will be to the account of the *Contractor* and/or its *Subcontractors*.
- 50.9 With the exception of Section 50.1(b) (automobile liability), all insurance noted above shall specify that it is primary coverage and not contributory with or in excess of any other insurance that may be maintained by the *Owner*.
- 50.10 The *Contractor* shall place all policies with insurers which are licensed to provide insurance in the Province of Ontario with insurers acceptable to the *Owner*, and in a form acceptable to the *Owner*;
- 50.11 All limits and deductibles are expressed in Canadian dollars.
- 50.12 The *Owner* and the *Owner's Representative*, where applicable, shall be included as an Additional Insured under coverages noted in Commercial General Liability and Excess/Umbrella Liability but only with respect to their rights and interest in the operations of the *Contractor* and shall be added a Loss Payee as the *Owner's* interest may appear, under coverage All Risks Installation Floater.
- 50.13 Coverages noted in Commercial General Liability and Excess/Umbrella Liability shall contain a Cross Liability clause and a Severability of Interests clause.
- 50.14 Coverage provided for the *Owner* shall not be invalidated or vitiated by actions or inactions of others.
- 50.15 The insurance requirements under this *Contract* shall be in force prior to the commencement of *Work* under the contract and shall remain in force during the entire term of the contract. Notwithstanding anything else in the *Contract*:
- (a) the *Contractor* shall not commence providing the said services prior to the *Owner's* receipt of a valid Standard Insurance Certificate evidencing compliance with all terms of this Article 50 - Insurance Provided by Contractor
 - (b) if the required insurance coverage expires during the term of the *Contract*, the *Contractor* shall not continue providing the *Work* prior to the *Owner's* receipt of a valid Standard Insurance Certificate evidencing continued compliance with all terms of this Article 50 - Insurance Provided by Contractor; and
 - (c) in addition to any other remedy that the *Owner* may have against the *Contractor* as a result of the *Contractor's* failure to comply with all the terms of this Article 50 - Insurance Provided by Contractor, the *Contractor* shall, to the extent that delay in providing the said services occurs as a result of the non-delivery of a certificate of insurance required to be supplied under this *Contract*, be liable to the *Owner* for all damages arising out of the said delay.
- 50.16 Neither the providing of insurance by the *Contractor* in accordance with the requirements of this Article 50 - Insurance Provided by Contractor, nor the insolvency, bankruptcy, or

failure of any insurance company to pay any claim shall be held to relieve the *Contractor* from any other provisions of the *Contract* with respect to liability of the *Contractor*, or otherwise.

50.17 Unless otherwise stated herein, the dollar amount of the deductible in the policies for any one loss shall be subject to the approval of the *Owner*, and in no case shall the deductible exceed [REDACTED] or such lower limit imposed by *Law*.

50.18 The *Contractor* shall ensure that its Subcontractors meet the obligations herein in the same manner as the *Contractor* must meet them.

Article 51 - Security, Bonds and Guarantees

51.1 The *Contractor* shall provide to the *Owner* at Contractors' cost, the following security:

[REDACTED]

[REDACTED]

(c) a performance bond, with Hydro One as obligee, in the amount of [REDACTED] of the *Contract Price* with a duly licensed surety company authorized to transact a business of suretyship in the Province of Ontario with an A.M Best rating of at least A-, to remain in place until *Total Performance of the Work*;

(d) a labour and materials bond, with Hydro One as obligee, in the amount of [REDACTED] of the *Contract Price* with a duly licensed surety company authorized to transact a business of suretyship in the Province of Ontario with an A.M Best rating of at least A-, to remain in place until *Total Performance of the Work*;

(e) [REDACTED]

Article 52 - Independent Contractor

52.1 For the purposes of the *Contract* and the *Work*, the *Contractor* shall be an independent contractor and not the agent or employee of the *Owner*.

52.2 All persons employed or retained by the *Contractor* in connection with the performance of its obligations shall be its employees or those of its *Subcontractors*, as the case may be, and not the employees or agents of the *Owner* in any respect.

- 52.3 The *Contractor* shall indemnify and hold harmless the *Owner*, against all claims, demands, losses, damages, expenses, actions and proceedings whatsoever, including reasonable legal fees, which may be incurred by the *Owner* as a result of any determination by any tribunal or court that any *Contractor Personnel* pursuant to the terms of this *Contract* are for any purposes agents or employees of the *Owner*.
- 52.4 The *Contractor* shall have no authority whatsoever to make any statement, representation or commitment of any kind, or to take any action, which may be binding on the *Owner*, except as provided for in this *Contract*, as authorized in writing by the *Owner*.

Article 53 - Conflict of Interest

- 53.1 The *Contractor* shall exercise reasonable care and diligence to prevent any actions or conditions which could result in a conflict with the *Owner's* best interests. This obligation shall apply to the activities of the *Contractor* and its *Subcontractors* and their respective employees and agents, in their relations or dealings with the employees of the *Owner* and their families, and other third parties, arising from the *Contract* or the performance of the *Work*. The efforts made by the *Contractor* in this regard shall include, but shall not be limited to, establishing reasonable precautions to prevent *Subcontractors* and their respective employees from offering, or providing entertainment, gifts, loans, payments or other considerations to the *Owner's* employees, consultants and agents or their family members.
- 53.2 The *Contractor* acknowledges and agrees that the *Owner's* directors, officers, employees, agents, representatives, and business partners are bound by the *Owner's* Code of Business Conduct.
- 53.3 The *Contractor* will not take any action that would cause the *Owner* or any of its directors, officers, employees, agents, representatives, or business partners to be in breach of any of the obligations set out in *Owner's* corporate Code of Business Conduct. A current copy of the code may be reviewed by downloading the electronic document by following the appropriate link at the following hyperlink: <http://www.HydroOne.com/CodeofConduct>
- 53.4 In connection with any of the work under this contract, the *Contractor* covenants and agrees, not to offer or give directly or indirectly to any of the *Owner's* employees or representatives, or their immediate family members (including their common law relationships) known to the *Contractor* to the best of its knowledge and belief, each of the foregoing persons an "*Insider*", collectively "*Insiders*", any of the following:
- (a) any form of bribe or kickback;
 - (b) gifts of cash, gift certificates, services, discounts, or loans;
 - (c) any gift, entertainment, or similar type of benefit that does not serve a legitimate business purpose; or

- (d) any gift, entertainment, or similar type of benefit that may compromise or appear to compromise their ability to make business decisions in the best interest of the *Owner*.
- 53.5 The Contractor represents and warrants that in anticipation of this contract, it did not directly or indirectly participate in any acts prior to entering into this contract that would be precluded by Section 53.4.
- 53.6 The *Contractor* further represents, warrants, and covenants that, at the commencement of this contract, and throughout its term, to the best of the *Contractor*'s knowledge and belief, no *Insider* has (or will have) an interest (whether directly or indirectly, or personal, or financial), in the supplies, work, or business to which this contract relates, or in any portion of the profits thereof, or in any monies to be derived therefrom ("*Insider's Interest*"); however, there is no breach of the foregoing where:
- (a) at the time of entering into this contract, the *Contractor* has disclosed all relevant facts known to it concerning the *Insider's Interest*, and the *Owner* has provided the *Contractor* with a written determination, made at the *Owner*'s sole and absolute discretion, that the *Insider's Interest*:
 - (i) does not have potential for real or perceived conflict of interest, or
 - (ii) has a potential for real or perceived conflict of interest but it can be managed in a way that protects the integrity and reputation of the *Owner*, and would withstand the test of reasonable and independent scrutiny, and a suitable method of monitoring and managing such real or perceived conflict has been determined and is implemented.
 - (b) the *Contractor* is a publicly-traded company that offers its registered securities to the general public and the *Insiders*, collectively, have an insignificant interest in the stock of that company, not to exceed a total of five per cent of the outstanding stock of the *Contractor*.

Article 54 - Audit Access

- 54.1 The *Contractor* shall preserve the *Records* in good order during the *Contract Time* and for a period of [REDACTED] years thereafter.
- 54.2 The *Contractor* shall permit authorized representatives of the *Owner* to review the *Records* at all reasonable times during the *Contract Time*, and for a period of two years thereafter for the purposes of:
- (a) determining the *Contractor*'s compliance with all of the terms of the *Contract*, including, but not limited to:
 - (i) Article 19 - Changes and Article 39 - Delays Caused by the Contractor; and
 - (ii) the *Policies*; and

- (b) verifying of all *Work* performed and all reimbursable costs and other charges payable under the *Contract*.

- 54.3 Where the *Contract Price* is not on a cost reimbursable basis, the *Contractor* may black-out any information in the *Records* relating to price before access is given to the *Owner*.
- 54.4 Where requested by the *Owner*, the *Contractor* shall provide the *Owner* or its authorized representative with office accommodation for their exclusive use (including a desk and access to telephone), as well as facilities and reasonable assistance required for the proper performance of their duties.

Article 55 - Representatives and Notices

- 55.1 The *Owner's Representative* has the authority to bind the *Owner* in accordance with the processes under the *Contract* on all matters relating to the *Work* and the *Contract*, and all communications to or with the *Owner's Representative* shall be deemed to be communications to or with the *Owner*.
- 55.2 The *Contractor* shall not change the *Contractor's Representative*, except with the prior approval of the *Owner*. The *Contractor's Representative* has the authority to bind the *Contractor* in accordance with the processes under the *Contract* on all matters relating to the *Work* and the *Contract*, and all communications to or with *Contractor's Representative* shall be deemed to be communications to or with the *Contractor*.
- 55.3 Unless otherwise specifically indicated in the *Contract*, all notices, approvals, consents, authorizations and other communications required or permitted pursuant to the *Contract*, shall be in writing and shall be communicated to the *Contractor's Representative* or the *Owner's Representative*, as the case may be. In addition, all legal notices, consents, authorizations and other such communications shall be delivered by personal delivery, courier or facsimile to the *Contractor's Address for Legal Notices* set out above, or to the *Owner's Legal Address*, as applicable.
- 55.4 Either party may change its contact information for the purposes of Section 55.3 by providing the other party with 5 days notice of such a change.
- 55.5 E-mail may be used for day-to-day general communication between the parties, but e-mail shall not be used for the communication of a notice which is prescribed by the *Contract*.

Article 56 - General

- 56.1 No failure or delay on the part of either party in exercising any right, power or privilege hereunder shall operate as a waiver thereof, unless otherwise specified hereunder.
- 56.2 The *Owner* may deduct or set-off any amounts owing from the *Contractor* pursuant to this *Contract* from any payments due or owing to the *Contractor* or a third party to whom the *Owner* could become ultimately liable.

- 56.3 No waiver of any right, power or privilege by a party shall limit or affect that party's rights with respect to any breach of the *Contract* by the other party.
- 56.4 The *Contractor* shall prepare subcontract terms and conditions appropriately reflective of the terms and conditions of this *Contract*, as applicable to each subcontract with each *Subcontractor*.
- 56.5 Each of the parties hereto shall execute such further documents and give such further assurances as are required to give effect to the *Contract*.
- 56.6 If a court of competent jurisdiction determines that any provision of this *Contract* is invalid or unenforceable, such determination shall not affect the validity or enforceability of the remaining provisions of the *Contract*.
- 56.7 All of the covenants and agreements herein contained on the part of either party shall apply and enure to the benefit of and be binding upon their respective legal representatives, successors and assigns.
- 56.8 Each of the parties hereby represents and warrants that it has the power and authority to enter into the *Contract* and to perform all of its obligations hereunder.
- 56.9 The *Contract* constitutes the entire agreement between the parties with respect to the *Work* and supersedes and replaces all previous communications, representations and agreements, either written or verbal.
- 56.10 This *Contract* shall be governed by and construed in accordance with the laws of the Province of Ontario, and, subject to Appendix F - Dispute Resolution Procedure, the parties attorn to the jurisdiction of the courts of the Province of Ontario, and any legal proceedings shall be commenced and heard in the City of Toronto.
- 56.11 This *Contract* shall be executed by the parties, or their representatives, in person with original signatures, but may be executed in counterpart. Subsequent documents may be executed by the parties, or their representatives, and such execution may be by way of facsimile or electronic transfer.
- 56.12 This Contract is written in the English language at the express wish of the Parties. Ce contrat a été rédigé en anglais à la demande expresse des parties.

- Exhibits and Appendices attached -

Exhibit A

Safety Courses

The Contractor must complete the Station Safety Awareness - External Contractor (Course Code SSSAEX), at least one week prior to arrival at the Owner's Site: This training is available On-Line at: <https://www.services.hydroone.com/eLearning/>

Password: TrainingH1

The first screen you see will be the logon screen.

If you have used external e-Learning previously using your logon information, fill out this screen.

If this is your first attempt you must register. To register click on "register" button at the bottom of the screen.

You must fill out the required fields. It is very important that these fields are correctly filled out to receive credit for your training.

Before taking any e-learning course you MUST test that the Flash Player Plug-in is correctly installed on your computer or the course may malfunction (e.g., the "Continue" button will not appear).

In your internet browser address bar, type or copy the link below:

Link: http://www.adobe.com/devnet/flash/samples/interactivity_3/index.html

If the Flash animation is not working, in your internet browser address bar, type or copy the link, and then install the latest version of the Adobe Flash Player Plug-in.

In your internet browser address bar, type or copy the link below, then install the Player:

Link: <http://get.adobe.com/flashplayer/?promoid=BUIGP>

Exhibit B

Safeguards and Personal Protective Equipment

The following is required and the *Contractor* shall also ensure, at no additional cost to the *Owner*, that all personnel, including but not limited to *Subcontractors*, working or supplying *Work*, *Procured Goods* or *Goods* within the *Work Site*, with the exception of the fenced off administrative area clearly designated as such, shall wear:

- Head protection (CSA Z94.1) Class E (Type 1 or 2)
- Foot protection (CSA Z195) Green triangle and Omega symbol (class 1 toe protection and electrically resistant)
- Eye/Face Protection (CSA Z94.3) High velocity impact with side shields and no metal frames;
- Arc Flash/Flame Resistant clothing with a minimum Arc Rating of 8.0 Cal/cm². The exterior layer of such FR clothing shall meet the ASTM 1506-02 standard (Standard Performance Specification for Flame Resistant Textile Materials for Wearing Apparel for Use by Electrical Workers Exposed to Momentary Electric Arc and Related Thermal Hazards), as such standard may be updated from time to time. Coverage must be from wrists to ankles (e.g. full length pants and long sleeved shirts). Clothing can incorporate the high visibility requirements below. If the FR clothing is not high visibility then a high visibility FR garment (vest) must be worn over top of the FR clothing.
- High visibility clothing must meet O.Reg 213/91 sec. 69.1(1-4) sec. 106(1.1-1.4 for daytime and nighttime visibility). If certified to CSA Z96 garment must be certified to Class 2 Level 2. Vests shall be arc flash/flame resistant.

The *Contractor* will ensure that any worker entering a flash protection boundary must be qualified and must be wearing appropriate PPE. The Flash Protection Boundary is required to be calculated by NFPA 70E.

Lake Superior Link - Scope of Work - Division of Responsibility

			Owner	EPC
#	Activity	Deliverables	Hydro One	SNC-Lavalin
1.0	Project Development	All activities to permit the project		
1.01	Environment	Pre-disturbance Assessment (PDA) (Biophysical Survey) - Raptor Nest Surveys - Migratory Bird Surveys - Sensitive Species Survey - Vegetation, Weed, Soil Surveys		X
1.02	Environment	Historical Resource Impact Assessment and Clearance		X
1.03	Environment	Environmental Field Report (EFR) - Crown Land only		X
1.04	Environment	Environmental Specifications Requirements (ESR)		X
1.05	Environment	Ontario Water Act and Fisheries Approvals		X
1.06	Environment	Caribou Protection Plan		X
1.07	Environment	Traditional Land Use (TLU) Surveys		X
1.08	Environment	Environmental Contamination: Phase I ESA (Haz Mat survey) and Phase II/III ESAs if required.		X
1.09	Environment	Environmental Studies for Permitting		X
1.1	External Engagement	Communications / Public Relations	X	Assist
1.11	External Engagement	Consultation (Indigenous Communities and others)	X	X
1.12	External Engagement	Government Relations	X	
1.13	External Engagement	Aboriginal Consultations	X	Assist
1.14	External Engagement	Letter of Adequacy	X	
1.15	External Engagement	Forest Management Agreements and Timber Damage Agreements	X	
1.16	Siting	T Line Spotting		X
1.17	Siting	Commitments to Landowners / Occupants	X	
1.18	Siting	Route or Structure Changes Due to Landowner/Affected Parties Negotiations	X	
1.19	Land	Land Easements / Individual Ownership Plans	X	
1.2	Land	Land Acquisition - Buy Out	X	
1.21	Land	Crown Easement (EZE) Disposition Application Submissions/Approval	X	
1.22	Land	Obtain Preconstruction TFAs (Crown only)	X	
1.23	Regulatory	EA Preparation and Submission		X

			Owner	EPC
#	Activity	Deliverables	Hydro One	SNC-Lavalin
1.24	Regulatory	LTC Preparation and Submission including IRs	X	Assist
1.25	Regulatory	OEB Directed Route Adjustments	X	
1.26	Permits	Access Permits (Landowners)	X	
1.27	Permits	Water Course Crossing Notifications; Powerline Cable Crossing Form		X
1.28	Permits	DFO Permits: Temporary Water Crossing Permit; FOC Operations Statement		X
1.29	Permits	Road Maintenance Agreements - Construction Only		X
1.3	Permits	Road Maintenance Agreements - Permanent Only	X	
1.31	Permits	Temporary Construction Permits (including Land Use Proposal Submission Form, building permits, camp permits)		X
1.32	Permits	Water Use: Temporary Diversion Licence and Temporary Diversion Access		X
1.33	Crossings and Facilities	Facility Mitigation Studies (e.g. pipelines)	X	Assist
1.34	Crossings and Facilities	Existing Facility Agreements (e.g. pipeline, wellhead, rail, road) - Crossing agreements (temporary and permanent) - Alberta Transportation Highway Crossings - Proximity Agreements - Encroachment Agreements	X	Assist
1.35	Construction	Lease Agreements for private land used for yards, temporary facilities, etc.		X
2.0	General Management	All activities in planning and PMPC		
2.01	Construction	Construction Execution Planning		X
2.02	Construction	Identify all Access Requirements and Temporary Worksites (including geotech, access, material yards, pull sites, etc.)		X
2.03	Construction	Construction Accommodations		X
2.04	Construction	Temporary Facilities for Construction (offices, trailers, etc.)		X
2.05	Construction	Temporary Power During Construction		X
2.06	Construction	Reclamation Plan		X
2.07	Construction	Construction period insurance		X
2.08	Environment	Vegetation Management Plan		X
2.09	Environment	Environmental management plans including CEMP		X

			Owner	EPC
#	Activity	Deliverables	Hydro One	SNC-Lavalin
2.10	Land	Field Verification of Property Descriptions ("Survey Truthing" for structure location coordinates)		X
2.11	Labour	Project and Commercial Management		X
2.12	Labour	Project Controls and Reporting		X
2.13	Labour	Construction Management		X
3.0	Engineering	All activities to design		
3.01	Engineering	LiDAR Data and Variation in Topographical Conditions		X
3.02	Engineering	Geotech Studies and Variation in Ground Conditions		X
3.03	Engineering	Tower Spotting		X
3.04	Engineering	Tower Design and Testing		X
3.05	Engineering	Design Requirements Over and Above Functional Specification		X
3.06	Engineering	Design and Engineering - including all drawing packages		X
3.07	Engineering	Design Reviews (intermediate and final)	X	X
3.08	Engineering	Interface with Owner for Design		X
3.09	Engineering	Design certification for Ontario		X
3.10	Engineering	Constructability Review		X
3.11	Crossings and Facilities	Design and Construction of Crossing Structures		
4.0	Procurement	All activities to procure material and services		
4.01	Equipment	Procurement of Material and Major Equipment Required for Construction		X
4.02	Equipment	Procurement of Material and Equipment Required for Construction Consumables		X
4.03	Equipment	Equipment Manufacturing, Quality, and Delivery		X
4.04	Construction	Executing contracts for miscellaneous construction services		X
5.0	Access & Clearing	All activities for access and clearing construction		
5.01	Construction	Construction Labour Availability and Pricing		X
5.02	Construction	Contracts for Labour Required for Construction		X
5.03	Labour	Field Coordinators and Monitors (Safety, Construction)		X
5.04	Labour	Field Monitors (Environment, Quality)		X
5.05	Labour	Field Engineering Construction Support		X

			Owner	EPC
#	Activity	Deliverables	Hydro One	SNC-Lavalin
5.06	Construction	Weather Mitigations		X
5.07	Construction	Wildfire Management		X
5.08	External Engagement	Construction Coordination with Affected Parties (Land Coordinators, Public Relations Coordinators)	X	X
5.09	Crossings and Facilities	Facility Mitigation Installation (e.g. pipelines)		X
5.10	Construction	Timber Salvage - Plan, Laydown Areas, Contractor (Construction Only)		X
6.0	Foundations	All activities for foundation and anchor construction		
6.01	Construction	Construction Labour Availability and Pricing		X
6.02	Construction	Contracts for Labour Required for Construction		X
6.03	Labour	Field Coordinators and Monitors (Safety, Construction)		X
6.04	Labour	Field Monitors (Environment, Quality)		X
6.05	Labour	Field Engineering Construction Support		X
6.06	Construction	Weather		X
6.07	Construction	Wildfire Management		X
6.08	External Engagement	Construction Coordination with Affected Parties (Land Coordinators, Public Relations Coordinators)	X	X
7.0	Transmission Line	All activities for 230kV and 115kV construction		
7.01	Construction	Construction Labour Availability and Pricing		X
7.02	Construction	Contracts for Labour Required for Construction		X
7.03	Construction	Staking - Avoidance Area, RoW, Tower		X
7.04	Labour	Field Coordinators and Monitors (Safety, Construction)		X
7.05	Labour	Field Monitors (Environment, Quality)		X
7.06	Labour	Field Engineering Construction Support		X
7.07	Construction	Weather Mitigations		X
7.08	External Engagement	Construction Coordination with Affected Parties (Land Coordinators, Public Relations Coordinators)	X	X
7.09	Crossings and Facilities	Coordination of Outages for Transmission Line Crossings / Replacement of structures in park	X	X
7.10	Crossings and Facilities	Construction Parallel to Existing Facilities (Safety, Construction Considerations)		X

			Owner	EPC
#	Activity	Deliverables	Hydro One	SNC-Lavalin
7.11	Crossings and Facilities	Traffic Management for Crossings (e.g. Highway Crossings)		X
10.0	Commissioning	All activities for final commissioning of the facilities		
10.01	Construction	T-Line End to End Testing		X
10.02	Construction	T-Line Phaseout		X
10.03	Commissioning	Fibre Optic Splicing and Testing		X
10.04	Construction	Final acceptance	X	
10.05	Construction	In-Service switching	X	
11.0	EPC Closeout	All activities to close the contract		
11.01	Land	Land Survey Post Construction		X
11.02	Engineering	As-Built Drawings		X
11.03	Procurement	SubContract Closures		X
11.04	Construction	Punch List Items		X
11.05	Labour	Final Invoice and Reconciliations	X	X

APPENDIX B – Contract Price

- 1 The *Contract Price*, which excludes Value Added Taxes, is:

 dollars and cents (\$).
- 2 Value Added Taxes as at the time of this Contract is the HST only (at 13%) and the *HST* payable by the Owner to the Contractor is:

 dollars and cents (\$).
- 3 Total amount payable by the Owner to the Contractor for the performance of the Work is:

 dollars and cents (\$).
- 4 All reference to dollar amount herein shall be in Canadian funds.
5. These amounts shall be subject to adjustments as expressly provided in the *Contract*.
6. In accordance with the Contract, the Owner shall make milestone payments to the Contractor when requested at the completion of the Contract stipulated performance milestones, as set forth in the Milestone Performance Payment Schedule, attached as Schedule “A” to this Appendix B for completion of a milestone (“Milestone Payment”).

SCHEDULE “A” –

Milestone Performance Payment Schedule

Milestone Number	Description of Milestone	Percentage of Contract Price
-----------------------------	-------------------------------------	---

1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

APPENDIX C – Policy and Guidelines

The Owner's *Policy and Guidelines* shall include the following:

Health & Safety Policy

[REDACTED]

Environmental Policy

[REDACTED]

Public Safety Policy

[REDACTED]

Workplace Violence & Harassment Policy

[REDACTED]

Hydro One Safety Rules

[REDACTED]

APPENDIX D - Liquidated Damages for Delay

If the *Contractor* fails to reach *Substantial Performance* by the *Scheduled Substantial Performance Date*, then the *Contractor* shall pay to the *Owner* the sum of [REDACTED] per day for each day of delay as delay liquidated damages (“Delay Liquidated Damages”). The *Owner* and *Contractor* agree that such Delay Liquidated Damages are not a penalty, but are a genuine pre-estimate of the loss suffered by the *Owner* solely and exclusively in respect of the delay, and are the *Contractor’s* entire liability and *Owner’s* sole and exclusive remedy for all loss, damages, costs and/or expenses suffered or incurred by the *Owner* in respect of the losses suffered by the delay, where *Substantial Performance* is achieved by the *Contractor* within [REDACTED] days of the *Scheduled Substantial Performance Date*, and the Parties agree the maximum amount of such Delay Liquidated Damages shall not exceed [REDACTED] of the *Contract Price*.

FORM 6
CERTIFICATE OF SUBSTANTIAL PERFORMANCE OF THE CONTRACT UNDER SECTION 32 OF THE ACT
Construction Lien Act

.....
*(County/District or Regional Municipality/City or Borough of Municipality of
Metropolitan Toronto in which premises are situate)*

.....
(street address and city, town, etc., or, if there is no street address, the location of the premises)

This is to certify that the contract for the following improvement:

.....
(short description of the improvement)

to the above premises was substantially performed on
(date substantially perform

Date certificate signed:

.....
(payment certifier where there is one)

.....
(owner and contractor, where there is no payment certifier)

Name of owner:

Address for service:

Name of contractor:

Address for service:

Name of payment certifier:
(where applicable)

Address:

(Use A or B whichever is appropriate)

A. Identification of premises for preservation of liens:

.....
*(where liens attach to premises, reference to lot and plan number or instrument
registration number)*

B. Office to which claim for lien must be given to preserve lien:

.....
(where liens do not attach to premises)

Appendix E – Forms
Key Personnel Confidentiality, Proprietary Information and Consent Agreement

Dated effective , 20

TO:

(the "*Contractor*")

AND TO: Hydro One Networks Inc.
(the "*Owner*")

I, (the "*Employee*"), in consideration of the *Owner* consenting to my participation in the performance of certain work (the "*Work*") by the *Contractor* for the *Owner* pursuant to an agreement (the "*Agreement*") made between the *Owner* and the *Contractor* dated as of , 20 with respect to [Project]; and for the further consideration of \$1.00, from each of the *Contractor* and the *Owner*, the receipt and the sufficiency of which are hereby acknowledged, do hereby agree, separate and apart from the *Contractor*, as follows:

1. I have had my role and responsibilities explained to me by the *Contractor*, or I have reviewed a copy of the *Agreement* and agree to observe the terms and conditions that relate to employees and subcontractors of the *Contractor*.
2. I am referred to herein as the *Employee* even though I may not be an actual employee of the *Contractor*, and may, in fact, be a subcontractor to the *Contractor*.
3. I acknowledge that the *Owner* has an interest in securing the performance of the *Work* by the *Contractor* and that the ability of the *Contractor* to perform the *Work* primarily depends on my continued employment with the *Contractor*.
4. I shall perform for the *Contractor* such duties as may be assigned to me by the *Contractor* from time to time pertaining to the *Work*. I agree that all inventions, copyright, copyrightable works, discoveries, improvements, industrial designs and other intellectual and proprietary rights conceived, originated or prepared by me, arising directly or indirectly from the performance of the *Work*, are and shall be the exclusive property of the *Owner* or the *Contractor* as determined in accordance with the terms of the *Agreement*.

...

5. I shall not, without the prior written consent of the *Contractor* and the *Owner*, either during or for a 5 year period after my employment by the *Contractor*, use or disclose any information acquired by me in the course of or by reason of my participation in the performance of the *Work*, nor will I disclose to any person not in the employ of the *Contractor* any such information, including, without limitation, any information as to technology, policies, operations, processes or formulae used, owned or supervised by the *Owner* or by any of its affiliates. At the termination of the *Agreement* or earlier if so requested, I shall forthwith return to the *Owner* all confidential information in my possession.

I agree that, if any provision in this undertaking is found to be invalid or otherwise unenforceable at law, such provision shall be severed, and the remaining provisions shall continue in full force and effect.

Witness Signature
Witness Name: (print)
Date: (print)

Employee Signature
Date: (print)

Pre-Job Kick Off Meeting Checklist

AR #:	PO #:
Contract Title:	
Contractor:	
Contractor Representative:	
HONI Contract Manager/Administrator:	
Date:	

Item #	Description	Covered
1	Introduction and Background <ul style="list-style-type: none"> Meeting Purpose Introductions 	<input type="checkbox"/> <input type="checkbox"/>
2	Organization <ul style="list-style-type: none"> HONI and Owner's Rep. Contractor and Key Personnel 	<input type="checkbox"/> <input type="checkbox"/>
3	Safety / Health / Environment <ul style="list-style-type: none"> Designated Substances list Identified Hazards on Site Contractor Site Specific Health & Safety Plan Contractor Site Specific Environmental Plan 	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
4	Security <ul style="list-style-type: none"> Security Clearance & Access to Critical Cyber Assets (if applicable) Station Access 	<input type="checkbox"/> <input type="checkbox"/>
5	Contract <ul style="list-style-type: none"> Review of the Notice of Project General Scope of Work (In/Out of Scope) Contract Objective List of Deliverables Key Success Factors Stakeholders Identification Responsibility Matrix Required Permits and their Renewals Labour Relations Requirements (EPSCA, CUSW, PWU, Society) Mark up Meeting Site Layout (construction offices, parking, laydown area etc.) Boundaries Work Protection Training Requirements (Contractor & HONI training) 	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
6	Quality Assurance / Quality Control / Quality Surveillance <ul style="list-style-type: none"> HONI / Owner's Rep. Responsibility Contractor Responsibility 	<input type="checkbox"/> <input type="checkbox"/>

Pre-Job Kick Off Meeting Checklist

Item #	Description	Covered
7	Drawings/ Documentation <ul style="list-style-type: none"> HONI Supporting Documentation Design Drawings and their Distribution Drawing Control Contractor Drawing Submittals, Approvals, Schedule and Reviews Test Reports 	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
8	Communication Protocol <ul style="list-style-type: none"> Lines of Communication Progress Review Meetings (frequency) Reports (frequency and desired format) HONI Contact Name and Address Owner's Rep. Name and Address Contractor Name and Address Formal Notices Community Relations (complaint log) 	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
9	Schedule of work <ul style="list-style-type: none"> Major Milestones Completion Dates List of the Schedules to be Developed Dates of Submittals Schedule Review Meetings Schedule Update Outage Planning 	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
10	Payments <ul style="list-style-type: none"> Progress Payment Schedule Progress Measurement and Approval Invoices and Certificates of Payments Holdbacks Final Payment Trade Hours Reporting 	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
11	Contract Changes (Contract Change Request, Contract Change Directive, Contract Change Authorization, and Change Order) <ul style="list-style-type: none"> Within Scope Outside Scope 	<input type="checkbox"/> <input type="checkbox"/>
12	Insurance / Bonds (Confirmation of Issuance)	<input type="checkbox"/>
13	Warranties	<input type="checkbox"/>
14	Contract Documents Clarification	<input type="checkbox"/>
15	Turnover and Acceptance	<input type="checkbox"/>
16	<i>Contract Close- out</i> <ul style="list-style-type: none"> List of Deficiencies (Category A & B) Notice of Substantial Performance 	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Pre-Job Kick Off Meeting Checklist

Item #	Description	Covered
	<ul style="list-style-type: none"> • Certificate of Substantial Performance • Final Inspection • Notice of Total Completion of Contract 	<input type="checkbox"/> <input type="checkbox"/>

APPENDIX E – FORMS

RELEASE AND CERTIFICATE OF FINAL PAYMENT

This is Appendix E - Forms - Release and Certificate of Final Payment referred to in the Engineering, Procurement and Construction Contract (“*Contract*”) made as of , 20 between Hydro One Networks Inc. (“*Owner*”) and (“*Contractor*”)

Capitalized terms used and not defined in this document shall have the meaning given thereto in the Contract where so defined.

In consideration of \$1.00, the sufficiency of which is hereby acknowledged:

I solemnly declare that I am an authorized signing officer of the *Contractor*, I have personal knowledge of the facts that:

- (a) the *Contractor* has made full payment, or will make full payment from the final payment to be received from the *Owner*, of all costs, charges and expenses incurred by the *Contractor* or on its behalf for the work, labour, services, materials and equipment supplied in connection with this *Contract* or otherwise used in connection with the Work;
- (b) to *Contractor's* best knowledge and belief, each of its *Subcontractors* and Suppliers have made full payment of all costs, charges and expenses incurred by them or on their behalf for work, labour, services, materials and equipment in connection with the *Contract* or otherwise used by them in connection with the Work;
- (c) all assessments, levies and charges under the *Workers' Compensation Act* and other *Law* in respect of the *Contract* have been paid and, to the *Contractor's* best knowledge and belief, each and all of its *Subcontractors* have paid such assessments, levies and charges on their own account; and
- (d) the *Contractor* unconditionally releases and forever discharges the *Owner*, the *Owner's* Site and all property of the *Owner* from all construction liens and liens of whatsoever kind or nature arising out of or in connection with the performance of the *Contract*;
- (e) the *Contractor* unconditionally releases and forever discharges the *Owner* from any and all claims, demands, actions or proceedings arising out of the performance of the Work of which it has knowledge, and in respect of which notice in writing has not, by the date hereof, been given by the *Contractor* to the *Owner*. The *Contractor* acknowledges and agrees that nothing herein contained relieves it of any obligations under the provisions of the *Contract* which by their nature survive completion of the Work including, without limitation, warranties, guarantees and indemnities.

....continued on page 2

I make this solemn declaration conscientiously believing it to be true and knowing that it is of the same force and effect as if made under oath.

DECLARED BEFORE ME at _____, in the
Province of Ontario, this _____ day of _____,
20____.

A Commissioner for Oaths in and for the Province
of Ontario,
Notary Public,
Justice the Peace, etc.

[INSERT CONTRACTOR'S NAME
HERE]

Per: _____

Name:

Title:

“I have authority to bind the *Contractor*”

STATUTORY DECLARATION

IN THE MATTER OF THE ENGINEERING, PROCUREMENT AND CONSTRUCTION CONTRACT between HYDRO ONE NETWORKS INC. (“Owner”) and (“Contractor”)

for (insert location and description of the work as it appears in the Contract Documents)(“Contract”)

I solemnly declare that I am an authorized signing officer of the *Contractor* named in the *Contract* referenced above, and that as such I have personal knowledge of the facts that:

1. The last application for progress payment for which the *Contractor* has received payment is No. dated the day of , 20 ; and
2. All accounts for labour, subcontracts, products, goods, services, construction machinery and equipment and other indebtedness which have been incurred by the *Contractor* in the performance of the work as required by the *Contract*, and for which the *Owner* might in any way be held responsible, have been paid in full up to and including the latest progress payment received, as identified above, except for:
 - (a) Holdback monies properly retained, and
 - (b) Amounts withheld by reason of legitimate dispute which have been identified to the party or parties from whom payment has been withheld, which amounts and disputes are described in detail in Schedule “A” attached hereto.

Schedule “A” is attached: (state “yes” if Schedule “A” is attached; a blank or “no” means Schedule “A” is not attached)

I make this solemn Declaration conscientiously believing it to be true, and knowing that it is of the same force and effect as if made under Oath.

DECLARED before me at the
of , in the Province of Ontario,
this day of , 20 .

(insert full legal name of contractor)

Per:

Name:
A Commissioner for Oaths,
Notary Public,
Justice of the Peace, etc.

Name:
Title:

SCHEDULE “A”

(see Section 2(b) in Statutory Declaration – complete only if applicable)

Application for Payment

From: Contractor Name
Contractor Address

Application #:
PO #:
Period Covered:

Date:

To: Hydro One Networks Inc.
483 Bay Street, 4th floor, South Tower
Toronto, ON M5G 2P5

Attention: _____
Hydro One Contract Manager/Administrator

RE: Contract Title

Application is hereby made for payment of CDN _____ (which is the amount due shown below) on account of work performed for the completion of milestone # _____ under the Contract. Supporting documentation including proposed invoice, as required, is attached.

Milestone description:	
Value of Work :	
Advance Payment for Goods:	
Holdback:	
HST:	
Amount Due:	

If you have any questions, please contact _____.

Signature:

Name (Print or type):

Title:

Appendix F - Dispute Resolution Procedure

1. In the event of disagreement between the parties as to the performance of the *Work* or the interpretation, application or administration of the *Contract*, the *Contractor* shall perform the *Work* as directed by the *Owner's Representative*. All differences between the parties not resolved by the decision of the *Owner's Representative* and all disputes and claims of either party arising out of the *Contract* and its performance shall be settled in accordance with this Appendix F – Dispute Resolution Procedure.
2. The parties shall make all reasonable efforts to resolve all disputes and claims by negotiation and agree to provide, without prejudice, open and timely disclosure of relevant facts, information and documents to facilitate these negotiations. The parties shall attempt to deal with each other in good faith, and amicably and promptly.
3. If the parties are unable to resolve the dispute within ten (10) *Work Days*, the parties shall attempt to resolve the dispute by appointing a senior representative of each party, to attempt to mutually agree upon a resolution prior to further action being taken by either party.
4. In connection with any disputes, claims, and differences arising out of or in connection with the *Contract*, either party may, at any time, seek appropriate relief with a court of competent jurisdiction in the City of Toronto, Ontario. Any legal proceedings shall be commenced and heard in the City of Toronto

APPENDIX G – KEY PERSONNEL

Position	Name	Title	Curriculum Vitae (to be attached hereto)
Project Manager			
Site Supervisor			
Quality Assurance/ Quality Control Manager			
Health & Safety Manager			
Environmental Manager			
Project Scheduler/Planner			
Utility Work Protection Code (UWPC) personnel			

TAB 33

1 MR. SPENCER: So SNC-Lavalin is one of our pre-
2 qualified engineering partners and EPC partners.
3 Specifically on EPC, we have two. The other firm was
4 conflicted on this particular case because they've worked
5 previously with NextBridge, so they did not -- were unable
6 to participate with us, but we worked directly with SNC-
7 Lavalin on this project.

8 MR. RUBENSTEIN: And I understand from the schedule
9 that you don't actually have a -- or you weren't scheduled
10 to have a signed contract at this point. What is the
11 status of the contract with SNC-Lavalin?

12 MR. KARUNAKARAN: So we do have a memorandum of
13 understanding between the two parties, and through the
14 development of the works that we've been doing and the
15 development of the estimate and the offer, we've negotiated
16 an EPC contract as well and that's in an executable
17 version.

18 MR. RUBENSTEIN: So you signed -- I missed that last
19 part. So you actually have an executed EPC contract?

20 MR. KARUNAKARAN: It is not executed. It is an
21 executable version.

22 MR. SPENCER: We would only execute if we were
23 successful in the section 92 proceeding.

24 MR. RUBENSTEIN: I'm trying to avoid asking for the
25 full contract; it's very detailed.

26 Is the memorandum of agreement substantially similar
27 in terms of the terms as the executable version, or is it
28 actually -- was there some...

School Energy Coalition Interrogatory # 6

Reference:

N/A

Interrogatory:

With respect to the forecast project construction costs:

- a) For each material contract that Hydro One has or expects to enter into for construction of the proposed project, please provide a) summary of the work to be done, b) status of the contract, c) type of contract (i.e. fixed price, target price, etc.), d) the basis for contractor selection (i.e. RFP, RFQ, sole source, etc.), e) value of the contract, f) the name of the contractor (if available) g) JT 2.2 category of spending the contract work consists falls under.
- b) Please provide the total value of the construction budget that is forecast to be made up of fixed price contracts.

Response:

- a) Hydro One has entered into a fixed price agreement with SNC-Lavalin Inc.
 - a. The scope is for the Engineering, Procurement and Construction (EPC) of the entire line.
 - b. The contract has been negotiated and is ready to be executed once the Leave to Construct is granted to Hydro One.
 - c. The contract is a fixed price contract
 - d. Sole source. Market / bench tested
 - e. \$547M
 - f. SNC-Lavalin Inc.
 - g. Assuming the reference categories are JT2.20, SNC-Lavalin's mandate would be for (1) Construction, (2) Site Clearing, Preparation & Site Remediation, (3) Material, (4) Construction Management, Engineering & Design
- b) SNC-Lavalin's fixed price contract is \$547M. This encompasses all construction costs.

OEB Staff Interrogatory # 6

Reference:

EB-2017-0364 Evidence, Hydro One's Application filed on February 15, 2018, Exhibit B, Tab 11, Schedule 1, Page 1

Hydro One projects an in-service date of December 2021.

Interrogatory:

- a) Hydro One is projecting that it will complete construction of its proposal in 38 months; from OEB approval to the in-service date.
 - i. Please provide a list of transmission projects that Hydro One has completed within a comparable timeline in the past 10 years.
- b) If approved, will Hydro One require internal resources to be re-allocated to ensure that it meets the proposed project timeline?
- c) If Hydro One schedule falls behind, what corrective measures will Hydro One take to bring the project back on track?

Response:

- a) A list of transmission projects that Hydro One has completed within a comparable timeline in the last 10 years is provided in Attachment 1. In this list, Hydro One has also identified Projects that have been subject to OEB leave to construct approval.
- b) Due to the EPC contract with SNC-Lavalin, limited internal resources will need to be reallocated to ensure that Hydro One meets the proposed project timeline.
- c) Hydro One will monitor the SNC-Lavalin contract through regular project updates against defined reporting requirements. Standard project and contract management techniques will be used to bring the project back on track if the schedule falls behind such as looking at utilization of additional resources, overtime, etc. Also note that within the EPC contract SNC-Lavalin has risk exposure of liquidated damages should their substantial completion date not be met, and are therefore incentivized to deliver the project on schedule.

- a. Project Management and Project Controls for the EPC Project
- b. Engineering:
 - i. Development and design of structure types
 - ii. Selection of centerline and structure spotting on the right of way
 - iii. Design of assembly and hardware details
 - iv. Geo-technical interpretation and design of foundations
 - v. Specifications for procurement of materials
- c. Procurement:
 - i. Procurement of all materials (e.g. lattice tower steel, conductor, hardware and assemblies, etc.)
 - ii. Establishment and administration of all subcontracts for services utilized in the construction of the project
- d. Construction
 - i. Establishment of temporary facilities associated with the project (e.g. construction person camps, site offices, material laydown yards, fly yards, etc.)
 - ii. Establishment of temporary access roads to the ROW
 - iii. Clearing and brushing of the ROW
 - iv. Construction of the foundations associated with the transmission line
 - v. Assembly, erection and stringing of the transmission line
 - vi. Restoration and site remediation associated with the de-mobilization of the construction works

In developing a fixed price to cover the scope of works associated with the EPC contract, a risk and contingency allowance is derived to cover differences in quantities, construction execution techniques, variances in production rates, etc., associated with the level of definition at time of bid to those experienced during project execution. Changes to the EPC Contract price will only occur for items that are outside of the scope of the EPC Contract and given the broad and encompassing nature of the EPC Contract between Hydro One and SNC-Lavalin, many of the interface risks between engineering, procurement and construction activities would fall under the scope of SNC-Lavalin. In other project delivery methods chosen by other owners or developers, where there are elements of the engineering and procurement being handled by the owner, the risk of construction costs impacts increases for changes or delays associated with the engineering and material supply, resulting in price adjustments which would be borne by the rate payer

TAB 34

Project Schedule & In-Service

Project Schedule and Key Milestones		
Activity	Start	Finish
External Communications	February 2018	On-going through 2021
LTC Review and Decision	December 2017	October 2018
EA Studies, Review, Approval	February 2018	June 2019
Detailed Engineering	November 2017	October 2018
Procurement	January 2019	On-going through 2021
Construction	July 2019	November 2021
Project Substantial Completion		December 2021

Details

- Project schedule developed to date, outlining all major tasks, durations, and dependencies. Further detail to be built out in later stages of project.
- Minimal float available in EPC schedule, but comfortable to target Substantial Completion by Dec 31, 2021, with liquidated damages of up to \$53 million at 180 days late.
- Key dependencies to Project Substantial Completion by Dec 31, 2021:
 - Start of construction dependent on receiving approved EA by June 30th, 2019.
 - Receiving a continuous 2 week double circuit outage in August of 2020 and additional single circuit outages in summer of 2021 to complete the stringing activities.

TAB 35

Project Risks

Details

- Hydro One and SNC-Lavalin utilized consistent project risk assessment methodologies, including development of risk registry and probabilistic modeling to inform appropriate project contingencies. Project Risk Assessments were completed jointly for all project elements, regardless of accountability between the two companies.
 - Hydro One has contingency at \$14 million, and
 - SNC-Lavalin Contingency & Risk funded at approximately \$50 million.
- An allocation of risks matrix and summary of key risks are presented in appendix materials.
- The most critical project risk to cost, schedule, and reputation is whether or not Hydro One will be able to utilize the NextBridge EA work, as well as undertake an approved regulatory process to meet EA obligations associated with route modifications to lessen environmental impacts.

Key Project Risks

- Ability to utilize EA report/work done by NextBridge.
- This extension assumes that Environmental Assessment (EA) obligations can be met in 18 months.
- This requires use of NextBridge's EA and ability for Hydro One to undertake regulatory process to meet additional EA obligations associated with Hydro One route modifications.
- This is the largest risk to project success; both in terms of cost (not-to-exceed price) and schedule.
- Other significant risks include litigation process initiated by NextBridge; NextBridge's potential request to use Hydro One's corridor structures; and reputational risk with Hydro One's proposed route passing through resistant communities whereas NextBridge's does not.

1 embedded within the construction, the clearing, and other
2 elements, but we can't see the details. Perhaps those who
3 have access to the confidential information would be able
4 to, but we have a total of -- they have a total of
5 \$50 million contingency within their leave to construct and
6 Hydro One has 10 that's managed at the same level of detail
7 and about 55 which is managed within the EPC contract with
8 fixed-price terms.

9 The other substantial difference is in material cost.
10 And so this is where the route optimization through
11 Pukaskwa delivers significant benefit, and we've done the
12 approximation. It is approximately \$17 million worth of
13 reduced material costs, steel, conductor, shield, wire,
14 those types of materials.

15 The route length, just in terms of -- sorry, the
16 optimized tower design -- sorry, we'll retrace. The
17 optimized tower design that SNC-Lavalin and Hydro One have
18 designed here is substantially more efficient from an
19 engineering perspective, and that reduced steel weight,
20 without compromising reliability in any way, is effectively
21 a \$17 million savings. The shorter route length through
22 Pukaskwa is approximately \$10 million of savings, and our
23 approach to procurement of materials, specifically steel,
24 for the lattice towers, we will be procuring this on a
25 global purchasing basis, where our understanding is
26 NextBridge is most likely, although we're not certain, most
27 likely sourcing within North American markets, which are
28 potentially subject to other costs and tariffs and the

Inability to undertake an approved regulatory process to meet EA obligations in a timely manner	Medium-High	Schedule Delay Potential Cost Increase	<ul style="list-style-type: none"> Consultations with MOECC began in late 2017; regulatory measure is possible if Project is compelling to Province
Substantive unforeseen conditions imposed on EA Approvals	Low-Medium	Potential Schedule Delay Potential Cost Increase	<ul style="list-style-type: none"> Any conditions imposed would be the same for Hydro One and NextBridge in shared route areas; Hydro One's route changes expected to result in reduced environmental impacts and therefore reduced mitigation measures
OEB approval not received by October 2018	Medium	Potential Schedule Delay Potential Cost Increase	<ul style="list-style-type: none"> Respond timely to all scheduled timelines
Archaeology findings delaying construction work more than 2 weeks/per instance	Medium	Potential Schedule Delay Potential Cost Increase	<ul style="list-style-type: none"> Accelerate work schedules Parallel existing route and only 10% of the route is greenfield.

1

2 Based on the Monte Carlo results, and given the terms of the fixed-price contract
3 between Hydro One and SNC-Lavalin, SNC-Lavalin carrying its own contingency, and
4 Hydro One's past experience, Hydro One is carrying a much smaller contingency (\$10.8
5 million) than is typical for a capital project of this size.

6

7 The contingency includes allowances to cover the following potential risks which will not
8 impact rate payers:

- 9 • Commodity price fluctuations and foreign exchange variations (until November
10 2018)
- 11 • Accumulated funds used during construction interest rate variations (other than
12 those required by OEB through the statutory regulatory process)
- 13 • Material delivery delay due to procurement or vendor issues.

14

v. RISKS ELEMENTS NOT INCLUDED IN THE HYDRO ONE PRICE

No contingencies have been made for the following unlikely events and reasonable price adjustments would be submitted to OEB for prudency review only after all other recourses have been exhausted:

- Labour disputes;
- Safety or environmental incidents not covered by the insurance program of Hydro One;
- Significant changes in costs of materials, commodity rates and/or exchange rates post-October 2018) (NB: the dollar amount subject to these risks is less than 8 percent of total project costs);
- Any conditions imposed by regulatory bodies or Governmental agencies;
- Force Majeure events.

vi. COSTS OF COMPARABLE PROJECTS

A comparable project constructed by Hydro One would be the Niagara Reinforcement Project as it will also be a new 230 kV line upon completion. Due to the unique construction arrangement for the Lake Superior Link, two similar high-voltage projects completed by SNC-Lavalin have also been included in **Table 5**. Lastly, for ease of reference, Hydro One has also included the NextBridge East West Tie Line Project submission for comparative purposes.

1 iii. As the Project has progressed, Hydro One has updated its contingency since some risks
2 that were originally anticipated have not materialized and/or some have. The updated
3 contingency estimate for the Hydro One-specific portion of the LSL project is now
4 \$5.4M. The risks not currently covered by Hydro One's contingency remain those
5 identified in Exhibit B, Tab 7, Schedule 1, of the prefilled evidence.

6
7 iv. Please refer to the response to ii above.

1 included in the NextBridge application, and should be borne by the transmitter selected to
2 construct the project.

3 *Real Estate Costs – Construction Phase*

4
5 The cost increase for Construction of \$0.8M to the Original Application Estimated is attributable
6 to the delays outlined in the Development Costs rationale for Real Estate above.

7
8 *Project Management Costs – Construction Phase*

9
10 Project Management cost in Construction phase have increased slightly (\$0.3M) through this
11 phase.

12
13 *Indigenous Consultation Costs – Construction Phase*

14
15 Certain costs during the construction phase of the Project have been identified to have increased,
16 such as First Nations and Métis costs and Environmental Approval costs. However, these costs
17 have been off-set by the reduction in Hydro One's contingency costs. The rationale for these
18 increased costs are explained in the section above that deals with development costs.

19
20 *Environmental Approval Costs – Construction Phase*

21
22 The increase in Environmental Approval costs during the Construction phase of approximately
23 \$1.6 million can be attributed to a number of factors including:

- 24 • \$890K in contingency costs expected to be realized during the construction phase for
25 post-EA work such as permitting and additional approvals;
- 26 • changes in the approach to environmental approvals, scope of studies and consultation as
27 a result of these activities continuing past the LTC date (approximately \$714K). These
28 items include: Parks Canada Detail Impact Assessment, Dorion Route Alternatives
29 studies, and conducting the Individual EA Process concurrently with the Declaration
30 Order approach. These additional scope activities are all described in the Development
31 Phase Environmental Approval cost increases above.

32
33 *Contingency – Construction Phase*

34
35 Estimated contingency has been reduced (-\$5.4M) due to a number of risks being materialized,
36 mostly related to Environmental Approval and Indigenous Consultation. Interest during

Vulnerable Energy Consumers Coalition Interrogatory #8

Reference:

Exhibit B, Tab 7, Schedule 1, pg. 9

Interrogatory:

Preamble: The evidence states that “*Hydro One is carrying a much smaller contingency (\$10.8 million) than is typical for a capital project of this size.*”

- a) What would be the normal contingency used by Hydro One for a project of this size and complexity?
- b) Should Hydro One exceed its contingency allowance will any excess above the \$10.8 million be sought for rate recovery or alternatively absorbed by the shareholder?

Response:

- a) For a project of this size and complexity, Hydro One would typically have a contingency amount in the order of 10%.

The referenced \$10.8 million reflects only the portion of contingency that was estimated for the portion of work Hydro One is delivering directly (i.e. Real Estate rights, Indigenous consultation, environmental approval, indirect overheads for corporate services, and interest during construction). In addition to this amount, SNC-Lavalin’s fixed-price EPC contract includes \$54 million of contingency and risk.

The total project contingency for the Lake Superior Link is in the order of 10%.

- b) Hydro One’s total project cost in the application has been estimated within a -5% to +6% range, and any necessary and realized costs beyond the approved amount would be sought for rate recovery and would be subject to prudence review by the OEB.

Hydro One has also responded to questions regarding not-to-exceed pricing alternatives at Exhibit I, Tab 1, Schedule 18

TAB 36

1 MR. SPENCER: So SNC-Lavalin is one of our pre-
2 qualified engineering partners and EPC partners.
3 Specifically on EPC, we have two. The other firm was
4 conflicted on this particular case because they've worked
5 previously with NextBridge, so they did not -- were unable
6 to participate with us, but we worked directly with SNC-
7 Lavalin on this project.

8 MR. RUBENSTEIN: And I understand from the schedule
9 that you don't actually have a -- or you weren't scheduled
10 to have a signed contract at this point. What is the
11 status of the contract with SNC-Lavalin?

12 MR. KARUNAKARAN: So we do have a memorandum of
13 understanding between the two parties, and through the
14 development of the works that we've been doing and the
15 development of the estimate and the offer, we've negotiated
16 an EPC contract as well and that's in an executable
17 version.

18 MR. RUBENSTEIN: So you signed -- I missed that last
19 Part. So you actually have an executed EPC contract?

20 MR. KARUNAKARAN: It is not executed. It is an
21 executable version.

22 MR. SPENCER: We would only execute if we were
23 successful in the section 92 proceeding.

24 MR. RUBENSTEIN: I'm trying to avoid asking for the
25 full contract; it's very detailed.

26 Is the memorandum of agreement substantially similar
27 in terms of the terms as the executable version, or is it
28 actually -- was there some...

1 **Interrogatory:**

- 2 a) Has Hydro One ever constructed 87 230 kV quad (or double circuit) towers of similar design
3 within a span of two weeks in the province of Ontario? If yes, please provide the examples.
4
- 5 b) Will all the required construction work (removal of all existing towers and lines,
6 reinforcement of existing foundations, replacement of existing foundations as required, and
7 erection of new quad towers and stringing of the four transmission circuits and associated
8 communication cables) be completed in the two-week window within the Pukaskwa National
9 Park? Please provide Hydro One's construction and resourcing plans that outline the details
10 of how this aggressive timeline will be met.
11
- 12 c) Has Hydro One taken into account potential weather-related delays for the two-week
13 schedule considering it plans to use helicopters to install the new quad towers? What
14 mitigation plans does Hydro One have to correct for weather-related delays to ensure the
15 overall project remains on schedule?
16
- 17 d) Is the geographical location for the proposed quad towers within the Pukaskwa National Park
18 a major risk factor in Hydro One's ability to meet the in-service timeline? Please explain.
19
- 20 e) If the outage window that Hydro One is proposing to take in August 2020 to install the quad
21 towers within Pukaskwa is missed, when is the next two-week window? What impact would
22 this type of delay have on Hydro One's ability to meet its proposed in-service date in 2021?
23
- 24 f) Have there been any communications between the IESO and Hydro One regarding the
25 proposed two-week outage? If so, has the IESO agreed to Hydro One's proposed two-week
26 outage, in principal? Please provide details of any discussions/communications and copies of
27 all correspondence between Hydro One and the IESO with respect to this matter.
28
- 29 g) What happens if Hydro One's proposed work takes longer than two weeks?
30

31 **Response:**

- 32 a) No, Hydro One has not had the need to construct 87, 230 kV quad circuit towers in a span of
33 two weeks. The construction of the LSL Project will be undertaken by SNC-Lavalin through
34 an EPC contract.

- 1 ii. The estimated cost of construction at the time SNC-Lavalin was contracted to work on
- 2 the project and the actual cost of construction.
- 3 iii. The estimated cost of any procurement of equipment or material over \$1 million to be
- 4 undertaken by SNC-Lavalin at the time SNC-Lavalin was contracted to work on the
- 5 project and the actual cost the procured equipment and material.
- 6 iv. Any project owner Indigenous Community concerns expressed or received related to
- 7 safety, procurement, contracting or construction practices, including cost overruns,
- 8 and provide copies of any associated documents.
- 9

10 **Response:**

- 11 a) SNC-Lavalin Inc. and its affiliates are party to various claims and litigation arising in the
- 12 normal course of operations. Due to the inherent uncertainties of litigation and/or the early
- 13 stage of proceedings, it is not possible to predict the final outcome of ongoing claims and
- 14 litigation at any given time or to determine the amount of any potential losses, if any. With
- 15 respect to claims or litigation arising in the normal course of operations which are at a more
- 16 advanced stage and which present a better assessment of potential outcome, SNC-Lavalin
- 17 Group Inc. does not expect the resolution of these matters to have a materially adverse effect
- 18 on the solvency, liquidity or financial condition of SNC-Lavalin Group Inc. or any of its
- 19 affiliates including SNC-Lavalin Inc.
- 20

21 For further details regarding the various legal proceedings, please refer to SNC-Lavalin
22 Group Inc.'s (i) 2017 audited consolidated financial statements (see particularly Note 34 –
23 Contingent Liabilities), and (ii) unaudited interim condensed consolidated financial
24 statements as at and for the six-month periods ended June 30, 2018 and 2017 (see particularly
25 Note 13 – Contingent Liabilities), as filed on www.sedar.com.

26
27 With respect to specific government agency rulings or court rulings, within the Clean Power
28 Sector, we are not aware of any such rulings. With respect to executed settlement agreements
29 over the last 5 years, please note that any such settlement agreements are confidential by their
30 nature between the parties and we do not have authority or consent to transmit any such
31 settlement agreements.

32
33 With respect to any public court cases, should there be any such judgments or court rulings in
34 Canada, such judgments would be searchable in the public databases. We are not aware of
35 any such public court judgments or rulings within the Clean Power Sector. We cannot,
36 however, confirm with certainty whether any of our colleagues in other Sectors would have
37 any such judgments.

TAB 37



SNC • LAVALIN

Q2

Interim Condensed Consolidated Financial Statements (unaudited)

As at and for the six-month periods ended
June 30, 2018 and 2017

SNC-Lavalin Group Inc.

INTERIM CONDENSED CONSOLIDATED STATEMENTS OF FINANCIAL POSITION

(UNAUDITED)

(IN THOUSANDS OF CANADIAN DOLLARS)

	Note	June 30 2018	December 31 2017
ASSETS			
Current assets			
Cash and cash equivalents		\$ 721,408	\$ 706,531
Restricted cash		17,174	20,932
Trade receivables		1,430,247	1,445,859
Contract assets		1,507,499	–
Contracts in progress		–	1,329,861
Inventories		118,909	110,237
Other current financial assets		180,507	442,500
Other current non-financial assets		496,768	450,877
Assets of disposal group classified as held for sale and assets held for sale	15	–	107,994
Total current assets		4,472,512	4,614,791
Property and equipment		442,167	414,138
Capital investments accounted for by the equity method	4	340,872	296,664
Capital investments accounted for by the cost method	4	56,091	55,614
Goodwill	17	6,366,107	6,323,440
Intangible assets related to business combinations		1,011,974	1,089,837
Deferred income tax asset		645,960	545,551
Non-current portion of receivables under service concession arrangements		316,591	273,340
Other non-current financial assets		27,672	44,321
Other non-current non-financial assets		122,417	104,810
Total assets		\$ 13,802,363	\$ 13,762,506
LIABILITIES AND EQUITY			
Current liabilities			
Trade payables		\$ 2,183,498	\$ 2,176,947
Contract liabilities		775,710	–
Downpayments on contracts		–	149,388
Deferred revenues		–	758,392
Other current financial liabilities		257,683	264,724
Other current non-financial liabilities		541,985	584,102
Current portion of provisions		329,667	174,534
Short-term debt and current portion of long-term debt:			
Recourse		657,384	318,757
Non-recourse from Capital investments		15,976	15,566
Liabilities of disposal group classified as held for sale	15	–	60,440
Total current liabilities		4,761,903	4,502,850
Long-term debt:			
Recourse		1,520,537	1,026,782
Limited recourse		978,529	1,475,177
Non-recourse from Capital investments		327,637	297,398
Other non-current financial liabilities		26,152	15,425
Non-current portion of provisions		717,518	791,060
Other non-current non-financial liabilities		54,408	53,367
Deferred income tax liability		393,685	377,225
Total liabilities		8,780,369	8,539,284
Equity			
Share capital		1,805,080	1,801,733
Retained earnings		2,932,088	3,145,424
Other components of equity	9	285,821	277,974
Equity attributable to SNC-Lavalin shareholders		5,022,989	5,225,131
Non-controlling interests		(995)	(1,909)
Total equity		5,021,994	5,223,222
Total liabilities and equity		\$ 13,802,363	\$ 13,762,506

See accompanying notes to interim condensed consolidated financial statements.

SNC-Lavalin Group Inc.

INTERIM CONDENSED CONSOLIDATED STATEMENTS OF CHANGES IN EQUITY
(UNAUDITED)

SIX MONTHS ENDED JUNE 30
(IN THOUSANDS OF CANADIAN DOLLARS, EXCEPT
NUMBER OF COMMON SHARES)

					2018		
Equity attributable to SNC-Lavalin shareholders							
Share Capital							
Common shares (in thousands)	Amount	Retained earnings	Other components of equity (Note 9)	Total	Non-controlling interests	Total equity	
Balance at beginning of the period	175,488	\$ 1,801,733	\$ 3,145,424	\$ 277,974	\$ 5,225,131	\$ (1,909)	\$ 5,223,222
Transitional adjustments on adoption of new accounting standards (Note 2B)	—	—	(327,387)	5,448	(321,939)	369	(321,570)
Adjusted balance at beginning of the period	175,488	1,801,733	2,818,037	283,422	4,903,192	(1,540)	4,901,652
Net income for the period	—	—	161,083	—	161,083	413	161,496
Other comprehensive income for the period	—	—	54,367	2,399	56,766	3	56,769
Total comprehensive income for the period	—	—	215,450	2,399	217,849	416	218,265
Dividends declared (Note 7)	—	—	(100,753)	—	(100,753)	—	(100,753)
Shares issued under stock option plans	66	3,347	(646)	—	2,701	—	2,701
Capital contributions by non-controlling interests	—	—	—	—	—	129	129
Balance at end of the period	175,554	\$ 1,805,080	\$ 2,932,088	\$ 285,821	\$ 5,022,989	\$ (995)	\$ 5,021,994

SIX MONTHS ENDED JUNE 30
(IN THOUSANDS OF CANADIAN DOLLARS, EXCEPT
NUMBER OF COMMON SHARES)

2017							
Equity attributable to SNC-Lavalin shareholders							
Share Capital				Other components of equity (Note 9)	Total	Non-controlling interests	Total equity
Common shares (in thousands)	Amount	Retained earnings					
Balance at beginning of the period	150,357	\$ 554,839	\$ 2,959,366	\$ 359,017	\$ 3,873,222	\$ 23,112	\$ 3,896,334
Net income for the period	–	–	226,103	–	226,103	3,374	229,477
Other comprehensive income (loss) for the period	–	–	974	(15,775)	(14,801)	24	(14,777)
Total comprehensive income (loss) for the period	–	–	227,077	(15,775)	211,302	3,398	214,700
Dividends declared (Note 7)	–	–	(82,151)	–	(82,151)	–	(82,151)
Dividends declared by subsidiaries to non-controlling interests	–	–	–	–	–	(607)	(607)
Stock option compensation	–	–	139	–	139	–	139
Shares issued under stock option plans	181	8,597	(1,735)	–	6,862	–	6,862
Balance at end of the period	150,538	\$ 563,436	\$ 3,102,696	\$ 343,242	\$ 4,009,374	\$ 25,903	\$ 4,035,277

See accompanying notes to interim condensed consolidated financial statements.

SNC-Lavalin Group Inc.

INTERIM CONDENSED CONSOLIDATED INCOME STATEMENTS
(UNAUDITED)

(IN THOUSANDS OF CANADIAN DOLLARS, EXCEPT
EARNINGS PER SHARE AND NUMBER OF SHARES)

		SECOND QUARTER		SIX MONTHS ENDED JUNE 30	
	Note	2018	2017 ⁽¹⁾	2018	2017 ⁽¹⁾
Revenues from:					
E&C		\$ 2,469,920	\$ 1,868,161	\$ 4,837,117	\$ 3,656,485
Capital investments accounted for by the consolidation or cost methods		10,682	15,663	23,598	28,095
Capital investments accounted for by the equity method		46,517	51,049	97,798	99,563
		2,527,119	1,934,873	4,958,513	3,784,143
Direct cost of activities		2,305,729	1,779,966	4,503,025	3,458,593
Total segment EBIT ⁽²⁾		221,390	154,907	455,488	325,550
Corporate selling, general and administrative expenses		24,503	43,109	55,162	71,670
Impairment loss arising from expected credit losses		124	—	654	—
Loss (gain) arising on financial assets at fair value through profit or loss		(4,574)	(4,544)	(398)	1,636
Net class action lawsuits settlement expense	13B	88,000	—	88,000	—
Restructuring costs		1,053	22,306	2,581	25,131
Acquisition-related costs and integration costs	16C	12,789	55,272	23,491	56,635
Amortization of intangible assets related to business combinations		52,787	14,301	109,514	29,664
Gain on disposal/partial disposal of a Capital investment	4A	(62,714)	(5,403)	(62,714)	(5,403)
Loss (gain) from disposals of E&C businesses		312	(287)	312	(1,006)
Gain on disposal of the head office building	18	—	(115,101)	—	(115,101)
EBIT ⁽²⁾		109,110	145,254	238,886	262,324
Financial expenses	5	47,140	16,366	87,329	31,651
Financial income and net foreign exchange losses (gains)	5	(10,040)	(2,968)	(8,204)	(5,059)
Earnings before income taxes		72,010	131,856	159,761	235,732
Income taxes		(11,211)	(2,549)	(1,735)	6,255
Net income for the period		\$ 83,221	\$ 134,405	\$ 161,496	\$ 229,477
Net income (loss) attributable to:					
SNC-Lavalin shareholders		\$ 83,011	\$ 136,390	\$ 161,083	\$ 226,103
Non-controlling interests		210	(1,985)	413	3,374
Net income for the period		\$ 83,221	\$ 134,405	\$ 161,496	\$ 229,477
Earnings per share (in \$)					
Basic		\$ 0.47	\$ 0.91	\$ 0.92	\$ 1.50
Diluted		\$ 0.47	\$ 0.91	\$ 0.92	\$ 1.50
Weighted average number of outstanding shares (in thousands)	6				
Basic		175,534	150,483	175,528	150,432
Diluted		175,612	150,597	175,605	150,572

⁽¹⁾ Comparative figures have been revised (see Note 2C)

⁽²⁾ Earnings before interest and income taxes ("EBIT")

See accompanying notes to interim condensed consolidated financial statements.

SNC-Lavalin Group Inc.

INTERIM CONDENSED CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME
(UNAUDITED)THREE MONTHS ENDED JUNE 30
(IN THOUSANDS OF CANADIAN DOLLARS)

	2018			2017		
	Attributable to SNC-Lavalin shareholders	Non- controlling interests	Total	Attributable to SNC-Lavalin shareholders	Non- controlling interests	Total
Net income (loss) for the period	\$ 83,011	\$ 210	\$ 83,221	\$ 136,390	\$ (1,985)	\$ 134,405
Other comprehensive income (loss):						
Exchange differences on translating foreign operations (Note 9)	(94,563)	(1)	(94,564)	9,812	202	10,014
Available-for-sale financial assets (Note 9)	—	—	—	813	—	813
Cash flow hedges (Note 9)	(13,918)	—	(13,918)	12,009	—	12,009
Share of other comprehensive loss of investments accounted for by the equity method (Note 9)	(869)	—	(869)	(358)	—	(358)
Income taxes (Note 9)	3,926	—	3,926	(529)	—	(529)
Total of items that will be reclassified subsequently to net income	(105,424)	(1)	(105,425)	21,747	202	21,949
Financial assets at fair value through other comprehensive income (Note 9)	(487)	—	(487)	—	—	—
Income taxes (Note 9)	25	—	25	—	—	—
Remeasurement on defined benefit plans (Note 9)	40,507	—	40,507	789	—	789
Income taxes (Note 9)	(6,957)	—	(6,957)	829	—	829
Total of items that will not be reclassified subsequently to net income	33,088	—	33,088	1,618	—	1,618
Total other comprehensive income (loss) for the period	(72,336)	(1)	(72,337)	23,365	202	23,567
Total comprehensive income (loss) for the period	\$ 10,675	\$ 209	\$ 10,884	\$ 159,755	\$ (1,783)	\$ 157,972

SIX MONTHS ENDED JUNE 30
(IN THOUSANDS OF CANADIAN DOLLARS)

	2018			2017		
	Attributable to SNC-Lavalin shareholders	Non- controlling interests	Total	Attributable to SNC-Lavalin shareholders	Non- controlling interests	Total
Net income for the period	\$ 161,083	\$ 413	\$ 161,496	\$ 226,103	\$ 3,374	\$ 229,477
Other comprehensive income (loss):						
Exchange differences on translating foreign operations (Note 9)	9,247	3	9,250	(22,039)	24	(22,015)
Available-for-sale financial assets (Note 9)	—	—	—	3,431	—	3,431
Cash flow hedges (Note 9)	(9,248)	—	(9,248)	4,195	—	4,195
Share of other comprehensive loss of investments accounted for by the equity method (Note 9)	(99)	—	(99)	(347)	—	(347)
Income taxes (Note 9)	2,499	—	2,499	(1,015)	—	(1,015)
Total of items that will be reclassified subsequently to net income	2,399	3	2,402	(15,775)	24	(15,751)
Financial assets at fair value through other comprehensive income (Note 9)	(189)	—	(189)	—	—	—
Income taxes (Note 9)	25	—	25	—	—	—
Remeasurement on defined benefit plans (Note 9)	65,757	—	65,757	47	—	47
Income taxes (Note 9)	(11,226)	—	(11,226)	927	—	927
Total of items that will not be reclassified subsequently to net income	54,367	—	54,367	974	—	974
Total other comprehensive income (loss) for the period	56,766	3	56,769	(14,801)	24	(14,777)
Total comprehensive income for the period	\$ 217,849	\$ 416	\$ 218,265	\$ 211,302	\$ 3,398	\$ 214,700

See accompanying notes to interim condensed consolidated financial statements.

SNC-Lavalin Group Inc.

INTERIM CONDENSED CONSOLIDATED STATEMENTS OF CASH FLOWS

(UNAUDITED)

(IN THOUSANDS OF CANADIAN DOLLARS)		SECOND QUARTER		SIX MONTHS ENDED JUNE 30	
	Note	2018	2017	2018	2017
Operating activities					
Net income for the period		\$ 83,221	\$ 134,405	\$ 161,496	\$ 229,477
Income taxes received (paid)		(27,088)	16,778	(3,408)	6,009
Interest paid from E&C		(38,701)	(18,137)	(89,415)	(29,455)
Interest paid from Capital investments		(324)	(1,639)	(7,132)	(11,657)
Other reconciling items	10A	76,992	(49,448)	170,894	(40,050)
		94,100	81,959	232,435	154,324
Net change in non-cash working capital items	10B	(154,485)	(164,462)	(439,569)	(423,602)
Net cash used for operating activities		(60,385)	(82,503)	(207,134)	(269,278)
Investing activities					
Acquisition of property and equipment		(37,347)	(21,306)	(68,668)	(53,045)
Proceeds from disposal of the head office building	18	–	173,288	–	173,288
Costs associated to a foreign exchange option	16C	–	(54,134)	–	(54,134)
Recovery associated to a foreign exchange option	16C	–	5,407	–	5,407
Change in restricted cash position		4,123	5,527	4,123	9,753
Increase in receivables under service concession arrangements		(33,841)	(53,262)	(76,957)	(103,244)
Recovery of receivables under service concession arrangements		18,117	31,738	37,336	60,773
Decrease in short-term and long-term investments		–	11,417	1,707	33,157
Net cash inflow on disposal/partial disposal of a Capital investment accounted for by the equity method	4A	92,214	23,270	92,214	23,270
Other		9,256	(289)	5,770	4,635
Net cash generated from (used for) investing activities		52,522	121,656	(4,475)	99,860
Financing activities					
Increase in recourse debt	10C	946,679	160,431	1,845,065	160,431
Payment for recourse debt issue costs	10C	(1,657)	–	(4,216)	–
Repayment of recourse debt	10C	(323,935)	(160,431)	(1,061,105)	(160,431)
Repayment of limited recourse debt	10D, 14C	(500,000)	–	(500,000)	–
Increase in non-recourse debt from Capital investments	10D	9,450	–	29,784	–
Repayment of non-recourse debt from Capital investments	10D	–	(1,173)	–	(3,549)
Proceeds from exercise of stock options		1,078	5,135	2,701	6,862
Dividends paid to SNC-Lavalin shareholders	7, 10D	(50,376)	(41,094)	(100,753)	(82,151)
Amount advanced for contingent acquisition of non-controlling interest	19	–	(31,220)	–	(31,220)
Other	10D	1,947	374	4,631	411
Net cash generated from (used for) financing activities		83,186	(67,978)	216,107	(109,647)
Increase (decrease) from exchange differences on translating cash and cash equivalents		(753)	826	10,340	6,115
Net increase (decrease) in cash and cash equivalents		74,570	(27,999)	14,838	(272,950)
Cash and cash equivalents at beginning of period ⁽¹⁾		646,838	810,533	706,570	1,055,484
Cash and cash equivalents at end of period		\$ 721,408	\$ 782,534	\$ 721,408	\$ 782,534
Presented on the statement of financial position as follows:					
Cash and cash equivalents		\$ 721,408	\$ 737,361	\$ 721,408	\$ 737,361
Assets of disposal group classified as held for sale and assets held for sale		–	45,173	–	45,173
		\$ 721,408	\$ 782,534	\$ 721,408	\$ 782,534

⁽¹⁾ The amount of \$646.8 million as at March 31, 2018 and the amount of \$706.6 million as at December 31, 2017 included \$1 thousand and \$39 thousand, respectively, of cash and cash equivalents comprised within “Assets of disposal group classified as held for sale and assets held for sale”.

See accompanying notes to interim condensed consolidated financial statements.

NOTES TO INTERIM CONDENSED CONSOLIDATED FINANCIAL STATEMENTS

NOTE	PAGE
1. DESCRIPTION OF BUSINESS	7
2. BASIS OF PREPARATION	7
3. SEGMENT DISCLOSURES	17
4. CAPITAL INVESTMENTS	23
5. NET FINANCIAL EXPENSES	24
6. WEIGHTED AVERAGE NUMBER OF OUTSTANDING SHARES	25
7. DIVIDENDS	25
8. REDEMPTION OF SHARES	25
9. OTHER COMPONENTS OF EQUITY	26
10. STATEMENTS OF CASH FLOWS	28
11. RELATED PARTY TRANSACTIONS	32
12. FINANCIAL INSTRUMENTS	32
13. CONTINGENT LIABILITIES	34
14. SHORT-TERM DEBT AND LONG-TERM DEBT	38
15. DISPOSAL GROUP AND NON-CURRENT ASSETS CLASSIFIED AS HELD FOR SALE	39
16. BUSINESS COMBINATIONS	39
17. GOODWILL	42
18. GAIN ON DISPOSAL OF THE HEAD OFFICE BUILDING	42
19. CONTINGENT ACQUISITION OF NON-CONTROLLING INTEREST	42

Notes to Interim Condensed Consolidated Financial Statements

(ALL TABULAR FIGURES IN THOUSANDS OF CANADIAN DOLLARS, UNLESS OTHERWISE INDICATED)
(UNAUDITED)

1. DESCRIPTION OF BUSINESS

SNC-Lavalin Group Inc. is incorporated under the Canada Business Corporations Act and has its registered office at 455 René-Lévesque Boulevard West, Montreal, Quebec, Canada H2Z 1Z3. SNC-Lavalin Group Inc. is a public company listed on the Toronto Stock Exchange in Canada. Reference to the “Company” or to “SNC-Lavalin” means, as the context may require, SNC-Lavalin Group Inc. and all or some of its subsidiaries or joint arrangements, or SNC-Lavalin Group Inc. or one or more of its subsidiaries or joint arrangements.

The Company provides consulting, design, engineering, construction as well as sustaining capital and operations and maintenance expertise, which together are referred to as “E&C”, through its network of offices in over 50 countries, and is currently working on projects around the world. SNC-Lavalin also makes select investments that are complementary to its other activities, which are referred to as “Capital investments” or “Capital” in these financial statements.

2. BASIS OF PREPARATION

A) BASIS OF PREPARATION

The Company’s financial statements are presented in **Canadian dollars**. All values are rounded to the nearest thousand dollars, except where otherwise indicated.

These financial statements have been prepared in accordance with IAS 34, *Interim Financial Reporting*, (“IAS 34”).

The IFRS accounting policies that are set out in Note 2 to the Company’s annual audited consolidated financial statements for the year ended December 31, 2017 were consistently applied to all periods presented, except for the change in an accounting policy and the accounting policies affected by new standards, amendments and an interpretation adopted in the six-month period ended June 30, 2018, as described in Notes 2B and 2C.

The preparation of financial statements in conformity with IAS 34 requires the use of certain critical accounting estimates. It also requires management to exercise its judgment in the process of applying the Company’s accounting policies. The areas involving a higher degree of judgment or complexity, or areas where assumptions and estimates are significant, are disclosed in Note 3 in the Company’s annual audited consolidated financial statements for the year ended December 31, 2017 and remained unchanged for all periods presented, except for the new judgments and estimates related to the adoption of IFRS 15, *Revenue from Contracts with Customers*, effective January 1, 2018, as described in Note 2D.

The Company’s financial statements have been prepared on the historical cost basis, with the exception of i) certain financial instruments, derivative financial instruments and liabilities for share unit plans, which are measured at fair value; ii) the defined benefit liabilities, which are measured as the net total of the present value of the defined benefit obligation minus the fair value of plan assets; and iii) investments measured at fair value, which are held by SNC-Lavalin Infrastructure Partners LP, an investment entity accounted for by the equity method and for which SNC-Lavalin elected to retain the fair value measurement applied by that investment entity. Historical cost generally represents the fair value of consideration given in exchange for assets upon initial recognition.

Fair value is the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date, regardless of whether that price is directly observable or estimated using another valuation technique. In estimating the fair value of an asset or a liability, the Company takes into account the characteristics of the asset or liability if market participants would take those characteristics into account when pricing the asset or liability at the measurement date. Fair value for measurement and/or disclosure purposes in these consolidated financial statements is determined on such a basis, except for share-based payment transactions that are within the scope of IFRS 2, *Share-based Payment*, and measurements that have some similarities to fair value but are not fair value, such as net realisable value in IAS 2, *Inventories*, or value in use in IAS 36, *Impairment of Assets*.

These interim condensed consolidated financial statements do not include all of the information required for annual financial statements and should be read in conjunction with the Company’s 2017 annual audited consolidated financial statements.

These Company’s interim condensed consolidated financial statements were authorized for issue by the Board of Directors on August 1, 2018.

2. BASIS OF PREPARATION (CONTINUED)

B) NEW STANDARDS, AMENDMENTS AND AN INTERPRETATION ADOPTED IN THE SIX-MONTH PERIOD ENDED JUNE 30, 2018

The following standards, amendments to existing standards and interpretation have been adopted by the Company on January 1, 2018:

- IFRS 9, *Financial Instruments*, (“IFRS 9”) covers mainly: i) the classification and measurement of financial assets and financial liabilities; ii) the new impairment model for the recognition of expected credit losses; and iii) the new hedge accounting model.
- IFRS 15, *Revenue from Contracts with Customers*, (“IFRS 15”) outlines a single comprehensive model for entities to use in accounting for revenue arising from contracts with customers. It supersedes previous revenue recognition guidance including IAS 18, *Revenue*, IAS 11, *Construction Contracts*, and related Interpretations.
- Amendments to IFRS 15 clarify how to: i) identify a performance obligation in a contract; ii) determine whether a company is a principal or an agent; and iii) determine whether the revenue from granting a license should be recognized at a point in time or over time. In addition, the amendments to IFRS 15 include two additional transition reliefs.
- Amendments to IFRS 2, *Share-based Payment*, (“IFRS 2”) provide requirements on the accounting for: i) the effects of vesting and non-vesting conditions on the measurement of cash-settled share-based payments; ii) share-based payment transactions with a net settlement feature for withholding tax obligations; and iii) a modification to the terms and conditions of a share-based payment that changes the classification of a transaction from cash-settled to equity-settled.
- Amendments to IAS 28, *Investments in Associates and Joint Ventures*, clarify that the election to measure at fair value through profit or loss an investment in an associate or a joint venture that is held by an entity that is a venture capital organisation, or other qualifying entity, is available for each investment in an associate or joint venture on an investment-by-investment basis, upon initial recognition.
- IFRIC Interpretation 22, *Foreign Currency Transactions and Advance Consideration*, clarifies that: i) the date of the transaction, for the purpose of determining the exchange rate, is the date of initial recognition of the non-monetary prepayment asset and deferred income liability; and ii) if there are multiple payments or receipts in advance, a date of transaction is established for each payment or receipt.
- *Transfers of Investment Property* (Amendments to IAS 40, *Investment Property*) state that an entity shall transfer a property to, or from, investment property when, and only when, there is an evidence of a change in use. A change in use occurs if property meets, or ceases to meet, the definition of investment property. A change in management’s intentions for the use of a property by itself does not constitute evidence of a change in use.

Except for IFRS 9, IFRS 15, amendments to IFRS 15 and IFRS 2, the amendments and interpretation listed above did not have a significant impact on the Company’s financial statements.

ADOPTION OF IFRS 9

Transition

IFRS 9, *Financial Instruments*, replaced IAS 39, *Financial Instruments: Recognition and Measurement*, (“IAS 39”) and was applied in accordance with transitional provisions of IFRS 9, which require an entity to apply IFRS 9 in accordance with IAS 8, *Accounting Policies, Change in Accounting Estimates and Errors*. The transitional provisions of IFRS 9 for classification and measurement of financial assets and financial liabilities oblige an entity to apply IFRS 9 requirements retrospectively.

As per the optional exemption in IFRS 9, the Company elected not to restate comparative figures.

IFRS 9 is not applied to financial assets and financial liabilities that have been derecognized at the date of initial application (i.e., the date when an entity first applies the requirements in IFRS 9), which is January 1, 2018 for SNC-Lavalin.

Main changes

In general, the main changes introduced by IFRS 9 relate to the classification and measurement of financial assets, the introduction of a new impairment model based on expected credit losses (rather than incurred losses as per IAS 39) and hedge accounting.

2. BASIS OF PREPARATION (CONTINUED)

Classification and measurement of financial assets and financial liabilities

The following table presents the carrying amount of financial assets held by SNC-Lavalin at December 31, 2017 by measurement category under IAS 39 and under IFRS 9:

	NOTE	IAS 39		IFRS 9	
		MEASUREMENT CATEGORY ⁽¹⁾	CARRYING AMOUNT	MEASUREMENT CATEGORY ⁽¹⁾	CARRYING AMOUNT
Cash and cash equivalents		FVTPL	\$ 706,531	FVTPL	\$ 706,531
Restricted cash		FVTPL	20,932	FVTPL	20,932
Trade receivables	A	Amortized cost	1,445,859	Amortized cost	1,442,815
Other current financial assets:					
Derivative financial instruments used for hedges		FVTPL	37,967	FVTPL	37,967
Financial assets at FVTPL		FVTPL	5,271	FVTPL	5,271
Other current financial assets		Amortized cost	399,262	Amortized cost	399,262
Capital investments accounted for by the cost method:					
At fair value	B	FVTOCI	52,708	FVTPL	52,708
At cost		Cost	2,350	FVTOCI	1,377
At amortized cost		Amortized cost	556	Amortized cost	556
Non-current portion of receivables under service concession arrangements		Amortized cost	273,340	Amortized cost	273,340
Other non-current financial assets:					
Derivative financial instruments		FVTPL	7,602	FVPTL	7,602
Derivative financial instruments used for hedges		FVTPL	14,552	FVTPL	14,552
At cost		Cost	1,783	FVTOCI	1,346
At amortized cost		Amortized cost	20,384	Amortized cost	20,384
Total			\$ 2,989,097		\$ 2,984,643

⁽¹⁾ FVTPL: Fair value through profit or loss

FVTOCI: Fair value through other comprehensive income

A. See section “New impairment model” below.

B. Relates to Astoria Project Partners II LLC, a Capital investment accounted for by the cost method. Under IFRS 9, since the contractual terms of this investment do not give rise, on specified dates, to cash flows that are solely payments of principal and interest and the Company did not make an irrevocable election to measure this investment at FVTOCI, the Company classified this investment in the FVTPL measurement category. As at January 1, 2018, the cumulative gain of \$8.9 million net of taxes related to this available-for-sale financial asset included in the “Other components of equity” was reclassified to the Company’s opening retained earnings (see Note 9).

2. BASIS OF PREPARATION (CONTINUED)

The following table presents the carrying amount of financial liabilities held by SNC-Lavalin at December 31, 2017 by measurement category under IAS 39 and under IFRS 9:

	IAS 39		IFRS 9	
	MEASUREMENT CATEGORY ⁽¹⁾	CARRYING AMOUNT	MEASUREMENT CATEGORY ⁽¹⁾	CARRYING AMOUNT
Trade payables	Amortized cost	\$ 2,176,947	Amortized cost	\$ 2,176,947
Downpayments on contracts	Amortized cost	149,388	See ⁽²⁾	See ⁽²⁾
Other current financial liabilities:				
Derivative financial instruments used for hedges	FVTPL	20,775	FVTPL	20,775
Other current financial liabilities	Amortized cost	243,949	Amortized cost	243,949
Provisions	Amortized cost	52,519	Amortized cost	52,519
Short-term debt and long-term debt	Amortized cost	3,133,680	Amortized cost	3,133,680
Other non-current financial liabilities:				
Derivative financial instruments used for hedges	FVTPL	1,303	FVTPL	1,303
Other non-current financial liabilities	Amortized cost	14,122	Amortized cost	14,122
Total		\$ 5,792,683		\$ 5,643,295

⁽¹⁾ FVTPL: Fair value through profit or loss

⁽²⁾ Presented as part of "Contract assets/Contract liabilities" in 2018

New impairment model

The IAS 39 incurred credit loss model was replaced by the IFRS 9 expected credit loss model. Expected credit losses are the present value of all cash shortfalls over the expected life of the financial instrument.

The new impairment model generally requires entities to recognize expected credit losses in profit or loss for all financial assets, even those that are newly originated or acquired. Although IFRS 9 does not require the loss allowance to be recognized at initial recognition of the new financial asset but rather at the next reporting date, the effect is the same as to recognizing a day one loss. This is different from IAS 39, under which no impairment was recognized unless and until a loss event occurs after the initial recognition of a financial asset.

Under IFRS 9, impairment is measured as either: i) 12-month expected credit losses; or ii) lifetime expected credit losses.

The Company applies the simplified approach to recognize lifetime expected credit losses for its trade receivables and contract assets that are in scope of IFRS 15 and that do not have a significant financing component. The Company applies the 12-month expected credit losses to its receivables under service concession arrangements that have a significant financing component.

The following table presents the reconciliation of the ending allowances as at December 31, 2017 to the opening loss allowances determined in accordance with IFRS 9 at the date of initial application:

Model	TRADE RECEIVABLES	CONTRACT ASSETS	RECEIVABLES UNDER SERVICE CONCESSION ARRANGEMENTS
	Life-time expected credit losses	Life-time expected credit losses	12-month expected credit losses
Allowances as at December 31, 2017	\$ 163,985	\$ 154,794	\$ –
Additional loss allowance recognized on January 1, 2018	3,044	2,471	–
Impairment allowance under IFRS 9 as at January 1, 2018	\$ 167,029	\$ 157,265	\$ –

As at January 1, 2018, the current portion of receivable under service concession arrangements amounted to \$nil, which resulted in a \$nil impairment allowance based on a 12-month expected credit loss model.

Hedge accounting

As permitted by IFRS 9, the Company continues to apply the requirements contained in IAS 39 for hedge accounting.

2. BASIS OF PREPARATION (CONTINUED)

ADOPTION OF IFRS 15 AND AMENDMENTS TO IFRS 15

IFRS 15 introduces a 5-step model to revenue recognition for contracts with customers. Such model requires an entity to: 1) identify the contract with the customer; 2) identify the performance obligations related to that contract; 3) determine the transaction price of the contract; 4) allocate such transaction price between the performance obligations; and 5) recognize revenue when (or as) performance obligations are satisfied. In addition to recognition and measurement, IFRS 15 also provides new requirements on presentation and disclosures.

Transition

The Company elected to adopt IFRS 15 using the modified retrospective method, with recognition of transitional adjustments in opening retained earnings on the date of initial application (January 1, 2018), without restatement of comparative figures.

IFRS 15 provides for certain optional practical expedients, including those related to the initial adoption of the standard. The Company applied the following practical expedients upon adoption of IFRS 15 on January 1, 2018:

PRACTICAL EXPEDIENT	DESCRIPTION
Completed contract	The Company applied IFRS 15 retrospectively only to contracts that are not completed contracts as at January 1, 2018.
Contract modifications	The Company did not separately evaluate the effects of each contract modification prior to January 1, 2018. Instead, it reflected the aggregate effect of all modifications that occurred prior to January 1, 2018 when: i) identifying the satisfied and unsatisfied performance obligations; ii) determining the transaction price; and iii) allocating the transaction price to the satisfied and unsatisfied performance obligations.

Change orders and claims

Change orders and claims, referred to as contract modifications, were previously recognized as per guidance provided in IAS 11, *Construction Contracts*, (“IAS 11”). Under such guidance, revenue could be recognized on contract modifications only when certain conditions were met, including the fact that it was **probable** the customer will approve the modification and the amount of revenue arising from such contract modifications. IFRS 15 also provides guidance on the recognition of revenue from contract modifications, but such guidance is based, among other factors, on the fact that the contract modification is approved and it is **highly probable** that a significant reversal in the amount of cumulative revenue recognized on such contract modifications will not occur when the uncertainty is subsequently resolved. Given the higher level of probability to be applied under IFRS 15, some revenue recognized under IAS 11 was reversed as at January 1, 2018, resulting in an approximate \$210 million adjustment to equity on that date. Revenue from these contract modifications will be recognized when, and if, IFRS 15 guidance is met.

Measure of anticipated revenues and determination of progress

Under IFRS 15, the amount of anticipated revenue used when determining the amount of revenue to be recognized must be based on contracts with legally enforceable rights and obligations. As a result, certain contracts under which the Company anticipates some volume of work based on discussions with the customer or other indicators, but for which formal purchase orders or work orders need to be issued by the customer in order to formalize the exact scope of work, were assessed to determine when the anticipated revenue should be included in the transaction price, resulting in a decrease in the Company’s cumulative revenues recognized on these contracts as at January 1, 2018 (approximately \$105 million adjustment to equity on that date).

Furthermore, for projects having revenue recognized based on the stage of completion method using a cost input method, the Company was accounting for its assurance-type warranty costs the same way as other project costs. As a result, the Company did not carry a provision for such expected warranty costs. Rather, it recognized such costs as they were incurred, which in turn was included in the measure of progress of the project based on the stage of completion method and, as such, generated revenue.

Under IFRS 15, these assurance-type warranty costs are to be excluded from the measure of progress of projects for which revenue is recognized over time using a cost input method. Such costs will rather be recognized as a provision in accordance with IAS 37, *Provisions, Contingent Liabilities and Contingent Assets*, based on the advancement of the projects, and the provision recognized will then either be used when costs are incurred or reversed if it is no longer needed.

In addition to these warranty-related costs, the Company reviewed its other project costs on contracts for which revenue is recognized over time to determine if each of these costs is contributing to the transfer of control of the goods or services to the customer. Such review resulted in an insignificant impact on the Company’s equity as at January 1, 2018.

2. BASIS OF PREPARATION (CONTINUED)

Presentation

In accordance with IFRS 15, the Company changed its presentation of contract-related assets and liabilities. As such, the Company now presents its contract balances, on a contract-by-contract basis, in a net contract asset or liability position, separately from its accounts receivable. Contract assets and accounts receivable are both rights to consideration in exchange for goods or services that the Company has transferred to a customer, however the classification depends on whether such right is only conditional on the passage of time (accounts receivable) or if it is also conditional on something else (contract assets), such as the satisfaction of further performance obligations under the contract. A contract liability is the amount received by the Company that exceeds the right to consideration resulting from the Company's performance under a given contract.

The Company's contract assets and contract liabilities include mainly the balances that were presented as "Contracts in progress", "Retentions on client contracts" included in "Other current financial assets", "Deferred revenues" and "Downpayments on contracts" in the Company's consolidated statement of financial position until December 31, 2017.

Procedures and controls

The Company has updated and implemented revised procedures and controls in order to meet the requirements of IFRS 15, notably the recording of the transition adjustment and the change in presentation to be reported in the Company's unaudited consolidated financial statements for the six-month period ended June 30, 2018, as well as additional disclosures to be provided in the Company's 2018 audited annual consolidated financial statements.

ADOPTION OF AMENDMENTS TO IFRS 2

The impact from the adoption of amendments to IFRS 2 relate to share-based payment transactions that are unvested at the date that an entity first applies the amendments, i.e., January 1, 2018 for SNC-Lavalin, and to share-based payment transactions with a grant date on or after that date. As per the amendments to IFRS 2, vesting conditions, other than market conditions, are to be taken into account by adjusting the number of awards included in the measurement of the liability arising from the transaction. The amount of the liability has to be based on the best available estimate of the number of awards that are expected to vest.

As at January 1, 2018, the Company estimated the number of its unvested share units that will eventually vest and recognized the effect of the remeasurement in the opening retained earnings of \$4.2 million (\$3.0 million net of taxes), with a corresponding decrease to the share unit plans' liabilities.

The Company adopted the amendments to IFRS 2 in accordance with its transitional provisions and did not restate comparative figures.

IMPACT FROM THE ADOPTION OF IFRS 9, IFRS 15 AND AMENDMENTS TO IFRS 2

The following table presents the impact of adopting IFRS 9, IFRS 15 and amendments to IFRS 2 on the Company's equity as at January 1, 2018:

	SHARE CAPITAL	RETAINED EARNINGS	OTHER COMPONENTS OF EQUITY	NON-CONTROLLING INTERESTS	TOTAL EQUITY
Balance as at December 31, 2017	\$ 1,801,733	\$ 3,145,424	\$ 277,974	\$ (1,909)	\$ 5,223,222
Transitional adjustments on adoption of new accounting standards:					
Adoption of IFRS 9	—	3,396	(8,874)	—	(5,478)
Adoption of IFRS 15	—	(333,826)	14,322	369	(319,135)
Adoption of amendments to IFRS 2	—	3,043	—	—	3,043
	—	(327,387)	5,448	369	(321,570)
Balance as at January 1, 2018	\$ 1,801,733	\$ 2,818,037	\$ 283,422	\$ (1,540)	\$ 4,901,652

2. BASIS OF PREPARATION (CONTINUED)

C) CHANGES IN ACCOUNTING POLICIES AND IN PRESENTATION

Financial instruments

Financial assets and liabilities

Unless specifically covered by another accounting policy, the measurement of financial assets and financial liabilities is based on their classification, which is one of the following for SNC-Lavalin:

CATEGORY – SUBSEQUENTLY MEASURED AT	APPLICABLE TO	INITIAL MEASUREMENT	SUBSEQUENT MEASUREMENT	RECOGNITION OF INCOME/EXPENSE AND GAINS/LOSSES ON REMEASUREMENT, IF ANY
Fair value through profit or loss (“FVTPL”)	Financial assets and financial liabilities	Fair value	Fair value	All recognized in net income
Fair value through other comprehensive income (“FVTOCI”)	Financial assets	Fair value including transaction costs	Fair value derived from published bid price quotations for listed securities. Where there is no active market, fair value is determined using valuation techniques. Where fair value cannot be reliably measured, assets are carried at cost.	Investment income, which includes interest, dividends and distributions, is recognized in net income. For equity instruments, gains (losses) from revaluation are recognized in other comprehensive income with no reclassification to net income on disposal of such assets.
Amortized cost	Financial assets and financial liabilities	Fair value including transaction costs	Amortized cost using the effective interest method	All recognized in net income

Impairment of assets subsequently measured at amortized cost

For “Trade receivables” and “Contract assets”, the amount of the loss allowance recognized is the amount equal to lifetime expected credit losses that result from all possible default events over the expected life of a financial instrument.

For “Non-current portion of receivables under service concession arrangements”, if the credit risk has not increased significantly since initial recognition, the amount of the loss allowance recognized is the amount equal to 12-month expected credit losses that result from default events on a financial instrument that are possible within the 12 months after the reporting date.

Write-off

The gross carrying amount of a financial asset is reduced when there are no reasonable expectations of recovering a financial asset in its entirety or a portion thereof.

Revenue recognition

Revenue from contracts with customers is recognized, for each performance obligation, either over a period of time or at a point in time, depending on which method better reflects the transfer of control of the goods or services underlying the particular performance obligation to the customer.

In most cases, for performance obligations satisfied over time, the Company recognizes revenue over time using costs incurred to date relative to total estimated costs at completion to measure progress toward satisfying such performance obligations. Under certain contracts, notably certain cost-plus contracts or unit-rate contracts, the Company recognizes revenue based on its right to consideration when such amount corresponds directly with the value to the customer of the entity’s performance completed to date. In certain other situations, the Company might recognize revenue at a point in time, when the criteria to recognize revenue over time are not met. In any event, when the total anticipated costs exceed the total anticipated revenues on a contract, such loss is recognized in its entirety in the period it becomes known.

The amount of revenue recognized by the Company is based on the transaction price allocated to each performance obligation. Such transaction price corresponds to the amount of consideration to which the Company expects to be entitled in exchange for transferring promised goods or services to a customer, excluding amounts collected on behalf of third parties. The transaction price includes, among other things and when applicable, an estimate of variable consideration only to the extent that it is highly probable that a significant reversal in the amount of cumulative revenue recognized will not occur when the uncertainty associated with the variable consideration is subsequently resolved. Variable consideration is usually derived from incentives, performance bonuses, and penalties, and could include claims and unpriced change orders.

2. BASIS OF PREPARATION (CONTINUED)

SNC-Lavalin may enter into contractual arrangements with a client to deliver services on one project which span more than one performance obligation, such as Engineering, Procurement and Construction (“EPC”) or Engineering, Procurement, and Construction and Management (“EPCM”), Operations and Maintenance (“O&M”) and/or Capital investments. When entering into such arrangements, the Company allocates the transaction price by reference to the stand-alone selling price of each performance obligation. Accordingly, when such arrangements exist on the same project, the value of each performance obligation is based on its stand-alone selling price and recognized according to the respective revenue recognition methods described above.

The Company usually accounts for a contract modification, which consists of a change in the scope or price (or both) of a contract, as part of an existing contract, in which case the Company recognizes an adjustment to revenue on a cumulative catch-up basis at the date of contract modification. Under certain circumstances, the Company might account for a contract modification as a separate contract, in which case revenue is recognized separately on the contract modification.

The Company recognizes assurance-type warranty costs as a provision in accordance with IAS 37, *Provisions, Contingent Liabilities and Contingent Assets*, based on the advancement of the projects, and the provision recognized is then either used when costs are incurred or reversed if it is no longer needed.

In all cases, the value of construction activities, material and equipment purchased by SNC-Lavalin, when acting as purchasing agent for a client, is not recorded as revenue.

The Company may apply its revenue recognition policy to a portfolio of contracts or performance obligations with similar characteristics if the effect on its financial statements of applying such policy to the portfolio is not reasonably expected to differ materially from applying its policy to the individual contracts or performance obligations within that portfolio.

The Company presents its contract balances, on a contract-by-contract basis, in a net contract asset or liability position, separately from its trade receivables. Contract assets and trade receivables are both rights to consideration in exchange for goods or services that the Company has transferred to a customer, however the classification depends on whether such right is only conditional on the passage of time (trade receivables) or if it is also conditional on something else (contract assets), such as the satisfaction of further performance obligations under the contract. A contract liability is the amount received by the Company that exceeds the right to consideration resulting from the Company’s performance under a given contract.

REVENUES FROM CAPITAL INVESTMENTS

Revenues from **Capital investments** include the following:

ACCOUNTING METHODS FOR THE COMPANY’S CAPITAL INVESTMENTS	REVENUES INCLUDED IN THE COMPANY’S CONSOLIDATED INCOME STATEMENT
Consolidation	Revenues that are recognized and reported by the Capital investments
Equity method	SNC-Lavalin’s share of net results of the Capital investments or dividends from its Capital investments for which the carrying amount is \$nil but would otherwise be negative based on historical financial results and dividends if SNC-Lavalin had an obligation to fund the investment. Dividends are recognized when the Company’s right to receive payment has been established.
Cost method	Dividends and distributions from the Capital investments

Share-based payments

Share units

The 2017 Performance Share Unit plan (“2017 PSU plan”), 2014 Performance Share Unit plan (“2014 PSU plan”), Restricted Share Unit plan (“RSU plan”), and Deferred Share Unit plan (“DSU plan”) are collectively referred as “share units”. For share units granted to employees under the share unit plans, a liability is recognized and measured at the fair value of the liability, which is based on the Company’s share price. At the end of each reporting period until the liability is settled, and at the date of settlement, the fair value of the liability is remeasured, with any changes in fair value recognized in net income for the period. The fair value of the grants of share units is expensed in the income statement on a straight-line basis over the vesting period, based on the Company’s estimate of share units that will eventually vest.

2. BASIS OF PREPARATION (CONTINUED)

Segment disclosures and income statement

Effective January 1, 2018, the Company modified the presentation of its income statement by changing its definition of “direct costs of activities”, which now refers to all costs, including allocation of certain costs, associated to its revenue generating activities and front-end support, whereby in the past it was substantially limited to its project-related costs. As such, this change resulted in a reclassification of \$146.8 million and of \$269.1 million from “Selling, general and administrative expenses” to “Direct cost of activities” in the three-month and six-month periods ended June 30, 2017, respectively.

At the same time, the Company changed the definition of segment EBIT, its measure of profit or loss for its reportable segments, to reflect a change made to its internal reporting. As such, segment EBIT now includes an additional allocation of certain corporate selling, general and administrative expenses, whereas in the past it only included corporate selling, general and administrative expenses that were directly related to projects or segments. The additional costs that are being allocated to the segment EBIT are mainly related to information technology and to employee benefits and incentives. These are allocated on a per employee basis for the information technology costs and on an employee compensation basis for the benefits and incentives. The Company believes that such allocation improves the measure of profitability of its reportable segments by better reflecting the overall costs incurred to support its operations. In addition, the Company introduced the measure of Total segment EBIT, which represents the sum of all segment EBIT and non-controlling interests before income taxes. Such measure of Total segment EBIT is now aligned with the presentation adopted in the Company’s statement of income and corresponds to the Company’s revenues less direct costs of activities.

Furthermore, the Company initiated a strategic realignment of its organizational structure aimed at integrating the Atkins business, more effectively serving its clients worldwide and strengthening its position for longer-term growth. This realignment, which became effective January 1, 2018, resulted in a change to the Company’s reportable segments, which are now: i) Mining & Metallurgy; ii) Oil & Gas; iii) Nuclear; iv) Clean Power; v) Thermal Power; vi) Infrastructure; vii) Engineering, Design and Project Management (“EDPM”); and viii) Capital. See Note 3 for description of each of the segments.

In addition, concurrent to the adoption of IFRS 9, *Financial Instruments*, on January 1, 2018, the Company presents “Gain (loss) arising on financial assets at fair value through profit or loss” separately in its income statement. This change resulted in a reclassification of a gain of \$4.5 million for the three-month period ended June 30, 2017 and of a loss of \$1.6 million for the six-month period ended June 30, 2017 related to derivative financial instruments used by the Company to limit its exposure to the variability of its share unit plans’ liabilities from “Corporate selling, general and administrative expense” to “Gain (loss) arising on financial assets at fair value through profit or loss”.

These changes were made in accordance with IAS 8, *Accounting Policies, Changes in Accounting Estimates and Errors*, resulting in the restatement of 2017 figures.

D) CRITICAL ACCOUNTING JUDGMENTS AND KEY SOURCES OF ESTIMATION UNCERTAINTY

Revenue recognition

The identification of revenue-generating contracts with customers, the identification of performance obligations, the determination of the transaction price and its allocation between identified performance obligations and the use of the appropriate revenue recognition method for each performance obligation are the main steps involved in the revenue recognition process, all of which require the exercise of judgment and the use of assumptions.

The transaction price corresponds to the amount of consideration to which the Company expects to be entitled in exchange for transferring promised goods or services to a customer. Such amount may require the Company to estimate an amount of variable consideration, notably from estimated volume of work, claims and unpriced change orders, incentives or penalties, among others. As such, the Company needs to estimate the amount for which it is highly probable that a significant reversal in the amount of cumulative revenue recognized will not occur when the uncertainty associated with the variable consideration is subsequently resolved. Such estimated amount then needs to be updated at the end of each reporting period.

The determination of anticipated costs for completing a contract is based on estimates that can be affected by a variety of factors such as potential variances in scheduling and cost of materials along with the availability and cost of qualified labour and subcontractors, productivity, and possible claims from subcontractors.

2. BASIS OF PREPARATION (CONTINUED)

As risks and uncertainties are different for each project, the sources of variations between anticipated costs and actual costs incurred will also vary for each project. In particular, while consulting, design, engineering and construction activities usually do not exceed 4 years, operations and maintenance activities include contracts for which the duration might exceed 20 years, notably on certain public-private partnership arrangements. The long-term nature of certain arrangements usually results in significant estimates related to scheduling and costs. The determination of estimates is based on SNC-Lavalin's business practices as well as its historical experience. Furthermore, management regularly reviews underlying estimates of project profitability.

E) STANDARD AND AMENDMENTS ISSUED TO BE ADOPTED AT A LATER DATE

The following standard has been issued and is applicable to the Company for its annual periods beginning on January 1, 2019 and thereafter, with an earlier application permitted for entities that have also adopted IFRS 15:

- IFRS 16, *Leases*, ("IFRS 16") provides a comprehensive model for the identification of lease arrangements and their treatment in the financial statements of both lessees and lessors. It will supersede IAS 17, *Leases*, ("IAS 17") and its associated interpretative guidance.

The following amendments to standards have been issued and are applicable to the Company for its annual periods beginning on January 1, 2019 and thereafter, with an earlier application permitted:

- *Prepayment Features with Negative Compensation* (Amendments to IFRS 9, *Financial Instruments*) allow financial assets with a prepayment option that could result in the option's holder receiving compensation for early termination to meet the solely payments of principal and interest condition if specified criteria are met.
- *Long-term Interests in Associates and Joint Ventures* (Amendments to IAS 28, *Investments in Associates and Joint Ventures*) clarify that an entity applies IFRS 9, including its impairment requirements, to long-term interests in an associate or joint venture that form part of the net investment in the associate or joint venture but to which the equity method is not applied.
- Amendments to IFRS 3, *Business Combinations*, state that an entity shall remeasure its previously held interest in a joint operation when it obtains control of the business.
- Amendments to IFRS 11, *Joint Arrangements*, state that an entity shall not remeasure its previously held interest in a joint operation when it obtains joint control of the business.
- Amendments to IAS 12, *Income Taxes*, clarify that all income tax consequences of dividends (i.e., distribution of profits) should be recognized in profit or loss, regardless of how the tax arises.
- Amendments to IAS 23, *Borrowing Costs*, clarify that if any specific borrowing remains outstanding after the related asset is ready for its intended use or sale, that borrowing becomes part of the funds that an entity borrows generally when calculating the capitalization rate on general borrowings.
- *Plan Amendment, Curtailment or Settlement* (Amendments to IAS 19, *Employee Benefits*) specifies how an entity determines pension expenses when changes to a defined benefit pension plan occur. When a change to a plan – an amendment, curtailment or settlement – takes place, IAS 19 requires an entity to remeasure its net defined benefit liability or asset. The amendments require an entity to use the updated assumptions from this remeasurement to determine current service cost and net interest for the remainder of the reporting period after the change to the plan.

The Company is currently evaluating the impact of adopting these standard and amendments on its financial statements.

Considerations for the Implementation of IFRS 16

IFRS 16 is required to be applied for annual reporting periods beginning on or after January 1, 2019. SNC-Lavalin is not early adopting IFRS 16.

IFRS 16 introduces a single lease accounting model for lessees which will result in an on-balance sheet recognition of most of its leases with few potential exemptions. The Company expects that the adoption of IFRS 16 will result in a material increase to its assets and liabilities through the recognition of a right-of-use asset and of a lease liability reflecting the present value of future lease payments. Depreciation expense on the right-of-use asset and interest expense on the lease liability will replace the operating lease expenses that were recognized under IAS 17.

2. BASIS OF PREPARATION (CONTINUED)

During the six-month period ended June 30, 2018, the Company continued to assess the impact of the application of IFRS 16 on its financial statements. As such, the Company is currently reviewing its lease portfolio and is working on changing certain processes and internal controls, including the implementation of a new lease management and accounting system. The Company is also evaluating the transition options and practical expedients available under IFRS 16.

The Company's current implementation roadmap extends into the fourth quarter of 2018; therefore, it will report progress achieved over the course of 2018.

3. SEGMENT DISCLOSURES

SNC-Lavalin's reportable segments are i) **Mining & Metallurgy**; ii) **Oil & Gas**; iii) **Nuclear**; iv) **Clean Power**; v) **Thermal Power**; vi) **Infrastructure**; vii) **Engineering, Design and Project Management ("EDPM")**; and viii) **Capital**.

The description of each of the segments is as follows:

Mining & Metallurgy combines global-caliber expertise with deep local capabilities to provide tailored solutions for projects of any size, scope or complexity in the aluminium, gold, copper, iron ore, nickel, fertilizer, commodities related to rechargeable batteries for cars, mobile phone and other electronic devices, and sulphur product sectors, among others. It includes a full range of activities and services in studies, sustaining capital and consulting, and major projects.

Oil & Gas includes projects in the upstream, midstream, downstream and supporting infrastructure sectors for major oil and gas and resources companies. It supports these clients across the asset life cycle, from front-end evaluation through decommissioning (operational and capital expenditures).

Nuclear supports clients across the entire Nuclear life cycle with the full spectrum of services from consultancy, EPCM services, field services, technology services, spare parts, reactor support & decommissioning and waste management. As stewards of the CANDU technology, it also provides new-build and full refurbishment services of CANDU reactors.

Clean Power combines the Company's established leadership in hydro, transmission and distribution and extensive renewable energy capabilities, including in energy storage, providing fully integrated life-of-asset services capabilities.

Thermal Power includes projects in thermal power generation, a market that the Company is currently exiting.

Infrastructure provides end-to-end services to a broad range of sectors, including mass transit, heavy rail, roads, bridges, airports, ports and harbours, facilities architecture and engineering (structural, mechanical, electrical), industrial (pharmaceutical, agrifood, life sciences, automation, industrial processes), geotechnical engineering, materials testing, and water infrastructure. In addition, Infrastructure includes O&M projects.

EDPM incorporates all engineering, design and project management services around the world, except for the Canadian market which remains fully integrated within Infrastructure segment. It also harnesses our enhanced capabilities in intelligent mobility and digital asset management. Projects are mainly in transportation, including rail, mass transit and roads, infrastructure, aerospace, defence and security & technology. Some projects are primarily funded by the public sector and include projects with several departments of transportation, as well as the water treatment, environment, city and county markets, and the intermodal business.

Capital is the investment and asset management arm of SNC-Lavalin. Its main purpose is to invest equity or subordinated debt into projects to generate integrated, whole life-cycle revenues in engineering and construction, as well as operations and maintenance. All investments are structured to earn a return on capital adequate for the risk profile of each individual project. SNC-Lavalin makes capital investments in a variety of infrastructure assets such as bridges and highways, mass transit systems, power facilities, energy infrastructure and water treatment plants.

Additional information on revenue

The adoption of IFRS 15 in 2018 resulted in additional disclosures of financial information related to the disaggregation of revenue from contracts with customers. As such, the Company added details, after the segment information table, on 2018 revenues by geographic area and type of contracts, with a reconciliation between revenues from contracts with customers under the scope of IFRS 15 and total revenues.

3. SEGMENT DISCLOSURES (CONTINUED)

While the geographic areas presented are consistent with those disclosed annually by the Company, the types of contracts presented are defined as follow:

Reimbursable and engineering service contracts: Under reimbursable contracts, the Company charges the customer for the actual cost incurred plus a mark-up that could take various forms such as a fixed-fee per unit, a percentage of costs incurred or an incentive fee based on achieving certain targets, performance factors or contractual milestones. Reimbursable contracts also include unit-rate contracts for which a fixed amount per quantity is charged to the customer, and reimbursable contracts with a cap. Engineering service contracts include: i) time and material agreements based on hourly rates and fixed-price lump-sum contracts with limited procurement or construction risks; and ii) O&M contracts.

EPC fixed-price contracts: Under EPC fixed-price contracts, the Company completes the work required for the project at a lump-sum price. Before entering into such contracts, the Company estimates the total cost of the project, plus a profit margin. The Company's actual profit margin may vary based on its ability to achieve the project requirements at above or below the initial estimated costs.

3. SEGMENT DISCLOSURES (CONTINUED)

The following table presents revenues and EBIT according to the Company's segments for the three-month periods ended June 30, 2018 and 2017:

THREE MONTHS ENDED JUNE 30			2018			2017 ⁽¹⁾		
	REVENUES	SEGMENT EBIT			REVENUES	SEGMENT EBIT		
		E&C	CAPITAL	TOTAL		E&C	CAPITAL	TOTAL
Mining & Metallurgy	\$ 137,538	\$ 585	\$ —	\$ 585	\$ 94,827	\$ 6,557	\$ —	\$ 6,557
Oil & Gas	657,110	17,260	—	17,260	807,236	26,752	—	26,752
Nuclear	233,351	39,689	—	39,689	127,592	18,022	—	18,022
Clean Power	76,267	3,247	—	3,247	127,480	20,939	—	20,939
Thermal Power	7,475	(11,122)	—	(11,122)	111,556	2,596	—	2,596
Infrastructure	551,353	26,157	—	26,157	556,283	24,103	—	24,103
EDPM	806,826	94,477	—	94,477	43,187	2,978	—	2,978
Total E&C segments	2,469,920	170,293	—	170,293	1,868,161	101,947	—	101,947
Capital	57,199	—	50,837	50,837	66,712	—	54,945	54,945
	\$ 2,527,119			221,130	\$ 1,934,873			156,892
Reversal of non-controlling interests before income taxes included above		260	—	260		(1,985)	—	(1,985)
Total segment EBIT		170,553	50,837	221,390		99,962	54,945	154,907
Corporate selling, general and administrative expenses		(18,109)	(6,394)	(24,503)		(36,039)	(7,070)	(43,109)
Impairment loss arising from expected credit losses		(124)	—	(124)		—	—	—
Gain arising on financial assets at fair value through profit or loss		4,567	7	4,574		4,544	—	4,544
Net class action lawsuits settlement expense (Note 13B)		(88,000)	—	(88,000)		—	—	—
Restructuring costs		(1,053)	—	(1,053)		(22,306)	—	(22,306)
Acquisition-related costs and integration costs (Note 16C)		(12,789)	—	(12,789)		(55,272)	—	(55,272)
Amortization of intangible assets related to business combinations		(52,787)	—	(52,787)		(14,301)	—	(14,301)
Gain on disposal/partial disposal of a Capital investment (Note 4A)		—	62,714	62,714		—	5,403	5,403
Gain (loss) from disposals of E&C businesses		(312)	—	(312)		287	—	287
Gain on disposal of the head office building (Note 18)		—	—	—		115,101	—	115,101
EBIT		1,946	107,164	109,110		91,976	53,278	145,254
Net financial expenses (Note 5)		35,447	1,653	37,100		10,474	2,924	13,398
Earnings (loss) before income taxes		(33,501)	105,511	72,010		81,502	50,354	131,856
Income taxes		(16,902)	5,691	(11,211)		(3,868)	1,319	(2,549)
Net income for the period	\$	(16,599)	\$ 99,820	\$ 83,221	\$	85,370	\$ 49,035	\$ 134,405
Net income (loss) attributable to:								
SNC-Lavalin shareholders				\$ 83,011				\$ 136,390
Non-controlling interests				210				(1,985)
Net income for the period				\$ 83,221				\$ 134,405

⁽¹⁾ Comparative figures have been revised to reflect a change made to the measure of profit or loss for the Company's reportable segments and a change made to the Company's reporting structure (see Note 2C).

3. SEGMENT DISCLOSURES (CONTINUED)

The following table presents revenues and EBIT according to the Company's segments for the six-month periods ended June 30, 2018 and 2017:

SIX MONTHS ENDED JUNE 30		2018				2017 ⁽¹⁾			
	REVENUES	SEGMENT EBIT				SEGMENT EBIT			
		E&C	CAPITAL	TOTAL		E&C	CAPITAL	TOTAL	
Mining & Metallurgy	\$ 251,600	\$ 6,961	\$ —	\$ 6,961	\$ 196,238	\$ 11,629	\$ —	\$ 11,629	
Oil & Gas	1,300,147	64,999	—	64,999	1,663,781	80,385	—	80,385	
Nuclear	463,378	70,930	—	70,930	294,143	63,057	—	63,057	
Clean Power	156,328	13,517	—	13,517	249,029	31,261	—	31,261	
Thermal Power	54,195	(22,152)	—	(22,152)	196,925	(23,939)	—	(23,939)	
Infrastructure	1,017,298	38,250	—	38,250	973,607	43,997	—	43,997	
EDPM	1,594,171	175,195	—	175,195	82,762	5,507	—	5,507	
Total E&C segments	4,837,117	347,700	—	347,700	3,656,485	211,897	—	211,897	
Capital	121,396	—	107,269	107,269	127,658	—	110,279	110,279	
	\$ 4,958,513			454,969	\$ 3,784,143				322,176
Reversal of non-controlling interests before income taxes included above		519	—	519		3,374	—	3,374	
Total segment EBIT		348,219	107,269	455,488		215,271	110,279	325,550	
Corporate selling, general and administrative expenses		(41,661)	(13,501)	(55,162)		(58,208)	(13,462)	(71,670)	
Impairment loss arising from expected credit losses		(654)	—	(654)		—	—	—	
Gain (loss) arising on financial assets at fair value through profit or loss		883	(485)	398		(1,636)	—	(1,636)	
Net class action lawsuits settlement expense (Note 13B)		(88,000)	—	(88,000)		—	—	—	
Restructuring costs		(2,581)	—	(2,581)		(25,131)	—	(25,131)	
Acquisition-related costs and integration costs (Note 16C)		(23,491)	—	(23,491)		(56,635)	—	(56,635)	
Amortization of intangible assets related to business combinations		(109,514)	—	(109,514)		(29,664)	—	(29,664)	
Gain on disposal/partial disposal of a Capital investment (Note 4A)		—	62,714	62,714		—	5,403	5,403	
Gain (loss) from disposals of E&C businesses		(312)	—	(312)		1,006	—	1,006	
Gain on disposal of the head office building (Note 18)		—	—	—		115,101	—	115,101	
EBIT		82,889	155,997	238,886		160,104	102,220	262,324	
Net financial expenses (Note 5)		76,195	2,930	79,125		20,527	6,065	26,592	
Earnings before income taxes		6,694	153,067	159,761		139,577	96,155	235,732	
Income taxes		(8,451)	6,716	(1,735)		3,511	2,744	6,255	
Net income for the period		15,145	146,351	\$ 161,496		\$ 136,066	\$ 93,411	\$ 229,477	
Net income attributable to:									
SNC-Lavalin shareholders				\$ 161,083				\$ 226,103	
Non-controlling interests				413				3,374	
Net income for the period				\$ 161,496				\$ 229,477	

⁽¹⁾ Comparative figures have been revised to reflect a change made to the measure of profit or loss for the Company's reportable segments and a change made to the Company's reporting structure (see Note 2C).

3. SEGMENT DISCLOSURES (CONTINUED)

The Company also discloses in the table below supplementary information such as its net income from E&C, its dividends from 407 International Inc. ("Highway 407 ETR"), and its net income from other Capital investments, as this information may be useful in assessing the Company's value.

It should be noted that supplementary information provided in the following table does not reflect information related to the Company's segments, but is rather an allocation of net income attributable to SNC-Lavalin shareholders between various components.

	SECOND QUARTER		SIX MONTHS ENDED JUNE 30	
	2018	2017	2018	2017
Supplementary information:				
Net gain (loss) from disposals of E&C businesses	\$ (312)	\$ 245	\$ (312)	\$ 857
Net gain on disposal of the head office building (Note 18)	—	101,531	—	101,531
Net class action lawsuits settlement expense, after income taxes (Note 13B)	(64,504)	—	(64,504)	—
Excluding the items listed above	48,007	(14,420)	79,548	30,305
Net income (loss) attributable to SNC-Lavalin shareholders from E&C	(16,809)	87,356	14,732	132,693
Net gain on disposal/partial disposal of a Capital investment (Note 4A)	58,403	5,403	58,403	5,403
Highway 407 ETR dividends	37,952	34,799	75,904	69,605
Excluding the items listed above	3,465	8,832	12,044	18,402
Net income attributable to SNC-Lavalin shareholders from Capital	99,820	49,034	146,351	93,410
Net income attributable to SNC-Lavalin shareholders for the period	\$ 83,011	\$ 136,390	\$ 161,083	\$ 226,103

3. SEGMENT DISCLOSURES (CONTINUED)

The following table presents revenues by geographic area according to project location:

	THREE MONTHS ENDED JUNE 30, 2018			SIX MONTHS ENDED JUNE 30, 2018		
	REVENUE FROM CONTRACTS WITH CUSTOMERS	OTHER REVENUE	TOTAL	REVENUE FROM CONTRACTS WITH CUSTOMERS	OTHER REVENUE	TOTAL
Americas:						
Canada	\$ 674,388	\$ 52,364	\$ 726,752	\$ 1,291,580	\$ 111,502	\$ 1,403,082
United States	398,385	491	398,876	825,858	1,178	827,036
Latin America	99,567	—	99,567	188,166	—	188,166
Middle East and Africa:						
Saudi Arabia	258,907	—	258,907	493,863	—	493,863
Other Middle East countries	232,483	—	232,483	399,888	—	399,888
Africa	106,379	(452)	105,927	194,695	—	194,695
Asia Pacific:						
Australia	156,420	—	156,420	345,101	—	345,101
Other	57,150	—	57,150	115,851	—	115,851
Europe:						
United Kingdom	411,736	—	411,736	843,896	—	843,896
Other	79,301	—	79,301	146,935	—	146,935
	\$ 2,474,716	\$ 52,403	\$ 2,527,119	\$ 4,845,833	\$ 112,680	\$ 4,958,513

In the three-month period ended June 30, 2018, Canada, the United States, Saudi Arabia and the United Kingdom were the only countries where the Company derived more than 10% of its revenues. In the six-month period ended June 30, 2018, Canada, the United States and the United Kingdom were the only countries where the Company derived more than 10% of its revenues.

The following table presents revenues by type of contracts:

	THREE MONTHS ENDED JUNE 30, 2018			SIX MONTHS ENDED JUNE 30, 2018		
	REIMBURSABLE AND ENGINEERING SERVICE CONTRACTS	EPC FIXED-PRICE CONTRACTS	TOTAL	REIMBURSABLE AND ENGINEERING SERVICE CONTRACTS	EPC FIXED-PRICE CONTRACTS	TOTAL
Mining & Metallurgy	\$ 35,801	\$ 101,737	\$ 137,538	\$ 73,915	\$ 177,685	\$ 251,600
Oil & Gas	444,269	212,841	657,110	930,824	369,323	1,300,147
Nuclear	231,125	2,226	233,351	458,521	4,857	463,378
Clean Power	30,618	45,649	76,267	62,409	93,919	156,328
Thermal Power	6,713	762	7,475	13,047	41,148	54,195
Infrastructure	252,569	298,784	551,353	503,365	513,933	1,017,298
EDPM	806,826	—	806,826	1,594,171	—	1,594,171
Revenue from contracts with customers - Total E&C segments	1,807,921	661,999	2,469,920	3,636,252	1,200,865	4,837,117
Revenue from contracts with customers - Capital segment			4,796			8,716
Other revenue - Capital segment			52,403			112,680
	\$ 1,807,921	\$ 661,999	\$ 2,527,119	\$ 3,636,252	\$ 1,200,865	\$ 4,958,513

4. CAPITAL INVESTMENTS

SNC-Lavalin makes investments in infrastructure concessions for public services such as airports, bridges, public service buildings, highways, mass transit systems, power facilities, energy infrastructure and water treatment plants.

The main concessions and public-private partnerships contracts reported under IFRIC Interpretation 12, *Service Concession Arrangements*, (“IFRIC 12”) are all accounted for under the financial asset model.

In order to provide the reader of the financial statements with a better understanding of the financial position and results of operations of its Capital investments, the Company presents certain distinct financial information related specifically to its Capital investments throughout its financial statements, as well as additional information below.

A) VARIATIONS IN OWNERSHIP INTERESTS IN INVESTMENTS

I) IN THE SIX-MONTH PERIOD ENDED JUNE 30, 2018

On June 28, 2018, SNC-Lavalin announced that it has finalized the transfer of its investment in McGill Healthcare Infrastructure Group (“MHIG”) and its holding company to SNC-Lavalin Infrastructure Partners LP (the “SNCL IP Partnership”).

Net gain on disposal of MHIG

SIX MONTHS ENDED JUNE 30	2018
Consideration received in cash	\$ 92,214
Consideration received in equity instruments of the SNCL IP Partnership	23,054
Total consideration received	115,268
Net assets disposed of ⁽¹⁾	(50,792)
Disposition-related costs	(1,762)
Gain on disposal of MHIG	62,714
Income taxes	(4,311)
Net gain on disposal of MHIG	\$ 58,403

⁽¹⁾ Net assets disposed of mainly included a loan receivable of \$88.9 million, a Capital investment accounted for by the equity method of \$17.5 million, a deferred income tax liability of \$59.3 million and other current net assets of \$3.7 million.

II) IN THE SIX-MONTH PERIOD ENDED JUNE 30, 2017

MCGILL HEALTHCARE INFRASTRUCTURE GROUP

On June 30, 2017, the joint venture McGill Healthcare Infrastructure Group, in which SNC-Lavalin previously held a 60% ownership interest, issued equity instruments to the other investor in MHIG, which resulted in a dilution of SNC-Lavalin’s ownership interest to 50%. In addition, the Company’s subordinated loan receivable from MHIG of \$109.3 million (the “Subordinated Loan”) was partially sold to the other investor in MHIG and was partially reimbursed by MHIG for total cash consideration of \$23.3 million.

Gain on equity transaction of MHIG

SIX MONTHS ENDED JUNE 30	2017
SNC-Lavalin’s share of the contribution by the other investor in MHIG	\$ 5,052
Cost of deemed disposal of 10% of ownership interest in MHIG	(2,480)
Gain before income taxes	2,572
Income taxes	—
Net gain on equity transaction of MHIG	\$ 2,572

4. CAPITAL INVESTMENTS (CONTINUED)

Gain on Subordinated Loan transaction

SIX MONTHS ENDED JUNE 30	2017
Consideration received	\$ 23,270
Carrying amount of the Subordinated Loan sold to the other investor	(18,218)
Carrying amount of the reimbursed Subordinated Loan	(2,221)
Gain before income taxes	2,831
Income taxes	—
Net gain on Subordinated Loan transaction	\$ 2,831

For the six-month period ended June 30, 2017, the gain on partial disposal of MHIG is presented in the Company's consolidated income statement as follows:

SIX MONTHS ENDED JUNE 30	2017
Gain on equity transaction of MHIG	\$ 2,572
Gain on Subordinated Loan transaction	2,831
Gain on partial disposal of MHIG	\$ 5,403

B) NET BOOK VALUE OF CAPITAL INVESTMENTS

The Company's consolidated statement of financial position includes the following net assets (liabilities) from its consolidated Capital investments and net book value from its Capital investments accounted for by the equity and cost methods.

	JUNE 30 2018	DECEMBER 31 2017
Net liabilities from Capital investments accounted for by the consolidation method	\$ (22,479)	\$ (36,099)
Net book value of Capital investments accounted for by the equity method ⁽¹⁾	340,872	296,664
Net book value of Capital investments accounted for by the cost method	56,091	55,614
Total net book value of Capital investments	\$ 374,484	\$ 316,179

⁽¹⁾ Includes the Company's investment in Highway 407 ETR, for which the net book value was \$nil as at June 30, 2018 and December 31, 2017.

In 2016, SNC-Lavalin signed an agreement to support a commitment of US\$100 million to a fund focused on global infrastructure investments sponsored by The Carlyle Group ("Carlyle"), subject to certain conditions. The intent of this agreement is for SNC-Lavalin and Carlyle to cooperate with respect to investments in, and work on, infrastructure projects related to energy, power and other natural resources that include a significant amount of greenfield development, construction or other capital expenditures programs. The accounting conditions required to recognize a liability in relation to this agreement have not been met yet as at June 30, 2018 and December 31, 2017.

5. NET FINANCIAL EXPENSES

THREE MONTHS ENDED JUNE 30	2018			2017		
	FROM E&C	FROM CAPITAL	TOTAL	FROM E&C	FROM CAPITAL	TOTAL
Interest on debt:						
Recourse	\$ 19,513	\$ —	\$ 19,513	\$ 5,505	\$ —	\$ 5,505
Limited recourse	22,080	—	22,080	—	—	—
Non-recourse	—	4,239	4,239	—	5,861	5,861
Other	1,305	3	1,308	5,095	(95)	5,000
Financial expenses	42,898	4,242	47,140	10,600	5,766	16,366
Financial income	(2,386)	(2,178)	(4,564)	(214)	(2,712)	(2,926)
Net foreign exchange losses (gains)	(5,065)	(411)	(5,476)	88	(130)	(42)
Financial income and net foreign exchange losses (gains)	(7,451)	(2,589)	(10,040)	(126)	(2,842)	(2,968)
Net financial expenses	\$ 35,447	\$ 1,653	\$ 37,100	\$ 10,474	\$ 2,924	\$ 13,398

5. NET FINANCIAL EXPENSES (CONTINUED)

SIX MONTHS ENDED JUNE 30	2018			2017		
	FROM E&C	FROM CAPITAL	TOTAL	FROM E&C	FROM CAPITAL	TOTAL
Interest on debt:						
Recourse	\$ 34,384	\$ –	\$ 34,384	\$ 10,948	\$ –	\$ 10,948
Limited recourse	48,112	–	48,112	–	–	–
Non-recourse	–	7,681	7,681	–	11,944	11,944
Other	(2,856)	8	(2,848)	8,759	–	8,759
Financial expenses	79,640	7,689	87,329	19,707	11,944	31,651
Financial income	(4,225)	(4,405)	(8,630)	(2,938)	(5,749)	(8,687)
Net foreign exchange losses (gains)	780	(354)	426	3,758	(130)	3,628
Financial income and net foreign exchange losses (gains)	(3,445)	(4,759)	(8,204)	820	(5,879)	(5,059)
Net financial expenses	\$ 76,195	\$ 2,930	\$ 79,125	\$ 20,527	\$ 6,065	\$ 26,592

6. WEIGHTED AVERAGE NUMBER OF OUTSTANDING SHARES

The weighted average number of outstanding shares for the second quarters and six-month periods ended June 30, 2018 and 2017 used to calculate the basic and diluted earnings per share were as follows:

(IN THOUSANDS)	SECOND QUARTER		SIX MONTHS ENDED JUNE 30	
	2018	2017	2018	2017
Weighted average number of outstanding shares - basic	175,534	150,483	175,528	150,432
Dilutive effect of stock options	78	114	77	140
Weighted average number of outstanding shares - diluted	175,612	150,597	175,605	150,572

In the second quarters and six-month periods ended June 30, 2018 and 2017, all outstanding stock options have been included in the computation of diluted earnings per share.

7. DIVIDENDS

During the six-month period ended March 31, 2018, the Company recognized as distributions to its equity shareholders dividends of \$100.8 million or \$0.574 per share (2017: \$82.2 million or \$0.546 per share).

SIX MONTHS ENDED JUNE 30	2018	2017
Dividends payable at January 1	\$ –	\$ –
Dividends declared during the period	100,753	82,151
Dividends paid during the period	(100,753)	(82,151)
Dividends payable at June 30	\$ –	\$ –

8. REDEMPTION OF SHARES

In the second quarter of 2018, the Company announced that it had filed a notice to renew, for a 12-month period, its normal course issuer bid, which expired on June 5, 2018. In the notice, SNC-Lavalin stated that a maximum of 1,500,000 common shares may be purchased for cancellation, on the open market. Purchases may commence on June 6, 2018 and will terminate no later than June 5, 2019. For the period from June 6, 2017 to June 5, 2018, the number of common shares subject to the issuer bid was 1,500,000 common shares.

There was no redemption of shares in the first six months of 2018 and 2017.

9. OTHER COMPONENTS OF EQUITY

The Company has the following elements, net of income taxes, within its other components of equity at June 30, 2018 and December 31, 2017:

	JUNE 30 2018	DECEMBER 31 2017
Exchange differences on translating foreign operations	\$ 290,066	\$ 266,497
Available-for-sale financial assets	—	8,874
Cash flow hedges	(7,341)	(566)
Share of other comprehensive income of investments accounted for by the equity method	3,096	3,169
Other components of equity	\$ 285,821	\$ 277,974

- Exchange differences on translating foreign operations component represents exchange differences relating to the translation from the functional currencies of the Company's foreign operations into Canadian dollars. On disposal of a foreign operation, the cumulative translation differences are reclassified to net income as part of the gain or loss on disposal. Exchange differences also include gains and losses on the hedging instrument, if any, relating to the effective portion of hedges of net investments of foreign operations, which are reclassified to net income on the disposal of the foreign operation.
- Prior to January 1, 2018, Available-for-sale financial assets component arose upon the revaluation of available-for-sale financial assets. When a revalued financial asset was sold, the portion of the component that relates to that financial asset, and was effectively realized, was recognized in net income. When a revalued financial asset was impaired, the portion of the component that relates to that financial asset was recognized in net income.
- Cash flow hedges component represents hedging gains and losses recognized on the effective portion of cash flow hedges. The cumulative deferred gain or loss on the hedge is recognized in net income when the hedged transaction impacts net income, or is included as a basis adjustment to the non-financial hedged item, consistent with the applicable accounting policy.
- Share of other comprehensive income (loss) of investments accounted for by the equity method component represents the Company's share of the other comprehensive income (loss) from its investments accounted for by the equity method.

9. OTHER COMPONENTS OF EQUITY (CONTINUED)

A) ITEMS THAT WILL BE RECLASSIFIED SUBSEQUENTLY TO NET INCOME

The following table provides a reconciliation of each element of other components of equity for the second quarters and the six-month periods ended June 30, 2018 and 2017:

	SECOND QUARTER		SIX MONTHS ENDED JUNE 30	
	2018	2017	2018	2017
Exchange differences on translating foreign operations:				
Balance at beginning of period	\$ 384,629	\$ 357,875	\$ 266,497	\$ 389,726
Transitional adjustment on adoption of a new accounting standard (Note 2B)	—	—	14,322	—
Current period gains (losses)	(108,473)	9,812	35,434	(22,039)
Net investment hedge - current period gains (losses)	13,910	—	(26,187)	—
Balance at end of period	290,066	367,687	290,066	367,687
Available-for-sale financial assets:				
Balance at beginning of period	—	3,817	8,874	2,384
Transitional adjustment on adoption of a new accounting standard (Note 2B)	—	—	(8,874)	—
Current period gains ⁽¹⁾	—	751	—	3,034
Income taxes relating to current period gains	—	(367)	—	(1,552)
Reclassification to net income ⁽¹⁾	—	62	—	397
Balance at end of period	—	4,263	—	4,263
Cash flow hedges:				
Balance at beginning of period	2,881	(562)	(566)	6,695
Current period gains (losses)	(5,673)	11,159	(7,635)	6,896
Income tax relating to current period gains (losses)	2,581	(1,461)	2,875	(1,697)
Reclassification to net income	(8,245)	850	(1,613)	(2,701)
Income taxes relating to amounts reclassified to net income	1,115	702	(402)	1,495
Balance at end of period	(7,341)	10,688	(7,341)	10,688
Share of other comprehensive income (loss) of investments accounted for by the equity method:				
Balance at beginning of period	3,735	(39,635)	3,169	(39,788)
Current period share	(942)	(4,108)	(264)	(6,030)
Income taxes relating to current period share	250	1,109	70	1,765
Reclassification to net income	73	3,750	165	5,683
Income taxes relating to amounts reclassified to net income	(20)	(512)	(44)	(1,026)
Balance at end of period	3,096	(39,396)	3,096	(39,396)
Other components of equity	\$ 285,821	\$ 343,242	\$ 285,821	\$ 343,242

(1) For the second quarter and six-month period ended June 30, 2017, the gain arising on derivatives designated as hedging instruments in fair value hedges amounted to \$0.1 million and to \$0.4 million, respectively, and the loss arising on adjustments for the hedged item attributable to hedged risk in a designated fair value hedge accounting relationship amounted to \$0.1 million and to \$0.4 million, respectively.

B) ITEMS THAT WILL NOT BE RECLASSIFIED SUBSEQUENTLY TO NET INCOME

Remeasurement recognized in other comprehensive income

The following table provides changes in the cumulative amount of remeasurement gains (losses) recognized in other comprehensive income relating to defined benefit pension plans and other post-employment benefits for the second quarters and the six-month periods ended June 30, 2018 and 2017:

	THREE MONTHS ENDED JUNE 30			SIX MONTHS ENDED JUNE 30		
	2018	2017		2018	2017	
	BEFORE TAX	INCOME TAX	NET OF TAX	BEFORE TAX	INCOME TAX	NET OF TAX
Cumulative amount at beginning of period	\$ (26,926)	\$ 4,009	\$ (22,917)	\$ (74,762)	\$ 10,194	\$ (64,568)
Gains (losses) recognized during the period	40,507	(6,957)	33,550	789	829	1,618
Cumulative amount at end of period	\$ 13,581	\$ (2,948)	\$ 10,633	\$ (73,973)	\$ 11,023	\$ (62,950)
	BEFORE TAX	INCOME TAX	NET OF TAX	BEFORE TAX	INCOME TAX	NET OF TAX
Cumulative amount at beginning of period	\$ (52,176)	\$ 8,278	\$ (43,898)	\$ (74,020)	\$ 10,096	\$ (63,924)
Gains (losses) recognized during the period	65,757	(11,226)	54,531	47	927	974
Cumulative amount at end of period	\$ 13,581	\$ (2,948)	\$ 10,633	\$ (73,973)	\$ 11,023	\$ (62,950)

9. OTHER COMPONENTS OF EQUITY (CONTINUED)

Financial assets at fair value through other comprehensive income

THREE MONTHS ENDED JUNE 30	2018			2017		
	BEFORE TAX	INCOME TAX	NET OF TAX	BEFORE TAX	INCOME TAX	NET OF TAX
Cumulative amount at beginning of period	\$ 298	\$ –	\$ 298	\$ –	\$ –	\$ –
Gains (losses) recognized during the period	(487)	25	(462)	–	–	–
Cumulative amount at end of period	\$ (189)	\$ 25	\$ (164)	\$ –	\$ –	\$ –

SIX MONTHS ENDED JUNE 30	2018			2017		
	BEFORE TAX	INCOME TAX	NET OF TAX	BEFORE TAX	INCOME TAX	NET OF TAX
Cumulative amount at beginning of period	\$ –	\$ –	\$ –	\$ –	\$ –	\$ –
Gains (losses) recognized during the period	(189)	25	(164)	–	–	–
Cumulative amount at end of period	\$ (189)	\$ 25	\$ (164)	\$ –	\$ –	\$ –

10. STATEMENTS OF CASH FLOWS

A) OTHER RECONCILING ITEMS

The following table presents the items to reconcile net income to cash flows from operating activities presented in the statements of cash flows:

	SECOND QUARTER		SIX MONTHS ENDED JUNE 30	
	2018	2017	2018	2017
Depreciation of property and equipment and amortization of other non-current assets:				
From E&C	\$ 78,692	\$ 28,744	\$ 162,835	\$ 57,138
Income taxes recognized in net income	(11,211)	(2,549)	(1,735)	6,255
Net financial expenses recognized in net income (Note 5)	37,100	13,398	79,125	26,592
Share-based expense	11,009	7,260	24,335	21,155
Income from Capital investments accounted for by the equity method	(46,517)	(51,049)	(97,798)	(99,563)
Dividends and distributions received from Capital investments accounted for by the equity method	41,953	37,331	80,662	75,631
Net change in provisions related to forecasted losses on certain contracts	(16,699)	(11,536)	(44,863)	(23,847)
Gain on disposal/partial disposal of a Capital investment (Note 4A)	(62,714)	(5,403)	(62,714)	(5,403)
Remeasurement of a foreign exchange option (Note 16C)	–	48,727	–	48,727
Restructuring costs recognized in net income	1,053	22,306	2,581	25,131
Restructuring costs paid	(4,162)	(16,176)	(12,582)	(45,987)
Loss (gain) from disposals of E&C businesses	312	(287)	312	(1,006)
Gain on disposal of the head office building (Note 18)	–	(115,101)	–	(115,101)
Net class action lawsuits settlement expense (Note 13B)	88,000	–	88,000	–
Other	(39,824)	(5,113)	(47,264)	(9,772)
Other reconciling items	\$ 76,992	\$ (49,448)	\$ 170,894	\$ (40,050)

10. STATEMENTS OF CASH FLOWS (CONTINUED)

B) NET CHANGE IN NON-CASH WORKING CAPITAL ITEMS

The following table presents the items included in the net change in non-cash working capital related to operating activities presented in the statements of cash flows:

	SECOND QUARTER		SIX MONTHS ENDED JUNE 30	
	2018	2017	2018	2017
Decrease (increase) in trade receivables	\$ 63,117	\$ (1,172)	\$ 93,600	\$ 63,256
Increase in contract assets	(65,138)	–	(275,337)	–
Increase in contracts in progress	–	(137,703)	–	(355,142)
Decrease (increase) in inventories	2,219	(694)	(2,351)	1,621
Decrease (increase) in other current financial assets	(44,342)	57,122	(9,580)	99,115
Increase in other current non-financial assets	(12,151)	(50,937)	(33,515)	(79,733)
Increase (decrease) in trade payables	(48,415)	39,017	(59,104)	40,849
Decrease in contract liabilities	(14,949)	–	(45,846)	–
Decrease in downpayments on contracts	–	(16,260)	–	(3,909)
Decrease in deferred revenues	–	(88,291)	–	(146,337)
Decrease in other current financial liabilities	(12,935)	(12,007)	(12,607)	(11,819)
Increase (decrease) in other current non-financial liabilities	(21,891)	46,463	(94,829)	(31,503)
Net change in non-cash working capital items	\$ (154,485)	\$ (164,462)	\$ (439,569)	\$ (423,602)

C) CHANGES ARISING FROM CASH FLOWS – RECOURSE DEBT

SIX MONTHS ENDED JUNE 30

RECOURSE DEBT	2018		
	INCREASE OF DEBT	REPAYMENT OF DEBT	PAYMENT FOR DEBT ISSUE COSTS
Revolving Facility	\$ 670,865	\$ (663,552)	\$ (1,526)
Term Facility	–	(397,553)	–
Term Loan (Note 14B)	500,000	–	(1,375)
Debentures maturing in 2020	–	–	(357)
Debentures maturing in 2019, 2021 and 2023 (Note 14A)	523,713	–	(800)
Debentures maturing in 2019 (Note 14A)	149,850	–	(158)
Bank overdraft	637	–	–
Total	\$ 1,845,065	\$ (1,061,105)	\$ (4,216)

10. STATEMENTS OF CASH FLOWS (CONTINUED)

D) CHANGES IN LIABILITIES ARISING FROM FINANCING ACTIVITIES

The following table provides a reconciliation between the opening and closing balances in the statement of financial position for liabilities arising from financing activities for the six-month period ended June 30, 2018:

	Recourse debt ⁽¹⁾	Limited recourse debt	Non-recourse debt from Capital investments ⁽²⁾	Dividends declared to SNC-Lavalin shareholders	Other non-current financial liabilities ⁽³⁾	Other non-current non-financial liabilities ⁽³⁾
Balance at January 1, 2018	\$ 1,345,539	\$ 1,475,177	\$ 312,964	\$ –	\$ 15,425	\$ 53,367
Changes arising from cash flows:						
Increase	1,845,065	–	29,784	–	5,226	11,108
Repayment	(1,065,321)	(500,000)	–	(100,753)	(1,382)	(10,125)
Total - changes arising from cash flows	779,744	(500,000)	29,784	(100,753)	3,844	983
Non-cash changes:						
Declaration of dividends to SNC-Lavalin shareholders	–	–	–	100,753	–	–
Effect of foreign currency exchange differences	49,055	–	410	–	305	58
Amortization of deferred financing costs and discounts	3,583	3,352	455	–	–	–
Loss on derivatives used for hedges	–	–	–	–	6,578	–
Balance at June 30, 2018	\$ 2,177,921	\$ 978,529	\$ 343,613	\$ –	\$ 26,152	\$ 54,408

(1) Recourse short-term debt and recourse long-term debt were presented in the Company's consolidated statements of financial position as follows:

	JUNE 30 2018	JANUARY 1 2018
Recourse short-term debt	\$ 657,384	\$ 318,757
Recourse long-term debt	1,520,537	1,026,782
Total	\$ 2,177,921	\$ 1,345,539

(2) Non-recourse short-term debt and long-term debt from Capital investments were presented in the Company's consolidated statements of financial position as follows:

	JUNE 30 2018	JANUARY 1 2018
Non-recourse short-term debt from Capital investments	\$ 15,976	\$ 15,566
Non-recourse long-term debt from Capital investments	327,637	297,398
Total	\$ 343,613	\$ 312,964

(3) Change arising from cash flows of other non-current financial liabilities and other non-current non-financial liabilities was presented in the financing activities in the Company's consolidated statement of cash flows as follows:

SIX MONTHS ENDED JUNE 30	2018
Other non-current financial liabilities	\$ 3,844
Other non-current non-financial liabilities	983
Other	(196)
Total	\$ 4,631

10. STATEMENTS OF CASH FLOWS (CONTINUED)

The following table provides a reconciliation between the opening and closing balances in the statement of financial position for liabilities arising from financing activities for the six-month period ended June 30, 2017:

	Recourse debt	Non-recourse debt from Capital investments ⁽¹⁾	Dividends declared to SNC-Lavalin shareholders	Other non- current financial liabilities ⁽²⁾	Other non- current non- financial liabilities ⁽²⁾
Balance at January 1, 2017	\$ 349,369	\$ 493,582	\$ —	\$ 5,928	\$ 15,846
Changes arising from cash flows:					
Increase	160,431	—	—	854	666
Repayment	(160,431)	(3,549)	(82,151)	(201)	(522)
Total - changes arising from cash flows	—	(3,549)	(82,151)	653	144
Non-cash changes:					
Declaration of dividends to SNC-Lavalin shareholders	—	—	82,151	—	—
Effect of foreign currency exchange differences	—	748	—	(22)	12
Amortization of deferred financing costs and discounts	118	408	—	—	—
Non-current portion of deferred tenant allowance related to the disposal of the head office building	—	—	—	—	24,814
Reclassification of non-recourse debt from Capital investments to “Liabilities of disposal groups classified as held for sale”	—	(183,872)	—	—	—
Balance at June 30, 2017	\$ 349,487	\$ 307,317	\$ —	\$ 6,559	\$ 40,816

(1) Non-recourse short-term debt and long-term debt from Capital investments were presented in the Company's consolidated statements of financial position as follows:

	JUNE 30 2017	JANUARY 1 2017
Non-recourse short-term debt from Capital investments	\$ 15,553	\$ 21,011
Non-recourse long-term debt from Capital investments	291,764	472,571
Total	\$ 307,317	\$ 493,582

(2) Change arising from cash flows of other non-current financial liabilities and other non-current non-financial liabilities was presented in the financing activities in the Company's consolidated statement of cash flows as follows:

SIX MONTHS ENDED JUNE 30	2017
Other non-current financial liabilities	\$ 653
Other non-current non-financial liabilities	144
Other	(386)
Total	\$ 411

11. RELATED PARTY TRANSACTIONS

In the normal course of its operations, SNC-Lavalin enters into transactions with certain of its associates and joint ventures, mainly its Capital investments. Investments in which SNC-Lavalin has significant influence or joint control, which are accounted for by the equity method, are considered related parties.

Consistent with IFRS, intragroup profits generated from revenues with investments accounted for by the equity or consolidation methods are eliminated in the period they occur, except when such profits are deemed to have been realized by the investment. Profits generated from transactions with investments accounted for by the cost method are not eliminated.

The accounting treatment of intragroup profits is summarized below:

INVESTMENT	ACCOUNTING METHOD	ACCOUNTING TREATMENT OF INTRAGROUP PROFITS
Capital investments accounted for under IFRIC 12	Consolidation method	Not eliminated upon consolidation in the period they occur, as they are considered realized by the Capital investment through the contractual agreement with its client.
	Equity method	Not eliminated upon consolidation in the period they occur, as they are considered realized by the Capital investment through the contractual agreement with its client.
Others	Equity method	Eliminated in the period they occur, as a reduction of the underlying asset and subsequently recognized over the depreciation period of the corresponding asset.
	Cost method	Not eliminated, in accordance with IFRS.

For the second quarter and the first six months of 2018, SNC-Lavalin recognized E&C revenues of \$301.2 million (2017: \$214.2 million) and \$551.6 million (2017: \$423.8 million), respectively, from contracts with investments accounted for by the equity method. SNC-Lavalin also recognized its share of net income from Capital investments accounted for by the equity method of \$46.5 million for the second quarter of 2018 (2017: \$51.0 million) and \$97.8 million for the six-month period ended June 30, 2018 (2017: \$99.6 million), respectively.

SNC-Lavalin's trade receivables from investments accounted for by the equity method amounted to \$103.9 million as at June 30, 2018 (December 31, 2017: \$77.6 million). SNC-Lavalin's other current financial assets receivable from these investments accounted for by the equity method amounted to \$115.2 million as at June 30, 2018 (December 31, 2017: \$103.6 million). SNC-Lavalin's remaining commitment to invest in its Capital investments accounted for by the equity method was \$98.0 million at June 30, 2018 (December 31, 2017: \$98.0 million).

In the second quarter of 2018, SNC-Lavalin transferred its investment in McGill Healthcare Infrastructure Group and its holding company to an investment accounted for by the equity method, namely SNC-Lavalin Infrastructure Partners LP, which resulted in a gain on disposal of \$62.7 million before income taxes (\$58.4 million after income taxes) (see Note 4A).

All of these related party transactions are measured at fair value.

12. FINANCIAL INSTRUMENTS

The following table presents the carrying value of financial assets held by SNC-Lavalin at June 30, 2018 by category and classification, with the corresponding fair value, when available:

AT JUNE 30	2018						
	CARRYING VALUE OF FINANCIAL ASSETS BY CATEGORY						
			AMORTIZED		DERIVATIVES		
	FVTPL ⁽¹⁾	FVTOCI ⁽²⁾	COST	USED FOR HEDGES	TOTAL	FAIR VALUE	
Cash and cash equivalents	\$ 721,408	\$ —	\$ —	\$ —	\$ 721,408	\$ 721,408	
Restricted cash	17,174	—	—	—	17,174	17,174	
Trade receivables	—	—	1,430,247	—	1,430,247	1,430,247	
Other current financial assets	9,049	—	135,955	35,503	180,507	180,507	
Capital investments accounted for by the cost method	55,314	189	588	—	56,091	56,091	
Non-current portion of receivables under service concession arrangements ⁽³⁾	—	—	316,591	—	316,591	331,452	
Other non-current financial assets ⁽³⁾	1,710	630	19,626	5,706	27,672	27,672	
Total	\$ 804,655	\$ 819	\$ 1,903,007	\$ 41,209	\$ 2,749,690		

⁽¹⁾ Fair value through profit or loss ("FVTPL")

⁽²⁾ Fair value through other comprehensive income ("FVTOCI")

⁽³⁾ For non-current portion of receivables under service concession arrangements and most of the other non-current financial assets other than at fair value, the Company uses the present value technique to determine the fair value.

12. FINANCIAL INSTRUMENTS (CONTINUED)

The following table presents the carrying value of financial assets held by SNC-Lavalin at December 31, 2017 by category and classification, with the corresponding fair value, when available:

AT DECEMBER 31	2017						
	CARRYING VALUE OF FINANCIAL ASSETS BY CATEGORY						
	FVTPL ⁽¹⁾	AVAILABLE- FOR-SALE	LOANS AND RECEIVABLES	DERIVATIVES USED FOR HEDGES	TOTAL	FAIR VALUE	
Cash and cash equivalents	\$ 706,531	\$ —	\$ —	\$ —	\$ 706,531	\$ 706,531	
Restricted cash	20,932	—	—	—	20,932	20,932	
Trade receivables	—	—	1,445,859	—	1,445,859	1,445,859	
Other current financial assets	5,271	—	399,262	37,967	442,500	442,500	
Capital investments accounted for by the cost method ⁽²⁾	—	55,058	556	—	55,614	See ⁽²⁾	
Non-current portion of receivables under service concession arrangements ⁽³⁾	—	—	273,340	—	273,340	291,238	
Other non-current financial assets ⁽³⁾	7,602	—	22,167	14,552	44,321	44,321	
Total	\$ 740,336	\$ 55,058	\$ 2,141,184	\$ 52,519	\$ 2,989,097		

⁽¹⁾ Fair value through profit or loss ("FVTPL"), comprised of financial assets classified as held for trading.

⁽²⁾ These available-for-sale financial assets represented mainly equity instruments that did not have a quoted market price in an active market.

⁽³⁾ For non-current portion of receivables under service concession arrangements and most of the other non-current financial assets other than at fair value, the Company uses the present value technique to determine the fair value.

The following tables present the carrying value of financial liabilities held by SNC-Lavalin at June 30, 2018 and December 31, 2017 by category and classification, with the corresponding fair value, when available:

AT JUNE 30	2018				
	CARRYING VALUE OF FINANCIAL LIABILITIES BY CATEGORY				
	DERIVATIVES USED FOR HEDGES	AMORTIZED COST	TOTAL	FAIR VALUE	
Trade payables	\$ —	\$ 2,183,498	\$ 2,183,498	\$ 2,183,498	
Other current financial liabilities	24,109	233,574	257,683	257,683	
Provisions	—	41,909	41,909	41,909	
Short-term debt and long-term debt ⁽¹⁾	—	3,500,063	3,500,063	3,532,818	
Other non-current financial liabilities	7,654	18,498	26,152	26,152	
Total	\$ 31,763	\$ 5,977,542	\$ 6,009,305		

AT DECEMBER 31	2017				
	CARRYING VALUE OF FINANCIAL LIABILITIES BY CATEGORY				
	DERIVATIVES USED FOR HEDGES	OTHER FINANCIAL LIABILITIES	TOTAL	FAIR VALUE	
Trade payables	\$ —	\$ 2,176,947	\$ 2,176,947	\$ 2,176,947	
Downpayments on contracts	—	149,388	149,388	149,388	
Other current financial liabilities	20,775	243,949	264,724	264,724	
Provisions	—	52,519	52,519	52,519	
Short-term debt and long-term debt ⁽¹⁾	—	3,133,680	3,133,680	3,178,071	
Other non-current financial liabilities	1,303	14,122	15,425	15,425	
Total	\$ 22,078	\$ 5,770,605	\$ 5,792,683		

⁽¹⁾ The fair value of short-term debt and long-term debt was determined using public quotations or the discounted cash flows method in accordance with current financing arrangements. The discount rates used correspond to prevailing market rates offered to SNC-Lavalin or to the Capital investments, depending on which entity has issued the debt instrument, for debt with the similar terms and conditions.

For the six-month periods ended June 30, 2018 and 2017, there were no changes in valuation techniques and in inputs used in the fair value measurements and there were no transfers between the levels of the fair value hierarchy.

13. CONTINGENT LIABILITIES

A) ONGOING INVESTIGATIONS

In February 2012, the Board of Directors initiated an independent investigation (the “Independent Review”), led by its Audit Committee, of the facts and circumstances surrounding certain payments that were documented (under certain agreements presumed to be agency agreements) to construction projects to which they did not relate, and certain other contracts. On March 26, 2012, the Company announced the results of the Independent Review and related findings and recommendations of the Audit Committee to the Board of Directors and provided information to the appropriate authorities. The Company understands that investigations by law enforcement and securities regulatory authorities remain ongoing in connection with this information, which are described in greater detail below. The Company also continues to review compliance matters (including matters beyond the scope of the Independent Review), including to assess whether amounts may, directly or indirectly, have been improperly paid to persons owing fiduciary duties to the Company, and as additional information, if any, arises as a result thereof, the Company will continue to investigate and review such information as it has in the past.

Charges and RCMP investigations

On February 19, 2015, the Royal Canadian Mounted Police (the “RCMP”) and the Public Prosecution Service of Canada laid charges against the Company and its indirect subsidiaries SNC-Lavalin International Inc. and SNC-Lavalin Construction Inc. Each entity has been charged with one count of fraud under Section 380 of the Criminal Code (Canada) (the “Criminal Code”) and one count of corruption under Section 3(1)(b) of the Corruption of Foreign Public Officials Act (Canada) (the “CFPOA”), (the “Charges”). These Charges follow the RCMP’s formal investigation (including in connection with the search warrant executed by the RCMP at the Company on April 13, 2012) into whether improper payments were made or offered, directly or indirectly, to be made, to a government official of Libya to influence the award of certain engineering and construction contracts between 2001 and 2011. This investigation also led to criminal charges being laid against two former employees of the Company. The Company understands that the charges laid against one or both of these former employees include bribery under the CFPOA, fraud, laundering the proceeds of crime and possession of property obtained by crime under the Criminal Code, and contravention of the *Regulations Implementing the United Nations Resolutions on Libya* in Canada. Due to the inherent uncertainties of these proceedings, it is not possible to predict the final outcome of the Charges, which could possibly result in a conviction on one or more of the Charges. The preliminary inquiry in respect of the Charges has been scheduled for a court hearing in October 2018. The Company cannot predict what, if any, other actions may be taken by any other applicable government or authority or the Company’s customers or other third parties as a result of the Charges, or whether additional charges may be brought in connection with the RCMP investigation of these matters.

The Charges and potential outcomes thereof, and any negative publicity associated therewith, could adversely affect the Company’s business, results of operations and reputation and could subject the Company to sanctions, fines and other penalties, some of which may be significant. In addition, potential consequences of the Charges could include, in respect of the Company or one or more of its subsidiaries, mandatory or discretionary suspension, prohibition or debarment from participating in projects by certain governments (such as the Government of Canada and/or Canadian provincial governments) or by certain administrative organizations under applicable procurement laws, regulations, policies or practices. The Company derives a significant percentage of its annual global revenue (and an even larger percentage of its annual Canadian revenue) from government and government-related contracts. As a result, suspension, prohibition or debarment, whether discretionary or mandatory, from participating in certain government and government-related contracts (in Canada, Canadian provinces or elsewhere) could have a material adverse effect on the Company’s business, financial condition and liquidity and the market prices of the Company’s publicly traded securities.

The Company understands that a RCMP investigation, relating to alleged payments in connection with a 2002 contract for the refurbishment of the Jacques Cartier bridge by a consortium including SNC-Lavalin and which led to a guilty plea by the former head of the Canada Federal Bridges Corporation in 2017, continues and its scope may include the Company.

AMF Investigation; AMF Certification under the Quebec Act Respecting Contracting by Public Bodies

The Company understands that there is an ongoing investigation being conducted in the context of applicable securities laws and regulations by the securities regulator in the Province of Quebec, the Autorité des marchés financiers (the “AMF”).

13. CONTINGENT LIABILITIES (CONTINUED)

Certain subsidiaries of the Company require certification from the AMF, subject to periodic renewal, to contract with public bodies in the Province of Quebec, as required pursuant to the *Act Respecting Contracting by Public Bodies*. If an entity or any of its affiliates is convicted of certain specified offences under the Criminal Code or the CFPOA, AMF certification can be automatically revoked. In addition, the AMF has the discretionary power to refuse to grant an authorization or revoke or not renew an authorization if it determines that the enterprise concerned fails to meet the high standards of integrity that the public is entitled to expect from a party to a public contract or subcontract. Those subsidiaries of the Company that need to be certified by the AMF have obtained that certification.

World Bank Settlement

On April 17, 2013, the Company announced a settlement in connection with the previously announced investigations by the World Bank Group relating to a project in Bangladesh and a project in Cambodia, which includes a suspension of the right to bid on and to be awarded World Bank Group-financed projects by SNC-Lavalin Inc., a subsidiary of the Company, and its controlled affiliates for a period of 10 years (the “World Bank Settlement”). The suspension could be lifted after eight years, if the terms and conditions of the settlement agreement are complied with fully. According to the terms of the World Bank Settlement, the Company and certain of its other affiliates continue to be eligible to bid on and be awarded World Bank Group-financed projects as long as they comply with all of the terms and conditions imposed upon them under the terms of the World Bank Settlement, including an obligation not to evade the sanction imposed. The World Bank Settlement also requires that the Company cooperate with the World Bank on various compliance matters in the future. The World Bank Settlement has led to certain other multilateral development banks following suit, debarring SNC-Lavalin Inc. and its controlled affiliates on the same terms.

African Development Bank Settlement

On October 1, 2015, the Company announced a settlement with the African Development Bank relating to allegations of corruption in two African countries (the “African Development Bank Settlement”). The African Development Bank Settlement requires that the Company cooperate with the African Development Bank on various compliance matters in the future.

Canada’s Integrity Regime

The Canadian government announced the Integrity Regime for procurement and real property transactions on July 3, 2015. The scope of offences which may cause a supplier to be deemed ineligible to carry on business with the federal government are broad and encompass offences under the Criminal Code, the Competition Act, and the CFPOA, among others. Some of the offences qualifying for ineligibility include: bribery, fraud, money laundering, falsification of books and documents, extortion, and offences related to drug trafficking. A determination of ineligibility to participate in federal government procurement projects may apply for 10 years for listed offences. However, the Integrity Regime permits the ineligibility period to be reduced by up to five years if a supplier can establish that it has cooperated with law enforcement authorities or addressed the causes of misconduct.

If a supplier is charged with a listed offence (as is presently the case with the Company), it may under the Integrity Regime be ineligible to do business with the Canadian government while legal proceedings are ongoing.

If a supplier applies for a reduced ineligibility period, or if a supplier charged with a listed offence is notified that it could be ineligible to do business with the Canadian government, as a condition of granting the reduced ineligibility period or not suspending the supplier an administrative agreement may be imposed to monitor the supplier. Administrative agreements include conditions and compliance measures that the supplier must meet to remain eligible to contract with the federal government.

The Company has signed an administrative agreement with Public Services and Procurement (PSP) of the Government of Canada under the Integrity Regime.

Failure of the Company to abide by the terms of any of its certification from the AMF, the World Bank Settlement, the African Development Bank Settlement and/or the PSP Administrative Agreement could result in serious consequences for the Company, including new sanctions, legal actions and/or suspension from eligibility to carry on business with the government or agency involved or to work on projects funded by them. The Company is taking steps that are expected to mitigate this risk.

13. CONTINGENT LIABILITIES (CONTINUED)

Other Investigations

The Company understands that there are also investigations by various authorities ongoing in various jurisdictions with respect to the above and other matters. In addition, Pierre Duhaime and Riadh Ben Aïssa, former Company employees, have been charged by authorities in the Province of Quebec with various fraud offences allegedly in connection with a Company project in the Province of Quebec. On July 10, 2018, Mr. Ben Aïssa pleaded guilty to the charge of using a forged document in exchange for other charges being dropped, and was accordingly sentenced to 51 months incarceration.

On October 1, 2014, Mr. Ben Aïssa entered guilty pleas to certain criminal charges in the Federal Criminal Court of Switzerland following a lengthy investigation by Swiss authorities and the detention of Mr. Ben Aïssa by Swiss authorities from April 2012 to October 2014. The Company was recognized as an injured party in the context of the Swiss proceedings and was awarded for certain offences for which Mr. Ben Aïssa has plead guilty a sum equivalent to CA\$17.2 million translated using the exchange rates as at October 1, 2014 (representing the equivalent of 12.9 million CHF and US\$2.0 million) plus interest. The Company has received all amounts due under this award.

The Company is currently unable to determine when any of the above investigations will be completed or whether other investigations of the Company by these or other authorities will be initiated or the scope of current investigations broadened. While the Company continues to cooperate and communicate with authorities in connection with all ongoing investigations as noted above, if regulatory, enforcement or administrative authorities or third parties determine to take action against the Company or to sanction the Company in connection with possible violations of law, contracts or otherwise, the consequences of any such sanctions or other actions, whether actual or alleged, could require the Company to pay material fines or damages, consent to injunctions on future conduct or lead to other penalties including temporary or permanent, mandatory or discretionary suspension, prohibition or debarment from participating in projects by certain administrative organizations (such as those provided for in the World Bank Settlement) or by governments (such as the Government of Canada and/or the Government of Quebec) under applicable procurement laws, regulations, policies or practices, each of which could, materially adversely affect the Company's business, financial condition and liquidity and the market price of the Company's publicly traded securities.

The outcomes of the above investigations or the Charges could also result in, among other things, i) covenant defaults under various project contracts, ii) third party claims, which may include claims for special, indirect, derivative or consequential damages, or iii) adverse consequences on the Company's ability to secure or continue its own financing, or to continue or secure financing for current or future projects, any of which could materially adversely affect the Company's business, financial condition and liquidity and the market prices of the Company's publicly traded securities. In addition, the Charges, these investigations and outcomes of these investigations or Charges and any negative publicity associated therewith, could damage SNC-Lavalin's reputation and ability to do business. Finally, the findings and outcomes of the Charges or these investigations may affect the course of the class action lawsuits (described below).

Due to the uncertainties related to the outcome of the Charges and each of the above investigations, the Company is currently unable to reliably estimate an amount of potential liabilities or a range of potential liabilities, if any, in connection with the Charges or any of these investigations.

The Company's senior management and Board of Directors have been required to devote significant time and resources to the investigations described above and ongoing related matters which have distracted and may continue to distract from the conduct of the Company's daily business, and significant expenses have been and may continue to be incurred in connection with these investigations including substantial fees of lawyers and other advisors. In addition, the Company and/or other employees or additional former employees of the Company could become the subject of these or other investigations by law enforcement and/or regulatory authorities in respect of the matters described above or other matters which, in turn, could require the devotion of additional time of senior management and the diversion or utilization of other resources.

13. CONTINGENT LIABILITIES (CONTINUED)

B) CLASS ACTION LAWSUITS

The Company is subject to class actions in Quebec and Ontario commenced in 2012 on behalf of security holders (collectively, the “Actions”). The Actions are brought pursuant to the secondary market civil liability provisions in the various Canadian provincial and territorial securities statutes. The Actions allege the agent payments that were the subject of the Independent Review were bribes to public officials and that bribes were also offered in relation to the project in Bangladesh that forms part of the World Bank Settlement. Consequently, it is alleged that various of the Company’s public disclosure documents issued between November 2009 and November 2011 included misrepresentations. The Actions seek damages, on behalf of all persons who acquired securities of SNC-Lavalin between November 6, 2009 and February 27, 2012, based on the decline in market value of SNC-Lavalin shares following the Company’s February 28, 2012 news release and other public announcements.

The oral discovery stage is substantially complete in the Ontario Action. The Quebec Action is presently in abeyance while the Ontario Action proceeds.

On May 22, 2018, the Company announced it had reached an agreement to settle the Actions, with the Company agreeing to pay \$88.0 million to the plaintiffs. The settlement is subject to the approvals of the Ontario and Quebec courts, the outcome of which application for approval should be known later in 2018.

Due to the inherent uncertainties of litigation, it is not possible to predict the final outcome of the approval applications and SNC-Lavalin may, in the future, be subject to further class action lawsuits or other litigation. While SNC-Lavalin has directors’ and officers’ liability insurance insuring individuals against liability for acts or omissions in their capacities as directors and officers, the Company does not maintain any other insurance in connection with the Actions. The amount of coverage under the directors’ and officers’ policy is limited and such coverage may be an insignificant portion of any amounts the Company is required or determines to pay in connection with the Actions. In the event the Company is required or determines to pay amounts in connection with these lawsuits or other litigation, such amounts could be significant and may have a material adverse impact on SNC-Lavalin’s liquidity and financial results.

C) OTHER

On June 12, 2014, the Quebec Superior Court rendered a decision in “Wave 1” of the matter commonly referred to as the “Pyrrhotite Case” in Trois-Rivières, Quebec and in which SNC-Lavalin is one of numerous defendants. The Superior Court ruled in favour of the plaintiffs, awarding an aggregate amount of approximately \$168 million in damages apportioned amongst the then-known defendants, on an *in solidum* basis (the “Wave 1 claims”). SNC-Lavalin, among other parties, filed a Notice to Appeal the Superior Court decision both on merit and on the apportionment of liability. Based on the current judgment, SNC-Lavalin’s share of the damages would be approximately 70%, a significant portion of which the Company would expect to recover from its external insurers (such insurance coverage is itself subject to litigation). In addition to the appeal of the decision, recourses in warranty were filed against another party, which may result in reduction of SNC-Lavalin’s share of the damages. The appeal hearing started in October 2017 and was completed in the week of April 30th, 2018. The parties now await for the Court of appeal to confirm if further hearings will be necessary before they take the matter under advisement.

In parallel to the appeal and warranty recourses for Wave 1 claims, additional potential claims were notified and continue to be notified against numerous defendants, including SNC-Lavalin, in “Wave 2” of the Pyrrhotite Case. Wave 2 claims are currently undergoing discovery stage and it is still premature to evaluate SNC-Lavalin’s total liability exposure in respect of same, if any. It is currently estimated that a significant portion of the damages claimed are in respect of buildings for which the concrete foundations were poured outside of SNC-Lavalin’s liability period, as determined in the Wave 1 judgement. SNC-Lavalin also expects some insurance coverage for Wave 2 claims. In addition, SNC-Lavalin has undertaken a warranty recourse against another party with respect to Wave 2 claims.

Legal proceedings

SNC-Lavalin becomes involved in various legal proceedings as a part of its ordinary course of business and this section describes certain important ordinary course of business legal proceedings, including the general cautionary language relating to the risks inherent to all litigation and proceedings against SNC-Lavalin, which is equally applicable to the legal proceedings described below.

13. CONTINGENT LIABILITIES (CONTINUED)

While SNC-Lavalin cannot predict with certainty the final outcome or timing of the legal proceedings described below, based on the information currently available (which in some cases remains incomplete), SNC-Lavalin believes that it has strong defences to these claims and intends to vigorously defend its position.

SNC-Lavalin Inc. has initiated court proceedings against a Canadian client stemming from engineering, procurement, and construction management services that SNC-Lavalin Inc. provided in relation to the client's expansion of an ore-processing facility. SNC-Lavalin claimed from the client certain amounts due under the project contract. The client has counterclaimed alleging that SNC-Lavalin defaulted under the project contracts and seeking damages.

Due to the inherent uncertainties of litigation, it is not possible to (a) predict the final outcome of these and other related proceedings generally, (b) determine if the amount included in the Company's provisions is sufficient or (c) determine the amount of any potential losses, if any, that may be incurred in connection with any final judgment on these matters.

The Company is a party to other claims and litigation arising in the normal course of operations, including by clients, subcontractors, and vendors presenting claims for, amongst other things, recovery of costs related to certain projects. Due to the inherent uncertainties of litigation and/or the early stage of certain proceedings, it is not possible to predict the final outcome of all ongoing claims and litigation at any given time or to determine the amount of any potential losses, if any. With respect to claims or litigation arising in the normal course of operations which are at a more advanced stage and which permit a better assessment of potential outcome, the Company does not expect the resolution of these matters to have a materially adverse effect on its financial position or results of operations.

14. SHORT-TERM DEBT AND LONG-TERM DEBT

A) DEBENTURES ISSUED IN THE SIX-MONTH PERIOD ENDED JUNE 30, 2018

On March 2, 2018, the Company issued new unsecured debentures of \$525.0 million aggregate principal amount. The issuance was divided in three series consisting of: i) \$150.0 million in floating rate Series 2 Debentures due in March 2019 (the "Series 2 Debentures"); ii) \$175.0 million in floating rate Series 3 Debentures due in March 2021 (the "Series 3 Debentures"); and iii) \$200.0 million in 3.235% Series 4 Debentures due in March 2023. The Series 2 and 3 Debentures bear interest at a rate equal to the 3-month CDOR plus an applicable margin. The net proceeds were used by the Company to repay tranches 2 and 3 of its Term Facility in full and certain indebtedness outstanding under the Revolving Facility.

On June 6, 2018, the Company issued new unsecured debentures of \$150.0 million aggregate principal amount (the "Series 5 Debentures"). The Series 5 Debentures due in June 2019 bear interest at a rate equal to the 3-month CDOR plus an applicable margin. SNC-Lavalin used the net proceeds of the offering to repay certain outstanding indebtedness and for general corporate purposes.

B) AMENDMENTS TO THE CREDIT AGREEMENT

On March 20, 2018, the Company amended its existing revolving credit facility for the purpose of, among other things: i) decreasing the limit applicable to tranche B of the Revolving Facility, which borrowings may be obtained only in the form of non-financial or documentary letters of credit, from \$750 million to \$600 million; ii) increasing the aggregate outstanding amount of bilateral letters of credit allowed under the Credit Agreement from \$2,500 million to \$3,000 million; and iii) extending the maturity date of the Revolving Facility from May 15, 2021 to May 15, 2022.

On April 30, 2018, the Company amended and restated in its entirety the Credit Agreement for the purpose of, among other things: i) making available a new 5-year non-revolving term loan in the principal amount of \$500 million (the "Term Loan"); and ii) making other amendments to the provisions of the Credit Agreement. The net proceeds from the issuance of the Term Loan of \$500 million were used by the Company to repay tranche B of its CDPQ Loan (see Note 14C).

C) CDPQ LOAN

On April, 30, 2018, the Company repaid tranche B of its CDPQ Loan, which is a limited recourse debt, in full for a total amount of \$500 million (see Note 10D).

15. DISPOSAL GROUP AND NON-CURRENT ASSETS CLASSIFIED AS HELD FOR SALE

As at June 30, 2018, there were no disposal group and non-current assets classified as held for sale included in the consolidated statement of financial position.

As at December 31, 2017, the disposal group and non-current assets classified as held for sale included: i) a Capital investment accounted for by the equity method, namely MHIG, and its holding company; and ii) other non-current assets, mainly project equipment, included in the Oil & Gas segment.

The major classes of assets and liabilities of the disposal group and assets held for sale as at December 31, 2017 were as follows:

AT DECEMBER 31, 2017	OTHER NON-CURRENT ASSETS		TOTAL	
	MHIG			
Cash and cash equivalents	\$ 39	\$ –	\$	39
Other current assets	1,428	–		1,428
Capital investments accounted for by the equity method	106,321	–		106,321
Other non-current assets	–	206		206
Assets of disposal group classified as held for sale and assets held for sale	107,788	206		107,994
Current liabilities	1,182	–		1,182
Non-current liabilities	59,258	–		59,258
Liabilities of disposal group classified as held for sale	60,440	–		60,440
Net assets of disposal group classified as held for sale and assets held for sale	\$ 47,348	\$ 206	\$	47,554

16. BUSINESS COMBINATIONS

A) WS ATKINS PLC

On July 3, 2017, SNC-Lavalin acquired WS Atkins Limited (previously WS Atkins plc). Headquartered in the United Kingdom, Atkins is a global design, engineering and project management consultancy, with a position across the infrastructure, transportation and energy sectors. The primary reasons for the acquisition were to bring to SNC-Lavalin new and complementary capabilities in its existing activities, with minimal overlap in its service offering, and to broaden the Company's presence in Europe, the U.K., Scandinavia, the U.S., the Middle East and Asia.

The acquisition of Atkins has been accounted for using the acquisition method, and Atkins has been consolidated from the effective date of acquisition with the Company acquiring 100% of the voting shares of Atkins.

FINAL ALLOCATION OF PURCHASE PRICE

In the second quarter of 2018, the Company modified the preliminary allocation of purchase price and has retrospectively revised the impact of changes to the preliminary allocation of purchase price. However, since the effect on net income was not material to the period subsequent to acquisition date, the cumulative adjustment to earnings was accounted for in the six-month period ended June 30, 2018.

16. BUSINESS COMBINATIONS (CONTINUED)

AT JULY 3, 2017	PRELIMINARY ALLOCATION OF PURCHASE PRICE	NOTE	ADJUSTMENTS	FINAL ALLOCATION OF PURCHASE PRICE
Cash and cash equivalents	\$ 388,280		\$ –	\$ 388,280
Trade receivables	584,319	A	(14,780)	569,539
Contracts in progress / Contract assets	337,230	A	4,269	341,499
Other current assets	131,760	A	1,201	132,961
Other non-current assets	240,068	A	45,496	285,564
Intangible assets related to Atkins acquisition	721,756		317,283	1,039,039
Trade payables and other current liabilities	(1,018,962)	B	(181,422)	(1,200,384)
Short-term debt and long-term debt	(517,759)		–	(517,759)
Non-current liabilities and non-controlling interests	(578,400)	C	(133,730)	(712,130)
Net identifiable assets of business acquired	288,292		38,317	326,609
Goodwill ⁽¹⁾	3,219,402		(38,317)	3,181,085
Total purchase price	\$ 3,507,694		\$ –	\$ 3,507,694

⁽¹⁾ Goodwill represents the excess of the cost of acquisition over the net identifiable tangible and intangible assets acquired and liabilities assumed at their acquisition-date fair values. The fair value allocated to tangible and intangible assets acquired and liabilities assumed are based on assumptions of management. These assumptions include the future expected cash flows arising from the intangible assets identified as revenue backlog, customer relationships and trademarks.

The main adjustments made to the preliminary allocation of purchase price are as follows:

A. Project-related assets

The Company adjusted the initial value of project-related assets, such as trade receivables and contracts in progress / contract assets, to reflect new information obtained about facts and circumstances that existed at the date of acquisition related to these projects.

B. Trade payables and other current liabilities

The Company adjusted the initial value allocated to certain trade payables and other current liabilities, mainly on project-related liabilities and on the short-term portion of certain provisions existing at the date of acquisition.

C. Non-current liabilities and non-controlling interests

This adjustment mainly represents the impact on deferred income tax liability from adjustments discussed above, as well as adjustments made to the fair value of certain provisions existing at the date of acquisition.

B) DATA TRANSFER SOLUTIONS LLC

On October 31, 2017, SNC-Lavalin announced the acquisition of Data Transfer Solutions LLC (“DTS”). Completed on October 30, 2017, the acquisition added to the capabilities of SNC-Lavalin’s EDPM segment and enhanced service offerings in digital asset management for clients.

The acquisition of DTS has been accounted for using the acquisition method and DTS has been consolidated from the effective date of acquisition with the Company acquiring 100% of the voting shares of DTS.

16. BUSINESS COMBINATIONS (CONTINUED)

FINAL ALLOCATION OF PURCHASE PRICE

In the six-month period ended June 30, 2018, the Company modified the preliminary allocation of purchase price and has retrospectively revised the impact of changes to the preliminary allocation of purchase price. However, since the effect on net income was not material to the period subsequent to acquisition date, the cumulative adjustment to earnings was accounted for in the six-month period ended June 30, 2018.

AT OCTOBER 30, 2017	PRELIMINARY ALLOCATION OF PURCHASE PRICE	ADJUSTMENTS	FINAL ALLOCATION OF PURCHASE PRICE
Cash and cash equivalents	\$ 1,619	\$ –	\$ 1,619
Trade receivables	5,492	(205)	5,287
Contracts in progress / Contract assets	3,865	(3,525)	340
Other current assets	172	–	172
Other non-current assets	1,995	(2)	1,993
Intangible assets related to DTS acquisition	–	25,145	25,145
Trade payables and other current liabilities	(4,209)	(751)	(4,960)
Net identifiable assets of business acquired	8,934	20,662	29,596
Goodwill ^{(1), (2)}	49,993	(20,662)	29,331
Total purchase price	\$ 58,927	\$ –	\$ 58,927

⁽¹⁾ The goodwill amount determined according to the preliminary allocation of purchase price included identifiable intangible assets, which are now presented separately under “Intangible assets related to DTS acquisition” in the final allocation of purchase price.

⁽²⁾ Goodwill represents the excess of the cost of acquisition over the net identifiable tangible and intangible assets acquired and liabilities assumed at their acquisition-date fair values. The fair value allocated to tangible and intangible assets acquired and liabilities assumed are based on assumptions of management. These assumptions include the future expected cash flows arising from the intangible assets identified as revenue backlog, customer relationships and trademarks.

C) ACQUISITION-RELATED COSTS AND INTEGRATION COSTS

	SECOND QUARTER		SIX MONTHS ENDED JUNE 30	
	2018	2017	2018	2017
Remeasurement of a foreign exchange option	\$ –	\$ 48,727	\$ –	\$ 48,727
Professional fees and other related costs	12,789	6,545	23,491	7,908
Acquisition-related costs and integration costs	\$ 12,789	\$ 55,272	\$ 23,491	\$ 56,635

For the six-month period ended June 30, 2018, integration costs amounted to \$23.5 million.

In the second quarter of 2017, in relation with the agreement to acquire Atkins, SNC-Lavalin entered into a foreign exchange option to hedge the foreign exchange exposure of the transaction. Until its settlement in the second quarter of 2017, this option was classified as a derivative used for cash flow hedges and was measured at its fair value with gains and losses arising from periodic remeasurements and not qualifying for hedge accounting being recognized in net income. In the second quarter of 2017, the loss arising from remeasurement of the foreign exchange option amounted to \$48.7 million and was included in “Acquisition-related costs and integration costs” in the Company’s consolidated income statement.

For the six-month period ended June 30, 2017, acquisition-related costs related to Atkins acquisition amounted to \$56.4 million.

In addition, following the settlement of the option described above, SNC-Lavalin entered into forward foreign exchange contracts under which SNC-Lavalin sold Canadian dollars and bought British pounds having a notional value of £1,500 million. These forward foreign exchange contracts were classified as derivatives used for cash flow hedges until the payment date, which occurred in July 2017.

17. GOODWILL

The following table details a reconciliation of the carrying amount of the Company's goodwill:

Balance at January 1, 2018	\$ 6,323,440
Additional amount recognized from the adjustments to the final allocation of purchase price of Atkins	11,358
Amount derecognized from the adjustments to the final allocation of purchase price of DTS	(20,662)
Net foreign currency exchange differences	51,971
Balance at June 30, 2018	\$ 6,366,107

Following the Company's new organizational structure that took effect on January 1, 2018 (see Note 2C), the Company's goodwill was reallocated to the following cash-generating units ("CGU") and groups of CGU as follows:

CGU OR GROUP OF CGU	JUNE 30 2018	JANUARY 1 2018
Mining & Metallurgy	\$ 93,023	\$ 96,257
Oil & Gas	2,816,444	2,831,472
Infrastructure	93,736	93,720
O&M	53,134	53,134
Nuclear	657,170	645,797
Clean Power	14,249	14,221
EDPM	2,638,351	2,588,839
	\$ 6,366,107	\$ 6,323,440

18. GAIN ON DISPOSAL OF THE HEAD OFFICE BUILDING

On June 22, 2017, SNC-Lavalin announced that it completed the sale of its Montreal head office building and the adjacent empty lot of land located on René-Lévesque Boulevard West for \$173.3 million to GWL Realty Advisors on behalf of institutional clients. Concurrently, SNC-Lavalin entered into a 20 year lease for the building.

Net gain on disposal of the head office building

SIX MONTHS ENDED JUNE 30	2017
Consideration received	\$ 173,288
Carrying amount of the head office building and land	(22,781)
Deferred tenant allowance	(31,017)
Deferred gain on disposal of the head office building	(2,905)
Disposition-related costs	(1,484)
Gain on disposal of the head office building	115,101
Income taxes	(13,570)
Net gain on disposal of the head office building	\$ 101,531

19. CONTINGENT ACQUISITION OF NON-CONTROLLING INTEREST

In the second quarter of 2017, SNC-Lavalin signed an agreement to acquire 26% of non-controlling interest of Saudi Arabian Kentz Company Limited, which increased SNC-Lavalin's ownership interest in this subsidiary from 49% to 75%, for total cash consideration of US\$45.8 million (approximately CA\$62 million). Completion of the acquisition was subject mainly to the approval by the Saudi Arabian government. On the signing of the agreement, the first tranche of cash consideration of US\$22.9 million (CA\$31.2 million) was paid to the seller, while the second tranche of US\$22.9 million was due on the effective sale date, which occurred in the third quarter of 2017.



SNC • LAVALIN

www.snclavalin.com

SNC-LAVALIN

455 René-Lévesque Blvd. West

Montreal, Quebec

H2Z 1Z3 Canada

Tel.: 514-393-1000

Fax: 514-866-0795

TAB 38

SNC-Lavalin announces agreement to settle class actions brought in 2012

Montreal May 22, 2018

- > *The Company and its insurers have reached an agreement to settle two class actions, brought in Quebec and Ontario on behalf of security holders, relating to alleged disclosure misrepresentation during 2009-2011.*
- > *The Company will contribute \$88M to the settlement of both class actions.*

SNC-Lavalin (TSX:SNC) announces that it has, subject to required court approvals, reached a settlement agreement in relation to class actions in Quebec and Ontario filed in 2012 on behalf of security holders (collectively, the "Actions"). The Actions were brought pursuant to the secondary market civil liability provisions in various Canadian securities statutes.

The Company has contributed \$88M to a settlement of both class actions.

In 2012, the Company initiated a series of significant changes and enhancements to reinforce its ethics and compliance procedures company-wide. These enhancements include, but not limited to, external validation of the ethics and compliance program by an independent compliance Monitor, who reports directly to the World Bank. Its program is now considered by external third-parties to be proactive, robust and a benchmark in the engineering services and construction industry.

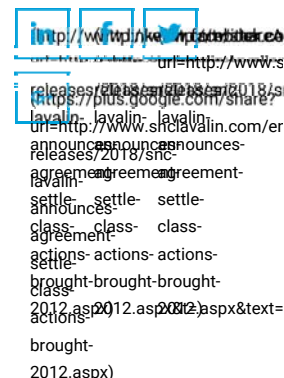
The Class action lawsuit settlement is another step in resolving our legacy issues and de-risking the future of SNC-Lavalin, along with signing an administrative agreement with Public Works and Government Services Canada under the federal government's new Integrity Regime in 2015, reaching an agreement with the Commissioner of Canada Elections and with the Ordre des ingénieurs du Québec in 2016, and reaching a fair and final settlement with Quebec's Voluntary Reimbursement Program in 2017.

ABOUT SNC-LAVALIN

Founded in 1911, SNC-Lavalin is a global fully integrated professional services and project management company and a major player in the ownership of infrastructure. From offices around the world, SNC-Lavalin's employees are proud to build what matters. Our teams provide comprehensive end-to-end project solutions – including capital investment, consulting, design, engineering, construction, sustaining capital and operations and maintenance – to clients across oil and gas, mining and metallurgy, infrastructure, clean power, nuclear and EDPM (engineering design and project management). On July 3, 2017, SNC-Lavalin acquired Atkins, one of the world's most respected design, engineering and project management consultancies, which has been integrated into our sectors. www.snclavalin.com

-30-

SHARE THIS ON



SITE

Markets & Services
(<http://www.snclavalin.com/en/market-services/>)

Projects (/en/projects)

About Us (/en/about-us)

Geographies
(/en/geographies)

Media (/en/media)

FOLLOW US



Investors (http://www.snclavalin.com/en/investors)	Careers (/en/careers) (http://www.snclavalin.com/en/careers)	Sustainability (/en/sustainability/2017)
Contact (/en/contacts-offices)	Health, Safety & Environment (/en/health-safety)	Suppliers (/en/supplier-registration) Ethics & Compliance Reporting Line (http://www.snclavalin.com/en/ethics-and-compliance-hotline)
Code of Ethics (/en/code-of-ethics)	Stock Information (http://www.snclavalin.com/en/investors/essentials/stock-information.aspx)	Glossary (http://www.snclavalin.com/en/glossary)



Founded in 1911, SNC-Lavalin is a global fully integrated professional services and project management company and a major player in the ownership of infrastructure. From offices around the world, SNC-Lavalin's employees are proud to build what matters. Our teams provide comprehensive end-to-end project solutions – including capital investment, consulting, design, engineering, construction management, sustaining capital and operations and maintenance – to clients across oil and gas, mining and metallurgy, infrastructure, clean power, nuclear and EDPM (engineering design and project management). On July 3, 2017, SNC-Lavalin acquired Atkins, one of the world's most respected design, engineering and project management consultancies, which has been integrated into our sectors.



Privacy Notice (<http://www.snclavalin.com/en/privacy-notice.aspx>)

| Legal Notice (<http://www.snclavalin.com/en/legal-notice.aspx>)

TAB 39

1 This policy reflects a clear understanding that, in general, the use of existing corridors
2 has less environmental impact than greenfield development. In this particular project,
3 these benefits are reflected in several ways:

- 4 • The widening required for the existing Hydro One ROW to accommodate the
5 new transmission line is at least 40% in total, narrower than that required by
6 NextBridge, yielding a substantially smaller footprint and ultimately less
7 maintenance;
- 8 • The existing Hydro One ROWs reflect technical, economic and environmental
9 considerations; for example, the route alternative of existing corridors has
10 already been studied and selected to minimize socio-economic and
11 environmental impacts therefore requiring less study reducing corresponding
12 costs;
- 13 • The larger footprint of a new ROW, required by the NextBridge solution,
14 translates into greater potential effects on the natural and/or socio-economic
15 environment, property owners, and the interests of Indigenous Communities.

16
17 The NextBridge route requires corridor widening in sections which run adjacent to the
18 existing Hydro One corridor. Typical widening required by Nextbridge has been
19 indicated to be approximately 64 meters. For the majority of the corridor, since the
20 Lake Superior Link will be running adjacent to the existing Hydro One corridor, Hydro
21 One will only require a 37 meter widening of the existing corridor to accommodate its
22 proposed technical solution. Therefore, for the approximately 257 km where the
23 proposed twinning of the existing EWT line is the same, the impact associated with the
24 Hydro One widening will be significantly less².

² Hydro One will require approximately 46 metres when it is not able to overlap these existing corridors to achieve synergies. It is expected that the majority of the corridor can be developed with the benefit of the overlapping synergy.

NextBridge Interrogatory # 59

Reference:

EB-2017-0364 - February 15, 2018 HONI Lake Superior Link Application EXHIBIT C, TAB 1, SCHEDULE 1, Page 7, lines 4-6 and EXHIBIT E, TAB 1, SCHEDULE 1, page 1, lines 9-12

Interrogatory:

Preamble: “The widening required for the existing Hydro One ROW to accommodate the new transmission line is at least 40% in total, narrower than that required by NextBridge, yielding a substantially smaller footprint and ultimately less maintenance.”

“The proposed Line corridor (the “Corridor”) will have a right-of-way (ROW) width of approximately 37 metres where Hydro One parallels and overlaps is existing...transmission corridors...”

- a) Please confirm that HONI intends to parallel and overlap the existing EWT line ROW for the majority of the route;
- b) Please confirm that when NextBridge raised the concept of overlapping ROW with HONI in the designation phase, HONI stated that there was no “extra” right-of-way, and that NextBridge would be required to have a full ROW width.
- c) Confirm that if NextBridge’s Leave to Construct Application is approved, HONI will provide NextBridge the ability to overlap the existing EWT Line ROW. If not confirmed, explain your answer in detail.

Response:

- a) The LSL ROW will parallel and marginally overlap by 10 feet the existing EWT ROW, with the exception of the Loon Lake/Dorion bypass and Pukaskwa National Park.
- b) The whole width of the existing EWT ROW (about 150’) is needed for the existing line if NextBridge or another proponent builds a new transmission line adjacent to the EWT ROW. The 10 foot overlap of the EWT ROW by the LSL ROW is acceptable as Hydro One would have control of both transmission lines and their combined ROW (about 270’). This allows Hydro One to continue its maintenance and restoration practices in the long-term without restriction and maintain flexibility to respond to emergent needs. As an example, in the unlikely event of a tower failure (either an existing EWT tower or a new LSL tower), Hydro

- 1 One will be able to install temporary bypass circuits at the two edges of the combined ROW
- 2 to allow safe and timely replacement of the failed tower.
- 3
- 4 c) Hydro One will not provide NextBridge the ability to overlap the existing EWT Line ROW.
- 5 The rationale is set out in part b) above.

TAB 40

School Energy Coalition Interrogatory # 26

Reference:

[Motion Hearing, JT2.20, JT2.23; JT2.25]

Interrogatory:

With respect to Hydro One's by-pass route cost forecast:

- a) Please confirm that this by-pass route is the same route proposed by Nextbridge.
- b) Please explain how Hydro One forecast these costs.
- c) Hydro One states in JT 2.20 that the cost estimate is the "best estimate at this point in time, and the proposed solution has not been detailed to the same level as what was filed as part of the s.92 application". What is the AACE classification of the bypass-route?
- d) Please provide a similar table as shown in JT2.25 showing the accuracy range and upper/lower cost bounds for the estimate.
- e) In JT2.25, Hydro One states that incremental cost for the EPC contract for the bypass route is \$37M for total cost of \$583M. Is this a Hydro One estimate, or is it one that has been estimated by SNC-Lavalin?

Response:

- a) The bypass route is meant to reflect the same route proposed by NextBridge.
- b) The route was ascertained from information publicly available from NextBridge's route, including their s. 92 and EA applications. As Hydro One LiDAR assessments and detailed engineering or consultations have not been performed on this route, the estimate was a parametric exercise using the unit rates derived from the rest of the line.
- c) This portion of the route would be assessed as an AACE Class 4 estimate.

UNDERTAKING – JT 2.20

Undertaking

Hydro One to replicate Table 3 in the additional evidence to the application on construction cost for the route proposed by NextBridge.

Response

Provided below is an updated Table 3 from Hydro One’s original evidence, Exhibit B, Tab 7, Schedule 1, comparing the cost of Hydro One’s proposed route through Pukaskwa National Park with the route proposed by NextBridge going around the Park (the “By-Pass”).

This compares to NextBridge’s construction cost of \$737 million.

Please note that the “By-Pass” costs shown below are Hydro One’s best estimate at this point in time, and the proposed solution has not been detailed to the same level as what was filed as part of the s.92 application.

Exhibit B/T7/S1 Table 3: Construction Costs (\$000s)	HONI S.92	HONI By-Pass	Delta
Route Length	403 km	443 km	9.9%
Construction	\$ 354,030	\$ 371,732	5.0%
Site Clearing, Preparation & Site Remediation	\$ 104,339	\$ 116,860	12.0%
Material	\$ 58,713	\$ 64,584	10.0%
Project Management	\$ 5,802	\$ 5,802	0.0%
Other Costs	\$ 9,451	\$ 9,481	0.3%
Construction Management, Engineering, Design & Procurement	\$ 17,828	\$ 18,719	5.0%
Real Estate	\$ 9,798	\$ 9,798	0.0%
First Nations & Métis Consultations	\$ 1,133	\$ 1,627	43.6%
Environmental Approval	\$ 819	\$ 1,819	122.1%
Other Consultations	\$ 160	\$ 160	0.0%
Contingency	\$ 10,775	\$ 10,775	0.0%
Interest During Construction(“IDC”)	\$ 42,596	\$ 44,838	5.3%
Overhead	\$ 8,502	\$ 8,502	0.0%
Total Construction Cost	\$ 623,946	\$ 664,697	6.5%
Adder to go around Pukaskwa National Park		\$ 40,751	

UNDERTAKING – JT 2.23

Undertaking

To estimate the value of contract following the NextBridge route.

Response

In the event that Hydro One were to follow the “NextBridge route” around Pukaskwa National Park, the incremental cost for the fixed-price EPC contract would be approximately \$37 million for an EPC contract total of \$583 million.

- 1 d) Hydro One's cost estimate at the time of the S92 application would be considered an AACE
2 Class 3 estimate based on scope definition. The published band accuracy per AACE is -20%
3 to +30%, however Hydro One expects its accuracy band to be +/-6% given the portion of the
4 estimate that is fixed under the EPC contract as well as the risk and contingency analysis and
5 allowances provided within the estimate.
- 6 i. To bring the estimate to a Class 1, all permits and property access rights would need
7 to be confirmed or secured, supplier and labour contracts would need to be signed and
8 detailed engineering would need to be finalized.
- 9 ii. The possibility of the pricing within the Table 3 estimates increasing significantly is
10 extremely low as over 85% of the costs are from fixed pricing through the SNC-
11 Lavalin EPC contract.
- 12
- 13 e) The costs for the Pukaskwa National Park are included in SNC-Lavalin's fixed price estimate
14 and are not broken out separately.
- 15
- 16 f) Please refer to Exhibit I, Tab 1, Schedules 10 and 11.
- 17
- 18 g) Please refer to Exhibit I, Tab 1, Schedule 11.
- 19
- 20 h) Table 3 cost estimate will increase if the in-service date is delayed beyond December 2021.
21 Please refer to Exhibit I, Tab 1, Schedule 7.
- 22
- 23 i) Please refer to Exhibit I, Tab 1, Schedule 7. A 2023 cost impact scenario has not been
24 developed at this time as Hydro One intends to deliver the Project before the end of 2022 and
25 that a delay beyond 2022 is very unlikely.
- 26
- 27 j) Above answers can be associated to the alternative route around the Pukaskwa National Park
28 except for item d). The uncertainty in costs for the alternative is increased as there has not
29 been any engineering or site evaluations been done for the remainder of the line. This
30 portion would be considered an AACE Class 4 with a -30% to +50% band accuracy.

1 **School Energy Coalition Interrogatory # 18**

2
3 **Reference:**

4 N/A

5
6 **Interrogatory:**

7 Please confirm Hydro One is only seeking leave to construct approval for its preferred route
8 through Pukaskwa National Park. If so, please confirm that if the approval is not granted by
9 Parks Canada then Hydro One would need to seek a variance of any leave to construct approval.

10
11 **Response:**

12 Hydro One is seeking approval to construct the route through Pukaskwa National Park. As
13 identified, in Exhibit I, Tab 1, Schedule 20, the OEB typically requires, as a condition of
14 approval, that the Applicant advise the Board's designated representative of any proposed
15 material change in the Project, including, but not limited to, material changes in the proposed
16 route, construction techniques, construction schedule, restoration procedures, or any other
17 material impacts of construction. Hydro One would inform the OEB of any material changes and
18 await OEB direction.

TAB 41

School Energy Coalition Interrogatory # 5

Reference:

N/A

Interrogatory:

Please provide a similar schedule as requested in SEC-HONI-4, which includes a decision by Parks Canada that Hydro One cannot go through Pukaskwa National Park.

Response:

The current schedule is provided in the Table below:

TASK	START	FINISH
Submit Section 92 Application to OEB		February 2018
Projected Section 92 Approval	February 2018	January 2019
Execute EPC Contract with SNCL		January 2019
Environment Assessment and Consultation		
Obtain EA Approval from MOECC	January 2018	August 2019 ¹
Ongoing First Nations & Métis Consultation and Consultation with Stakeholders	February 2018	December 2021
Lines Construction Work		
Real Estate Land Acquisition	March 2018	May 2020
Detailed Engineering	March 2018	Oct 2019
Tender and Award Procurement	January 2019	July 2020
Construction	September 2019	November 2021
Commissioning	September 2021	December 2021
In Service		December 2021

¹ Assumption: Declaration Order approved by MECP Minister

Please refer to Attachment 1 for Gantt chart

1 **School Energy Coalition Interrogatory # 18**

2
3 **Reference:**

4 N/A

5
6 **Interrogatory:**

7 Please confirm Hydro One is only seeking leave to construct approval for its preferred route
8 through Pukaskwa National Park. If so, please confirm that if the approval is not granted by
9 Parks Canada then Hydro One would need to seek a variance of any leave to construct approval.

10
11 **Response:**

12 Hydro One is seeking approval to construct the route through Pukaskwa National Park. As
13 identified, in Exhibit I, Tab 1, Schedule 20, the OEB typically requires, as a condition of
14 approval, that the Applicant advise the Board's designated representative of any proposed
15 material change in the Project, including, but not limited to, material changes in the proposed
16 route, construction techniques, construction schedule, restoration procedures, or any other
17 material impacts of construction. Hydro One would inform the OEB of any material changes and
18 await OEB direction.

TAB 42

Project Schedule – Transmission Lines

Hydro One has been working to the following high-level schedule and is confident in the ability to complete the project by year-end 2021, which is a one-year extension to the current need date of 2020. This work would be completed in parallel and in coordination with the terminal station work at Lakehead TS, Marathon TS, and Wawa TS.

Activity	Start	Finish
Refine project assumptions and cost Estimate to Inform Indicative Offer to IESO	August 2017	October 2017
Refine project assumptions and cost estimate in development of LTC Filing	September 2017	December 2017
Leave to Construct Submission to OEB		December 15, 2017
Leave to Construct Review & Decision by OEB	December 15, 2017	October 2018
Detailed Engineering	October 2018	May 2019
Procurement	November 2018	September 2019
Construction	March 2019	December 2021

Cost Estimate

Substantial engineering and other project definition work has been completed by Hydro One and SNC-Lavalin for the proposed solution. Based on the amount of work completed to-date, the total project cost for the transmission lines is **estimated to be less than \$650m**, including:

- All EPC costs (engineering, procurement, construction, project management, project controls, quality assurance),
- Project contingency
- Costs to amend the draft environmental assessment prepared by NextBridge
- Real estate acquisition and licensing fees,
- Interest during construction, and
- Project setup and governance costs.

Hydro One and SNC-Lavalin are committed to completing further design work prior to submission of the Leave to Construct application in December, and are **targeting an all-in price of less than \$600m, including a guaranteed “not-to-exceed” provision.**

At time of writing, the largest cost uncertainties remain with access and contracted construction costs. Further data will soon be available from detailed helicopter inspections and laser scanning which will be used to refine assumptions into design packages for materials and construction labour. Firm bid pricing will be obtained for all material and construction labour prior to submission of the LTC.

In addition to lower upfront capital costs, Hydro One can add substantial value on an on-going basis through lower operations & maintenance (O&M) expenses. By leveraging Hydro One’s existing

TAB 43

Project Schedule

TASK	START	FINISH
Submit Section 92 Application to OEB		February 2018
Projected Section 92 Approval	February 2018	October 2018
Finalize EPC Contract with SNCL		November 2018
Environment Assessment and Consultation		
Obtain EA Approval from MOECC	January 2018	June 2019
Ongoing First Nations & Métis Consultation and Consultation with Stakeholders	February 2018	December 2021
Lines Construction Work		
Real Estate Land Acquisition	March 2018	March 2020
Detailed Engineering	April 2018	July 2019
Tender and Award Procurement	January 2019	September 2019
Construction	July 2019	November 2021
Commissioning	October 2021	December 2021
In Service		December 2021

Hydro One recognizes that the IESO has recommended an in-service date of 2020 for the East-West Tie Project¹ and that the proposed in-service date in this Application is one year beyond that recommended date. Hydro One believes that a delay to the in-service date to 2021 is manageable and should not impact the supply of electricity to the Northwest.

¹ Exhibit B, Tab 2, Schedule 1, Attachment 2

TAB 44

work tasks. SNC-Lavalin will also monitor the schedule for creep or slippage of any tasks completed by others that could impact the overall construction schedule.

The Construction Project Manager will be responsible for facilitating work task definitions, sequencing, scheduling and other estimating tasks with the Project Team.

The Project Team is responsible for participating in work task definition, sequencing, duration, and resource estimating. The Project Team will also review and validate the proposed schedule and perform assigned activities once the schedule is approved.

SNC-Lavalin will schedule, track, and monitor the Project in Primavera P6 to ensure that the Project achieves established key milestone targets. SNC-Lavalin's field representative will provide progress reports to the scheduler for inputting who will consolidate in a master schedule. Updated schedules will be provided to the SNC-Lavalin Project Manager on a weekly basis in both PDF and Primavera version. In addition to the schedule, a variance report will also be submitted detailing delays and actions being taken to get back on schedule.

The schedule will be communicated to the Hydro One Project team who will ensure updates are provided to PNP staff.

Schedule Milestones

	PNP Milestones	Milestone Dates
1	Construction Mobilization	01-Feb-2020
2	Clearing and Access Start	05-Feb-2020
3	Foundations Start	06-Mar-2020
4	Tower Assembly Start	08-Jun-2020
5	Pukaskwa National Park Outage Start (2 weeks)	01-Aug-2020
6	Tower Erection Start	02-Aug-2020
7	Single Circuit Outages Start (12 weeks)	16-Jun-2021
8	Stringing Start	17-Jun-2021
9	Construction Substantial Completion	10-Sep-2021
10	EPC Substantial Project Completion	25-Oct-2021

12) Project Management Methodology

The proposed Project organizational chart can be seen below (Figure 1). The Project Manager has the overall authority and responsibility for managing and executing the individual work package projects according to the Project Plan, its Subsidiary Management Plans and Construction Baseline Schedule for the Work Package they are tasked with. The Project Team will consist of personnel from the Transmission Operations, Health, Safety and Environmental and Finance Departments within SNC-Lavalin and our nominated Sub-contractors. The Project Manager will work with the requisite divisions within SNC-Lavalin to perform project planning, scheduling, materials handling, resourcing and other activities. All project and subsidiary management plans prepared by or for the Project Manager as well as funding decisions will be reviewed and approved by the Program Director and Program Sponsors (The

TAB 45

1 MR. RUBENSTEIN: I'm looking for a month. What is the
2 month and year that you will not meet your December --
3 reasonably meet your December 2021 date?

4 MR. KARUNAKARAN: If we had EA approval after the
5 winter, as in if you come in in March, February-March of
6 2020, we would lose that first season, and we would not be
7 able to, at that point, reasonably meet the 2021 date.

8 MR. RUBENSTEIN: So March what is what? Nine, ten
9 months from your schedule, and you can still meet the in-
10 service addition with a ten-month delay in the
11 environmental assessment?

12 MR. KARUNAKARAN: There would be additional costs
13 associated with doing so -- no no, hang on. I said if we
14 actually got the EA, right, by the March of 2020, that
15 means we've lost that winter clearing of 19/20, then we
16 would not be able to make in-service date.

17 MR. RUBENSTEIN: But in February, you still would be
18 able to?

19 MR. KARUNAKARAN: No, no. What -- no. I mean, one
20 month of clearing is effectively losing the season.

21 MR. RUBENSTEIN: So what month and year, if you get
22 EA, it is now -- there's a delay of some amount.

23 MR. KARUNAKARAN: Mm hmm.

24 MR. RUBENSTEIN: What is that date and year, month and
25 year?

26 MR. KARUNAKARAN: I'd say December, subject to
27 verification.

28 MR. RUBENSTEIN: All right. Thank you.

UNDERTAKING – JT 2.29

Undertaking

Hydro One is to advise what is the point at which field construction work must be postponed to the following year.

Response

To be able to maintain the December 2021 completion date, construction work must begin no later than January 13, 2020.

TAB 46

OEB Staff Interrogatory # 7

Reference:

EB-2017-0364 Evidence, Addendum to the 2017 Updated Assessment for the Need for the East-West Tie Expansion, Reliability Impacts and the Projected System Costs of a Delay to the Project In-Service Date, June 29, 2018 (prepared by the IESO)

In the Conclusion section, the IESO continues to recommend an in-service date of 2020 for the East-West Tie Expansion. The IESO provides that its recommended in-service date is based on applicable planning and reliability criteria to ensure the reliability needs in the Northwest are met and to avoid the additional risks and associated costs of not having expanded transmission capability between the Northwest and Southern Ontario.

Interrogatory:

- a) Has the IESO's update in any way impacted Hydro One's proposed project or ability to construct in the timeline that it is proposing? If so, please explain how and provide details.
- b) What potential issues in Hydro One's proposal could potentially result in Hydro One's in-service date being delayed past the end of 2022?

Response:

- a) No, it has not.
- b) Hydro One fully intends to deliver the LSL Project by December 2021. However, Hydro One is cognizant of the fact that there could potentially be delays outside of Hydro One's control. For instance, a delay in obtaining EA Approval after August 2020 could result in the in-service date being delayed past the end of 2022. Hydro One has completed a sensitivity analysis to illustrate the impact of a one, three, five, or twelve-month delays that an EA approval would have on the in-service date and costs of the Project. This is provided in Table 1 below. Hydro One believes the likelihood of the EA being approved after August 2020 to be very low; therefore, an in-service date beyond December 2022 is also unlikely.

1 The current schedule is provided in the Table below:

TASK	START	FINISH
Submit Section 92 Application to OEB		February 2018
Projected Section 92 Approval	February 2018	January 2019
Execute EPC Contract with SNCL		January 2019
Environment Assessment and Consultation		
Obtain EA Approval from MOECC	January 2018	August 2019 ¹
Ongoing First Nations & Métis Consultation and Consultation with Stakeholders	February 2018	December 2021
Lines Construction Work		
Real Estate Land Acquisition	March 2018	May 2020
Detailed Engineering	March 2018	Oct 2019
Tender and Award Procurement	January 2019	July 2020
Construction	September 2019	November 2021
Commissioning	September 2021	December 2021
In Service		December 2021

2
3 ¹ Assumption: Declaration Order approved by MECP Minister

4 Please refer to Attachment 1 for Gantt Chart

5
6 b) Final requirements for approvals and permits will be outlined in EA approval
7 documents. Studies and consultation conducted as part of the EA will inform this final
8 determination.

Risk Counter	Risk Title	Risk Status	Probability Ranking	Cost Impact Estimate	Schedule Impact	Additional Comments on Cost and Schedule
1	Because this EA Amendment procedure is unprecedented with the MOECC it is unclear at this time if it will be accepted by the MOECC. MOECC may require HONI to begin at a different stage gate in the IEA process (ie new TOR, or new EA). A condition required to proceed; Note risk updated in September 2018 to reduce probability ranking as more clarity around process is now available	ACTIVE	UNLIKELY 25% - 49%		Order of magnitude 2+ years for EA approval	Cost impact initially not carried as would greatly alter working assumptions; now additional cost included in LSL cost update, based on current knowledge of regulatory approval process - assuming Declaration Order or Individual EA using publicly available work from NextBridge; if NextBridge approval/work cannot be referenced then order of magnitude cost is increased by approximately \$20M
2	Additional studies, reports and/or consultation, including open houses. September 2018 update: Initially intended for EA Amendment scope. This contingency is now included in the cost, however, approach of Declaration Order and IEA for entire route add additional scope and cost which is now also included in the updated cost.	CLOSED	LIKELY 75% - 94%			Cost incorporated into updated base cost for Environmental Approvals
3	Construction delays due to above risk #2; cost included in EPC cost impact due to delays	ACTIVE	LIKELY 75% - 94%			If EA Approval granted later then Aug 2019; need to re-base schedule and cost
4	Additional cost to explore other routing alternatives for Park section. September 2018 update: Initially intended for EA Amendment scope. This contingency is now included in the cost, however, approach of Declaration Order and IEA for entire route add additional scope and cost which is now also included in the updated cost.	CLOSED	VERY LIKELY 95% - 100%			Cost incorporated into updated base cost for Environmental Approvals
5	EPC Contractor has to use four circuit towers around Loon Lake / Dorion, refer to above risk #4	Inactive	REMOTE 0% - 24%			
6	EPC Contractor has to make a bypass around Loon Lake / Dorion, refer to above risk #4	CLOSED	VERY LIKELY 95% - 100%			
7	If there is a separate commercial entity (including Hydro One as well as other entities) which will be the owner of the infrastructure within PNP will this affect the license agreement and the ability to consider this as existing infrastructure (ie not a new development)?	ACTIVE	REMOTE 0% - 24%			Potential delays to agreements; not likely cost implications; refer to schedule delay scenarios
8	A large portion of the EA document needs to be rewritten to reflect the design, construction, maintenance and operation practices of Hydro One.	CLOSED	VERY LIKELY 95% - 100%		Incorporated into updated Sept 2018 schedule	Cost incorporated into updated base cost for Environmental Approvals
9	Nextbridge IEA was intended to meet the MNRF Class EA requirements for both the disposition of Crown land and works in Provincial Parks. We will need to follow up with the MNRF to confirm that this EA and the subsequent Amendment meet their Class EA requirements. MNRF may require further information or time to conduct further Class EA work of their own.	ACTIVE	EVEN ODDS 50% - 74%		2-3 months delay to start of construction	Risk cost impact combined with risk 10
10	Nextbridge IEA was intended to meet the Ministry of Infrastructures Class EA requirements for the disposition or modification of IO/ORC lands. Nextbridge was to submit additional information to MOI under a separate cover that is not currently in the public realm. There may be no trigger for the Class EA or if there is the MOI may deem the current IEA and additional information provided by Nextbridge inadequate to meet their Class EA requirements.	ACTIVE	LIKELY 75% - 94%	\$ 1,000,000	2-3 months delay to start of construction	
11	Schedule impact due to delays under S. 35. (expropriation delaying construction)	ACTIVE	UNLIKELY 25% - 49%	\$ 1,000,000	6 month delay	
12	A written plan for construction will need to be submitted per article 8.01 of the current licence agreement. Parks Canada will not approve the modification of the route. A condition required to proceed with base scenario.	ACTIVE	REMOTE 0% - 24%			Risk would result in route around Pukaskwa National Park; development costs same
13	Parks Canada Detail Impact Assessment; September 2018 update: Although basic or detailed impact assessment expected under CEAA - no additional cost originally included in budget as Parks Canada indicated they would allow use of existing IEA document. This is not the case, as conveyed in July 2018, due to the more complicated scope and addition of Dorion route in IEA ToR.	CLOSED	LIKELY 75% - 94%		Not a Risk	Cost incorporated into updated base cost for Environmental Approvals
14	Analyses, Studies and reports within the EA will need to be amended to reflect the changes in routing and construction practices (such as ROW width, access). Many of these studies are time sensitive and seasons specific. We may need 4 seasons to complete all of the necessary studies. There is also the risk that early access agreements will not be in place to allow for conducting the studies at the appropriate time.	ACTIVE	UNLIKELY 25% - 49%		6 month delay to start of construction	Cost captured in Risk 20
15	Delay in coordinating Indigenous monitors which may be required for various studies including Archaeology and Natural Heritage.	ACTIVE	UNLIKELY 25% - 49%		6 months delay to construction start	Not likely a significant additional cost, only affects schedule and any resulting costs from schedule delay

Risk Counter	Risk Title	Risk Status	Probability Ranking	Cost Impact Estimate	Schedule Impact	Additional Comments on Cost and Schedule
16	The reaction by Indigenous communities to additional consultation from Hydro One is uncertain. Indigenous communities may be limited in the extent they can share information with Hydro One given existing agreements with Nx. (Cost Incorporates risks 26-29)	ACTIVE	EVEN ODDS 50% - 74%	\$ 1,000,000	6-12 month delay to construction start	
17	If leave to construct is awarded to Hydro One and Nx EA is not complete there is a risk of Nx not completing the EA.	ACTIVE	EVEN ODDS 50% - 74%		6 months delay to construction start	Cost implications difficult to determine, as it is not clear if portions of NextBridge work may be utilized by Hydro One; refer to Risk 1
18	Indigenous monitors may need to be present for Geotechnical studies.	ACTIVE	VERY LIKELY 95% - 100%		3-6 month delay to construction start	Cost risk captured in Risk 15
19	Permits for such things as water crossings, roads, tree clearing etc. may run into delays or added costs depending on availability and requirements of Regulatory staff and other stakeholders (ie Sustainable Forest Licences).	ACTIVE	EVEN ODDS 50% - 74%	\$ 1,200,000	(3-6 month delay)	
20	There is a risk that various environmental features may delay, post-pone or constrain construction activities by imposing timing restrictions. Eg. Species at Risk, nesting birds, water crossings, wet terrain. May also result in unplanned studies or mitigation.	ACTIVE	LIKELY 75% - 94%		SNCL Risk	
21	Stage 2 Archaeology, Cultural Heritage Evaluation Report and Heritage Impact Assessment may have findings that could result in additional studies (such as Stage 3 or 4 archaeological investigations) if mitigation or avoidance is not possible.	ACTIVE	EVEN ODDS 50% - 74%		Exclude from risk model and capture in S92 conditions	
22	Archaeological findings may cause delays to construction and modification to construction access routes or structure locations. Archaeology may not be fully complete before construction begins and may result in the adjustment to construction staging. May cause delays which may result in CCN's.	ACTIVE	EVEN ODDS 50% - 74%		Exclude from risk model and capture in S92 conditions	
23	Requirement for clearance letters from MTCS can cause delays by slow turn around.	ACTIVE	REMOTE 0% - 24%	\$ 600,000	1-2 month delay in construction start	
24	Environmental Monitoring commitments made in the IEA and required by Regulator Permits may result in added analysis, studies and reports (ie Turbidity and Total Suspended Solids at water crossings).	ACTIVE	LIKELY 75% - 94%		SNCL to take on risk of construction delays	
25	POST EA Work During and Post Construction may be higher than anticipated	CLOSED	VERY LIKELY 95% - 100%			Cost incorporated into updated base cost for Environmental Approvals
26	Indigenous communities may decide to remove themselves from the consultation process, which can affect the consultation budget.	ACTIVE	REMOTE 0% - 24%		combine with 15	Risk cost captured in Risk 15
27	Indigenous communities may request additional meetings in order to conclude the consultation process which can delay necessary approvals and affect the consultation budget	ACTIVE	REMOTE 0% - 24%		combine with 15	Risk cost captured in Risk 15
28	Indigenous communities may raise issues that Hydro One cannot respond to and must be addressed by the Crown, which can delay necessary approvals and affect the consultation budget.	ACTIVE	REMOTE 0% - 24%		combine with 15	Risk cost captured in Risk 15
29	Additional Indigenous communities may assert rights in the Project area and request to be consulted which can delay necessary approvals and affect the consultation budget.	ACTIVE	REMOTE 0% - 24%		combine with 15	Risk cost captured in Risk 15
30	The risk of the regulatory approval taking longer than anticipated and not having visibility on when the EA approval will be received	ACTIVE	LIKELY 75% - 94%			If EA Approval granted later then Aug 2019; need to re-base schedule and cost
31	Land Value Study results lower than individual full narrative property appraisals.	CLOSED	UNLIKELY 25% - 49%			Risk materialized; cost impact (\$500K) reflected in revised base budget
32	Property owner delayed authorisation or refusal to grant access for studies and assessments prior to s.92 approval.	ACTIVE	REMOTE 0% - 24%		minimal schedule impact	
33	Refusal to grant option for permanent lands rights, necessitating e	ACTIVE	EVEN ODDS 50% - 74%	\$ 2,400,000	nil	Construction can be managed around the 14-18 months expropriation process, without impacting I/S
34	Compensation for Business Disruption/Loss associated in the grant of permanent land rights.	ACTIVE	UNLIKELY 25% - 49%	\$ 800,000		

Risk Counter	Risk Title	Risk Status	Probability Ranking	Cost Impact Estimate	Schedule Impact	Additional Comments on Cost and Schedule
35	Underlying rights within Provincial Crown lands, e.g. minerals (consent approval).	ACTIVE	EVEN ODDS 50% - 74%	\$ 500,000		
36	Project requirements for route result in impact to primary residence or major out building (Buyout/Relocation).	CLOSED	UNLIKELY 25% - 49%			Risk materialized; cost impact reflected in revised base budget
37	Obtaining agreement and associated permits from FN (Pays Platt and Michipicoten) to accept current rental formula with other FN (annual amount).	ACTIVE	LIKELY 75% - 94%			Cost impact, if materialized is on OM&A
38	Undefined access road for temporary requirements (relying on preliminary information).	ACTIVE	LIKELY 75% - 94%	\$ 525,000		
39	Unable to procure necessary Land Agent resources in a timely manner (substitute with internal staff).	ACTIVE	REMOTE 0% - 24%	\$ 260,000		
40	Real Estate Buyouts found in the last moment (already addressed within Risk 36).	CLOSED	VERY LIKELY 95% - 100%			Risk materialized; cost impact reflected in revised base budget
41	IESO may reject the 15 days double circuit outage as it does not consider it as a valid plan	CLOSED	REMOTE 0% - 24%			
42	15 days double circuit outage cancelled two weeks before scheduled start date. New start date moved to following year.	ACTIVE	REMOTE 0% - 24%	\$ 5,000,000		
43	15 days double circuit outage delayed for one week, 1 day before original scheduled start date.	ACTIVE	REMOTE 0% - 24%			
44	Single circuit outage(s) start delayed four hours in the morning of starting daily outage (\$100k per instance)	ACTIVE	EVEN ODDS 50% - 74%	\$ 600,000		
45	Communication cost due to POST EA Work During and Post Construction may be higher than anticipated	ACTIVE	VERY LIKELY 95% - 100%	\$ 300,000		
46	Risk that Indigenous Communities request more than industry-typical study scopes	ACTIVE	EVEN ODDS 50% - 74%			Cost risk captured in Risk 15
47	MECP does not approve NxB EA by end of Q4 2018 as anticipated	ACTIVE	VERY LIKELY 95% - 100%			Result is delay and associated cost as described in Risk 30
48	MECP does not approve NxB at all and transfers all issues to H1	ACTIVE	EVEN ODDS 50% - 74%			Similar implications to Risk 17: Cost implications difficult to determine, as it is not clear if portions of NextBridge work may be utilized by Hydro One; refer to Risk 1
49	HONI is not granted Dec order, CEAA approval by August 15/19	ACTIVE	EVEN ODDS 50% - 74%			Result is delay and associated cost as described in Risk 30
50	Delay to project due to MECP tying Station EA approval to Dec order/IEA approval for LSL	ACTIVE	EVEN ODDS 50% - 74%		Current Jan 2019 EA approval as expected maintains in-service date of Dec 2021	Delay beyond that in assumptions will result in delay and associated cost as described in Risk 30

TAB 47

OEB Staff Interrogatory # 20

Reference:

Other Approval Conditions

Interrogatory:

a) In Hydro One's view, what other conditions should be placed on the successful proponent?

b) Does Hydro One agree that the successful proponent should be granted LTC approval subject to a condition that the construction commences by a specific date (for example, one year from LTC approval)? If so, what should that time period be in Hydro One's view?

Response:

a) Please refer to Exhibit I, Tab 1, Schedule 19.

b) Hydro One believes that the standard condition of approval being contingent on commencement of construction occurring within one year of leave to construct approval would be reasonable. Should any unforeseeable delays occur to the construction commencement then other conditions could be relied upon. For instance, the OEB typically requires that the Applicant advise the Board's designated representative of any proposed material change in the Project, including but not limited to material changes in the proposed route, construction techniques, construction schedule, restoration procedures, or any other material impacts of construction. The Applicant is typically not able to make a material change without prior approval of the Board or its designated representative.

Power Workers' Union Interrogatory #3

Reference:

EB-2017-0364, Undertaking — JT 2.9

Interrogatory:

In the reference, Hydro One provided a project schedule that updated the original project schedule provided in Exhibit B, Tab 11, Schedule 1, Page 1. The updated schedule includes minor adjustments but assumes that Section 92 approval would be obtained by October 2018.

- a) Is it still Hydro One's position that Section 92 approval could be obtained by October 2018? What would be the impact, if any, on in-service date of a delay in approval by a month or two?

Response:

- a) Due to the timing and complexity of the combined hearing, Hydro One now anticipates that LTC will be granted by mid-January 2019. A new project schedule is provided at Exhibit I, Tab 1, Schedule 5. A delay of this magnitude, from October 2018 until Jan 2019 would not impact the in-service date of December 2021. Please refer to Exhibit I, Tab 1, Schedule 7 for time scenarios and relative impact.

TAB 48

Transformer Station Project Schedule

(updated May 31, 2018)

Deliverable	Timeline
Class EA Notice of Completion filed with MECP	July 04, 2018 - Delayed
Land purchased from MNRF (for new diameter)	July 13, 2018
Relocate Shack Lake trail	July 20, 2018 to September 27, 2018
Clear trees in new 'diameter'	August 06, 2018 to August 31, 2018
Site stripping of land (removal of 24" of dirt)	August 20, 2018 to October 19, 2018
Install concrete footings for structures	October 22, 2018 to August 2019
Install steel structures	May 06, 2019 to October 15, 2019
Install cables between structures and insulators	October 18, 2019 to January 17, 2020
Install 230 kV breakers and equipment	June 14, 2019 to May 22, 2020
Install new 230 kV control building	May 13, 2019 to December 15, 2019
Commission all equipment	June 15, 2020 to October 12, 2020
Connect new transmission lines to station diameter	October 12, 2020 to December 09, 2020
New diameter In-Service	December 11, 2020

MECP staff stated that a decision package on NextBridge's EA would not be prepared for the Minister until "late Fall 2018" and, during further questioning, clarified this to mean November or December 2018. Based on this, Hydro One has now assumed approval of the NextBridge Individual EA by end of Q4 2018. The Hydro One assumptions, cost and schedule have been updated accordingly. Therefore, based on this new assumed date of approval of the NextBridge EA there are some implications to the overall project schedule and in-service dates as documented in Exhibit I, Tab 1, Schedule 3. Assuming a Declaration Order process is followed, Hydro One will meet the in-service date of end 2021.

iii. Hydro One does not require the disclosures of NextBridge's non-public EA documents; however, Hydro One has requested non-public supporting EA studies from MECP and is awaiting response. In the event these studies are not made available, Hydro One will complete these studies where required. Possible delays relating to completion of these studies are outlined in Exhibit I, Tab 1, Schedule 7.

d) Attachment 2 of this interrogatory response addresses material MECP correspondence since May 2018. Please also refer to part e) below for additional correspondence with MECP regarding a separate matter, the station work required at Marathon Transformer Station.

e) i) Hydro One received correspondence from MECP and engaged in discussions with MECP as provided in Attachment 3. Also included in Attachment 3b is a copy of the June 27, 2018 correspondence from Hydro One to MECP and the original May 15, 2018 correspondence from MECP which prompted the Hydro One response.

ii) The stations upgrades were expected to commence in July 2018 in order to complete the station work concurrently with NextBridge's EWT in-service date of end 2020. As a result of the decision to delay formal approval of the Marathon Station EA until approval of the line EA, the baseline schedule in the Station Upgrade is affected. Assuming a NextBridge EA approval by or before January 2019, the in-service date of the Station work would be December 2021.

f) Please see part a) above.

g) In the event that Hydro One cannot rely on NextBridge's Individual EA approval to pursue a Declaration Order, Hydro One is pursuing an Individual EA process of our own in parallel.

TAB 49



LET'S GET
GREAT

hydro**One**

REPORT ON

Risk Review Board Meeting

SUBMITTED TO

HYDROONE PROJECT DELIVERY TEAM

For Project

AR 19927| East-West Tie Connection

Mar 06, 2017

List of attendees

Invitees Name	Company	Participation
Tom Meta	HydroOne	Attended
Danoush Taef	HydroOne	Attended
Joe Ly	HydroOne	Attended
Rana Zoora	HydroOne	Attended
Zeljko Grasic	HydroOne	Attended
Amelia Arcaina	HydroOne	Attended
Chris Minhas	HydroOne	Attended
Pasquale Catalano	HydroOne	Attended
Robyn Oldewening	HydroOne	Attended
Hemant Barot	HydroOne	Attended
Ahmed Al-Tamimi	HydroOne	Attended
Flavia Redshaw	HydroOne	Attended
Dan Fudge	HydroOne	Attended
Edward Marttunen	HydroOne	Attended
Doug Dupuis	HydroOne	Attended
Jimjiahengjim Tu	HydroOne	Attended
Tibor Kertesz	HydroOne	Attended
Sergey Legatov	HydroOne	Attended
Arnold Brakel	HydroOne	Attended
Kevin Bros	HydroOne	Attended
Mike Johnson	HydroOne	Attended
Gregory Wing	HydroOne	Attended
Anthony Pellecchia	HydroOne	Regrets
Alex Meekhoff	HydroOne	Regrets
David Eckensweiler	HydroOne	Regrets
Garry Landon	HydroOne	Regrets
Aaron Fair	HydroOne	Regrets
Hamid Hamadanizadeh	HydroOne	Regrets
Randy Lundmark	HydroOne	Regrets
Robert Newton	HydroOne	Regrets
Dave Dormer	HydroOne	Regrets
Jonathon Bradley	HydroOne	Regrets
Clifford Anstey	HydroOne	Regrets
Christine Brown	HydroOne	Regrets
Roch Galipeau	HydroOne	Regrets
Robert Savard	HydroOne	Regrets
Joanne Richardson	HydroOne	Regrets
Daniel Charbonneau	HydroOne	Regrets
Mike Keski-Pukkila	HydroOne	Regrets
Maja Shkolnik	HydroOne	Regrets
Vishal Verma	Burns & McDonnell	Attended
Tushar Meshram	Burns & McDonnell	Attended

Table of Contents

1. Introduction	4
2. Risk Review board meeting Process overview.....	4
3. Wawa Package	5
i. Top Project Risk	5
ii. Method and simulation results.....	7
iii. Conclusion.....	10
4. Marathon Package	11
i. Top Project Risk.....	11
ii. Method and simulation results.....	13
iii. Conclusion.....	16
5. Lakehead Package	17
i. Top Project Risk.....	17
ii. Method and simulation results.....	19
iii. Conclusion.....	22

1. INTRODUCTION

The primary objective of the Risk Management process is to identify, mitigate and track all foreseeable risks (threats and opportunities) in a manner that is proactive and effective. This will enhance the project's chances of success and help maintaining risk exposure at an acceptable level. This process will also document the collaborative relationship between Project Management and the PMO by identifying scope of work and responsibilities related to risk management. The objective of this process was to set expectations related to the implementing and execution of Project AR 19927 East-West Tie Connection in compliance with the HONI Enterprise Risk Management principles and guidelines.

2. RISK REVIEW BOARD MEETING PROCESS OVERVIEW

The purpose of Risk Review Board (RRB) is to ensure management receives all necessary information from all the lines of business experts to make timely and effective decisions on contingency. This will allow for coordination of actions by the risk team, allocation of resources, and a consistent, disciplined approach. Periodic risk review at all critical stages of the project will be carried out to identify new risks and release unmaterialized risks. The risk review board supports the PM by giving them an effective early warning of developing threats on their project. Initial identification is carried out at the estimate preparation stage prior to final PDR submission.

A detailed communication was sent to all the PMs with a standard risk register template and a risk reference database file prior to the meeting.

- The risk reference database showed a list of generic risks and various functional areas commonly affecting transmission and distribution project.
- Assumptions and possible risks identified in the PDR by the planners during estimating phase were populated in a standard risk register template and were used to kick start the meeting.
- The planners and the PMs introduced the scope of the project and started the discussion on some of the primary threats on the project.
- LOB leads were asked to determine schedule impacts of risks to their activities and evaluate the possibilities of not hitting their milestone dates.
- Based on the discussion and identified issues throughout the meeting, the PM, in coordination with the Risk Manager populated potential risks, probabilities and associated cost impacts in the risk register

- The PMs' review of risks associated with this project were based on the DETL estimate prepared for PDR submission

Following additional assumptions were made to facilitate the Risk Review meeting:

1. RISK REGISTER

- Probable risks for the project are identified by the Line of Business Managers and Subject Matter Experts.
- The PMs were asked to refer to the risk reference database to get an idea of typical transmission and substation risks.
- While discussing each risk, the PMs identified schedule delays, interest charges, and construction charges, with equipment and labor overages and calculated the cost impact based on their best estimation technique.
- The Cost Impact and Probability Ranking evaluated in this meeting for each risk items, are based on the current estimation, knowledge and project understanding.

2. RISK DATABASE

- In addition to specified risks in the draft PDR report, a high level Risk Reference database file was used (Shown in Table B below) to kick start the risk discussion.
- Based on the information provided by the PMs for each project and lessons learned, the risk reference database will be improved and standardized to meet Hydro One's future project needs.

3. WAWA PACKAGE

I. TOP PROJECT RISK

The top 4 project risks are shown in the table below. These risks are the major contributors to the total contingency suggested for this project.

Top Project Risks

Risk Title	Probability Impact	Cost Impact
<i>The risk - if we get a full release and there are delays due to design changes & regulatory</i>	EVEN ODDS 50% - 74%	\$ 2,000,000
<i>The risk is that HONI's may not be able to acquire an outage for the 1 year window</i>	EVEN ODDS 50% - 74%	\$ 3,050,000
<i>Protection and Controls Drawing issues/Staging of cutover from the old to the new - Currently Wawa has shown issues applied to all three SS</i>	LIKELY 75% - 94%	\$ 2,400,000

The risk is if we have one set of engineers - we may miss the package at the execution phase - impact the schedule. This may be contracted out which introduces inherent risks

VERY LIKELY 95% -100%

\$ 592,920

During the RRB meeting the PM anticipated a risk of delays in design changes and regulatory approvals after a full funding release for the project. A standard 5% as the carrying cost per year was used to calculate the risk estimate and a delay of one year was assumed if this risk occurs. The full funding release amount was estimated to be \$40M for Wawa package. Any delay beyond one year due to delay in regulatory approvals would fall under the category of IROV. The risk was considered to have 50% to 74% probability of occurrence.

The PS planners have estimate a 1 year construction period for Wawa work. There is a risk that HydroOne may not get an outage window to during the construction period and the project may get delayed for one additional year to accommodate outages. The PM assumed a fully funded project carrying cost for this risk. Also it was decided to use the carrying cost of the project with largest funding approval. Based on these assumptions, the PM estimated a risk impact of \$ 3,050,000, with Likely (75% - 94%) probability of occurrence.

During the RRB discussion a known risk for staging of cutover from old to new lines was identified. This risk with Protection and Control issue was estimated to be 20% of the total protection and control package of \$12M for Wawa station. The PM has estimated a risk impact of \$ 2,400,000 with a probability of Likely (75% - 94%).

At the estimation stage of AR 19927 only one set of engineers were allocated for all three sites (Wawa, Marathon and Lakehead). The estimate assumes that additional resources will be made available to all three stations simultaneously to meet the deadline of Dec 2020 ISD. The estimating process for all three packages has been challenging for engineers so far as they have divided the allotted time for the three sites in order to meet estimate submission date resulting in reduced detail engineering. There is a risk that limited engineering resources will be available at the execution stage. The PM anticipated one month delay per year due to this issue for three years assuming partial funding release and construction delay assuming 12 person crew at a rate of \$100 an hour for three months. The estimated risk for Wawa station was calculated to be \$ 592,920 and was placed at high probability (95% - 100%) of risk occurrence.

A. RISKS ASSOCIATED WITH SCHEDULE DELAYS:

The following risks were identified to have a possible impact on schedule during project execution phase:

- Partial release for this project is required in the first quarter of 2017. Any delays due to section 92, building specification & tendering of reactors, breakers & capacitor banks can cause significant delays to the ISD.

- The PM identified a major risk associated with not having a detailed schedule available during risk review board meeting and estimate preparation. An unrealistic detailed schedule may lead to an IROV and possible delay of the project by up to 1 year.
- The timber construction of the bridge connecting the Wawa station and access road is known to be rotten. The component access and replacement work would require load calculations, repair work etc. This is considered as a major schedule risk for Wawa station.
- Steel structural design and fabrication defects identified on site may lead to rework and onsite fabrication. This is likely to delay the construction schedule by 20 days.
- The PM identified a possibility of forced outage due to aging equipment and equipment failure. Based on recent trends, HONI has seen two cases of breaker failure and a subsequent Switch failure on projects. A Schedule delay of 2 weeks was considered for this risk.
- Missing of critical equipment manufacturer drawings such as basic layout of reactors or capacitor bank during construction stage is a high impact schedule delay risk.
- Control building delays may impact the outage plan and lead to shuffling of the crews, mob-demob. etc. this may result in overall Schedule delays of a month (based on historic trend).

B. RELATION OF TOP PROJECT RISKS WITH CORPORATE/ENTERPRISE RISK MANAGEMENT

N/A

II. METHOD AND SIMULATION RESULTS

Burns & McDonnell with the help of Hydro One's Subject Matter Experts (SMEs) used the cost estimate file and draft PDR report as initial inputs into the risk model. The RRB allowed for the collection of additional information to improve the model. A Monte Carlo simulation ran 10,000 iterations for each risk value and related probability to come up with the most likely P95 value (95% Confidence level) that represents all identified risks associated with this project. The P95 value denotes a 95% confidence in the model if all the risks were to materialize at the risk estimate and probability level identified in the RRB. All the uncertain parameters were assumed to have equal likelihood of occurrence in order for the simulation to run.

The Probability Ranking Matrix used to do this analysis is shown below:

PROBABILITY RANKING MATRIX	LOWPROB	HIGHPROB
VERY LIKELY 95% - 100%	95%	100%
LIKELY 75% - 94%	75%	94%
EVEN ODDS 50% - 74%	50%	74%
UNLIKELY 25% - 49%	25%	49%
REMOTE 0% - 24%	0%	24%

The Cost Impact Ranking Matrix used to do this analysis is shown below:

COST IMPACT RANKING MATRIX	LOW_IMP	HI_IMP
CATASTROPHIC > 99%	> 99%	
SEVERE 51% TO 99%	51%	99%
SIGNIFICANT 34% TO 50%	34%	50%
MAJOR 9% TO 33%	9%	33%
MODERATE 3% TO 8%	3%	8%
MINOR 1% TO 2%	1%	2%

Based on the assumptions and method stated above, Oracle Crystal Ball came up with the following range of contingency values for “AR 19927- Wawa Package”:

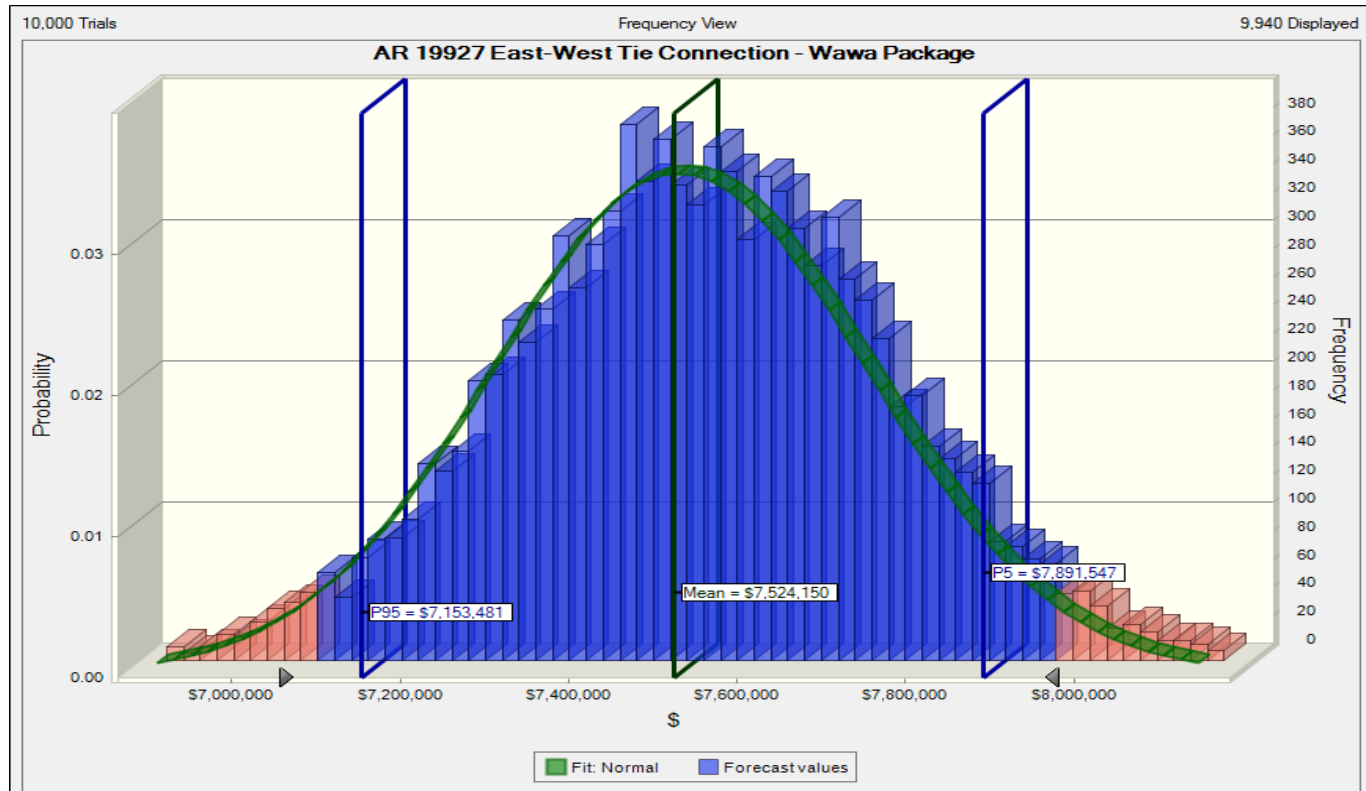
Full Value of Risk Cost Impact identified in the meeting	Un-modelled	\$10,689,714
Percentage Confidence contingency level value	P 5	\$7,891,547
	P 10	\$7,809,837
	P 80	\$7,335,409
	P 95	\$7,153,481

All risks identified in the risk register were assigned a level 1 WBS distribution line of business category. Based on the statistical output of Monte Carlo analysis, the risk results were assigned to the corresponding level 1 WBS category as shown in the table below:

AR	PID NUMBER	ESTIMATE DISTRIBUTION	LEV1DES (LEV1)	BASE COSTS	OTHER COSTS	RISK OUTPUT
19927		Project Management	Project Management (PM)	\$ 1,236,376		\$ 1,695,241
19927		Engineering	Engineering (EN)	\$ 3,305,076		\$ 609,297
19927		Procurement	Procurement (PR)	\$12,127,762		\$ 82,308
19927		Customer Operations	Real Estate (RE)	-		
19927		Construction	Construction (CN)	\$ 7,756,848		\$ 2,796,989
19927		Construction	Commissioning (CM)	\$ 3,564,603		\$ 1,969,645
19927		Removals	Others*		\$ 704,043	
19927		Past Cost	Others*		\$ 380,000	
19927		CAP OH	Others*		\$ 5,010,719	
19927		CAP INT	Others*		\$ 1,542,639	
TOTAL				\$ 27,990,665	\$ 7,637,455	\$ 7,153,481

*Note that interest and overhead (other costs) are based on the original estimated and will be recalculated based on additional contingency amount (total of risk output amount)

The figure below shows a fitted normal distribution curve for “AR 19927- Wawa Package” risk calculation which confirms the validity of this simulation.



Frequency Forecast and the normal distribution fit for results generated from Monte Carlo Simulation

A. QUARTERLY CONTINGENCY DRAWDOWN FORECAST

Following a detailed risk review, a follow up session was held to identify the spread of contingency over the duration of “AR 19927- Wawa Package”. Due to the unavailability of a detailed project schedule at this point, the PM needed to manually spread the drawdown triggers for each risk. Based on a cumulative total weighting for all risks, a percentage spread was mathematically calculated to show the risk distribution over the period of the project on a quarterly basis.

RISK FORECAST / QUARTERS	Q1 2018	Q2 2018	Q3 2018	Q4 2018	Q1 2019	Q2 2019	Q3 2019	Q4 2019	Q1 2020
RISK DISTRIBUTIONS	\$325,158	\$1,840,396	\$500,744	\$705,539	\$341,416	\$513,750	\$341,416	\$650,316	\$286,139
	Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Total	
	\$637,310	\$221,108	\$182,089	\$221,108	\$263,378	\$81,290	\$42,271	\$7,153,481	

Note that due to the unavailability of the detailed schedule, the above manual methodology was used.

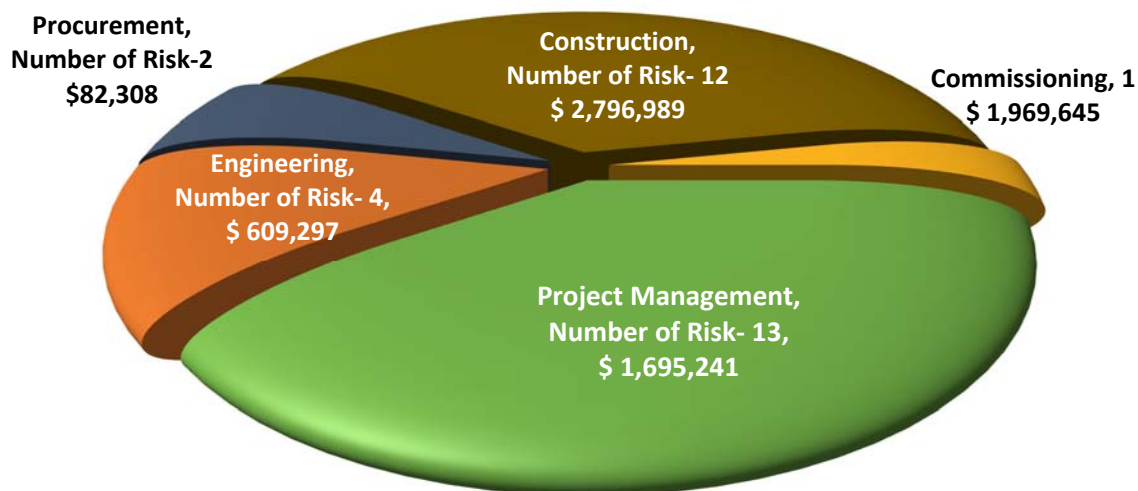
III. CONCLUSION

The recommended total contingency amount for project “AR 19927- Wawa Package” East-West Tie Connection is \$ 7,153,481. This is 25% of the base cost estimate. It is recommended that the risk register is reviewed periodically (See Table A below) during each phase to ensure the successful completion of AR 19927 within budget and on schedule.

A. TOP LOB ELEMENT AFFECTED ON THE PROJECT

Risks were categorized under a list of various Lines of Business / WBS categories following the Risk Review Board meeting. This categorization was purely based on the WBS allocation given to each risk in the meeting and may get modified as periodic risk reviews take place during various phases of the project. Based on this categorization, the risks associated with Project Management is more than its base cost estimate and can be considered as the top LOB element affecting the project.

AR-19927: Wawa, Affected Line Of Business



4. MARATHON PACKAGE

I. TOP PROJECT RISK

The top 5 project risks are shown in the table below. These risks are the major contributors to the total contingency suggested for this project.

Top Project Risks

Risk Title	Probability Impact	Cost Impact
<i>The risk - if we get a full release and there are delays due to design changes & regulatory</i>	EVEN ODDS 50% - 74%	\$ 3,050,000
<i>The risk is that HONI's may not be able to acquire an outage for the 1 year window</i>	EVEN ODDS 50% - 74%	\$ 3,050,000
<i>2 Units for Marathon TS shunt reactor requires tender. The price provided is based on quotation. It is subject to change and also tied to currency exchange rate at the time of actual purchase</i>	LIKELY 75% - 94%	\$ 680,000
<i>The risk is if we have one set of engineers - we may miss the package at the execution phase - impact the schedule. This may be contracted out which introduces inherent risks</i>	VERY LIKELY 95% -100%	\$ 587,017
<i>Risk is Geo Tech reports are not done outside the station area. Potential of more money based on differing soil conditions across expansion area.</i>	VERY LIKELY 95% -100%	\$ 1,100,000

During the RRB meeting the PM anticipated a risk of delays in design changes and regulatory approvals after a full funding release for the project. A standard 5% as the carrying cost per year was used to calculate the risk estimate and a delay of one year was assumed if this risk occurs. The full funding release amount was estimated to be \$61M for Marathon package. Any delay beyond one year due to delay in regulatory approvals would fall under the category of IROV. The risk was considered to have 50% to 74% probability of occurrence.

The PS planners have estimate a 1 year construction period for Marathon work. There is a risk that HydroOne may not get an outage window to during the construction period and the project may get delayed for one additional year to accommodate outages. The PM assumed a fully funded project carrying cost for this risk. Based on these assumptions, the PM estimated a risk impact of \$ 3,050,000, with Likely (75% - 94%) probability of occurrence.

Marathon TS requires tendering on 2 units of shunt reactor. The price provided in the estimate is based on quotation. This quote is subject to change and to fluctuations due to currency exchange and rates. In the past trends have shown this fluctuation to be in between 10% to 15% of the quotation price. In the case of Marathon package, the PM assumed a risk that the shunt reactors may tender 20% the price used in the estimate with a Likely (75% - 94%) probability of occurrence. The shunt reactors are forecasted to be on site in the 3rd and 4th quarter of 2018.

At the estimation stage of AR 19927 only one set of engineers were allocated for all three sites (Wawa, Marathon and Lakehead). The estimate assumes that additional resources will be made available to all three stations simultaneously to meet the deadline of Dec 2020 ISD. The estimating process for all three packages has been challenging for engineers so far as they have divided the allotted time for the three sites in order to meet estimate submission date resulting in reduced detail engineering. There is a risk that limited engineering resources will be available at the execution stage. The PM anticipated one month delay per year due to this issue for three years assuming partial funding release and construction delay assuming 12 person crew at a rate of \$100 an hour for three months. The risk estimate for Marathon station was calculated to be \$ 587,017 and was placed at high probability (95% - 100%) of risk occurrence.

Soil conditions across expansion areas on Marathon TS have been assumed identical to the ones specified in the existing soil report. Geotechnical investigation for the expansion area is currently outstanding and shall be conducted to confirm the subject assumption. The PM considered a 40% change in the cost of foundations if the soil conditions are seen to not agree with the soil report. The risk estimate for Marathon station was calculated to be \$ 1,100,000 and was placed at likely probability (75% - 94%) of risk occurrence.

A. RISKS ASSOCIATED WITH SCHEDULE DELAYS:

The following risks were identified to have a possible impact on schedule during project execution phase:

- Partial release for this project is required in the first quarter of 2017. Any delays due to section 92, building specification & tendering of reactors, breakers & capacitor banks can cause significant delays to the ISD.
- The current schedule for Environmental permitting and sequencing with the new EA process is aggressive. Any delay will impact overall schedule delay by six months.
- The PM identified a major risk associated with not having a detailed schedule available during risk review board and estimate preparation. An unrealistic detailed schedule may lead to an IROV and possible delay of the project by up to 1 year.
- Steel structural design and fabrication defects identified on site may lead to rework and onsite fabrication. This is likely to delay the construction schedule by 20 days.
- The PM identified a possibility of forced outage due to aging equipment and equipment failure. Based on recent trends, HONI has seen two cases of breaker failure and a subsequent Switch failure on projects. A Schedule delay of 2 weeks was considered for this risk.
- Missing of critical equipment manufacturer drawings such as basic layout of reactors or capacitor bank during construction stage is a high impact schedule delay risk.

- There is a risk that materials and equipment delivery may get delayed which could push the construction by approximately 20 days.
- As this project has a direct impact to OPG, there is a risk that OPG may cancel outages based on historic trend. The PM considered a total of 8 outages for this project and assumed a delay of 5 construction days per outage. This is likely to push the schedule by 40 days in addition to the challenges faced during mobilization and demobilization of the construction crew.
- Control building delays may impact the outage plan and lead to shuffling of the crews, mob-demob. etc. this may result in overall Schedule delays of a month (based on historic trend).

B. RELATION OF TOP PROJECT RISKS WITH CORPORATE/ENTERPRISE RISK MANAGEMENT

N/A

II. METHOD AND SIMULATION RESULTS

Burns & McDonnell with the help of Hydro One's Subject Matter Experts (SMEs) used the cost estimate file and draft PDR report as initial inputs into the risk model. The RRB allowed for the collection of additional information to improve the model. A Monte Carlo simulation ran 10,000 iterations for each risk value and related probability to come up with the most likely P95 value (95% Confidence level) that represents all identified risks associated with this project. The P95 value denotes a 95% confidence in the model if all the risks were to materialize at the risk estimate and probability level identified in the RRB. All the uncertain parameters were assumed to have equal likelihood of occurrence in order for the simulation to run.

The Probability Ranking Matrix used to do this analysis is shown below:

PROBABILITY RANKING MATRIX	LOWPROB	HIGHPROB
VERY LIKELY 95% - 100%	95%	100%
LIKELY 75% - 94%	75%	94%
EVEN ODDS 50% - 74%	50%	74%
UNLIKELY 25% - 49%	25%	49%
REMOTE 0% - 24%	0%	24%

The Cost Impact Ranking Matrix used to do this analysis is shown below:

COST IMPACT RANKING MATRIX	LOW_IMP	HI_IMP
CATASTROPHIC > 99%	> 99%	
SEVERE 51% TO 99%	51%	99%
SIGNIFICANT 34% TO 50%	34%	50%
MAJOR 9% TO 33%	9%	33%

MODERATE 3% TO 8%	3%	8%
MINOR 1% TO 2%	1%	2%

Based on the assumptions and method stated above, Oracle Crystal Ball came up with the following range of contingency values for “AR 19927- Marathon Package”:

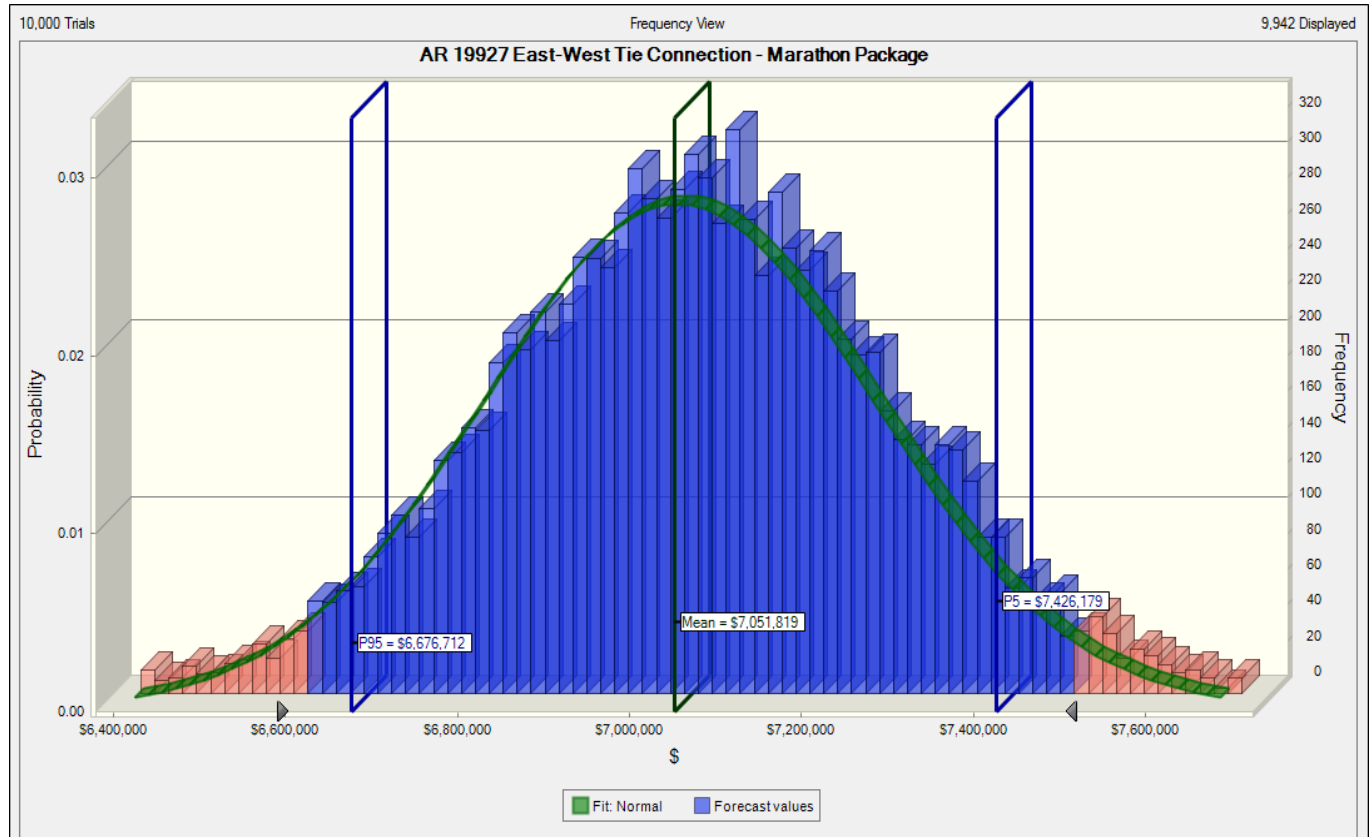
Full Value of Risk Cost Impact identified in the meeting	Un-modelled	\$10,500,023
	P 5	\$7,426,179
	P 10	\$7,345,641
	P 80	\$6,859,104
	P 95	\$6,676,712

All risks identified in the risk register were assigned a level 1 WBS distribution line of business category. Based on the statistical output of Monte Carlo analysis, the risk results were assigned to the corresponding level 1 WBS category as shown in the table below:

AR	PID NUMBER	ESTIMATE DISTRIBUTION	LEV1DES (LEV1)	BASE COSTS	OTHER COSTS	RISK OUTPUT
19927		Project Management	Project Management (PM)	\$ 1,585,744		\$ 3,395,404
19927		Engineering	Engineering (EN)	\$ 4,742,554		\$ 1,150,030
19927		Procurement	Procurement (PR)	\$ 22,591,044		\$ 82, 299
19927		Customer Operations	Real Estate (RE)			
19927		Construction	Construction (CN)	\$ 12,134,035		\$ 2,048,366
19927		Construction	Commissioning (CM)	\$ 4,591,262		
19927		Removals	Others*		\$ 442,547	
19927		Past Cost	Others*		\$ 370,000	
19927		CAP OH	Others*		\$ 7,991,074	
19927		CAP INT	Others*		\$ 2,747,664	
TOTAL				\$ 45,644,639	\$ 11,551,285	\$ 6,676,099

*Note that interest and overhead (other costs) are based on the original estimated and will be recalculated based on additional contingency amount (total of risk output amount)

The figure below shows a fitted normal distribution curve for “AR 19927- Marathon Package” risk calculation which confirms the validity of this simulation.



Frequency Forecast and the normal distribution fit for results generated from Monte Carlo Simulation

A. QUARTERLY CONTINGENCY DRAWDOWN FORECAST

Following a detailed risk review, a follow up session was held to identify the spread of contingency over the duration of “AR 19927- Marathon Package”. Due to the unavailability of a detailed project schedule at this point, the PM needed to manually spread the drawdown triggers for each risk. Based on a cumulative total weighting for all risks, a percentage spread was mathematically calculated to show the risk distribution over the period of the project on a quarterly basis.

RISK FORECAST / QUARTERS	Q1 2017	Q2 2017	Q3 2017	Q4 2017	Q1 2018	Q2 2018	Q3 2018	Q4 2018	Q1 2019	Q2 2019
RISK DISTRIBUTIONS	\$50,870	\$50,870	\$54,050	\$292,504	\$839,358	\$1,379,854	\$333,836	\$769,412	\$254,351	\$317,939
	Q3 2019	Q4 2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021
	\$413,320	\$451,473	\$260,710	\$413,320	\$187,584	\$149,341	\$187,584	\$149,431	\$79,485	\$41,332
Total										
	\$6,676,712									

Note that due to the unavailability of the detailed schedule, the above manual methodology was used.

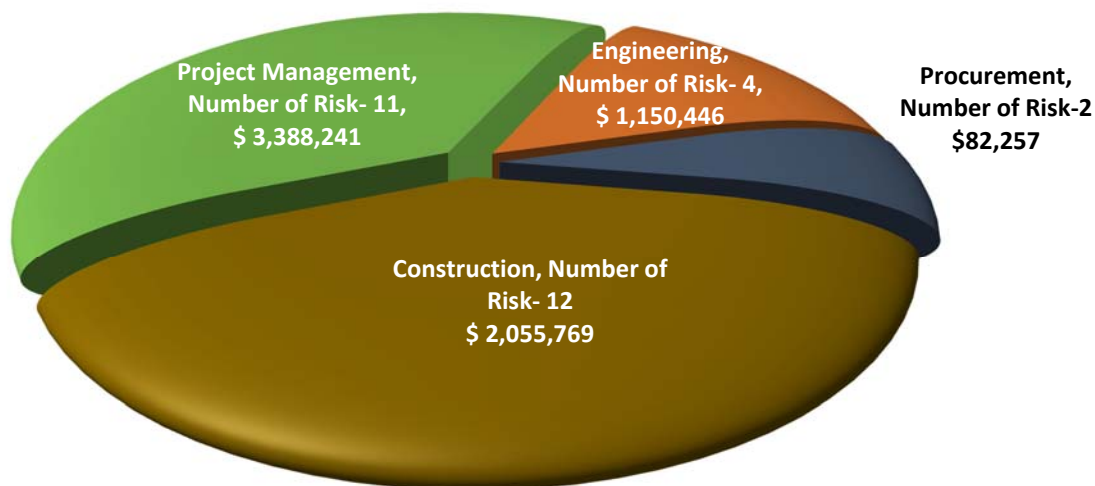
III. CONCLUSION

The recommended total contingency amount for project “AR 19927- Marathon Package” East-West Tie Connection is \$ 6,676,712. This is 14.4% of the base cost estimate. It is recommended that the risk register is reviewed periodically (See Table A below) during each phase to ensure the successful completion of “AR 19927- Marathon Package” within budget and on schedule.

A. TOP LOB ELEMENT AFFECTED ON THE PROJECT

Risks were categorized under a list of various Lines of Business / WBS categories following the Risk Review Board meeting. This categorization was purely based on the WBS allocation given to each risk in the meeting and may get modified as periodic risk reviews take place during various phases of the project. Based on this categorization, the risks associated with Project Management is approx. double than its base cost estimate and can be considered as the top LOB element affecting the project.

AR-19927: Marathon, Affected Line Of Business



5. LAKEHEAD PACKAGE

I. TOP PROJECT RISK

The top 3 project risks are shown in the table below. These risks are the major contributors to the total contingency suggested for this project.

Top Project Risks

Risk Title	Probability Impact	Cost Impact
<i>The risk - if we get a full release and there are delays due to design changes & regulatory</i>	EVEN ODDS 50% - 74%	\$ 2,550,000
<i>The risk is that HONI's may not be able to acquire an outage for the 1 year window</i>	EVEN ODDS 50% - 74%	\$ 2,550,000
<i>The risk is if we have one set of engineers - we may miss the package at the execution phase - impact the schedule. This may be contracted out which introduces inherent risks</i>	VERY LIKELY 95% -100%	\$ 579,378

During the RRB meeting the PM anticipated a risk of delays in design changes and regulatory approvals after a full funding release for the project. A standard 5% as the carrying cost per year was used to calculate the risk estimate and a delay of one year was assumed if this risk occurs. The full funding release amount was estimated to be \$51M for Lakehead package. Any delay beyond one year due to delay in regulatory approvals would fall under the category of IROV. The risk was considered to have an Even Odds (50% to 74%) probability of occurrence.

The PS planners have estimate a 1 year construction period for Lakehead work. There is a risk that HydroOne may not get an outage window to during the construction period and the project may get delayed for one additional year to accommodate outages. The PM assumed a fully funded project carrying cost for this risk. Based on these assumptions, the PM estimated a risk impact of \$ 2,550,000 with an Even Odds (50% to 74%) probability of occurrence.

At the estimation stage of AR 19927 only one set of engineers were allocated for all three sites (Wawa, Marathon and Lakehead). The estimate assumes that additional resources will be made available to all three stations simultaneously during execution phase to meet the deadline of Dec 2020 ISD. The estimating process for all three packages has been a challenging for engineers so far as they divided the allotted time for the three sites in order to meet estimate submission date resulting in reduced detail engineering. There is a risk that limited engineering resources will be available at the execution stage. The PM anticipated one month delay per year due to this issue

for three years assuming partial funding release and construction delay assuming 12 person crew with at \$100 an hour for three months. The risk estimate for Lakehead station was calculated to be \$ 579,378 and was placed at high probability (95% - 100%) of risk occurrence.

A. RISKS ASSOCIATED WITH SCHEDULE DELAYS:

The following risks were identified to have a possible impact on schedule during project execution phase:

- Partial release for this project is required in the first quarter of 2017. Any delays due to section 92, building specification & tendering of reactors, breakers & capacitor banks can cause significant delays to the ISD.
- The PM identified a major risk associated with not having a detailed schedule available during risk review board and cost estimation. An unrealistic detailed schedule may lead to an IROV and possible delay of the project by up to 1 year.
- Steel structural design and fabrication defects identified on site may lead to rework and onsite fabrication. This is likely to delay the construction schedule by 20 days.
- The PM identified a possibility of forced outage due to aging equipment and equipment failure. Based on recent trends, HONI has seen two cases of breaker failure and a subsequent Switch failure on projects. A Schedule delay of 2 weeks was considered for this risk.
- Missing of critical equipment manufacturer drawings such as basic layout of reactors or capacitor bank during construction stage is a high impact schedule delay risk.
- There is a risk that materials and equipment delivery may get delayed which could push the construction by approximately 20 days.
- As this project has a direct impact to OPG, there is a risk that OPG may cancel outages based on historic trend. The PM considered a total of 8 outages for this project and assumed a delay of 5 construction days per outage. This is likely to push the schedule by 40 days in addition to the challenges faced during mobilization and demobilization of the construction crew.
- Control building delays may impact the outage plan and lead to shuffling of the crews, mob-demob. etc. this may result in overall Schedule delays of a month (based on historic trend).

B. RELATION OF TOP PROJECT RISKS WITH CORPORATE/ENTERPRISE RISK MANAGEMENT

N/A

II. METHOD AND SIMULATION RESULTS

Burns & McDonnell with the help of Hydro One's Subject Matter Experts (SMEs) used the cost estimate file and draft PDR report as initial inputs into the risk model. The RRB allowed for the collection of additional information to improve the model. A Monte Carlo simulation ran 10,000 iterations for each risk value and related probability to come up with the most likely P95 value (95% Confidence level) that represents all identified risks associated with this project. The P95 value denotes a 95% confidence in the model if all the risks were to materialize at the risk estimate and probability level identified in the RRB. All the uncertain parameters were assumed to have equal likelihood of occurrence in order for the simulation to run.

The Probability Ranking Matrix used to do this analysis is shown below:

PROBABILITY RANKING MATRIX	LOWPROB	HIGHPROB
VERY LIKELY 95% - 100%	95%	100%
LIKELY 75% - 94%	75%	94%
EVEN ODDS 50% - 74%	50%	74%
UNLIKELY 25% - 49%	25%	49%
REMOTE 0% - 24%	0%	24%

The Cost Impact Ranking Matrix used to do this analysis is shown below:

COST IMPACT RANKING MATRIX	LOW_IMP	HI_IMP
CATASTROPHIC > 99%	> 99%	
SEVERE 51% TO 99%	51%	99%
SIGNIFICANT 34% TO 50%	34%	50%
MAJOR 9% TO 33%	9%	33%
MODERATE 3% TO 8%	3%	8%
MINOR 1% TO 2%	1%	2%

Based on the assumptions and method stated above, Oracle Crystal Ball came up with the following range of contingency values for "AR 19927- Lakehead Package":

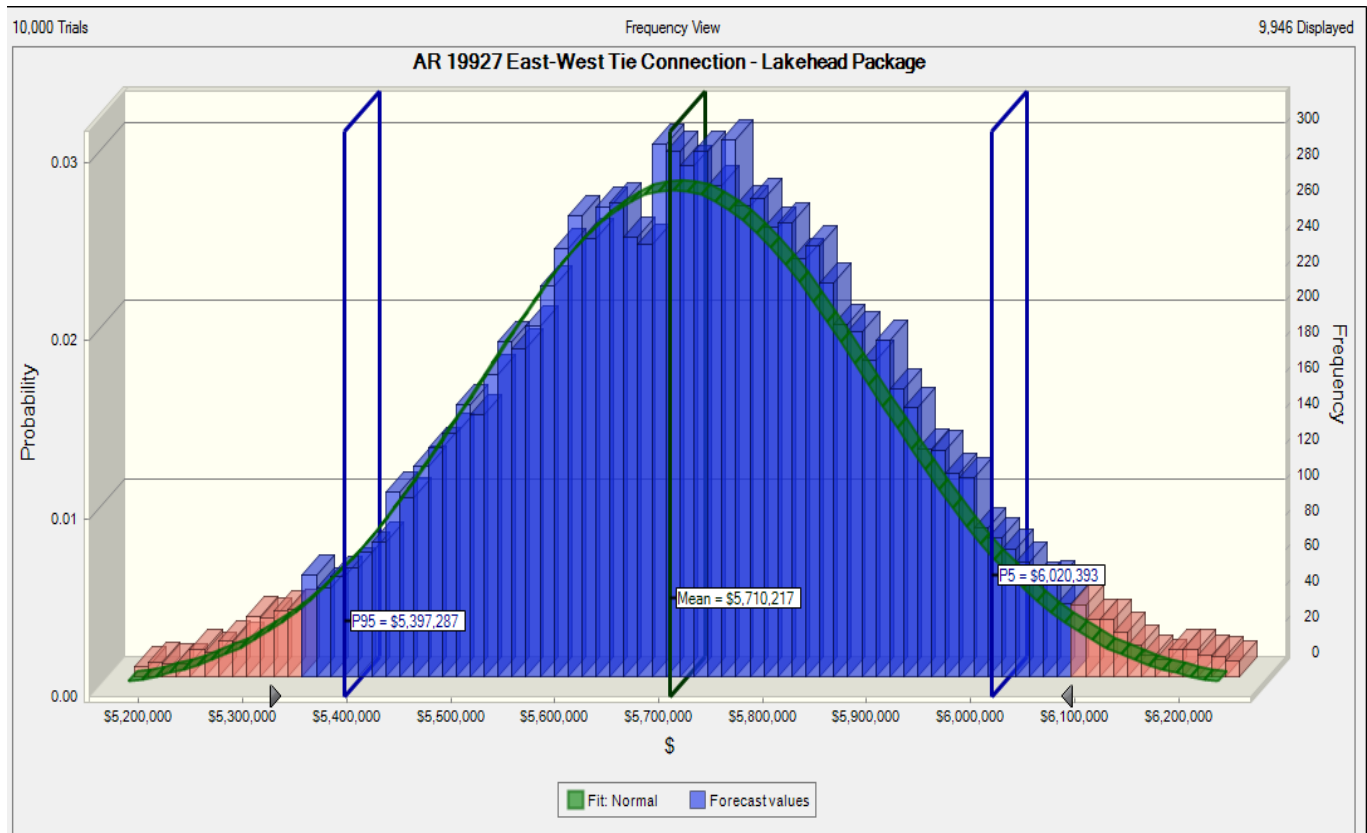
Full Value of Risk Cost Impact identified in the meeting	Un-modelled	\$8,838,111
Percentage Confidence contingency level value	P 5	\$6,020,393
	P 10	\$5,952,722
	P 80	\$5,551,157
	P 95	\$5,397,287

All risks identified in the risk register were assigned a level 1 WBS distribution line of business category. Based on the statistical output of Monte Carlo analysis, the risk results were assigned to the corresponding level 1 WBS category as shown in the table below:

AR	PID NUMBER	ESTIMATE DISTRIBUTION	LEV1DES (LEV1)	BASE COSTS	OTHER COSTS	RISK OUTPUT
19927		Project Management	Project Management (PM)	\$ 1,348,446		\$ 2,038,578
19927		Engineering	Engineering (EN)	\$ 3,960,463		\$ 870,058
19927		Procurement	Procurement (PR)	\$ 17,145,012		\$ 82,451
19927		Customer Operations	Real Estate (RE)	-		
19927		Construction	Construction (CN)	\$ 11,671,734		\$ 2,406,200
19927		Construction	Commissioning (CM)	\$ 3,516,564		
19927		Removals	Others*		\$ 827,550	
19927		Past Cost	Others*		\$ 370,000	
19927		CAP OH	Others*		\$ 6,705,000	
19927		CAP INT	Others*		\$ 2,203,780	
TOTAL				\$ 37,642,219	\$ 10,106,385	\$ 5,397,287

*Note that interest and overhead (other costs) are based on the original estimated and will be recalculated based on additional contingency amount (total of risk output amount)

The figure below shows a fitted normal distribution curve for “AR 19927- Lakehead Package” risk calculation which confirms the validity of this simulation.



Frequency Forecast and the normal distribution fit for results generated from Monte Carlo Simulation

B. QUARTERLY CONTINGENCY DRAWDOWN FORECAST

Following a detailed risk review, a follow up session was held to identify the spread of contingency over the duration of “AR 19927- Lakehead Package”. Due to the unavailability of a detailed project schedule at this point, the PM needed to manually spread the drawdown triggers for each risk. Based on a cumulative total weighting for all risks, a percentage spread was mathematically calculated to show the risk distribution over the period of the project on a quarterly basis.

RISK FORECAST / QUARTERS	Q4 2017	Q1 2018	Q2 2018	Q3 2018	Q4 2018	Q1 2019	Q2 2019	Q3 2019	Q4 2019	Q1 2020
RISK DISTRIBUTIONS	\$183,998	\$287,038	\$1,238,923	\$961,698	\$257,598	\$306,664	\$257,598	\$471,036	\$196,265	\$377,810
	Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Total		
	\$144,745	\$115,306	\$144,745	\$176,638	\$126,666	\$93,226	\$61,333	\$5,397,286		

Note that due to the unavailability of the detailed schedule, the above manual methodology was used.

III. CONCLUSION

The recommended total contingency amount for project “AR 19927- Lakehead Package” - East-West Tie Connection is \$ 5,397,286. This is 14% of the base cost estimate. It is recommended that the risk register is reviewed periodically (See Table A below) during each phase to ensure the successful completion of “AR 19927- Lakehead Package” within budget and on schedule.

A. TOP LOB ELEMENT AFFECTED ON THE PROJECT

Risks were categorized under a list of various Lines of Business / WBS categories following the Risk Review Board meeting. This categorization was purely based on the WBS allocation given to each risk in the meeting and may get modified as periodic risk reviews take place during various phases of the project. Based on this categorization, the risks associated with Project Management is approx. 1.5 times more than its base cost estimate and can be considered as the top LOB element affecting the project.

AR-19927: Leakhead, Affected Line Of Business

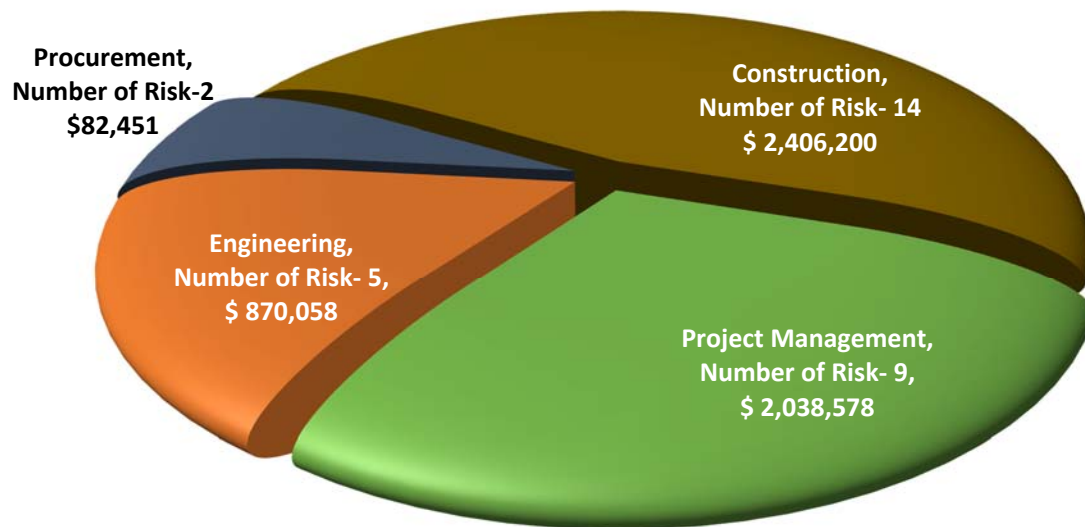


Table A
AR 19927| East-West Tie Connection
Risk Register

AR	AR Description	Lev1 Description	Risk Title	Risk Type	Probability Ranking	Risk Impact Estimate	Cost Impact related to Base cost	Comments
19927	East-West Tie Connection	Project Management (PM)	The risk is of getting a partial release and encountering delays due to property acquisition, environmental approvals, specification & tendering, confirm/lock basic layout, building specification & tendering of reactors, breakers & capacitor banks and Section 92.	Threats	VERY LIKELY 95% - 100%	\$ 67,680	MINOR 1% to 2%	All three Projects (Per site) potential Schedule delay to tendering as this is a new components -may not get a partial release; Partial release required by 1st quarter of 2017 for the following to meet required I/S date If this is beyond 12 months - it may lead to an IROV (potential 12 month delay) Carrying cost for 9 months ? Carrying cost \$1,353,607 *.05
19927	East-West Tie Connection	Project Management (PM)	The risk is of getting a full release and encountering delays due to design changes & regulatory approvals	Threats	EVEN ODDS 50% - 74%	\$ 2,000,000	MODERATE 3% to 8%	If this is beyond 12 months - it may lead to an IROV (potential 12 month delay) Carrying cost for 9 months ? Carrying cost \$150M *.05 ; (\$61M for Marathon) = \$61 X 5% ; Wawa \$40M X 5%; Lakehead \$51 X 5% used this cost instead of whole \$150M
19927	East-West Tie Connection	Project Management (PM)	Risk is Geo Tech reports are not done outside the station. Potential of more money based on differing soil conditions	Threats	LIKELY 75% - 94%	\$ 200,000	MINOR 1% to 2%	Marathon and Wawa - Wawa TS & Marathon TS - Soil conditions across expansion area have been assumed identical to the ones specified in the existing soil report. Geotechnical investigation for the expansion area is outstanding; shall be conducted to confirm the subject assumption. (Cost of foundations - Marathon \$2.2M X 20% as change in foundation cost; Wawa TS \$1M X 20%)
19927	East-West Tie Connection	Construction (CN)	The risk is that the cost of control building may go higher than the estimate. Wawa, Marathon & Lakehead - The cost for building is based on previous project – AR22279 Holland TS PO#4500506828; building specification is unavailable at time of estimate preparation	Threats	LIKELY 75% - 94%	\$ 478,872	MINOR 1% to 2%	Taken the average of the scenario; Assumed Per Sq M \$9,633 X (Wawa 27X12M; Marathon 22X15; Lakehead 24X10) ; Higher limit Per Sq M \$11,111 (Difference between assumed and higher limit)
19927	East-West Tie Connection	Engineering (EN)	The risk is if we have only one set of engineers for all packages at the execution phase - we may miss the package at the execution phase - impact the schedule. This may be contracted out which introduces inherent risks	Threats	VERY LIKELY 95% - 100%	\$ 592,920	MODERATE 3% to 8%	Additional resource requirements if only one set of engineers are available for all three sites at the execution phase - Resources are assumed available for each TS in execution phase to meet required I/S date; during estimate preparation there is only one set of engineers working for three site - Wawa, Marathon & Lakehead estimates have been a challenging situation to engineers, they divided the allotted time for the three sites in order to meet estimate submission date resulting to a reduced detail engineering. The proposed plan in execution phase is to have different set of engineers for each site to meet required Dec 2020 I/S date - This is still carrying cost delay assumed 3 months (1 Month per year) + carrying cost assuming partial funding = Average Crew per site 12 person X \$100 X 40 Hrs X 4 Weeks X 3 Months (per station)
19927	East-West Tie Connection	Project Management (PM)	Risk of not getting documents and temporary access on time - Partial release (Real Estate/ Environmental) - not the quickest process to get approval/release from MNR (May go from 1 year to 18 months) Long lead time	Threats	EVEN ODDS 50% - 74%			Expand Marathon - started to purchase land for Marathon - potential schedule delay (if the release is delayed) we will need funds at the time of purchase. Wawa - owners may not look at the expansion based on HONI market value 20% of fair market value. (Wawa will be mitigated as owner has been cooperative) Marathon - Carrying cost for 6 months or overtime will be required. (Overtime - 20% X 3 months of overtime of construction cost)
19927	East-West Tie Connection	Engineering (EN)	Risk of getting Partial release (Engineering)	Threats				Covered in other engineering risks - No additional information
19927	East-West Tie Connection	Project Management (PM)	The risk of Section 92 delay - Filing joint application with NextBridge - first time filing this with NextBridge - Delay to the start of construction	Threats	LIKELY 75% - 94%	\$ 203,041	MINOR 1% to 2%	Potential 2 to 3 years delay All three projects (Carrying cost) + Might have to go through the process for environmental again. \$3M X 5% interest per year X 3 years (typical max delay for S-92)
19927	East-West Tie Connection	Project Management (PM)	Schedule delays associated with Tight schedule for Environmental permitting and sequencing with the new EA process	Threats	EVEN ODDS 50% - 74%			Marathon schedule - assuming we start on Jan 2017 - EA approval by Jan 2018 - tree cutting - geo tech (assuming no first nations issues general public issues) Carrying Cost We are already beyond January 2017 and have not received a partial release yet. This could introduce schedule delays (e.g. the EA consultant cannot be retained until funds are released)
19927	East-West Tie Connection	Construction (CN)	Construction permits for access to the sites (Road access permit) Covered Above	Threats	LIKELY 75% - 94%			Historic delay of 2 years on Burwash for access roads - issues with MTO
19927	East-West Tie Connection	Construction (CN)	The risk of Bridge repair - Wawa Bridge - timbers are rotten - impact on component replacement - identify the loads to be going across the bridge	Threats	VERY LIKELY 95% - 100%	\$ 375,840	MINOR 1% to 2%	Schedule and cost risk - assuming the bridge repair starts after full fund release and construction start (May have to cover the assessment fee for Bridge inspection) - Construction crew 1 month inactive + Carrying cost 6 months + Assessment fee (\$150K)
19927	East-West Tie Connection	Project Management (PM)	Wawa Transformer replacement is in the top 20 advanced readiness list	Threats	VERY LIKELY 95% - 100%	\$ 67,680	MINOR 1% to 2%	Potential schedule impact due to potential high priority projects - next five years 600M of capital spend - reassessment risk-Transformer and breaker replacement program may impact ISD. As partial release is aimed for Jan 2017, there is a very good chance that sustainment cost will have to be added (This is going to be separate AR) = We will have carrying cost - partial release 1 year
19927	East-West Tie Connection	Construction (CN)	Winter - Weather additional Heating and hoarding cost (not estimated when winter work is starting)	Threats	REMOTE 0% - 24%	\$ 360,000	MINOR 1% to 2%	Marathon and Lakehead (3 months) - Wawa working from April to Dec (Not on site in winter months); Historically the outage delays have pushed such projects into the colder months. \$120k (renting ground heaters is 5k/week + fuel - just for the heater) X 3 years on winter

AR	AR Description	Lev1 Description	Risk Title	Risk Type	Probability Ranking	Risk Impact Estimate	Cost Impact related to Base cost	Comments
19927	East-West Tie Connection	Construction (CN)	Differed outages or cancelled outage particularly with OPG if there is not coordination. Only tie between North Ontario and South Ontario	Threats	EVEN ODDS 50% - 74%	\$ 280,000	MINOR 1% to 2%	Marathon-Lakehead and Marathon-Wawa 3 months construction delays; time of the year (weather etc.) will have to work 3 months more to reassess the outage. Difficult to take an outage in spring time. Opportune time is the Fall time for outages. If we don't get an outage in Fall time we may have to wait for the whole season to get another outage. Mob Demob cost (IESO, OPG, Weather, windfarm etc. primary factors); Due to direct impact to OPG - economic concerns, weather. Construction day = 6 FTEs = \$85*10hrs/day+ \$120*6= \$5820/day+ Equipment (lift, truck..)1000 = \$7000/day. Approx. 3 circuit outages/year = 8 days per year. Since we are only working with breakers and light switches - it may not be easy to reassign crews quickly +Mob and Demob. Assume 5 total outages missed for the project. Historically dealing with OPG has been an issue. It is quite possible that we may miss all outages - 8 total outages at 5 days an outage = 40 construction days
19927	East-West Tie Connection	Construction (CN)	The risk is that HONI's may not be able to acquire an outage for the 1 year window	Threats	EVEN ODDS 50% - 74%	\$ 3,050,000	MAJOR 9% to 33%	The current estimate assumes 3 years of construction. Also note associated PM costs. The carrying costs will be impacted by this delay. The carrying cost for XX spent @5%. This may not be significant as the crew can be utilized on other projects. Using the highest of all three stations (\$61M for Marathon) = \$61 X 5% ; Wawa \$40M X 5%; Lakehead \$51 X 5%
19927	East-West Tie Connection	Engineering (EN)	Installation of additional temporary wave trap	Threats	REMOTE 0% - 24%			will be included in the estimate
19927	East-West Tie Connection	Construction (CN)	Risk of Control Building delayed - Outages planned will be scrapped - associated overtime cost to meet the schedule	Threats	LIKELY 75% - 94%	\$ 56,000	MINOR 1% to 2%	Historic trend 1 month or more; schedule delays due to shuffling crews, outages, mob-demob etc. Productivity could be affected by upto 8 days. Outage delays have been captured above.
19927	East-West Tie Connection	Procurement (PR)	Risk of missing equipment - material delays	Threats	LIKELY 75% - 94%	\$ 50,000	MINOR 1% to 2%	All three projects generally 20 days construction delay if the material is not procured on time 2,500 per day
19927	East-West Tie Connection	Procurement (PR)	The risk of material fabrication defects (quality control) rework - or sending material back	Threats	LIKELY 75% - 94%	\$ 50,000	MINOR 1% to 2%	All three projects Steel - lightning towers - structures 20 days average delays - (e.g. not matching with foundation)
19927	East-West Tie Connection	Construction (CN)	The risk of additional Aggregate cost; There is a risk of cost overrun on gravel and Equipment in NW Ontario. For PCB area	Threats	LIKELY 75% - 94%	\$ 10,000	MINOR 1% to 2%	Current issue in NW Ontario. Delivery charge is currently 100-300% higher. 200 tonnes. Cost @ \$60/tonne per project
19927	East-West Tie Connection	Construction (CN)	The risk of soil contamination; The risk is that there may be contaminated soil associated with PCB	Threats	REMOTE 0% - 24%	\$ 24,000	MINOR 1% to 2%	Expansion Geo-tech studies; Cost associated with digging, waste management and transportation. Waste management - \$600 tipping fee + transportation =\$1200/load. 20 loads - per project
19927	East-West Tie Connection	Project Management (PM)	Endangered species vegetation management. Triggering EA. Having to compensate for the lost of Habitat	Threats	UNLIKELY 25% - 49%	\$ 200,000	MINOR 1% to 2%	All three projects.
19927	East-West Tie Connection	Project Management (PM)	The risk is that we don't get a approval within 1 year. First MNRF approval is required before EA consideration for MNRF requirements	Threats	UNLIKELY 25% - 49%	\$ 50,000	MINOR 1% to 2%	By Acquiring their land we are automatically triggering this risk - Three month delay possible. Impact the ISD. Construction cost and carrying cost
19927	East-West Tie Connection	Project Management (PM)	The risk of encountering Bed Rock - final decision based on the results of GEO tech report	Threats	UNLIKELY 25% - 49%			Marathon and Wawa
19927	East-West Tie Connection	Project Management (PM)	Section 92 delay - external interveners covered above	Threats	VERY LIKELY 95% - 100%			
19927	East-West Tie Connection	Engineering (EN)	The risk of missing Manufacturer drawing - basic layout of reactor and capacitor bank	Threats	EVEN ODDS 50% - 74%	\$ 67,680	MINOR 1% to 2%	Schedule delay to construction start 6 months construction delay for all three projects; Carrying cost % by each substation - partial release
19927	East-West Tie Connection	Project Management (PM)	External Contractor issues ; see control building risk above	Threats				
19927	East-West Tie Connection	Construction (CN)	The risk of Ailing equipment's - Old equipment - forced outages; Forced outages due to aging equipment and equipment failure (Historic trend)	Threats	LIKELY 75% - 94%	\$ 56,000	MINOR 1% to 2%	We just had two failures- breaker fail and a subsequent switch fail. This may impact the project schedule. 2 weeks (8 days)
19927	East-West Tie Connection	Commissioning (CM)	The risk is Protection and Controls Drawing may have issues/Staging of cutover from the old to the new - Currently Wawa has shown issues applied to all three SS	Threats	LIKELY 75% - 94%	\$ 2,400,000	MAJOR 9% to 33%	add 20% of the time from P&C perspective \$12M More risks at Wawa
19927	East-West Tie Connection	Construction (CN)	OGCC outage risks; Covered under outages	Threats				
19927	East-West Tie Connection	Construction (CN)	A risk of strong opposition to NextBridge's EW Tie project/EA may carry over into our work at the stations associated with that project	Threats	REMOTE 0% - 24%	\$ 50,000	MINOR 1% to 2%	Potential delays will be considerable. Show Stopper. Based on historic trend in Barwick. Opposition will be from First Nations or Public. Possible start for EA for our project will be end of July. Schedule impact. Delay in carrying cost.
19927	East-West Tie Connection	Project Management (PM)	Ultimate Stage layout - proximity to the lake bank - transformers banks will be positions 15 to 20 meters away from the banks	Threats				Identified and mitigated



AR 19927 East-West Tie Connection Marathon Package
Risk Register



AR	AR Description	Lev1 Description	Risk Title	Risk Type	Probability Ranking	Risk Impact Estimate	Cost Impact related to Base cost	Comments
19927	East-West Tie Connection	Engineering (EN)	The risk of increase in price for 2 Units for Marathon TS shunt reactor and 1 unit for Lakehead as they require tender. The price provided is based on quotation. It is subject to change and also tied to currency exchange rate at the time of actual purchase, (forecast 3rd to 4th quarter of 2018).	Threats	LIKELY 75% - 94%	\$ 680,000	MINOR 1% to 2%	Added into the tender - may go higher or lower (generally 10% to 15% higher or lower) Price =2X 1.7 = \$3.34M (20%) for Marathon
19927	East-West Tie Connection	Project Management (PM)	The risk is of getting a partial release and encountering delays due to property acquisition, environmental approvals, specification & tendering, confirm/lock basic layout, building specification & tendering of reactors, breakers & capacitor banks and Section 92.	Threats	VERY LIKELY 95% - 100%	\$ 50,000	MINOR 1% to 2%	Potential Schedule delay to tendering as this is a new components -may not get a partial release; Partial release required by 1st quarter of 2017 for the following to meet required I/S date If this is beyond 12 months - it may lead to an IROV (potential 12 month delay) Carrying cost for 12 months for Marathon based on partial release of \$881,324 Carrying cost \$1,000,000 *.5%
19927	East-West Tie Connection	Project Management (PM)	The risk is of getting a full release and encountering delays due to design changes & regulatory approvals	Threats	EVEN ODDS 50% - 74%	\$ 3,050,000	MODERATE 3% to 8%	If this is beyond 12 months - it may lead to an IROV (potential 12 month delay) Carrying cost for 12 months of full fund release: Carrying cost \$150M *.05 ; (\$61M for Marathon) = \$61 X 5% ; Wawa \$40M X 5%; Lakehead \$51 X 5% used this cost instead of whole \$150M
19927	East-West Tie Connection	Project Management (PM)	Risk is Geo Tech reports are not done outside the station. Potential of more money based on differing soil conditions	Threats	LIKELY 75% - 94%	\$ 1,100,000	MODERATE 3% to 8%	Marathon and Wawa - Wawa TS & Marathon TS - Soil conditions across expansion area have been assumed identical to the ones specified in the existing soil report. Geotechnical investigation for the expansion area is outstanding; shall be conducted to confirm the subject assumption. (Cost of foundations - Marathon \$2.2M + Cost of Blasting = 40% as change in foundation cost; Wawa TS \$1M X 20%)
19927	East-West Tie Connection	Project Management (PM)	The risk is that the cost of control building may go higher than the estimate. Wawa, Marathon & Lakehead - The cost for building is based on previous project – AR22279 Holland TS PO#4500506828; building specification is unavailable at time of estimate preparation	Threats	LIKELY 75% - 94%	\$ 487,740	MINOR 1% to 2%	Taken the average of the scenario; Assumed Per Sq M \$9,633 X (Wawa 27X12M; Marathon 22X15; Lakehead 24X10) ; Higher limit Per Sq M \$11,111 (Difference between assumed and higher limit)
19927	East-West Tie Connection	Engineering (EN)	The risk is if we have only one set of engineers for all packages at the execution phase - we may miss the package at the execution phase - impact the schedule. This may be contracted out which introduces inherent risks	Threats	VERY LIKELY 95% - 100%	\$ 587,017	MINOR 1% to 2%	Additional resource requirements if only one set of engineers are available for all three sites at the execution phase - Resources are assumed available for each TS in execution phase to meet required I/S date; during estimate preparation there is only one set of engineers working for three site - Wawa, Marathon & Lakehead estimates have been a challenging situation to engineers, they divided the allotted time for the three sites in order to meet estimate submission date resulting to a reduced detail engineering. The proposed plan in execution phase is to have different set of engineers for each site to meet required Dec 2020 I/S date - This is still carrying cost delay assumed 3 months (1 Month per year) + carrying cost assuming partial funding = Average Crew per site 12 person X \$100 X 40 Hrs X 4 Weeks X 3 Months (per station) (Construction cost (25 resources + 6 additional commissioning crew) = average of 12 in total = rate at \$100 an hr X 40 hrs a week)
19927	East-West Tie Connection	Project Management (PM)	Risk of not getting documents and temporary access on time - Partial release (Real Estate/ Environmental) - not the quickest process to get approval/release from MNR (May go from 1 year to 18 months) Long lead time	Threats	EVEN ODDS 50% - 74%	\$ 115,200	MINOR 1% to 2%	Expand Marathon - started to purchase land for Marathon - potential schedule delay (if the release is delayed) we will need funds at the time of purchase. Wawa - owners may not look at the expansion based on HONI market value 20% of fair market value. (Wawa will be mitigated as owner has been cooperative) Marathon - Carrying cost for 6 months or overtime will be required. (Overtime - 20% X 3 months of overtime of construction cost)
19927	East-West Tie Connection	Engineering (EN)	Risk of getting Partial release (Engineering)	Threats	EVEN ODDS 50% - 74%			Covered in other engineering risks - No additional information
19927	East-West Tie Connection	Project Management (PM)	Risk of Section 92 delay - Filing joint application with NextBridge - first time filing this with NextBridge - Delay to the start of construction	Threats	LIKELY 75% - 94%	\$ 150,000	MINOR 1% to 2%	Potential 2 to 3 years delay All three projects (Carrying cost) + Might have to go through the process for environmental approval again. \$3M X 5% interest per year X 3 years (typical max delay for S-92)
19927	East-West Tie Connection	Project Management (PM)	The risk is that we don't get a approval within 1 year. First MNRF approval is required before EA consideration for MNRF requirements	Threats	UNLIKELY 25% - 49%	\$ 50,000	MINOR 1% to 2%	By Acquiring their land we are automatically triggering this risk - Three month delay possible. Impact the ISD. carrying cost
19927	East-West Tie Connection	Project Management (PM)	Endangered species vegetation management. Triggering EA. Having to compensate for the lost of Habitatte	Threats	UNLIKELY 25% - 49%	\$ 200,000	MINOR 1% to 2%	All three projects.
19927	East-West Tie Connection	Project Management (PM)	Schedule delays associated with Tight schedule for Environmental permitting and sequencing with the new EA process Covered in the MNRF and EA species Veg Mgmt risks	Threats	VERY LIKELY 95% - 100%			Marathon schedule - assuming we start on Jan 2017 - EA approval by Jan 2018 - tree cutting - geo tech (assuming no first nations issues general public issues) Carrying Cost for 6 months We are already beyond January 2017 and have not received a partial release yet. This could introduce schedule delays (e.g. the EA consultant cannot be retained until funds are released) Potential one to two years for EA. Delay of cost and schedule delays to be considered
19927	East-West Tie Connection	Construction (CN)	Construction permits for access to the sites (Road access permit) Same as Item 9	Threats	LIKELY 75% - 94%			Historic delay of 2 years on Burwash for access roads - issues with MTO



AR 19927 East-West Tie Connection Marathon Package
Risk Register



AR	AR Description	Lev1 Description	Risk Title	Risk Type	Probability Ranking	Risk Impact Estimate	Cost Impact related to Base cost	Comments
19927	East-West Tie Connection	Construction (CN)	Winter - Weather additional Heating and hoarding cost (not estimated when winter work is starting)	Threats	REMOTE 0% - 24%	\$ 360,000	MINOR 1% to 2%	Marathon and Lakehead (3 months) - Wawa working from April to Dec (Not on site in winter months); Historically the outage delays have pushed such projects into the colder months. \$120k (renting ground heaters is 5k/week + fuel - just for the heater) X 3 years on winter
19927	East-West Tie Connection	Construction (CN)	Differed outages or cancelled outage particularly with OPG if there is not coordination. Only tie between North and South Ontario	Threats	EVEN ODDS 50% - 74%	\$ 280,000	MINOR 1% to 2%	Marathon-Lakehead and Marathon-Wawa 3 months construction delays; time of the year (weather etc.) will have to work 3 months more to reassess the outage. Difficult to take an outage in spring time. Opportune time is the Fall time for outages. If we don't get an outage in Fall time we may have to wait for the whole season to get another outage. Mob Demob cost (IESO, OPG, Weather, windfarm etc. primary factors); Due to direct impact to OPG - economic concerns, weather. Construction day = 6 FTEs = \$85*10hrs/day+ \$120*6= \$5820/day+ Equipment (lift, truck..)1000 = \$7000/day. Approx. 3 circuit outages/year = 8 days per year. Since we are only working with breakers and light switches - it may not be easy to reassign crews quickly +Mob and Demob. Assume 5 total outages missed for the project. Historically dealing with OPG has been an issue. It is quite possible that we may miss all outages - 8 total outages at 5 days an outage = 40 construction days
19927	East-West Tie Connection	Construction (CN)	The risk is that HONI's may not be able to acquire an outage for the 1 year window	Threats	EVEN ODDS 50% - 74%	\$ 3,050,000	MODERATE 3% to 8%	The current estimate assumes 3 years of construction. Also note associated PM costs. The carrying costs will be impacted by this delay. The carrying cost for XX spent @5%. This may not be significant as the crew can be utilized on other projects. Using the highest of all three stations (\$61M for Marathon) = \$61 X 5% ; Wawa \$40M X 5%; Lakehead \$51 X 5%
19927	East-West Tie Connection	Construction (CN)	Control Building delayed - Outages planned will be scrapped - associated overtime cost to meet the schedule	Threats	LIKELY 75% - 94%	\$ 56,000	MINOR 1% to 2%	Historic trend 1 month or more; schedule delays due to shuffling crews, outages, mob-demob etc. Productivity could be affected by upto 8 days. Outage delays have been captured above.
19927	East-West Tie Connection	Procurement (PR)	Risk of missing equipment - material delays	Threats	LIKELY 75% - 94%	\$ 50,000	MINOR 1% to 2%	All three projects generally 20 days construction delay if the material is not procured on time 2,500 per day
19927	East-West Tie Connection	Procurement (PR)	The risk of material fabrication defects (quality control) rework - or sending material back	Threats	LIKELY 75% - 94%	\$ 50,000	MINOR 1% to 2%	All three projects Steel - lightning towers - structures 20 days average delays - (e.g. not matching with foundation)
19927	East-West Tie Connection	Construction (CN)	The risk of additional Aggregate cost; There is a risk of cost overrun on gravel and Equipment in NW Ontario. For PCB area	Threats	LIKELY 75% - 94%	\$ 10,000	MINOR 1% to 2%	Current issue in NW Ontario. Delivery charge is currently 100-300% higher. 200 tones. Cost @ \$60/tonne per project
19927	East-West Tie Connection	Construction (CN)	The risk of soil contamination; The risk is that there may be contaminated soil associated with PCB	Threats	REMOTE 0% - 24%	\$ 24,000	MINOR 1% to 2%	Expansion Geo-tech studies; Cost associated with digging, waste management and transportation. Waste management - \$600 tipping fee + transportation =\$1200/load. 20 loads - per project
19927	East-West Tie Connection	Project Management (PM)	The Risk of encountering Bed Rock - final decision based on the results of GEO tech report (Covered in GEO tech above)	Threats	UNLIKELY 25% - 49%			Marathon and Wawa
19927	East-West Tie Connection	Project Management (PM)	The risk of section 92 delay - external interveners (covered above)	Threats	VERY LIKELY 95% - 100%			
19927	East-West Tie Connection	Engineering (EN)	The risk of missing Manufacturer drawing - basic layout of reactor and capacitor bank	Threats	EVEN ODDS 50% - 74%	\$ 44,066	MINOR 1% to 2%	Schedule delay to construction start 6 months construction delay for all three projects; Carrying cost % by each substation - partial release
19927	East-West Tie Connection	Project Management (PM)	The risk of external Contractor issues ; see control building risk (covered above)	Threats				
19927	East-West Tie Connection	Construction (CN)	The risk of ailing equipment's - Old equipment - forced outages; Forced outages due to aging equipment and equipment failure (Historic trend)	Threats	LIKELY 75% - 94%	\$ 56,000	MINOR 1% to 2%	We just had two failures- breaker fail and a subsequent switch fail. This may impact the project schedule. 2 weeks (8 days)
19927	East-West Tie Connection	Commissioning (CM)	The risk of issues with protection and Controls Drawing /Staging of cutover from the old to the new - Currently Wawa has shown issues applied to all three SS	Threats	LIKELY 75% - 94%			add 20% of the time from P&C perspective \$12M More risks at Wawa
19927	East-West Tie Connection	Construction (CN)	OGCC outage risks; Covered under outages	Threats				
19927	East-West Tie Connection	Construction (CN)	A risk of strong opposition to NextBridge's EW Tie project/EA may carry over into our work at the stations associated with that project	Threats	REMOTE 0% - 24%	\$ 50,000	MINOR 1% to 2%	Potential delays will be considerable. Show Stopper. Based on historic trend in Barwick. Opposition will be from First Nations or Public. Possible start for EA for our project will be end of July.
19927	East-West Tie Connection	Construction (CN)	Ultimate Stage layout - proximity to the lake bank - transformers banks will be positions 15 to 20 meters away from the banks	Threats				Identified and mitigated

AR	AR Description	Lev1 Description	Risk Title	Risk Type	Probability Ranking	Risk Impact Estimate	Cost Impact related to Base cost	Comments
19927	East-West Tie Connection	Engineering (EN)	The risk of increase in price for 2 Units for Marathon TS shunt reactor and 1 unit for Lakehead as they require tender. The price provided is based on quotation. It is subject to change and also tied to currency exchange rate at the time of actual purchase, (forecast 3rd to 4th quarter of 2018).	Threats	LIKELY 75% - 94%	\$ 340,000	MINOR 1% to 2%	Added into the tender - may go higher or lower (generally 10% to 15% higher or lower) Price =2X 1.7 = \$3.34M (20%) Marathon and Lakehead
19927	East-West Tie Connection	Project Management (PM)	The risk is of getting a partial release and encountering delays due to property acquisition, environmental approvals, specification & tendering, confirm/lock basic layout, building specification & tendering of reactors, breakers & capacitor banks and Section 92.	Threats	VERY LIKELY 95% - 100%	\$ 13,513	MINOR 1% to 2%	All three Projects (Per site) potential Schedule delay to tendering as this is a new components -may not get a partial release; Partial release required by 1st quarter of 2017 for the following to meet required I/S date If this is beyond 12 months - it may lead to an IROV (potential 12 month delay) Carrying cost for 9 months ? Carrying cost \$1.5M *.05
19927	East-West Tie Connection	Project Management (PM)	The risk is of getting a full release and encountering delays due to design changes & regulatory approvals	Threats	EVEN ODDS 50% - 74%	\$ 2,550,000	MODERATE 3% to 8%	If this is beyond 12 months - it may lead to an IROV (potential 12 month delay) Carrying cost for 9 months ? Carrying cost \$150M *.05 ; (\$61M for Marathon) = \$61 X 5% ; Wawa \$40M X 5%; Lakehead \$51 X 5% used this cost instead of whole \$150M
19927	East-West Tie Connection	Project Management (PM)	The risk is that the cost of control building may go higher than the estimate. Wawa, Marathon & Lakehead - The cost for building is based on previous project – AR22279 Holland TS PO#4500506828; building specification is unavailable at time of estimate preparation	Threats	LIKELY 75% - 94%	\$ 354,720	MINOR 1% to 2%	Taken the average of the scenario; Assumed Per Sq M \$9,633 X (Wawa 27X12M; Marathon 22X15; Lakehead 24X10) ; Higher limit Per Sq M \$11,111 (Difference between assumed and higher limit)
19927	East-West Tie Connection	Engineering (EN)	The risk is if we have only one set of engineers for all packages at the execution phase - we may miss the package at the execution phase - impact the schedule. This may be contracted out which introduces inherent risks	Threats	VERY LIKELY 95% - 100%	\$ 579,378	MINOR 1% to 2%	Additional resource requirements if only one set of engineers are available for all three sites at the execution phase - Resources are assumed available for each TS in execution phase to meet required I/S date; during estimate preparation there is only one set of engineers working for three site - Wawa, Marathon & Lakehead estimates have been a challenging situation to engineers, they divided the allotted time for the three sites in order to meet estimate submission date resulting to a reduced detail engineering. The proposed plan in execution phase is to have different set of engineers for each site to meet required Dec 2020 I/S date - This is still carrying cost delay assumed 3 months (1 Month per year) + carrying cost assuming partial funding = Average Crew per site 12 person X \$100 X 40 Hrs X 4 Weeks X 3 Months (per station)
19927	East-West Tie Connection	Construction (CN)	The risk is - we are assuming a unit cost for replacing 1.6 Km of sky wire - Grounding study on the old measurement - impact on material cost - more copper will required - more digging (Labor and material additions) slight chance that the ground resistivity may change. Modifications/upgrade to the structures is not included.	Threats	LIKELY 75% - 94%	\$ 264,500	MINOR 1% to 2%	Lakehead - Skywire and Structure upgradation Unit cost of 6 spans total of 1.6 Km (Modifications of 6 towers) = \$529,000 X 50% - only for 2021 scope
19927	East-West Tie Connection	Engineering (EN)	Risk of getting Partial release (Engineering)	Threats				Covered in other engineering risks - No additional information
19927	East-West Tie Connection	Engineering (EN)	Drawing Modifications due to temperory configurations covered in Sec 92 delay filing joint application		EVEN ODDS 50% - 74%			In the event that NextBridge are not on schedule for installing the lines. Temporary measures will have to be done to mitigate this risk
19927	East-West Tie Connection	Project Management (PM)	Risk of Section 92 delay - Filing joint application with NextBridge - first time filing this with NextBridge - Delay to the start of construction	Threats	LIKELY 75% - 94%	\$ 150,000	MINOR 1% to 2%	Potential 2 to 3 years delay All three projects (Carrying cost) + Might have to go through the process for environmental again. \$3 M X 5% interest per year X 3 years (typical max delay for S-92)
19927	East-West Tie Connection	Construction (CN)	Construction permits for access to the sites (Road access permit) Covered Above	Threats	LIKELY 75% - 94%			Historic delay of 2 years on Burwash for access roads - issues with MTO
19927	East-West Tie Connection	Construction (CN)	Access road issues for lakehead - we may have to go around the site	Threats	EVEN ODDS 50% - 74%	\$ 800,000	MODERATE 3% to 8%	Substantial cost for installation of access road.
19927	East-West Tie Connection	Construction (CN)	Winter - Weather additional Heating and hoarding cost (not estimated when winter work is starting)	Threats	REMOTE 0% - 24%	\$ 360,000	MINOR 1% to 2%	Marathon and Lakehead (3 months) - Wawa working from April to Dec (Not on site in winter months); Historically the outage delays have pushed such projects into the colder months. \$120k (renting ground heaters is 5k/week + fuel - just for the heater) X 3 years on winter
19927	East-West Tie Connection	Construction (CN)	Differed outages or cancelled outage particularly with OPG if there is not coordination. Only tie between North and South Ontario: Upto 2020	Threats	EVEN ODDS 50% - 74%	\$ 70,000	MINOR 1% to 2%	Marathon-Lakehead and Marathon-Wawa 3 months construction delays; time of the year (weather etc.) will have to work 3 months more to reassess the outage. Difficult to take an outage in spring time. Opportune time is the Fall time for outages. If we don't get an outage in Fall time we may have to wait for the whole season to get another outage. Mob Demob cost (IESO, OPG, Weather, windfarm etc. primary factors); Due to direct impact to OPG - economic concerns, weather. Construction day = 6 FTEs = \$85*10hrs/day+ \$120*6= \$5820/day+ Equipment (lift, truck..)1000 = \$7000/day. Approx 3 circuit outages/year = 8 days per year. Since we are only working with breakers and light switches - it may not be easy to reassign crews quickly +Mob and Demob. Assume 5 total outages missed for the project. Historically dealing with OPG has been an issue. It is quite possible that we may miss all outages - 8 total outages at 5 days an outage = 40 construction days * 25% in the year 2020

AR	AR Description	Lev1 Description	Risk Title	Risk Type	Probability Ranking	Risk Impact Estimate	Cost Impact related to Base cost	Comments
19927	East-West Tie Connection	Construction (CN)	Differed outages or cancelled outage particularly with OPG if there is not coordination. Only tie between North and South Ontario: Upto 2021	Threats	EVEN ODDS 50% - 74%	\$ 210,000	MINOR 1% to 2%	Marathon-Lakehead and Marathon-Wawa 3 months construction delays; time of the year (weather etc.) will have to work 3 months more to reassess the outage. Difficult to take an outage in spring time. Opportune time is the Fall time for outages. If we don't get an outage in Fall time we may have to wait for the whole season to get another outage. Mob Demob cost (IESO, OPG, Weather, windfarm etc. primary factors); Due to direct impact to OPG - economic concerns, weather. Construction day = 6 FTEs = \$85*10hrs/day+ \$120*6= \$5820/day+ Equipment (lift, truck..)1000 = \$7000/day. Approx 3 circuit outages/year = 8 days per year. Since we are only working with breakers and light switches - it may not be easy to reassign crews quickly +Mob and Demob. Assume 5 total outages missed for the project. Historically dealing with OPG has been an issue. It is quite possible that we may miss all outages - 8 total outages at 5 days an outage = 40 construction days * 75% in the year 2021
19927	East-West Tie Connection	Construction (CN)	The risk is that HONI's may not be able to acquire an outage for the 1 year window	Threats	EVEN ODDS 50% - 74%	\$ 2,550,000	MODERATE 3% to 8%	The current estimate assumes 3 years of construction. Also note associated PM costs. The carrying costs will be impacted by this delay. The carrying cost for XX spent @5%. This may not be significant as the crew can be utilized on other projects. Using the highest of all three stations (\$61M for Marathon) = \$61 X 5% ; Wawa \$40M X 5%; Lakehead \$51 X 5%
19927	East-West Tie Connection	Project Management (PM)	Control Building delayed - Outages planned will be scrapped - associated overtime cost to meet the schedule	Threats	LIKELY 75% - 94%	\$ 56,000	MINOR 1% to 2%	Historic trend 1 month or more; schedule delays due to shuffling crews, outages, mob-demob etc. Productivity could be affected by upto 8 days. Outage delays have been captured above.
19927	East-West Tie Connection	Procurement (PR)	Risk of missing equipment - material delays	Threats	LIKELY 75% - 94%	\$ 50,000	MINOR 1% to 2%	All three projects generally 20 days construction delay if the material is not procured on time 2,500 per day
19927	East-West Tie Connection	Procurement (PR)	Material fabrication defects (quality control) rework - or sending material back	Threats	LIKELY 75% - 94%	\$ 50,000	MINOR 1% to 2%	All three projects Steel - lightning towers - structures 20 days average delays - (e.g. not matching with foundation)
19927	East-West Tie Connection	Construction (CN)	additional Aggregate cost; There is a risk of cost overrun on gravel and Equipment in NW Ontario. For PCB area	Threats	LIKELY 75% - 94%	\$ 10,000	MINOR 1% to 2%	Current issue in NW Ontario. Delivery charge is currently 100-300% higher. 200 tons. Cost @ \$60/tonne per project
19927	East-West Tie Connection	Construction (CN)	Soil contamination; The risk is that there may be contaminated soil associated with PCB	Threats	REMOTE 0% - 24%	\$ 24,000	MINOR 1% to 2%	Expansion Geo-tech studies; Cost associated with digging, waste management and transportation. Waste management - \$600 tipping fee + transportation =\$1200/load. 20 loads - per project
19927	East-West Tie Connection	Construction (CN)	encountering Bed Rock - final decision based on the results of GEO tech report	Threats	UNLIKELY 25% - 49%			Marathon and Wawa
19927	East-West Tie Connection	Project Management (PM)	Section 92 delay - external interveners covered above	Threats	VERY LIKELY 95% - 100%			
19927	East-West Tie Connection	Project Management (PM)	Endangered species vegetation management. Triggering EA. Having to compensate for the lost of Habitate	Threats	UNLIKELY 25% - 49%	\$ 200,000	MINOR 1% to 2%	All three projects.
19927	East-West Tie Connection	Project Management (PM)	The risk is that we don't get a approval within 1 year. First MNRF approval is required before EA consideration for MNRF requirements	Threats	UNLIKELY 25% - 49%	\$ 50,000	MINOR 1% to 2%	By Acquiring their land we are automatically triggering this risk - Three month delay possible. Impact the ISD. Construction cost and carrying cost
19927	East-West Tie Connection	Engineering (EN)	Missing Manufacturer drawing - basic layout of reactor and capacitor bank	Threats	EVEN ODDS 50% - 74%	\$ 50,000	MINOR 1% to 2%	Schedule delay to construction start 6 months construction delay for all three projects; Carrying cost % by each substation - partial release - Revisit amount
19927	East-West Tie Connection	Project Management (PM)	External Contractor issues ; see control building risk above	Threats				
19927	East-West Tie Connection	Construction (CN)	Ailing equipment's - Old equipment - forced outages; Forced outages due to aging equipment and equipment failure (Historic trend)	Threats	LIKELY 75% - 94%	\$ 56,000	MINOR 1% to 2%	We just had two failures- breaker fail and a subsequent switch fail. This may impact the project schedule. 2 weeks (8 days)
19927	East-West Tie Connection	Construction (CN)	OGCC outage risks; Covered under outages	Threats				
19927	East-West Tie Connection	Construction (CN)	Ultimate Stage layout - proximity to the lake bank - transformers banks will be positions 15 to 20 meters away from the banks	Threats				Identified and mitigated
19927	East-West Tie Connection	Construction (CN)	A risk of strong opposition to NextBridge's EW Tie project/EA may carry over into our work at the stations associated with that project	Threats	REMOTE 0% - 24%	\$ 50,000	MINOR 1% to 2%	Potential delays will be considerable. Show Stopper. Based on historic trend in Barwick. Opposition will be from First Nations or Public. Possible start for EA for our project will be end of July. Schedule impact. Delay in carrying cost.

Table B
Risk Reference Database

	Level 1	Level 2	Prob. Ranking	Risks Relevant to your project
Potential Risks - Hydro One Project	Stake Holder Initiation (Risk associated with Initiation phase of the Project)	Business Case due diligence	VERY LIKELY 95% - 100%	
		Internal Approval	LIKELY 75%-94%	
		Funding Approval	EVEN ODDS 50%-74%	
	External Stakeholder Management & Outreach (Risks associated with public involvement and Stake Holder Management)	Municipal Outreach	UNLIKELY 25%- 49%	
		Residential Outreach	REMOTE 0%- 24%	
		Key Stakeholders Outreach (NGO's, Business Groups etc.)		
		Real Estate acquisition / Right of Way		
	Environmental and Permitting (Impacts due to environmental assessment and permitting)	Environmental Surveys		
		Licensing and Permitting		
		Impact Caused Due to Non-Compliance		
		Regulatory Citation/Notice of Violation		
		Rare, Threatened, & Endangered Species		
		Vegetation Management		
		Unanticipated subsurface discovery		
	Technical (Risks associated with the technical aspects of the Project)	Preliminary Design & Technology		
		Issued for Construction		
		As Built		
	Procurement (Risks associated in the Procurement phase of the Project)	Material Management		
		PO Management		
		Vendor Management		
	Outage	Outage Issues		
	Construction	General Construction Issue (Geological/ Resources/ Compliance)		
		T- Line Above Grade		
		T- Line below Grade		
		Substation Above Grade		
		Substation Below Grade		
		Commissioning & Closeout		
	Program Management (Risks associated with aspects of execution of the project which require management)	Project Management		
		Resources Management		
		Safety		
	Project Controls (Risks associated with commercial aspects and financial terms of the project)	Cost Management		
		Accrual/ Invoice Management		
		EVM		
		Risk Management		
		Change Control		
	External/ Unplanned Risk	Nature		
		Other (Misc.)		
	Opportunities			

TAB 50

1 Prior to the outage, work will commence to install all foundations and the four guy
2 anchors for the 87 guyed structures under the still-energized line. All 87 structures will
3 be assembled in three flight yards located on either side of the Park. The guy wire,
4 insulators and travelers will be attached to the assembled structures.

5
6 During the two-week outage, the heavy lift helicopters, with a capacity of 24,000 lbs, will
7 be engaged for the installation of the new structures and the decommissioning of the
8 existing structures. For every new structure, two helicopter lifts are required, while for
9 every existing structure removal, one lift is required. Each helicopter crew is capable of
10 achieving on average seven structures per day.

11
12 c) Yes, weather delays are accounted for in the production rate. The following contingency
13 mitigations will be implemented:

- 14 • The new offset locations allow the existing structures to remain in place until the new
15 structures are fully erected. This provides flexibility to manage the risks, if
16 necessary, by allowing the 15-day outage to be extended, with the ability to recall the
17 EWT line when required during the extension period.
- 18 • If an outage extension in 2020 becomes necessary due to unexpected interruptions
19 and is not permitted, the existing transmission line will remain in-service and a
20 second outage would be required in 2021 to complete the Project.

21
22 d) No.

23
24 e) Hydro One is not currently aware of the next available window. However, Hydro One will
25 work with the IESO to arrange another suitable window to accommodate the required outage
26 to maintain the schedule.

27
28 f) Hydro One has met with the IESO and discussed the Lake Superior Link's baseline outage
29 requirements. The IESO has agreed in principle to this request. Additional conversations
30 have occurred with Ontario Power Generation (OPG), Manitoba Hydro Electric Board
31 (MHEB) and Minnesota Power (MP), as these entities' participation will also be instrumental
32 in supporting the outage posture. Hydro One will continue the discussions with the IESO and
33 additional stakeholders on a regular basis in preparation for the two-week outage, currently
34 scheduled for the period of August 10 – 24, 2020.

TAB 51

1 dedicated website for the project, email and toll free number that any interested individuals
2 can use to contact for further information.

3 **i)** www.HydroOne.com/LakeSuperiorLink

4 **ii)** Community.Relations@HydroOne.com

5 **iii)** 1-877-345-6799

6
7 Please refer to Attachment 1 of this interrogatory response for Hydro One's Record of
8 Consultation for Terms of Reference

9
10 b) Please refer to Attachment 2 for a copy of the Hydro One Communication and Consultation
11 Plan.

12
13 c)

14 **i)** Please refer to Attachment 2.

15 **ii)** Hydro One has hosted 19 Community Information Centres since February 2018. Please
16 see supporting documentation for dates and locations of Hydro One LSL Community
17 Open Houses at Attachment 3 of this interrogatory response.

18
19 d) Hydro One is not in receipt of any letters

20
21 e) Hydro One has received one letter. Please refer to Attachment 4 for a letter received from
22 the Common Voice Northwest.

TAB 52

SEC INTERROGATORY #12

INTERROGATORY

[B-14-1, p.1] Please confirm that contrary to its application for designation, Nextbridge is not bringing forward a proposal for performance based ratemaking in its leave to construct application, and has decided to simply rely on the Board's filing requirement for electricity transmitters for its first revenue requirement proposal. Please explain why this is appropriate.

RESPONSE

NextBridge confirms it is not bringing forward a proposal for performance based ratemaking in its leave to construct application. Rather, it will put forward a proposal consistent with the Board's February 11, 2016, Chapter 2 filing requirement for Revenue Requirement Applications for electricity transmitters in its first revenue requirement application. Given the relatively recent issuance of the requirements, NextBridge believes it is more appropriate for it to study those requirements and propose an approach during its first request to recover its revenue requirements than during the consideration of a leave to construct application.

SEC INTERROGATORY #16

INTERROGATORY

Please provide a table showing, for all capital projects completed by any of the three shareholders of Nextbridge or any of their affiliates within the last 10 years with an original budgeted cost of at least \$400M, the i) name of the project, ii) type of project, iii) utility who undertook the project, iv) budgeted cost, v) actual cost, vi) forecast in-service date at a comparable point in time to the budget for the proposed line project, vii) actual in-service date, viii) variance analysis of cost, ix) variance analysis of schedule, x) lessons learned that are applicable to the proposed line project.

RESPONSE

NextBridge is a partnership between affiliates of NextEra Energy Canada, Enbridge and OMERS Infrastructure. The responses below are presented by the respective partners.

NextEra Energy:

The table below includes those projects executed by affiliates of NextEra Energy, Inc. with an original budget of \$400M (\$U.S.) or greater over the last 10 years. FPL in the table is Florida Power and Light Company, while “NEER” identified indirect wholly-owned subsidiaries of NextEra Energy Resources, LLC (NEER), which are not utilities, but are provided as representative projects. A positive cost variance means the project came in below the management approved budget. A positive schedule variance means the project came in on or ahead of the planned schedule date and a negative variance means the actual in-service date was later than planned.

There are lessons to be learned on all projects however the only transmission project that is responsive to the request for information and is applicable to the proposed line project is the Lone Star Transmission project. This project was constructed in central Texas and was approximately 330 miles of 345kV double circuit transmission built on more than 2500 concrete and steel monopole structures. There were also three switching stations and two reactive compensation stations in Lone Star’s project scope. The major lessons learned included 1) the need for early procurement of structures, insulators, conductor and OPGW to ensure timely delivery for the contractor to remain on schedule and 2) unencumbered access to land when scheduled to again ensure the contractor and its subcontractors can work sequentially without delay.

Name of the Project	Type of Project	Utility who undertook the project	Budgeted Cost	Actual Cost	Variance analysis of cost	Forecasted I/S date	Actual I/S date	Variance analysis of schedule	Lessons learned
Turkey Point Unit 5	Fossil	FPL	\$580	\$552	5%	06/01/07	05/01/07	31	
West County 1	Fossil	FPL	\$689	\$742	-8%	06/01/09	08/27/09	(87)	
West County 2	Fossil	FPL	\$632	\$579	8%	06/01/10	11/03/09	210	
West County 3	Fossil	FPL	\$865	\$842	3%	06/01/11	05/23/11	9	
Cape Canaveral	Fossil	FPL	\$1,115	\$963	14%	06/01/13	04/24/13	38	
Riviera Beach	Fossil	FPL	\$1,276	\$1,271	0%	06/01/14	04/01/14	61	
Port Everglades Energy Center	Fossil	FPL	\$1,185	\$1,140	4%	06/01/16	04/01/16	61	
Lauderdale & Ft. Myers Peakers	Fossil	FPL	\$774	\$619	20%	12/31/16	12/31/16	0	
Martin Solar - Thermal	Solar	FPL	\$476	\$410	14%	12/31/10	12/10/10	21	
Solar Project 1	Solar	NEER	\$1,122	\$977	13%	09/01/13	06/01/13	92	
Solar Project 2	Solar	NEER	\$1,111	\$1,171	-5%	04/01/14	03/07/14	25	
Solar Project 3	Solar	NEER	\$1,096	\$1,075	2%	02/27/15	12/01/14	88	
Solar Project 4	Solar	NEER	\$542	\$535	1%	09/30/16	04/28/16	155	
Solar Project 5	Solar	NEER	\$672	\$651	3%	11/30/16	06/15/16	168	
Solar Project 6	Solar	NEER	\$1,121	\$1,041	7%	09/30/16	06/21/16	101	
Lone Star	Transmission	Lone Star	\$794	\$740	7%	03/31/13	03/31/13	0	see narrative
Wind Project 1	Wind	NEER	\$556	\$530	5%	12/31/07	11/30/07	31	
Wind Project 2	Wind	NEER	\$443	\$469	-6%	12/31/09	12/19/09	12	
Wind Project 3	Wind	NEER	\$406	\$405	0%	12/31/12	12/06/12	25	
Wind Project 4	Wind	NEER	\$426	\$409	4%	12/31/14	12/03/14	28	
Wind Project 5	Wind	NEER	\$400	\$401	0%	12/31/15	12/14/15	17	

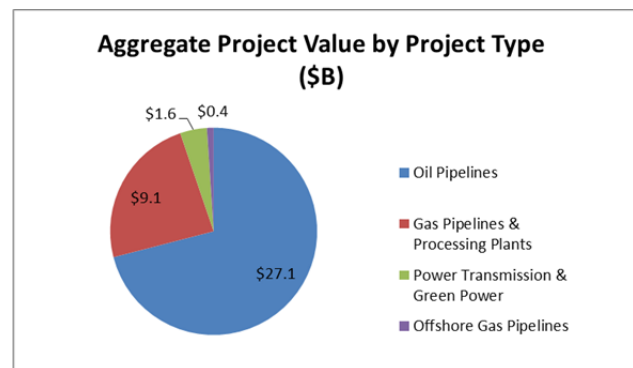
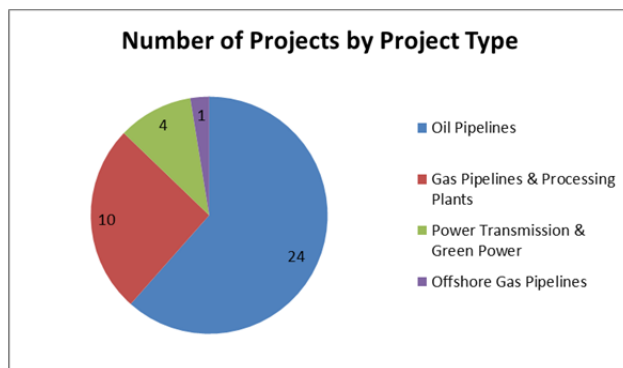
Enbridge Inc.

Enbridge projects include energy pipelines, associated facilities and terminals, power generation, power transmission, rail loading, gas processing plants and offshore energy projects.

Below is a summary of Enbridge's performance since 2008. Please note that in 2017 Enbridge acquired Spectra Energy. As such, information on legacy Spectra and Union Gas projects has also been included.

Since 2008 Enbridge has placed into service 39 projects (each worth over \$0.4B) at a total cost of \$38B at less than 1% over budget and 27 delivered early or on time. Enbridge's successful cost and schedule performance is a result of the Major Project organization that executes projects and by employing a proven project management framework which is based upon disciplined processes, strong leadership and skilled resources.

Projects Statistics			Number of Projects by Project Type	Aggregate Project Value by Project Type (\$Billions)
# Projects Under/On Budget	27	Oil Pipelines	24	\$ 27.1
# Projects Over Budget	12	Gas Pipelines & Processing Plants	10	\$ 9.1
# Projects Early/On Time	27	Power Transmission & Green Power	4	\$ 1.6
# Projects Late	12	Offshore Gas Pipelines	1	\$ 0.4
% capitol under/over budget	0.6%			
% projects under or on budget	69.2%			
% projects early or on schedule	69.2%			
USD is considered to be on par with CAD				



- Underpinning the project management framework that is used to execute all projects is the Life Cycle Gating Control process which helps to ensure schedule, cost, safety and quality objectives are on track and met for each stage of a project's development and execution. Lessons learned is contained within the Life Cycle Gating Control process to ensure continuous improvement on how projects are executed.

In recent years, opposition to energy projects has impacted permitting and Enbridge found this to be one of its biggest challenges. Enbridge mitigates this challenge through the coordination of highly experienced Enbridge and external specialists in law, regulatory, permitting, land acquisition, and public and government relations at the local, state, provincial and federal levels.

OMERS Infrastructure

While OMERS Infrastructure has not completed any capital projects directly in the utilities it has invested in, it is an investor in various electric, gas and water utilities globally. OMERS Infrastructure has direct equity investments in:

- i. Alectra Utilities, an electric local distribution company servicing communities in southern Ontario,
- ii. Oncor, the largest electric transmission and distribution utility in Texas,
- iii. Caruna, Finland's largest electricity distribution company,
- iv. Ellevio, Sweden's second largest electricity distributor,
- v. Net4Gas, the exclusive gas transmission operator in the Czech Republic,
- vi. Scotia Gas Networks, the second largest gas distribution network in the UK, and
- vii. Thames Water, the largest water utility in England and Wales.

OMERS Infrastructure has minority holdings in Alectra Utilities and Oncor and does not control capital projects. OMERS Infrastructure has significant ownership interests in Caruna, Ellevio, Net4Gas, Scotia Gas Networks and Thames Water. Neither Caruna, Ellevio, Net4Gas, Scotia Gas Networks nor Thames Water have undertaken capital projects of at least \$400M since OMERS Infrastructure invested in each business.

TAB 53

UPPER CANADA TRANSMISSION, INC.

**Response to Board Interrogatory 32
to all Applicants**

Please complete the following tables, detailing all transmission projects greater than 100 km in length, undertaken by the applicant, its partners, shareholders, affiliates, or any other entities which the applicant is relying on for the purposes of its application, in the past 10 years in all jurisdictions. Please provide the reasons for the budget and schedule variances for each project.

a) Budget Variance Table

Name of project	Details of project	Budgeted cost	Stage of process at which budget created	Actual cost	Variance	Reason for variance

b) Schedule Variance Table

Name of project	Details of project	Estimated development and construction time	Stage of process at which time estimate made	Actual development and construction time	Variance	Reason for variance

Response:

For ease of reading, NextBridge has isolated the project descriptions outside the table.

Lone Star Transmission, LLC (LST)

- Rate regulated transmission operator in Texas.
- 512 km, primarily double circuit 345 kV.
- Five high voltage transmission substations, including series compensation and reactive resources.
- Begins in the Abilene area of Texas to just south of the Dallas metropolitan area.
- Included approximately 1000 tracts of land and 700 landowners.
- Terrain features include a mix of high sandy plains, prairies, savannah, woodlands, limestone surface formations, as well as rocky terrain crossed by narrow streams, occasional drop offs and rolling terrain with clay soils.

Texas Clean Energy Express (TCEE)

- Private generator tie line that connects the Horse Hollow area wind facilities near Abilene, Texas to the LCRA Kendall Substation, southwest of Austin, Texas.
- 344 km, single circuit 345kV and associated 138 kV radial feeders.
- Two 345 kV substations and six 138 kV collection substations including series compensation.
- 270 landowners, 504 crossing agreements, all negotiated without access to the right of expropriation.
- Begins in the Abilene area of Texas with rolling countryside, and transitions into “Hill Country” of central Texas marked by numerous canyons, rocky terrain with occasional steep drop offs and numerous long-span peak to peak crossings of up to 700 feet; the route is heavily wooded with only small portions containing significant areas of population.

Blythe Energy, LLC (BE)

- Private generator tie line that connects the 520 MW Blythe Energy plant to the California ISO Julian Hinds substation.
- 108 km, single circuit 230 kV.

- Two-thirds of the land is managed by the U.S. Department of the Interior, Bureau of Land Management, as well as approximately an additional 50 private landowners.
- Terrain includes agricultural lands in the Palo Verde Valley, California, crossing desert lands with scrub, trees and shrubs, sand dunes and blowing sand playas; there is steeper topography near Desert Center, CA, including unvegetated rock outcrops and some rocky shrub lands.

Peetz-Logan Intertie (PLI)

- Private generator tie line located between Peetz and Fort Morgan, Colorado.
- 125 km, single circuit 230 kV.
- Over 50 separate landowners.
- The majority of the route is rolling grassland plains typical of Northeastern Colorado.

Montana-Alberta Tie Line (MATL)

- Contracted merchant transmission line from Great Falls, Montana to Lethbridge, Alberta
- 330 km, 230 kV single circuit
- The line is situated on a combination of privately owned agricultural crop land; Crown lands and State of Montana grasslands with low to very low population densities.

a) Budget Variance Table

Name of project	Budgeted cost	Stage of process at which budget created	Actual cost	Variance	Reason for variance
LST	\$794.1 MM	Public Utility Commission of Texas – Certificate of Convenience and Necessity Filing - April 2010	Forecast cost to completion is \$731.6 MM. Commercial operation commenced March, 2013	(\$62.5 MM)	Reductions in AFUDC due to lower capital expenditure, as a result of favourable pricing of EPC services due to negotiations with vendors.
TCEE	\$238 MM	NextEra OpComm ¹ – June 2008	\$267.4 MM	\$29.4 MM	Increase in line length from 315 to 344 km, due to inability to expropriate. Addition of capacitor banks, extensive rock excavation.
BE	\$95 MM	NextEra OpComm ¹ – January 2009	\$80 MM	(\$15 MM)	Favourable pricing of EPC services. Decision to lease versus building substation.
PLI	\$34.1 MM	NextEra Board Meeting - May 2006	\$36.1 MM	\$2.0 MM	Line length increase from 107 to 125 km, offset by per km construction costs decreased.
MATL	\$139 MM	The budget was created when the asset was acquired in Q3 2011. At the time construction had been halted by previous owners.	Ongoing with costs not finalized.	Estimated at \$25 MM	Increased contractor and legal costs due to regulatory delay and remediation of construction issues (legacy issues associated with previous project owner).

b) Schedule Variance Table

Name of project	Estimated development and construction time	Stage of process at which time estimate made	Actual development and construction time	Variance	Reason for variance
LST	4 years, 2 months ²	Public Utility Commission of Texas – Certificate of Convenience and Necessity and Filing 4/2010	4 years, 2 months	None	Not applicable.
TCEE	16 months	OpComm ¹ – June 2008	15 months	(1 month)	Expediting and paralleling of development, design and construction activities.
BE	18 months	OpComm ¹ – January 2009	16.5 months	(6 weeks)	Construction expediting.
PLI	17 months	NextEra Board Meeting - May 2006	16 months	(1 month)	Construction expediting.
MATL	Approximately 1 year from the date of acquisition, with expected completion by end of September 2012.	The schedule was created when the asset was acquired in Q3 2011.	Ongoing with expected completion by end of June 2013.	Estimated at 9 months	Regulatory delay.

¹ OpComm (Operating Committee) is an internal NextEra vetting and approval process which includes a presentation of project budget, schedule, risks and benefits. OpComm approves the budget for a given project.

Based on 2009-01-29 Texas Public Utility Commission award of CREZ project through a 2013-03-31 construction completion.

TAB 54

School Energy Coalition Interrogatory # 6

Reference:

N/A

Interrogatory:

With respect to the forecast project construction costs:

- a) For each material contract that Hydro One has or expects to enter into for construction of the proposed project, please provide a) summary of the work to be done, b) status of the contract, c) type of contract (i.e. fixed price, target price, etc.), d) the basis for contractor selection (i.e. RFP, RFQ, sole source, etc.), e) value of the contract, f) the name of the contractor (if available) g) JT 2.2 category of spending the contract work consists falls under.
- b) Please provide the total value of the construction budget that is forecast to be made up of fixed price contracts.

Response:

- a) Hydro One has entered into a fixed price agreement with SNC-Lavalin Inc.
 - a. The scope is for the Engineering, Procurement and Construction (EPC) of the entire line.
 - b. The contract has been negotiated and is ready to be executed once the Leave to Construct is granted to Hydro One.
 - c. The contract is a fixed price contract
 - d. Sole source. Market / bench tested
 - e. \$547M
 - f. SNC-Lavalin Inc.
 - g. Assuming the reference categories are JT2.20, SNC-Lavalin's mandate would be for (1) Construction, (2) Site Clearing, Preparation & Site Remediation, (3) Material, (4) Construction Management, Engineering & Design
- b) SNC-Lavalin's fixed price contract is \$547M. This encompasses all construction costs.

OEB Staff Interrogatory # 6

Reference:

EB-2017-0364 Evidence, Hydro One's Application filed on February 15, 2018, Exhibit B, Tab 11, Schedule 1, Page 1

Hydro One projects an in-service date of December 2021.

Interrogatory:

- a) Hydro One is projecting that it will complete construction of its proposal in 38 months; from OEB approval to the in-service date.
 - i. Please provide a list of transmission projects that Hydro One has completed within a comparable timeline in the past 10 years.
- b) If approved, will Hydro One require internal resources to be re-allocated to ensure that it meets the proposed project timeline?
- c) If Hydro One schedule falls behind, what corrective measures will Hydro One take to bring the project back on track?

Response:

- a) A list of transmission projects that Hydro One has completed within a comparable timeline in the last 10 years is provided in Attachment 1. In this list, Hydro One has also identified Projects that have been subject to OEB leave to construct approval.
- b) Due to the EPC contract with SNC-Lavalin, limited internal resources will need to be reallocated to ensure that Hydro One meets the proposed project timeline.
- c) Hydro One will monitor the SNC-Lavalin contract through regular project updates against defined reporting requirements. Standard project and contract management techniques will be used to bring the project back on track if the schedule falls behind such as looking at utilization of additional resources, overtime, etc. Also note that within the EPC contract SNC-Lavalin has risk exposure of liquidated damages should their substantial completion date not be met, and are therefore incentivized to deliver the project on schedule.

- a. Project Management and Project Controls for the EPC Project
- b. Engineering:
 - i. Development and design of structure types
 - ii. Selection of centerline and structure spotting on the right of way
 - iii. Design of assembly and hardware details
 - iv. Geo-technical interpretation and design of foundations
 - v. Specifications for procurement of materials
- c. Procurement:
 - i. Procurement of all materials (e.g. lattice tower steel, conductor, hardware and assemblies, etc.)
 - ii. Establishment and administration of all subcontracts for services utilized in the construction of the project
- d. Construction
 - i. Establishment of temporary facilities associated with the project (e.g. construction person camps, site offices, material laydown yards, fly yards, etc.)
 - ii. Establishment of temporary access roads to the ROW
 - iii. Clearing and brushing of the ROW
 - iv. Construction of the foundations associated with the transmission line
 - v. Assembly, erection and stringing of the transmission line
 - vi. Restoration and site remediation associated with the de-mobilization of the construction works

In developing a fixed price to cover the scope of works associated with the EPC contract, a risk and contingency allowance is derived to cover differences in quantities, construction execution techniques, variances in production rates, etc., associated with the level of definition at time of bid to those experienced during project execution. Changes to the EPC Contract price will only occur for items that are outside of the scope of the EPC Contract and given the broad and encompassing nature of the EPC Contract between Hydro One and SNC-Lavalin, many of the interface risks between engineering, procurement and construction activities would fall under the scope of SNC-Lavalin. In other project delivery methods chosen by other owners or developers, where there are elements of the engineering and procurement being handled by the owner, the risk of construction costs impacts increases for changes or delays associated with the engineering and material supply, resulting in price adjustments which would be borne by the rate payer

NextBridge Interrogatory # 5

Reference:

EB-2017-0364 - February 15, 2018 HONI Lake Superior Link Application.

Interrogatory:

- a) Explain in detail why HONI decided to file its Application in February 2018 and not sooner?
- b) Explain in detail when HONI first decided to file the Application?
- c) Explain in detail when HONI first decided to attempt to route through Pukaskwa National Park.
- d) Confirm that HONI never worked towards developing a leave to construct application in order to meet a 2020 in-service date for the Lake Superior Link project. If not confirmed, explain your answer in detail.

Response:

- a) Hydro One and SNC-Lavalin formed a confidential project team in early 2017, and undertook feasibility studies to determine if a technically compliant and cost-effective solution could be developed. It was determined in the coming months that the joint experience was potentially beneficial, although against an unknown cost and project plan from NextBridge. When NextBridge filed their Leave to Construct on July 31, 2017 with a total construction price of \$777 million, Hydro One realized there was a significant cost savings opportunity based on feasibility studies.

While the IESO was updating the Needs Assessment at the Minister of Energy's direction given the updated cost filed by NextBridge, Hydro One commenced full project development efforts. Further work was undertaken with SNC-Lavalin on scope development, engineering, engagement with suppliers and construction partners, estimation of costs, schedule development, risk assessments, external engagement, etc.

A fully-costed EPC proposal was delivered by SNC-Lavalin in late November which underpinned the project review with the Board in December, and ultimately their approval on February 13, 2018 to submit the Application, which was filed on February 15, 2018.

- b) and c) The table below contains material variance explanations were actual costs greater or in-service dates later relative to the originally approved internal budget and schedule or authority to construct.

Material Variance Explanations

Project	Cost Variance	Schedule Variance	EPC Contractor
Claireville x Cherrywood: Unbundle 500kV Circuits	Higher costs due to material cost escalation, fluctuations in the foreign exchange rate and additional interest expenses as a result of an extended schedule.	Extended implementation schedule as a result of a change in delivery approach from EPC to material supply as a result of no responses to the initial tender request.	n/a
Hydro One-Hydro Québec 1,250MW Interconnection	Deferral of in-service date from 2003 to 2009. Installation of 36 steel poles vs. lattice towers as recommended by the OEB	Legal and political issues deferred the commencement of construction until Nov. 2006.	n/a
Northeast Transmission Reinforcement (SVCs at Porcupine/Kirkland Lake)	n/a	The Kirkland Lake SVC in-service date was delayed as a result of the discovery of contaminated soil, and delays in the submission of the Certificate of Approval engineering package to the Ministry of the Environment.	Porcupine SVC: Alstom Grid Canada ULC Kirkland Lake: ABB Inc.
New 500kV Bruce to Milton Double Circuit Transmission Line	Increased cost related to line clearing and civil construction costs the result of land acquisition process; construction costs related to delay in attaining EA	4-month in-service delay the result of 15 month delay in attaining EA (resulting in construction start delay), offset by staged construction and favorable weather.	Valard Construction LP
Midtown Transmission Reinforcement: Leaside x Bridgeman	Installation of a new ventilation building, tunnel ventilation, discharge system and project delays.	Challenges with construction of the main tunnel shaft at Mt. Pleasant Road, the learning curve with the use of new technology (ground freeze for excavation of shafts), outage constraints during the summer months, and increased scope of ventilation.	MMM Group Ltd. Technicore Underground Inc. Arno Electric Ltee Black & McDonald
Hearn Rebuild	Higher costs for GIS station and protection and control modification and facilities.	Property acquisition for new switchyard.	ABB Inc.
Riverside x Strachan: H2JK and K6J	Updated scope and in-service date after earlier filing	Updated scope and in-service date after earlier filing	Black & McDonald
Clarington TS: New 500/230kV Station	n/a	EA approval was delayed due to community opposition. The late approvals together with the fact that circuit outages were not permitted during summer months delayed start of station construction.	Black & McDonald
Guelph Area Transmission Reinforcement	n/a	Due to some unforeseen delays in the delivery of certain equipment and conflicting outages required to install protection equipment.	EPTCON Ltd.

Hydro One Networks Inc.

483 Bay Street, South Tower, 8th Floor
Toronto, Ontario, Canada
M5G 2P5



LAW

Michael Engelberg, Assistant General Counsel
Telephone: (416) 345-6305
Fax: (416) 345-6972
E-mail: mengelberg@HydroOne.com

September 28, 2018

Ms. Kirsten Walli
Board Secretary
Ontario Energy Board
Suite 2700, 2300 Yonge Street
P.O. Box 2319
Toronto, ON M4P 1E4

Dear Ms. Walli:

EB-2017-0182/0194/0364 – East-West Tie/Lake Superior Link – Confidential Documents of Hydro One

In accordance with the letter circulated yesterday by fellow counsel for Hydro One, Robert Warren, please find attached an unredacted version of Hydro One's response to Exhibit I, Tab 1, Schedule 18. This response is being provided in full and is no longer considered confidential.

Regarding the other two documents that have been redacted, Hydro One will make these documents available, but only in hard copy. Hydro One has been directed to not disclose these documents electronically, and SNC-Lavalin counsel will be present on the opening day of the proceeding to provide justification for the confidential treatment of said documents. In summary, given the competitive nature of this proceeding and the intellectual property associated with the innovative design, Hydro One will not electronically disclose Exhibit I, Tab 2, Schedule 24, Attachment 1 and Exhibit I, Tab 5, Schedule 21 electronically.

Hydro One relies on subsections 10.04(d) and (e) of the Board's Rules of Practice and Procedure to submit that the Board can order that the confidential version of a document be disclosed under suitable arrangements as to confidentiality or make any other order that the Board finds to be in the public interest.

Yours very truly,

ORIGINAL SIGNED BY MICHAEL ENGELBERG

Michael Engelberg
enc

OEB Staff Interrogatory # 18

Reference:

EB-2011-0140, UCT's Application for Designation to Develop the East-West Tie Line, Section 5, Pages 72-74 (filed January 4, 2013)

According to section 96(2) of the Ontario Energy Board Act, in an application under section 92, the OEB shall consider the interests of consumers with respect to prices, and the reliability and quality of electricity service, and the promotion of the use of renewable energy sources in a manner consistent with the policies of the Government of Ontario.

Given the public interest mandate that is engaged in LTC applications, OEB staff is interested in exploring potential options with respect to prices and cost certainty.

Hydro One stated in its September 22, 2017 letter to the OEB that "Hydro One is prepared to submit a Leave to Construct application, which will include a not-to-exceed price...".

NextBridge indicated in its designation application that it would assume some risk for the construction cost forecast through performance-based ratemaking. At the time of the designation application, NextBridge planned to present this proposal as part of the LTC process.

Interrogatory:

- a) Is Hydro One willing to provide the OEB with a not-to-exceed price for the project? If so, what is that price? If not, please explain.
- b) Would Hydro One consider providing the OEB with varying capital costs for the project that reflect different risk sharing proposals between itself and ratepayers? For example, would Hydro One consider having certain specific risks shared between ratepayers and the utility, other risks absorbed by the utility, and other risks absorbed by the ratepayers, all of which would result in a specific project cost? If yes, please fill in Table 2 with the scenarios Hydro One is willing to provide. If not, please explain.

Table 2 (Please add or remove rows in the table below, as needed)					
Scenario #	Risks borne by the utility	Risks borne by the ratepayer	Risks shared between the utility and ratepayers	Project Cost (\$)	Comments
1				\$M	
2				\$M	
3				\$M	
4				\$M	

c) Does Hydro One have any other proposals that the OEB might consider implementing in order to ensure the successful proponent brings its project into service in the timeline and cost established in this proceeding?

Response:

a) Hydro One would be open to consideration of a not-to-exceed price of \$683 million to deliver the project in accordance with the February Application and updated evidence, subject to the conditions of receiving Leave to Construct in January 2019, as well as environmental approvals by August 2019. This amount represents the upper bound of the updated Lake Superior Link cost estimate as per Exhibit I, Tab 1, Schedule 11 and follows the same methodology as outlined in Exhibit JT2.25.

Binding this commitment would require approval of the new Hydro One Board of Directors effective as of August 14th, and could be sought should the OEB consider Hydro One's application to be the preferred alternative.

1 b) Should the OEB wish to further explore additional alternatives, Hydro One would be happy
2 to further discuss in-camera, however at this point in time Hydro One believes the
3 Application as filed and the not-to-exceed alternative presented in a) provide good
4 optionality for consideration.

5
6 c) Hydro One strongly believes a number of innovative solutions have been proposed in the
7 Application as-filed, and the consideration of granting leave with a not-to-exceed price
8 would be new for both Hydro One and the OEB.

9
10 Another potential consideration could be to have a performance-based incentive provided to
11 the successful proponent if they are able to bring the project in-service close to or below
12 budget, with sliding benefits the further away from approved budget. For example, should
13 the project be delivered on-time and for say 2% under budget (i.e. \$629 million actual with
14 2% below updated forecast of \$641.8 million), an appropriate incentive could be paid to the
15 transmitter as a rider to future revenue requirements with reasonable consideration to sharing
16 between the proponent and customers.