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BY COURIER

May 28, 2019

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-2019-0077 – Hydro One Networks Inc.'s and Hydro Ottawa Ltd.'s Section 92 – Power South Nepean Project – Application and Evidence

Please find attached Hydro One Networks Inc.'s ("Hydro One") and Hydro Ottawa Ltd.'s ("Hydro Ottawa") Joint Application and Evidence in support of an Application pursuant to Section 92 of the Ontario Energy Board Act for an Order or Orders granting leave to upgrade and construct existing and new transmission line facilities and a construct a new municipal transformer station (the "Power South Nepean Project", or the "Project") located in the the South Nepean Area of Ottawa.

An electronic copy of the complete application has been filed through the Ontario Energy Board's Regulatory Electronic Submission System (RESS).

Sincerely,

ORIGINAL SIGNED BY JOANNE RICHARDSON

Joanne Richardson

cc. Patrick Brown – Manager, Regulatory Policy and Research - Hydro Ottawa

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ONTARIO ENERGY BOARD

In the matter of the *Ontario Energy Board Act, 1998*;

And in the matter of an Application by Hydro One Networks Inc. and Hydro Ottawa Ltd. pursuant to s. 92 of the *Ontario Energy Board Act, 1998* for an Order or Orders granting leave to upgrade an existing transmission line, construct a new transmission line and construct new municipal transformer station facilities ("the PSN Project") in the South Nepean Area of Ottawa, Ontario.

And in the matter of an Application by Hydro One Networks Inc. and Hydro Ottawa Ltd. pursuant to s. 97 of the *Ontario Energy Board Act, 1998* for an Order granting approval of the forms of the agreement offered or to be offered to affected landowners.

APPLICATION

1. The Co-Applicants are Hydro One Networks Inc. ("Hydro One"), a subsidiary of Hydro One Inc., and Hydro Ottawa Ltd. ("Hydro Ottawa"), a wholly-owned subsidiary of Hydro Ottawa Holding Inc., herein referred to as "The Applicants". Hydro One is an Ontario corporation with its head office in Toronto and is licensed under Ontario Energy Board ("OEB" or the "Board") Electricity Transmitter Licence No. ET-2003-0035. Hydro One carries on the business, among other things, of owning and operating transmission facilities within Ontario. Hydro Ottawa is an Ontario corporation with its head office in Ottawa and is licensed under OEB Electricity Distributor Licence No. ED-2002-0556. Hydro Ottawa carries on the business, among other things, of owning and operating distribution facilities within the City of Ottawa and the Village of Casselman.

2. The Applicants hereby apply to the Board pursuant to Section 92 of the *Ontario Energy Board Act, 1998* ("the Act") for an Order or Orders granting leave to construct approximately 12.2 km of double circuit 230 kV transmission line to supply the proposed new Municipal Transformer Station ("MTS") to be constructed by Hydro Ottawa. Please refer to the Project Area Map for an illustration of the existing and proposed transmission line routes and the new station location filed at **Exhibit C, Tab 2, Schedule 1, Attachments 1 and 2**.

3. The new double circuit 230 kV line will replace approximately 10.9 km of the existing 115 kV single circuit transmission line (known as the 'S7M' circuit) from West Hunt Club Road to Cambrian Road and will extend an additional approximate 1.3 km from Cambrian Road to the new MTS. One circuit on the new line will connect to the 115 kV circuit S7M and operate as the S7M circuit. The other circuit will connect to the existing 230 kV circuit E34M and operate as the E34M circuit. Consistent with the Board's Decision in the Supply to Essex County Transmission Reinforcement Application[1], Hydro Ottawa is applying for an Order or Orders granting leave to construct the new station facilities.

4. The line connection and station work together are referred to as the Power South Nepean Project (the "Project"). These facilities are required to increase supply capacity to accommodate Hydro Ottawa's customer load growth in the South Nepean area of Ottawa.

5. The proposed Project will involve the following transmission line work by Hydro One:

[1] EB-2013-0421- Decision on Threshold Questions, issued December 16, 2014.

- Rebuild the existing 115 kV single circuit line S7M, an approximate distance of 10.9 km, as a double circuit 230 kV line. This section will span between a point along West Hunt Club Road at the current S7M connection point, known as *S7M STR 673N JCT*, along the current S7M Right of Way to the intersection of Trail Road and Cambrian Road (to be known as "Cambrian Road JCT").
- Construct a new double circuit line section, an approximate distance of 1.3 km, from Cambrian Road JCT in an easterly direction, to the new proposed MTS (to be known as the 'South Nepean MTS' or 'MTS'). Both circuits on the double circuit line will be connected to the new South Nepean MTS.
- Connect one circuit on the new line to the 115 kV circuit S7M. This circuit will continue to be operated at 115 kV and continue to supply the three existing 115 kV stations of the area. This line's circuit nomenclature will remain as S7M.
- Connect the other circuit to the 230 kV circuit E34M and operate it at 230 kV. This line's circuit nomenclature will be E34M.
- Perform necessary protection and control work on circuit S7M and E34M to incorporate the connection of the new MTS.

6. The Project will involve the following station work by Hydro Ottawa:

- Construct the new South Nepean MTS to be owned and operated by Hydro Ottawa. The new MTS will be connected to both the E34M and S7M circuits and will consist of one 100MVA 230/27.6 kV transformer and one 100MVA 115/27.6 kV transformer. These will supply 27.6 kV switchgear with six feeder breakers. Both transformers will be designed and capable of supplying the entire South Nepean MTS load in the event that one of the circuits is unavailable. Under normal operating conditions, the South Nepean MTS will be supplied via the 230 kV circuit. Hydro Ottawa will be the only customer supplied by the new South Nepean MTS.

7. The proposed in-service date for the Project is November 2021, assuming a construction commencement date of September 30, 2019. A Project schedule is provided at **Exhibit B, Tab 11, Schedule 1**.

8. The need for the Project was established in the Independent Electricity System Operator's ("IESO"s) Ottawa Area Integrated Regional Resource Plan ("**IRRP**") dated April 28, 2015, and the Greater Ottawa Regional Infrastructure Plan ("**RIP**") dated December 2, 2015. These plans are provided at **Exhibit B, Tab 3, Schedule 1, Attachments 1 and 2** and are jointly referred to as the **Regional Planning Need Evidence.** The IESO also provided a letter to the Applicants on April 25, 2016, requesting them to initiate work on a new transmission station and connection line. The IESO's letter is provided at **Exhibit B, Tab 3, Schedule 1, Attachment 3**.

9. Hydro Ottawa is forecasting robust electricity load growth for the South Nepean area. The Project is required to meet this growing load and is required to be in service by 2021. Based on the South Nepean Planning forecast provided in the IESO's April 2016 letter, the transformation capacity for the area has already been reached. The Project meets the immediate near-term and medium-term needs of the area and contributes to a longer term plan to address the broader needs across the West Ottawa area. Further information on the Project's need is found in **Exhibit B, Tab 3, Schedule 1**.

10. Hydro Ottawa has secured the option to purchase the land required to build the new station along Cambrian Road, approximately 1.3 km east of the intersection of Cambrian Road and Trail Road. Hydro One will need to acquire property rights for building the proposed line to the station. This includes acquiring property rights to expand certain sections of the existing S7M Right of Way ("ROW") and acquiring a new 1.3 km long ROW from Cambrian Road JCT to the site of the new station. Additionally, temporary construction rights for access and/or staging areas may be

required for the duration of the construction period of the Project. Further information on land related matters is found at **Exhibit E, Tab 1, Schedule 1**.

11. The IESO has provided a draft System Impact Assessment ("**SIA**") for the proposed facilities. The final version is expected from the IESO within the next six weeks and will be filed upon receipt. The draft SIA concludes that the Project is expected to have no adverse impact on the reliability of the integrated power system. The draft SIA is provided in **Exhibit F, Tab 1, Schedule 1**.

12. Hydro One has completed a draft Customer Impact Assessment ("**CIA**") in accordance with Hydro One's connection procedures. The final version is expected to be completed after the IESO finalizes the SIA and provides it to Hydro One. The CIA is expected to be finalized within ten days after receiving the final SIA. The draft CIA results show that the project will improve the reliability to the area customers and that there will be no adverse impacts on short-circuit levels and voltage performance as a result of the Project. A copy of the draft CIA is provided in **Exhibit G, Tab 1, Schedule 1**.

13. The cost of the transmission line and related facilities for which Hydro One is seeking approval is approximately $58.8 million. The cost of the MTS and related facilities for which Hydro Ottawa is seeking approval is approximately $27.0 million. This results in a total project cost of approximately $85.8 million. The details pertaining to these costs are provided at **Exhibit B, Tab 7, Schedule 1**.

14. Project economics, as filed in **Exhibit B, Tab 9, Schedule 1**, estimate there will be a slight decrease in transmission rates for the Hydro One construction portion of the Project to Hydro One transmission ratepayers. The line connection pool rate of Ontario's Uniform Transmission Rates ("UTRs") will remain unchanged, whereas the network connection pool rate is forecast to decrease by $0.01/kW in 2029.

15. The Application is supported by written evidence which includes details of the co-Applicants' proposal for the transmission line and station work. The written evidence is prefiled and may be amended from time to time prior to the Board's final decision on this Application.

16. Given the information provided in the prefiled evidence, the Applicants submit that the Project is in the public interest. The Project meets Hydro Ottawa's needs for additional supply capacity and will improve quality of service and reliability.

17. In order to meet the immediate supply needs of the South Nepean area by in-servicing the Project by November 2021, construction must commence by the end of September. The Applicants are hoping to receive a leave to construct order by September 25, 2019.

18. The Applicants request that a copy of all documents filed with the Board be served on the Co-Applicants and the Co-Applicants' counsel, as follows:

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Project Overview

Hydro One and Hydro Ottawa's jointly proposed PSN Project will contribute to meeting the immediate near-term and medium-term capacity needs in the South Nepean area of southwest Ottawa. This Project will also contribute to a longer-term plan to address the broader electricity needs across the West Ottawa area.

Electricity demand has been steadily increasing in the South Nepean area over the last 15 years as a result of regional growth. This strong growth trend is expected to continue going forward, with demand expected to more than double over the next 20 years due to planned residential and commercial development[1]. The need for new electricity transmission facilities to service the increase in forecast area load was identified in the 2015 Integrated Regional Resource Plan[2] and the 2015 Regional Infrastructure Plan[3]. Following these reports, the Independent Electricity System Operator ("IESO")[1] asked Hydro One and Hydro Ottawa to initiate work on a new line and station to supply the forecast increase in electricity loads in the South Nepean area.

The Project consists of both transmission line and stations work, each of which is described below.

Line Work

The Project line work will result in the construction of a new approximate 12.2 km double circuit 230 kV line, to be owned and operated by Hydro One. This work entails:

[1] IESO Letter – April 25, 2016, provided at Exhibit B, Tab 3, Schedule 1 Attachment 3.
[2] IESO IRRP – April 28, 2015, provided at Exhibit B, Tab 3, Schedule 1 Attachment 1.
[3] Hydro One RIP – December 2, 2015, provided at Exhibit B, Tab 3, Schedule 1 Attachment 2.

a) Rebuilding a 10.9 km section, from a point known as S7M STR 673N JCT (at West Hunt Club Road) to Cambrian Road JCT, of the existing 115 kV single circuit line S7M as a double circuit 230 kV line.

b) Building a new 1.3 km section of double circuit 230 kV line from Cambrian Road JCT to the new MTS.

One of the two new circuits will be connected to the 115 kV S7M circuit and will continue to supply the existing 'step-down' transformer stations in the area at 115 kV, specifically, Richmond MTS, Manotick DS and Fallowfield MTS. The new second circuit, which is an extension of the E34M circuit, will connect to the existing E34M circuit at the West Hunt Club Road S7M connection point, S7M STR 673N JCT. It will operate at 230 kV. Both S7M and E34M circuits will supply the proposed new Hydro Ottawa-constructed MTS.

Figure 1 below shows the schematic diagrams of Hydro One's existing transmission system and facilities.

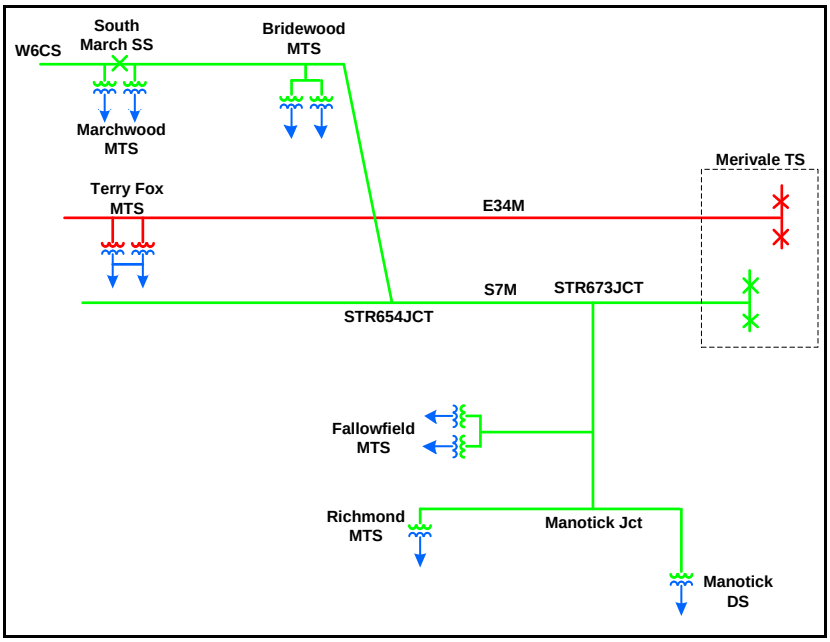


Figure 1: Schematic Diagram Showing Existing Line Facilities

Figure 2 below shows the Hydro One transmission line facilities, including the proposed new transmission lines for connection of Hydro Ottawa's new South Nepean MTS.

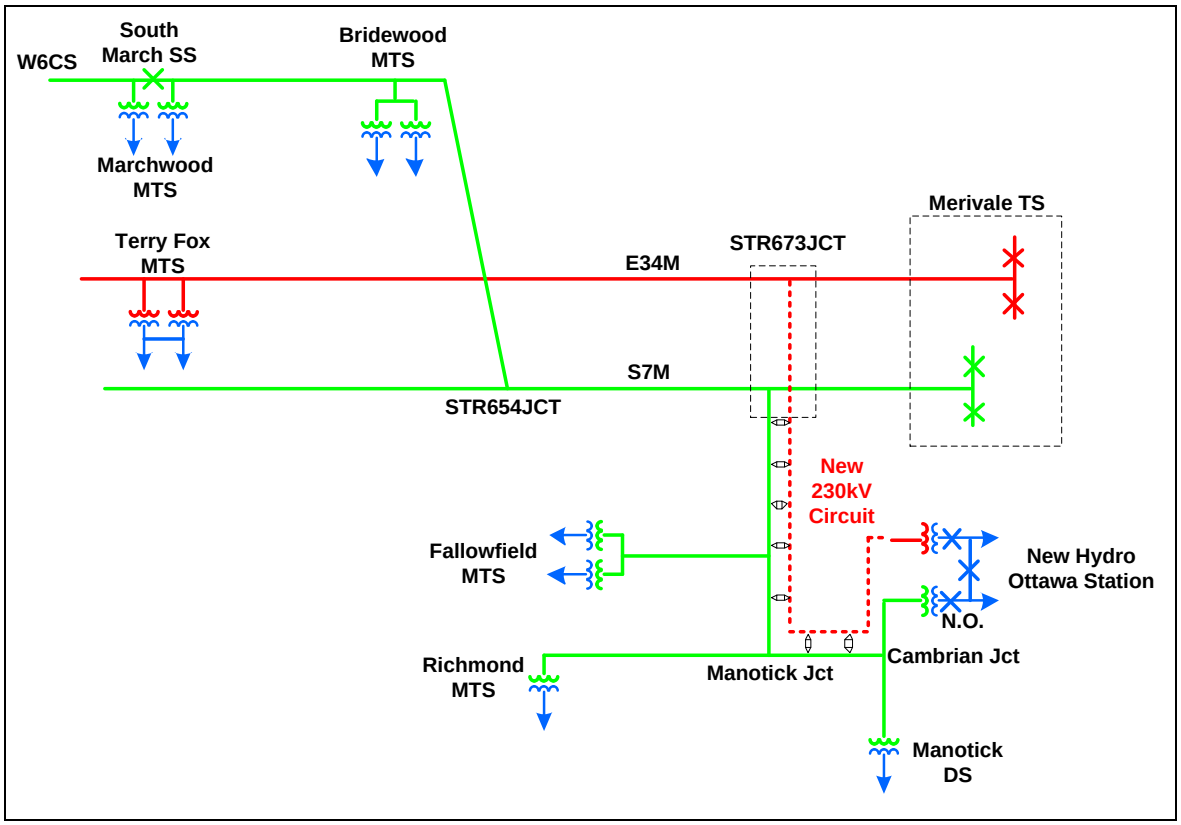


Figure 2: Schematic Diagram Showing Proposed New Line Facilities

Station Work

A new dual supply (230 kV and 115 kV) MTS operating at 27.6 kV would be constructed, owned and operated by Hydro Ottawa. The MTS will consist of one 100MVA 230/27.6 kV transformer and one 100MVA 115/27.6 kV transformer. These will supply a Dual Element Spot Network secondary switchgear configuration, with six feeder breakers. The MTS fenced-off site will have an approximate footprint of 105m by 105m (an area of approximately three acres). The proposed MTS will be located on the north side of Cambrian Road, approximately 1.3 km east of the intersection of Trail Road and

Cambrian Road in Ottawa, known as Cambrian Road JCT. An aerial view of the proposed MTS site location is provided in **Figure 3** below.

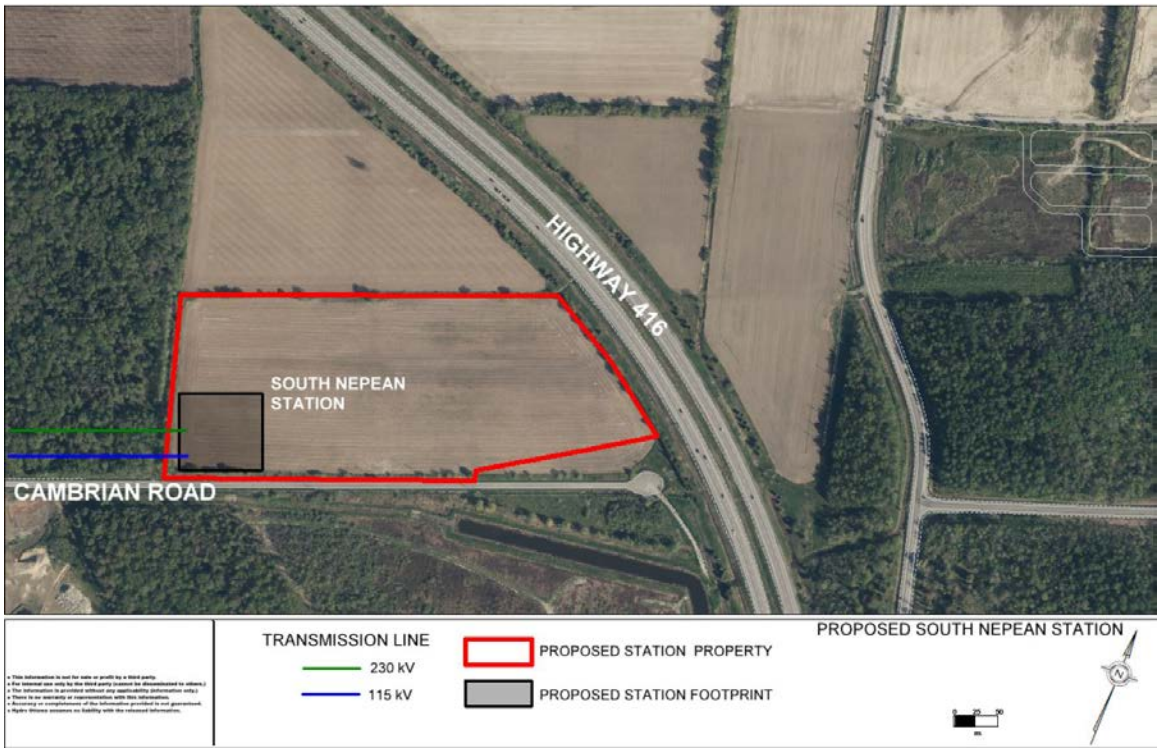


Figure 3: Location and Footprint of Proposed Municipal Transformer Station

A single line diagram for the South Nepean MTS is included at **Exhibit C, Tab 1, Schedule 1 Attachment 2.** A detailed design of the South Nepean MTS is included at **Exhibit C, Tab 1, Schedule 1 Attachment 3**.

The planned in-service date for the Project is November 2021.

Further information on the Physical Design is provided in **Exhibit C, Tab 1, Schedule 1**.

The Project will increase the area supply capacity to approximately 180 MW.

A map showing the geographic location of the proposed facilities is provided in **Exhibit C, Tab 2, Schedule 1, Attachment 1**. This map can be used by the OEB as the ***Notice Map*** for this Application.

All proposed facilities are subject to Section 92 approval.

Evidence In Support of Need

This Project is part of well-developed regional plans, and the bulk of the evidence in support of the need of this Project is embedded within these regional plans. This exhibit provides a summary of those plans.

The proposed Project is consistent with transmission solutions identified in the IESO's *Ottawa Area Integrated Regional Resource Plan* ("**IRRP**") dated April 28, 2015, and in the *Greater Ottawa Regional Infrastructure Plan* ("**RIP**") dated December 2, 2015. The plans are provided as **Exhibit B, Tab 3, Schedule 1, Attachments 1 and 2** and referred to jointly as the "**Regional Planning Need Evidence**". The Regional Planning Need Evidence identifies near and medium-term supply needs in the South Nepean area, in addition to long-term requirements.

On April 25, 2016, the IESO provided a letter (the "Letter") to Hydro One and Hydro Ottawa, requesting initiation of work for the development of a new transmission station and connection line in the South Nepean area to target an in-service date of 2021. The Letter confirms the need for the project and that development of additional transmission (and distribution) facilities should be pursued to meet the growing electricity demand in the South Nepean area, stating,

> *"Hydro Ottawa anticipates the peak demand in the area to reach 88 MW by 2020 and 134 MW by 2032, an increase of about 78 MW more than doubling today's level. This growth will place increased stress on the existing transmission and distribution infrastructure – the 115 kV line, step-down stations and distribution feeders. Over time these systems elements will exceed their respective capacities."*

The IESO's Letter, which provides further information of the need for the PSN Project, is provided at **Exhibit B, Tab 3, Schedule 1, Attachment 3**.

In terms of assessing the adequacy of the existing supply to the South Nepean area, and determining the preferred alternatives, the IESO's Letter expressly states that, in terms of the immediate need,

> *"… each of the three stations supplying South Nepean is reaching, or has already exceeded its planning capacity[1] … in addition to the station and feeder capacities being exceeded, the 115 kV single circuit transmission line, S7M, which provides the primary supply to this area and its surroundings, is also approaching its limit. The forecast demand on this circuit will reach its capacity of 108 MW in 2026.[2]"*

After having identified potential solution options, the IESO's Letter[3] concludes that,

> *"Based on the timeline and magnitude of the need for additional supply capacity in South Nepean, it is clear that it will not be feasible to address the need through additional conservation and local generation. Therefore, a new supply station and connection line are recommended".*

The benefits of the proposed solution are discussed in **Exhibit B, Tab 5, Schedule 1** and **Exhibit B, Tab 6, Schedule 1**.

The Project will meet the IESO-identified capacity and reliability of supply needs of the area while respecting operating limits. The replacement of the existing 115 kV circuit with a new double circuit 230 kV line will provide necessary relief to the existing South

[1] IESO Letter dated April 25, 2016, Page 4.
[2] IESO Letter dated April 25, 2016, Page 4.
[3] IESO Letter dated April 25, 2016, Page 5.

Nepean area and facilitate future system expansion to meet the expected growth in demand. Additionally, the Project will contribute to the longer-term needs identified in the Regional Planning Need Evidence for a solution to address the broader electricity requirements across the West Ottawa area.

OTTAWA AREA INTEGRATED REGIONAL RESOURCE PLAN

Part of the Greater Ottawa Planning Region | April 28, 2015



ieso
Independent Electricity System Operator

Integrated Regional Resource Plan

Ottawa Region

This Integrated Regional Resource Plan ("IRRP") was prepared by the IESO pursuant to the terms of its Ontario Energy Board licence, EI-2013-0066.

This IRRP was prepared on behalf of the Ottawa Region Working Group, which included the following members:

- Independent Electricity System Operator
- Hydro Ottawa Limited
- Hydro One Networks Inc. (Distribution) and
- Hydro One Networks Inc. (Transmission)

The Ottawa Region Working Group assessed the adequacy of electricity supply to customers in the Ottawa Region over a 20-year period; developed a flexible, comprehensive, integrated plan that considers opportunities for coordination in anticipation of potential demand growth scenarios and varying supply conditions in the Ottawa Region; and developed an implementation plan for the recommended options, while maintaining flexibility in order to accommodate changes in key assumptions over time.

Ottawa Region Working Group members agree with the IRRP's recommendations and support implementation of the plan through the recommended actions. Ottawa Region Working Group members do not commit to any capital expenditures and must still obtain all necessary regulatory and other approvals to implement recommended actions.

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Appendix A: Demand Forecast

List of Abbreviations

Abbreviation	Description
C&S	Codes and Standards
CDM	Conservation Demand Management
CEP	Corporate Energy Plan
CHPSOP	Combined Heat and Power Standard Offer Program
DE	District Energy
DESN	Dual Element Spot Network
DG	Distributed Generation
DR	Demand Response
EA	Environmental Assessment
EE	Energy Efficiency
EM&V	Evaluation, Measurement and Verification
FIT	Feed-in Tariff
GEA	Green Energy Act, 2009
GTA	Greater Toronto Area
HVDC	High-Voltage Direct Current
HVDS	High-Voltage Distribution Station
ICI	Industrial Conservation Initiative
IESO	Independent Electricity System Operator
IPSP	(2007) Integrated Power System Plan
IRRP	Integrated Regional Resource Planning
L/R	Load Rejection
LRT	Light Rail Transit
LAC	Local Advisory Committee
LDC	Local Distribution Company
LMC	Load Meeting Capability
LTEP	(2013) Long-Term Energy Plan
LTR	Limited Time Rating
MEP	Municipal Energy Plan
MEP/CEP	Municipal or Community Energy Planning
MTS	Municipal Transfer Station
OEB or Board	Ontario Energy Board
OPA	Ontario Power Authority
ORTAC	Ontario Resource and Transmission Assessment Criteria
PPWG	Planning Process Working Group
Region	Ottawa Region
RIP	Regional Infrastructure Plan
SPS	Special Protection System
TOR	Terms of Reference
TOU	Time-of-Use
TS	Transformer Station
Working Group	Technical Working Group for Ottawa Region IRRP

1. Introduction

This Integrated Regional Resource Plan ("IRRP") addresses the electricity needs for the Ottawa Region ("Region") over the next 20 years. This report was prepared by the Independent Electricity System Operator ("IESO") on behalf of a technical working group ("Working Group") composed of the IESO, Hydro Ottawa Limited ("Hydro Ottawa"), Hydro One Distribution and Hydro One Transmission.

This Region encompasses the City of Ottawa ("City"), including the Greenbelt, Kanata, Nepean and Orléans. Ottawa is the nation's capital and has a population of just under 900,000 people, an increase of 7.9% since 2001.[1] With a peak demand of about 1,500 MW, it is one of the largest electricity planning regions in Ontario. Electricity distribution and conservation initiatives are carried out by two local distribution companies: Hydro Ottawa, a municipally owned utility which operates in the City and in the Village of Casselman, and Hydro One, which provides service to customers both in the City and in surrounding areas. Hydro One is the transmission asset owner in the Region.

In Ontario, planning to meet the electrical supply and reliability needs of a large area or region is done through regional electricity planning, a process that was formalized by the Ontario Energy Board ("OEB" or "Board") in 2013. In accordance with the OEB regional planning process, transmitters, distributers and the IESO are required to carry out regional planning activities for the 21 electricity planning regions at least once every five years .

The Region has experienced a reduction in peak electricity demand in recent years due to a variety of factors, including cooler summers, the impact of distributed generation ("DG"), and the impact of provincial conservation and peak shifting initiatives. However this overall trend does not reflect localized developments in the Region. Electricity demand in the downtown core of Ottawa is expected to grow over the coming years due to intensification and significant development has also been occurring in recent years outside of the Greenbelt. The electricity demand requirements in the Ottawa Region are expected to continue to increase over the forecast horizon, driven by growth in residential and commercial sectors as indicated by the City's growth plans, as well as the development of transportation infrastructure including a new Light Rail Transit ("LRT") line. As a result, there is a need for integrated regional electricity planning to ensure adequate and reliable electricity supply is maintained.

[1] http://ottawa.ca/en/long-range-financial-plans/economy-and-demographics/population

The Ottawa Region covered by this IRRP constitutes a sub-region of the "Greater Ottawa" Region established through the OEB's regional planning process. Hence, this report contributes to fulfilling the requirements for the Greater Ottawa Region as mandated by the OEB. Because economic, demographic and technological conditions will inevitably change, the regional planning process will be carried out on a 5-year cycle for each region so that plans can be updated as the electricity outlook changes over time.

This IRRP for Ottawa identifies and coordinates the many different options to meet customer needs in the Region over the next 20 years. Specifically, this IRRP identifies investments for immediate implementation necessary to meet near-term needs in the Region. The plan for the medium and long term identifies near-term actions to develop alternatives and engage with the community.

This report is organized as follows:

- A summary of the recommended plan for the Region is provided in Section 2;
- The process and methodology used to develop the plan are discussed in Section 3;
- The context for electricity planning in the Region and the study scope are discussed in Section 4;
- Demand forecast scenarios, and conservation and DG assumptions, are described in Section 5;
- The near- and medium-term plan is presented in Section 6;
- The long-term plan is presented in Section 7;
- A summary of community, aboriginal and stakeholder engagement to date and moving forward in developing this IRRP is provided in Section 8; and
- A conclusion is provided in Section 9.

2. The Integrated Regional Resource Plan

The Ottawa IRRP addresses the Region's electricity needs over the next two decades, based on application of the IESO's Ontario Resource and Transmission Assessment Criteria ("ORTAC").[2] The IRRP was developed based on consideration of planning criteria including feasibility, cost, reliability, and, in the near term, seeking to maximize the use of existing electricity infrastructure.

The 20-year outlook used for regional planning allows the long-term trends in a region to be considered while implementing near-term actions. The plan for the first 10 years is described as the near- and medium-term plan and has been developed based on demand trends, conservation targets and other local developments that can be forecast with relative certainty. A single reference planning forecast is used as a basis for this period. This forecast can be found in Appendix A. Within the first 10 years, a further distinction is made between the first five years ("the near term") and the following five years ("the medium term") based on different approaches to addressing needs for these two periods. Electricity supply needs that are identified for the near term typically require that specific solutions be recommended immediately, given the lead time to develop electricity infrastructure. For medium-term needs there is more time available for planning and consideration of alternatives. Nevertheless, development work for longer lead-time options must be initiated early in order to maintain their feasibility.

The plan for the subsequent 10 years is described as the long-term plan and is characterized by greater forecast uncertainty. In addition to the reference planning forecast mentioned above, a second forecast scenario, based on the long term forecast contained in Ontario's 2013 Long-Term Energy Plan ("LTEP") is introduced for this period. The IRRP for the long-term focuses on near-term actions that are required to develop and maintain the viability of long-term electricity supply options, with a particular emphasis on identifying the potential for integrating conservation, DG, or other localized solutions. Community engagement during the 5-year regional planning cycle will gather input on community preferences for long-term options so that these can be reflected in future regional plans.

The needs and recommended actions comprising the near- and medium-term plan, as well as the long-term plan are summarized below.

[2] http://www.ieso.ca/Documents/marketAdmin/IMO_REQ_0041_TransmissionAssessmentCriteria.pdf

2.1 The Near- and Medium-Term Plan

The first component of the near-term plan is the implementation of planned conservation. While this planned conservation is expected to make a significant contribution to addressing growth in the Region, residual demand growth, as well as other reliability needs which are not growth related give rise to a number of near- and medium-term needs in the Region (see sidebar). Due to the nature and timing of these needs, transmission and distribution reinforcements are recommended as the preferred near-term options to address these needs. These projects are described below and their location is indicated in Figure 2-1.

Near- and Medium-Term Needs

1) Additional 230/115 kV transformer capacity at Hawthorne TS – **Today**

2) Improved reliability of supply to Terry Fox MTS – **Today**

3) Additional supply capacity for a section of circuit S7M – **2019**

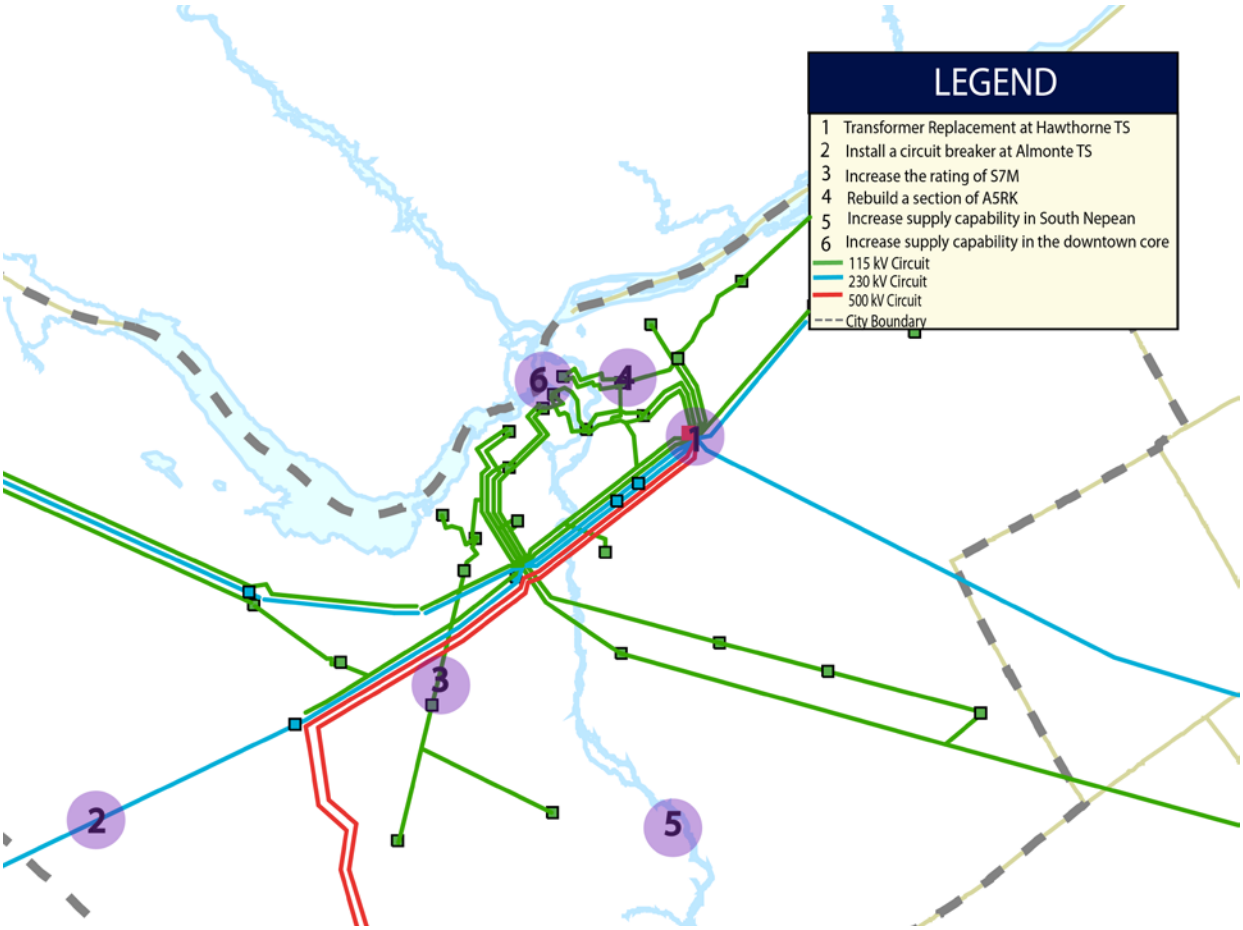
4) Additional supply capacity for circuit A4K – **around 2017**

5) Additional supply capacity in the South Nepean area – **around 2020**

6) Additional capacity at some stations in the downtown core and improved reliability of supply – **around 2018**

7) Additional 230/115 kV transformer capacity at Merivale TS.

Figure 2-1: Projects Included in the Ottawa Near-Term Plan



Recommended Actions

1. Implement conservation and distributed generation

The implementation of provincial conservation targets established in the 2013 LTEP is a key component of the near- and medium-term plan for the Region. In developing the demand forecast, peak-demand impacts associated with the provincial targets established in the 2013 LTEP were assumed before identifying any residual needs, consistent with the provincial Conservation First Framework. Conservation resources are expected to offset nearly 50% of the growth in the area between 2015 and 2032.

The achievement of these demand reductions will partially depend on the extent to which local distribution companies ("LDCs") conservation programs provide peak-demand reductions. Monitoring of conservation success, including measurement of peak demand savings, will be an important element of the near- and medium-term plan, and will also provide input for long-term planning by reviewing the performance of specific conservation measures in the Region, and assessing the potential for future conservation initiatives.

Provincial programs that encourage the development of DG, such as the Feed-in Tariff ("FIT"), microFIT, and Combined Heat and Power Standard Offer ("CHPSOP") programs, can also contribute to reducing peak demands on the transmission system in the Region, depending on local interest and opportunities for development. The LDCs and the IESO will continue their activities to support these initiatives and monitor their impacts.

2. Transmission projects initiated as a result of the regional planning process

In June 2014 the former Ontario Power Authority ("OPA") provided a letter ("June 2014 letter")[3] to Hydro One, the transmission asset owner in the area, to initiate development work on four transmission reinforcement projects, addressing near-term needs that were identified as a result of the regional planning process. Alternative means, such as reducing demand through conservation or DG, were not feasible options given the nature and timing of these needs. The four projects, which were initiated in 2014, are:

i. Replacing two lower rated 230/115 kV transformers at Hawthorne TS, which are approaching their end-of-life, with higher rated transformers. These two transformers are limiting the supply capability at Hawthorne TS, one of the two main supply points for the Region (addresses need number 1 in the above sidebar).
ii. Installing a circuit breaker on circuit M29C at Almonte TS to reduce interruptions to loads connected to M29C, including Terry Fox MTS (addresses need number 2 in the above sidebar).
iii. Increasing the rating of the section of circuit S7M supplying Fallowfield DS, Manotick DS and Richmond DS in order to increase supply capacity for these three stations (addresses need number 3 in the above sidebar).
iv. Rebuilding the section of circuit A5RK between Overbrook TS and the junction with circuit A6R near Riverdale TS into a double-circuit line in order to provide additional supply capacity for circuit A4K, reinforcing transmission supply to the downtown area. As part of this project, supply to Overbrook TS will be reconfigured from being supplied

[3] http://www.ieso.ca/Documents/Regional-Planning/Greater_Ottawa/Letter-to-H1-Ottawa.pdf

by A4K/A5RK to being supplied by A5RK/A6R (addresses need number 4 in the above sidebar).

3. Further recommended actions

In addition, the Working Group has identified further actions that are required to address near- and medium-term needs:

i. Need for additional supply capacity in the South Nepean area has been identified (number 5 in the above sidebar). The next step in the regional planning process is to engage the community on the options for supplying forecast medium-term demand growth in the South Nepean area. Based on the timing of the need for additional supply capacity (around the end of the decade), it would be beneficial for Hydro Ottawa to initiate early planning work for a new transformer station ("TS") in the South Nepean area, with a targeted in-service date in 2020, in parallel with the community engagement. Hydro One would work in conjunction with Hydro Ottawa to carry out detailed investigation of transmission supply options for this station.

ii. Increasing distribution system transfer capability between downtown stations, and increasing station capacity at King Edward TS (addresses need number 6 in the above sidebar).

iii. Monitoring of demand growth on the Merivale 115 kV system in conjunction with the development of a plan to supply growth in South Nepean (item 5 above), to confirm whether the need for additional transformer capacity at Merivale TS will be addressed (number 7 in the above sidebar).

2.2 The Long-Term Plan

The long-term forecast for the Region projects steady demand growth for the second half of the planning period (2025 to 2032), however specific long-term needs are not evident at this time. The recommended long-term planning actions for the next few years therefore focus on preparing for the next regional planning cycle. The next cycle may be initiated in advance of the 5-year minimum review timeline if significant changes occur relative to the current outlook.

Recommended Actions

1. Undertake community engagement

Engaging local communities to receive input on preferences for long-term electricity supply alternatives, including conservation and DG, will provide input for planning decisions. The IESO will establish a Local Advisory Committee ("LAC") consisting of community

representatives and stakeholders. Advice from the LAC will be reflected in future planning activities for the Region.

2. Monitor demand growth, conservation achievement and distributed generation uptake

On an annual basis, the IESO will coordinate a review of conservation achievement, DG program uptake, and actual demand growth in the Region. This information will be used to track the near- and medium-term needs that have already been identified in this IRRP and to anticipate additional needs to be addressed in the next planning cycle.

3. Initiate the next regional planning cycle early, if required

Based on current forecasts and conservation assumptions, no specific long-term needs for the Region have been identified in this IRRP. If monitoring activities indicate that actual net load growth is exceeding the current planning forecast, then the next regional planning cycle may be initiated earlier than the minimum 5-year timeline.

3. Development of the IRRP

3.1 The Regional Planning Process

In Ontario, planning to meet the electricity needs of customers at a regional level is done through regional planning. Regional planning assesses the interrelated needs of a region - defined by common electricity supply infrastructure over the near- medium- and long-term, and develops a plan to ensure cost-effective, reliable, electricity supply. Regional plans consider the existing electricity infrastructure in an area, forecast growth and customer reliability, evaluate options for addressing needs, and recommend actions.

Regional planning has been conducted on an as needed basis in Ontario for many years. Most recently, the OPA carried out regional planning activities to address regional electricity supply needs. The OPA conducted joint regional planning studies with distributors, transmitters, the IESO and other stakeholders in regions where a need for coordinated regional planning had been identified.

In 2012, the OEB convened the Planning Process Working Group ("PPWG") to develop a more structured, transparent, and systematic regional planning process. This group was composed of industry stakeholders including electricity agencies, utilities, and stakeholders. In May 2013, the PPWG released the Working Group Report to the Board, setting out the new regional planning process. Twenty-one electricity planning regions in the province were identified in the Working Group Report and a phased schedule for completion was outlined. The Board endorsed the Working Group Report and formalized the process timelines through changes to the Transmission System Code and Distribution System Code in August 2013, as well as through changes to the OPA's licence in October 2013. The OPA license changes required it to lead a number of aspects of regional planning, including the completion of comprehensive IRRPs. Following the merger of the IESO and the OPA on January 1, 2015, the regional planning responsibilities identified in the OPA's licence were transferred to the IESO.

The regional planning process begins with a Needs Screening process performed by the transmitter, which determines whether there are needs requiring regional coordination. If regional planning is required, the IESO then conducts a Scoping Assessment to determine whether a comprehensive IRRP is required, which considers conservation, generation, transmission, and distribution solutions, or whether a straightforward "wires" solution is the only option. If the latter applies, then a transmission and distribution focused Regional

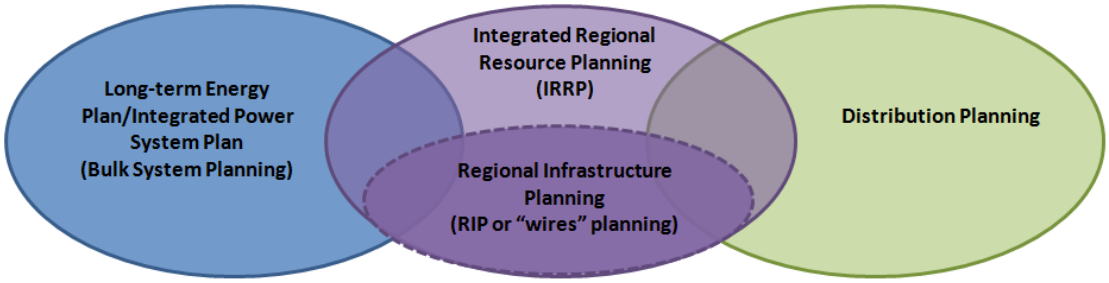
Infrastructure Plan ("RIP") is required. The Scoping Assessment process also identifies any sub-regions that require assessment. There may also be regions where infrastructure investments do not require regional coordination and can be planned directly by the distributor and transmitter, outside of the regional planning process. At the conclusion of the Scoping Assessment, the IESO produces a report that includes the results of the Needs Screening process – identifying whether an IRRP, RIP or no regional coordination is required - and a preliminary Terms of Reference ("TOR"). If an IRRP is the identified outcome, then the IESO is required to complete the IRRP within 18 months. If a RIP is required, the transmitter takes the lead and has six months to complete it. Both RIPs and IRRPs are to be updated at least every five years.

The final IRRPs and RIPs are to be posted on the IESO and relevant transmitter websites, and can be used as supporting evidence in a rate hearing or Leave to Construct application for specific infrastructure investments. These documents may also be used by municipalities for planning purposes and by other parties to better understand local electricity growth and infrastructure requirements.

Regional planning, as shown in Figure 3-1, is just one form of electricity planning that is undertaken in Ontario. There are three types of electricity planning in Ontario:

- Bulk system planning
- Regional system planning
- Distribution system planning

Figure 3-1: Levels of Electricity System Planning



Bulk System Planning

- 500 kV & 230 kV transmission
- Interconnections
- Inter-area network transfer capability
- System reliability (security and adequacy) to meet NERC, NPCC, ORTAC
- Congestion and system efficiency
- System supply and demand forecasts
- Incorporation of large generation
- Typically medium- and long-term focused

Regional Planning

- 230 kV & 115 kV transmission
- 115/230 kV autotransformers and associated switchyard facilities
- Customer connections
- Load supply stations
- Regional reliability (security and adequacy) to meet NERC, NPCC & ORTAC
- ORTAC local area reliability criteria
- Regional/local area generation & CDM resources
- Typically near- & medium-term focused

Distribution Network Planning

- Transformer stations to connect to the transmission system
- Distribution network planning (e.g. new & modified Dx facilities)
- Distribution system reliability (capacity & security)
- Distribution connected generation & CDM resources
- LDC demand forecasts
- Near- & medium-term focused

Planning at the bulk system level typically considers the 230 kV and 500 kV network. Bulk system planning considers the major transmission facilities and assesses the resources needed to adequately supply the province. Bulk system planning is typically carried out by the IESO. Distribution planning, which is carried out by LDCs, looks at specific investments on the low voltage, distribution system.

Regional planning can overlap with bulk system planning. For example, overlap can occur at interface points where regional resource options may also address a bulk system issue. Similarly, regional planning can overlap with the distribution planning of LDCs. An example of this is when a distribution solution addresses the needs of the broader local area or region. Therefore, to ensure efficiency and cost-effectiveness, it is important for regional planning to be coordinated with both bulk and distribution system planning.

By recognizing the linkages with bulk and distribution system planning, and coordinating multiple needs identified within a given region over the long term, the regional planning process provides an integrated assessment of needs. Regional planning aligns near- and long-term solutions and allows specific investments recommended in the plan to be understood as part of a larger context. Furthermore, regional planning optimizes ratepayer interests by avoiding piecemeal planning and asset duplication, and allows Ontario ratepayers' interests to

be represented along with the interests of LDC ratepayers. Where IRRPs are undertaken, they allow an evaluation of the multiple options available to meet needs, including conservation, generation, and "wires" solutions. Regional plans also provide greater transparency through engagement in the planning process, and by making plans available to the public.

3.2 The IESO's Approach to Regional Planning

IRRPs assess electricity system needs for a region over a 20-year period. The 20-year outlook anticipates long-term trends so that near-term actions are developed within the context of a longer-term view. This enables coordination and consistency with the long-term plan, rather than simply reacting to immediate needs.

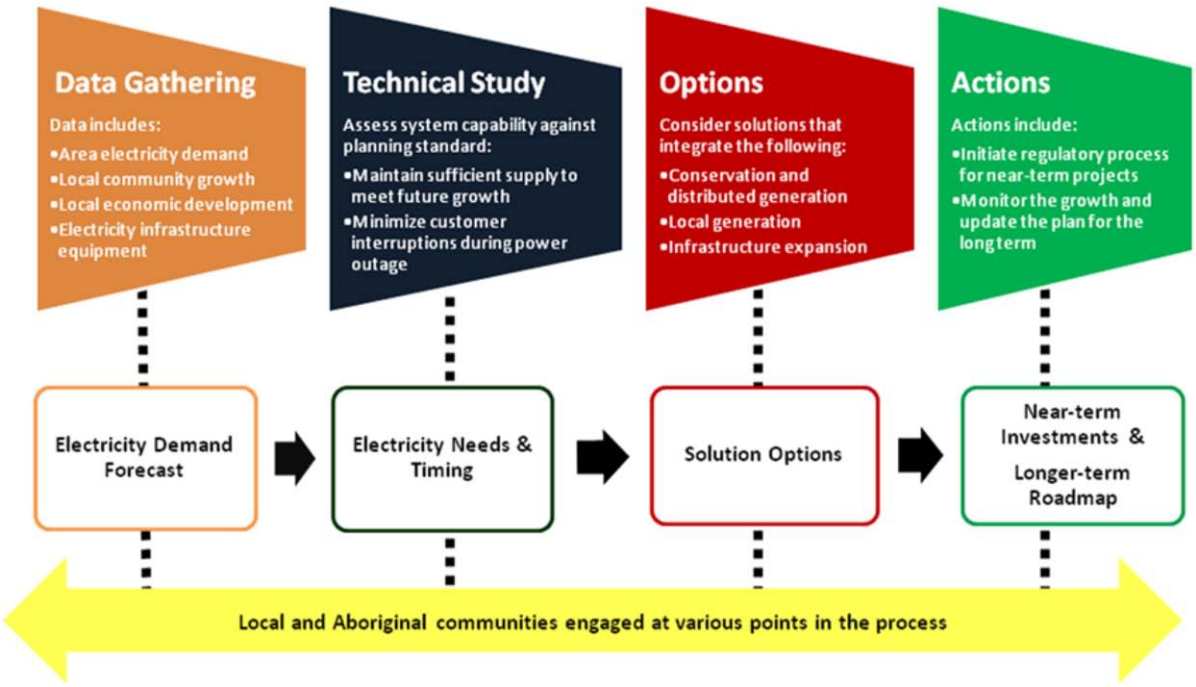
In developing an IRRP, a different approach is taken to developing the plan for the first 10 years of the plan—the near- and medium-term—than for the longer-term period of 10-20 years. The plan for the first 10 years is developed based on best available information on demand, conservation, and other local developments. Given the long lead-time to develop electricity infrastructure, near-term electricity needs require prompt action to enable the specified solutions in a timely manner. By contrast, the long-term plan is characterized by greater forecast uncertainty and longer development lead-time; as such solutions do not need to be committed to immediately. Given the potential for changing conditions and technological development, the IRRP for the long term is more directional, focusing on developing and maintaining the viability of options for the future, and continuing to monitor demand forecast scenarios.

In developing an IRRP, the IESO and Regional Working Group (see Figure 3-2 below) carry out a number of steps. These steps include electricity demand forecasts; technical studies to determine electricity needs and the timing of these needs; the development of potential options; and, a recommended plan including actions for the near and long term. Throughout this process, engagement is carried out with stakeholders and First Nations and Métis communities. The steps of an IRRP are illustrated in Figure 3-2 below.

The IRRP report documents the inputs, findings and recommendations developed through the process described above, and provides recommended actions for the various entities responsible for plan implementation. Where "wires" solutions are included in the plan recommendations, the completion of the IRRP report is the trigger for the transmitter to initiate an RIP process to develop those options. Other actions may involve: development of

conservation, local generation, or other solutions; community engagement; or information gathering to support future iterations of the regional planning process in the Region.

Figure 3-2: Steps in the IRRP Process



3.3 Ottawa Region Working Group and IRRP Development

Regional planning in the Ottawa Region was underway prior to the OEB's formalization of the regional planning process. In 2002, Hydro One and Hydro Ottawa assessed the transmission system supplying the Region over a 10-year planning horizon. The study recommended several major system upgrades, which have since been completed. These include:

1. Adding a new 230/115 kV auto-transformer at Hawthorne TS;
2. Building 2.7 km of new double-circuit 115 kV transmission line between Hawthorne TS and Blackburn Junction, and adding a second circuit on the existing Blackburn Junction x Russell TS 115 kV tower line;
3. Increasing the ampacity rating of 115 kV circuit H9A (as part of the Ontario-Quebec HVDC interconnection project); and
4. Replacing 115 kV breakers at Merivale TS and closing the 115 kV bus tie.

Between 2003 and 2010, a number of developments also impacted the electricity supply in the area. These included a new high voltage direct current ("HVDC") connection to Hydro Quebec at Outaouais, near Hawthorne TS; the *Green Energy Act, 2009* ("GEA"), which led to

development of renewable energy generation in the area; and continued load growth in the Region.

In 2011, a regional planning process was initiated and the Working Group was established. Over the subsequent two years, the Working Group made significant progress in identifying the Region's electricity requirements and alternatives to address those needs.

When the regional planning process was formalized in 2013 by the OEB, the Working Group revised the TOR[4] to reflect the new process and updated study information, including the planning forecast. The Working Group identified near- and medium-term needs in the Region and recommended actions included in this IRRP. Implementation began in 2014 with the former OPA providing a letter to Hydro One supporting the immediate development of "wires" solutions to address four near-term needs. These four projects were initiated in advance of completing this IRRP so that they may be put into service by the time the needs they are addressing are expected to materialize.

This IRRP is therefore a "transitional" IRRP in that it began prior to development of the OEB's regional planning process and much of the work was completed before the new process and its requirements were known.

[4] http://www.ieso.ca/Documents/Regional-Planning/Greater_Ottawa/Ottawa-TOR-w-Explanatory-Note.pdf

4. Background and Study Scope

This report presents an IRRP for the Ottawa Region for the period from 2015 to 2032. To set the context, the scope of this IRRP and the Region's existing electricity system are described in Section 4.1. As well, the regional planning sub-systems, which are used later in this report, are described.

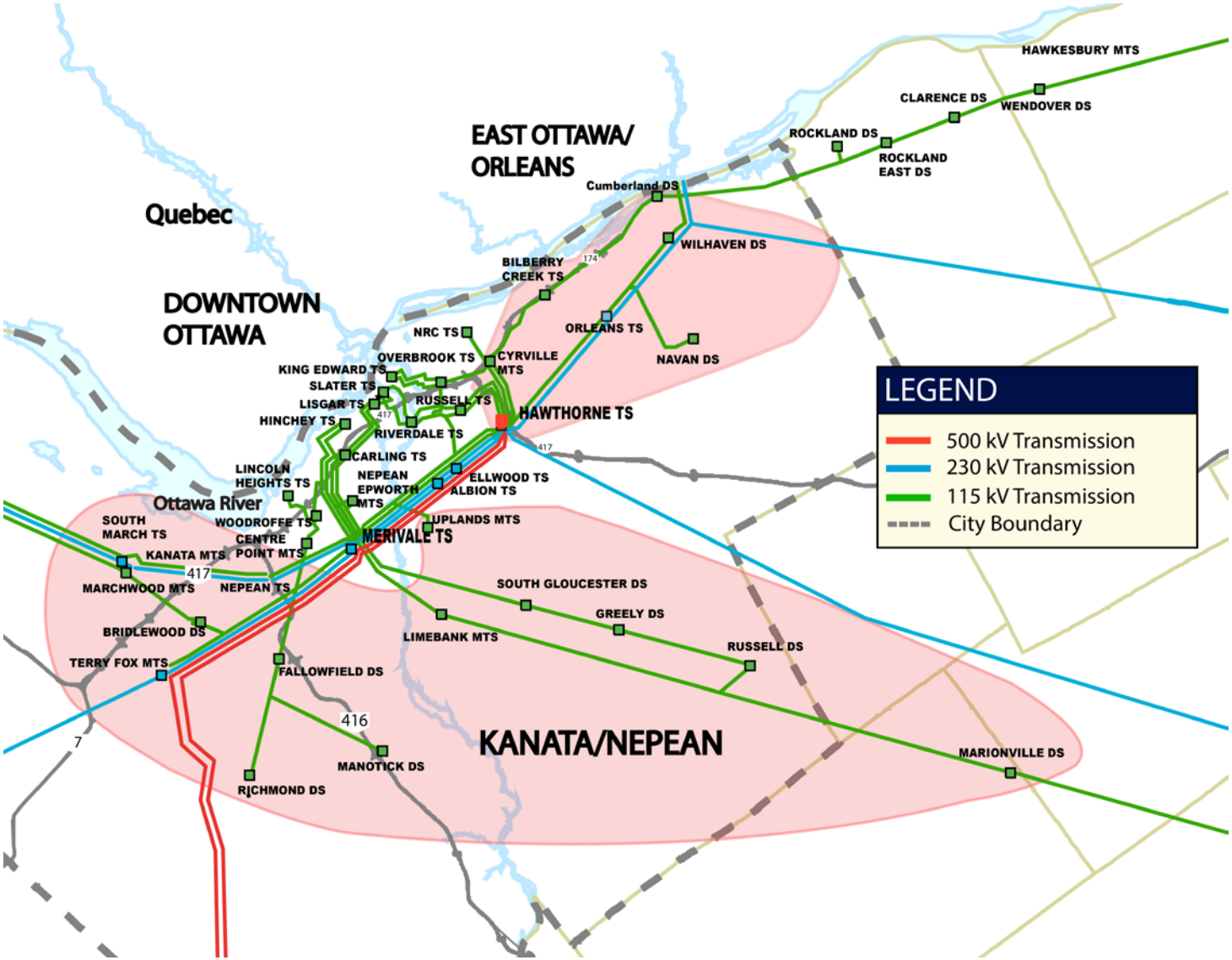
4.1 Study Scope

The scope of this IRRP encompasses the City of Ottawa, including the Greenbelt, Kanata, Nepean and Orléans. The electricity infrastructure supplying the area is shown in Figure 4-1. The Region is supplied by a combination of transmission connection to the Ontario grid and electricity generation facilities located in the Region, including hydroelectric generating stations on the Madawaska and Ottawa Rivers, behind-the-meter generators, and renewable generation procured through the FIT and microFIT programs. Hawthorne TS and Merivale TS are the two main supply points for the Region.

For the purposes of this IRRP, the transmission system in the Region is divided into the following three sub-systems, depicted in Figure 4-1, below:

1. The Nepean-Kanata sub-system, located beyond the Greenbelt in the southwest part of the Ottawa Region, includes loads supplied by both the 230 kV and 115 kV systems;
2. The Downtown Ottawa sub-system is geographically bounded to the north by the south bank of Ottawa River and to the south by the Hawthorne-Merivale transmission corridor. Load in this sub-system is supplied mainly by the 115 kV system while the southeast portion of this system is supplied by the 230 kV system;
3. The East Ottawa-Orléans sub-system is supplied by Bilberry Creek TS and Orléans TS via the 115 kV and 230 kV systems

Figure 4-1: Three Sub-systems in the Ottawa Region



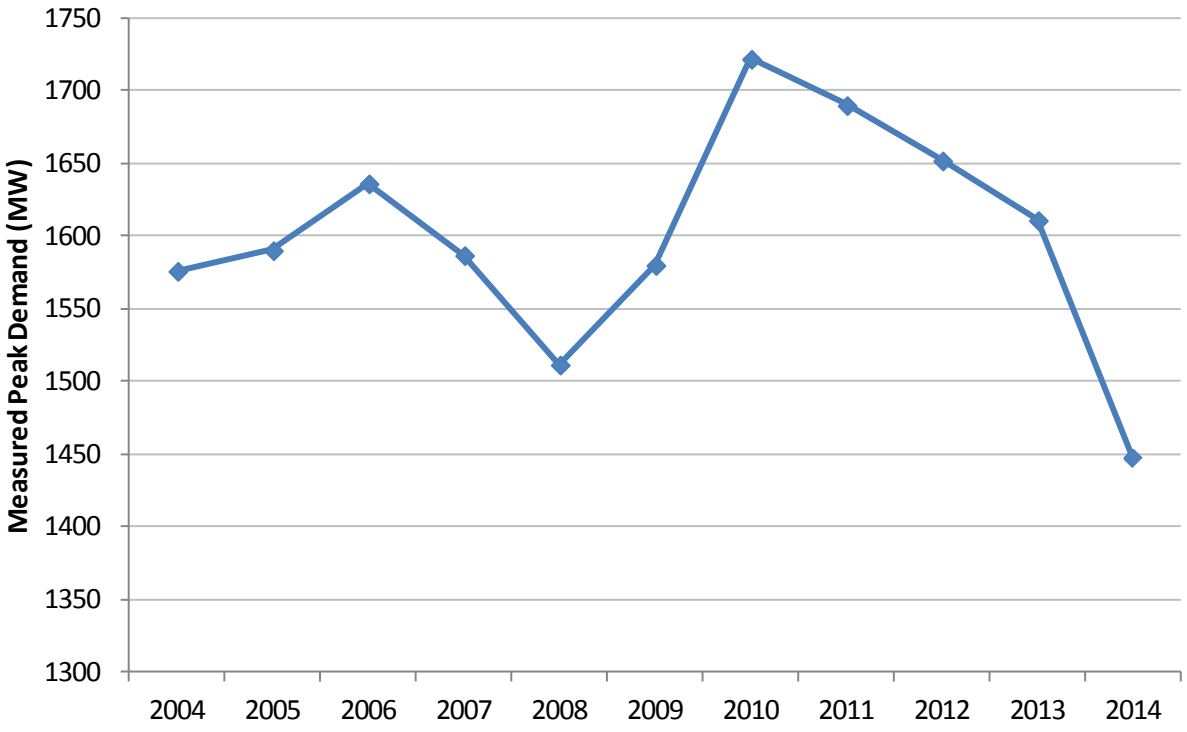
5. Electricity Demand Forecast

This section details the development of the demand forecast for the Ottawa Region. Section 5.1 begins by describing the historic electricity demand trends in the Region from 2004 to 2014. Section 5.2 describes the demand forecast used in this study and the methodology used to develop it.

5.1 Historical Demand

Figure 5-1 shows the summer peak net electricity demand recorded for the Region from 2004 to 2014. While this data shows the net electricity demand for Region to be declining, it is important to note other trends that are reflected in this data. First, this measured demand includes the impact of summer weather conditions, which, for example, were unusually cool across the province in 2014. Second, demand on the distribution system that was met by DG resources, which were operating at the time of the annual peak, are not reflected in the demand supplied from the transmission system, which is what is measured by this historical demand data. Finally, the data also reflects the achievements of provincial conservation and peak-shifting initiatives, including the Industrial Conservation Initiative ("ICI") for large customers.

Figure 5-1: Ottawa Region Historical Electricity Demand[5]



5.2 Demand Forecast Methodology

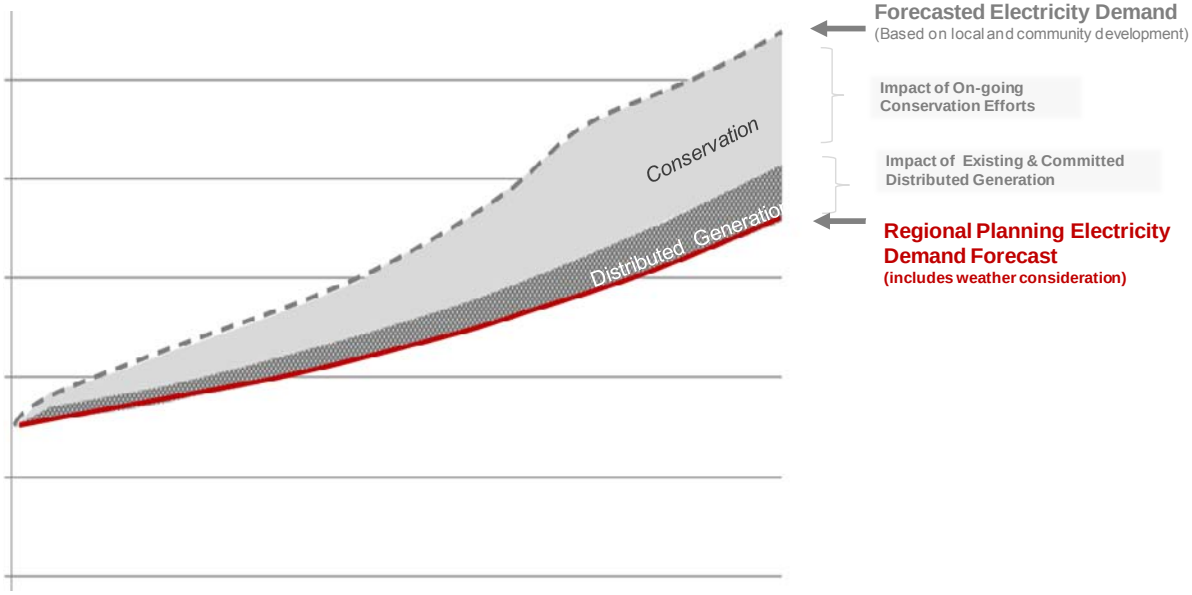
Regional electricity needs are driven by the limits of the infrastructure supplying the area, which is sized to meet peak demand requirements. Therefore, regional planning typically focuses on growth in coincident peak demand, which is the electricity demand of individual stations that coincides with the annual peak demand of the Region. It is likely that each station will reach its individual peak demand at a slightly different point in time. From the perspective of ensuring sufficient transmission supply to the entire area though, it is important to consider the coincident peak, the point in time when the total demand from the stations in the area peaks. Aggregating the coincident station peak forecasts identifies the peak electricity demand that must be served by the area's transmission system and represents the electricity demand when the transmission assets in the overall area are most stressed and resources are most constrained.

[5] Historical electricity demand includes the impact of weather experienced at the time of system peak demand.

Energy adequacy is usually not a concern in regional planning, as the Region can generally draw upon energy available from the provincial electricity grid, with energy adequacy for the Province being planned through a separate process.

A regional peak demand forecast was developed for the forecast period. The steps taken to develop the planning forecast are depicted in Figure 5-2. Gross demand forecasts, which assume the weather conditions of an average year based on historical weather conditions and referred to as 'normal weather', were developed by Hydro Ottawa and Hydro One. These forecasts were then modified to reflect the peak demand impacts of provincial conservation targets and DG contracted through provincial programs such as FIT and microFIT, and adjusted to reflect extreme weather conditions in order to produce a reference planning forecast. The reference forecast was then used to assess electricity supply needs in the Region.

Figure 5-2: Development of Demand Forecasts



Using a planning forecast that is net of provincial conservation targets provides consistency with the province's Conservation First Framework by reducing demand requirements before assessing any growth-related needs. The planning forecast assumes that the targets will be met, and will produce the expected local peak demand impacts. Therefore, an important aspect of plan implementation will be monitoring the actual peak demand impacts of conservation programs delivered by the local LDCs and, as necessary, adapting the plan.

For the long term outlook, from 2023 to 2032, an additional forecast scenario, consistent with the growth assumptions embodied in the government's 2013 LTEP was added. This Ottawa provincial derived scenario represents a future with lower electricity demand growth, due to high electricity prices, increased electricity conservation, and lower energy intensity of the economy.

5.3 Reference Forecast

5.3.1 Gross Demand Forecast

The summer peak gross demand forecasts provided by Hydro Ottawa and Hydro One for each of the transformer stations in the Region can be found in Appendix A. These forecasts reflect the expected demand at each station at the time of the area's coincident peak under normal weather conditions, based on factors such as population, household and economic growth, and are consistent with known developments in the Region and the City of Ottawa's official plans.

Strong growth is expected to continue throughout the City of Ottawa. Based on the LDC's gross demand forecasts, the entire study area is expected to grow by nearly 700 MW of peak demand over the forecast period, with an average annual growth rate of about 2%, not including impacts of conservation or DG.

5.3.2 Conservation Assumed in the Reference Forecast

Conservation plays a key role in maximizing the useful life of existing infrastructure, and maintaining reliable supply. The 2013 LTEP established a long-term conservation target for the province of 30 TWh by 2032. These targets include all three components of conservation: codes and standards ("C&S"), customer response to time-of-use pricing, and efficiency programs implemented by LDCs. In order to represent the effect of these targets within regional planning, the IESO developed an annual forecast for peak demand savings resulting from the provincial energy savings target, which was then expressed as a percentage of demand in each year. These percentages were applied to the LDCs' demand forecasts to develop an estimate of the peak demand impacts in Ottawa from the provincial targets. The resulting conservation assumed in the reference forecast is shown in Table 5-1 below.

Table 5-1: Conservation Assumed in the Reference Forecast

Year	2014	2016	2018	2020	2022	2024	2026	2028	2030	2032
Savings (MW)	29	52	74	134	163	206	240	287	321	366

It is assumed that existing demand response ("DR") in the base year will continue through the entire Study Period. Savings from potential future DR resources are not included in the forecast and are instead considered as possible solutions to identified needs.

The above conservation forecast methodology was not applied in developing the longer-term Ottawa provincial derived scenario. This is because the Ottawa provincial derived scenario already accounts for the anticipated impact of the 2032 conservation targets in its overall growth rate assumptions.

5.3.3 Distributed Generation Assumed in the Reference Forecast

In addition to conservation resources, DG in the Region is also anticipated to offset peak demand requirements. The introduction of the GEA, and the associated development of the FIT program, has increased the significance of distributed renewable generation in Ontario. This generation, while intermittent in nature, contributes to meeting the electricity demands of the province.

In developing the planning forecast, after applying the conservation savings to the demand forecast, as described above, the forecast is further reduced with the expected peak contribution from existing and contracted DG in the area.

5.4 Planning Forecasts

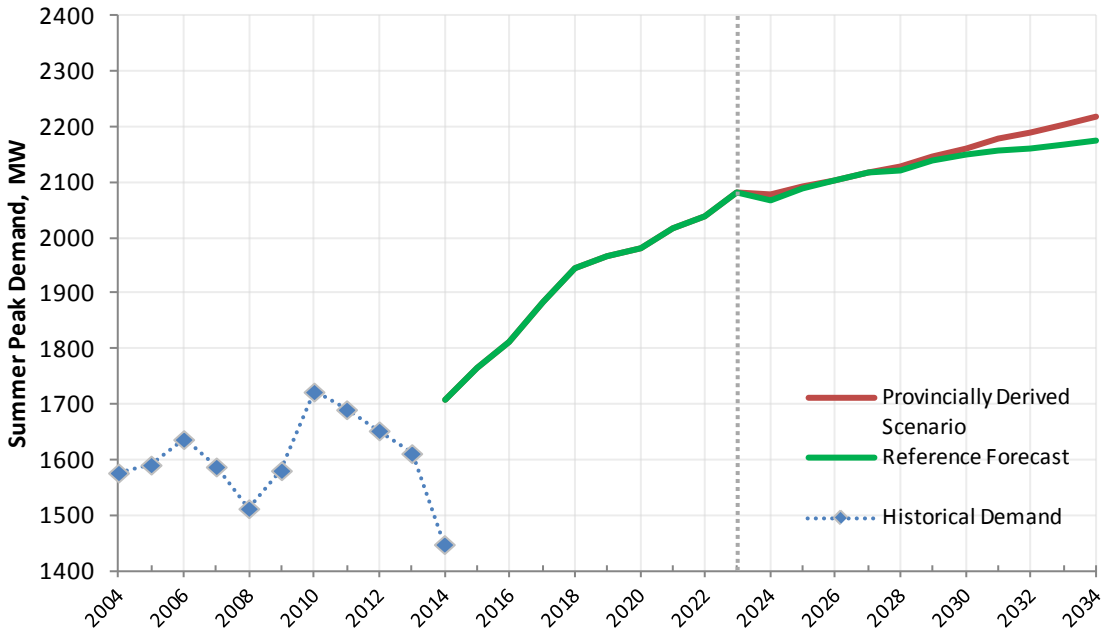
After taking into consideration the combined impacts of conservation and DG, a 20-year planning forecast was produced based on the LDC's demand forecasts. Beyond the first 10 years of the planning horizon (i.e. beginning in 2023) a second scenario referencing population projections and other electricity demand drivers as laid out in the 2013 LTEP is applied to account for long-term planning uncertainty. This scenario was developed by applying the average annual growth rate assumed for the Ottawa zone in the LTEP demand forecast, about 1% per year, to the Ottawa Region forecast, starting from 2023.

Figure 5-3 shows the reference forecast and the Ottawa provincial derived scenario, along with historic demand in the Region.

In the short term, the reference planning forecast for the entire Region grows at an average rate of approximately 2.1% per year, from 1,765 MW in 2015 to 2,080 MW in 2023; then starting in 2024, two planning scenarios are considered and two different growth scenarios can be observed: the LDC forecast scenario grows at 0.4% per year to 2,161 MW in 2032; and, the Ottawa provincial derived scenario grows at 0.9% per year to 2,246 MW in 2032. In the long term, both forecast scenarios are consistent in indicating that the Region will experience electricity demand growth.

In Figure 5-3 below, a significant difference between the 2014 actual historical load level and the forecast starting point can be observed. This is due to the fact that historical demand includes the impact of actual weather at the time of peak, while forecast demand includes the expected impact of extreme weather at time of peak.

Figure 5-3: Ottawa Region Historical Demand and Forecast Scenarios



6. Near- and Medium-Term Plan

This section describes the near- and medium-term needs for the Ottawa Region, as well as the options to address these needs. The near- and medium-term needs are based on the forecast provided by the Region's LDCs, reflecting known developments in the area, including the impact of planned conservation initiatives and DG. Regional planning involves comparing expectations for future electricity demand, as projected in a planning forecast, with the capability of the existing system, based on provincial assessment criteria, which are described in Section 6.1. This IRRP also included consideration of planning criteria, including reliability, cost, feasibility and maximizing the existing electricity system where economic to do so.

Supply needs for the Ottawa Region have been considered in two stages. First, the near- and medium-term plan for the overall Ottawa area is described in Section 6.2. This covers needs which affect supply to large portions of the Region. Further, the near- and medium-term plan for each of the three sub-systems: Nepean/Kanata, Downtown Ottawa, and East Ottawa/Orléans are covered in Sections 6.3, 6.4, and 6.5, respectively. This IRRP does not include assessment of the bulk supply to the Region, such the 500 kV supply.

Conservation was implicitly considered as the first alternative to meet the needs through the development of a planning forecast that includes the peak-demand effects of the provincial conservation targets, along with contracted DG. While additional conservation beyond the established targets was not considered as an alternative to meet the Region's near-term needs, the success of the near-term plan is dependent on the achievement of the peak-demand savings associated with meeting the LTEP conservation target. Efforts in the near term should be focused on ensuring that these savings materialize. Therefore, monitoring conservation efforts to ensure that this goal is met are included as a recommendation in the plan.

Due to the timing of the near-term needs, as well as the lead time required to develop and implement transmission solutions, the former OPA recommended in its June 2014 letter that development work be initiated on four transmission projects (see Section 2.1 above). The considerations around these recommendations are detailed below.

6.1 Ontario Resource and Transmission Assessment Criteria

The IESO's ORTAC,[6] the provincial standard for assessing the reliability of the transmission system, was applied to assess supply capacity and reliability needs.

The ORTAC includes criteria related to assessment of the bulk transmission system, as well as the assessment of local or Regional reliability requirements. The latter criteria are of relevance to this study and guided the technical studies performed in assessing the electricity system needs in the Ottawa Region. They can be broadly categorized as addressing two distinct aspects of reliability: (1) providing supply capacity, and (2) limiting the impact of supply interruptions.

With respect to supply capability, ORTAC specifies that the transmission system must be able to provide continuous supply to a local area, under specific transmission and generation outage scenarios. The performance of the system in meeting these conditions is used to determine the load meeting capability ("LMC") of an area for the purpose of regional planning. The LMC is the maximum load that can be supplied in the local area with no interruptions in supply or, under certain permissible conditions, with limited controlled interruptions as specified by ORTAC.

With respect to supply interruptions, ORTAC requires that the transmission system be designed to minimize the impact to customers of major outages, such as a contingency on a double-circuit tower line resulting in the loss of both circuits, in two ways: by limiting the amount of customer load affected; and by restoring power to those affected within a reasonable timeframe. Specifically, ORTAC requires that no more than 600 MW of load be interrupted in the event of a major outage involving two elements. Further, load lost during a major outage is to be restored within the following timeframes:

- All load lost in excess of 250 MW must be restored within 30 minutes;
- All load lost in excess of 150 MW must be restored within four hours; and
- All load lost must be restored within eight hours.

For the load loss and restoration criteria, ORTAC includes provisions whereby a request for exemption may be made to the IESO.

[6] http://www.ieso.ca/imoweb/pubs/marketadmin/imo_req_0041_transmissionassessmentcriteria.pdf

6.2 Overall Regional Supply

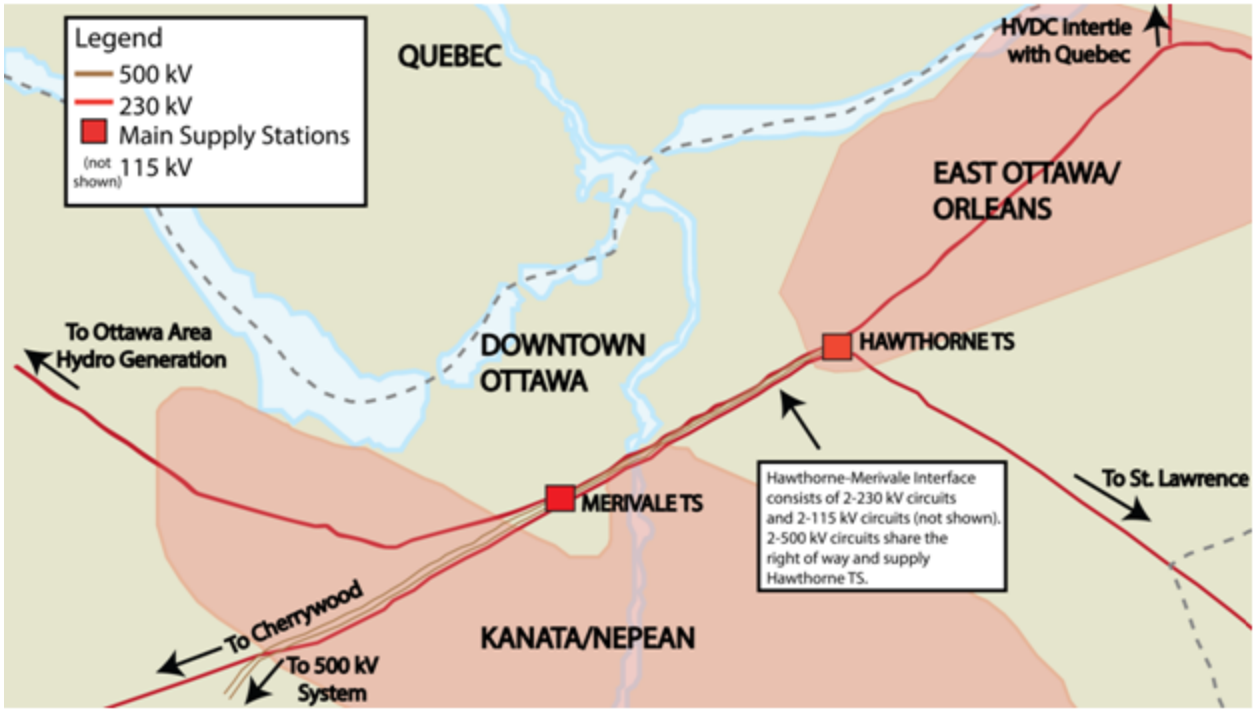
6.2.1 230/115 kV System Description

Transmission supply to the Region is provided through a 500 kV double circuit bulk system transmission line connecting to Hawthorne TS, a major TS on the eastern side of the city, and an expansive network of 230 kV and 115 kV transmission lines. Hawthorne TS and a second major TS on the west side of the City, Merivale TS, are the two main supply points for the Region. These stations have a total of six 230/115 kV transformers providing supply to the 115 kV system: four at Hawthorne and two at Merivale. Hawthorne and Merivale are connected by two 230 kV circuits in parallel with two 115 kV circuits. Together these circuits make up the Hawthorne-Merivale transmission interface, the major transmission supply path across the City. Merivale TS is the primary supply point for the western half of the Region and receives the majority of its supply through the Hawthorne-Merivale interface.

There are three transmission connected hydroelectric generating stations on the Madawaska River (Stewartville, Barrett Chute and Arnprior) and one on the Ottawa River (Chats Falls) which, due to their connectivity in the western part of the Ottawa area system, have the potential to reduce the need for supply from the transmission system. However, it is important to note that these hydroelectric plants are run-of-river type generators, which do not have the ability to store water for controlled use at specific times. This type of generation typically produces peak output during the spring due to melting snow and ice. Therefore, despite their combined nameplate capacity of 422 MW, these generators produce very low output at the time of peak system demand (which typically occurs during the summer) and do not contribute to offsetting the supply requirements from the transmission system. According to ORTAC, a planning study shall assume a level of output for run-of-river hydroelectric generation that is available 98% of the time. This results in an output level of approximately 12 MW for these generators.

Ontario's electricity system is connected to the Hydro Quebec system through an HVDC interconnection east of Hawthorne TS. Approximately 20% of power that is imported into Ontario through the HVDC interconnection flows toward Merivale TS via the Hawthorne-Merivale interface. The remainder is distributed towards other load centres in the province via the 500 kV connection at Hawthorne. The 500 kV and 230 kV transmission lines providing supply to the Region are show in Figure 6-1, below.

Figure 6-1: The Region's Major Transmission Lines and Stations



As shown in Figure 6-1, bulk system planning is generally distinct from regional planning, however there are important overlaps. In the case of Ottawa, ongoing bulk system studies are reviewing bulk supply issues that impact the Region, including use of the HVDC intertie for transactions with Quebec, as well as voltage support and 500 kV supply to the Region.

The existing transmission system in downtown Ottawa was built to meet urban electricity needs, with stations connected to double-circuit 115 kV and 230 kV lines providing redundant supply. The loads in the surrounding suburban (previously rural) and rural areas were primarily supplied by long, single-circuit 115 kV and 230 kV lines that provide limited supply diversity. With urban development now occurring across large parts of the Region, the existing system presents challenges for meeting the reliability of these broader and denser urban loads.

6.2.2 Near- and Medium-Term Forecast

Over the next 10 years, the peak demand across the entire Ottawa Region is forecast to grow by nearly 400 MW, or 22%. This growth is spread more or less proportionately over the three sub-systems, as described in more detail in subsequent sections.

6.2.3 Near- and Medium-Term Needs

Two near and medium-term needs have been identified that impact the overall Ottawa system:

1. the need for additional 230/115 kV transformer capacity at Hawthorne TS, and
2. the need for additional 230/115 kV transformer capacity at Merivale TS.

Need for Additional 230/115 kV Transformer Capacity at Hawthorne TS

The 230/115 kV transformer capability at Hawthorne TS is limited by two of the four transformers, T5 and T6. These two transformers have less transformation capability (225 MVA continuous rating) compared to the other two (250 MVA continuous rating). An outage under today's demand level at one of the larger transformers at Hawthorne TS, T5 or T6 would cause an overload under peak demand conditions in violation of the ORTAC supply adequacy criteria.[7] The forecast demand growth on the Ottawa 115 kV system will worsen the overload in future. In addition, these two transformers are about 60-years-old and approaching their end-of-life.

Need for Additional 230/115 kV Transformer Capacity at Merivale TS

There are two 230/115 kV transformers at Merivale TS that have different ratings: T21 is rated at 393 MVA and T22 is rated at 312 MVA (both LTR). Two key variables impact the utilization of these transformers: the demand in the area supplied by the Merivale 115 kV system, and the level of output from the three hydroelectric generators connected to that system (Stewartville and Barrett Chute and part of the Chats Falls Generating Station). As the demand on the two transformers increases under the current load forecast, the loss of T21 will result in T22 overloading in violation of the ORTAC supply adequacy criteria. At this point, additional transformer capacity will be required. The timing of this need for additional capacity will depend on the rate of demand growth; the level of generator output will also impact the net demand. These two variables are discussed further below.

Forecast demand growth that is impacting Merivale TS is also driving a more localized need for additional supply capability in the South Nepean area. This need is detailed in Section 6.3.3. A plan to supply this growth has not yet been finalized, but may consist of supplying future demand growth from a new 230 kV supply station southwest of Merivale, instead of continuing to add load to the 115 kV system as indicated in the current demand forecast. This option

[7] Limited-time ratings ("LTR") apply during outage conditions.

would reduce the loading on the transformers at Merivale compared to the current forecast and defer the need for increased transformer capacity.

Two of the hydroelectric generators on the Madawaska River, Stewartville and Barrett Chute, are connected to the Merivale 115 kV system. The output from these generators reduces the need for supply from the Merivale transformers. Based on the ORTAC, as described in Section 6.2.1, these two generators can be relied upon to supply about 12 MW of output for the two plants combined, or less than 5% of their combined nameplate capacity, a very low level of output. In combination with the demand forecast, this assumption suggests that additional transformer capacity would be required as early as 2019. However, if, for example, a level of 50 MW of output were available from these two generators, additional transformer capacity would not be required at Merivale until 2021. These results show the sensitivity of the transformer requirement to the dependable water output level.

6.2.4 Near- and Medium-Term Options

Need for Additional 230/115 kV Transformer Capacity at Hawthorne TS

Given the age of transformers, along with the immediate timing of the need, the Working Group recommends that Hydro One upgrade T5 and T6 with standard-sized 250 MVA units, at an estimated cost of $14 million and with a proposed in-service date of late 2017. This project was included in the June 2014 letter to Hydro One.

Need for Additional 230/115 kV Transformer Capacity at Merivale TS

The South Nepean area is currently supplied by stations connected to the Merivale 115 kV system. Based on the current demand forecast, additional supply will be needed in the South Nepean area around the end of the decade. One of the alternatives under consideration for South Nepean consists of transferring load from the existing 115 kV system to a new 230 kV supply point. Reducing demand on the 115 kV system in the South Nepean area would reduce the loading on the Merivale transformers, mitigating the need for increased Merivale transformer capability. Considering the lead-time required to implement a new 230 kV supply point a plan for the area must be confirmed in the near future. With this planning timeline in mind, it is reasonable to hold-off on committing to upgrade the two Merivale transformers until the plan for South Nepean, which may reduce the need for Merivale transformer capacity, has been finalized. A detailed discussion about the South Nepean supply issue can be found in Section 6.3, below.

Nevertheless, if no changes are made to the existing system and the current demand forecast materializes, there is a risk that low hydroelectric output during peak hours may impact supply reliability beyond 2019. If the situation arises where there is a need for additional transformer capacity before a planned solution is in place, a special protection system ("SPS") may be implemented for an interim period to enable the required amount of post-contingency load rejection ("L/R").

A community engagement process is the next step to confirming the preferred alternative for supply to South Nepean. In the near term, the focus will be on monitoring the load growth on the Merivale 115 kV system and the development of a supply plan for South Nepean. Following the release of this IRRP, the Working Group plans to meet at least once annually to review demand trends in the area and review the near-term forecast. As part of this monitoring plan, the timing for the thermal overload on the Merivale transformers can be updated, as this need is largely driven by the forecast demand in the area.

6.3 Nepean/Kanata

6.3.1 Sub-system Description

Located to the west and southwest of the Greenbelt, the Nepean/Kanata area has experienced extensive urbanization in recent years, a trend that is forecast to continue. The transmission system supplying this part of the Region was originally built to supply low density rural loads and consists of step-down transformer stations connected to long, single-circuit transmission lines with limited supply diversity. The configuration of this system presents challenges to meeting reliability criteria under extensive development and load growth. The situation is further complicated by geographical constraints, as any new transmission corridors to supply this part of the Region would have to cross the National Capital Commission Greenbelt and/or one of several rivers or developed communities in the area. A key focus of this IRRP, in addition to planning for supply capacity to meet forecast load growth, is to address these reliability challenges in a manner that minimizes costs and environmental impacts.

Figure 6-2: Nepean/Kanata Sub-system



The Nepean/Kanata sub-system as defined in this study is shown in Figure 6-2. The area encompasses the loads and future load growth supplied from the stations listed in Table 6-1

The majority of the step-down transformer stations in the area are supplied from the 115 kV circuits S7M, C7BM, L2M, A8M and M1R. These are single-circuit transmission lines that provide limited supply diversity. The northwestern part of the Nepean/Kanata sub-system is supplied by the 230 kV circuits C3S and M32S.

A new 230 kV station, Terry Fox MTS, owned by Hydro Ottawa, located at the western edge of Kanata, and supplied by the 230 kV circuit M29C came into service in November 2013, providing additional supply diversity in the area.

Table 6-1: Nepean/Kanata Step-down Transformer Stations

Supply Circuits	Transformer Station	Voltage (kV)	10 day LTR[8] (MW)	2014 Peak (MW)
S7M	Bridlewood MTS	115	36.9	34.2
S7M	Marchwood MTS	115	34.0	40.8
S7M	Fallowfield DS	115	26.0	36.1
S7M	Manotick DS	115	16.9	7.4
S7M	Richmond DS	115	5.4	4.9
C7BM	Manordale MTS	115	21.6	11.8
L2M	Limebank MTS	115	68.0	38.0
L2M	Marionville DS	115	15.0	13.0
A8M	Uplands MTS	115	29.7	29.4
M1R	South Gloucester DS	115	7.5	4.0
M1R	Greely DS	115	40.0	17.5
M1R	Russell DS	115	7.5	3.5
C3S/M32S	Kanata MTS	230	54.5	72.0
C3S/M32S	South March TS - H.O.	230	108.9	42.7
C3S/M32S	South March TS - H1	230	108.9	55.7
M32S	Nepean TS	230	144.0	142.7
M29C	Terry Fox MTS	230	90.0	0.0
N/A	National Aeronautical CTS	N/A	N/A	0.6

6.3.2 Near- and Medium-Term Forecast

Over the next 10 years, the peak demand in the Nepean/Kanata sub-system is forecast to increase by 134 MW or 23%. This increase includes the future connection of a new 20 MW load

[8] LTR apply during outage conditions.

customer at Richmond DS, as well as significant residential development in the South Nepean area. This localized demand growth is discussed in more detail below.

6.3.3 Near- and Medium-Term Needs

Three near term needs have been identified in the Nepean/Kanata sub-system:

1. the need for improved reliability of supply to Terry Fox MTS;
2. the need for additional supply capacity for a section of circuit S7M; and
3. the need for additional supply capacity in the South Nepean area.

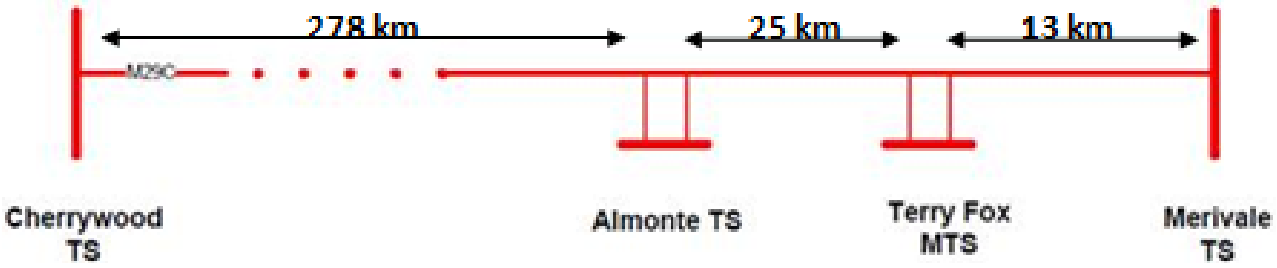
Need for Improved Reliability of Supply to Terry Fox MTS

Terry Fox MTS is a dual element spot network ("DESN") type station, a design which is typically supplied by two circuits, however the initial configuration of Terry Fox consists of two transformers, both connecting onto 230 kV circuit M29C, the only 230 kV supply in the vicinity. M29C is a 316 km circuit connecting Merivale TS in Ottawa to Cherrywood TS in east Greater Toronto Area ("GTA"). Another station - Almonte TS - is located west of Terry Fox, and is also solely supplied by this circuit.

Without a second supply circuit, any outage on M29C – usually occurring about 7-10 times per year - means an interruption of supply to load customers at these two stations. Generally these interruptions are momentary, however due to the configuration described above, there are currently limited options for restoring a sustained outage through distribution system transfers.

The addition of a new supply point benefits customers in the Nepean/Kanata area. Load that was previously supplied by stations connected to the 115 kV circuit S7M, which is nearing its supply capacity limit, has been transferred to Terry Fox, relieving the 115 kV system. An additional supply source in the area also provides improved reliability for some of the customers that continue to be supplied by S7M in the event of an outage on that circuit. The demand at Terry Fox is forecast to grow to a level of nearly 70 MW by 2020. Based on this forecast there is a need to improve the ability to restore interruptions at Terry Fox MTS.

Figure 6-3: 230 kV Circuit M29C



Need for Additional Supply Capacity for a Section of Circuit S7M

Circuit S7M is a 115 kV single circuit transmission line originating from Merivale TS and supplying the Nepean/Kanata area. With forecast demand growth in South Nepean, a section of the S7M circuit, the tap to Fallowfield DS (shown in the Figure 6-4 below), is expected to exceed its thermal capacity by 2019 under pre-contingency conditions. This section of the S7M circuit has the capability of supplying roughly 77 MW of load, based on its thermal rating. Three stations are supplied by this section: Fallowfield DS, Richmond DS and Manotick DS. Fallowfield DS and Richmond DS are both owned by Hydro Ottawa and Manotick DS is owned by Hydro One. By 2019 the demand for these three stations is forecast to reach 87 MW. This forecast includes a large Hydro Ottawa customer that has requested connection for a new 20 MW load at Richmond DS in 2019. Once the bulk load customer is connected, along with other growth that will be supplied by these stations, the capability of this section of S7M will be exceeded.

Figure 6-4: Limiting Section of Circuit S7M

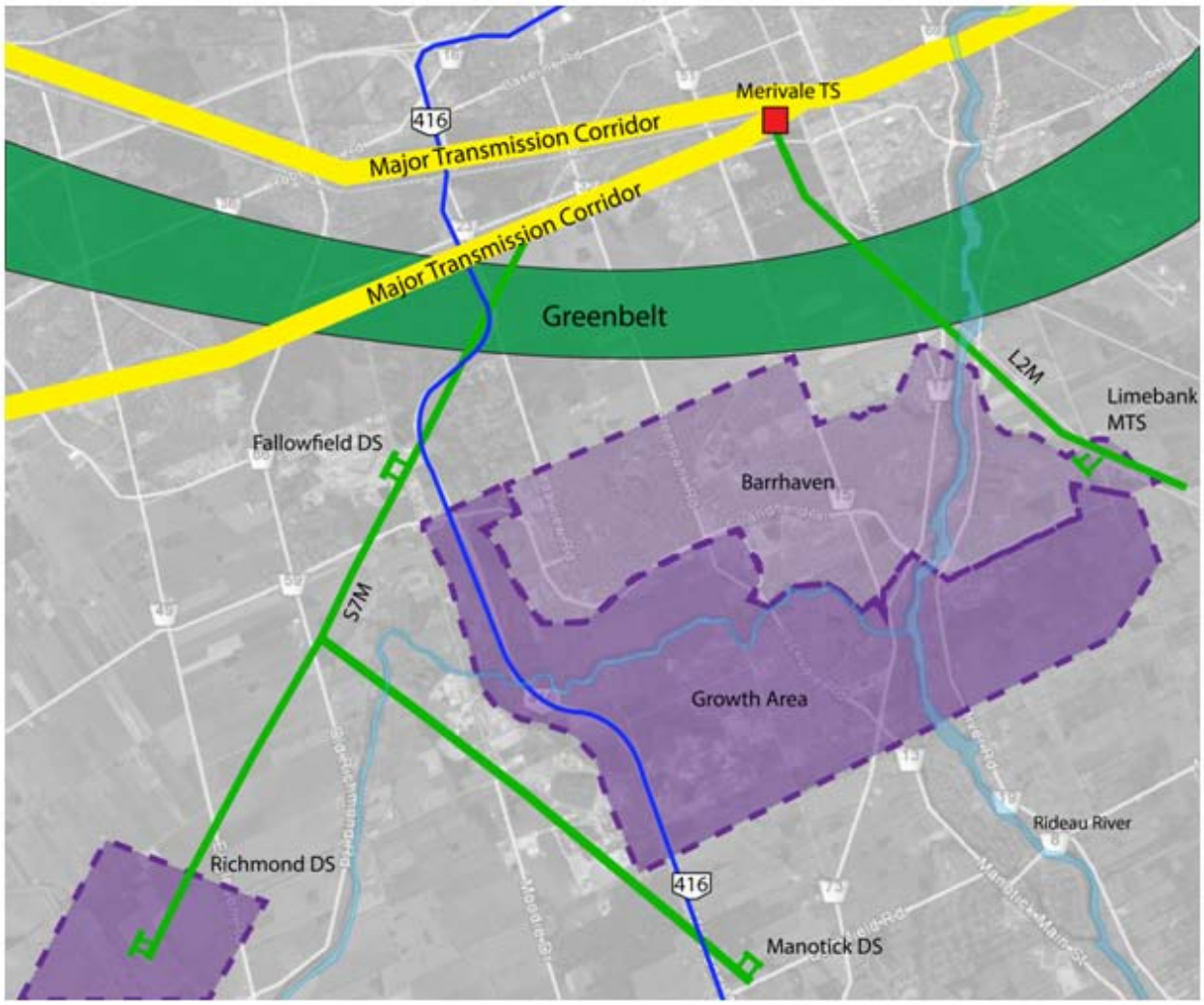


Need for Additional Supply Capacity in the South Nepean Area

While growth is forecast throughout the Nepean/Kanata area, over the next five years the most intense growth is forecast to be located in the South Nepean area, south of Barrhaven, as depicted in Figure 6-5 below. This area is divided by the Rideau River and is currently supplied by four surrounding stations which already supply Barrhaven: Fallowfield DS, Richmond DS, Manotick DS and Limebank MTS. Fallowfield, Richmond and Manotick are supplied by S7M, a single 115 kV circuit on the west side of the river, while Limebank is supplied by L2M, a single

115 kV circuit on the east side of the river. Fallowfield DS and Limebank MTS have already reached their station capacities.

Figure 6-5: South Nepean Growth Area



In addition to the thermal capacity need on the S7M section, transformer capacity is also needed in the South Nepean area. In the near term, Richmond DS will exceed its station capacity once the large industrial customer noted above is connected. In 2013, Hydro Ottawa increased the reliability of Fallowfield DS by adding a second supply transformer to the station; however this did not increase the station capacity, which is based on one element being out-of-service. Due to increasing demand from residential and commercial development in the area, Fallowfield DS will exceed its station capacity around the end of the decade.

6.3.4 Near- and Medium-Term Options

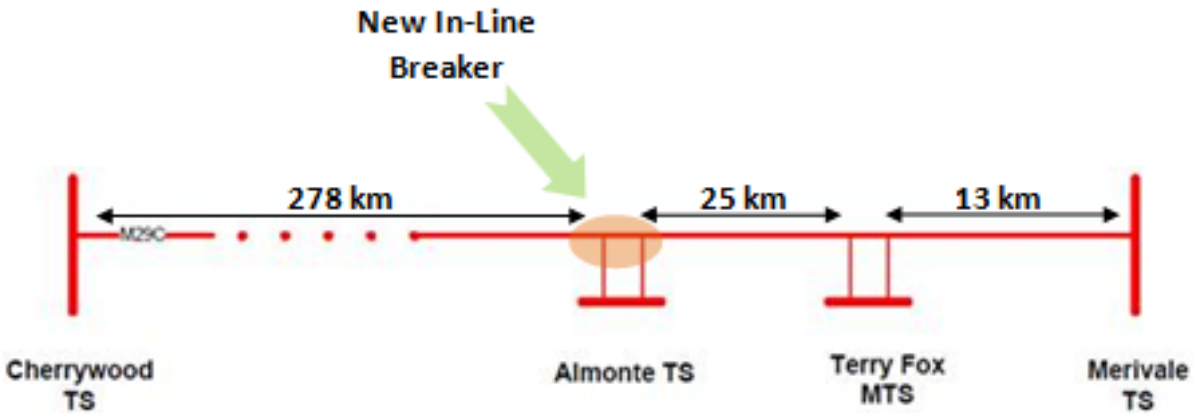
Need to Improve Reliability of Supply to Terry Fox MTS

The poor supply reliability at Terry Fox MTS is due to the system configuration in this area and is not triggered by load growth. Therefore, additional conservation and DG were not considered as viable options to meet this need. The Working Group has recommended proceeding with a near-term project of installing an in-line circuit breaker on M29C, west of Terry Fox MTS at Almonte TS, dividing this long circuit into two sections. This project will improve the reliability performance of the section of M29C supplying Terry Fox because following an outage affecting the long section of M29C west of the in-line breaker, the section east of the breaker would remain in service, supplied radially from Merivale TS. The Working Group discussed options for locating the breaker and agreed that the best location would be at Almonte TS because it could also provide benefits to the loads supplied from Almonte TS.

This project was included in the June 2014 letter to Hydro One. The breaker is scheduled to be in service by mid- 2015, with an estimated cost of under $5 million.

The Working Group noted that the breaker does not protect against outages occurring on M29C on the Merivale side of the breaker. Due to the long length of M29C, it is not feasible to restore Terry Fox MTS after an outage between Merivale TS and Terry Fox MTS, as operating this circuit radially from Cherrywood TS would result in voltage collapse. Nevertheless, it will provide substantial improvement in reliability for both stations, and can be achieved relatively quickly.

Figure 6-6: Recommended in-line Breaker on M29C



Need for Additional Capacity for a Section of Circuit S7M

To address the thermal capacity need on the S7M section, additional conservation and DG were considered as measures to manage demand growth. However, since this thermal need is mainly driven by the requested connection of a single large industrial customer, managing future demand growth for existing customers is not sufficient to address these capacity needs.

Hydro Ottawa is planning to upgrade Richmond DS in the near term in order to accommodate the anticipated growth at that station. In conjunction with this station upgrade, the Working Group has recommended increasing the rating of the limiting section of S7M to support the forecast demand growth in the area. This issue was included in the June 2014 letter to Hydro One. An increased rating on S7M will be achieved by Hydro Ottawa lowering a distribution feeder which passes under S7M, to increase the separation between the transmission line and the feeder. The combination of the upgraded Richmond DS and increased rating on S7M will be sufficient to serve the forecast growth in the Richmond community for the forecast period.

Need for Additional Supply Capacity in the South Nepean Area

Despite recently completed and planned upgrades to the existing transmission lines and stations serving the area, as well as current assumptions of significant conservation contributions across the Region, forecast demand growth in the South Nepean area will exceed the supply capability of the existing system around the end of the decade.

The next step in the regional planning process is for public engagement following the release of this IRRP in order to identify the preferred alternative for meeting the supply needs of this area, including consideration of the potential for incremental conservation and DG resources.

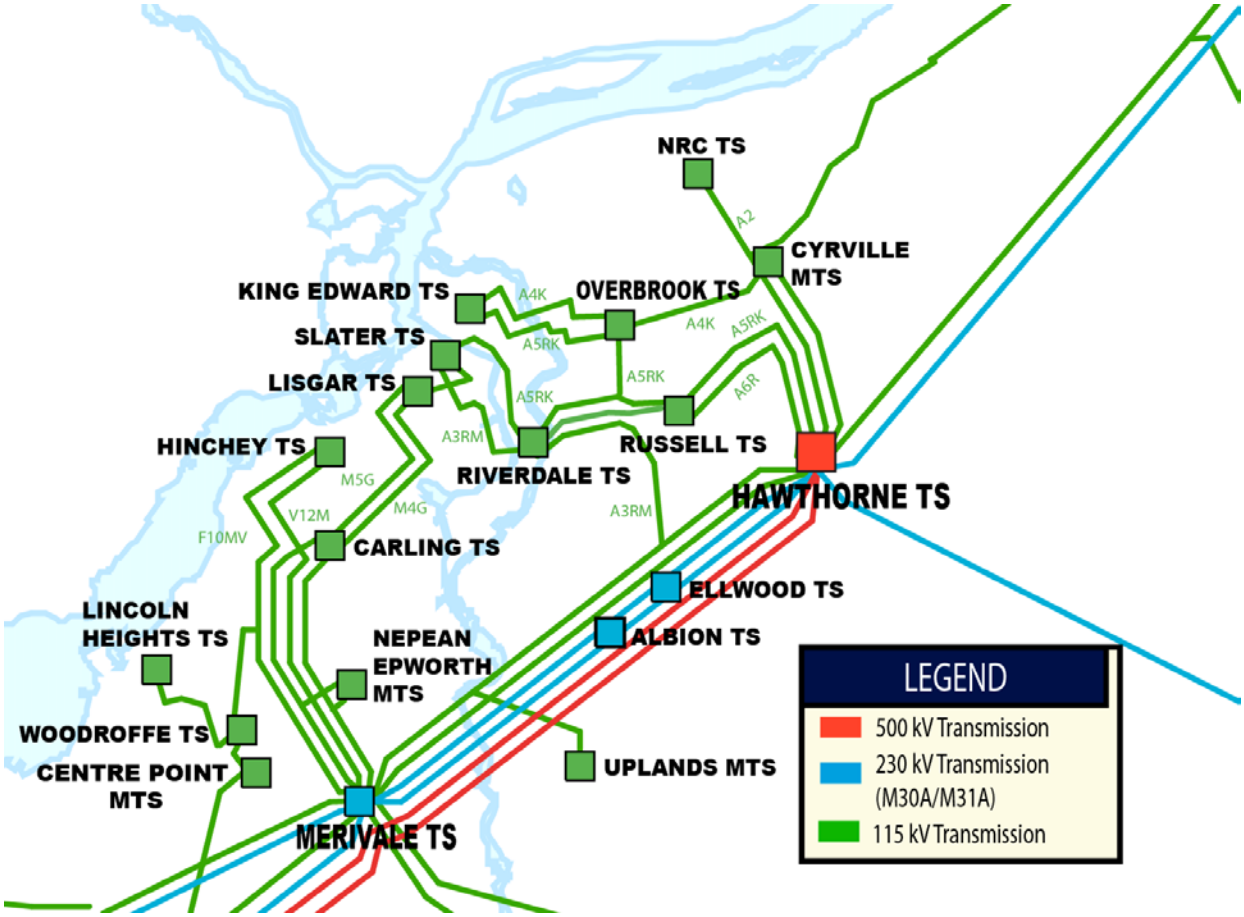
One option for providing new supply for South Nepean is transmission expansion in the form of a new TS and connection line supplied from the existing 230 kV system which is north of the Greenbelt. The timeline for early planning work, approvals (including environmental assessment) and construction of a new TS and connection line is typically at least five years. Given the required timeline, the Working Group recognizes that it would be beneficial for early planning work for a new TS and 230 kV connection line in the South Nepean area be initiated as an outcome of this IRRP, in parallel to the engagement process, in order to maintain this transmission solution as a feasible option.

6.4 Downtown Ottawa

6.4.1 System Description

For the purpose of this IRRP, Downtown Ottawa is defined as the geographic area bounded to the north by the Ottawa River and to the south by the Greenbelt, as shown in Figure 6-7 below. Downtown Ottawa is a substantially developed area with a high density of residential and commercial loads. The downtown system currently supplies about 800 MW of demand, including the downtown commercial core of the City of Ottawa, Parliament Hill, and the national museums and monuments located in the area.

Figure 6-7: Supply to Downtown Ottawa



The existing Downtown Ottawa transmission system is supplied from two main supply sources, Hawthorne TS and Merivale TS, from which 230 kV and 115 kV transmission lines radiate to supply 12 step-down transformer stations. The majority of the step-down transformer stations in the area are connected to 115 kV circuits A4K, A5RK, A6R and M4G/M5G. There are also connections to other 115 kV circuits including A3RM, A8M and F10MV/V12M. The south-eastern portion of Downtown Ottawa is supplied by the 230 kV circuits M30A/M31A.

All of the step-down transformer stations serving the Downtown Ottawa area are co-owned by Hydro One and Hydro Ottawa with the exception of Ellwood TS, which is wholly owned by Hydro Ottawa.

Planned Capacity Improvements in the Downtown Area

In 2014, Hydro Ottawa identified the requirement for increased transformer capacity at Lisgar TS by 2016 in order to supply anticipated near-term demand growth in the downtown sub-

system. Hydro Ottawa subsequently requested that Hydro One, the asset owner, increase the capacity at Lisgar TS by replacing both of the two existing 45/60/75 MVA transformers at the station with larger 60/80/100 MVA units. Hydro Ottawa has noted that the existing transformers have limited reverse power flow capability and that the new transformers will also be capable of connecting a larger capacity of renewable generation to the distribution system in the area.

The transformers at Overbrook TS are reaching their end-of-life. At Hydro Ottawa's request, Hydro One is proceeding to replace the two transformers at Overbrook with two larger units, increasing the supply capability of the station in conjunction with their planned sustainment driven replacement. The increased station capabilities at Lisgar and Overbrook have been included in the existing system capability for the analysis of future needs.

Table 6-2: Downtown Ottawa Step-down Transformer Stations

Supply Circuits	Transformer Station	High-Side Voltage (kV)	10 day LTR[9] (MW)	2014 Peak (MW)
M4G/M5G	Carling TS	115	92.7	89
F10MV/C7BM	Lincoln Heights TS	115	71.1	49
F10MV/C7BM	Woodroffe TS	115	91.8	29
F10MV/V12M	Hinchey TS	115	77.4*	40
M4G/A5RK/A3RM	Slater TS	115	117.9	105
M4G/M5G	Lisgar TS	115	108.0*	74
A4K/A5RK	King Edward TS	115	71.0	79
A6R/A5RK	Russell TS	115	69.3	64
A4/A5RK	Overbrook TS	115	129.6*	72
A3RM/A6R	Riverdale TS	115	105.3	82
M30A/M31A	Albion TS	230	88.2	61
M30A/M31A	Ellwood TS	230	58.5	34
A2	Nation Research TS	115	24.7	25
X522A/X523A	Hawthrone TS - H.O.	500	89.1	43
X522A/X523A	Hawthrone TS - H1	500	89.1	67
C7BM	Centrepoint MTS	115	35.1	13
M30A/M31A/M32S/M29C	Merivale TS	230	18.0	14
M4G/M5G	Epworth MTS	115	25.2	14

*These LTR reflect the completion of transformer replacement work that is currently planned or in progress

[9] LTR apply during outage conditions.

6.4.2 Near- and Medium-Term Forecast

Over the next 10 years, the peak demand in the downtown area is forecast to grow by about 205 MW or 21%. This growth demonstrates the continued intensification and development in the downtown area, including development of Ottawa's LRT system, the Confederation Line.

6.4.3 Near- and Medium-Term Needs

Three near- and medium-term needs have been identified in the downtown sub-system:

1. the need for additional transformer capacity at Russell TS, Riverdale TS and King Edward TS; and
2. the need to increase thermal capacity on the A4K circuit.

Need for Additional Transformer Capacity in the Downtown Core

When determining the overall transformer capacity needs of the downtown core, distribution system load transfers between stations, where feasible, are the preferred means of accommodating demand growth so as to maximize the use of existing TS infrastructure. After crediting the load transfers that are currently feasible in the demand forecast, three downtown stations, Russell, Riverdale, and King Edward are still expected to reach their supply capability around 2018.

Need for Additional Supply Capacity for Circuit A4K

A4K is a 115 kV circuit that originates at Hawthorne TS and supplies the east part of the downtown sub-system. Beginning around 2017, the main section of A4K, from Hawthorne TS to Blackburn Junction, is expected to exceed its rating following the loss of the companion circuit, A5RK. Following the loss of A5RK, A4K must supply Moulton TS, Overbrook TS, King Edward TS and part of Cyrville TS (also supplied by A2).

6.4.4 Near- and Medium-Term Options

Need for Additional Transformer Capacity in the Downtown Core

Based on recommendations from the Working Group, Hydro Ottawa, the LDC serving the downtown sub-system, plans to take the following three near-term actions to address the transformer capacity needs at Russell TS, Riverdale TS and King Edward TS:

1. Increase load transfer capability between Russell TS and other near-by stations by creating new distribution ties.

2. Increase load transfer capability between Riverdale TS and other near-by stations by creating new distribution ties.
3. Request Hydro One, the asset owner, to increase the station capacity at King Edward TS. The two transformers at King Edward TS have different ratings, with one rated at 45/75 MVA and the other rated at 60/100 MVA. Hydro One has confirmed that additional station capacity can be provided at King Edward TS by replacing the smaller transformer with a larger unit.

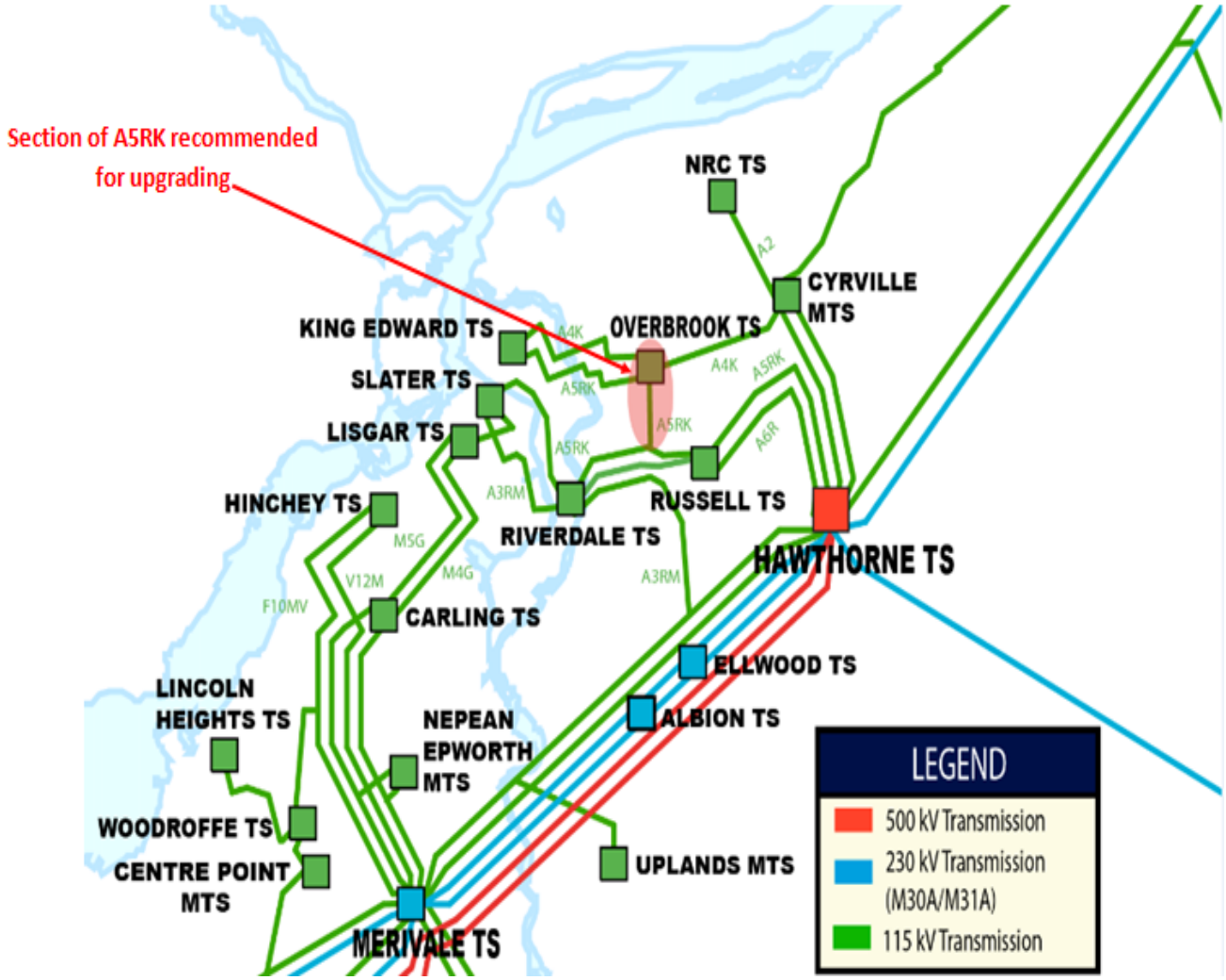
Need for Additional Supply Capacity for Circuit A4K

By 2025 demand from load served by A4K following the loss of A5RK is expected to exceed the supply capability of A4K by more than 45 MW and by 2032 the requirement for additional capacity is expected to be greater than 50 MW. Based on this large requirement, it is not feasible to target demand reduction through conservation or DG as a sufficient means of alleviating the need.

The Working Group therefore considered two transmission options to address the need: upgrading the main section of A4K and rebuilding a section of A5RK. Upgrading A4K would involve a section that is approximately 8 km in length while the rebuilding of the A5RK would involve a section that is about 2 km. Due to the ampacity rating of the existing main section of A4K, upgrading may not provide significant incremental supply capacity to the area. Therefore, the Working Group did not pursue the option of upgrading A4K.

The Working Group has recommended rebuilding the section of A5RK between Overbrook TS and Riverdale Junction and adding a tap to A6R to provide a double-circuit line supply to Overbrook TS. As part of this project, the supply to Overbrook TS will be reconfigured from being supplied by A4K/A5RK to being supplied by A5RK/A6R. This would reduce the loading on A4K following the loss of A5RK and relieve the thermal overload. This project was included in the June 2014 letter to Hydro One.

Figure 6-8: Recommended Rebuild Section of A5RK



6.5 East Ottawa/Orléans

6.5.1 System Description

The East Ottawa/Orléans area is defined in this study as shown in Figure 6-9 below. The main source of supply to the East Ottawa/Orléans area are the four 230/115 kV transformers at Hawthorne TS. The system serving the area includes the 230 kV circuit D5A and the 115 kV circuits H9A, A2 and A4K that originate at Hawthorne TS. The sub-system encompassing the loads and future load growth supplied from the stations are listed in Table 6-3. Orléans TS is a new Hydro One station that is expected to come into service in the second quarter of 2015, providing a new supply point for the southern part of the sub-system.

Figure 6-9: Supply to East Ottawa/Orléans

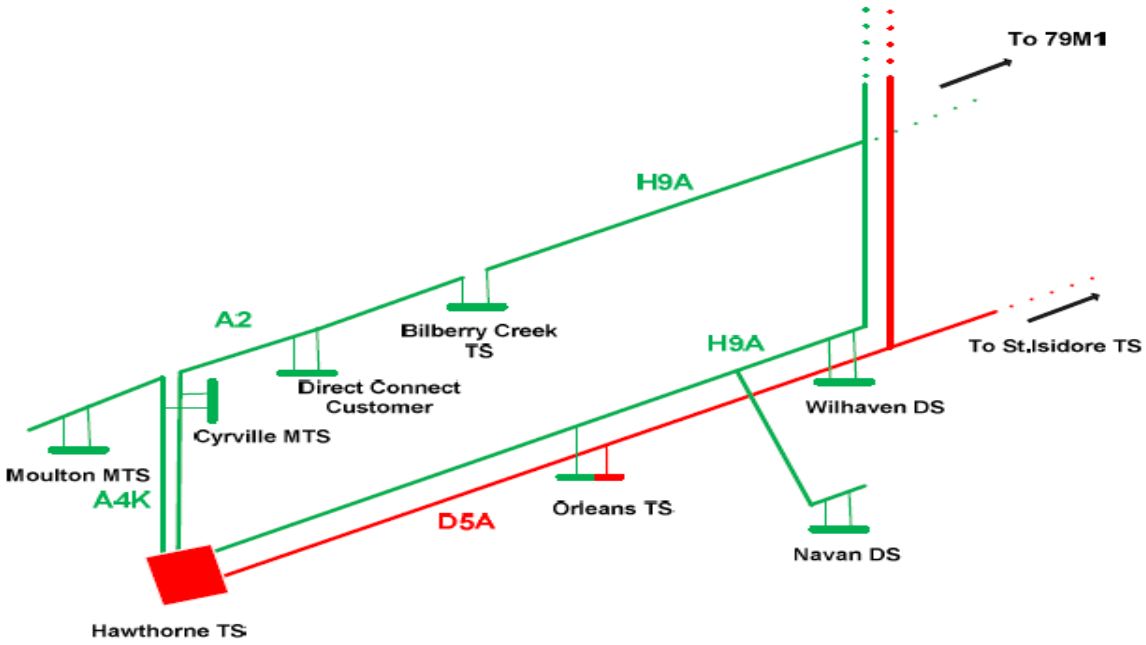


Table 6-3: East Ottawa/Orléans Step-down Transformer Stations

Circuit	Transformer Station	Voltage (kV)	10 day LTR[10] (MW)	2014 Peak (MW)
A2/H9A	Bilberry Creek TS - H.O.	115	84.6	45
A2/H9A	Bilberry Creek TS - H1	115	84.6	31
D5A/H9A	Orléans TS	230/115	101.7	0
A4K/A2	Cyrville MTS	115	58.5	20
A4K	Moulton MTS	115	34.0	26
H9A	Wilhaven DS	115	57.5	43
H9A	Navan DS	115	15.0	17
H9A	Cumberland DS	115	15.0	6

6.5.2 Near- and Medium-Term Forecast

Over the next 10 years, the East Ottawa/Orléans area will see an increase in the peak demand of about 57 MW or 27%. This increase is in part driven by the residential developments in the East Urban Community, where 4,000 housing units are expected to be built in the coming years.

6.5.3 Near- and Medium-Term Needs

Need for End-of-Life Refurbishment at Bilberry Creek TS

Bilberry Creek TS is a 115 kV station built in 1964 and owned by Hydro One. In recent years, this station has supplied a total of about 80 MW of load consisting mainly of Hydro Ottawa customers located in the northern part of the area as well as some Hydro One Distribution customers in the south part of the area. As mentioned above, Orléans TS is a new Hydro One station which will come into service in 2015 and will serve Hydro One Distribution customers who were previous supplied by Bilberry Creek TS, Wilhaven DS and Navan DS. Orléans TS

[10] Limited-time ratings (LTR) apply during outage conditions.

will reduce the load supplied by Bilberry Creek to about 50 MW consisting of solely Hydro Ottawa customers, allowing the remaining station capacity to be utilized as an emergency backup for Hydro One customers.

Hydro One Transmission has informed the Working Group that the two transformers, the low voltage breakers and the associated protection system at Bilberry Creek will reach their end-of-life around 2023. A decision will be needed around 2020 on whether to refurbish the station and maintain the 115 kV system in the area, or decommission the station and transfer its load to other stations, including Orléans TS.

Need for Improved Reliability of Supply to Orléans TS

Orléans TS is a DESN type station, a design which is typically supplied by two 230 kV circuits, or two 115 kV circuits, however the initial configuration of Orléans consists of one 230 kV circuit and one 115 kV circuit. The two transformers at Orléans are therefore connected to H9A (115 kV) and D5A (230 kV), respectively. As each transformer is connected to a different voltage, the station will be operated with the low voltage bus-tie breaker open. For loss of either the 230 kV or 115 kV supply circuit, the bus-tie breaker will close automatically, restoring supply to customers.

Despite the initial configuration of Orléans TS, the station improves the reliability in the East Ottawa/Orléans area as compared to the previous system. Under the previous system configuration, loads were supplied by HVDS, including Wilhaven and Navan, which could not survive following an N-1 contingency on H9A. Orléans TS provides additional transformation capacity in the area and accommodates some of the area's load growth on the 230 kV system, and provides dual supply reliability to customers who were previously connected to single supply stations on H9A (i.e. Wilhaven DS and Navan DS). However, due to the open bus-tie configuration, loads at Orléans TS will experience momentary outages upon N-1 transmission contingencies as the affected load is switched from one half of the station to the other stations. The demand at Orléans TS is forecast to grow to around 100 MW by 2022. Based on this forecast, this is not an immediate need.

6.5.4 Near- and Medium-Term Plan

Due to the timing of the need for a decision on the future of Bilberry Creek TS, no specific plan for this station is recommended at this time. Instead, this issue will be revisited in the next regional planning cycle, which is expected to begin around 2018. A preliminary study of the

two main options, refurbishing Bilberry Creek on the 115 kV system, or decommissioning the station and transferring load to the 230 kV system, indicates that the cost of the two alternatives is similar. Demand growth on the 115 kV system in downtown Ottawa over the next few years may make the decommissioning option more valuable, so as to limit the 115 kV system to the downtown area where urban density makes new transmission supply infeasible. On the other hand, the decommissioning option would remove a supply point from the northern part of the sub-system, increasing feeder exposure for customers in that area, and reducing flexibility on the distribution system.

No action is recommended for Orléans TS at this time, however, the reliability of supply at Orléans should be revisited during the next regional planning cycle in conjunction with the plan for Bilberry Creek TS. Increased demand at Orléans TS as a result of load transferred from Bilberry Creek may necessitate a second 230 kV supply to Orléans.

As an outcome of this IRRP, the Working Group will monitor demand in the East Ottawa/Orléans area over the next planning cycle. Should the near term demand in the East Ottawa/Orléans materialize sooner than forecast, the next planning cycle could be initiated in advance of the 5-year minimum timeline.

6.6 Summary of Recommended Actions for the Near- and Medium-Term Plan

Beginning in 2015, the province's LDCs will deliver energy efficiency ("EE") programs to their customers as part of Ontario's Conservation First Framework based on assigned energy targets. As described in Section 5.3.2, the IESO has estimated the impact of these programs on peak demand, as well as the impact of other initiatives such as improved C&S and TOU rates. These impacts have been included in the planning forecast that has been used to identify the near- and medium-term needs.

Similarly, DG continues to be added to the Region, as a result of province-wide generation procurement programs including the FIT and microFIT renewable generation programs. As described in Section 5.3.3, the impact of contracted distributed generation on peak demand has also been factored into the planning forecast.

Transmission and Distribution Reinforcements

A number of transmission reinforcements have been identified as part of the near- and medium-term plan for the Region. In June 2014 the former OPA provided a letter to Hydro One to initiate development work on four reinforcement projects, as discussed in Section 2.1.

The recommended actions to address the near-term needs are summarized in Table 6-4 below.

Table 6-4: Summary of Needs and Recommended Actions

Area	Needs	Timing	Recommended Actions
Overall Regional Supply	Additional 230/115 kV transformer capacity at Hawthorne TS	Today	June 2014 letter to Hydro One recommended replacing two transformers which are approaching their end-of-life with higher capacity units.
	Additional 230/115 kV transformer capacity at Merivale TS	As early as 2019	Monitor demand growth on the Merivale 115 kV system in conjunction with the development of a supply plan for South Nepean. If the situation arises where there is a need for additional transformer capacity before a planned solution is in place, a SPS may be implemented for an interim period to enable the required amount of post-contingency load rejection.
Nepean/ Kanata	Improved reliability of supply to Terry Fox MTS	Today	June 2014 letter to Hydro One recommended the installation of an in-line breaker in circuit M29C at Almonte TS.
	Additional supply capacity for a section of circuit S7M	By 2019	An increased rating for S7M will be achieved by Hydro Ottawa lowering a distribution feeder which passes under S7M, to increase the separation between the transmission line and the feeder.
	Additional supply capacity in the South Nepean area	Around 2020	Engagement will identify the community's preferred alternative for meeting supply needs in this area. Given the required timeline, it would be beneficial for early planning work for a new TS and 230 kV connection line in the South Nepean area be initiated in parallel to the engagement process, in order to maintain this transmission solution as a feasible option.
Downtown Ottawa	Additional transformer capacity in the downtown core	Around 2018	It is recommended that Hydro Ottawa, the LDC serving downtown Ottawa: Increase load transfer capability between Russell TS and other near-by stations. Increase load transfer capability between Riverdale TS and other near-by stations Request that Hydro One, the asset owner, increase the station capacity at King Edward TS.
	Additional supply capacity for circuit A4K	Around 2017	June 2014 letter to Hydro One recommended rebuilding the section of A5RK between Overbrook TS and the junction with A6R into a double-circuit line. As part of this project, supply to Overbrook TS will be reconfigured from being supplied by A4K/A5RK to being supplied by A5RK/A6R.
	End-of-life refurbishment at Bilberry TS	2023	A decision on whether to maintain Bilberry Creek TS or retire the station and transfer the load to the 230 kV system will be required by 2020. No specific actions are recommended at this time.

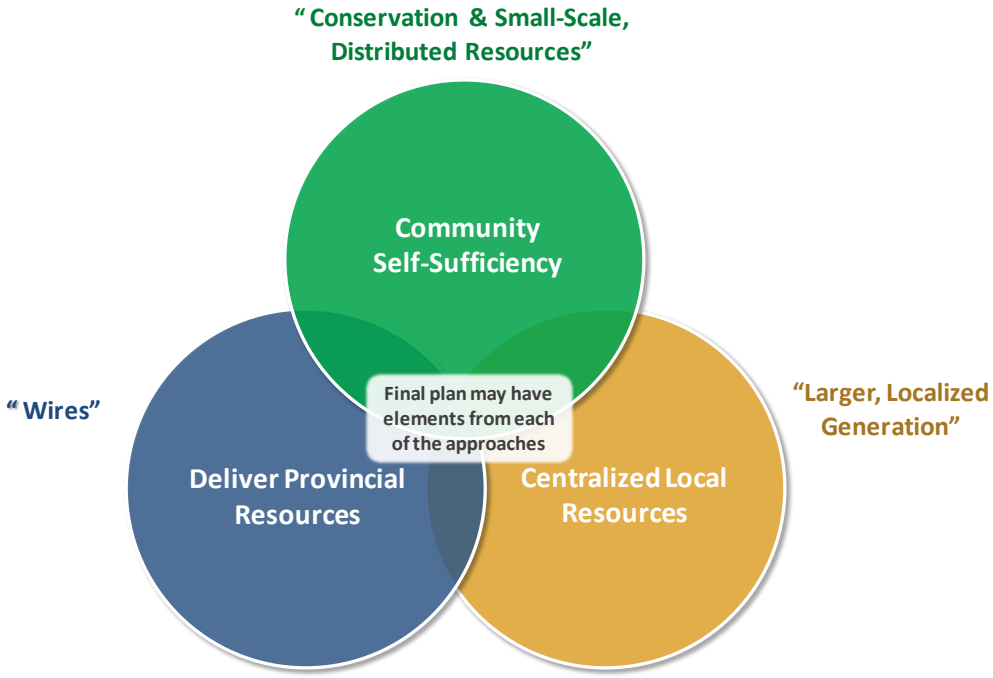
7. Long-Term Plan

No long-term supply capacity needs have been identified for the Ottawa Region at this time. Instead of considering specific needs and planning options, long-term planning activities for the Region will include engaging with First Nations and Métis communities and stakeholders; monitoring demand, conservation and DG trends in the area; coordinating with MEP/CEP activities; and generally laying the foundation for informed planning in the future. One additional consideration for the Region is that with continued load growth, there may be a need for voltage support in the long term. This bulk system issue, which is not part of the regional planning process, requires further detailed study. The IESO is planning to initiate this study in 2015.

In recent years, a number of trends, including technology advances, policy changes supporting DG, greater emphasis on conservation as part of electricity system planning, and increasing community interest and desire for involvement in electricity planning and infrastructure siting, are changing the landscape for Regional electricity planning. Traditional "wires" based approaches to electricity planning may not be the best fit for all communities. New approaches that acknowledge and take advantage of these trends, in addition to more traditional "wires-based", should also be considered.

To facilitate discussions about how a community might plan its future electricity supply, three conceptual approaches for meeting a region's long-term electricity needs provide a useful framework (see Figure 7-1). Based on regional planning experience across the province over the last 10 years, it is clear that different approaches are preferred in different Regions, depending on local electricity needs and opportunities, and the desired level of involvement by the community in planning and developing its electricity infrastructure.

Figure 7-1: Approaches to Meeting Long-Term Needs



The three approaches are as follows:

- **Delivering provincial resources**, or "wires" planning, is the traditional Regional electricity planning approach associated with the development of centralized electric power systems over many decades. This approach involves using transmission and distribution infrastructure to supply a Region's electricity needs, taking power from the provincial electricity system. This model takes advantage of generation that is planned at the provincial level, with generation sources typically located remotely from the Region. In this approach, utilities (transmitters and distributors) play a lead role in development.
- The **Centralized local resources** approach involves developing one or a few large, local generation resources to supply a community. While this approach shares the goal of providing supply locally with the community self-sufficiency approach below, the emphasis is on large central-plant facilities rather than smaller, distributed resources.
- The **Community self-sufficiency** approach entails an emphasis on meeting community needs largely with local, distributed resources, which can include: aggressive conservation beyond provincial targets; DR; DG and storage; smart grid technologies for managing distributed resources; integrated heat/power/process systems; and electric vehicles. While many of these applications are not currently in widespread use, for regions with long-term needs (i.e., 10-20 years in the future) there is an opportunity to

develop and test out these options before commitment of specific projects is required. The success of this approach depends on early action to explore potential and develop options, and on the local community taking a lead role. This could be through a MEP/CEP planning process, or an LDC or other local entity taking initiative to pursue and develop options.

Given that no long-term supply capacity needs have been identified in the Region, it is not necessary to consider the application of these options for Ottawa at this time. These concepts, which are being referenced in other planning regions around the province, are provided as background information for community members and stakeholders who are interested in the long-term considerations for regional electricity supply in Ottawa.

8. Community, Aboriginal and Stakeholder Engagement

Community engagement is an important aspect of the regional planning process. Providing opportunities for input in the regional planning process enables the views and preferences of communities to be considered in the development of the plan, and helps lay the foundation for successful implementation. This section outlines the engagement principles as well as the activities undertaken to date for the Ottawa IRRP and those that will take place to discuss the longer-term needs identified in the plan and obtain input in the development of options.

A phased community engagement approach has been developed for the Ottawa IRRP based on the core principles of creating transparency, engaging early and often, and bringing communities to the table. These principles were established as a result of the IESO's outreach with Ontarians to determine how to improve the regional planning process, and they are now guiding the IRRP outreach with communities and will ensure this dialogue continues and expands as the plan moves forward.

Figure 8-1: Ottawa IRRP Community Engagement Process



Creating Transparency

To start the dialogue on the Ottawa IRRP and build transparency in the planning process, a number of information resources were created for the plan. A dedicated web page was created on the IESO (former OPA) website to provide a map of the regional planning area, information on why the plan was being developed, the TOR for the IRRP and a listing of the organizations involved was posted on the websites of the Working Group members. A dedicated email

subscription service was also established for the Ottawa IRRP where communities and stakeholders could subscribe to receive email updates about the IRRP.

Engaging Early and Often

The first step in the engagement of the Ottawa IRRP was providing information to the municipalities and First Nation communities in the planning area. During the meeting held with the municipal planning representatives from the City of Ottawa, discussion included confirmation of the growth projections, discussion of the near- medium- and long-term needs identified in the area, a review of the identified near-term projects including those that have already begun due to timing requirements, and a discussion of the possible approaches to address medium- and long-term needs. The presentation and information was well received and form the foundation for building broader engagement and transparency in the development of the Ottawa IRRP.

Moving forward, engagement will continue on both the IRRP and the related near-term projects. For the projects identified as part of the near-term plan, Hydro Ottawa and Hydro One will undertake engagements on individual projects as needed. Information on these project-level engagements will be provided on the organization's website and will also be listed on the Ottawa IRRP main webpage.

Bringing Communities to the Table

Engagement on the IRRP will continue with a broader community discussion about the medium- and long-term needs identified in the regional plan. This engagement will begin with a webinar hosted by the Working Group to discuss the plan and initiate discussion of possible medium- and long-term options. Presentations on the Ottawa IRRP will also be made to the City of Ottawa Council, First Nation communities and the Métis Nation of Ontario on request.

To further continue the dialogue, a Local Advisory Committee (LAC) will be established in Ottawa as an advisory body to the Ottawa IRRP Working Group. The purpose of the committee is to establish a forum for members to be informed of the regional planning process. Their input and recommendations, information on local priorities, and ideas on the design of community engagement strategies will be considered throughout engagement and planning processes. The LAC meetings will be open to the public and meeting information will be posted on the IESO website. Information on the formation of the Ottawa LAC is available on the Ottawa IRRP main webpage.

Strengthening processes for early and sustained engagement with communities and the public were introduced following an engagement held in 2013 with 1,250 Ontarians on how to enhance regional electricity planning. This feedback resulted in the development of a series of recommendations that were presented to, and subsequently adopted by the Minister of Energy. Further information can be found in the report entitled "Engaging Local Communities in Ontario's Electricity Planning Continuum"[11] available on the IESO website.

Information on outreach activities for the Ottawa IRRP can be found on the IESO website and updates will be sent to all subscribers who have requested updates on the Ottawa IRRP.

[11] http://www.powerauthority.on.ca/stakeholder-engagement/stakeholder-consultation/ontario-Regional-energy-planning-review

9. Conclusion

This report documents an IRRP that has been carried out for the Ottawa Region, a sub-region of the Greater Ottawa planning region. The IRRP identifies electricity needs in the Region over the period from 2014 to 2032, recommends a plan to address the near-term needs that have been identified, and identifies actions to develop alternatives for the medium-term. No long-term needs have been identified in the Region at this time.

Implementation of the near-term plan is already underway, with the LDCs developing CDM plans consistent with the Conservation First Framework, and with infrastructure projects being developed by Hydro One.

To support development of the medium- and long-term plan, a number of actions have been identified to develop alternatives, engage with the community, and monitor growth in the Region. Information gathered as a result of these activities will inform the next regional planning cycle.

The planning process does not end with the publishing of this IRRP. Communities will be engaged in the development of the options for the medium and long term. In addition, the Working Group will continue to meet regularly throughout the implementation of the plan to monitor progress and developments in the area. If the demand forecast changes or conservation achievement is higher than forecast, the plan may be revisited in advance of the OEB-mandated 5-year schedule. This outcome would allow more time to develop alternatives and to take advantage of advances in technology in the next planning cycle.



Greater Ottawa

REGIONAL INFRASTRUCTURE PLAN

December 2, 2015

hydro one

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Prepared and supported by:

Company
Hydro One Networks Inc. (Lead Transmitter)
Hydro Ottawa Limited
Independent Electricity System Operator
Hydro One Networks Inc. (Distribution)
Hydro Hawkesbury Inc.
Ottawa River Power Corporation

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DISCLAIMER

This Regional Infrastructure Plan ("RIP") report was prepared for the purpose of developing an electricity infrastructure plan to address all near and mid-term needs identified in previous planning phases and also any additional needs identified based on new and/or updated information provided by the RIP Working Group.

The preferred solution(s) that have been identified in this report may be reevaluated based on the findings of further analysis. The load forecast and results reported in this RIP report are based on the information provided and assumptions made by the participants of the RIP Working Group.

Working Group participants, their respective affiliated organizations, and Hydro One Networks Inc. (collectively, "the Authors") make no representations or warranties (express, implied, statutory or otherwise) as to the RIP report or its contents, including, without limitation, the accuracy or completeness of the information therein and shall not, under any circumstances whatsoever, be liable to each other, or to any third party for whom the RIP report was prepared ("the Intended Third Parties"), or to any other third party reading or receiving the RIP report ("the Other Third Parties"), for any direct, indirect or consequential loss or damages or for any punitive, incidental or special damages or any loss of profit, loss of contract, loss of opportunity or loss of goodwill resulting from or in any way related to the reliance on, acceptance or use of the RIP report or its contents by any person or entity, including, but not limited to, the aforementioned persons and entities.

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EXECUTIVE SUMMARY

THIS REGIONAL INFRASTRUCTURE PLAN ("RIP") WAS PREPARED BY HYDRO ONE AND THE WORKING GROUP IN ACCORDANCE WITH THE ONTARIO TRANSMISSION SYSTEM CODE REQUIREMENTS. IT IDENTIFIES INVESTMENTS IN TRANSMISSION FACILITIES, DISTRIBUTION FACILITIES, OR BOTH, THAT SHOULD BE DEVELOPED AND IMPLEMENTED TO MEET THE ELECTRICITY INFRASTRUCTURE NEEDS WITHIN THE GREATER OTTAWA REGION.

The participants of the RIP Working Group included members from the following organizations:

- Hydro Ottawa Limited
- Hydro Hawkesbury Inc.
- Hydro One Networks Inc. (Distribution)
- Independent Electricity System Operator
- Hydro One Networks Inc. (Transmission)
- Ottawa River Power Corporation

This RIP provides a consolidated summary of needs and recommended plans for both the Ottawa Area Sub-Region and Outer Ottawa Area Sub-Region that make up the Greater Ottawa Region for the near term (up to 5 years) and the mid-term (5 to 10 years). No long term needs and associated plans (10 to 20 years) have been identified.

This RIP is the final phase of the regional planning process and it follows the completion of the Ottawa Sub-Region's Integrated Regional Resource Plan ("IRRP") by the IESO in April 2015 and the Outer Ottawa Area Sub-Region's Needs Assessment ("NA") Study by Hydro One in July 2014.

The major infrastructure investments planned for the Greater Ottawa Region over the near and mid-term, identified in the various phases of the regional planning process, are given in the Table below.

No.	Project	I/S date	Cost
1	Almonte TS: addition of breaker to sectionalize line M29C	November 2015	$4.7M
2	Russell TS and Riverdale TS: construction of feeder ties to allow extra load transfers	2017-2020	$2.0M
3	Lisgar TS: replacement of transformers T1 and T2	December 2017	$13.9M
4	Hawthorne TS: replacement of autotransformers T5 and T6	May 2018	$15.7M
5	Overbrook TS: replacement of transformers T3 and T4	June 2018	$1.1M[(1)]
6	115kV Circuit A6R: additional tap to off load Circuit A4K	June 2019	$9-11M
7	Hawthorne TS: replacement of transformers T7 and T8 and add one 44kV feeder position	October 2019	$1.1M[(2)]
8	King Edward TS: Replace Transformer T4	June 2021	$12M

[(1)] The transformers are at end of life and are being replaced as part of Hydro One sustainment program. The cost shown here represents the incremental cost of installing the next larger size units.

[(2)] Incremental cost for larger transformer only.

The IRRP study had also identified the need for additional 230/115 kV autotransformation capacity at Merivale TS and provision for a supply for a new station in the southwest area. The options to address these needs are still being studied by the Working Group and as part of the IESO community engagement activities. The Working Group expects to finalize recommendation to address these needs by summer 2016.

Investments to address the other mid-term needs, for cases where a decision is not required until 2020, will be reviewed and finalized in the next regional planning cycle.

No long term needs were identified at this time. As per the OEB mandate, the Regional Plan should be reviewed and/or updated at least every five years. The region will continue to be monitored and should there be a need that emerges due to a change in load forecast or any other reason, the next regional planning cycle will be started earlier to address the need.

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1. INTRODUCTION

THIS REPORT PRESENTS THE REGIONAL INFRASTRUCTURE PLAN ("RIP") TO ADDRESS THE ELECTRICITY NEEDS OF THE GREATER OTTAWA REGION.

The report was prepared by Hydro One Networks Inc. ("Hydro One") and documents the results of the joint study carried out by Hydro One, Hydro Ottawa Limited ("Hydro Ottawa"), Hydro Hawkesbury Inc. ("Hydro Hawkesbury"), Ottawa River Power Corporation ("ORPC") and the Independent Electricity System Operator ("IESO") in accordance with the Regional Planning process established by the Ontario Energy Board ("OEB") in 2013.

The Greater Ottawa Region covers the municipalities bordering the Ottawa River from Arnprior in the West to Hawkesbury in the East and North of Highway 43. At the center of this region is the City of Ottawa. Electrical supply to the Region is provided from fifty-two 230 kV and 115 kV step-down transformer stations. The summer 2015 area load of the Region was about 1800 MW. The boundaries of the Region are shown in Figure 1-1 below.

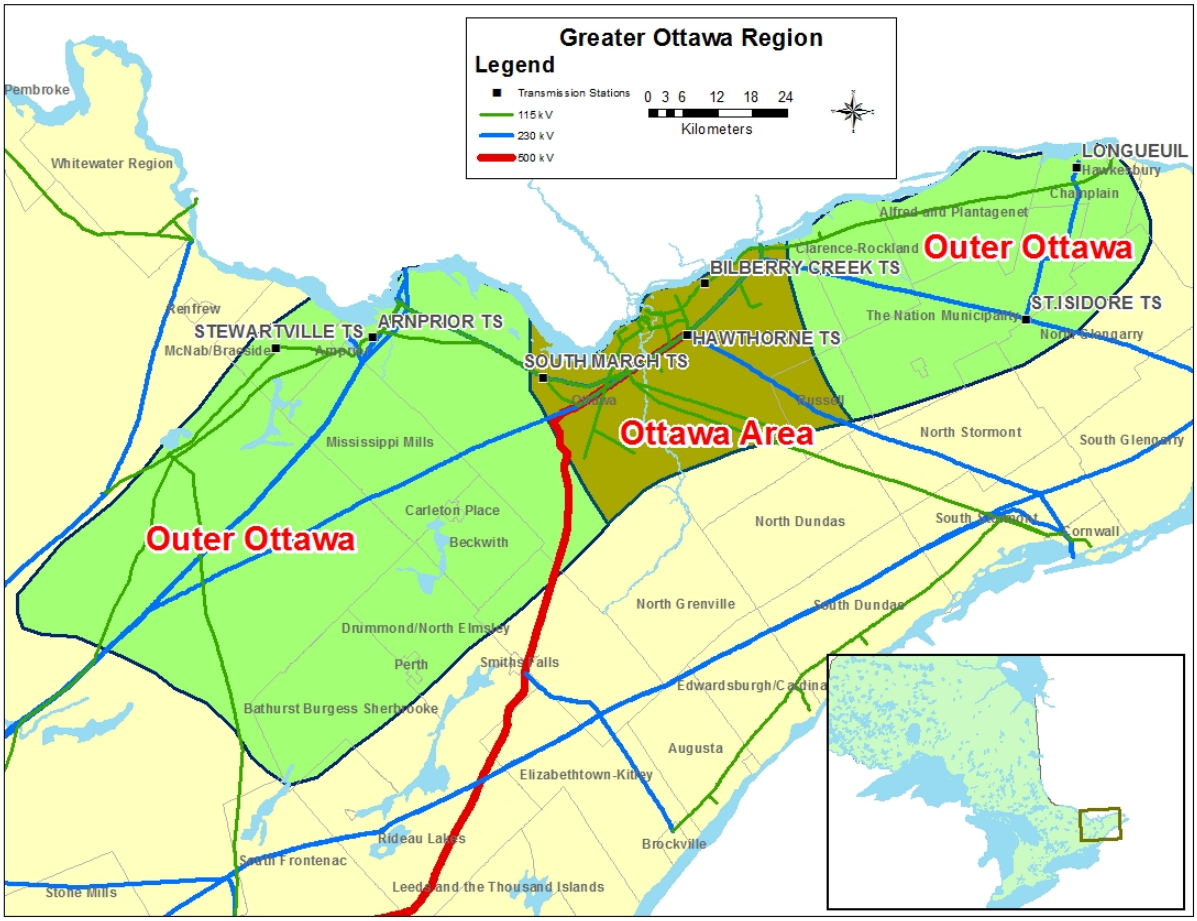


Figure 1-1 Greater Ottawa Region

1.1 Scope and Objectives

This RIP report examines the needs in the Greater Ottawa Region. Its objectives are to: identify new supply needs that may have emerged since previous planning phases (e.g. Needs Assessment, Local Plan, and/or Integrated Regional Resource Plan); assess and develop a wires plans to address these needs; provide the status of wires planning currently underway or completed for specific needs; and identify investments in transmission and distribution facilities or both that should be developed and implemented to meet the electricity infrastructure needs within the region.

The RIP reviews factors such as the load forecast, transmission and distribution system capability along with any updates with respect to local plans, conservation and demand management ("CDM"), renewable and non-renewable generation development, and other electricity system and local drivers that may impact the need and alternatives under consideration.

The scope of this RIP is as follows:

- A consolidated report of the needs and relevant plans to address near and mid-term needs (2015-2025) identified in previous planning phases (Needs Assessment, Scoping Assessment, Local Plan or Integrated Regional Resource Plan).
- Identification of any new needs over the 2015-2025 period and a wires plan to address these needs based on new and/or updated information.
- Develop a plan to address any longer term needs identified by the Working Group

The IRRP or RIP Working Group did not identify any long term needs at this time. If required, further assessment will be undertaken in the next planning cycle because adequate time is available to plan for required facilities.

1.2 Structure

The rest of the report is organized as follows:

- Section 2 provides an overview of the regional planning process.
- Section 3 describes the region.
- Section 4 describes the transmission work completed over the last ten years.
- Section 5 describes the load forecast and study assumptions used in this assessment.
- Section 6 describes the results of the adequacy assessment of the transmission facilities and identifies the needs.
- Section 7 discusses the needs and provides the alternatives and preferred solutions.
- Section 8 provides the conclusion and next steps.

2. REGIONAL PLANNING PROCESS

2.1 Overview

Planning for the electricity system in Ontario is done at essentially three levels: bulk system planning, regional system planning, and distribution system planning. These levels differ in the facilities that are considered and the scope of impact on the electricity system. Planning at the bulk system level typically looks at issues that impact the system on a provincial level, while planning at the regional and distribution levels looks at issues on a more regional or localized level.

Regional planning looks at supply and reliability issues at a regional or local area level. Therefore, it largely considers the 115 kV and 230 kV portions of the power system that supply various parts of the province.

2.2 Regional Planning Process

A structured regional planning process was established by the Ontario Energy Board ("OEB") in 2013 through amendments to the Transmission System Code ("TSC") and Distribution System Code ("DSC"). The process consists of four phases: the Needs Assessment [1] ("NA"), the Scoping Assessment ("SA"), the Integrated Regional Resource Plan ("IRRP"), and the Regional Infrastructure Plan ("RIP").

The regional planning process begins with the NA phase, which is led by the transmitter to determine if there are regional needs. The NA phase identifies the needs and the Working Group determines whether further regional coordination is necessary to address them. If no further regional coordination is required, further planning is undertaken by the transmitter and the impacted local distribution company ("LDC") or customer and develops a Local Plan ("LP") to address them. These needs are local in nature and can be best addressed by a straight forward wires solution.

In situations where identified needs require coordination at the regional or sub-regional levels, the IESO initiates the SA phase. During this phase, the IESO, in collaboration with the transmitter and impacted LDCs, reviews the information collected as part of the NA phase, along with additional information on potential non-wires alternatives, and makes a decision on the most appropriate regional planning approach. The approach is either a RIP, which is led by the transmitter, or an IRRP, which is led by the IESO. If more than one sub-region was identified in the NA phase, it is possible that a different approach could be taken for different sub-regions.

The IRRP phase will generally assess infrastructure (wires) versus resource (CDM and Distributed Generation) options at a higher or more macro level, but sufficient to permit a comparison of options. If the IRRP phase identifies that infrastructure options may be most appropriate to meet a need, the RIP phase will conduct detailed planning to identify and assess the specific wires alternatives and recommend

[1] Also referred to as Needs Screening.

a preferred wires solution. Similarly, resource options that the IRRP identifies as best suited to meet a need are then further planned in greater detail by the IESO. The IRRP phase also includes IESO led stakeholder engagement with municipalities and establishes a Local Advisory Committee in the region or sub-region. Since the Ottawa Sub-Region was in transition to the new regional planning process, the IESO led IRRP engagement for this sub-region was initiated after the completion of the IRRP.

The RIP phase is the final stage of the regional planning process and involves: confirmation of previously identified needs; identification of any new needs that may have emerged since the start of the planning cycle; and development of a wires plan to address the needs where a wires solution would be the best overall approach. This phase is led and coordinated by the transmitter and the deliverable of this stage is a comprehensive report of a wires plan for the region. Once completed, this report can be referenced in rate filing submissions or as part of LDC rate applications with a planning status letter provided by the transmitter. Reflecting the timelines provisions of the RIP, plan level stakeholder engagement is not undertaken at this stage. However, stakeholder engagement at a project specific level will be conducted as part of the project approval requirement.

The regional planning process specifies a 20 year planning assessment period for the IRRP. No specific period has been specified for the RIP. The RIP focuses on the wires options and, given the forecast uncertainty and the fact that adequate time is available to identify and plan new wire facilities in subsequent planning cycles, a study period of 10 years is considered adequate for the RIP. The only exception would be the case where major regional transmission is required for an area with limited or no transmission facilities. In these cases the RIP would review and assess longer term needs if identified in the IRRP.

To efficiently manage the regional planning process, Hydro One has been undertaking wires planning activities in collaboration with the IESO and LDCs for the region as part of and/or in parallel with:

- Planning activities that were already underway in the region prior to the new regional planning process taking effect.
- The NA, SA, and LP phases of regional planning.
- Participating in and conducting wires planning as part of the IRRP for the region or sub-region.

Figure 2-1 illustrates the various phases of the regional planning process (NA, SA, IRRP, and RIP) and their respective phase trigger, lead, and outcome.

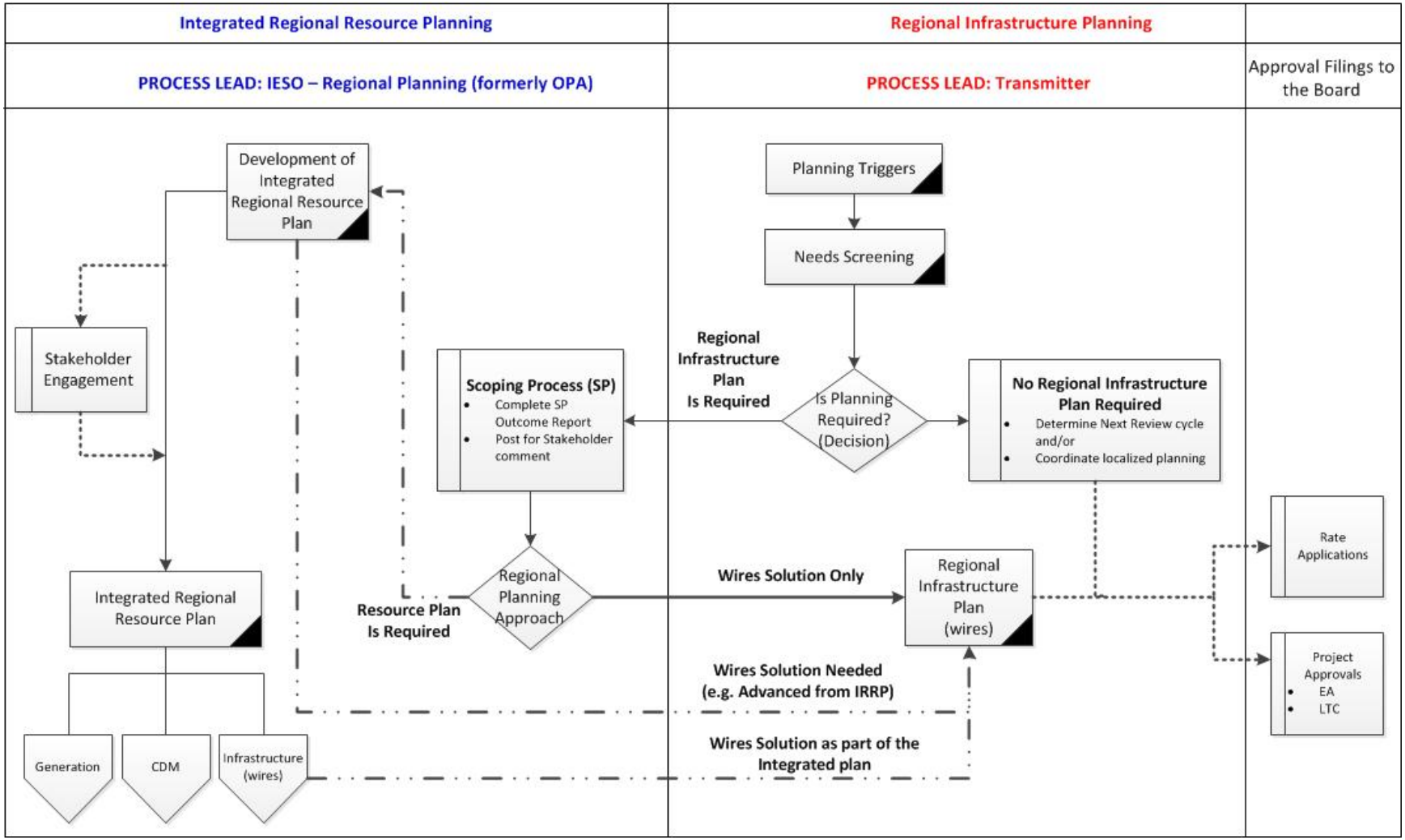


Figure 2-1 Regional Planning Process Flowchart

2.3 RIP Methodology

The RIP phase consists of a four step process (see Figure 2-2) as follows:

1. Data Gathering: The first step of the process is the review of planning assessment data collected in the previous stages of the regional planning process. Hydro One collects this information and reviews it with the Working Group to reconfirm or update the information as required. The data collected includes:
   - Net peak demand forecast at the transformer station level. This includes the effect of any distributed generation or conservation and demand management programs.
   - Existing area network and capabilities including any bulk system power flow assumptions.
   - Other data and assumptions as applicable such as asset conditions; load transfer capabilities, and previously committed transmission and distribution system plans.
2. Technical Assessment: The second step is a technical assessment to review the adequacy of the regional system including any previously identified needs. Additional near and mid-term needs may be identified at this stage.
3. Alternative Development: The third step is the development of wires options to address the needs and to come up with a preferred alternative based on an assessment of technical considerations, feasibility, environmental impact and costs.
4. Implementation Plan: The fourth and last step is the development of the implementation plan for the preferred alternative.

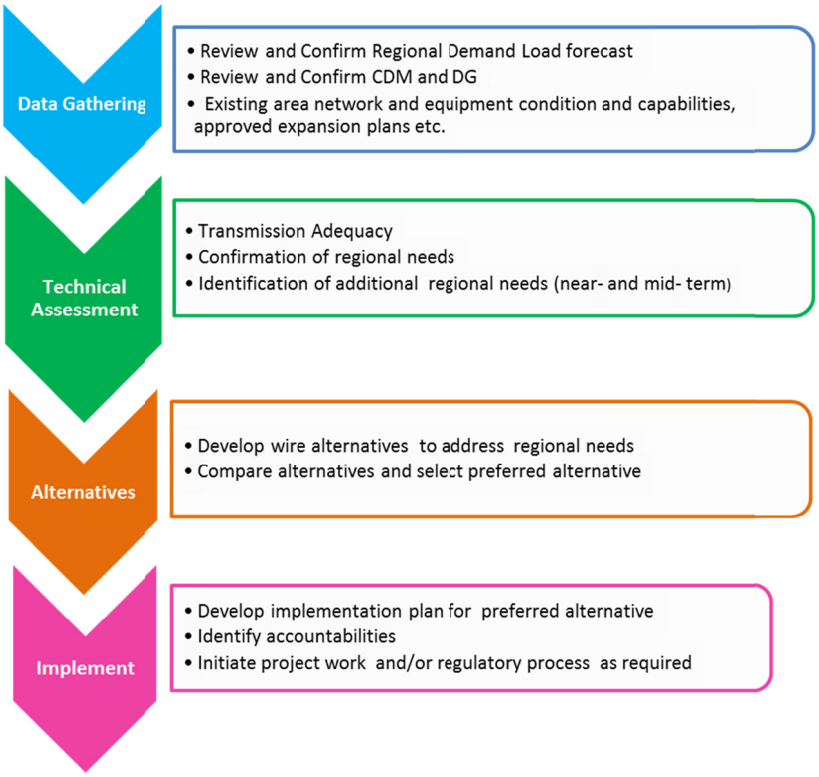


Figure 2-2 RIP Methodology

3. REGIONAL CHARACTERISTICS

THE GREATER OTTAWA REGION COVERS THE MUNICIPALITIES BORDERING THE OTTAWA RIVER FROM ARNPRIOR IN THE WEST TO HAWKESBURY IN THE EAST AND NORTH OF HIGHWAY 43. AT THE CENTER OF THIS REGION IS THE CITY OF OTTAWA (SEE FIGURE 3-1). ELECTRICAL SUPPLY TO THE REGION IS PROVIDED FROM FIFTY-TWO 230 KV AND 115 KV STEP-DOWN TRANSFORMER STATIONS. THE 2015 SUMMER PEAK AREA LOAD OF THE REGION WAS APPROXIMATELY 1840 MW.

Bulk electrical supply to the Greater Ottawa Region is provided through the 500/230 kV Hawthorne TS and a network of 230 kV and 115 kV transmission lines and step-down transformation facilities. The area has been divided into two sub-regions as shown in Figure 1-1 and described below:

- The Ottawa Sub-Region comprises primarily the City of Ottawa. It is supplied by two 230/115 kV autotransformer stations (Hawthorne TS and Merivale TS, eight 230 kV and thirty-three 115 kV transformer stations stepping down to a lower voltage. Local generation in the area consists of the 74 MW Ottawa Health Science Non-Utility Generator ("NUG") located near the downtown area and connected to the 115 kV network. The Ottawa Sub-Region is shown in Figure 3-1 below.

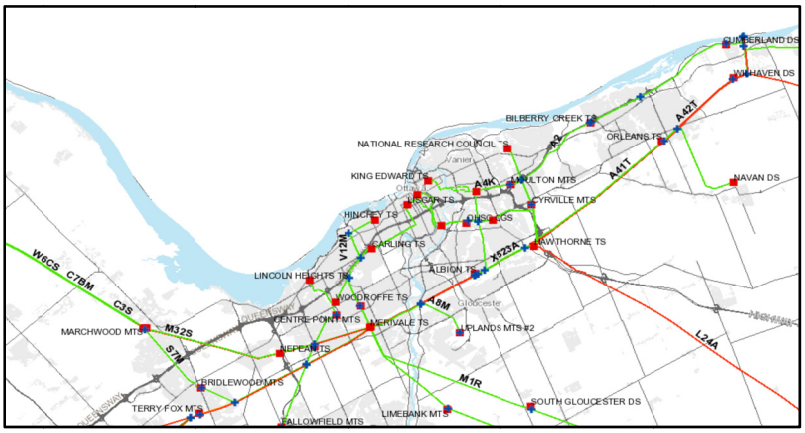


Figure 3-1 Ottawa Sub-Region

Hydro Ottawa is the main LDC that serves the electricity demand for the City of Ottawa. Hydro One Distribution supplies load in the outlying areas of the sub-region. Both Hydro Ottawa and Hydro One Distribution receive power at the step-down transformer stations and distribute it to the end users, i.e. industrial, commercial and residential customers.

- The Outer Ottawa Sub-Region covers the remaining area of the Greater Ottawa Region. The eastern area (shown in Figure 3-2) is served by three 230 and five 115 kV step-down transformer stations. Hydro One Distribution and Hydro Hawkesbury are the LDCs in the area that distribute power from the stations to the end use customers. It also includes a large industrial customer, Ivaco Rolling Mills, in L'Orignal, Ontario.

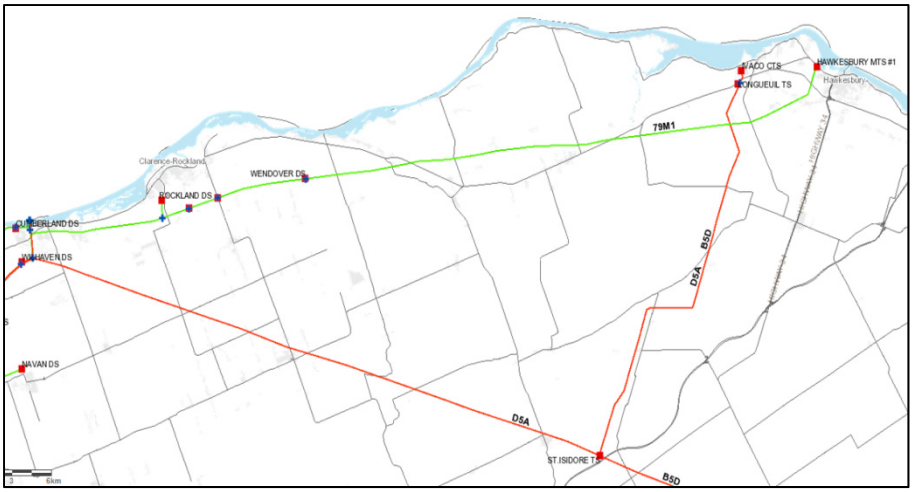


Figure 3-2 Outer Ottawa Sub-Region, Eastern Area

The western area of the Outer Ottawa Sub-Region is served by one 230 kV and two 115 kV step-down transformer stations. Hydro One Distribution is the LDC that supplies end use customers for these stations. The area includes the following generating stations: Barrett Chute GS, Chats Falls GS and Stewartville GS with a peak generation capacity of about 450 MW.

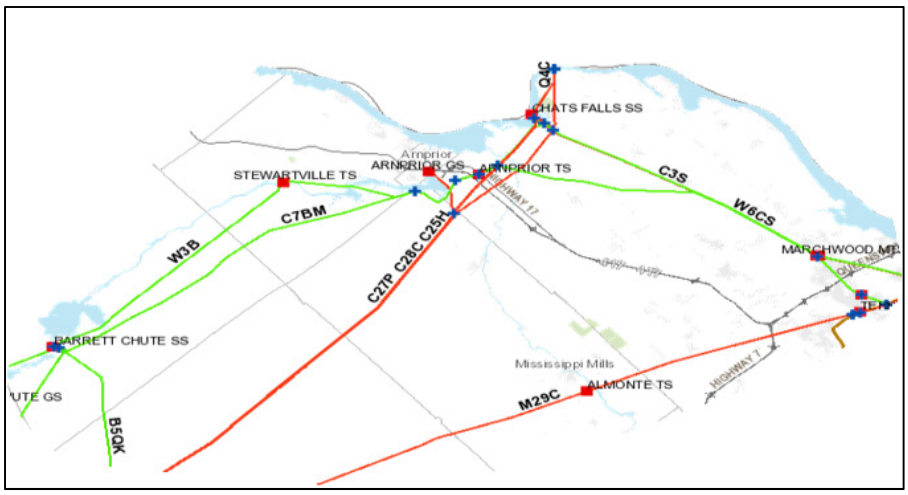


Figure 3-3 Outer Ottawa, Western Area

An electrical single line diagram for the Greater Ottawa Region facilities is shown in Figure 3-4.

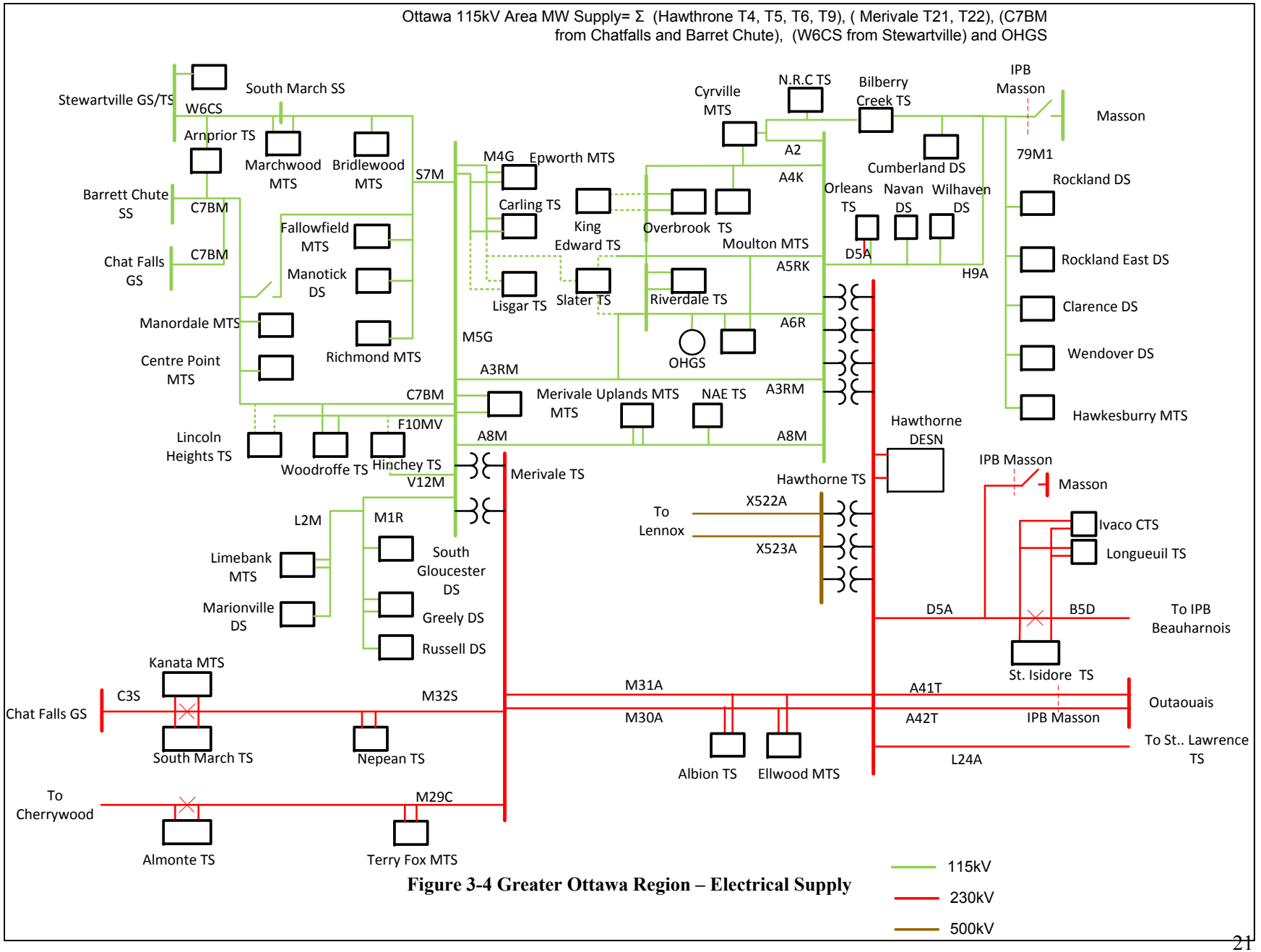


Figure 3-4 Greater Ottawa Region – Electrical Supply

4. TRANSMISSION FACILITIES COMPLETED OVER LAST TEN YEARS OR CURRENTLY UNDERWAY

OVER THE LAST 10 YEARS A NUMBER OF TRANSMISSION PROJECTS HAVE BEEN COMPLETED, OR ARE UNDERWAY, AIMED AT IMPROVING THE SUPPLY TO THE GREATER OTTAWA REGION IN GENERAL AND THE CITY OF OTTAWA IN PARTICULAR.

These projects were identified as a result of either: joint Hydro One, IESO and Hydro Ottawa planning studies to meet the needs of Hydro Ottawa or Hydro One Distribution; and/or, to meet provincial government policies. A brief listing of the completed projects over the last 10 years is given below:

- Hawthorne TS x Gamble Junction double circuit 230 kV Overhead line (2008) – the single 115 kV circuit H9A was rebuilt as a two circuit 230 kV tower line with increased capacity. Connect Cyrville MTS (2008) – connected new Hydro Ottawa owned Cyrville TS to 115 kV circuits A4K and A2.
- Hawthorne TS x Outaouais TS double circuit 230 kV line (2009) – built to provide up to 1250MW of transfer capability with Hydro Quebec as part of the new HVDC interconnection.
- Connect Ellwood MTS (2012) – connected new Hydro Ottawa owned Ellwood TS to 230 kV circuits M30A and M31A.
- Connect Terry Fox MTS (2013) – connected new Hydro Ottawa owned Terry Fox MTS to 230 kV circuit M29C.
- Hawthorne TS 115 kV switchyard Upgrade (2014) – replaced 115 kV breakers with inadequate short circuit capability with new breakers of higher short circuit capability. This work improved system reliability by allowing 115kV switchyards to be operated with bus tie closed. This work also facilitated incorporation of DG in the Ottawa area.
- Build new Orleans TS (2015) – built a new step-down transformer station in East Ottawa supplied from 230 kV circuit D5A and 115 kV circuits H9A. This station will provide additional load meeting capability to meet Hydro One Distribution and Hydro Ottawa requirements. It will also provide improved reliability for Hydro One Distribution customers in the Orleans-Cumberland area.
- Hinchey TS (2015) – Connect idle winding of transformer T1/T2 to new Hydro Ottawa metalclad switchgear.

The following projects are currently underway:

- Add 230 kV inline breaker on 230 kV circuit M29C at Almonte TS (2015) – to improve reliability of supply for Almonte TS and Terry Fox MTS.
- Replace 45/75 MVA, 115/13.2 kV step down transformers with new 60/100 MVA, 115/13.2 kV at Overbrook TS (2017) – the existing transformers are at end-of-life and the new replacement transformers have a higher rated capacity and will provide additional load meeting capability.

- Replace 225 MVA, 230/115 kV autotransformers T5 and T6 at Hawthorne TS with new 250 MVA, 230/115 kV autotransformers (2018) – the existing transformers have inadequate capacity and were identified and recommended for replacement during the IRRP phase for the Ottawa Sub-Region [1].
- Replace 50/83 MVA, 230/44 kV step down transformers with new 75/125 MVA, 230/44 kV units at Hawthorne TS (2019) – the existing transformers are at end-of-life and the new replacement transformers have a higher rated capacity and will provide additional load meeting capability.

5. FORECAST AND OTHER STUDY ASSUMPTIONS

5.1 Load Forecast

The load in the Greater Ottawa Area is forecast to increase at an average rate of approximately 2.25% annually up to 2020, at 0.96% between 2020 and 2025 and at 0.45% beyond 2025. The growth rate varies across the Region with most of the growth concentrated in the Ottawa Sub-region.

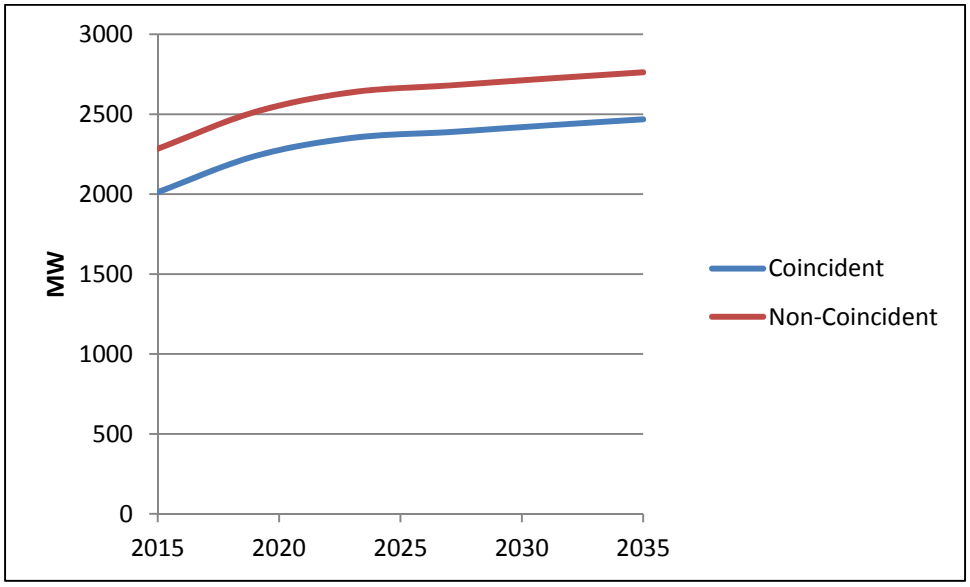


Figure 5-1 Greater Ottawa Region Summer Extreme Weather Peak Forecast

Figure 5-1 shows the Greater Ottawa Region extreme weather peak summer coincident and non-coincident load forecast. The coincident forecast represents the sum of the peak load at the time of the region's peak load and represents loads that would be seen by the autotransformer stations and is used to determine the need for additional auto-transformation capacity. The non-coincident forecast represents the sum of the individual stations peak load and is used to determine the need for stations and line capacity. Coincident and Non-coincident load forecasts for the individual stations in the Greater Ottawa Region are given in Appendix A.

The RIP load forecast was developed as follows:

- RIP Working Group participants confirmed that the load forecast, CDM, and DG information used in the IESO's 2015 IRRP for the Ottawa Sub-Region[1] and Hydro One's 2014 NA [2] was still valid and there were no changes.
- The station coincident loads used in the RIP are as given in the IRRP for Ottawa Sub-Region and NA for the Outer Ottawa Sub-Region. The coincident loading is used for evaluating the adequacy of bulk transmission circuits and the 230/115kV autotransformers.

- Stations non-coincident load forecast was developed using the summer 2015 actual peak load adjusted for extreme weather and applying the station net growth rates as identified in the IRRP and NA. The non-coincident forecast is used to determine adequacy of station capacity. The net growth rate accounts for CDM measures and connected DG. Details on the CDM and connected DG are provided in the IRRP [1] and NA for Ottawa Sub-Region [2] and are not repeated here.

5.2 Other Study Assumptions

The following other assumptions are made in this report.

- The study period for the RIP Assessments is 2015-2025.
- All planned facilities for which work has been initiated and are listed in Section 4 are assumed to be in-service.
- Summer is the critical period with respect to line and transformer loadings. The assessment is based therefore based on summer peak loads.
- Station capacity adequacy is assessed by comparing the non-coincident peak load with the station's normal planning supply capacity, assuming a 90% lagging power factor for stations having no low-voltage capacitor banks and 95% lagging power factor for stations having low-voltage capacitor banks. Normal planning supply capacity for transformer stations in this Sub-Region is determined by the summer 10-Day Limited Time Rating (LTR).
- Adequacy assessment is conducted as per ORTAC.

6. ADEQUACY OF FACILITIES AND REGIONAL NEEDS OVER THE 2015-2025 PERIOD

THIS SECTION REVIEWS THE ADEQUACY OF THE EXISTING TRANSMISSION AND DELIVERY STATION FACILITIES SUPPLYING THE GREATER OTTAWA REGION AND LISTS THE FACILITIES REQUIRING REINFORCEMENT OVER THE NEAR AND MID-TERM. NO LONG TERM NEEDS HAVE BEEN IDENTIFIED.

Within the current regional planning cycle two regional assessments have been conducted for the Greater Ottawa Region. The April 2015 Ottawa Sub-Region IRRP report [1] was prepared by the IESO in conjunction with Hydro One and Hydro Ottawa. The July 2014 Outer Ottawa Sub-Region NA report [2] was prepared by Hydro One and considered the remainder of the Greater Ottawa region.

The IRRP [1] and NA [2] planning assessments identified a number of regional needs to meet the area forecast load demand over the near to mid-term between 2015 and 2025. These regional needs are summarized in Table 6.1 and include needs for which work is already underway and/or being addressed by an LP study. A detailed description and status of work initiated or planned to meet these needs is given in Section 7.

A review of the loading on the transmission lines and stations in the Greater Ottawa Region was also carried out as part of the RIP report. Sections 6.1 to 6.3 present the results of this review. Additional needs identified as a result of the review are also listed in Table 6-1.

Table 6-1 Near and Mid-Term Regional Needs

Type	Section	Needs	Timing[4]
Needs identified in IRRP [1] and NA [2]			
230/115kV Transformation Capacity	7.1	Hawthorne TS T5 and T6 – LTR[1] exceeded	2018[2]
	7.2.1	Merivale TS T22 - LTR[1] exceeded	2019
Transmission Circuit Capacity	7.2.2	S7M Circuit – Capacity	2019 and 2026
	7.3	A4K Circuit - Capacity	2019[2]
Station Capacity	7.4	Center 115kV Area - Capacity	2017-2021[3]
	7.5	Hawthorne TS T7 and T8 – LTR[1] exceeded	2019
	7.2.2	South West Area - Capacity	2020
	7.6	Bilberry Creek TS - Refurbishment	2023
Supply Security, Reliability and Restoration	7.7	Almonte TS/Terry Fox MTS - Reliability	2015
	7.8	Orleans TS - Reliability	No plan recommended[5]
	7.9	B5D+D5A Circuits – Restoration	No plan recommended[5]
	7.10	Load Loss for S7M Contingency	No plan recommended[5]
Voltage Regulation	7.11	79M1 Circuit – Voltage Regulation	2023
	7.12	Stewartville TS – Voltage Regulation	No plan recommended[5]
	7.13	Almonte TS/Terry Fox MTS –Voltage Regulation	No plan recommended[5]
	7.14	Almonte TS – Low Power Factor	No plan recommended[5]
Additional Needs identified in RIP			
	7.2.1	Merivale TS T22 and Hawthorne TS T9 – Continuous ratings exceeded	2024/25
	7.4.2.4	King Edward TS – Capacity	2021

[1] LTR – Limited time ratings to accommodate emergency loading for a short time under contingency conditions
[2] Projects have been initiated.
[3] Miscellaneous stations. Some are already in execution.
[4] Timing shows the proposed in service date for project underway, and the need date for the projects not yet started.
[5] Review did not recommend plan for mitigation. Please see the need details in Section 7.

6.1 500 and 230 kV Transmission Facilities

All 500 kV and 230 kV transmission circuits in the Greater Ottawa Region are classified as part of the Bulk Electricity System ("BES"). They connect the Region to the rest of Ontario's transmission system and to the Hydro Quebec transmission system. A number of these circuits also serve local area stations within the region and the power flow on them depends on the bulk system transfers as well as local area loads. These circuits are as follows (refer to Figure 3-4):

1. Hawthorne TS to Merivale TS 230 kV transmission circuits M30A/M31A – supply Albion TS and Ellwood TS.
2. Hawthorne TS to Cornwall 230 kV transmission circuits D5A/B5D/B31L – supply Orleans TS, St. Isidore TS and Longueuil TS. Also connects to Hydro Quebec at Beauharnois Station and to Lievre Power at Masson GS.
3. Merivale TS to Chats Falls 230 kV transmission circuits M32S/C3S – supply Nepean TS, South March TS and Kanata MTS
4. Merivale TS x Cherrywood TS 230 kV transmission circuits E29C/E34M (M29C) – supply Terry Fox MTS and Almonte TS.

Based on current forecast station loadings and bulk transfers, the M30A/M31A circuits will require reinforcement by 2020. The M30A/M31A upgrade will be addressed by Hydro One based on the recommendation stemming from an IESO Bulk System Planning study [6]. All other 230 kV circuits are expected to be adequate over the study period.

6.2 230/115 kV Transformation Facilities

Almost sixty percent of the Region load is supplied from the 115 kV transmission system. The primary source of 115 kV supply is from 230/115 kV autotransformers at Hawthorne TS and Merivale TS. Additional support is provided from 115 kV generation at Barrett Chute GS, Stewartville GS, part of Chats Falls GS, and the Ottawa Health Science NUG and the Ottawa River generation at Chaudière. Support from DG and CDM was considered as part of the load forecast.

Table 6-2 summarizes the results of the adequacy studies and gives the need dates for reinforcement of the 230/115 kV autotransformer facilities at Hawthorne TS and Merivale TS. Assuming no change in the system configuration, the forecasted loading will result in the Limited Time Rating ("LTR") of the Merivale autotransformer being exceeded by 2019 and the continuous rating of the Merivale and Hawthorne autotransformers by 2024/25.

The need dates are sensitive to the availability of hydraulic generation from Barrett Chute GS, Stewartville GS and Chats Falls GS and are based on 98% dependable generation availability as per ORTAC criteria. This corresponds to about 18 MW of available generation. A higher level of generator output from these stations would defer the need dates.

The need dates assume that the Hawthorne TS 225 MVA, 230/115 kV autotransformers T5 and T6 have been replaced with new 250 MVA units. The T5 and T6 replacement work is underway and is therefore not identified in the table below.

Table 6-2 Adequacy of 230/115 kV Autotransformer Facilities

Overloaded Facilities	2015 MVA Loading	MVA Load Meeting Capability	Limiting Contingency	Need Date
Merivale TS 230/115kV autotransformer T22	261	312[(1)]	T21	2019
Merivale TS 230/115kV autotransformer T21	182	250	[(2)]	2024
Hawthorne TS 230/115kV autotransformer T9	189	250	[(2)]	2025

[(1)] Limited time rating exceeded.

[(2)] Continuous rating exceeded with all elements in service based on existing system configuration

6.3 115 kV Transmission Facilities

The Greater Ottawa Region 115 kV transmission facilities can be divided in five main sections: Please see Figure 3-4 for the single line diagram.

1. Hawthorne 115 kV Center – has four circuits A3RM, A4K, A5RK and A6R. Reinforcement is required for the A4K circuit as a loss of the A5RK circuit would result in the loading exceeding the rating on the A4K circuit between Hawthorne TS and Moulton MTS (for details see Section 7.3).
2. Hawthorne 115 kV East – has two circuits A2 and H9A/79M1. These are expected to be adequate over the study period.
3. Merivale 115 kV Center – has two circuits M4G and M5G. These are expected to be adequate over the study period.
4. Merivale 115 kV West – has five circuits C7BM, F10MV, S7M, V12M and W6CS. Upgrading is required of the S7M tap to Fallowfield TS since forecasted loading will exceed circuit continuous rating (for details see section 7.4)
5. Merivale 115 kV South – has two circuits L2M and M1R. These circuits are adequate for the study period.

The loading on the limiting sections is summarized in Table 6-3.

Table 6-3 Adequacy of 115 kV Circuits

Corridor	Section	Overloaded Circuit	Rating (A)	Contingency	2015 Loading (A)	Need Date
1. Hawthorne TS x Blackburn Jct. x Overbrook TS	Hawthorne TS x Moulton TS	A4K	1070	A5RK	1006	2017
4. S7M tap to Fallowfield MTS	STR R14-R15 x Fallowfield Jct.[2]	S7M	590	All facilities in-service[1]	278	2024

[1] Continuous rating exceeded.
[2] Please see Figure 7-4.

6.4 Step-Down Transformation Facilities

There are a total of fifty-two step-down transmission connected transformer stations in the Greater Ottawa Region. The stations have been grouped based on the geographical area and supply configuration. The non-coincident station loading in each area and the associated station capacity and need date for relief is provided in Table 6-4 below. As shown areas requiring additional transformation capacity are the Center 115kV area, the South West 115kV area and the South 115kV area. Table 6-5 shows the non-coincident station loads for all areas which are adequate over the 2015-2025 study period. Details of the areas and associated stations are given in Appendix B.

Table 6-4 Adequacy of Step-Down Transformer Stations - Areas Requiring Relief

Area/Supply	Capacity (MW)	2015 Loading (MW)	Need Date
Center 115	569[1]	516	2018
South West 115	70	60	2019
South 115	182	151	2024

[1] With Overbrook TS 45/75 MVA transformers replaced with larger 60/100 MVA units.

Table 6-5 Adequacy of Step-Down Transformer Stations – Areas Adequate

Area/Supply	Capacity (MW)	2015 Loading (MW)	2025 Loading (MW)
East 115	340	231	229
West 115	504	351	425
Center 230/13.2kV	147	121	126
Center 230/44kV	153[(1)]	103	136
West 230	397	382	389
Outer East 115	80	56	62
Outer West 115	106	83	96
Outer East 230	149[(2)]	92	90
Outer West 230	100	48	45

[(1)] With Hawthorne TS 50/83 MVA transformers replaced with larger 75/125 MVA size units.
[(2)] Includes Longueuil TS and St Isidore TS load.

7. REGIONAL PLANS

This section discusses needs, presents wires alternatives and the current preferred wires solution for addressing the electrical supply needs for the Greater Ottawa Region. These needs are listed in table 6-1 and include needs previously identified in the IRRP for the Ottawa Sub-Region [1] and the NA for the Outer Ottawa Sub-Region [2] as well as the adequacy assessment carried out as part of the current RIP report.

7.1 Hawthorne Autotransformer T5 and T6

7.1.1 Description

Hawthorne TS is a major supply point for the city of Ottawa (Figure 7 -1). The station has four 230kV/115 kV autotransformers. Two of these autotransformers, T5 and T6, have lower ratings, with 225 MVA continuous and 256 MVA LTR, respectively. Under contingency conditions, i.e. one of the autotransformers out of service, the ratings of these two autotransformers are exceeded and this limits the supply to the 115 kV network from the 230 kV system. As the load continues to grow on the 115 kV network, this limitation needs to be addressed. This had been identified as a near term need in the Ottawa Sub-Region IRRP [1] and was included in the Ontario Power Authority's ("OPA", now part of IESO) June 2014 letter to Hydro One [5].

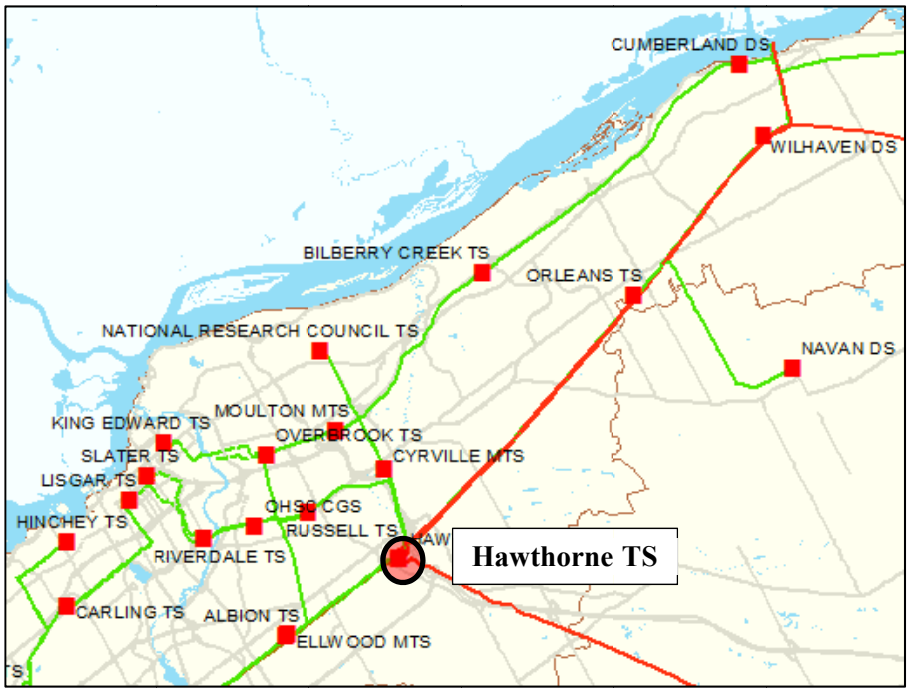


Figure 7-1 Hawthorne TS

7.1.2 Recommended Plan and Current Status

Hydro One has established a project to replace autotransformers T5 and T6 with new higher rated autotransformers. These autotransformers will have an LTR of at least 350 MVA. This investment will provide additional capacity and meet the needs of the area. It is expected that the project will be completed in 2018.

The cost of this project is expected to be $15.7 million. The project will be a transmission pool investment as the autotransformers provide supply to all customers in the Greater Ottawa Region.

7.2 Autotransformation Capacity and South West Area Station Capacity

7.2.1 Merivale TS Autotransformers T21 and T22/Hawthorne Autotransformer T9

Merivale TS has two 230 kV/115 kV autotransformers with an LTR station capacity of 312 MVA. The station is supplied from Hawthorne TS and from generators located west of Ottawa, along the Ottawa River and the Madawaska River. Merivale TS is shown in Figure 7-2.

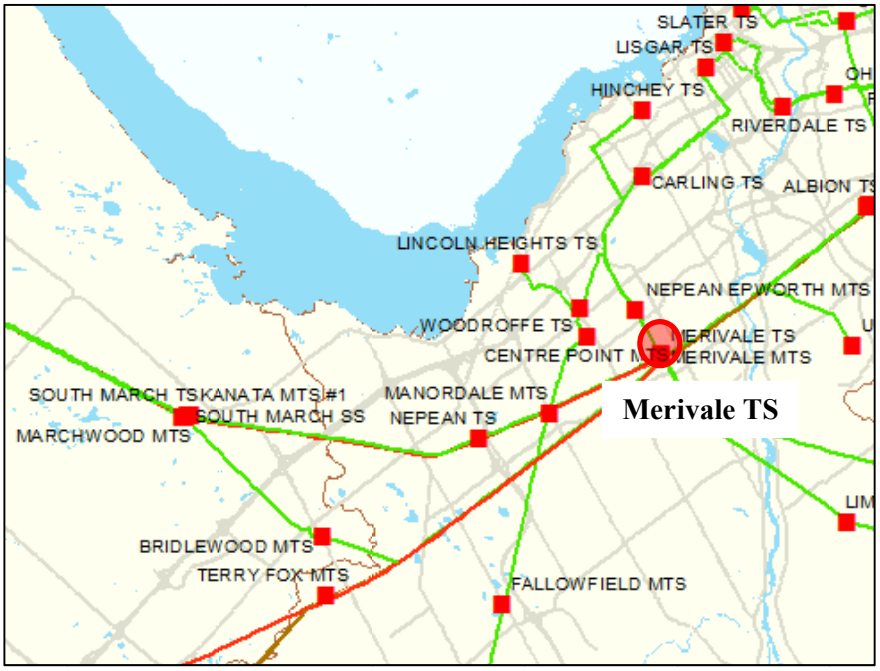


Figure 7-2 Merivale TS

The expected load growth provided by the LDCs and the minimum hydro generation assumption described in Section 6.2 causes the station capacity to be exceeded under contingency conditions by 2019. In addition, it is expected that autotransformers at Merivale TS and Hawthorne TS will reach their continuous loading limits of 250 MVA by 2024 and 2025. The exact timing of the autotransformer needs is dependent on the following factors:

- The South West area load forecast includes a proposed connection of a single large load increase coming into service in 2019.
- The need date is sensitive to generation at Stewartville GS, Barrett Chute GS and Chats Falls GS as its effect is to reduce the flow through the autotransformers.
- A potential solution to the need for additional supply capacity in the South West Area is a new 230 kV supply station which would remove some of the demand growth and existing load from the 115 kV network (see Section 7.2.2 for a complete description of this issue). This work would also help defer the need for additional autotransformer capacity at Merivale TS.

In order to address the Merivale TS autotransformer capacity concerns, additional 230/115 kV transformation capacity or load transfer from the 115 kV to the 230 kV system is required.

The provision of additional transformation capacity requires replacing the Merivale TS T22 autotransformer with a newer higher rated transformer in 2019 and adding a third autotransformer at the station in 2024. Alternatively a third transformer can be added at Merivale TS by 2019. To meet the required 2019 need date a decision on the autotransformer work is required by summer 2016.

Transferring load to the 230kV system requires establishing a new 230/27.6kV transformer station in the South West area to pick up some of the existing load and all of the new load growth. This is described in the following section.

7.2.2 Supply to South West Area – Line and Station Capacity

The South West area is served by Fallowfield MTS, Richmond MTS and Manotick DS connected to the 115kV circuit S7M out of Merivale TS. Load demand in the area is expected to increase by 52 MW in the next 10 years and both the line and station capacity are forecast to be exceeded by 2019.

The line limitation was identified in the OPA's June 2014 letter [5] to Hydro One. A section of the S7M circuit between the main line at STR R14-R15 JCT and Fallowfield Junction (see Figure 7-3 below) had a capacity of 420A. Hydro One review of the line capacity showed that the line rating was limited to respect safety clearances due to an underbuilt distribution feeder at Fallowfield MTS. This issue has been resolved with Hydro Ottawa carrying out the necessary work to lower the distribution feeder and increase the transmission line clearance. The line rating has been increased to 590A and is now adequate to meet forecast load until 2026.

Additional transformation capacity is required in the South West Area and both Fallowfield MTS and Richmond DS require load relief. Hydro Ottawa is planning for a capacity increase at Richmond DS and potentially a new station to relieve Fallowfield MTS in the Barrhaven area.

The IESO has initiated a public engagement process to gather community input for a preferred supply plan for the area including consideration of the potential for incremental CDM and DG resources and/or transmission expansion in the form of a new TS. The IRRP [1] recommended that given the required

timeline, it would be beneficial for early transmission planning options to be started in parallel to the engagement process, prior to completing the integrated plan.

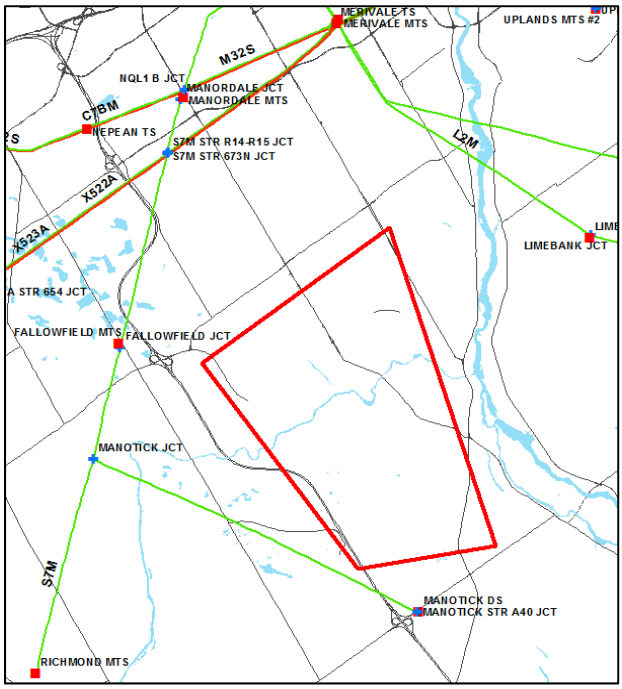


Figure 7-3 South West Area

At a high level, there are two main wire options to supply the South West area:

a) 115kV Option: Build a new 115/27.6kV transformer station and reinforce the existing 115 kV supply
b) 230kV option: Build a new 230/27.6kV transformer station and provide a new 230 kV transmission supply to the area.

The main advantage of the 115 kV option is that it defers the need for new transmission line until 2026. It however has a number of disadvantages: (a) loading will continue to increase on the 115kV system necessitating additional transformation capacity a Merivale TS by 2019 and Hawthorne TS by 2025, (b) all area stations remain on a single line supply until new transmission is built, and (c) the new 115 kV supply will provide less incremental capacity for the future.

The 230 kV option has the advantage of providing relief for the 230/115 kV autotransformers at Merivale TS and Hawthorne TS as well as provide more capacity to serve the area load. It also improves the area reliability by providing a second source of supply. The disadvantage is that transmission reinforcement will be required by 2019 and decision needs to be made as soon as possible.

The RIP has considered two options as examples for providing 230 kV supply to the area. Both examples consider building new double circuit 230 kV lines on existing Right of Way (“ROW”) in accordance with

the provincial government policy to maximize ROW use. The two options are described below (also refer to Figure 7-3).

- *S7M Based Option - Rebuild S7M as a double circuit 230 kV line.*

  This option would require rebuilding the existing single circuit115 kV circuit S7M tap to Fallowfield MTS as a new double circuit 230 kV line. The line would extend from the S7M STR R14-R15 JCT (on the main line) to Manotick Jct. Depending on the station location, a part of S7M from Manotick JCT to Manotick DS would also have to be rebuilt for a total line rebuild of up to 15.5 km. One circuit would be operated at 115 kV and continue to supply Fallowfield MTS, Richmond DS and Manotick DS. The other circuit would be tapped off the 230 kV circuit M29C which is adjacent to S7M at STR R14-R15 JCT and will be used to supply the new Hydro Ottawa station. This option may require sections of the existing ROW to be widened to accommodate the 230 kV circuits. Additional real estate rights will have to be obtained. EA and OEB Leave to Construct (Section 92) approvals will also be required.

- *L2M Based Option - Rebuild L2M as a double circuit 230 kV Line*

  This option would require rebuilding the existing 115 kV circuit L2M from Merivale TS to past Limebank MTS as a new double circuit 230 kV line. This section of the line would be constructed using the existing L2M ROW for a distance of 8.5 km. A new 6-8 km long ROW would need to be acquired going west from the L2M ROW to bring the transmission line to the load area, crossing the Rideau River. One circuit on the new line would remain L2M and be operated at 115 kV. The other circuit would connect to circuit M32S at Merivale TS and be operated at 230 kV. The new station will be supplied from the 230 kV circuit.

7.2.3 Recommended Plan and Current Status

The needs for autotransformation capacity and a new station in south west are interrelated. Further analysis is required to determine the impact of the 230 kV supply options for the new south west station on the Merivale TS and Hawthorne TS autotransformers. The planning assessment will consider whether a 115kV supply to the new station in combination with the addition of an autotransformer at Merivale is more cost effective than a 230kV supply.

The IESO is currently carrying out community engagement activities in the Ottawa region. The Working Group will be discussing the supply options for the South West area in conjunction with the autotransformer upgrade work at Merivale TS and expect to recommend a preferred plan for the area by summer 2016.

7.3 115 kV Transmission Circuit A4K Supply Capacity

7.3.1 Description

Circuit A4K is a 115 kV circuit supplying four downtown stations: Overbrook TS, King Edward TS, Cyrville MTS and Moulton MTS. Loading on the A4K this circuit can exceed its rating under peak load conditions for loss of 115 kV circuit A5RK. This need was identified as a near term need in the Ottawa Sub-Region IRRP [1] and included in the OPA's June 2014 letter to Hydro One [5]. In this letter, the preferred plan to relieve circuit A4K is outlined. This plan consists of rebuilding an approximately 2 km long section of single circuit 115 kV circuit A5RK between Overbrook TS to Riverdale Jct. as a double circuit line (see Figure 7-4). One of the circuits would remain A5RK and the other would be tapped to circuit A6R. Overbrook TS will be reconfigured to be supplied from circuits A5RK/A6R instead A4K/A5RK. This reconfiguration would remove Overbrook TS load from 115 kV circuit A4K and eliminate the overloading on A4K for the loss of A5RK.

7.3.2 Current Status

Hydro One has initiated the development work for this line rebuild. The project is currently in the engineering and estimating phase. The project is not expected to require Leave to Construct (Section 92) approval, but will require Environmental Assessment ("EA") approvals.

The project is expected to be in service by spring 2019 and preliminary estimates suggest the cost to be approximately $9 million to $11 million. This work will be part of the Line Connection pool and costs will be recovered from the rate revenue and/or customer capital contribution in accordance with the TSC. As a result, the LDC may be required to make a capital contribution.

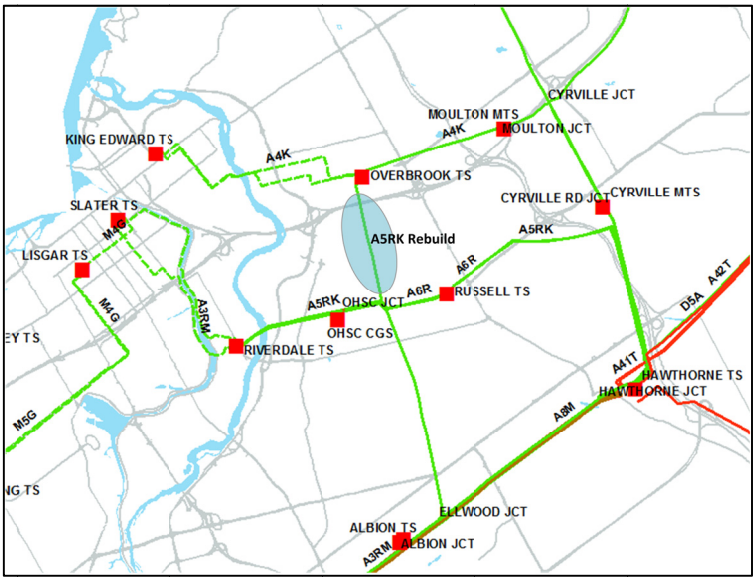


Figure 7-4 Option to Rebuild A5RK as Double-Circuit 115 kV Line

In the interim, Hydro One and Hydro Ottawa have operational mitigating measures to manage the overload on 115 kV circuit A4K if it becomes of concern before Hydro One has completed the line rebuild work. These measures include the transfer of Cyrville MTS to single supply from circuit A2 only by opening the A4K breaker at Cyrville MTS, and the transfer of some load from Moulton MTS to other stations in the area.

7.4 Station Capacity – Ottawa Centre 115 kV Area

7.4.1 Description

The Ottawa Center 115 kV area covers the City of Ottawa downtown district and extends from the Ottawa River in the north to Smyth Road in the south as shown in Figure 7-5 below. It is served by six 115/13.2 kV step-down transformer stations – King Edward TS, Lisgar TS, Overbrook TS, Riverdale TS, Russell TS and Slater TS. Most of the area stations are at or near capacity. Even with the Overbrook upgrade work now underway additional load meeting capability is forecast to be required by 2018 as shown in Table 6.3.

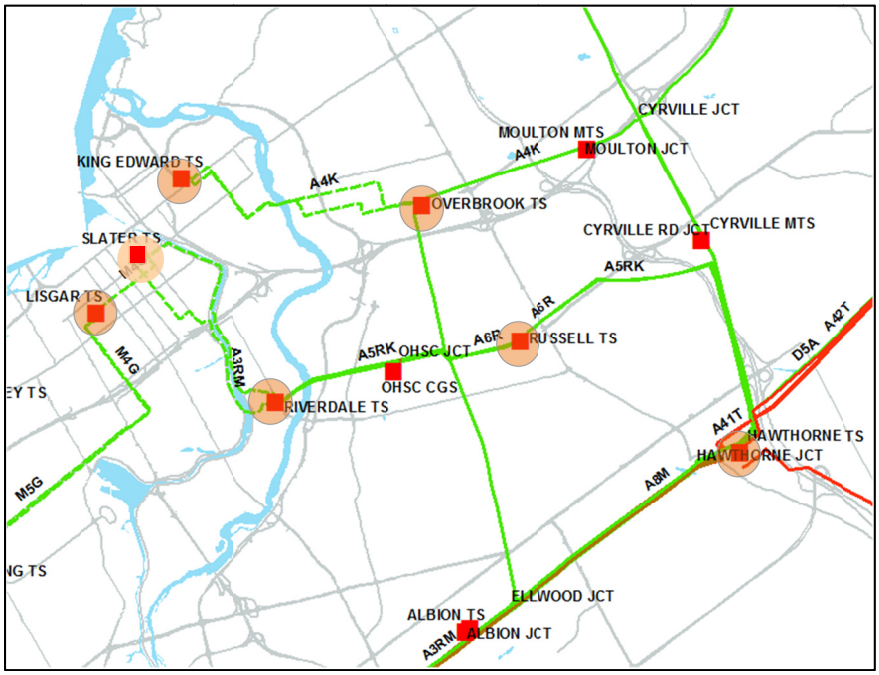


Figure 7-5 Downtown Ottawa Stations

7.4.2 Recommended Plan and Current Status

The existing step-down stations in the area are equipped with older 45/75 MVA transformers which have a LTR of between 70-80 MW. The preferred alternative to provide additional transformation capacity in the area is to replace these units with larger sized 100 MVA units where possible with an LTR of up to 130 MW.

During this regional planning cycle, the Working Group participants agreed to take advantage of transformer replacements necessitated by end-of-life considerations as this was the lowest cost and most practical option to provide additional capacity. The alternative of building a new station to provide capacity was ruled out because of the high cost and the difficulty in acquiring an appropriate site.

Upgrade of the end of life transformers at Overbrook TS is currently underway. In the future, the Working Group will continue to look for opportunities to upgrade based on end-of-life considerations of transformers. Hydro One will keep the Working Group informed of these opportunities. In addition, load transfers are also recommended to utilize available capacity at adjacent stations.

7.4.2.1 Russell TS and Riverdale TS

The loading on these stations will be kept within limits by Hydro Ottawa building feeder ties to transfer excess loads to other area stations. This will keep the loading on the transformers at these stations within their rating. A high level cost estimate of Hydro Ottawa's distribution work is $2 million.

7.4.2.2 Overbrook TS

Hydro One had identified that the step-down transformers at Overbrook TS were approaching end-of-life and consideration was therefore given to upgrading the transformers at the station. Accordingly Overbrook TS transformers are being replaced with larger sized units which will increase the station capacity from 72 MW to 130 MW. The work is underway and planned to be completed in Q2 2018. The incremental cost of upgrading to larger transformers is estimated to be $1.1 million. The cost of upgrading is expected to be recovered from incremental rate revenue in accordance with the TSC. Based on current forecast Hydro Ottawa is not expected to pay any capital contribution for this project.

7.4.2.3 Lisgar TS

Lisgar TS has two 75 MVA transformers. To meet the forecast load requirement additional transformation capacity is required in the Central 115kV area. Hydro Ottawa has therefore asked that the Lisgar TS transformers be replaced with larger 100 MVA units. The cost of the work is estimated to be about $14 million and will be recovered from rate revenue and customer capital contribution in accordance with the TSC. The target in-service date is Q4 2017.

7.4.2.4 King Edward TS

The capacity at King Edward TS is 71 MW. By replacing the limiting transformer T4 and additional low voltage ("LV") components such as circuit breakers and cable, a higher capacity of up to 130 MW can be achieved at King Edward TS.

Considering the Overbrook TS and Lisgar TS upgrades, adequate capacity will be available in the Center area until 2021. After discussion with Hydro Ottawa, the King Edward TS transformer upgrade work is tentatively scheduled for an in-service date of 2021. The project cost is estimated to be about $12M and will be recovered from rate revenue and customer capital contribution in accordance with the TSC.

7.5 Station Capacity - Hawthorne TS 44kV

Hawthorne TS has two 50/83 MVA, 230/44kV transformers with an LTR of 89 MW. Additional 44kV capacity is required at the station. Hydro One identified that the step- down transformers at Hawthorne TS were approaching end-of-life and needed to be replaced. The lowest cost alternative to provide this additional capacity was to take advantage of the transformer replacement work and install larger 75/125 MVA transformers with an LTR of 153 MW. This work is currently underway and planned to be completed by summer 2019.

Additional 44kV feeder positions will be required to utilize this increased capacity. These feeders will be added as required.

The incremental cost of upgrading to larger transformers is estimated to be approximately $1.1 million. Feeder position costs have not been estimated at this time. Incremental transformer costs and the feeder costs will be recovered in accordance with the TSC. Based on the current forecast Hydro Ottawa is not expected to pay any capital contribution for this project.

7.6 Bilberry Creek TS End of Life

7.6.1 Description

Bilberry Creek TS is a 115/27.6 kV step-down transformer in East Ottawa, supplying up to 85 MW of load customers to both Hydro Ottawa and Hydro One Distribution. The station was built in 1964 and a number of its key components have been identified for replacement by Hydro One. This station's refurbishment work is to be complete by 2023. A decision will be required by 2020 on whether to refurbish the station and keep the load on the 115 kV system or to retire the station and move the load over to the 230 kV system by supplying it from the newly built Orleans TS.

A Local Plan [3] carried out by Hydro One shows that the two options are similar in costs. The retirement option however, may be more attractive particularly if 115 kV load growth rate is high in the Ottawa Center area. The retirement option will reduce the loading of the 230 kV/115 kV autotransformers at Hawthorne TS and Merivale TS and make it available for the Ottawa Center 115 kV load. Figure 7-6 shows the area under consideration.

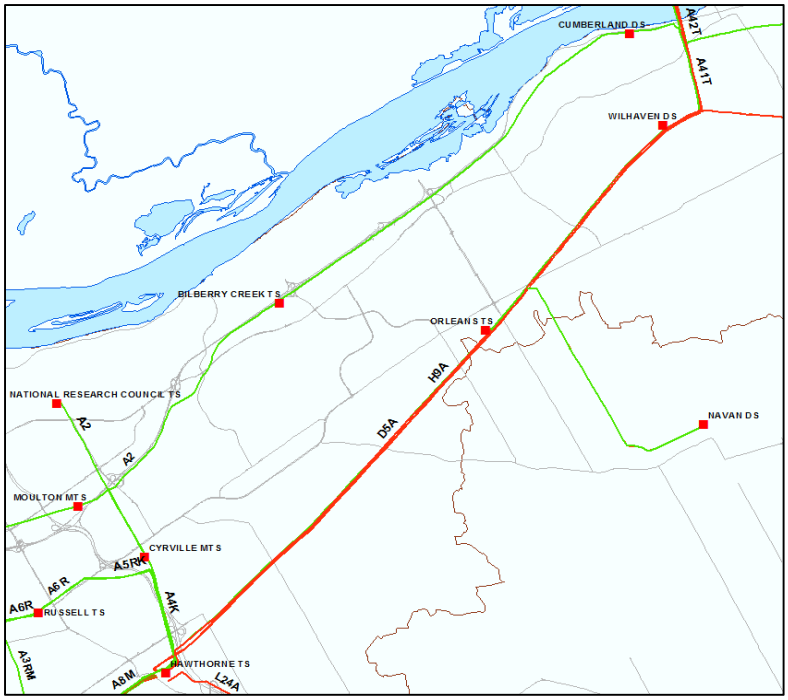


Figure 7-6 Bilberry Creek TS and the East Ottawa Area

7.6.2 Recommended Plan and Current Status

The two alternatives are very similar in cost and each has its own pros and cons. The refurbishment option minimizes work on the distribution system, but leaves the load on the 115kV system and with lower overall capacity to meet long term growth. The retirement option moves Bilberry Creek load to the 230kV system with higher long term load meeting capability but involves relocating distribution feeders from Bilberry Creek TS to Orleans TS.

The Working Group has recommended that a decision on Bilberry Creek refurbishment be deferred to the next regional planning cycle as there is still sufficient time to make an investment decision.

7.7 Almonte TS and Terry Fox TS Reliability

7.7.1 Description

Almonte TS and Terry Fox MTS are supplied from the 319 km long 230kV circuit M29C, see Figure 7-7. Due to the long length of the line the exposure to outages is high. The line has averaged approximately 6-7 interruptions per year over the last 10 years. With Terry Fox MTS coming into service in 2013, concerns were expressed about the number of outages that would be seen by the station. This issue was identified in the Ottawa Sub-Region IRRP [1] and the OPA's June 2014 letter [5].

7.7.2 Recommended Plan and Current Status

Hydro One had initiated a project in 2012 to install a 230 kV circuit breaker at Almonte TS. This breaker would sectionalize the M29C line into two sections: E29C – 281 km Cherrywood TS to Almonte TS; and E34M – 38 km Almonte TS to Merivale TS. This breaker will help with the number of interruptions at Almonte TS and Terry Fox MTS by eliminating outages due to the Almonte TS x Cherrywood section of the circuit.

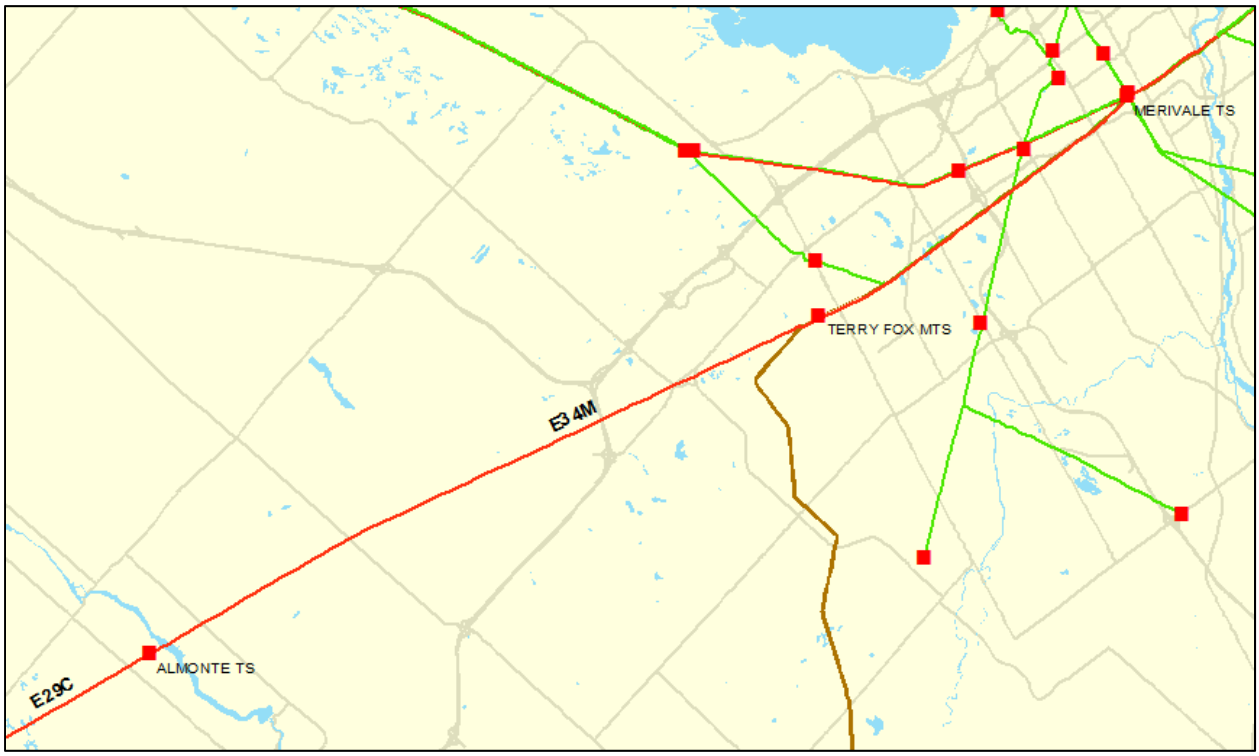


Figure 7-7 Lines E29C and E34M (M29C). In-Line Breaker at Almonte TS.

The total cost of this project is estimated to be $4.7 million and the project is scheduled to be completed by December 2015.

A second supply from Merivale TS to Terry Fox MTS was previously considered as an option to improve reliability. However it was decided to install the in-line breaker at Almonte TS since it was the cost effective and provided reliability improvement to both Almonte TS and Terry Fox MTS.

It should be noted that the Terry Fox TS is operated with the LV bus tie open. This arrangement has the disadvantage that in case of a transformer outage, the load connected to that transformer will be lost momentarily before the bus tie is closed to allow all loads to be supplied from the other side. A second supply to Terry Fox MTS can still be considered to address this issue as the load increases as part of a longer term supply plan. This will continue to be reviewed.

7.8 Orleans TS Reliability

7.8.1 Description

Orleans TS is a new station Hydro One built in East Ottawa to provide additional transformation capability and improve supply reliability for Hydro One Distribution customers connected to the 115 kV circuit H9A.

The Orleans TS is built adjacent to the double circuit H9A/D5A line about 10 km from Hawthorne TS and has one step-down transformer station supplied from 230 kV circuit D5A and the second step-down transformer supplied from the 115 kV circuit H9A. The station is operated with the LV bus tie open so as to avoid any power flow between the 230 kV and 115 kV systems through the station transformers. This arrangement has the disadvantage that in case of a circuit or transformer outage, the load connected to that circuit or transformer will be lost momentarily before the bus tie is closed to allow all loads to be supplied from the other side.

7.8.2 Recommended Plan and Current Status

Orleans TS has greatly improved the reliability of customers previous supplied from Wilhaven DS and Navan DS connected to 115kV circuit H9A. The customers experienced sustained interruptions every time circuit H9A had an outage. With the Orleans TS LV bus tie arrangement customer are exposed to a momentary interruption only as the load is picked up by closing the bus tie. This arrangement was accepted as a cost effective alternative to building 10 km of transmission line between Hawthorne TS and Orleans TS to provide a dual supply to Orleans TS.

Depending on the decision taken for Bilberry Creek TS described in section 7.6, Orleans TS could be converted to a 230 kV station and the LV bus tie closed. This option would be preferred if Bilberry Creek TS is recommended to be retired. If Bilberry Creek TS is refurbished then the plan will see Orleans TS continued operation with two different voltage supplies.

The Working Group recommendation is to monitor the performance of Orleans TS to see if mitigation measures are warranted. The Working Group will further review this issue in the next regional planning cycle as part of the Bilberry TS retirement study. No further action is required at this time.

7.9 Load Restoration for the Loss of B5D/D5A

7.9.1 Description and Current Status

The NA report for the Outer Ottawa Sub-Region [2] identified that the combined loss of circuits D5A and B5D would result in a load loss of up to 174 MW. The stations considered in this analysis are St Isidore TS, Longueil TS, and Ivaco CTS. Orleans TS is also supplied by D5A however; its second supply is H9A and is not considered for the combined loss of D5A/B5D. As indicated in ORTAC, any load lost above 150 MW must be restored within 4 hours and all load be restored within 8 hours.

A LP report [4] carried out by Hydro One shows that historically, the coincidental occurrence of forced sustained outages of B5D and D5A are rare and in all cases one of the circuits was restored in less than 4 hours as per ORTAC. The report concludes that no further action is required at this time.

7.10 Load Loss for S7M Contingency

7.10.1 Description and Current Status

Circuit S7M is the single supply for the following stations: Bridlewood MTS, Fallowfield MTS, Manotick DS, and Richmond DS. The combined load at these four stations is expected to exceed 150 MW by 2022. The ORTAC requires that not more than 150MW of load may be interrupted by configuration. However, given that the 150 MW limit is anticipated in the long term, no action is required at this time.

7.11 Voltage Regulation on 115kV Circuit 79M1

7.11.1 Description and Current Status

The 115 kV circuit 79M1 supplies Rockland DS, Rockland East DS, Clarence DS, Wendover DS, and Hawkesbury MTS. The NA for Outer Ottawa Sub-Region [2] identified that the voltage at Hawkesbury TS will approach operating limits under peak load and contingency conditions by 2023.

As mentioned in the Outer Ottawa Sub-Region NA report [2], Hydro One monitors the status of the network. Given the timing for this need, this will be reassessed during the next regional planning cycle.

7.12 Voltage at Stewartville TS

7.12.1 Description and Current Status

The load on the Stewartville TS is expected to increase significantly as a result of the connection of a large utility load forecasted for 2018. This load may require reactive support to help maintain the voltages within limits during peak load conditions and no generation at Stewartville GS.

A connection impact assessment will be undertaken by Hydro One as part of connecting the utility load. Any requirements to connect the load, including reactive power support, will be outlined in the document.

7.13 Voltage Drop at Terry Fox MTS for E34M open at the Merivale End

7.13.1 Description

Circuit E34M/E29C (new name for circuit M29C following the installation of a breaker at Almonte TS) is a 319 km line between Cherrywood TS in Pickering, and Merivale TS in Ottawa. If the circuit E34M (Almonte-Merivale) is open at the Merivale end, Terry Fox MTS and Almonte TS will be supplied

radially by Cherrywood TS. Given the distance between the Greater Ottawa stations and Cherrywood TS, voltages are lower than acceptable limits during normal and peak load periods and only load of up to 25 MW can be supplied with acceptable voltage. The 2012 IESO System Impact Assessment ("SIA") recommended the installation of 20 MVARs of capacitor banks at Terry Fox MTS to meet a peak load of up to 48 MW.

7.13.2 Recommended Plan and Current Status

It is recommended that Hydro Ottawa install 20 MVARs of capacitor banks at Terry Fox MTS. This should be adequate for the near term.

Terry Fox MTS is part of the Ottawa Area under voltage load rejection scheme ("UVLS"). This scheme is designed to shed the station load if the 230 kV supply voltage to the station drops below 204 kV when it is activated. Currently the scheme is only armed when the entire Ottawa Area UVLS is armed. It is proposed to modify the scheme so that it can be selectively armed when loading levels are higher than 48MW and under conditions that may result in a circuit M29C line end open at Merivale TS.

Historically the probability of this line end open occurring is low and it would typically occur while terminal maintenance is done at Merivale. By scheduling maintenance during off peak periods, the impact can be significantly reduced. No mitigation measures are therefore recommended at this time. Hydro One and Hydro Ottawa will be monitoring the system performance and the matter will be reconsidered in the next planning cycle based on operating experience.

7.14 Low Power Factor at Almonte TS

7.14.1 Description and Current Status

The IESO's SIA for Almonte T3 replacement noted a low power factor at Almonte TS. This potential issue was also reported in the Outer Ottawa Sub-Region NA report [2].

Hydro One has reviewed the power factor at Almonte TS. The station power factor varies from 0.89 to 0.95 at the LV bus which translates into approximately 0.86 to 0.92 on the HV bus. Part of the reason for the lower power factor is that the station has 29 MW of DG which generally operates at unity power factor. The generation reduces the net power in MW seen at the metering point. This reduction in power results in a lower power factor as seen from the HV bus since the generation does not offset the reactive power demand of the station. No action is required as the load power factor without DG is within the acceptable limits.

8. CONCLUSION AND NEXT STEPS

THIS REGIONAL INFRASTRUCTURE PLAN REPORT CONCLUDES THE REGIONAL PLANNING PROCESS FOR THE GREATER OTTAWA REGION. THIS REPORT MEETS THE INTENT OF THE PROCESS DESCRIBED IN SECTION 2 WHICH IS ENDORSED BY THE OEB AND MANDATED IN THE TSC AND DSC.

This RIP report addresses near term and mid-term regional needs identified in the earlier phases of the Regional Planning process and during the RIP phase. Next Steps, Lead Responsibility, and Timeframes for implementing the wires solutions for the near term needs are summarized in the Table 8-1 below.

Investments to address the mid-term needs, for cases where there is time to make a decision, will be reviewed and finalized in the next regional planning cycle. These needs are summarized in Table 8-2.

No long term needs were identified at this time. As per the OEB mandate, the Regional Plan should be reviewed and/or updated at least every five years.. The region will continue to be monitored and should there be a need that emerges due to a change in load forecast or any other reason, the next regional planning cycle will be started earlier to address the need.

Table 8-1 Regional Plans – Next Steps, Lead Responsibility and Plan In-Service Dates

No.	Project	Next Steps	Lead Responsibility	I/S Date	Cost
1	Almonte TS: addition of breaker to sectionalize line M29C	Construction in the final stages	Hydro One	Dec. 2015	$4.7M
2	Russell TS and Riverdale TS: construction of feeder ties to allow extra load transfers	LDC will lead this work	Hydro Ottawa	2017-2020	$2.0M
3	Lisgar TS: replacement of transformers T1 and T2	Transmitter to carry out this work	Hydro One	Dec. 2017	$13.9M
4	Hawthorne TS: replacement of autotransformers T5 and T6	Transmitter to carry out this work	Hydro One	May 2018	$15.7M
5	Overbrook TS: replacement of transformers T3 and T4	Transmitter to carry out this work	Hydro One	June 2018	$1.1M[(1)]
6	A6R: additional tap to offload A4K	Transmitter to carry out this work	Hydro One	June 2019	$9-11M
7	Hawthorne TS: replacement of transformers T7 and T8 and add one 44kV feeder position	Transmitter to carry out this work	Hydro One	Oct. 2019	$1.1M[(2)]
8	New South West Station And Merivale 230/115kV Transformation Capacity	IESO and Hydro Ottawa leading consultation	IESO/Hydro Ottawa	2020	--- [(3)]
9	King Edward TS: Replace Transformer T4	Transmitter to carry out this work	Hydro One	June 2021	$12M

[(1)] Incremental cost for larger transformer only.
[(2)] Incremental cost for larger transformer only. Feeder costs have not been estimated at this time.
[(3)] The Working Group expects to make a final recommendation on this plan by early 2016.

Table 8-2 List of Mid-Term Needs to be Reviewed in Next Regional Planning Cycle

No.	Need	Timing
1	Bilberry Creek TS - Refurbishment	2023
2	Orleans TS - Reliability	2023[(1)]
3	79M1 Circuit – Voltage regulation	2023

[(1)] Performance will be monitored to see if mitigation measures are warranted. Need will be reviewed along with Bilberry Creek TS refurbishment.

9. REFERENCES

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http://www.ieso.ca/Documents/Regional-Planning/Greater_Ottawa/2015-Ottawa-IRRP-Report.pdf

[2]. Hydro One, "Needs Screening Report, Greater Ottawa Region – Outer Ottawa Sub Region", 28 July 2014.
http://www.hydroone.com/RegionalPlanning/Ottawa/Documents/Needs%20Assessment%20Report%20-%20Greater%20Ottawa%20-%20Outer%20Ottawa%20SubRegion.pdf

[3]. Hydro One, "Local Planning Report – Supply to East Ottawa Area", 26 November 2015.
http://www.hydroone.com/RegionalPlanning/Ottawa/Documents/Local%20Planning%20Report%20-%20Supply%20to%20East%20Ottawa%20Area.pdf

[4]. Hydro One, "Local Planning Report - B5D-D5A Load Restoration", 22 September 2015.
http://www.hydroone.com/RegionalPlanning/Ottawa/Documents/Local%20Planning%20Report%20-%20B5D-D5A%20Load%20Restoration.pdf

[5]. Hydro One, "OPA Letter – Ottawa Area Regional Planning", 27 June 2014.
http://www.hydroone.com/RegionalPlanning/Ottawa/Documents/Letter%20to%20H1%20RE%20Ottawa.pdf

[6]. Independent Electricity System Operator, "Review of Ontario Interties", 14 October 2014.
http://www.ieso.ca/Documents/IntertieReport-20141014.pdf

APPENDIX A: STATIONS IN THE GREATER OTTAWA REGION

No.	Station	Voltage (kV)	Supply Circuits
1	Albion TS	230	M30A, M31A
2	Almonte TS	230	M29C (E34M, E29C)
3	Arnprior TS	115	W6CS, C7BM
4	Bilberry Creek TS	115	A2, H9A
5	Bridlewood MTS	115	S7M
6	Carling TS	115	M4G, M5G
7	Centrepoint MTS	115	C7BM
8	Clarence DS	115	79M1
9	Cumberland DS	115	H9A
10	Cyrville MTS	115	A2, A4K
11	Ellwood TS	230	M30A, M31A
12	Epworth MTS	115	M4G, M5G
13	Fallowfield DS	115	S7M
14	Greely DS	115	M1R
15	Hawkesbury MTS	115	79M1
16	Hawthorne	230	-
18	Ivaco	230	D5A
19	Kanata MTS	230	C3S, M32S
20	King Edward TS	115	A4K, A5RK
21	Limebank MTS	115	L2M
22	Lincoln Heights TS	115	C7BM, F10MV
23	Lisgar TS	115	M4G, M5G
24	Longueuil TS	115	B5D, D5A
25	Manordale MTS	115	C7BM
26	Manotick DS	115	S7M
27	Marchwood MTS	115	S7M, W6CS
28	Marionville DS	115	L2M
29	Merivale TS	115	-
30	Moulton MTS	115	A4RK
31	Nation Research TS	115	A2
32	National Aeronautical CTS	115	A8M
33	Navan DS	115	H9A
34	Nepean TS	115	M32S
35	Orleans TS	230 & 115	D5A, H9A
36	Overbrook TS	115	A4K, A5RK
38	Riverdale TS	115	A3RM, A5RK
39	Rockland DS	115	79M1
40	Rockland East DS	115	79M1

41	Russell DS	115	M1R
42	Russell TS	115	A5RK, A6R
43	Slater TS	115	A3RM, A5RK, M4G
44	South Gloucester DS	115	M1R
45	South March	230	C3S, M32S
46	St. Isidore TS	230	B5D, D5A
47	Stewartville TS	115	W3B, W6CS
48	Terry Fox MTS	230	M29C (E34M)
49	Uplands MTS	115	A8M
50	Wendover DS	115	79M1
51	Wilhaven DS	115	H9A
52	Woodroffe TS	115	C7BM, F10MV

APPENDIX B: TRANSMISSION LINES IN THE GREATER OTTAWA REGION

Location	Circuit Designations	Voltage (kV)
Hawthorne TS – Merivale TS	M30A, M31A	230
Hawthorne TS – St Isidore TS	D5A	230
Merivale TS – Almonte TS	E34C (formally M29C)	230
Merivale TS – South March TS	M32S	230
South March SS – Chats Falls SS	C3S	230
Hawthorne TS – Bilberry Creek TS	A2	115
Hawthorne TS - Merivale TS	A3RM, A8M	115
Hawthorne TS – Overbrook TS	A4K, A5RK	115
Hawthorne TS – Riverdale TS	A6R	115
Hawthorne TS – Hawkesbury MTS	H9A/79M1	115
Merivale TS – Chats Falls TS	C7BM	115
Merivale TS – Hinchey TS	F10MV, V12M	115
Merivale TS – Lisgar TS	M4G, M5G	115
Merivale TS – South March SS	S7M	115
Stewartville TS – South March SS	W6CS	115
Stewartville TS – Barrett Chute TS	W3B	115

APPENDIX C: DISTRIBUTORS IN THE GREATER OTTAWA REGION

Distributor Name	Station Name	Connection Type
Hydro 2000	Longueuil TS	Dx
Hydro Hawkesbury	Hawkesbury MTS	Tx
	Longueil TS	Dx
Hydro One	Almonte TS	Tx
	Arnprior TS	Tx
	Bilberry Creek TS	Tx
	Clarence DS	Tx
	Cumberland DS	Tx
	Greely DS	Tx
	Hawthorne TS	Tx
	Longueil TS	Tx
	Manotick DS	Tx
	Marionville DS	Tx
	Navan DS	Tx
	Orleans TS	Tx
	Rockland DS	Tx
	Rockland East DS	Tx
	Russell DS	Tx
	South Gloucester DS	Tx
	St Isidore TS	Tx
	Stewartville TS	Tx
	Wilhaven DS	Tx
Hydro Ottawa	Albion TS	Tx
	Almonte TS	Dx
	Bilberry Creek TS	Tx
	Bridlewood MTS	Tx
	Carling TS	Tx
	Centrepoint MTS	Tx
	Cyrville MTS	Tx
	Ellwood MTS	Tx
	Nepean Epworth MTS	Tx
	Fallowfield DS	Tx
	Hawthorne TS	Dx, Tx
	Hinchey TS	Tx
	Kanata MTS	Tx
	King Edward TS	Tx

Hydro Ottawa	Limebank MTS	Tx
	Lincoln Heights TS	Tx
	Lisgar TS	Tx
	Manordale MTS	Tx
	Marchwood MTS	Tx
	Moulton MTS	Tx
	Merivale MTS	Tx
	Nepean TS	Tx
	Orleans TS	Tx
	Overbrook TS	Tx
	Richmond MTS	Tx
	Riverdale TS	Tx
	Russell TS	Tx
	Slater TS	Tx
	South Gloucester DS	Dx
	South March TS	Dx, Tx
	St Isidore TS	Dx
	Terry Fox MTS	Tx
	Upland MTS	Tx
	Woodroffe TS	Tx
Ottawa River Power Corporation	Almonte TS	Dx
Renfrew Hydro	Stewartville TS	Dx

APPENDIX D: AREA STATIONS LOAD FORECAST

Table D-1 Stations Coincident Load Forecast (MW)

Area	Station	LTR	2015	2016	2017	2018	2019	2020	2021	2023	2025	2027	2029	2031	2033	2035
Center 115	King Edward TS	71	70	67	69	75	75	75	76	77	78	77	77	78	77	77
	Lisgar TS	75	64	67	71	74	74	75	75	87	88	90	90	90	89	89
	Overbrook TS	130	85	91	94	100	101	102	108	110	111	112	113	114	115	116
	Riverdale TS	105	102	99	102	111	112	112	114	118	119	120	121	123	123	124
	Russell TS	69	61	63	65	73	73	73	73	73	73	73	73	73	73	73
	Slater TS	118	106	113	114	116	115	114	114	113	112	112	111	110	110	110
	Total	**569**	**488**	**501**	**515**	**549**	**549**	**550**	**559**	**578**	**581**	**584**	**586**	**588**	**589**	**590**
Center 230	Albion	88	71	72	73	73	73	73	74	74	75	75	76	77	77	77
	Ellwood TS	59	27	28	28	28	28	28	28	28	28	28	28	28	29	29
	Hawthorne	153	107	117	120	124	126	128	132	137	136	140	138	139	138	138
	Total	**300**	**206**	**217**	**221**	**225**	**227**	**229**	**234**	**239**	**239**	**243**	**243**	**244**	**243**	**243**
East 115	Bilberry Creek TS	85	87	54	54	54	54	54	54	54	55	55	55	55	55	56
	Cumberland DS	15	5	6	6	6	6	6	6	6	6	6	6	6	7	7
	Cyrville MTS	59	24	30	35	35	37	38	40	42	44	44	44	44	44	44
	Moulton MTS	34	31	32	32	32	32	32	32	33	33	33	33	34	34	34
	Nation Research TS	25	18	18	18	18	18	18	18	18	18	18	18	18	18	18
	Navan DS	15	6	6	6	6	6	6	6	6	6	6	6	5	5	5
	Orleans TS	51	0	45	46	46	47	48	48	50	50	51	52	54	55	57
	Wilhaven DS	58	49	4	5	5	6	6	6	7	10	11	12	12	14	16
	Total	**340**	**221**	**193**	**201**	**202**	**205**	**208**	**210**	**215**	**221**	**224**	**226**	**228**	**232**	**237**
East 230	Orleans TS	51	0	45	46	46	47	48	48	50	50	51	52	54	55	57
	Total	51	**0**	**45**	**46**	**46**	**47**	**48**	**48**	**50**	**50**	**51**	**52**	**54**	**55**	**57**
South 115	Greely DS	40	17	18	18	18	18	18	18	18	18	18	19	19	19	19
	Limebank MTS	68	44	47	49	52	54	56	59	64	70	76	82	89	88	88
	Marionville DS	28	13	14	14	14	14	14	14	14	14	14	14	15	15	15
	National Aeronautical CTS	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Russell DS	8	3	3	3	3	3	3	3	3	3	3	3	3	3	4
	South Gloucester DS	8	4	4	4	4	4	4	4	4	4	5	5	5	5	5
	Uplands MTS	30	25	26	26	27	27	27	27	28	29	29	30	30	30	30
	Total	**182**	**109**	**112**	**115**	**118**	**121**	**123**	**126**	**133**	**140**	**147**	**154**	**161**	**161**	**161**
South West 115	Fallowfield DS	48	36	39	38	41	49	51	54	58	61	67	71	76	82	89
	Manotick DS	17	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	Richmond DS	5	9	10	11	13	31	34	36	36	37	38	39	38	38	38
	Total	**70**	**52**	**56**	**56**	**61**	**87**	**92**	**97**	**101**	**106**	**112**	**118**	**122**	**127**	**134**

West 115	Bridlewood MTS	37	22	22	23	22	22	22	23	39	39	39	39	39	39	39
	Carling TS	93	82	83	84	85	86	86	87	93	95	96	98	99	100	102
	Centrepoint MTS	35	17	17	17	17	17	16	16	16	16	16	16	16	16	16
	Epworth	25	15	15	16	16	16	16	15	15	15	15	15	15	15	15
	Hinchey TS	77	58	60	62	66	68	70	72	67	71	75	79	83	87	90
	Lincoln Heights TS	71	45	45	45	45	44	44	44	49	49	49	48	48	48	48
	Manordale MTS	22	11	11	11	11	11	11	11	11	11	11	11	10	10	10
	Marchwood MTS	34	34	34	34	35	34	34	34	35	34	35	35	35	36	37
	Merivale TS	18	14	14	13	15	15	15	15	16	17	19	20	20	19	19
	Woodroffe TS	92	39	40	41	42	42	43	43	53	54	55	56	56	57	58
	Total	**504**	**336**	**340**	**346**	**353**	**355**	**356**	**362**	**395**	**402**	**410**	**417**	**421**	**427**	**434**
West 230	Kanata MTS	55	46	47	47	47	47	46	47	47	48	48	48	48	48	48
	Nepean TS	144	145	144	143	143	141	139	138	136	134	132	130	128	127	127
	South March	109	116	110	115	119	123	126	131	123	104	104	104	104	103	104
	Terry Fox MTS	90	39	50	78	83	65	65	64	63	63	62	61	60	60	60
	Total	**397**	**346**	**351**	**383**	**391**	**376**	**376**	**380**	**370**	**349**	**345**	**343**	**340**	**337**	**338**
Outer East 115	Clarence DS	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Hawkesbury MTS	18	15	15	15	15	15	15	15	15	16	16	16	16	16	16
	Rockland DS	9	8	8	8	8	8	8	9	9	9	9	9	9	9	9
	Rockland East DS	15	12	12	12	12	12	12	12	13	13	13	13	13	13	13
	Wendover TS	34	12	12	12	12	12	12	12	14	14	14	14	13	13	13
	Total	**80**	**49**	**49**	**50**	**50**	**50**	**50**	**51**	**55**	**55**	**55**	**55**	**55**	**55**	**56**
Outer East 230	Ivaco	100	40	40	40	40	40	40	40	40	40	40	40	40	40	40
	Longueuil TS	98	31	31	31	31	30	30	30	30	30	30	30	30	30	30
	St. Isidore TS	52	35	35	36	35	35	35	35	35	35	35	35	35	35	35
	Total	**249**	**106**	**106**	**106**	**106**	**106**	**105**	**105**	**105**	**105**	**105**	**105**	**105**	**105**	**105**
Outer West 115	Arnprior TS	51	36	36	36	36	35	35	35	34	34	34	34	34	34	34
	Stewartville TS	55	30	30	30	46	46	45	45	45	45	45	45	45	45	45
	Total	**106**	**66**	**66**	**66**	**82**	**81**	**80**	**80**	**79**	**79**	**79**	**79**	**79**	**79**	**79**
Outer West 230	Almonte TS	100	35	34	34	34	34	33	33	33	33	33	33	33	33	33
	Total	**100**	**35**	**34**	**34**	**34**	**34**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**
Regional Total		**2948**	**2013**	**2069**	**2140**	**2219**	**2238**	**2249**	**2285**	**2352**	**2360**	**2388**	**2411**	**2430**	**2445**	**2468**

Table D-2 Stations Non Coincident Forecast (MW)

Area	Station	LTR	2015	2016	2017	2018	2019	2020	2021	2023	2025	2027	2029	2031	2033	2035
Center 115	King Edward TS	71	88	84	87	93	93	93	94	96	97	97	96	97	96	96
	Lisgar TS	75	67	70	74	78	78	78	79	91	92	94	94	94	93	93
	Overbrook TS	130	84	91	93	99	100	102	107	109	110	111	112	113	114	115
	Riverdale TS	105	78	76	78	84	85	86	87	90	91	92	93	93	94	95
	Russell TS	69	74	77	80	90	89	89	89	89	89	89	90	90	90	90
	Slater TS	118	125	133	134	136	135	134	134	133	132	131	131	130	129	129
	Total	**569**	**516**	**530**	**546**	**580**	**581**	**581**	**590**	**608**	**612**	**614**	**615**	**617**	**617**	**619**
Center 230	Albion	88	77	79	80	80	80	80	80	81	82	82	83	84	84	84
	Ellwood TS	59	43	43	44	44	44	43	44	44	44	44	44	45	45	45
	Hawthorne	153	103	115	120	124	126	128	132	137	136	140	138	139	138	138
	Total	**300**	**223**	**238**	**243**	**248**	**250**	**251**	**256**	**262**	**262**	**266**	**266**	**267**	**266**	**267**
East 115	Bilberry Creek TS	85	87	54	54	54	54	54	54	54	55	55	55	55	55	56
	Cumberland DS	15	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Cyrville MTS	59	25	31	37	37	39	40	42	44	47	47	47	47	47	47
	Moulton MTS	34	40	40	40	41	40	40	41	41	41	42	42	42	43	43
	Nation Research TS	25	18	19	19	19	19	18	19	19	19	18	18	18	18	18
	Navan DS	15	6	6	6	6	6	5	5	5	5	5	5	5	5	5
	Orleans TS	51	0	45	46	46	47	48	48	50	50	51	52	54	55	57
	Wilhaven DS	58	53	4	5	5	6	6	6	7	10	11	12	12	14	16
	Total	**340**	**231**	**200**	**208**	**209**	**212**	**215**	**217**	**223**	**229**	**231**	**234**	**236**	**240**	**244**
East 230	Orleans TS	51	0	45	46	46	47	48	48	50	50	51	52	54	55	57
	Total	**51**	**0**	**45**	**46**	**46**	**47**	**48**	**48**	**50**	**50**	**51**	**52**	**54**	**55**	**57**
South 115	Greely DS	40	35	35	36	36	36	36	36	36	37	37	37	38	38	38
	Limebank MTS	68	47	49	52	54	56	59	61	67	73	79	86	93	92	92
	Marionville DS	28	31	31	31	32	32	31	32	32	32	33	33	33	34	34
	National Aeronautical CTS	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Russell DS	8	12	13	13	13	13	13	13	13	13	13	13	13	13	13
	South Gloucester DS	8	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	Uplands MTS	30	20	20	20	21	21	21	21	22	22	23	23	24	23	23
	Total	**182**	**151**	**155**	**159**	**162**	**165**	**167**	**171**	**178**	**185**	**193**	**201**	**209**	**209**	**209**
South West 115	Fallowfield DS	48	45	49	48	51	61	64	68	72	76	84	89	95	102	111
	Manotick DS	17	8	8	9	9	9	9	9	9	9	9	9	9	9	9
	Richmond DS	5	7	7	8	10	22	24	25	26	27	27	28	28	27	27
	Total	**70**	**60**	**64**	**65**	**69**	**92**	**97**	**102**	**107**	**112**	**120**	**126**	**131**	**139**	**147**

West 115	Bridlewood MTS	37	34	34	35	35	34	34	35	61	61	60	61	61	60	60
	Carling TS	93	88	89	90	91	92	92	93	100	102	103	105	106	107	109
	Centrepoint MTS	35	21	21	21	21	21	21	21	21	21	20	20	20	20	20
	Epworth	25	15	15	16	16	16	16	16	16	15	15	15	15	15	15
	Hinchey TS	77	47	49	51	54	55	57	59	54	57	61	64	67	70	73
	Lincoln Heights TS	71	48	48	48	48	47	47	47	53	52	52	52	51	51	51
	Manordale MTS	22	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Marchwood MTS	34	35	35	35	36	35	35	36	36	36	36	36	36	37	38
	Merivale TS	18	18	19	18	20	20	20	20	22	23	26	27	26	26	26
	Woodroffe TS	92	35	36	36	37	38	38	39	47	48	49	49	50	51	51
	Total	**504**	**351**	**355**	**361**	**368**	**369**	**369**	**375**	**419**	**425**	**432**	**439**	**443**	**448**	**454**
West 230	Kanata MTS	55	87	88	88	88	88	87	88	89	89	90	90	90	90	90
	Nepean TS	144	153	152	151	150	148	146	145	144	141	139	137	135	133	133
	South March	109	98	93	97	101	104	107	110	102	87	87	87	87	86	87
	Terry Fox MTS	90	44	57	88	93	74	73	72	71	71	70	69	68	67	67
	Total	**397**	**382**	**390**	**424**	**432**	**414**	**412**	**416**	**406**	**389**	**385**	**383**	**379**	**377**	**377**
Outer East 115	Clarence DS	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Hawkesbury MTS	18	17	17	17	17	17	17	17	18	18	18	18	18	19	19
	Rockland DS	9	17	17	17	18	18	18	18	19	19	19	19	19	19	19
	Rockland East DS	15	11	11	11	12	12	12	12	13	13	13	13	13	13	13
	Wendover TS	34	9	9	9	9	9	9	10	11	11	11	10	10	10	10
	Total	**80**	**56**	**56**	**56**	**57**	**57**	**57**	**57**	**62**	**62**	**63**	**63**	**63**	**63**	**63**
Outer East 230	Ivaco	100	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Longueuil TS	98	44	44	44	44	43	43	43	43	43	43	43	43	43	43
	St. Isidore TS	52	48	48	48	48	47	47	47	47	47	47	47	47	47	47
	Total	**249**	**184**	**184**	**184**	**184**	**183**	**182**	**182**	**182**	**182**	**182**	**182**	**182**	**182**	**182**
Outer West 115	Arnprior TS	51	51	51	51	51	50	49	49	49	49	49	49	49	49	49
	Stewartville TS	55	32	32	32	49	49	48	48	48	48	48	48	48	48	48
	Total	**106**	**83**	**82**	**82**	**100**	**99**	**97**	**97**	**96**	**96**	**96**	**96**	**96**	**96**	**96**
Outer West 230	Almonte TS	100	48	48	47	47	47	46	46	45	45	45	45	45	45	45
	Total	**100**	**48**	**48**	**47**	**47**	**47**	**46**	**46**	**45**	**45**	**45**	**45**	**45**	**45**	**45**
Region Total		**2948**	**2284**	**2346**	**2421**	**2503**	**2514**	**2522**	**2558**	**2637**	**2650**	**2680**	**2702**	**2722**	**2738**	**2762**

APPENDIX E: LIST OF ACRONYMS

Acronym	Description
A	Ampere
BES	Bulk Electric System
BPS	Bulk Power System
CDM	Conservation and Demand Management
CIA	Customer Impact Assessment
CGS	Customer Generating Station
CTS	Customer Transformer Station
DESN	Dual Element Spot Network
DG	Distributed Generation
DSC	Distribution System Code
GS	Generating Station
GTA	Greater Toronto Area
HV	High Voltage
IESO	Independent Electricity System Operator
IRRP	Integrated Regional Resource Plan
kV	Kilovolt
LDC	Local Distribution Company
LP	Local Plan
LTE	Long Term Emergency
LTR	Limited Time Rating
LV	Low Voltage
MTS	Municipal Transformer Station
MW	Megawatt
MVA	Mega Volt-Ampere
MVAR	Mega Volt-Ampere Reactive
NA	Needs Assessment
NERC	North American Electric Reliability Corporation
NGS	Nuclear Generating Station
NPCC	Northeast Power Coordinating Council Inc.
NUG	Non-Utility Generator
OEB	Ontario Energy Board
OPA	Ontario Power Authority
ORTAC	Ontario Resource and Transmission Assessment Criteria
PF	Power Factor
PPWG	Planning Process Working Group
RIP	Regional Infrastructure Plan
ROW	Right-of-Way
SA	Scoping Assessment
SIA	System Impact Assessment
SPS	Special Protection Scheme
SS	Switching Station
TS	Transformer Station
TSC	Transmission System Code
UFLS	Under Frequency Load Shedding
ULTC	Under Load Tap Changer
UVLS	Under Voltage Load Rejection Scheme

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April 25, 2016

Lance Jefferies
Chief Electricity Distribution Officer
Hydro Ottawa Limited

Bing Young
Director, System Planning
Hydro One Networks Inc.

Dear Mr. Jefferies and Mr. Young,

Re: Initiating a Transmission Project for Supplying the Growing Electricity Demand in the South Nepean Area of Ottawa

The purpose of this letter is to:

- Recommend that an integrated solution, which comprises conservation and additional transmission and distribution ("wires") facilities, be pursued at this time to meet the growing electricity demand in the South Nepean area of Ottawa ; and
- Request Hydro Ottawa and Hydro One to initiate work associated with the development of a new transmission station and connection line in the South Nepean area for an in-service date of 2021.

As you are aware, a regional planning Working Group for the Ottawa area, consisting of the Independent Electricity System Operator (IESO), Hydro One and Hydro Ottawa, has been active since 2011. In 2013, the planning process was restructured to conform to the timeline and requirements of the Ontario Energy Board (OEB) formalized Regional Planning Process. In April 2015 the IESO released an Integrated Regional Resource Plan (IRRP) for the Ottawa area, documenting a 20 year plan developed by the Working Group. That plan provided forecasts of electricity demand growth in the region, identified short, medium and long-term needs, presented possible solutions, and recommended near-term actions. In December 2015 Hydro One completed a Regional Infrastructure Plan (RIP) as a subsequent step of the regional planning process.

The IRRP identified two issues affecting the western portion of the City of Ottawa which required additional planning focus. First, the more immediate need to supply demand growth in the southwest corner of the City (referred to as the South Nepean area), and second, the longer-term need to reinforce the 115 kV supply capability in the broader West Ottawa area, which includes the supply to downtown Ottawa. These areas are shown in Figure 1 below.

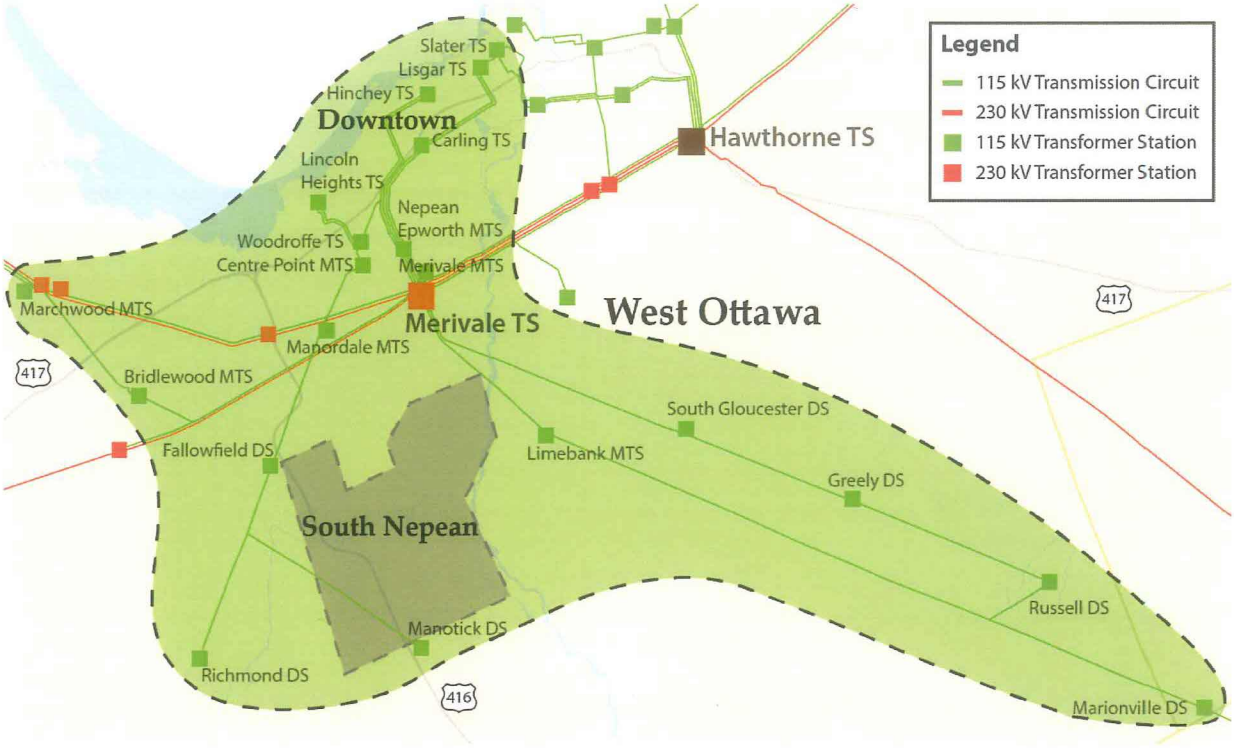


Figure 1. The South Nepean and West Ottawa areas.

While this letter is mainly focused on addressing the South Nepean issue, the proposed solution will contribute to relieving the broader West Ottawa supply issue.

Electricity Demand Growth in the South Nepean Community

For electricity planning purposes, the South Nepean service area is shown on the map in Figure 2, below. It is bounded by Fallowfield Road to the north, the Rideau River to the east, Bankfield Road to the south and Moodie Drive to the west. Hydro Ottawa, the local distribution company which serves customers in this part of the City, is forecasting robust electricity demand growth for this area. This forecast is consistent with the City of Ottawa's development plans for the area, including plans for the development of the Nepean Town Centre, the Strandherd Business Park, and residential developments that are associated with the Barrhaven South Community Design Plan, the Barrhaven South Urban expansion and Longfields Community Plan.

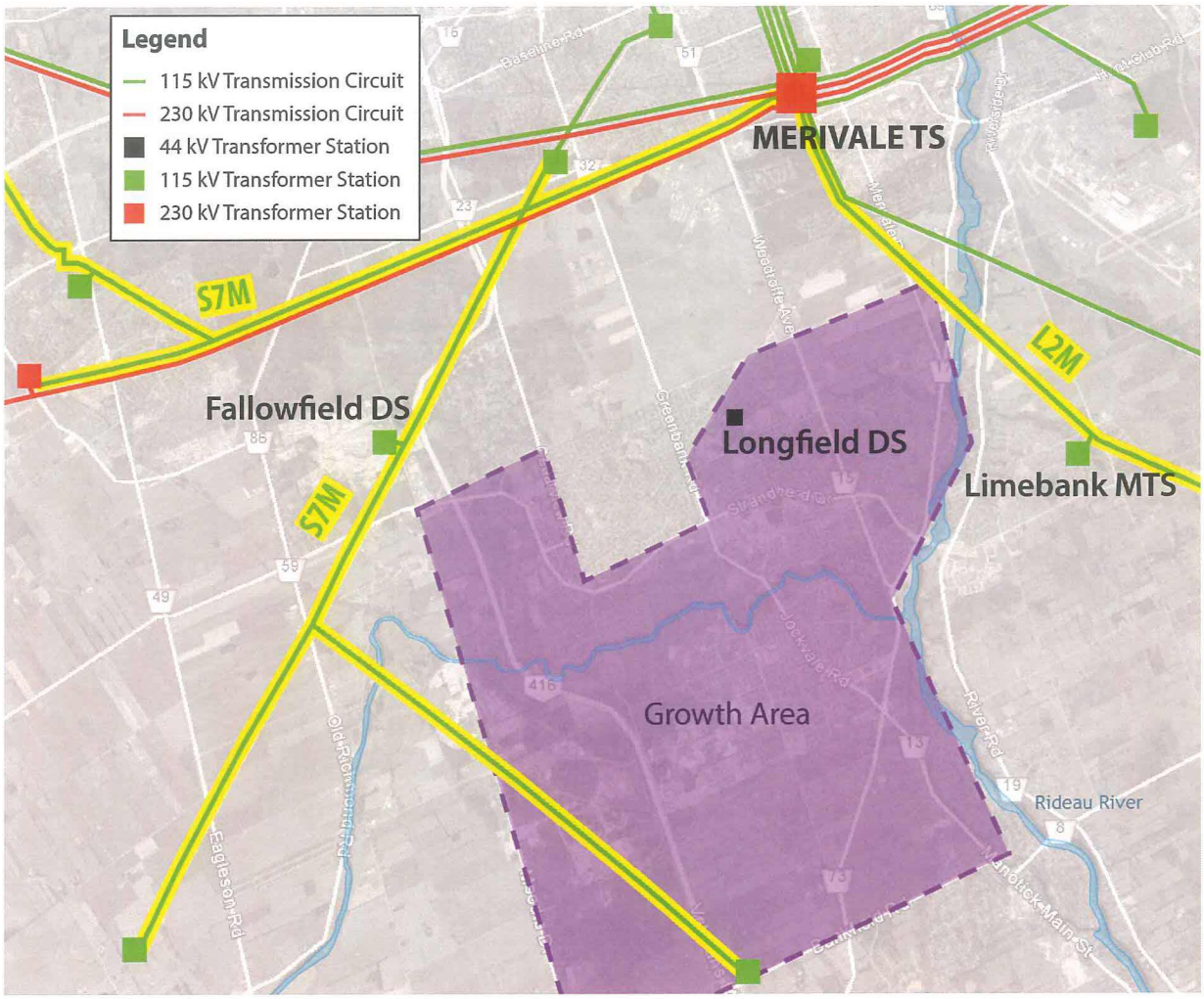


Figure 2. Electricity Supply to the South Nepean area.

The electricity demand in the South Nepean area peaked at 59 MW in the summer of 2015. Much of that demand was supplied from the provincial grid through the Merivale "hub" station in west Ottawa and delivered to the South Nepean area by two 115 kV transmission lines (S7M and L2M), and three step-down stations (Longfield DS, Limebank MTS and Fallowfield DS). These facilities are shown in Figure 2. In addition to the grid supply, there is some distributed generation connected to the three step-down stations, totaling about 7 MW, contributing to the area's supply.

The 115 kV network in the South Nepean area was originally developed to supply a relatively small number of customers in a rural area. Regional development has since given rise to significant demand growth on this legacy system as the area is being transformed into denser residential communities and commercial areas. With the forecasted growth, Hydro Ottawa anticipates the peak demand in the area to reach 88 MW by 2020 and 134 MW by 2032, an increase of about 78 MW, more than doubling today's level. This growth will place increased stress on the existing transmission and distribution infrastructure – the 115 kV line, step-down stations and distribution feeders. Over time these system elements will exceed their respective capacities.

Adequacy of Existing Supply to South Nepean

The Province's conservation initiatives are helping to manage future demand growth across the City of Ottawa. The forecast used for this planning study assumes that roughly 25% of growth in the South Nepean area will be met by increased efficiency, time of use savings, and conservation programs. Peak demand impacts associated with the aggressive conservation targets established in the 2013 LTEP were assumed before identifying the residual planning forecast, which is shown in Figure 3, below.

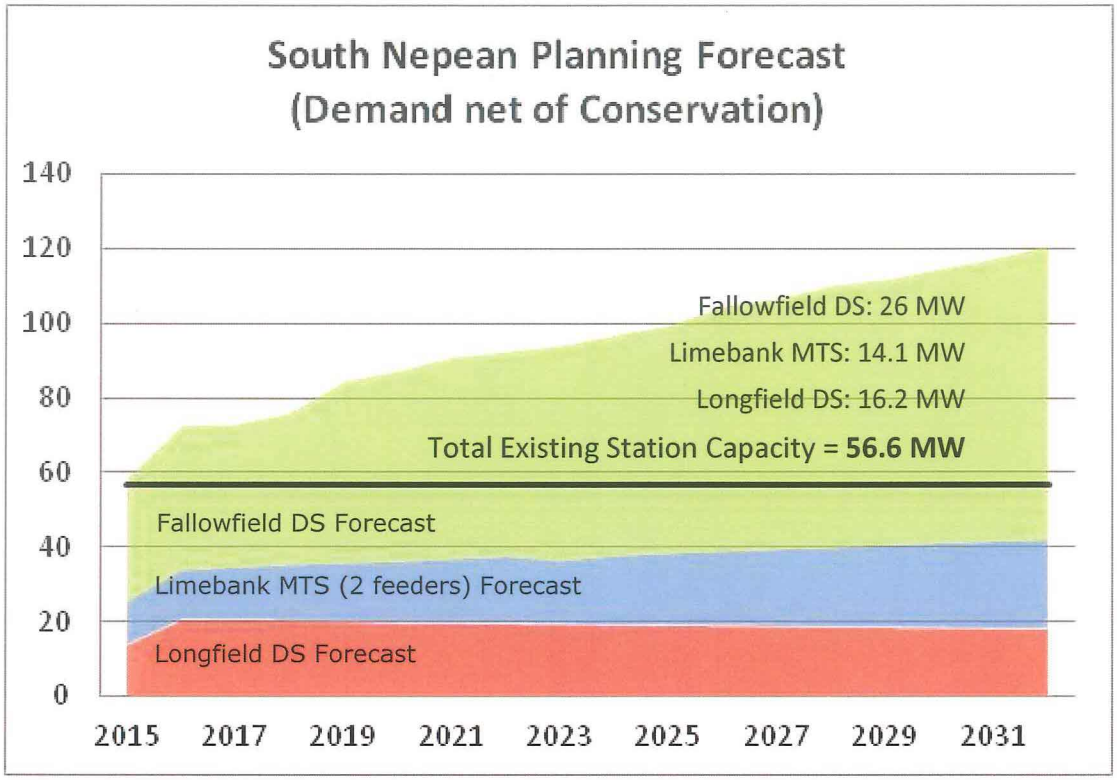


Figure 3. South Nepean Planning Forecast.

Figure 3 also shows that each of the three stations supplying South Nepean is reaching, or has already exceeded its planning capacity. Total supply capacity for South Nepean based on Hydro Ottawa's planning criteria is approximately 57 MW. This capacity is based on a combination of the ratings for the three stations, as well as the thermal ratings of individual feeders. The capability to transfer load at the distribution feeder level post contingency permits Hydro Ottawa to maintain reliable supply beyond the planning threshold, however this is not a permanent solution. Therefore, there is an imminent need to supply new connections in this growing corner of the City.

In addition to the station and feeder capacities being exceeded, the 115 kV single circuit transmission line, S7M, which provides the primary supply to this area and its surroundings, is also approaching its limit. The forecast demand on this circuit will reach its capacity of 108 MW in 2026. Therefore, solutions to relieving the station and feeder capacity constraints will also need to consider the line loading.

Solution Options Considered

Additional conservation, local generation, and transmission and distribution expansion were considered as means of increasing supply capacity in South Nepean. Given the near-term timing of the need for additional supply, in order for a solution to be feasible it must provide firm capacity in about five years, and be able to meet the total capacity need of over 60 MW by the end of the forecast period.

In order to rely entirely on conservation initiatives to provide additional capacity, more than four times the currently targeted level would need to be achieved. In terms of local generation, the magnitude of generation which would need to be connected to the distribution system in order to offset the need for additional station capacity is significantly higher than the historical uptake in the area. In addition, a distribution station like Fallowfield DS is not capable of absorbing a large amount of generation due to equipment rating limitations such as short circuit and thermal limits. New transmission connected generation in the area would not address the station limitation.

Based on the timeline and magnitude of the need for additional supply capacity in South Nepean, it is clear that it will not be feasible to address the need through additional conservation and local generation. Therefore, a new supply station and connection line are recommended for the South Nepean area.

Integrating Regional Transmission Considerations

As shown in Figure 1, South Nepean overlaps with the West Ottawa area, which is the 115 kV system supplied mainly by the Merivale hub station. A longer-term need to reinforce the 115 kV supply capability in West Ottawa was identified during the Ottawa area IRRP and in the RIP. The Merivale hub station has the capability of supplying roughly 645 MW and the 2015 peak demand in West Ottawa was 586 MW. The forecasted demand growth across West Ottawa, including the growth in South Nepean, will begin to exceed the Merivale hub capability as early as 2019. As a result of the overlap, if the new station in South Nepean is connected to the 230 kV system via a new 230 kV connection line into the area, it will take some pressure off the Merivale hub by moving demand growth off the West Ottawa 115kV system. The RIP report also reviewed potential wires solutions and indicated a preference for a 230 kV supply option if a wires solution were selected.

Community Engagement

In June of 2015 the IESO initiated the community engagement process by forming a Local Advisory Committee ("LAC") for the Greater Ottawa region consisting of eight volunteers from the community. Three meetings have been held thus far to discuss the issues which have been identified in the South Nepean and West Ottawa areas, and comments and advice have been received from the committee. Committee members generally agreed that there is a need to secure additional supply for the South Nepean area. While some LAC members support the recommended transmission solution, others feel that conservation and generation alternatives should be considered further. After consideration of the LAC's advice, transmission system expansion is nonetheless recommended, based on the magnitude and timing of the need for additional supply capacity, as well as the characteristics of the legacy system in

the area. However, a broader range of solutions may be feasible to address other planning issues where there is a longer timeline and broader scope.

Summary of Recommended Integrated Plan

The IESO, on behalf of the Working Group, recommends that an integrated solution, which comprises conservation and additional transmission and distribution ("wires") facilities be pursued at this time to meet the growing electricity demand in the South Nepean area. This recommendation also contributes to a longer-term plan to address the broader needs across the West Ottawa area.

Hydro Ottawa and Hydro One are requested to initiate work associated with the development of a new transmission station and connection line in the South Nepean area for an in-service date of 2021.

The Working Group looks forward to engaging with local communities, LAC members, and the broader public while continuing to develop a long-term integrated plan for the Greater Ottawa region.

Kind regards,



Michael Lyle
Vice President, Planning, Law and Aboriginal Relations
Independent Electricity System Operator

c.c.

Terry Young, IESO
Mike Penstone, Hydro One
Ottawa Regional Planning Working Group members

Project Classification and Categorization

Project Classification

Per the OEB's *Filing Requirements for Electricity Transmission Applications Chapter 4*, rate-regulated projects are classified into three groups based on their purpose.

- Development projects are those which:
  - (i) provide an adequate supply capacity and/or maintain an acceptable or prescribed level of customer or system reliability for load growth or for meeting increased stresses on the system; or
  - (ii) enhance system efficiency such as minimizing congestion on the transmission system and reducing system losses.
- Connection projects are those which provide connection of a load or generation customer or group of customers to the transmission system.
- Sustainment projects are those which maintain the performance of the transmission network at its current standard or replace end-of-life facilities on a "like-for-like" basis.

The line construction work that will be carried out by Hydro One can be classified as development, connection and sustainment, with the predominant driver being development.

The development part of the Project is:

- to provide supply capacity increase for meeting the needs of the South Nepean area into the long-term; and
- to minimize the impact of supply interruptions to customers in the South Nepean area.

The connection part of the Project is:

- to provide for the connection of Hydro Ottawa's new MTS to the transmission system. The MTS is required to supply the expected new load in the South Nepean area.

The sustainment part of the Project is:

- to replace an approximate 7.4 km section of the S7M conductor and towers that are at end of life.

Project Categorization

The Board's filing guidelines require that projects be categorized to distinguish between a project that is a "must-do", which is beyond the control of the applicant ("non-discretionary"), from a project that is at the discretion of the applicant ("discretionary").

Non-discretionary projects may be triggered or determined by such things as:

a) a mandatory requirement to satisfy obligations specified by regulatory organizations including, Northeast Power Coordinating Council, North American Electric Reliability Corporation, or by the Independent Electricity System Operator ("**IESO**");
b) a need to connect new load (of a distributor or large user) or new generation connection;
c) a need to address equipment loading or voltage/short circuit stresses when their rated capacities are exceeded;
d) projects identified in a provincial government-approved plan;
e) projects that are required to achieve provincial government objectives that are prescribed in governmental directives or regulations; and
f) a need to comply with a direction from the Ontario Energy Board in the event it is determined that the transmission system's reliability is at risk.

Based upon the above criteria, the PSN Project line work, which is required to supply and connect new load, is categorized as predominantly non-discretionary.

Categorization and Classification

		Project Need	
		Non-discretionary	Discretionary
Project Class	Development (Line)	**X**	

Cost Benefit Analysis and Options

Transmission Alternatives

Four alternatives were considered for the PSN Project to provide supply for Hydro Ottawa customers in the South Nepean area. These are described below.

Alternative One (1) – Build a new 115 kV / 27.6 kV station and upgrade 115 kV circuit S7M

Under this alternative, the new station would be supplied at 115 kV and the existing 115 kV circuit would be rebuilt to be able to supply the new station load.

Alternative Two (2) – Build a new 230 kV / 27.6 kV station and rebuild a section of 115 kV Circuit S7M as double circuit 230 kV line.

Under this alternative, the new station would be supplied at only 230 kV. The existing 115 kV circuit S7M would be rebuilt as a double circuit 230 kV line. One circuit would continue to operate at 115 kV (continuing to be designated as the S7M circuit) and supply the existing stations that it currently serves today at 115 kV – Fallowfield MTS, Richmond MTS and Manotick DS. The second circuit would operate at 230 kV and supply the new 230 kV / 27.6 kV station.

Alternative Three (3) – Build a new 230 kV / 115 k / 27.6 kV station and rebuild a section of 115 kV circuit (S7M) as a double circuit 230 kV line (Preferred Alternative).

Under this alternative, the new station would be built with dual supply capability. It would have one 230 kV/27.6 kV transformer and one 115 kV/27.6 kV transformer. The existing 115 kV circuit line, S7M, would be built as a double circuit 230 kV line. One circuit, the existing S7M 115 kV line, would continue to operate at 115 kV capacity, supplying the existing stations as well as the new station. The second circuit would operate at 230 kV and supply the new station.

Alternative Four (4) – Build a new 230 kV/115 kV/27.6 kV station and rebuild a section of 115 kV circuit L2M as a double circuit 230 kV line.

Alternative 4 is similar to Alternative 3, in that the new station would be built with dual supply capability. The difference in Alternative 4 is that supply would come from the 115 kV circuit L2M which is located further east, and supplies Limebank TS. The existing 115 kV circuit L2M line would be rebuilt as a double circuit 230kV line to Limebank TS and extended to the new station. One circuit would continue to operate at 115 kV, supplying the existing stations as well as the new station. The second circuit would operate at 230 kV and supply the new station. This line route would require Hydro One to acquire an additional 'greenfield' Right-of-Way ("ROW") corridor of approximately 9 km, compared to Alternative 3, which requires only 1.3 km of new ROW.

Analysis and Recommendation

Both *Alternatives 1 and 2* provide only a single circuit supply to the proposed MTS, and any outage to the single supply circuit would result in the load being interrupted. In terms of load security criteria, the IESO's *Ontario Resource and Transmission Assessment Criteria* ("ORTAC")[1] requires that not more than 150 MW of load may be interrupted by configuration. For both *Alternatives 1 and 2*, the load loss for the single circuit line in these alternatives would be greater than 150 MW. As such, they do not meet the IESO's ORTAC criteria and therefore were not considered further.

Alternatives 3 and 4 both provide a dual connection to the South Nepean MTS and adequate supply. However, *Alternative 4* requires a longer length of line to be built to connect the new station, resulting in additional towers, conductor and associated facilities costs. Under *Alternative 4,* Hydro One would also need to acquire a new greenfield ROW of approximately 9 km, which would be a costlier option compared to the new ROW distance required in *Alternative 3* (only 1.3 km). *Alternative 4* was not

[1] Ontario Resource and Transmission Assessment Criteria – Version 5.0 - August 22, 2007.

pursued further as it is expected to be significantly costlier and would have a broader impact on landowners, the environment and the South Nepean community. In contrast, *Alternative 3* uses the existing Hydro One S7M ROW, for approximately 10.9 km, and requires only approximately 1.3 km of new ROW corridor.

Given that *Alternative 3* has the least community, landowner and environmental impacts, in addition to being the lowest cost alternative that results in the ability to provide dual supply capacity to the MTS, it is therefore the preferred and recommended alternative. Additionally, this alternative satisfies the IESO's ORTAC requirements, as outlined above.

Benefits of the Project

As a result of the need for increased supply capacity, the IESO's April 2016[1] letter, on behalf of the Ottawa Regional Planning Working Group, identified the PSN Project as the preferred option.

In the Project, a section of the existing 115 kV single circuit line (S7M) will be rebuilt as a double circuit 230 kV line. The route of the new double circuit line is described in detail at **Exhibit B, Tab 2, Schedule 1**, and is shown on the Route Map at **Exhibit C, Tab 2, Schedule 1, Attachment 1.** A more detailed route map is also provided at **Exhibit E, Tab 1, Schedule 1, Attachment 1.**

The section of existing S7M line between S7M STR 673N JCT and Manotick JCT (a distance of approximately 7.4 km) was built in 1928 and has been identified by Hydro One as requiring replacement of both the wood poles and the line conductor. Both the conductor and a number of wood poles are in poor condition and are at end of life.

In the absence of the need for an upgrade to increase supply capacity in the South Nepean area, Hydro One would have refurbished this section of the circuit. The refurbishment would generally consist of replacing the conductor (with a like-for-like 115 kV conductor) and the replacement, as required, of any wood poles along the route. The Project eliminates the need for this refurbishment. The avoided costs for the sustainment work are provided and discussed further in **Exhibit B, Tab 7, Schedule 1.**

The Project also provides the additional quantitative and qualitative benefits.

[1] Exhibit B, Tab 3, Schedule 1, Attachment 3.

1.0 QUANTITATIVE BENEFITS

The PSN Project has the following quantitative benefits:

Increase thermal rating and line insulation of 10.9 km of 115 kV circuit S7M

This investment will increase the thermal limits of an approximate 10.9 km section of the 115 kV circuit S7M between the Hunt Club Road line tap connection (S7M STR 673N JCT) and the new station, to a summer continuous rating of 900A. This increased rating is required for Hydro One to supply power to the new MTS.

The upgraded S7M circuit will be insulated using 230 kV insulators so that the circuit can be operated at 230 kV when required in the future.

Provide new 230 kV tap from circuit E34M

The Project will provide 230 kV supply capability into the area, tapped off of the existing 230 kV circuit E34M. The new 230 kV circuit will extend from the Hunt Club Road tap connection point (S7M STR 673N JCT) to the new station and will have a minimum summer continuous rating of 900A, using a 997 kcmil Aluminum Conductor Steel-Reinforced ("ACSR") conductor.

2.0 QUALITATIVE BENEFITS

The Project has the following qualitative benefits:

Improve supply reliability to customers in the area

This Project will provide dual supply (115 kV and 230 kV) to the new MTS station. The advantages of dual supply capability will provide improved supply reliability for customers in the area. Instead of having a longer interruption when an existing single supply outage occurs, customers can be restored more quickly from this second (dual)

supply option. Customers connected to the MTS can expect to experience increased reliability in the area, in comparison to a single supply option. Having a second supply in the area will also enable distribution load transfers between the existing stations and the new station which will help shorten power restoration times to customers in the event of outages.

Increased capacity for forecast residential and commercial developments

The Project will facilitate future developments in the South Nepean area, including the CitiGate Business Park and Nepean Town Centre commercial and high density residential areas, as well as the City of Ottawa "Barrhaven South Expansion Community Design Plan"[2].

Increased distribution reliability through reduction of capacity constraints

The Project will relieve demand on the existing 28 kV distribution system, which is currently operating at or above the planning rating. During peak or near-peak conditions, additional switching or sectionalizing of circuits is required to restore customers, which can increase the duration of outages. The demand reductions to bring the system below planning rating will reduce switching required for restoration, improving reliability for customers.

[2] A Community Design Plan (CDP) provides the overall configuration of a new residential development. https://ottawa.ca/en/city-hall/public-engagement/projects/barrhaven-south-expansion-study-area-community-design-plan

Apportioning Project Costs & Risks

The estimated capital cost of the PSN Project, including overheads and capitalized interest, is shown below. The line-related scope of work will be completed by Hydro One, and the station-related scope of work will be completed by Hydro Ottawa.

1.0 LINE WORK - UNDERTAKEN BY HYDRO ONE

The estimated capital cost associated with Hydro One's line related work is estimated to be approximately $58.8M, including overheads and capitalized interest, and is shown In Table 1 below.

Table 1: Estimated Cost of Line Work

	$000's
Materials	15,702
Labour	11,137
Equipment & Rental Contractor Costs	16,063
Sundry	437
Contingencies	4,547
Overhead[1]	5,645
Allowance for Funds Used During Construction[2]	418
Real Estate	4,881
Total Line Work	**$58,830**

[1] Overhead costs allocated to the project are for corporate services costs. These costs are charged to capital projects through a standard overhead capitalization rate. 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] Capitalized interest (or AFUDC) is calculated using the Board's approved interest rate methodology (EB-2006-0117) to the Project's forecast monthly cash flow and carrying forward closing balances from the preceding month.

2.0 STATION WORK - UNDERTAKEN BY HYDRO OTTAWA

The estimated capital cost associated with Hydro Ottawa's transformation station work is estimated to be approximately $27.0M, including overheads and capitalized interest, and is shown In **Table 2** below.

Table 2: Estimated Cost of Station Work

	$000's
Materials	8,246
Labour	1,942
Equipment & Rental Contractor Costs	8,947
Sundry	366
Contingencies	4,051
Overhead[3]	1,797
Allowance for Funds Used During Construction[4]	1,608
Total Station Work	**$26,957**

The cost of the line and station work provided above allows for the schedule of approval, design and construction activities provided in **Exhibit B, Tab 11, Schedule 1.**

[3] Overhead costs allocated to the Project are a mix of Direct Overheads (Engineering, Direct Labour Supervision) and corporate services costs. These costs are charged to capital projects through a standard overhead capitalization rate.

[4] Capitalized interest (or AFUDC) is calculated using the Board's approved interest rate methodology (EB-2006-0117) to the Project's forecast monthly cash flow and carrying forward closing balance from the preceding month.

3.0 AVOIDED SUSTAINMENT WORK

As mentioned in **Exhibit B, Tab 6, Schedule 1**, in the absence of the need for construction of the PSN Project, Hydro One would be required to immediately undertake sustainment work on a section of the existing S7M 115 kV circuit between S7M STR 673N JCT and Manotick JCT, a distance of approximately 7.4 km. That section of the S7M circuit has been identified as being at end of life. Figure 1 below shows the S7M section of line where sustainment work is required.

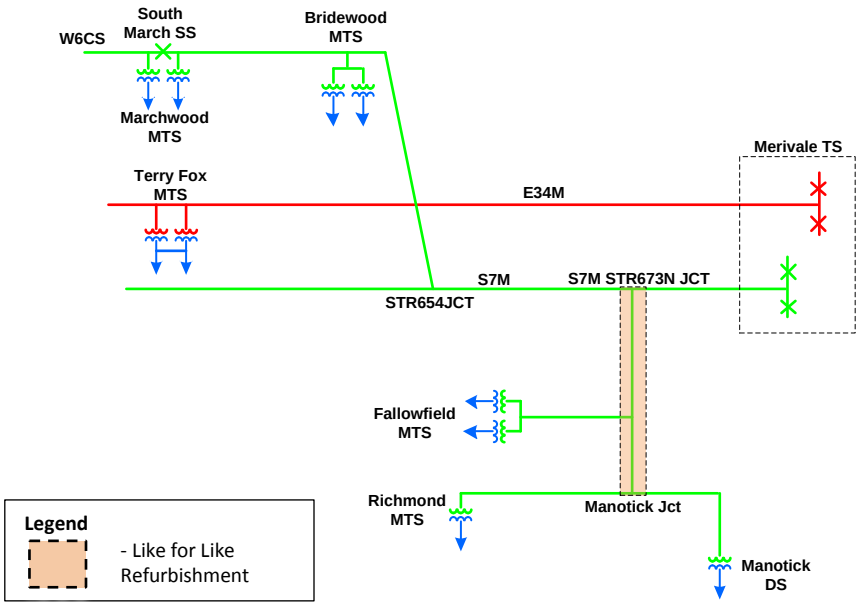


Figure 1: Schematic Diagram of Transmission Circuits in the Local Area Highlighting the Section of S7M Identified for Like-For-Like Refurbishment

The S7M circuit between S7M STR673N JCT and Manotick JCT consists of a single-circuit 115 kV wood H-Frame pole line. The scope of the work that would be required to complete the avoided sustainment work is as follows:

- Construct temporary bypass transmission circuit
- Replace 65 like-for-like wood pole structures

- Replace the existing conductors
- Replace the existing sky-wires

The avoided cost of this line sustainment work is estimated to be $8.7 million. A breakdown of that cost is provided below in **Table 3**.

Table 3: Estimated Cost of Avoided Sustainment Line Work

	$000's
Materials	1,626
Labour	3,116
Equipment & Rental Contractor Costs	1,829
Sundry	203
Contingencies	677
Overhead	894
Allowance for Funds Used During Construction[5]	373
Total Avoided Line Work	**8,717**

4.0 COST ALLOCATION

When determining the cost responsibility for the line scope of the Project work between the Customer and the rate pool, the Transmission System Code (TSC) requires that the cost of the avoided sustainment like-for-like replacement facility be taken into account.

The cost allocated to Hydro Ottawa for the line work will be limited to the incremental cost relative to the cost of the avoided sustainment work, consistent with the approach

[5] Capitalized interest (or AFUDC) is calculated using the Board's approved interest rate methodology (EB-2006-0117) to the project's forecast monthly cash flow and carrying forward closing balances from the preceding month.

set out in section 6.7.2(b) of the TSC relating to customer-driven incremental costs relative to the cost of a like-for-like replacement facility. That section reads as follows:

> *Where a transmitter-owned connection facility has reached its end-of-life and is planned to be retired and replacement with a new connection facility is determined to be the optimal solution, the transmitter shall undertake an assessment, in consultation with any affected customers, to determine the appropriate capacity of the replacement connection facility. Where the asset is replaced, the transmitter shall either:*
>
> *…*
>
> *(b) recover a capital contribution from a customer to replace the connection facility, where the customer requires additional capacity. The capital contribution shall be limited to the incremental cost relative to the cost of a like-for-like replacement facility.*[6]

The incremental cost for the Hydro One constructed portion of the Project attributed to the Customer is $50.1M. This was determined by assessing the cost of a like-for-like replacement facility of S7M sustainment scope of work, as described above, which is estimated to be $8.7M and deducting it from the cost of the PSN line scope project. The cost attributed to the transmission line pool is reflective of the cost Hydro One would have otherwise been required to incur in the absence of the need for this project and consequently there is no harm to pool ratepayers as a result of undertaking the Project. In other words, the customer will be allocated a portion of the total project cost equivalent to $50.1M utilizing the formula I = T - A; where

[6] Transmission System Code – Section 6.7.2 (b) – December 18, 2018

I = the Incremental Cost for the Line portion of the PSN Project attributed to the customer ($50.1M)

T = the Total Cost of the Line portion of the PSN Project ($58.8M)

A = the Avoided End-of-life Like-for-like Replacement Cost for S7M ($8.7M)

Therefore, the incremental cost of the line project relative to the cost of a like-for-like replacement line facility (on a section approximately 7.4 km in length along the identified Project route) is $50.1M ($58.8M - $8.7M). Total PSN Project costs are shown below in **Table 4**, categorized by facility type and cost responsibility.

Table 4: Project Cost Responsibility by Facility Type ($M)

	Project Cost of Work (by facility type)	Cost Responsibility	
		Customer	Pool
Transmission Line Facilities	58.8	50.1	8.7
Station Facilities	27.0	27.0	-
Total	85.8	77.1	8.7

Further details on how the avoided line sustainment cost is used to determine the cost allocation and capital contributions required from the customer are provided in **Exhibit B, Tab 9, Schedule 1**.

5.0 RISKS AND CONTINGENCIES

As with most projects, there is some risk associated with estimating costs. Hydro One and Hydro Ottawa's cost estimates include an allowance for contingencies in recognition of these risks.

Based on past experience, the estimate for this Project work includes allowances in the contingencies to cover the following potential risks:

- Delays in obtaining required approvals including Section 92 of the OEB Act and Section 67 of the Canadian Environmental Assessment Act, 2012
- Outage availability risk[7];
- Risk with real estate right acquisition;
- Extra cost and delays as a result of archeological finding and subsequent mitigation;
- Material delivery delay due to procurement or vendor issues;
- Delays associated with the potential emergence of community or other stakeholder concerns regarding the construction of the South Nepean MTS; and
- Disruptions to highway and municipal road operations may require mitigation and management measures either during or after construction.

Cost contingencies that have not been included, due to the unlikelihood or uncertainty of occurrence, include:

- Labour disputes;
- Safety or environmental incidents;
- Significant changes in costs of materials since the estimate preparation;
- Any other unforeseen and potentially significant event/occurrence, such as severe weather events.

6.0 COSTS OF COMPARABLE PROJECTS

The OEB Filing Requirements for Electricity Transmission Applications, Chapter 4, require the Applicant to provide information on the cost of similar projects constructed by the applicant for baseline cost comparison.

[7] Summer and winter outages may not be available since the circuit may be operating at full capacity.

The Project consists of a 230kV double circuit being built by Hydro One and a 230/27.6 kV transformer station being built by Hydro Ottawa. In accordance with the filing requirements, project cost comparisons of the lines work for the Project to other transmission lines projects completed by Hydro One is provided below in Section 6.1. Hydro One has provided three double circuit 230kV line comparison projects. Project cost comparisons of the station work for the Project to two other station work projects completed by Hydro Ottawa for the Project with is provided in Section 6.2 below.

6.1 Lines Work

Hydro One has provided three comparable projects for the line work: Guelph Area Transmission Reinforcement ("**GATR"**) Project, the Woodstock Area Transmission ("**WATR"**) Project, and the GTA - Parkway Station and Parkway to Richmond Hill Line (**"Parkway"**) Project. These projects are similar in that they all involve building a relatively short length (5 to 15 km) of double circuit 230kV transmission line in an urban/semi-urban environment on existing Hydro One rights-of-way with limited right-of-way clearances. Two of the comparison projects (GATR and WATR) involve replacing an existing 115kV double circuit line with a new 230V double circuit line, and the third project (Parkway) involves building a new double 230kV line on a corridor carrying multiple existing transmission lines.

A side-by-side comparison of these projects is provided in Table 5 below. The table illustrates the PSN line cost per km is approximately $3.6 M/km and lies between the $2.7 M/km to $5.1 M/km costs per km of the comparator projects provided.

1

Table 5: Costs of Comparable Lines Projects

Projects	**PSN Project**	**GATR Project**	**WATR Project**	**Parkway TS and 230kV Lines Project**
Technical	230 kV double circuits on single structures Predominantly steel poles with some lattice tower structures. Poor Soil - micropiles required for foundations	230 kV double circuits on single structures Predominantly steel lattice tower structures with some steel poles	230 kV double circuits on single structures Predominantly steel lattice tower structures with some steel poles	230 kV double circuits on single structures Predominantly steel poles with some lattice tower structures
Line Length (km)	12.2	5.0	13.6	6.3
Project Surroundings	Urban-Rural Parallel to Hwy 416 Multiple crossings – highway, roads	Urban Parallel to Hwy 6 Multiple crossings – highway, roads	Urban-Rural Parallel to Karn Rd Multiple road crossings	Urban Parallel to Hwy 407 Multiple crossings - highway, roads
Environmental Issues	None	None	None	None
In-Service Date	Nov - 2021	Nov - 2016	Mar - 2012	Dec -2006
Total Lines Work Cost	$57.7 M - Forecast	$23.1 M - Actual	$35.6 M - Actual	$25.1 M - Actual
Less: Non-Comparable Costs Real Estate Line bypass Foundation micropiles required	 $5.8 M $2.8 M $5.5 M	 $1.4 M	 $0.5 M $4.3 M	 $1.0 M
Total Comparable Project Costs	$43.6 M	$21.7 M	$30.8 M	$24.1 M
Add: Escalation Adjustment (2%/year)		$2.5M	$6.4 M	$8.3 M
Total Comparable Project Costs	$43.6 M	$24.2 M	$37.2 M	$32.4 M
Total Cost per Km ($M's / km)	$3.6 M	$4.8 M	$2.7 M	$5.1 M

A brief description of each comparable project is provided below with commentary highlighting any applicable similarities and/or differences to the Project which drive project costs for each:

a) The GATR project included building approximately 5.0 km of double circuit 230kV line to replace an existing double circuit 115 kV line utilizing a combination of steel lattice towers and steel pole structures. The project was located on an existing transmission corridor and consisted of a mix of provincially-owned properties, easement rights on private properties and municipal road corridors. The project went into service November 2016.

Compared to PSN's urban-rural location, GATR is situated in an urban area spanning parallel to Highway 6. This route required multiple highway road crossings and given the proximity to Highway 6 and complexity of the route (i.e. having to contend with several municipal road and low voltage distribution line crossings), GATR's structural tower designs have more steel compared to the average PSN project structure. The additional steel used in these towers contributes to a higher average line cost per km. Additionally, relative to the PSN Project, GATR was a significantly shorter line (measuring less than half the length of the PSN circuit) and as such the average line cost per km is impacted by higher construction and project management cost on a per km basis, as the fixed costs are recovered over a shorter distance.

b) The WATR project included building approximately 13.6 km of double circuit 230 kV line to replace an existing double circuit 115 kV line between Ingersoll TS and Woodstock TS utilizing a combination of steel lattice towers with some steel pole structures. The WATR project lands consisted of a mix of provincially-owned properties, easement rights on private properties and municipal road corridors. The project went into service in March 2012.

Both the WATR and PSN projects are similarly situated in urban-rural locations with similar line lengths. Relative to the WATR project, the PSN's line route is more complex, requiring multiple highway crossings and requires the crossing under a 500 kV transmission circuit. The WATR project consists of predominantly lattice steel towers (outside the urban areas) and to a minor extent steel poles (for a minor line section within the urban area). The PSN Project will use predominately steel pole structures so it can be accommodated within the S7M's existing right-of-way without the need for it to be widened for the higher voltage 230 kV circuits that will be constructed. Steel pole structures generally require more steel, compared to a lattice tower of the same height. The WATR project's lattice towers require less steel on average per tower compared to that of the PSN Project. The design of the PSN tower structures require additional steel, relative to WATR's average structures, and result in a higher average cost per km for the PSN Project.

c) The Parkway project consisted of building a new double circuit 230 kV line approximately 6.3 km in length between Parkway TS and Richmond Hill MTS. The project lands are located on a provincially-owned transmission corridor carrying multiple circuits. The project went in-service in December 2006.

Of the three comparable projects provided by Hydro One, the Parkway project is the most similar to the PSN Project scope. Both the PSN and Parkway projects utilize predominantly steel poles along the majority of the lines route, whereas GATR and WATR used mainly lattice towers with some steel pole requirements. The PSN and Parkway line routes involve multiple crossings of major highways. Compared to PSN's semi-rural location, Parkway is situated in a highly urbanized area. The Parkway project involved the added complexity of spanning parallel to, and crossing over a major intersection, at Highway 407 and Bayview Avenue,

necessitating shorter spans between towers, on average, compared to the more linear route of PSN, resulting in Parkway's higher average cost per km.

While both PSN and the Parkway projects require the new circuit 230kV line route to cross under 500kV lines, the Parkway project crosses under 500kV lines twice compared to only once for the PSN project. Given the Parkway route complexity, (i.e. proximity to the highway, multiple highway crossings and high voltage line crossings) on average the Parkway project required more structures and consequently more cost compared to PSN. The additional steel content requirement has contributed to a higher average cost per km.

The points at which a line requires a change in angular direction necessitate a structurally stronger 'dead-end' tower design to facilitate that direction change. These dead-end type towers require more structural strength compared to a 'suspension'[8] type tower; and hence the design requires more steel, resulting in a higher cost per tower, compared to the majority of a line's towers which are the suspension type. The more specialized towers included in the tower type 'mix' will increase the average cost of the project, compared to a project where the route was entirely linear.

Similar to GATR, the Parkway project was a shorter length of line, compared to the PSN line (approximately half the length of PSN), and as such this resulted in higher construction and project management costs on a per km basis, compared to PSN. Additionally, considering that the Parkway project was constructed over the 2004 to 2006 timeframe, inflationary cost increases for steel, equipment and other procurement-related materials have been experienced beyond that

[8] A suspension tower design doesn't need as much structural strength and is usually located along a straight line section of the conductor's route.

captured in Escalation Adjustment line in **Table 5** for the Parkway project. On a comparable basis, these factors have resulting in the Parkway project cost per km being approximately $1.5 M/km more expensive than the PSN Project.

6.2 Station

For cost comparisons to the Hydro Ottawa station, Table 6 below shows the cost, construction and technical comparisons of the South Nepean MTS to Hydro Ottawa's two recently constructed stations, Terry Fox MTS and Ellwood MTS.

Terry Fox MTS, completed in 2014, is a 230/27.6kV dual-element spot-network ("DESN") station. This station was constructed with two line taps which are taken off of the 230 kV Hydro One transmission system (from the E34M circuit), supplying two (2) 75 MVA transformers, which supply a total of six 27.6 kV feeder breakers.

Ellwood MTS, completed in 2012, is a 230/13.2kV main-tie-main station. This station was constructed with two line taps, which are taken off of the 230 kV Hydro One transmission system (from the M31A and M30A circuits) supplying two 50 MVA transformers, which supply a total of fourteen 13.2 kV feeder breakers.

For comparison, the South Nepean MTS will be supplied from both the 115kV (S7M) and 230kV (E34M) systems, and the station will also be designed in a DESN configuration. Two 100 MVA transformers, one 115/27.6kV unit and one 230/27.6kV unit, will supply a total of six 27.6kV feeder breakers.

The Terry Fox and Ellwood MTS projects were chosen as good comparators to the South Nepean MTS because of their similar construction conditions and design configurations. However, one feature of the South Nepean MTS project that does differentiate it from the comparator projects, and in turn, serves as a key reason for cost differentials, is the size of its transformers. The transformers at South Nepean MTS are 25 MVA larger than

1 those at Terry Fox MTS and 50 MVA larger than those at Ellwood MTS. Those two
2 comparison projects are provided against the proposed South Nepean MTS in **Table 6**
3 below.

4 **Table 6: Costs of Comparable Station Projects**

Project	**Ellwood MTS New Station Build (Actual)**	**Terry Fox MTS New Station Build (Actual)**	**South Nepean MTS New Station Build (Estimate)**
Technical	230/13.2kV Main-Tie-Main Including 2x Transformers, 14x feeders, 2x cap banks, and a P&C building	230/27.6kV DESN Including 2x Transformers, 6x feeders, 2x cap banks, and a P&C building	230/115/27.6kV DESN Including 2x Transformers, 6x feeders, 2x cap banks, and a P&C building
Length (km)	N/A	N/A	N/A
Project Surroundings	Mostly commercial & residential	Mostly commercial	Mostly agricultural & industrial
Environmental Issues	None	None	None
In-Service Date	December 2012	April 2014	November 2021
Total Project Cost	**$21,276k**	**$23,869k**	**$26,957k**
Escalation Adjustment (2%/year)	$3,684k	$3,869k	N/A
Total Comparable Project Costs	**$24,960k**[9]	**$27,738**[10]	**$26,957k**

[9] Adjusted for comparison to the PSN MTS project in-service date of November 2021.
[10] Adjusted for comparison to the PSN MTS project in-service date of November 2021.

Connection Projects Requiring Network Reinforcement

The PSN Project will not require reinforcement of network facilities as defined by the Transmission System Code.

Transmission Rate Impact Assessment

1.0 ECONOMIC FEASIBILITY

The proposed PSN Project, which comprises primarily Line assets, along with some minor Network assets, and the construction of a new MTS will contribute to meeting the near-term and long-term capacity requirements for the South Nepean area.

The Project includes the rebuilding of approximately 10.9 km of existing single circuit 115 kV line S7M with a double circuit steel pole 230 kV line from S7M STR 673N JCT (at West Hunt Club Road) to Cambrian Road JCT and the construction of a new 1.3 km double circuit 230 kV line tap to the proposed South Nepean MTS. The proposed work eliminates the need for Hydro One to refurbish an approximate 7.4 km section of existing circuit S7M between S7M STR673N JCT and Manotick JCT. The proposed line project requires protection changes on circuits S7M and E34M and also includes the construction of a new station, South Nepean MTS, to be constructed, owned and operated by Hydro Ottawa. The new MTS will be connected to both the E34M and S7M circuits and will consist of one 100MVA 230/27.6 kV transformer and one 100MVA 115/27.6 kV transformer. The new MTS is intended to be supplied only from the 230 kV side during normal operating conditions. As such, the incremental load forecast provided applies only to the 230 kV circuit, and not to the 115 kV circuit. Incremental capacity will be created on the 230 kV-system as a result of the Project. On this basis, all incremental load and revenue was applied to the Initial Economic Evaluation (IEE) of the 230 kV portions of the Project, as per the Transmission System Code (TSC). Accordingly, an IEE was also performed for the incremental expansion of the 115 kV system (1.3 km line tap) but with no incremental load allocated to that analysis (i.e. 100% of the load was applied to the 230 kV IEE).

The Project is driven by the growing capacity needs as identified by the Regional Planning Need Evidence. The cost of the line rebuild will be part of the line connection pool and will be borne by both Hydro Ottawa and Hydro One. Hydro One will be responsible for the avoided cost of the sustainment work. Hydro Ottawa will be responsible for the remainder of the line project cost which will be paid through load revenue and capital contribution. The cost of the circuit protection modifications undertaken by Hydro One will be borne by Hydro Ottawa, as the modifications are required to facilitate the connection of the new MTS. Hydro Ottawa will construct and operate the new MTS.

The cost of the line work undertaken by Hydro One is charged to both the line asset and the network asset pool, as shown below.

Transmission Asset Pool ($M)	
Line Asset Pool	$57.7
Network Assets Pool	1.1
Total	**$58.8**

A 25-year discounted cash flow analysis[1] of the entire Project's line asset pool work is provided in Table 5 below. The results show that based on the estimated initial cost of $57.7[2] million, plus assumed ongoing operating and maintenance costs and net of incremental revenue, the capacity enhancement project will have a negative net present

[1] To determine overall rate impact, all line pool costs and corresponding capital contribution from Hydro Ottawa were included in the analysis. $28.4 million with a respective capital contribution of $27 million are attributed to the new 230kV line, $29.3 million in total cost with a corresponding capital contribution of $20.7 million is attributable to the upgrade and addition of the 1.3 km line tap of 115kV line.
[2] Initial costs of $57.74 million include $56.18 million of up front capital costs plus $1.56 million cost of removals

value of $49.2 million.[3] The resulting revenue requirement shortfall will be recovered through a capital contribution from Hydro Ottawa and Hydro One line pool rates.

A 25-year discounted cash flow analysis[4] of the network asset pool work is provided in Tables 10 and 11 below. The results show that based on the estimated initial cost of $1.1 million, plus assumed ongoing operating and maintenance costs and net of incremental revenue, the capacity enhancement project will have a positive net present value of $8.2[5] million. The resulting revenue requirement surplus will be redistributed within Hydro One network pool rates.

2.0 COST RESPONSIBILITY

Work Performed by Hydro One

The $8.7M cost of the avoided sustainment work on the section of the existing S7M 115 kV line between S7M STR673N JCT and Manotick JCT that is at end of life will be included in Hydro One's rate base once the Project is in service. For more information regarding the S7M like-for-like sustainment project scope and costs that Hydro One would have undertaken, in the absence of this Project driven by Hydro Ottawa's request, refer to **Exhibit B, Tab 7, Schedule 1, Section 3.0**.

As show in Tables 1 and 2 below, Hydro Ottawa will therefore be responsible for $49.0M of the Project's line cost (calculated as $57.7M less sustainment avoided cost of $8.7M)

[3] The analysis for the negative $49.2M NPV was completed (Table 5). Components related to Hydro Ottawa's capital contribution are provided in Table 8 – DCF Analysis, Line Pool Capital Contribution (230kV line) and Table 9 – DCF Analysis, Line Pool Capital Contribution (115kV line) and the $29.3M Transmission Line Facilities (115kV Line expenditures not subject to an IEE),

[4] To determine overall rate impact, all network pool costs and corresponding capital contribution from Hydro Ottawa were included in the analysis. $0.6 million with a respective capital contribution of $0.0 million are attributed to circuit protection modification on 230kV line, $0.5 million in total cost with a corresponding capital contribution of $0.5 million is attributable to the circuit protection modification on 115kV line.

[5] Sum of PV Surplus in Table 10 ($8.6M) and PV Shortfall in Table 11 (-$0.4M)

and $1.1M of the Project's network cost for work performed by Hydro One. This approach is consistent with the approach set out in the TSC[6] relating to customer-driven incremental costs relative to the cost of a like-for-like replacement facility (see **Exhibit B, Tab 7, Schedule 1)**.

Table 1: Line Connection Pool Project Cost Responsibility and Capital Contribution ($M)

	Incremental Cost of Work (per B-7-1)	Cost Responsibility		Capital Contribution
		Customer	Pool	
Transmission Line Facilities (230kV Line)	28.4	28.4	-	27.0
Transmission Line Facilities (115kV Line	29.3	20.6	8.7	20.7
Total	**57.7**	**49.0**	**8.7**[7]	**47.7**

Table 2: Network Connection Pool Project Cost Responsibility and Capital Contribution

	Incremental Cost of Work (per B-7-1)	Cost Responsibility		Capital Contribution
		Customer	Pool	
Station Facilities (230kV Line)	0.6	0.6	-	-
Station Facilities (115kV Line	0.5	0.5	-	0.5
Total	**1.1**	**1.1**	**-**	**0.5**

[6] Transmission System Code section 6.7.2(b)
[7] See Exhibit B, Tab 7, Schedule 1 for calculation

Work Performed by Hydro Ottawa

100% of the costs of construction for the South Nepean MTS (i.e. the transformer station scope of work for the Project) will be included in Hydro Ottawa's rate base once in service, at a cost of $27.0M.

Table 3 below provides a summary of the total Project cost responsibilities and the capital contribution elements.

Table 3: Total Project Cost Responsibility and Capital Contribution

	Incremental Cost of Work (per B-7-1)	Cost Responsibility		Capital Contribution
		Customer	Pool	
Transmission Line Facilities	57.7	49.0	8.7	47.7
Network Connection Facilities	1.1	1.1	-	0.5
Station Facilities (Hydro Ottawa)	27.0	27.0	-	-
Total Project	**85.8**	**77.1**	**8.7**	**48.2**

3.0 RATE IMPACT ASSESSMENT – TRANSMISSION POOL IMPACT

The analysis of the asset pool's rate impacts has been carried out on the basis of Hydro One's transmission revenue requirement for the year 2019, and the most recently approved Ontario Transmission Rate Schedules.

Line Connection Pool

Based on the Project's initial line connection cost of $57.7 million and the associated line pool incremental cash flows, there will be a slight increase in the line pool revenue requirement once the Project's impacts are reflected in the transmission rate base at the projected in-service date. Over a 25-year time horizon, the line pool rate will remain

unchanged at $0.94/kW/month. The detailed analysis illustrating the calculation of the incremental line connection pool revenue shortfall and rate impact is provided in Table 6 below.

Network Connection Pool

Based on the Project's initial network connection cost of $1.1 million and the associated network pool incremental cash flows, there will be a slight change in the network pool revenue requirement once the Project's impacts are reflected in the transmission rate base at the projected in-service date. Over a 25-year time horizon, the network pool rate will decrease slightly from $3.71/kW/month to $3.70/kW/month. The maximum revenue requirement impact related to the proposed network connection facilities will be $0.05 million in the year 2028. However, this increase in revenue requirement will be more than offset by the incremental revenue generated by the Project's incremental load resulting in a 0.27% decrease in network connection facilities rate beginning in 2029. The detailed analysis illustrating the calculation of the incremental line connection pool revenue shortfall and rate impact is provided in Table 7 below.

Impact on Typical Residential Customer

Based on the load forecast, initial capital costs and ongoing maintenance costs, there will be minor decrease on transmission rates. The table below shows this result for a typical residential customer who is under the Regulated Price Plan (RPP).

Table 4: Rate Impact on Typical Residential Customer Bill

A. Typical monthly bill	$134.29 per month
B. Transmission component of monthly bill	$11.58 per month
C. Network Pool share of Transmission component	$6.43 per month
D. Line Connection Pool share of Transmission component	$1.52 per month
E. Transformation Connection Pool share of Transmission component	$3.63 per month
F. Impact on Network Pool Provincial Uniform Rates	-0.27%
G. Impact on Line Connection Pool Provincial Uniform Rates	0.00%
H. Impact on Transformation Connection Pool Provincial Uniform Rates	0.00%
I. Decrease in Transmission costs for typical monthly bill (C x E)	$0 per month (or -$0.05 per year)
J. Net impact on typical residential customer bill (G / A)	0.00%

Table 5: DCF Analysis Line Pool Total Project, Page 1

Date: 25-Apr-19
Project #

SUMMARY OF CONTRIBUTION CALCULATIONS
Line Pool - Estimated cost

Facility Name: South Nepean Transmission Reinforcement
Description: South Nepean Transmission Reinforcement - plus sustainment (Hydro One)
Customer: Hydro Ottawa plus Hydro One

		Month Year	In-Service Date Nov-15 2021 0	<------- Project year ended - annualized from In-Service Date -------> Nov-15 2022 1	Nov-15 2023 2	Nov-15 2024 3	Nov-15 2025 4	Nov-15 2026 5	Nov-15 2027 6	Nov-15 2028 7	Nov-15 2029 8	Nov-15 2030 9	Nov-15 2031 10	Nov-15 2032 11	Nov-15 2033 12
Revenue & Expense Forecast															
Load Forecast (MW)				0.0	0.0	0.0	0.7	7.2	12.1	15.5	18.9	22.0	25.0	26.8	29.0
Load adjustments (MW)				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.7	7.2	12.1	15.5	18.9	22.0	25.0	26.8	29.0
Tariff Applied ($/kW/Month)				0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Incremental Revenue - $M				0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3
Removal Costs - $M			(1.6)												
On-going OM&A Costs - $M			0.0	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Municipal Tax - $M				(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)
Net Revenue/(Costs) before taxes - $M			(1.6)	(0.2)	(0.2)	(0.2)	(0.2)	(0.1)	(0.1)	(0.0)	(0.0)	0.0	0.1	0.1	0.1
Income Taxes				0.4	0.6	1.1	1.0	0.9	0.8	0.8	0.7	0.6	0.6	0.5	0.5	0.4
Operating Cash Flow (after taxes) - $M				(1.1)	0.4	0.9	0.8	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.5
		Cumulative PV @ 5.59%													
PV Operating Cash Flow (after taxes) - $M	**(A)**	**6.7**		**(1.1)**	**0.4**	**0.8**	**0.7**	**0.6**	**0.6**	**0.5**	**0.5**	**0.4**	**0.4**	**0.3**	**0.3**	**0.3**
Capital Expenditures - $M															
Upfront - capital cost before overheads & AFUDC			(50.2)												
- Overheads			(5.5)												
- AFUDC			(0.4)												
Total upfront capital expenditures			**(56.2)**												
On-going capital expenditures				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PV On-going capital expenditures			0.0												
Total capital expenditures - $M			**(56.2)**												
Capital Expenditures - $M															
PV CCA Residual Tax Shield - $M			**0.3**												
PV Working Capital - $M			**(0.0)**												
PV Capital (after taxes) - $M	**(B)**	**(55.9)**	**(55.9)**												
Cumulative PV Cash Flow (after taxes) - $M	**(A) + (B)**	**(49.2)**	**(57.1)**	**(56.7)**	**(55.9)**	**(55.2)**	**(54.6)**	**(54.0)**	**(53.5)**	**(53.0)**	**(52.6)**	**(52.2)**	**(51.9)**	**(51.6)**	**(51.3)**

Discounted Cash Flow Summary

Economic Study Horizon - Years:		**25**
Discount Rate - %		**5.59%**
		Before Cont $M
PV Incremental Revenue		3.1
PV OM&A Costs		(1.6)
PV Municipal Tax		(2.9)
PV Income Taxes		0.4
PV CCA Tax Shield		8.0
PV Capital - Upfront	(56.2)	
Add: PV **Capital Contribution**	**0.0**	(56.2)
PV Capital - On-going		0.0
PV Working Capital		(0.0)
PV Surplus / (Shortfall)		**(49.2)**
Profitability Index*		**0.1**

Notes:
*PV of total cash flow, excluding net capital expenditure & on-going capital & proceeds on disposal / PV of net capital expenditure & on-going capital & proceeds on disposal

Other Assumptions

In-Service Date:	15-Nov-21
Payback Year:	2046
No. of years required for payback:	25

Table 5: DCF Analysis Line Pool Total Project, Page 2

Date:	25-Apr-19
Project #	

SUMMARY OF CONTRIBUTION CALCULATIONS
Line Pool - Estimated cost

Facility Name:	South Nepean Transmission Reinforcement
Description:	South Nepean Transmission Reinforcement - plus sustainment (Hydro One)
Customer:	Hydro Ottawa plus Hydro One

		<------- Project year ended - annualized from In-Service Date ------->												
Month		Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15
Year		**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**	**2042**	**2043**	**2044**	**2045**	**2046**
		13	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*25*
Revenue & Expense Forecast														
Load Forecast (MW)		31.3	33.9	34.4	34.7	35.7	36.8	38.0	39.1	40.3	41.5	42.7	43.9	45.0
Load adjustments (MW)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		31.3	33.9	34.4	34.7	35.7	36.8	38.0	39.1	40.3	41.5	42.7	43.9	45.0
Tariff Applied ($/kW/Month)		0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Incremental Revenue - $M		0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5
Removal Costs - $M														
On-going OM&A Costs - $M		(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Municipal Tax - $M		(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)
Net Revenue/(Costs) before taxes - $M		0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
Income Taxes		0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1
Operating Cash Flow (after taxes) - $M		0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
PV Operating Cash Flow (after taxes) - $M	**(A)**	**0.3**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
Capital Expenditures - $M														
Upfront - capital cost before overheads & AFUDC														
- Overheads														
- AFUDC														
Total upfront capital expenditures														
On-going capital expenditures		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PV On-going capital expenditures														
Total capital expenditures - $M														
Capital Expenditures - $M														
PV CCA Residual Tax Shield - $M														
PV Working Capital - $M														
PV Capital (after taxes) - $M	**(B)**													
Cumulative PV Cash Flow (after taxes) - $M	**(A) + (B)**	**(51.0)**	**(50.8)**	**(50.6)**	**(50.4)**	**(50.2)**	**(50.0)**	**(49.9)**	**(49.7)**	**(49.6)**	**(49.5)**	**(49.4)**	**(49.3)**	**(49.2)**

Table 6: Revenue Requirement and Line Pool Rate Impact, Page 1

Revenue Requirement and Line Pool Rate Impact **(After Capital Contribution)**

South Nepean Transmission Reinforcement		Project YE 15-Nov 2022	15-Nov 2023	15-Nov 2024	15-Nov 2025	15-Nov 2026	15-Nov 2027	15-Nov 2028	15-Nov 2029	15-Nov 2030	15-Nov 2031	15-Nov 2032	15-Nov 2033
Calculation of Incremental Revenue Requirement ($000)		1	2	3	4	5	6	7	8	9	10	11	12
In-service date	15-Nov-21												
Capital Cost	56,182												
Less: Capital Contribution Required	(47,688)												
Net Project Capital Cost	8,494												
Average Rate Base		4,169	8,261	8,106	7,951	7,796	7,641	7,486	7,331	7,175	7,020	6,865	6,710
Incremental OM&A Costs		2	2	2	2	2	2	2	2	2	2	2	2
Grants in Lieu of Municipal tax		212	212	212	212	212	212	212	212	212	212	212	212
Depreciation		155	155	155	155	155	155	155	155	155	155	155	155
Interest and Return on Rate Base		263	521	512	502	492	482	473	463	453	443	433	424
Income Tax Provision		(2)	(52)	(36)	(23)	(10)	1	12	21	29	37	44	50
REVENUE REQUIREMENT PRE-TAX		**630**	**839**	**844**	**848**	**851**	**853**	**853**	**853**	**851**	**849**	**846**	**842**
Incremental Revenue		0	0	0	8	81	135	174	212	247	281	301	326
SUFFICIENCY/(DEFICIENCY)		**(630)**	**(839)**	**(844)**	**(840)**	**(770)**	**(717)**	**(679)**	**(640)**	**(604)**	**(568)**	**(545)**	**(516)**
	Base Year												
Line Pool Revenue Requirement including sufficiency/(deficiency)	225,017	225,648	225,856	225,862	225,866	225,868	225,870	225,870	225,870	225,869	225,866	225,863	225,860
Line MW	240,481	240,481	240,481	240,481	240,489	240,567	240,626	240,667	240,708	240,745	240,781	240,802	240,829
Line Pool Rate ($/kw/month)	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Increase/(Decrease) in Line Pool Rate ($/kw/month), relative to base year		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RATE IMPACT relative to base year		**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

Assumptions

Incremental OM&A		$1.27k per new km of line each year.
Grants in Lieu of Municipal tax	0.38%	Transmission system average
Depreciation	2.00%	Reflects 50 year average service life for towers, conductors and station equipment, excluding land
Interest and Return on Rate Base	6.31%	Includes OEB-approved ROE of 9%, 2.29% on ST debt, and 4.68% on LT debt. 40/4/56 equity/ST debt/ LT debt split
Income Tax Provision	26.50%	2018 federal and provincial corporate income tax rate
Capital Cost Allowance	8.00%	100% Class 47 assets except for Land

Table 6: Revenue Requirement and Line Pool Rate Impact, Page 2

Revenue Requirement and Line Pool Rate Impact **(After Capital Contribution)**

South Nepean Transmission Reinforcement		15-Nov 2034	15-Nov 2035	15-Nov 2036	15-Nov 2037	15-Nov 2038	15-Nov 2039	15-Nov 2040	15-Nov 2041	15-Nov 2042	15-Nov 2043	15-Nov 2044	15-Nov 2045	15-Nov 2046
Calculation of Incremental Revenue Requirement ($000)		13	14	15	16	17	18	19	20	21	22	23	24	25
In-service date	15-Nov-21													
Capital Cost	56,182													
Less: Capital Contribution Required	(47,688)													
Net Project Capital Cost	8,494													
Average Rate Base		6,555	6,400	6,245	6,090	5,934	5,779	5,624	5,469	5,314	5,159	5,004	4,849	4,693
Incremental OM&A Costs		2	2	2	2	2	2	2	2	2	2	2	2	2
Grants in Lieu of Municipal tax		212	212	212	212	212	212	212	212	212	212	212	212	212
Depreciation		155	155	155	155	155	155	155	155	155	155	155	155	155
Interest and Return on Rate Base		414	404	394	384	375	365	355	345	335	326	316	306	296
Income Tax Provision		55	60	64	68	71	74	77	79	81	82	84	85	85
REVENUE REQUIREMENT PRE-TAX		**838**	**833**	**827**	**821**	**815**	**808**	**801**	**793**	**785**	**777**	**768**	**760**	**751**
Incremental Revenue		352	380	387	389	400	414	427	439	453	466	479	493	506
SUFFICIENCY/(DEFICIENCY)		**(486)**	**(453)**	**(441)**	**(432)**	**(415)**	**(395)**	**(374)**	**(354)**	**(333)**	**(311)**	**(289)**	**(267)**	**(245)**
	Base Year													
Line Pool Revenue Requirement including sufficiency/(deficiency)	225,017	225,855	225,850	225,845	225,839	225,832	225,826	225,818	225,811	225,803	225,794	225,786	225,777	225,768
Line MW	240,481	240,857	240,887	240,894	240,897	240,909	240,923	240,937	240,951	240,965	240,979	240,993	241,008	241,021
Line Pool Rate ($/kw/month)	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Increase/(Decrease) in Line Pool Rate ($/kw/month), relative to base year		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RATE IMPACT relative to base year		**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

Table 7: Revenue Requirement and Network Pool Rate Impact, Page 1

Revenue Requirement and Network Pool Rate Impact **(After Capital Contribution)**

South Nepean Transmission Reinforcement		Project YE 15-Nov 2022	15-Nov 2023	15-Nov 2024	15-Nov 2025	15-Nov 2026	15-Nov 2027	15-Nov 2028	15-Nov 2029	15-Nov 2030	15-Nov 2031	15-Nov 2032	15-Nov 2033
Calculation of Incremental Revenue Requirement ($000)		1	2	3	4	5	6	7	8	9	10	11	12
In-service date	15-Nov-21												
Capital Cost	1,090												
Less: Capital Contribution Required	(510)												
Net Project Capital Cost	580												
Average Rate Base		284	562	551	539	528	516	504	493	481	470	458	446
Incremental OM&A Costs		0	0	0	0	0	0	0	0	0	0	0	0
Grants in Lieu of Municipal tax		4	4	4	4	4	4	4	4	4	4	4	4
Depreciation		12	12	12	12	12	12	12	12	12	12	12	12
Interest and Return on Rate Base		18	36	35	34	33	33	32	31	30	30	29	28
Income Tax Provision		(0)	(5)	(3)	(2)	(1)	(1)	0	1	1	2	3	3
REVENUE REQUIREMENT PRE-TAX		**33**	**47**	**47**	**47**	**48**	**48**	**48**	**48**	**48**	**47**	**47**	**47**
Incremental Revenue		0	0	0	31	319	537	688	841	980	1,114	1,192	1,292
SUFFICIENCY/(DEFICIENCY)		**(33)**	**(47)**	**(47)**	**(17)**	**272**	**489**	**640**	**794**	**932**	**1,066**	**1,145**	**1,245**
	Base Year												
Network Pool Revenue Requirement including sufficiency/(deficiency)	923,981	924,014	924,028	924,028	924,028	924,028	924,029	924,029	924,029	924,028	924,028	924,028	924,028
Network MW	249,176	249,176	249,176	249,176	249,184	249,262	249,320	249,361	249,403	249,440	249,476	249,497	249,524
Network Pool Rate ($/kw/month)	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.70	3.70	3.70	3.70	3.70
Increase/(Decrease) in Network Pool Rate ($/kw/month), relative to base year		0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01
RATE IMPACT relative to base year		**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**-0.27%**	**-0.27%**	**-0.27%**	**-0.27%**	**-0.27%**

Assumptions

Incremental OM&A		Years 1 to 5 0.98% of Initial Capital each year; Years 6 to 15 1.95% of Initial Captial each year; Years 16 to 25 2.44% of Initial Capital each year.
Grants in Lieu of Municipal tax	0.38%	Transmission system average
Depreciation	2.00%	Reflects 50 year average service life for towers, conductors and station equipment, excluding land
Interest and Return on Rate Base	6.31%	Includes OEB-approved ROE of 9%, 2.29% on ST debt, and 4.68% on LT debt. 40/4/56 equity/ST debt/ LT debt split
Income Tax Provision	26.50%	2018 federal and provincial corporate income tax rate
Capital Cost Allowance	8.00%	100% Class 47 assets

Table 7: Revenue Requirement and Network Pool Rate Impact, Page 2

Revenue Requirement and Network Pool Rate Impact **(After Capital Contribution)**

South Nepean Transmission Reinforcement		15-Nov 2034	15-Nov 2035	15-Nov 2036	15-Nov 2037	15-Nov 2038	15-Nov 2039	15-Nov 2040	15-Nov 2041	15-Nov 2042	15-Nov 2043	15-Nov 2044	15-Nov 2045	15-Nov 2046
Calculation of Incremental Revenue Requirement ($000)		13	14	15	16	17	18	19	20	21	22	23	24	25
In-service date	15-Nov-21													
Capital Cost	1,090													
Less: Capital Contribution Required	(510)													
Net Project Capital Cost	580													
Average Rate Base		435	423	412	400	388	377	365	354	342	330	319	307	296
Incremental OM&A Costs		0	0	0	0	0	0	0	0	0	0	0	0	0
Grants in Lieu of Municipal tax		4	4	4	4	4	4	4	4	4	4	4	4	4
Depreciation		12	12	12	12	12	12	12	12	12	12	12	12	12
Interest and Return on Rate Base		27	27	26	25	25	24	23	22	22	21	20	19	19
Income Tax Provision		3	4	4	4	5	5	5	5	5	5	6	6	6
REVENUE REQUIREMENT PRE-TAX		**47**	**46**	**46**	**45**	**45**	**44**	**44**	**43**	**43**	**42**	**41**	**41**	**40**
Incremental Revenue		1,394	1,507	1,533	1,542	1,587	1,639	1,692	1,742	1,794	1,846	1,899	1,954	2,004
SUFFICIENCY/(DEFICIENCY)		**1,347**	**1,461**	**1,487**	**1,497**	**1,542**	**1,595**	**1,648**	**1,698**	**1,751**	**1,804**	**1,857**	**1,913**	**1,964**
	Base Year													
Network Pool Revenue Requirement including sufficiency/(deficiency)	923,981	924,027	924,027	924,027	924,026	924,026	924,025	924,025	924,024	924,024	924,023	924,022	924,022	924,021
Network MW	249,176	249,552	249,582	249,589	249,592	249,604	249,618	249,632	249,645	249,659	249,674	249,688	249,703	249,716
Network Pool Rate ($/kw/month)	3.71	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70
Increase/(Decrease) in Network Pool Rate ($/kw/month), relative to base year		-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
RATE IMPACT relative to base year		**-0.27%**	**-0.27%**	**-0.27%**	**-0.27%**	**-0.27%**	**-0.27%**	**-0.27%**	**-0.27%**	**-0.27%**	**-0.27%**	**-0.27%**	**-0.27%**	**-0.27%**

Table 8: DCF Analysis, Line Pool Capital Contribution (230kV line)

Facility Name: South Nepean Transmission Reinforcement
Description: South Nepean Transmission Reinforcement - 230kV line
Customer: Hydro Ottawa

			In-Service Date	<-------- Project year ended - annualized from In-Service Date -------->																									
		Month	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15
		Year	2021	2022	2023	2024	2025	2026 1st true-up	2027	2028	2029	2030	2031 2nd true-up	2032	2033	2034	2035	2036 3rd true-up	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046		
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		
Revenue & Expense Forecast																														
Load Forecast (MW)				0.0	0.0	0.0	0.7	7.2	12.1	15.5	18.9	22.0	25.0	26.8	29.0	31.3	33.9	34.4	34.7	35.7	36.8	38.0	39.1	40.3	41.5	42.7	43.9	45.0		
Load adjustments (MW)				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
				0.0	0.0	0.0	0.7	7.2	12.1	15.5	18.9	22.0	25.0	26.8	29.0	31.3	33.9	34.4	34.7	35.7	36.8	38.0	39.1	40.3	41.5	42.7	43.9	45.0		
Tariff Applied ($/kW/Month)				0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94		
Incremental Revenue - $k				0.0	0.0	0.0	7.8	80.6	135.5	173.6	212.3	247.3	281.1	300.8	325.9	351.7	380.2	386.8	389.2	400.5	413.6	426.9	439.4	452.6	465.9	479.1	493.0	505.7		
Removal Costs - $k			(274.3)																											
On-going OM&A Costs - $k			0.0	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	
Municipal Tax - $k				(106.4)	(106.4)	(106.4)	(106.4)	(106.4)	(106.4)	(106.4)	(106.4)	(106.4)	(106.4)	(106.4)	(106.4)	(106.4)	(106.4)	(106.4)	(106.4)	(106.4)	(106.4)	(106.4)	(106.4)	(106.4)	(106.4)	(106.4)	(106.4)	(106.4)	(106.4)	(106.4)
Net Revenue/(Costs) before taxes - $k			(274.3)	(107.2)	(107.2)	(107.2)	(99.4)	(26.6)	28.3	66.4	105.1	140.1	173.9	193.6	218.7	244.5	273.0	279.6	282.0	293.3	306.4	319.7	332.3	345.4	358.7	371.9	385.8	398.5		
Income Taxes - $k			72.7	301.5	552.7	510.7	470.1	415.3	368.1	327.9	290.0	255.3	223.0	196.2	169.8	144.7	120.4	103.2	88.4	72.4	56.9	42.3	28.8	16.0	3.9	(7.5)	(18.5)	(28.6)		
Operating Cash Flow (after taxes) - $k			(201.6)	194.3	445.5	403.5	370.7	388.7	396.4	394.4	395.1	395.4	396.9	389.8	388.5	389.2	393.4	382.8	370.4	365.7	363.3	362.0	361.1	361.4	362.6	364.4	367.3	369.9		
		Cumulative PV @ 5.59%																												
PV Operating Cash Flow (after taxes) - $k	**(A)**	**4,910.6**	**(201.6)**	**189.0**	**410.5**	**352.2**	**306.4**	**304.2**	**293.8**	**276.8**	**262.7**	**249.0**	**236.6**	**220.1**	**207.7**	**197.1**	**188.7**	**173.9**	**159.3**	**149.0**	**140.2**	**132.3**	**124.9**	**118.4**	**112.5**	**107.1**	**102.2**	**97.5**		
Capital Expenditures - $k																														
Capital cost before overheads & AFUDC - $k			(25,232.8)																											
- Overheads - $k			(2,728.7)																											
- AFUDC - $k			(202.3)																											
Total upfront capital expenditures - $k			**(28,163.8)**																											
On-going capital expenditures - $k				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
PV On-going capital expenditures - $k			0.0																											
Total capital expenditures - $k			**(28,163.8)**																											
PV CCA Residual Tax Shield - $k			**133.7**																											
PV Working Capital - $k			**(0.0)**																											
PV Capital (after taxes) - $k	**(B)**	**(28,030.1)**	**(28,030.1)**																											
Cumulative PV Cash Flow (after taxes) - $k	**(A) + (B)**	**(23,119.5)**	**(28,231.7)**	**(28,042.7)**	**(27,632.1)**	**(27,279.9)**	**(26,973.6)**	**(26,669.4)**	**(26,375.5)**	**(26,098.7)**	**(25,836.0)**	**(25,587.0)**	**(25,350.4)**	**(25,130.3)**	**(24,922.5)**	**(24,725.4)**	**(24,536.7)**	**(24,362.8)**	**(24,203.5)**	**(24,054.5)**	**(23,914.4)**	**(23,782.1)**	**(23,657.2)**	**(23,538.8)**	**(23,426.3)**	**(23,319.2)**	**(23,217.0)**	**(23,119.5)**		

Discounted Cash Flow Summary

Economic Study Horizon - Years: **25**

Discount Rate - % **5.59%**

		Before Cont $k		After Cont $k	Impact $k
PV Incremental Revenue		3,138.7		3,138.7	
PV OM&A Costs		(285.1)		(285.1)	
PV Municipal Tax		(1,453.4)		(1,453.4)	
PV Income Taxes		(371.1)		(371.1)	0.0
PV CCA Tax Shield		4,015.2		171.1	(3,844.1)
PV Capital - Upfront	(28,163.8)		(28,163.8)		
Add: PV Capital Contribution	**0.0**	(28,163.8)	**26,963.5**	(1,200.3)	26,963.5
PV Capital - On-going		0.0		0.0	
PV Working Capital		(0.0)		(0.0)	
PV Surplus / (Shortfall)		**(23,119.5)**		**(0.0)**	**23,119.5**
Profitability Index*		**0.2**		**1.0**	

Notes:
*PV of total cash flow, excluding net capital expenditure & on-going capital & proceeds on disposal / PV of net capital expenditure & on-going capital & proceeds on disposal

Capital Contributions

	Date	PV of Cont $k	Previous Cont Payments $k	Current Cont / (Credit) $k
Initial economic evaluation	2021	26,963.5		26,963.5
Total		**26,963.5**	**0.0**	**26,963.5**

Contribution Required (before HST)	**26,963.5**
HST @ 13%	3,505.3
Contribution Required (including HST)[1]	**30,468.8**

Notes:
1) Payment from customer must include HST.

Other Assumptions		**Notes:**
In-Service Date:	15-Nov-21	
Municipal Tax	0.38%	Transmission system average
Federal Income Tax	15.00%	2018 federal corporate income tax
Ontario Corporation Income Tax	11.50%	2018 provincial corporate income tax
Working cash net lag days	8.76	As per Lead Lag Study as prepared by Navigant for 2018/2019 rates
CCA Rate for Class 47 Assets	8%	100% Class 47 assets except for Land

Calculation Time Stamp: 24-Apr-19, 9:21 AM

Table 9: DCF Analysis, Line Pool Capital Contribution (115kV line)

Facility Name: South Nepean Transmission Reinforcement
Description: South Nepean Transmission Reinforcement - 115kV line tap
Customer: Hydro Ottawa

			In-Service Date	<-------- Project year ended - annualized from In-Service Date -------->																									
		Month	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15
		Year	2021	2022	2023	2024	2025	2026 1st true-up	2027	2028	2029	2030	2031 2nd true-up	2032	2033	2034	2035	2036 3rd true-up	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046		
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		
Revenue & Expense Forecast																														
Load Forecast (MW)				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Load adjustments (MW)				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tariff Applied ($/kW/Month)				0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Incremental Revenue - $k				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Removal Costs - $k			0.0																											
On-going OM&A Costs - $k			0.0	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)
Municipal Tax - $k				(11.1)	(11.1)	(11.1)	(11.1)	(11.1)	(11.1)	(11.1)	(11.1)	(11.1)	(11.1)	(11.1)	(11.1)	(11.1)	(11.1)	(11.1)	(11.1)	(11.1)	(11.1)	(11.1)	(11.1)	(11.1)	(11.1)	(11.1)	(11.1)	(11.1)	(11.1)	(11.1)
Net Revenue/(Costs) before taxes - $k			0.0	(11.9)	(11.9)	(11.9)	(11.9)	(11.9)	(11.9)	(11.9)	(11.9)	(11.9)	(11.9)	(11.9)	(11.9)	(11.9)	(11.9)	(11.9)	(11.9)	(11.9)	(11.9)	(11.9)	(11.9)	(11.9)	(11.9)	(11.9)	(11.9)	(11.9)	(11.9)	(11.9)
Income Taxes - $k			0.0	31.8	58.1	53.7	49.6	45.9	42.5	39.4	36.5	33.8	31.3	29.1	27.0	25.1	23.4	21.7	20.3	18.9	17.6	16.5	15.4	14.4	13.5	12.7	11.9	11.2		
Operating Cash Flow (after taxes) - $k			0.0	19.8	46.2	41.8	37.7	34.0	30.6	27.4	24.5	21.9	19.4	17.2	15.1	13.2	11.4	9.8	8.3	7.0	5.7	4.5	3.5	2.5	1.6	0.8	0.0	(0.7)		
		Cumulative PV @ 5.59%																												
PV Operating Cash Flow (after taxes) - $k	**(A)**	**286.9**	**0.0**	**19.3**	**42.5**	**36.4**	**31.2**	**26.6**	**22.7**	**19.3**	**16.3**	**13.8**	**11.6**	**9.7**	**8.1**	**6.7**	**5.5**	**4.5**	**3.6**	**2.8**	**2.2**	**1.7**	**1.2**	**0.8**	**0.5**	**0.2**	**0.0**	**(0.2)**		
Capital Expenditures - $k																														
Capital cost before overheads & AFUDC - $k			(2,644.0)																											
- Overheads - $k			(282.8)																											
- AFUDC - $k			(21.0)																											
Total upfront capital expenditures - $k			**(2,947.8)**																											
On-going capital expenditures - $k				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PV On-going capital expenditures - $k			0.0																											
Total capital expenditures - $k			**(2,947.8)**																											
PV CCA Residual Tax Shield - $k			**14.0**																											
PV Working Capital - $k			**(0.0)**																											
PV Capital (after taxes) - $k	**(B)**	**(2,933.8)**	**(2,933.8)**																											
Cumulative PV Cash Flow (after taxes) - $k	**(A) + (B)**	**(2,646.9)**	**(2,933.8)**	**(2,914.5)**	**(2,872.0)**	**(2,835.5)**	**(2,804.4)**	**(2,777.7)**	**(2,755.1)**	**(2,735.8)**	**(2,719.5)**	**(2,705.7)**	**(2,694.2)**	**(2,684.5)**	**(2,676.4)**	**(2,669.7)**	**(2,664.2)**	**(2,659.8)**	**(2,656.2)**	**(2,653.4)**	**(2,651.2)**	**(2,649.5)**	**(2,648.3)**	**(2,647.5)**	**(2,647.0)**	**(2,646.8)**	**(2,646.8)**	**(2,646.9)**		

Discounted Cash Flow Summary

Economic Study Horizon - Years:	**25**				
Discount Rate - %	**5.59%**				
		Before Cont		**After Cont**	**Impact**
		$k		$k	$k
PV Incremental Revenue		0.0		0.0	
PV OM&A Costs		(10.8)		(10.8)	
PV Municipal Tax		(152.1)		(152.1)	
PV Income Taxes		43.2		43.2	(0.0)
PV CCA Tax Shield		420.6		(19.9)	(440.6)
PV Capital - Upfront	(2,947.8)		(2,947.8)		
Add: PV Capital Contribution	**0.0**	(2,947.8)	**3,087.5**	139.7	3,087.5
PV Capital - On-going		0.0		0.0	
PV Working Capital		(0.0)		(0.0)	
PV Surplus / (Shortfall)		**(2,646.9)**		**0.0**	**2,646.9**
Profitability Index*		**0.1**		**(1.0)**	

Notes:
*PV of total cash flow, excluding net capital expenditure & on-going capital & proceeds on disposal / PV of net capital expenditure & on-going capital & proceeds on disposal

Capital Contributions

	Date	PV of Cont $k	Previous Cont Payments $k	Current Cont / (Credit) $k
Initial economic evaluation	2021	3,087.5		3,087.5
Total		**3,087.5**	**0.0**	**3,087.5**
Contribution Required (before HST)				**3,087.5**
HST @ 13%				401.4
Contribution Required (including HST)[1]				**3,488.9**

Notes:
1) Payment from customer must include HST.

Other Assumptions

		Notes:
In-Service Date:	15-Nov-21	
Municipal Tax	0.38%	Transmission system average
Federal Income Tax	15.00%	2018 federal corporate income tax
Ontario Corporation Income Tax	11.50%	2018 provincial corporate income tax
Working cash net lag days	8.76	As per Lead Lag Study as prepared by Navigant for 2018/2019 rates
CCA Rate for Class 47 Assets	8%	100% Class 47 assets except for Land

Calculation Time Stamp: 24-Apr-19, 9:02 AM

Table 10: DCF Analysis, Network Pool Capital Contribution (230kV line)

Facility Name: South Nepean Transmission Reinforcement
Description: South Nepean Transmission Reinforcement - 230kV line
Customer: Hydro Ottawa

			In-Service Date	<------- Project year ended - annualized from In-Service Date ------->																										
		Month	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15	Nov-15
		Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046		
								1st true-up					2nd true-up					3rd true-up												
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		
Revenue & Expense Forecast																														
Load Forecast (MW)				0.0	0.0	0.0	0.7	7.2	12.1	15.5	18.9	22.0	25.0	26.8	29.0	31.3	33.9	34.4	34.7	35.7	36.8	38.0	39.1	40.3	41.5	42.7	43.9	45.0		
Load adjustments (MW)				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
				0.0	0.0	0.0	0.7	7.2	12.1	15.5	18.9	22.0	25.0	26.8	29.0	31.3	33.9	34.4	34.7	35.7	36.8	38.0	39.1	40.3	41.5	42.7	43.9	45.0		
Tariff Applied ($/kW/Month)				3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71		
Incremental Revenue - $k				0.0	0.0	0.0	30.8	319.3	536.8	688.1	841.2	980.0	1,113.9	1,192.0	1,291.5	1,393.9	1,506.8	1,532.8	1,542.3	1,587.1	1,639.2	1,691.7	1,741.5	1,793.8	1,846.2	1,898.7	1,953.9	2,003.9		
Removal Costs - $k			0.0																											
On-going OM&A Costs - $k			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Municipal Tax - $k				(2.3)	(2.3)	(2.3)	(2.3)	(2.3)	(2.3)	(2.3)	(2.3)	(2.3)	(2.3)	(2.3)	(2.3)	(2.3)	(2.3)	(2.3)	(2.3)	(2.3)	(2.3)	(2.3)	(2.3)	(2.3)	(2.3)	(2.3)	(2.3)	(2.3)		
Net Revenue/(Costs) before taxes - $k			0.0	(2.3)	(2.3)	(2.3)	28.5	317.0	534.6	685.8	838.9	977.7	1,111.6	1,189.7	1,289.3	1,391.6	1,504.5	1,530.5	1,540.0	1,584.8	1,637.0	1,689.4	1,739.2	1,791.5	1,844.0	1,896.4	1,951.6	2,001.6		
Income Taxes - $k			0.0	7.0	12.8	11.9	2.8	(74.5)	(132.9)	(173.7)	(214.9)	(252.3)	(288.3)	(309.5)	(336.3)	(363.9)	(394.2)	(401.4)	(404.3)	(416.5)	(430.6)	(444.7)	(458.2)	(472.2)	(486.3)	(500.4)	(515.2)	(528.6)		
Operating Cash Flow (after taxes) - $k			0.0	4.7	10.6	9.6	31.3	242.5	401.7	512.1	624.1	725.4	823.3	880.2	952.9	1,027.7	1,110.3	1,129.1	1,135.7	1,168.4	1,206.4	1,244.7	1,281.1	1,319.3	1,357.6	1,396.0	1,436.4	1,473.0		
		Cumulative PV @ 5.59%																												
PV Operating Cash Flow (after taxes) - $k	**(A)**	**9,210.4**	**0.0**	**4.6**	**9.7**	**8.4**	**25.9**	**189.8**	**297.8**	**359.5**	**414.9**	**456.8**	**490.9**	**497.0**	**509.6**	**520.5**	**532.5**	**512.8**	**488.5**	**475.9**	**465.4**	**454.7**	**443.2**	**432.3**	**421.3**	**410.2**	**399.7**	**388.2**		
Capital Expenditures - $k																														
Capital cost before overheads & AFUDC - $k			(539.7)																											
- Overheads - $k			(57.7)																											
- AFUDC - $k			(4.3)																											
Total upfront capital expenditures - $k			**(601.7)**																											
On-going capital expenditures - $k				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
PV On-going capital expenditures - $k			0.0																											
Total capital expenditures - $k			**(601.7)**																											
PV CCA Residual Tax Shield - $k			**3.1**																											
PV Working Capital - $k			**0.0**																											
PV Capital (after taxes) - $k	**(B)**	**(598.6)**	**(598.6)**																											
Cumulative PV Cash Flow (after taxes) - $k	**(A) + (B)**	**8,611.8**	**(598.6)**	**(594.0)**	**(584.3)**	**(575.9)**	**(550.0)**	**(360.2)**	**(62.4)**	**297.1**	**712.0**	**1,168.8**	**1,659.7**	**2,156.7**	**2,666.3**	**3,186.8**	**3,719.3**	**4,232.1**	**4,720.7**	**5,196.6**	**5,662.0**	**6,116.8**	**6,560.0**	**6,992.3**	**7,413.6**	**7,823.8**	**8,223.5**	**8,611.8**		

Discounted Cash Flow Summary

Economic Study Horizon - Years:		**25**
Discount Rate - %		**5.59%**
		$k
PV Incremental Revenue		12,438.8
PV OM&A Costs		0.0
PV Municipal Tax		(31.1)
PV Income Taxes		(3,288.1)
PV CCA Tax Shield		93.8
PV Capital - Upfront	(601.7)	
Add: PV **Capital Contribution**	**0.0**	(601.7)
PV Capital - On-going		0.0
PV Working Capital		0.0
PV Surplus / (Shortfall)		**8,611.8**
Profitability Index*		**15.3**

Notes:
*PV of total cash flow, excluding net capital expenditure & on-going capital & proceeds on disposal / PV of net capital expenditure & on-going capital & proceeds on disposal

Other Assumptions		**Notes:**
In-Service Date:	15-Nov-21	
Municipal Tax	0.38%	Transmission system average
Federal Income Tax	15.00%	2018 federal corporate income tax
Ontario Corporation Income Tax	11.50%	2018 provincial corporate income tax
Working cash net lag days	8.76	As per Lead Lag Study as prepared by Navigant for 2018/2019 rates
CCA Rate for Class 47 Assets	8%	100% Class 47 assets

Calculation Time Stamp: 24-Apr-19, 8:44 AM

Table 11: DCF Analysis, Network Pool Capital Contribution (115kV line)

Facility Name:	South Nepean Transmission Reinforcement
Description:	South Nepean Transmission Reinforcement - 115kV line tap
Customer:	Hydro Ottawa

			In-Service Date	<-------- Project year ended - annualized from In-Service Date -------->																									
		Month / Year	Nov-15 2021	Nov-15 2022	Nov-15 2023	Nov-15 2024	Nov-15 2025	Nov-15 2026 1st true-up	Nov-15 2027	Nov-15 2028	Nov-15 2029	Nov-15 2030	Nov-15 2031 2nd true-up	Nov-15 2032	Nov-15 2033	Nov-15 2034	Nov-15 2035	Nov-15 2036 3rd true-up	Nov-15 2037	Nov-15 2038	Nov-15 2039	Nov-15 2040	Nov-15 2041	Nov-15 2042	Nov-15 2043	Nov-15 2044	Nov-15 2045	Nov-15 2046	
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
Revenue & Expense Forecast																													
Load Forecast (MW)				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Load adjustments (MW)				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tariff Applied ($/kW/Month)				3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71	3.71
Incremental Revenue - $k				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Removal Costs - $k			0.0																										
On-going OM&A Costs - $k			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Municipal Tax - $k				(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)
Net Revenue/(Costs) before taxes - $k			0.0	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)	(1.8)
Income Taxes - $k			0.0	5.7	10.4	9.6	8.9	8.2	7.6	7.0	6.5	6.0	5.6	5.2	4.8	4.5	4.1	3.8	3.6	3.3	3.1	2.9	2.7	2.5	2.4	2.2	2.1	1.9	
Operating Cash Flow (after taxes) - $k			0.0	3.8	8.6	7.8	7.1	6.4	5.8	5.2	4.7	4.2	3.7	3.3	3.0	2.6	2.3	2.0	1.7	1.5	1.3	1.1	0.9	0.7	0.5	0.4	0.2	0.1	
		Cumulative PV @ 5.59%																											
PV Operating Cash Flow (after taxes) - $k	**(A)**	55.0	**0.0**	**3.7**	**7.9**	**6.8**	**5.8**	**5.0**	**4.3**	**3.6**	**3.1**	**2.6**	**2.2**	**1.9**	**1.6**	**1.3**	**1.1**	**0.9**	**0.7**	**0.6**	**0.5**	**0.4**	**0.3**	**0.2**	**0.2**	**0.1**	**0.1**	**0.0**	
Capital Expenditures - $k																													
Capital cost before overheads & AFUDC - $k			(437.7)																										
- Overheads - $k			(46.8)																										
- AFUDC - $k			(3.5)																										
Total upfront capital expenditures - $k			**(488.0)**																										
On-going capital expenditures - $k				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PV On-going capital expenditures - $k			0.0																										
Total capital expenditures - $k			**(488.0)**																										
PV CCA Residual Tax Shield - $k			**2.5**																										
PV Working Capital - $k			**0.0**																										
PV Capital (after taxes) - $k	**(B)**	(485.5)	**(485.5)**																										
Cumulative PV Cash Flow (after taxes) - $k	**(A) + (B)**	(430.5)	**(485.5)**	**(481.8)**	**(473.9)**	**(467.1)**	**(461.2)**	**(456.2)**	**(452.0)**	**(448.3)**	**(445.2)**	**(442.6)**	**(440.4)**	**(438.5)**	**(436.9)**	**(435.6)**	**(434.5)**	**(433.6)**	**(432.8)**	**(432.2)**	**(431.7)**	**(431.3)**	**(431.0)**	**(430.8)**	**(430.7)**	**(430.5)**	**(430.5)**	**(430.5)**	

Discounted Cash Flow Summary

Economic Study Horizon - Years:	**25**			
Discount Rate - %	**5.59%**			
	Before Cont $k		**After Cont** $k	**Impact** $k
PV Incremental Revenue	0.0		0.0	
PV OM&A Costs	0.0		0.0	
PV Municipal Tax	(25.2)		(25.2)	
PV Income Taxes	6.7		6.7	(0.0)
PV CCA Tax Shield	76.1		(3.4)	(79.5)
PV Capital - Upfront	(488.0)		(488.0)	
Add: PV Capital Contribution	**0.0**	(488.0)	**509.9**	21.9	509.9
PV Capital - On-going		0.0		0.0	
PV Working Capital		0.0		0.0	
PV Surplus / (Shortfall)		(430.5)		(0.0)	**430.5**
Profitability Index*		**0.1**		**(1.0)**	

Notes:
*PV of total cash flow, excluding net capital expenditure & on-going capital & proceeds on disposal / PV of net capital expenditure & on-going capital & proceeds on disposal

Capital Contributions

	Date	PV of Cont $k	Previous Cont Payments $k	Current Cont / (Credit) $k
Initial economic evaluation	2021	509.9		509.9
Total		**509.9**	**0.0**	**509.9**
Contribution Required (before HST)				**509.9**
HST @ 13%				66.3
Contribution Required (including HST)[1]				**576.2**

Notes:
1) Payment from customer must include HST.

Other Assumptions		**Notes:**
In-Service Date:	15-Nov-21	
Municipal Tax	0.38%	Transmission system average
Federal Income Tax	15.00%	2018 federal corporate income tax
Ontario Corporation Income Tax	11.50%	2018 provincial corporate income tax
Working cash net lag days	8.76	As per Lead Lag Study as prepared by Navigant for 2018/2019 rates
CCA Rate for Class 47 Assets	8%	100% Class 47 assets

Calculation Time Stamp: 25-Apr-19, 9:02 AM

Table 12: DCF Assumptions

Hydro One Networks -- Transmission Connection Economic Evaluation Model
2019 Parameters and Assumptions

Transmission rates are based on current OEB-approved uniform provincial transmission rates.

	Monthly Rate ($ per kW)
Network	**3.71**
Line	**0.94**

Grants in lieu of Municipal tax (% of up-front capital expenditure, a proxy for property value):		**0.38%**	Based on Transmission system average
Income taxes:			
Basic Federal Tax Rate - % of taxable income:	2018	**15.00%**	Current rate
Ontario corporation income tax - % of taxable income:	2018	**11.50%**	Current rate
Capital Cost Allowance Rate:			
Class 47 costs	2018	**8%**	Current rate
Decision Support defined costs (1)	2018	**0%**	
Decision Support defined costs (2)	2018	**0%**	
Decision Support defined costs (3)	2018	**0%**	
After-tax Discount rate:		**5.59%**	Based on OEB-approved ROE of 9% on common equity and 2.29% on short-term debt, 4.68% forecast cost of long-term debt and 40/60 equity/debt split, and current enacted income tax rate of 26.5%

Other Assumptions:

Estimated Incremental OM&A:	Project specific ($ k):		
	Overhead Line	**$1.3**	per new km of line each year
	Network Station	**1.0%**	of up-front capital expenditure each year for years 1 - 5
		2.0%	of up-front capital expenditure each year for years 6 - 15
		2.4%	of up-front capital expenditure each year for years 16 - 25

Deferral Account Requests

There are no new deferral account requests being made as part of this Application.

1 # Project Schedule

Power South Nepean Project		
TASK	**START**	**FINISH**
Submit Section 92		May 2019
Projected Section 92 Approval	May 2019	September 2019
Lines		
Property Rights Acquisition	April 2019	November 2019
Detailed Engineering	February 2019	September 2019
Long Lead Time Material Ordered	September 2019	December 2019
Tender and Award Construction Contract	September 2019	December 2019
Construction Start	September 2019	November 2021
Commissioning	September 2021	November 2021
In-Service		November 2021
Stations		
Detailed Engineering	October 2018	September 2019
Order Station Power Transformers	May 2019	August 2019
Tender and Award Other Major Station Equipment	May 2019	March 2020
Tender and Award Construction	September 2019	October 2019
Construction	October 2019	September 2021
Receive Major Station Equipment	July 2020	March 2021
Commissioning	August 2021	November 2021
In-Service		November 2021

Descriptions of the Physical Design

To ensure that the South Nepean area has sufficient power to support future load growth, Hydro Ottawa is proposing to construct a new MTS in the area, and Hydro One is proposing to upgrade and replace an existing section of the S7M single circuit 115 kV transmission line with new double circuit 230 kV capacity lines.

1.0 LINE FACILITIES

Proposed Line Facilities

The new double circuit line section will be extended approximately 1.3 km to the site of Hydro Ottawa's new station. One of the new circuit sections will continue to be known as S7M and will continue to be operated at 115 kV. The second, and new, circuit section will be known as E34M and will be operated at 230 kV. The connection, or tap point, for both of these lines will occur at the current starting point of S7M located on the existing transmission corridor along West Hunt Club Road at the S7M connection point, known as S7M STR 673N JCT. The new MTS will be fed by the new 230 kV E34M circuit. The reconductored 115 kV S7M circuit section will continue to feed the existing station facilities and will be a secondary supply option for the new MTS, via the new 1.3 km extension to the new MTS located on Cambrian Road.

To minimize environmental impact, the new double circuit transmission line will be constructed on the existing 115 kV S7M corridor by maintaining the current tower centre line.

The existing 115 kV circuit (S7M) is a single circuit wood pole H-frame line, strung with 477 kcmil ACSR (26/7) "Hawk" conductor from S7M 673N JCT to Manotick JCT and 4/0 (6/1) conductor from Manotick JCT to Manotick DS. A typical example (similar to that

illustrated in the below photograph) of the existing S7M 115 kV single circuit with H-frame wood pole structures is provided as **Figure A** below.

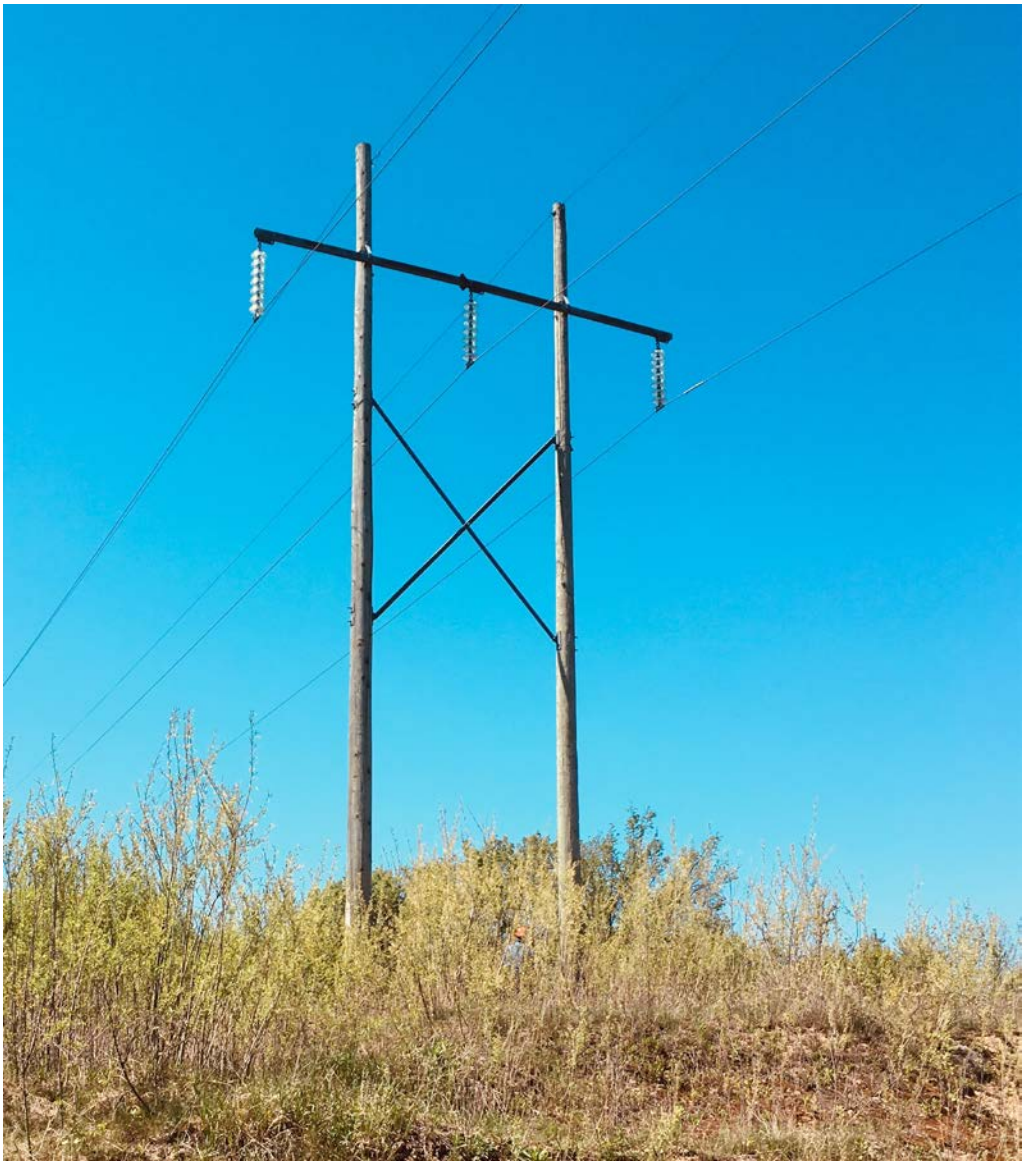


Figure A: Photograph – Wood Pole Structure

The average existing S7M tower structure is approximately a 65' H-frame design. The existing single circuit towers are not designed for, or capable of, being used to support the proposed double circuit 230 kV conductors due to the 230 kV circuit line spacing

requirements, increased ground clearances for 230 kV operation and security class requirements (i.e., structure loading).

The new double circuit transmission line will be built using the X17SP family of steel mono poles and X10 lattice towers, which will carry 230 kV E34M on one side and 230 kV capacity S7M (intended to be operated by Hydro One at 115 kV) on the other. Tower heights range from 130 feet to 150 feet in order to meet the required clearances for the proposed new two 230 kV circuits. The X10 tower design family consists of narrow base and 4-Legged semi-anchor (X10M-NB) and heavy anchor (X10H) towers. The design consists of 51 steel mono pole structures, three X10M-NB semi-anchor structures, and four X10H heavy anchor structures. Based on the ampacity and short circuit planning specification requirements the double circuit conductors will utilize 997 kcmil ACSR/TW ("Ontario" Type) wires and the shield wire shall be two 7#5 Alumoweld type wire (short-circuit capacity and rated tensile strength). Illustrations of the proposed transmission towers along this corridor are provided in **Exhibit C, Tab 1, Schedule 1, Attachment 1.** A typical example (similar to that illustrated in the below photograph) of the proposed 230 kV double circuit structures is provided as **Figure B** below.



Figure B: Photograph – Example of Proposed Structures

The new double circuit transmission line will be built along the existing S7M corridor (a Right of Way width of 30.48 meters), except when it spans over National Capital Commission ("NCC") owned land[1]. Over the NCC lands, the corridor width will not be expanded and will remain at 20.12 metres. Hydro One's tower and lines will be designed to fit within the existing NCC corridor.

The existing S7M 115 kV circuit is a radial feed to three existing stations: Fallowfield MTS, Richmond MTS and Manotick DS. As such, to maintain service to those stations during construction, Hydro One will require a temporary bypass to be constructed from the S7M Hunt Club Road connection point (STR 673N JCT) to Manotick JCT, and from

[1] NCC is a federal crown corporation responsible for long-term planning of federal lands and stewardship of nationally-significant public spaces in the National Capital region.

Manotick JCT to Cambrian Road Junction. In order to connect both new lines to Hydro Ottawa's new MTS, minor protections and controls related work will be undertaken by Hydro One. Maps indicating the geographic location of the existing line's route and the new line route extension to the new station are provided at **Exhibit C, Tab 2, Schedule 1, Attachments 1 and 2.** A schematic diagram of the proposed line facilities is provided in **Exhibit B, Tab 2, Schedule 1** Figure 1.

2.0 STATION FACILITIES

2.1 Proposed Hydro Ottawa Station Facilities

The proposed station will be located on the north side of Cambrian Road, approximately 1.3 km east of Cambrian Road JCT. and will be named the South Nepean MTS. It will be constructed, owned and operated by Hydro Ottawa. The site will have an approximate footprint of 105m by 105m (an approximate area of three acres). The station is designed to be capable of accommodating supply from either of Hydro One's 230 kV (E34M) or 115 kV (S7M) transmission systems. Under normal operating conditions the South Nepean MTS will be supplied at 230 kV (E34M).

Details of the Proposed Station Facilities

The station will be comprised of the following major assets:

- Two Line Entrance Structures
- One 230 kV Disconnect Switch
- One 115 kV Disconnect Switch
- One 230 kV Circuit Breaker
- One 115 kV Circuit Breaker
- One set of 230 kV Capacitor Voltage Transformers ("CVTs")
- One set of 115 kV CVTs
- One set of 230 kV station class Surge Arresters

- One set of 115 kV Station Class Surge Arresters
- Two sets of 27.6 kV Station Class Surge Arresters
- One 60/80/100 MVA Power Transformer (230 kV to 27.6 kV)
- One 60/80/100 MVA Power Transformer (115 kV to 27.6 kV)
- Two 27.6 kV Switchgear Lineup – one per Power Transformer – with the following:
    - One Main Breaker Cell
    - One PT and SST Fuse Cell
    - Three Feeder Breaker Cells
    - One Capacitor Bank Breaker Cell
- One 27.6 kV Switchgear Lineup used as a tie between main busses and feeder busses, with the following:
    - One Main Bus Tie Breaker Cell
    - Four Feeder Busses Tie Breaker Cells
- One Combined Switchgear and Protection and Control Building
- Two Capacitor Banks (MVAR – TBD)
- Two Station Service Transformers (27.6 kV to 120/208 V)

The conductor type ratings at the station are:

a) Three phases of one 230 kV transmission circuit E34M
    - 997 KCMIL ACSR

b) Three phases of one 115 kV transmission circuit S7M
    - 997 KCMIL ACSR

c) Three phases of two 27.6 kV distribution circuit
    - 4 x 2000 KCMIL Copper power cables insulated at 28 kV per phase

No high voltage underground cables are being installed in the South Nepean MTS as a part of the Project. However, Hydro Ottawa will be installing the following cables inside the transformer station:

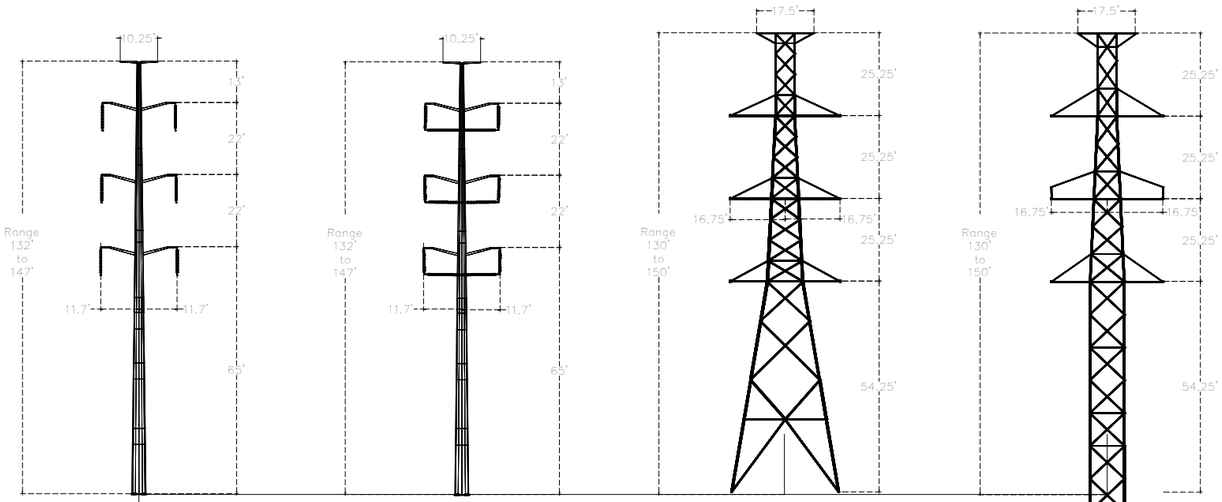
- 27.6 kV Power Transformer Secondary Cables, from the secondary bushings of the power transformers to the MV switchgear (4 x 2000 KCMIL copper power cables insulated at 28 kV per phase)
- 27.6 kV Feeder Cables (2 x 1000 KCMIL AL power cables insulated at 28 kV per phase)
- 27.6 kV Capacitor Bank Cables from the MV Switchgear to the capacitor banks (2 x 1000 KCMIL AL power cables insulated at 28 kV per phase)
- 120/208V AC Station Service Power Cables (Multiple Sizes)
- 125V DC Power Cables (Multiple Sizes)
- Metallic Control Cables
- Single-mode Fiber Optic Cables

The single line diagram of South Nepean MTS is provided at **Exhibit C, Tab 1, Schedule 1, Attachment 2**. For a detailed illustration of the South Nepean MTS facility layout being used please refer to the detailed station design provided at **Exhibit C, Tab 1, Schedule 1 Attachment 3**. An additional right-of-way of approximately 1.3 km is required to connect the circuits to the proposed new MTS station site. More details regarding the circuit's right-of-way and the proposed station site can be found at **Exhibit E, Tab 1, Schedule 1**.

NOTES:

UNLESS OTHERWISE NOTED:

1. All SUSPENSION TYPE STRUCTURE ARE STEEL MONO-POLES
2. ALL DEAD-END TYPE STRUCTURES ARE STEEL LATTICE
3. THIS DRAWING DOES NOT INCLUDE TAPPING STRUCTURES



230 KV
X17S TYPE
SUSPENSION POLES

230 KV
X17S-BRACED TYPE
SUSPENSION POLES

230 KV
X10H TYPE
HEAVY ANCHOR TOWER

230 KV
X10M TYPE
SEMI ANCHOR TOWER

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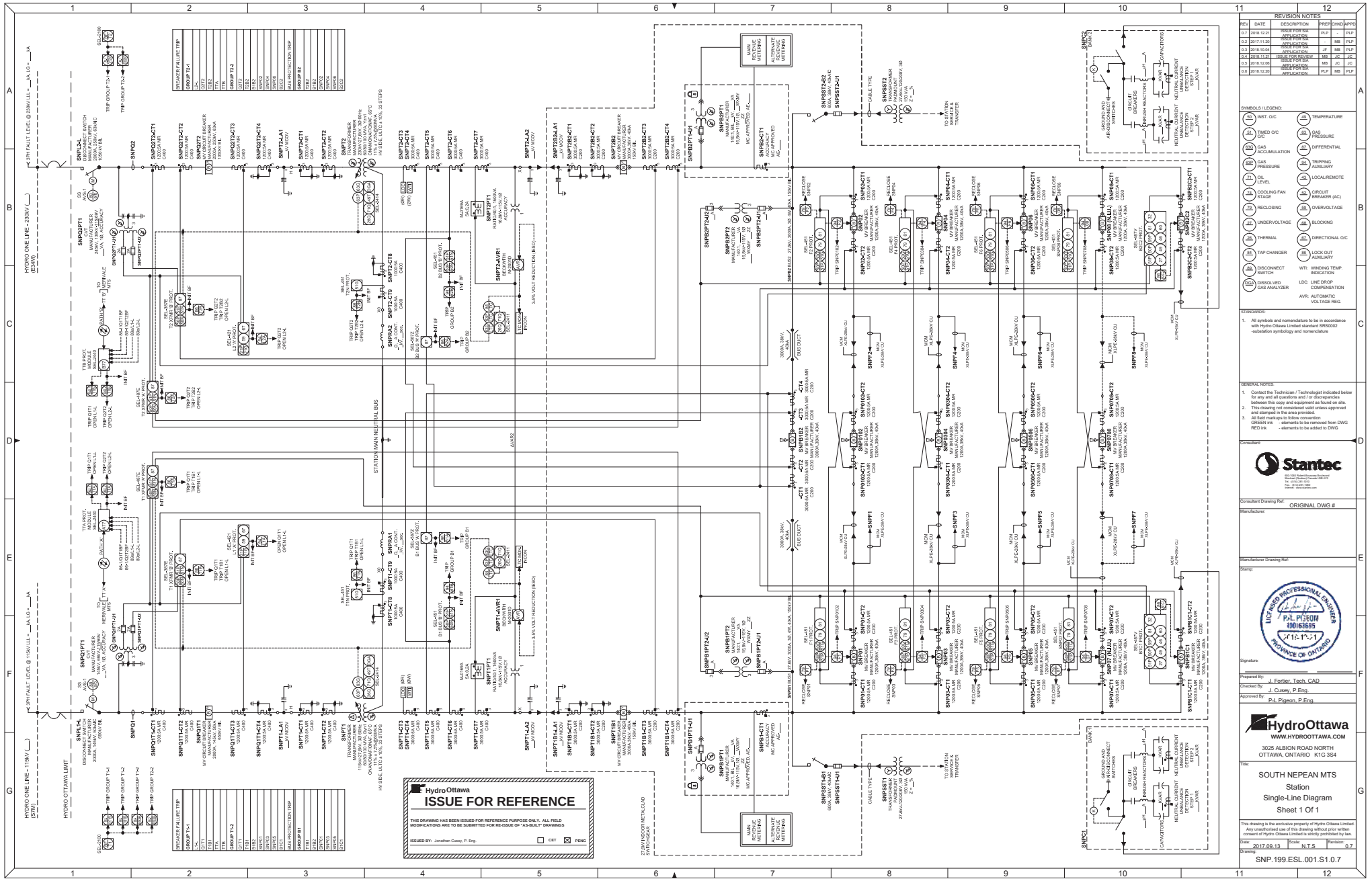
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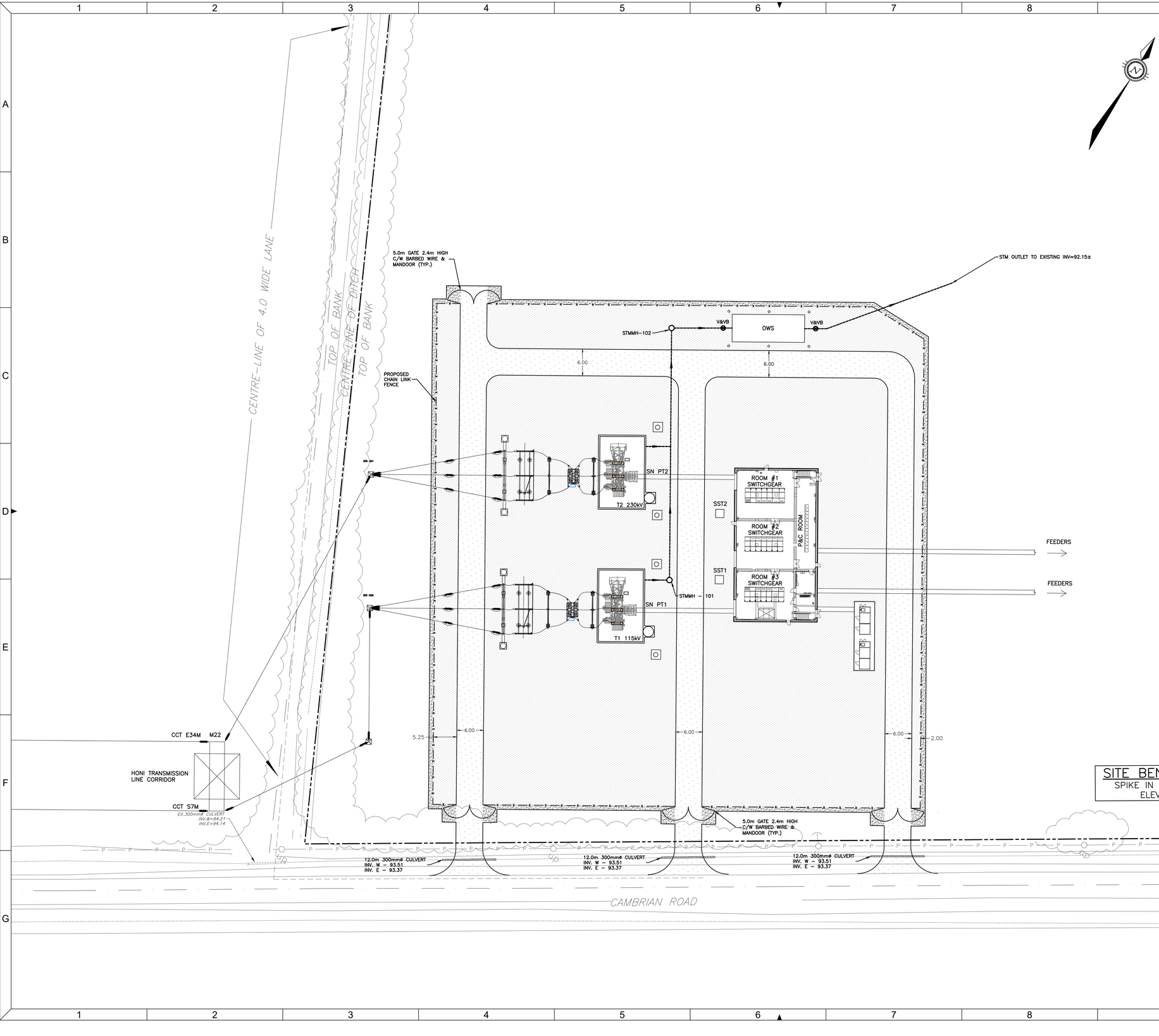
hydro one Hydro One Networks Inc.
ENGINEERING & CONSTRUCTION SERVICES

TRANSMISSION LINE SKETCH

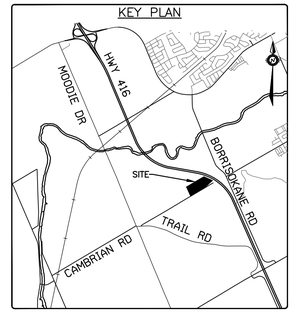
230KV/115KV S7M/E34M
TOWERLINE
STRUCTURE TYPE USED

MAIN LINE-TOWER TYPES 00


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PENG
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Checked By: J. Cusey, P.Eng.
Approved By: P-L Pigeon, P.Eng.
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Station
Single-Line Diagram
Sheet 1 Of 1
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KEY PLAN



LEGEND

Denotes		
MH–H	=	Maintenance Hole (Hydro)
Gate	=	Gate
PO–W	=	Wooden Pole
PO–M	=	Metal Pole
AN	=	Anchor
T/G	=	Top of Grate
CLF	=	Chain Link Fence
MF	=	Metal Fence
BOS	=	Bottom of Slope
TOS	=	Top of Slope
345.00	=	Location of Elevations
345.00*	=	Location of Overhead Wire Elevations
345.00**	=	Location of Top of Concrete Base Elevations
OHW	=	Overhead Wires
	=	Property Line
x x	=	Proposed Chain Link Fence
	=	Proposed C/L of Ditch
3.9%	=	Proposed Slope
94.25	=	Proposed Elevation
92.41 (SW)	=	Proposed Swale Elevation
94.56 (HP)	=	Proposed High Point Elevation
	=	Proposed Silt Fence (as per OPSD 219.130)
	=	Proposed Bollard
	=	Proposed Storm Manhole
V&VB	=	Proposed Valve and Valve Box
	=	Proposed Storm Sewer
	=	New Gravel Road 150mm Granular 'A' Compacted to 100% SPMDD 600mm Granular 'B' Type II Compacted to 100% SPMDD
	=	150mm Clearstone 3000 ohm-m Resistancy 150mm Granular 'A' Compacted to 100% SPMDD 600mm Granular 'B' Type II Compacted to 100% SPMDD
	=	150mm Clearstone 3000 ohm-m Resistancy 600mm Granular 'B' Type II Compacted to 100% SPMDD

REVISION NOTES

REV	DATE	DESCRIPTION	PREP	CHKD	APPD
1	11/02/2018	ISSUED FOR COORDINATION	AE	AA	AA
2	01/11/2018	ISSUED FOR COORDINATION	BC	AA	AA

Filed: 2019-05-28
EB-2019-0077
Exhibit C-1-1
Attachment 3
Page 1 of 1

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Manufacturer Drawing Ref:

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Signature: Date:

Prepared By: Brent Cuming, P. Eng.
Checked By: Brent Cuming, P. Eng.
Approved By: Alam Ansari, P. Eng.

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SOUTH NEPEAN MTS
4284 CAMBRIAN ROAD
SITE PLAN

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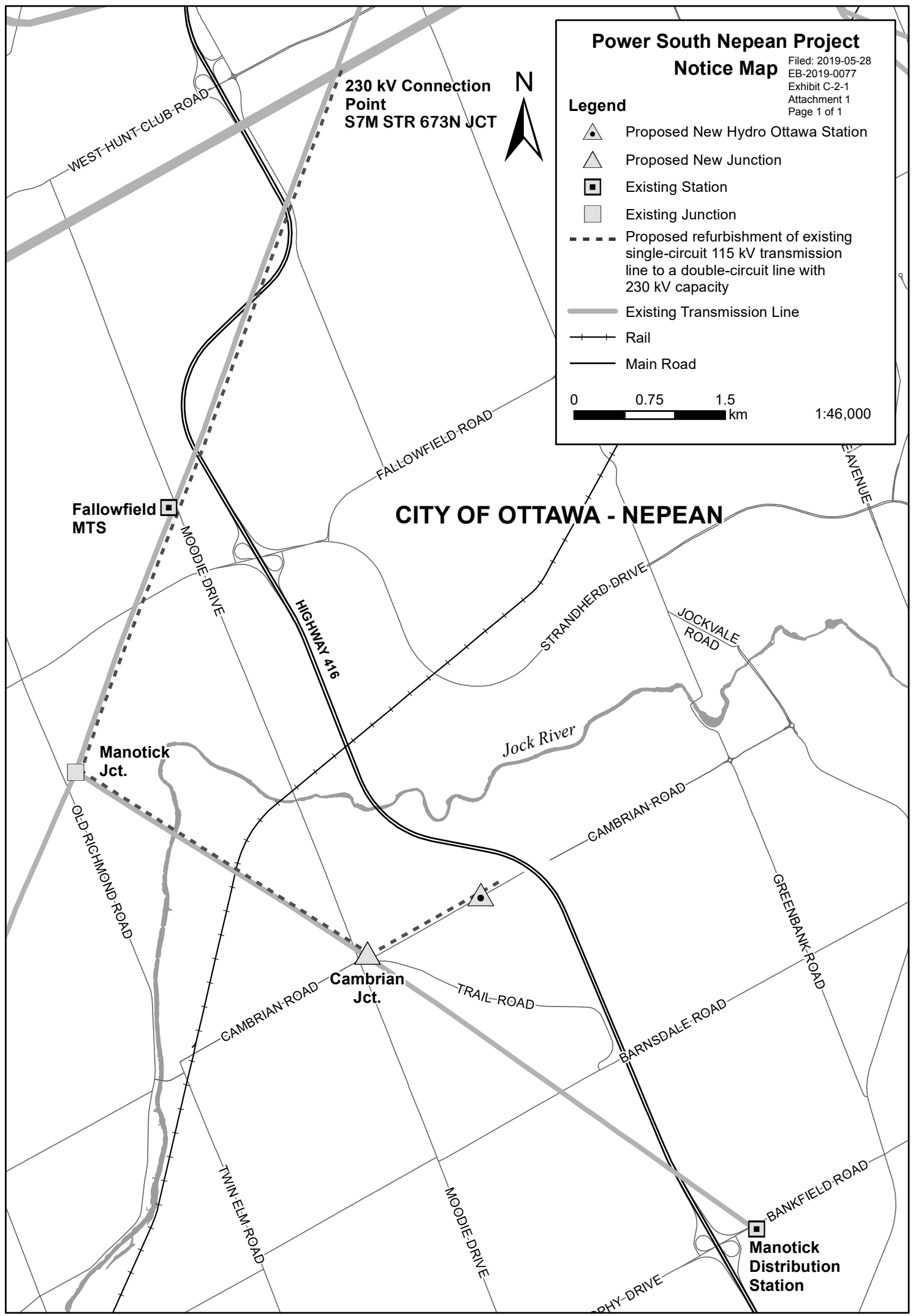
Maps

A map indicating the geographic location of the Project is provided at **Exhibit C, Tab 2, Schedule 1, Attachment 1**. Hydro One has provided this map to be used by the OEB as the Project's **Notice Map**.

This Project proposes connection of a new Municipal Transformer Station (the "MTS") to be built, owned and operated by Hydro Ottawa to a new a double circuit 230 kV line, owned and operated by Hydro One. A new transmission Right-of-Way ("ROW"), approximately 1.3 km in length, will be required by Hydro One to connect the circuits to the new MTS. All other line work will be completed on Hydro One's existing ROWs.

An illustrative aerial view map showing more detail of the footprint for the new South Nepean MTS proposed by Hydro Ottawa is provided at **Exhibit C, Tab 2, Schedule 1 Attachment 2**.

Further details, including diagrams, on land matters are available at **Exhibit E, Tab 1, Schedule 1**.


Power South Nepean Project
Notice Map
Filed: 2019-05-28
EB-2019-0077
Exhibit C-2-1
Attachment 1
Page 1 of 1
Legend
Proposed New Hydro Ottawa Station
Proposed New Junction
Existing Station
Existing Junction
Proposed refurbishment of existing single-circuit 115 kV transmission line to a double-circuit line with 230 kV capacity
Existing Transmission Line
Rail
Main Road
0
0.75
1.5
km
1:46,000
N
230 kV Connection Point
S7M STR 673N JCT
WEST HUNT CLUB ROAD
FALLOWFIELD ROAD
Fallowfield MTS
CITY OF OTTAWA - NEPEAN
MOODIE DRIVE
HIGHWAY 416
STRANDHERD DRIVE
JOCKVALE ROAD
Jock River
Manotick Jct.
OLD RICHMOND ROAD
CAMBRIAN ROAD
GREENBANK ROAD
Cambrian Jct.
TRAIL ROAD
BARNSDALE ROAD
TWIN ELM ROAD
BANKFIELD ROAD
Manotick Distribution Station

HIGHWAY 416

SOUTH NEPEAN
STATION

CAMBRIAN ROAD

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TRANSMISSION LINE

230 kV

115 kV

PROPOSED STATION PROPERTY

PROPOSED STATION FOOTPRINT

PROPOSED SOUTH NEPEAN STATION

0 25 50
m

N

Operational Details

The PSN Project includes replacement of the existing 115 kV S7M transmission line with a double circuit 230 kV capacity transmission line that will carry the S7M circuit as well as the 230 kV circuit E34M. The S7M circuit will continue to be operated at 115 kV. The existing stations in the area: Fallowfield MTS, Manotick DS and Richmond MTS, will remain supplied by the 115 kV operated circuit S7M. The new proposed station, South Nepean MTS, will be supplied by the 230 kV circuit E34M under normal operating conditions. However, the South Nepean MTS will also be connected to the 115 kV circuit S7M, which will function as an alternate supply option. The protection, controls, and telecommunication ("**PC&T**") will be modified at Merivale TS to include the new station connection.

Hydro One PC&T facilities at Merivale TS will protect the new double circuit line tap by detecting faults and isolating faulted elements. Lines protection for circuits S7M and E34M will be modified and coordinated for operation with the new South Nepean MTS. Operation of the proposed facilities will continue to be in accordance with the procedures administered by Hydro One's Ontario Grid Control Centre and the IESO.

Hydro Ottawa will build, own, and operate the South Nepean MTS. The station will be operated at 27.6 kV and consist of one 100MVA 230/27.6 kV transformer, and one 100MVA 115/27.6 kV transformer, connected to the E34M and S7M circuits, respectively. These will supply a Dual-Element Spot Network secondary switchgear configuration, with six feeder breakers.

Hydro Ottawa's operation of the South Nepean MTS will be from Hydro Ottawa's System Office via the company's supervisory control and data acquisition ("SCADA")

network. Hydro Ottawa will be the only customer supplied by the new E34M extension, with the MTS likewise supplying only Hydro Ottawa customers.

Land Matters

1.0 DESCRIPTION OF LAND RIGHTS

The PSN Project involves replacing a section of the existing S7M single-circuit 115 kV transmission line with a new double-circuit 230 kV transmission line. The current wooden H-frame design structures will be replaced with steel structure towers along the length of both the existing (10.9 km) and the new (1.3 km) transmission right-of-way ("ROW") to Hydro Ottawa's proposed new Municipal Transformer Station ("MTS").

The ROW will have a typical width of 30.48 metres, except for a short section, where the line crosses over the National Capital Commission ("NCC") owned land[1]. Over the NCC lands, the ROW width will not be expanded and will remain at 20.12 metres. Hydro One's towers and lines will be designed to fit within the existing NCC ROW. The new line will be situated within the existing S7M transmission ROW from the 230 kV connection point to Cambrian Road, where the transmission line will divert from the existing ROW and continue along a newly established ROW to Cambrian Road, where the line will connect to the MTS. Utilizing existing infrastructure and facilities, as contemplated in this Application, is consistent with the *Ministry of Municipal Affairs and Housing Provincial Policy Statement, 2014* under the *Planning Act*, which specifically encourages the employment of existing utility ROWs where possible.

As described in this Application, the Project will require new land rights associated with the replacement of the S7M circuit (i.e. a double circuit 230 kV line), and the new 1.3 km ROW along Cambrian Road. For illustrative purposes, details of the route are shown in **Attachment 1** ("Project Route Map") of this exhibit.

[1] NCC is a federal Crown corporation responsible for long-term planning of federal lands and stewardship of nationally-significant public spaces in the National Capital Region.

The ROW associated with the Project will require a combination of the following land rights:

- Hydro One's existing fee simple ownership and easement agreements (no land rights required);
- Statutory easement rights on Infrastructure Ontario Bill 58 lands (no land rights required);
- Easement or fee simple rights on municipally-owned, provincially-owned, federally-owned, and privately-owned properties (new land rights required);
- Temporary access and/or construction rights on municipally-owned, provincially-owned, and privately-owned properties (new land rights required); and
- Municipal road allowance (no land rights required).

These new permanent and existing land rights on all directly impacted properties between the 230 kV Connection Point and the new MTS will be required to accommodate the proposed transmission facilities. Temporary rights for construction purposes will also be required at specific locations along the ROW and will be acquired where needed. Temporary rights include access roads, material laydown and storage areas, temporary by-pass line, and temporary work headquarters.

2.0 DESCRIPTION OF NEW LAND RIGHTS REQUIRED

<u>New Land Rights Required by Hydro One</u>

Hydro One will require new land rights to construct, operate and maintain the proposed new transmission facilities. On directly impacted properties requiring new land rights, and where applicable, the following land rights agreements will be utilized:

- Early Access Agreement;
- Option to Purchase a Limited Interest – Easement;
- Compensation and Incentive Agreement – Easement;

- Option to Purchase – Fee Simple;
- Compensation and Incentive Agreement – Fee Simple;
- Agreement for Temporary Rights;
- Damage Claim Agreement/Waiver; and
- Temporary By-Pass Agreement.

Additionally, Federal Land Use License(s), Encroachment Permit(s), Rail Crossing Agreement(s), and Water Crossing Permit(s) are also expected to be required.

The ROW crosses a total of 47 properties under the ownership of 21 landowners. Hydro One will rely upon existing land rights for portions of the ROW but will also require new land rights on various properties. The property ownerships necessitating new land rights include the following:

- 17 privately-owned properties;
- 4 federally-owned properties;
- 2 municipally-owned properties;
- 1 railway property;
- 1 water crossing, under jurisdiction of Rideau Valley Conservation Authority; and
- Various municipal road allowances and highways.

Details of all directly impacted properties and associated ownership information are included in **Attachment 11** to this exhibit.

The land uses for the properties traversed by the ROW vary. The following comprise the typical land use types that have been observed: rural recreational, rural residential, vacant agricultural, improved agricultural, institutional lands, industrial, commercial, and sand and gravel resource.

The relative area proportions specific to the properties that are directly impacted and require new permanent land rights are as follows:

Land Ownership Type	Area (Hectares)	Proportion of Route (%)
Private Lands (Individual/Corporate Ownership)	10.43	55%
Federal Crown	5.60	29%
Municipal	3.13	16%

The construction of the transmission line also requires new temporary land rights on a total of 28 patented properties to facilitate a temporary by-pass during construction. These property ownerships include the following:

- 22 privately-owned properties;
- 2 federally-owned properties;
- 2 municipally-owned properties;
- 1 railway property;
- 1 water crossing under jurisdiction of Rideau Valley Conservation Authority; and
- Various municipal road allowances and highways.

<u>New Land Rights Required by Hydro Ottawa</u>

Hydro Ottawa requires new land rights for the MTS site for this project. Those rights are discussed in further detail in the sections below – **3.0 Early Access to Land** and **4.0 Land Acquisition Process**.

3.0 EARLY ACCESS TO LAND

Hydro One

Hydro One will require early access to the ROW to perform various activities/studies associated with Hydro One's Project-specific environmental studies, engineering and

design, and property-specific land valuations/studies. To facilitate the required access to the properties directly impacted by the transmission line route in advance of Section 92 Leave to Construct approval, Hydro One has acquired various early access agreements with directly impacted landowners. It is not anticipated that Hydro One will be required to apply to the OEB under Section 98 of the Act for early access in advance of a Section 92 approval.

Hydro Ottawa

Early access to the site where Hydro Ottawa proposes to construct the new MTS has been negotiated by Hydro Ottawa with the current owner of the preferred station site (a private landowner) and includes access for Hydro Ottawa and its agents to conduct surveying, testing and site preparation. This early access was granted as part of the Purchase and Sale agreement entered into between the private landowner ("the Vendor") and Hydro Ottawa. The agreement is included as **Attachment 13** to this exhibit.

4.0 LAND ACQUISITION PROCESS

(i) Hydro One Land Acquisition Process

The properties for which Hydro One requires land rights for the Project are depicted on the associated route maps provided in **Attachment 1** of this exhibit. Furthermore, a list of all directly impacted land owners requiring new land rights is summarized in **Attachment 12**. In order to facilitate the necessary property rights acquisitions required by Hydro One for privately owned lands, Hydro One has employed project-specific Land Acquisition Compensation Principles ("LACP") which guide all necessary property rights acquisitions specific to these property owners. These project-specific LACP are founded upon Hydro One's past experience pertaining to land acquisition matters for new transmission projects. Employing these principles has resulted in timely voluntary property rights acquisitions to date.

Hydro One's central consideration is the need for these property owners to have flexibility and choice, while balancing Hydro One's desire to achieve timely acquisition of property interests and its obligation to ensure that expenditures are fair and reasonable to Ontario ratepayers. Adoption and application of these compensation principles provides real value for timely settlements and to otherwise avoid potentially lengthier acquisitions pursuant to expropriation under section 99 of the OEB Act. Please see the booklet included as **Attachment 10** of this exhibit, which summarizes Hydro One's LACP specific to this Project. All directly impacted applicable property owners were sent a copy of the LACP in January 2019 to initiate the necessary land rights acquisition discussions.

Acquisition of Land Rights on Private Lands

As identified, the Project ROW requires approximately 10.43 hectares of land rights on patented lands owned by private landowners. To meet the required in-service date of the Project and in advance of approval of this Application, Hydro One will be engaging private landowners in voluntary property settlements based on the Project-specific LACP. Hydro One will be offering all impacted private landowners an option to purchase the required land rights. It is expected that all impacted private landowners will receive an option agreement offer based upon Hydro One's Project-specific LACP by Q2 of 2019. Hydro One's goal is to secure voluntary property option-to-purchase agreements with all directly impacted property owners in advance of approval of this Application. Pending approval of this Application, Hydro One will exercise all of the issued purchase option agreements to acquire all necessary lands rights for the Project.

Acquisition of Land Rights on Federal and Municipal Lands

As itemized in section 2.0 above, the ROW requires approximately 5.6 hectares of new permanent land rights on patented Federal lands and 3.13 hectares of new permanent land rights on Municipal lands. This excludes areas where Hydro One will occupy within public road allowances and enjoys legislated occupation rights pursuant to Section 41 of

the *Electricity Act, 1998*. Hydro One's LACP will not be applied to federally-owned and municipally-owned lands. It is Hydro One's intent to enter into all necessary land agreements and permits for the municipally-owned and federally-owned properties represented by the requisite Ministry/Agency. Hydro One has engaged these Ministries and Agencies to initiate new permanent land right acquisitions.

Acquisition of Land Rights on Public Roads and Highways

To complete the required PSN Project work, Hydro One intends to locate on public roads and highways. Given Hydro One's legislated occupation rights under Section 41 of the *Electricity Act*, *1998*, it does not require consent of the owner or any other person having an interest in public streets or highways to locate its proposed Project ROW. Hydro One will, however, engage with representatives from the appropriate municipalities having jurisdiction over these public roads and highways to ensure compliance with Section 41 of the *Electricity Act, 1998*. If necessary, Hydro One will obtain the requisite encroachment and occupancy permits within roadways under the jurisdiction of the Ministry of Transportation.

Hydro One Land Related Forms

Attachments 2 to 9 of this exhibit contain the land rights agreements that Hydro One intends to utilize in order to obtain the required land rights for the Project.

(ii) Hydro Ottawa Land Acquisition Process

Hydro Ottawa will need to purchase land for the station site in order to construct the South Nepean MTS. The MTS site footprint requires the fee simple purchase of approximately 24 acres of land. An appropriate geographically-situated site has been selected by Hydro Ottawa based on the Project's requirements (i.e. proximity to the load growth area, ability to maintain shorter distribution feeder lengths in order to maintain acceptable voltage tolerances, economic feasibility, and availability of land of suitable size in the vicinity of Hydro One's proposed new double circuit line).

In addition, through the Class Environmental Assessment ("Class EA") conducted for the Project, it was identified that, should the new station be located north of a City of Ottawa landfill in the vicinity, there would be significantly less environmental risk associated with the construction of the transmission line because there would be avoidance of the contaminated groundwater associated with the landfill. The reduction in environmental risk to the Project weighed heavily on Hydro Ottawa's site selection and ultimate proposal for a site north of the landfill. The preferred station site is currently owned by a private landowner ("the Vendor"), as illustrated in **Exhibit C, Tab 2, Schedule 1 Attachment 2**[2]. An Agreement of Purchase and Sale has been negotiated between Hydro Ottawa and the Vendor, and is included as **Attachment 13**. The Agreement allows Hydro Ottawa to also proceed with surveying, testing and site preparation on the Vendor's property.

[2] Hydro Ottawa and the Vendor had discussed the prospect of severing the applicable parcel of land. However, the Vendor ultimately chose not to proceed with this option.

Power South Nepean Transmission Route and Municipal Transformer Station

Legend

- Proposed Steel Pole
- Proposed Lattice Tower
- Proposed Tapping Structure
- Existing H-Frame Pole
- Station
- Existing Transmission Corridor
- Existing Transmission Line
- Highway 416
- Main Road
- Road
- Watercourse
- Federal Lands
- Greenbelt
- City of Ottawa Lands
- Property Boundary

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNRF, HYDRO ONE, NCC, CITY OF OTTAWA

0 0.125 0.25 0.5 km

N W E S

Filed: 2019-05-28
EB-2019-0077
Exhibit E-1-1
Attachment 1
Page 1 of 3

Graham Creek

230 kV Connection Point

Log Farm

CEDARVIEW ROAD

HIGHWAY 416

Cedarhill Community

MOODIE DRIVE

FALLOWFIELD MTS

FALLOWFIELD ROAD

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

FALLOWFIELD MTS

CEDARVIEW ROAD

FALLOWFIELD ROAD

HIGHWAY 416

MOODIE DRIVE

TRAIL ROAD

Unnamed Stream 5

Unnamed Stream 6

Mahoney Creek

Smith Drain

Jock River

Power South Nepean Transmission Route and Municipal Transformer Station

Legend

- Proposed Steel Pole
- Proposed Lattice Tower
- Proposed Tapping Structure
- Existing H-Frame Pole
- Station
- Existing Transmission Corridor
- Proposed New Transmission Line
- Existing Transmission Line
- Rail
- Highway 416
- Main Road
- Road
- Watercourse
- Waterbody
- Federal Lands
- Greenbelt
- City of Ottawa Lands
- Property Boundary

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNRF, HYDRO ONE, NCC, CITY OF OTTAWA

0 0.125 0.25 0.5 km

N W E S

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Power South Nepean Transmission Route and Municipal Transformer Station

Legend

- Proposed Steel Pole
- Proposed Lattice Tower
- Proposed Tapping Structure
- Existing H-Frame Pole
- Existing Transmission Corridor
- Proposed New Transmission Line
- Existing Transmission Line
- Proposed Hydro Ottawa Property
- Proposed MTS Footprint
- Highway 416
- Main Road
- Road
- Rail
- Watercourse
- Waterbody
- Greenbelt
- City of Ottawa Lands
- Property Boundary
- Capped Landfill

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNRF, HYDRO ONE,
NCC, CITY OF OTTAWA

0 0.125 0.25 0.5 km

N W E S

Jock River
Jock River
MOODIE DRIVE
HIGHWAY 416
Proposed New MTS
Trail Road Landfill
CAMBRIAN ROAD
TRAIL ROAD
Capped Landfill
BARNSDALE ROAD

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

THIS AGREEMENT made in duplicate the _____ day of _____ 2018.

BETWEEN:

(INSERT NAME)

(the **"Owner"**)
OF THE FIRST PART

AND:

HYDRO ONE NETWORKS INC.

(**"HONI"**)
OF THE SECOND PART

WHEREAS:

1. The Owner is the registered owner of lands legally described as ***(INSERT LEGAL DESCRIPTION)*** (the "Lands")

2. The Owner is agreeable in allowing HONI to enter onto a portion of the Lands highlighted in yellow as shown on the sketch attached hereto as Schedule "A" (the "Strip"), in order to commence pre-construction activities in conjunction with the Power South Nepean Project (the "Project"), which shall include but are not limited to soil studies, environmental studies, engineering studies, property appraisals and surveys in, on or below the Strip subject to the terms and conditions contained herein (collectively the "Activities").

NOW THEREFORE THIS AGREEMENT WITNESSES THAT in consideration of Two Dollars ($2.00) now paid by HONI to the Owner, and the respective covenants and agreements of the parties hereinafter contained and other valuable consideration, the receipt and sufficiency of which are hereby acknowledged by the parties hereto, the parties hereto agree as follows:

1. The Owner hereby grants to HONI and its respective officers, employees, workers, permittees, agents, surveyors, contractors and subcontractors, with or without vehicles, supplies, machinery, plant, material and equipment , (i) the right to commence the Activities on the Strip; and (ii) the right to enter upon and exit from, and to pass and repass at any and all times in, over, along, upon, across, and through the Strip and so much of the Lands as may be reasonably necessary.

2. The permission granted herein shall commence as of the date this Agreement (the "Commencement Date") and shall terminate two (2) years from the Commencement Date (the "Initial Term").

3. The Initial Term may be extended upon 30 days prior written notice from HONI to the Owner for an additional one (1) year on the same terms and conditions contained herein save for this right to extend (the "Extended Term").

4. All agents, representatives, officers, directors, employees and contractors and property of HONI located at any time on the Lands shall be at the sole risk of HONI and the Owner shall not be liable for any loss or damage or injury (including loss of life) to them or it however occurring except and to the extent to which such loss, damage or injury is caused by the negligence or willful misconduct of the Owner.

5. Upon execution of this Agreement by all parties, HONI shall pay to the Owner the amount of Two Thousand Five Hundred Dollars ($2,500.00), which is compensation for the permission granted herein for the Initial Term.

6. In the event that HONI exercises its right to extend the Initial Term, HONI shall pay to the Owner the amount of One Thousand Two Hundred Fifty Dollars ($1,250.00), which is compensation for the permission granted herein for the Extended Term.

7. HONI shall repair any physical damage to the Lands resulting from the Activities and, shall restore the Lands to its original condition so far as possible and practicable to the satisfaction of the Owner, acting reasonably.

8. HONI agrees that it shall indemnify and save harmless the Owner from and against all claims, demands, costs, damages, expenses and liabilities (collectively the "Costs") whatsoever arising out of HONI's presence on the Lands or of its activities on or in connection with the Lands arising out of the permission granted herein except to the extent any of such Costs arise out of the negligence or willful misconduct of the Owner.

9. This Agreement does not commit the Owner to enter into any further agreements with HONI in conjunction with the Project.

10. This Agreement shall be governed by and construed in accordance with the laws of the Province of Ontario and the laws of Canada applicable herein. The parties hereto submit themselves to the exclusive jurisdiction of the Courts of the Province of Ontario.

IN WITNESS WHEREOF the Parties have hereunto set their respective hands and seals to this Agreement.

SIGNED, SEALED AND DELIVERED
In the presence of)
)
)
)
)
)
_____) _____ (seal)
Print Name of Witness ***(INSERT NAME)***

)
)
)
)
)
)
_____) _____ (seal)
Print Name of Witness ***(INSERT NAME)***

HYDRO ONE NETWORKS INC.

Per: _____
Print Name:
Title:

I have authority to bind the Corporation

SCHEDULE "A"

*Sketch for reference only, not to scale.

OPTION AGREEMENT - EASEMENT

THIS OPTION AGREEMENT made as of the _____ day of _____, 2019 (the "**Agreement Date**").

B E T W E E N:

[INSERT FULL LEGAL NAME OF OWNER]

(hereinafter called the "**Owner**")

OF THE FIRST PART

- and -

HYDRO ONE NETWORKS INC.

(hereinafter called "**Hydro One**")

OF THE SECOND PART

- and -

[INSERT NAME OF SPOUSE, IF APPLICABLE]

(hereinafter called the "**Spouse**")

OF THE THIRD PART

RECITALS:

A. The Owner is the owner of the lands and premises described in Schedule "A" (the "**Lands**");

B. The Owner has agreed to grant to Hydro One for the consideration and on the terms and conditions set out herein and attached hereto as Schedule "B" (the "**Standard Terms and Conditions**") an option to purchase a right-of-way and easement in, on, over, under, across and through (the "**Easement**") that portion of the Lands described and shown on Schedule "A-1" attached hereto (the "**Easement Lands**"), the terms of which are more particularly set out in the Transfer and Grant of Easement (the "**Easement Agreement**") attached hereto as Schedule "C".

C. Hydro One has entered into an agreement with the Owner having a date the same as this Option Agreement (the **"Compensation and Incentive Agreement"**) whereby Hydro One has offered to compensate the Owner for injurious affection damages, if applicable in accordance with the terms and conditions contained therein.

D. Hydro One has offered, on the terms and conditions set out in the Compensation and Incentive Agreement, to compensate the Owner for injurious affection damages, if applicable (the "**IA Compensation**") in respect of that portion of the Lands which are not part of the Easement Lands and which may be subject to an existing easement in favour of Hydro One which existing easement will be released by Hydro One. Such injurious affection damages are calculated as shown on the calculation sheet attached to the Compensation and Incentive Agreement as Schedule "B" (the "**Calculation Sheet**").

NOW THEREFORE, the parties hereby agree as follows:

1. GRANT OF OPTION

In consideration of the sum of **Five Thousand Dollars ($5,000.00)** of lawful money of Canada paid by Hydro One to the Owner, the receipt and sufficiency of which is hereby acknowledged by the Owner, (the **"Option Payment"**) the Owner hereby grants to Hydro One the sole, exclusive and irrevocable option (the **"Option"**), to purchase the Easement upon and subject to the terms and conditions set out herein, the Standard Terms and Conditions and the Schedules hereto.

2. **PURCHASE PRICE**

In accordance with the terms and conditions set out herein, the Standard Terms and Conditions and the Schedules hereto, Hydro One agrees to pay to or to the order of the Owner the amount of **XXXXX** (**$XXXXX**) (the **"Purchase Price"**) on the Closing Date.

IN WITNESS WHEREOF the parties hereto have duly executed this Option Agreement as of the Agreement Date.

WITNESS:

Name:

Address:

OWNER:

l/s

Name: **[INSERT FULL LEGAL NAME OF OWNER]**

The spouse of [INSERT LEGAL OWNER] hereby consents to this Option Agreement

WITNESS:

Name:

Address:

SPOUSE OF OWNER:

l/s

Name: **[INSERT SPOUSE OF OWNER]**

HYDRO ONE NETWORKS INC.

Per:

Name:

Title:

I have authority to bind the Corporation

HYDRO ONE
HST 870865821RT0001

File: N

SCHEDULE "A"
LEGAL DESCRIPTION

[Note to Draft: Insert legal description of Lands]

SCHEDULE “A-1”
EASEMENT LANDS

[Note to Draft: Insert Legal Description of Easement Lands]

SCHEDULE "B"
STANDARD TERMS AND CONDITIONS

1. **EXERCISE OF OPTION**

The Option shall be open for exercise at any time from the Agreement Date until the 3rd anniversary of the Agreement Date, as same may have been extended in accordance with the terms hereof, (the "**Option Term**"), by providing written notice to the Owner (the "**Exercise Notice**"), after which time, subject to Section 2, this Option Agreement shall be null and void and no longer binding upon either of the parties. If the Option is exercised within the Option Term, then this Option Agreement shall become a binding agreement for the purchase and sale of the Easement and this Option Agreement shall be completed on the terms set out herein.

2. **EXTENSION OF OPTION TERM**

At any time during the Option Term, Hydro One may, by written notice delivered to the Owner prior to the expiration of the Option Term, as same may have been extended, extend the Option Term with respect to the Lands for two (2) additional periods of one (1) year each, provided that upon each such election, Hydro One pays to the Owner the amount of $1,500.00 in consideration for each such one (1) year extension of the Option Term.

3. **PURCHASE PRICE**

Hydro One shall pay the Purchase Price to or to the order of the Owner by way of a single payment by uncertified cheque or electronic funds transfer on the Closing Date (as hereinafter defined).

The Owner acknowledges receipt of an appraisal report commissioned by Hydro One and, prepared by an external, independent appraiser with the Accredited Appraiser Canadian Institute ("AACI") designation, (the "**HONI Appraisal**").

4. **CLOSING**

The transaction of purchase and sale contemplated by this Option Agreement shall be completed on the date that is ninety (90) days after Hydro One delivers the Exercise Notice to the Owner or on such other date as may be agreed by the parties (the **"Closing Date"**). If the Closing Date is a date on which the Land Registry Office (the "**Land Registry Office**") in which the Lands are registered is closed, the Closing Date shall be on the next following day when such Land Registry Office is open.

5. **ACKNOWLEDGEMENT AND DIRECTION**

The Owner and, if applicable, the Spouse, acknowledges and agrees that execution of the Option Agreement shall constitute execution of the Acknowledgement and Direction attached as Schedule "D" to the Option Agreement (the "**Acknowledgement and Direction**") authorizing Hydro One and its solicitors to register the Easement on title to the Lands. Hydro One covenants and agrees to hold the Acknowledgement and Direction in escrow until Hydro One has paid the Purchase Price at which time the executed Acknowledgement and Direction and Easement shall be released from escrow and may be acted upon by Hydro One.

6. **REGISTRATION OF EASEMENT**

The Owner acknowledges and agrees that Hydro One will register the Easement on title to the Lands on the Closing Date pursuant hereto and the Acknowledgement and Direction. Hydro One will provide notice to the Owner within a reasonable period of time after the Closing Date of the registration particulars of the Easement.

7. **RIGHT TO TRANSFER**

The Owner covenants and agrees with Hydro One that he/she/they has/have the right to grant the Easement without restriction and that Hydro One will quietly possess and enjoy the Easement Lands.

8. **INSPECTION PERIOD**

The Owner agrees and consents to Hydro One, its respective officers, employees, agents, contractors, sub-contractors, surveyors, workers and permittees or any of them entering on, exiting and passing and repassing in, on, over, along, upon, across, through and under the Easement Lands and so much of the Lands as may be reasonably necessary at all reasonable times from the Agreement Date until the later of the expiration of the Option Term (as same may be extended) and the Closing Date, with or without all plant, machinery, material, supplies, vehicles, and equipment, for all purposes necessary or convenient to conduct such inspections, tests, audits, reports as Hydro One sees fit in connection with the acquisition, exercise or enjoyment of the Easement. Hydro One shall restore the Lands to their prior condition so far as reasonably possible following such inspections, tests, audits and reports.

9. **SURVEY/REFERENCE PLAN**

Hydro One agrees to obtain and register, at its sole expense, any new Reference Plan with respect to the Easement Lands that may be required by Hydro One for completion of this Option Agreement.

10. **INCOME TAX ACT**

The Owner represents and warrants and covenants that it is not now and on Closing will not be a non-resident of Canada within the meaning of the *Income Tax Act (Canada).*

11. **HARMONIZED SALES TAX**

The Owner and Hydro One acknowledge and agree that the grant of easement which is proposed under this Option Agreement constitutes a purchase and sale transaction of an interest in real property, and therefore, in conformance with subsections 221(2) and 228(4) of the *Excise Tax Act* R.S.C. 1985, c E-15, as amended ("the Act"), Hydro One shall report and pay to the Receiver General for Canada the Harmonized Sales Tax ("HST") applicable to the purchase and sale of the Easement. For the purposes of this section 11, Hydro One shall warrants that it is an HST registrant in good standing under the Act, that its HST registration number is 870865821RT0001, and that it is acquiring the Easement for use primarily in the course of its commercial activities.

12. **NOTICE OF OPTION**

Hydro One may, in its sole discretion and at its sole expense register this Option Agreement or notice thereof on title to the Lands.

13. **NO OTHER RIGHTS**

The Owner covenants and agrees with Hydro One that the Owner shall not grant, create or transfer any easement, right, covenant, restriction, privilege, permission, or other agreement in, through, under, over or in respect of the Easement Lands prior to the registration of the Easement without the prior written consent of Hydro One.

14. **PRIOR ENCUMBRANCES**

The Owner hereby grants Hydro One permission, should Hydro One elect in its sole discretion, to approach any encumbrancer having an interest in the Easement Lands in priority to the Easement Agreement and to obtain (in registrable form) and register all necessary consents, postponements or subordinations from all current and future encumbrancers having an interest in the Easement Lands in priority to the Easement Agreement or this Option Agreement consenting, postponing or subordinating such encumbrance and their respective rights, title and interest to the Easement and this Option Agreement or to place the Easement Agreement and this Option Agreement in first priority on title to the Easement Lands.

15. **TIME OF ESSENCE**

Time shall in all respects be of the essence hereof; provided, however, that the time for doing or completing any matter provided for herein may be extended or abridged by an agreement in writing between the parties or their respective counsel.

16. **NOTICES**

Notices to be given to either party shall be in writing, personally delivered or sent by registered mail (except during a postal disruption or threatened postal disruption), telegram, electronic facsimile or other similar means of prepaid recorded communication to the applicable address set forth below (or to such other address as such party may from time to time designate in such manner):

HYDRO ONE:

Hydro One Networks Inc.
Real Estate Services
1800 Main Street East
Milton, Ontario L9T 5B9

Attention: Aaron Fair
Tel.: 416-919-6962

with a copy to its solicitors,

Barriston LLP
90 Mulcaster Street
Barrie, ON L4M 4Y5

Attention: Jim McIntosh
Fax: 705-721-4025

OWNER:

with a copy to its solicitors,

Notices personally delivered shall be deemed to have been validly and effectively given on the day of such delivery. Any notice sent by registered mail shall be deemed to have been validly and effectively given on the fifth (5^{th}) business day following the date on which it was sent. Any notice sent by telegram, electronic facsimile or other similar means of prepaid recorded communication shall be deemed to have been validly and effectively given on the Business Day next following the day on which it was sent. "Business Day" shall mean any day which is not a Saturday or Sunday or a statutory holiday in the Province of Ontario.

17. **ASSIGNMENT OF OPTION BY HYDRO ONE**

Hydro One shall have the right to assign all or any part of its interest in this Option Agreement and any or all rights, privileges and benefits accruing to Hydro One hereunder without the consent of the Owner prior to or on the Closing Date. Upon and to the extent of such assignment, this Option Agreement shall thenceforth be construed as if originally made with such assignee or assignees instead of Hydro One and Hydro One shall, to the extent of such assignment, thereupon be relieved of all liabilities and obligations whatsoever arising out of this Option Agreement.

18. **SURVIVAL OF REPRESENTATIONS**

The parties hereto agree that any representations or covenants contained in this Option Agreement shall not merge on closing, but survive and continue in full force and effect thereafter, but only as to the accuracy of the representation or covenant as at the date of completion of this Option Agreement.

19. **ENTIRE AGREEMENT**

The parties acknowledge that there are no covenants, representations, warranties, agreements or conditions, express or implied, collateral or otherwise, forming part of or in any way affecting or relating to this Option Agreement save as expressly set out in this Option Agreement and that this Option Agreement and all Schedules hereto constitute the entire agreement between the parties and may not be modified except as expressly agreed between the Owner and Hydro One in writing.

20. **SEVERABILITY**

Any provision or provisions of this Option Agreement is declared illegal or unenforceable, it or they shall be considered separate and severable from the Option Agreement and the remaining provisions shall remain in force and be binding upon the parties hereto as though the said provision or provisions had never been included.

21. **GOVERNING LAW**

This Option Agreement shall be governed by and construed in accordance with the laws of the Province of Ontario.

22. **SUCCESSORS AND ASSIGNS**

This Option Agreement shall enure to the benefit of and be binding upon the parties hereto and their respective heirs, attorneys, guardians, estate trustees, executors, trustees, successors and permitted assigns.

23. **EXECUTION AND DELIVERY**

This Option Agreement may be executed and delivered in counterparts by original, facsimile or scanned e-mail copy and each Option Agreement shall constitute and be deemed to be the entire agreement notwithstanding that all copies of this Option Agreement may not have all signatures.

24. **PLANNING ACT**

This Option Agreement is subject to the express condition that it is to be effective only if the provisions of the *Planning Act of Ontario* and amendments thereto are complied with.

25. **FURTHER ASSURANCES**

The Owner covenants and agrees to execute if necessary, at no further cost or condition to Hydro One such other instruments, plans and documents as may reasonably be required by Hydro One to effect the registration of the Easement or notice of this Option Agreement on title to the Lands.

26. **SPOUSAL CONSENT**

The Owner represents that, except to the extent such consent has been obtained, spousal consent to this transaction is not necessary and on closing will not be necessary under the provisions of the *Family Law Act*, R.S.O. 1990.

27. **AGE**

The Owner represents that the Owner is at least 18 years of age.

SCHEDULE "C"
TRANSFER AND GRANT OF EASEMENT

[INSERT FULL LEGAL NAME OF OWNER] (the "**Transferor**") is the owner in fee simple and in possession of the certain lands legally described as **[INSERT LEGAL DESCRIPTION]** (the "**Lands**").

Hydro One Networks Inc. (the "**Transferee**") has erected, or is about to erect, certain Works (as more particularly described in paragraph 1(a) hereof) in, through, under, over, across, along and upon the Lands.

1. The Transferor hereby grants and conveys to the Transferee, its successors and assigns the rights and easement, free from all encumbrances and restrictions, the following unobstructed and exclusive rights, easements, rights-of-way, covenants, agreements and privileges in perpetuity (the "**Rights**") in, through, under, over, across, along and upon that portion of the Lands of the Transferor described herein on Schedule A-1 (the "**Strip**"), for the following purposes:

(a) To enter and lay down, install, construct, erect, maintain, open, inspect, add to, enlarge, alter, repair and keep in good condition, move, remove, replace, reinstall, reconstruct, relocate, supplement and operate and maintain at all times in, through, under, over, across, along and upon the Strip electrical transmission systems and telecommunications systems consisting in both instances of pole structures, steel towers, anchors, guys and braces and all such aboveground or underground lines, wires, cables, telecommunications cables, grounding electrodes, conductors, apparatus, works, accessories, associated material and equipment, and appurtenances pertaining to or required by either such system (all or any of which are herein individually or collectively called the ("Works") as in the opinion of the Transferee are necessary or convenient thereto for use as required by Transferee in its undertaking from time to time, or a related business venture.

(b) To enter on and selectively cut or prune, and to clear and keep clear, and remove all trees (subject to compensation to Transferor for merchantable wood values), branches, bush and shrubs and other obstructions and materials in, over or upon the Strip, and without limitation, to cut and remove all leaning or decayed trees located on the Lands whose proximity to the Works renders them liable to fall and come in contact with the Works or which may in any way interfere with the safe, efficient or serviceable operation of the Works or this easement by the Transferee.

(c) To conduct all engineering, legal surveys, and make soil tests, soil compaction and environmental studies and audits in, under, on and over the Strip as the Transferee in its discretion considers requisite.

(d) To erect, install, construct, maintain, repair and keep in good condition, move, remove, replace and use bridges and such gates in all fences which are now or may hereafter be on the Strip as the Transferee may from time to time consider necessary.

(e) Except for fences and permitted paragraph 2(a) installations, to clear the Strip and keep it clear of all buildings, structures, erections, installations, or other obstructions of any nature (hereinafter collectively called the "**obstruction**") whether above or below ground, including removal of any materials and equipment or plants and natural growth, which in the opinion of the Transferee, endanger its Works or any person or property or which may be likely to become a hazard to any Works of the Transferee or to any persons or property or which do or may in any way interfere with the safe, efficient or serviceable operation of the Works or this easement by the Transferee.

(f) To enter on and exit by the Transferor's access routes and to pass and repass at all times in, over, along, upon and across the Strip and so much of the Lands as is reasonably required, for the Transferee, its employees, agents, contractors, subcontractors, workmen and permittees with or without all plant machinery, material, supplies, vehicles and equipment for all purposes necessary or

convenient to the exercise and enjoyment of this easement, subject to compensation afterwards for any crop or other physical damage only to the Lands or permitted structures sustained by the Transferor caused by the exercise of this right of entry and passageway.

(g) To remove, relocate and reconstruct the line on or under the Strip subject to payment by the Transferee of additional compensation for any damage caused thereby.

2. The Transferor agrees that:

(a) It will not interfere with any Works established on or in the Strip and shall not, without the Transferee's consent in writing erect or cause to be erected or permit in, under or upon the Strip any obstruction or plant or permit any trees, bush, shrubs, plants or natural growth which does or may interfere with the Rights granted herein. The Transferor agrees it shall not, without the Transferee's consent in writing, change or permit the existing configuration, grade or elevation of the Strip to be changed and the Transferor further agrees that no excavation or opening or work which may disturb or interfere with the existing surface of the Strip shall be done or made unless consent therefore in writing has been obtained from Transferee, provided however, that the Transferor shall not be required to obtain such permission in case of emergency. Notwithstanding the foregoing, in cases where in the reasonable discretion of the Transferee, there is no danger or likelihood of danger to the Works of the Transferee or to any persons or property and the safe or serviceable operation of this easement by the Transferee is not interfered with, the Transferor may at its expense and with the prior written approval of the Transferee, construct and maintain roads, lanes walks, drains, sewers water pipes, oil and gas pipelines, fences (not to exceed 2 metres in height) and service cables on or under the Strip (the "Installation") or any portion thereof; provided that prior to commencing such Installation, the transferor shall give to the Transferee thirty (30) days notice in writing thereof to enable the Transferee to have a representative present to inspect the proposed Installation during the performance of such work, and provided further that Transferor comply with all instructions given by such representative and that all such work shall be done to the reasonable satisfaction of such representative. In the event of any unauthorised interference aforesaid or contravention of this paragraph, or if any authorised interference, obstruction or Installation is not maintained in accordance with the Transferee's instructions or in the Transferee's reasonable opinion, may subsequently interfere with the Rights granted herein, the Transferee may at the Transferor's expense, forthwith remove, relocate, clear or correct the offending interference, obstruction, Installation or contravention complained of from the Strip, without being liable for any damages cause thereby.

(b) Notwithstanding any rule of law or equity, the Works installed by the Transferee shall at all times remain the property of the Transferee, notwithstanding that such Works are or may become annexed or affixed to the Strip and shall at anytime and from time to time be removable in whole or in part by the Transferee.

(c) No other easement or permission will be transferred or granted and no encumbrances will be created over or in respect to the Strip, prior to the registration of a Transfer of this grant of Rights.

(d) The Transferor will execute such further assurances of the Rights in respect of this grant of easement as may be requisite.

(e) The Rights hereby granted:

(i) shall be of the same force and effect to all intents and purposes as a covenant running with the Strip.

(ii) is declared hereby to be appurtenant to and for the benefit of the Works and undertaking of the Transferee described in paragraph 1(a).

3. The Transferor agrees that the Transferee may, at the Transferee's sole discretion, obtain at the Transferee's sole cost and expense all necessary postponements and subordinations (in

registrable form) from all current and future prior encumbrancers, postponing their respective rights, title and interests to the Transfer of Easement herein so as to place such Rights and easement in first priority on title to the Lands.

4. There are no representations, covenants, agreements, warranties and conditions in any way relating to the subject matter of this grant of Rights whether expressed or implied collateral or otherwise except those set forth herein.

5. No waiver of a breach or any of the covenants of this grant of Rights shall be construed to be a waiver of any succeeding breach of the same or any other covenant.

6. The burden and benefit of this transfer of Rights shall run with the Strip and the Works and undertaking of the Transferee and shall extend to, be binding upon and enure to the benefit of the parties hereto and their respective heirs, executors, administrators, successors and assigns.

SCHEDULE "D"
ACKNOWLEDGEMENT AND DIRECTION

TO: Hydro One Networks Inc. ("**Hydro One**") and its solicitors, Barriston LLP

AND TO: Any and all designees of the above

RE: Transfer and Grant of Easement in substantially the form attached **[as Schedule "C" to the Option Agreement or hereto]** (the "Easement Agreement")

This will confirm that:

- Hydro One and the Owner have reviewed the information set out in the draft document(s) attached to the Option Agreement, and that this information is accurate;
- You are authorized and directed to sign and register electronically on behalf of the undersigned the Easement Agreement as well as any other document(s) required to complete the transaction described above;
- You are authorized to amend the Easement Agreement as may be required to effect registration of such document;
- The effect of the electronic documents described in this Acknowledgement and Direction has been fully explained to the Owner and Hydro One, and the Owner and Hydro One understand that each are parties to and bound by the terms and provisions of these electronic document(s) to the same extent as if each had signed these documents;
- You are directed to insert the names set forth in the signatory section of the Option Agreement as persons authorized (or other authorized signing officers of Hydro One) to act on behalf of Hydro One and the Owner, as applicable;
- Hydro One and the Owner are in fact the parties named in the electronic documents described in this Acknowledgement and Direction and each has not misrepresented the identity of same to you.

Dated _____, 20__.

WITNESS:

_____
Name:

_____

_____
Address:

OWNER:

_____ l/s
Name: **[INSERT LEGAL OWNER NAME]**

The spouse of [INSERT LEGAL OWNER NAME] hereby consents to the Easement Agreement and the Option Agreement

WITNESS:

_____
Name:

_____

_____
Address:

SPOUSE OF OWNER:

_____ l/s
Name: **[INSERT SPOUSE NAME]**

_____

_____

_____

_____

COMPENSATION AND INCENTIVE AGREEMENT - EASEMENT

THIS COMPENSATION AND INCENTIVE AGREEMENT made as of the _____ day of _____, 2019 (the "**Agreement Date**").

B E T W E E N:

[INSERT FULL LEGAL NAME OF OWNER]

(hereinafter collectively called the "**Owner**")

OF THE FIRST PART

- and -

HYDRO ONE NETWORKS INC.

(hereinafter called "**Hydro One**")

OF THE SECOND PART

- and –

[NAME OF SPOUSE, IF APPLICABLE]

(hereinafter called the "**Spouse**")

OF THE THIRD PART

RECITALS:

A. The Owner is the owner of the lands and premises described in Schedule "A" of an Option Agreement between the parties hereto and having a date the same as this Compensation and Incentive Agreement (the "**Option Agreement**") (the "**Lands**").

B. Hydro One desires to purchase a right of way and easement, in, on, over, under, across and through that portion of the Lands, as more particularly described in the Option Agreement (the "**Easement Lands**"), upon the terms and conditions set out in the Option Agreement (the "**Easement**").

C. Hydro One has offered to pay the Option Payment to the Owner upon execution of the Option Agreement and upon closing to purchase the Easement from the Owner for the Purchase Price (collectively, the "**Easement Compensation**").

D. Hydro One has offered, on the terms and conditions set out herein, to compensate the Owner for injurious affection damages, if applicable (the "**IA Compensation**") in respect of that portion of the Lands which are not part of the Easement Lands and which may be subject to an existing easement in favour of Hydro One which existing easement will be released by Hydro One. Such injurious affection damages are calculated as shown on the calculation sheet attached hereto as Schedule "B" (the "**Calculation Sheet**").

E. To achieve a timely resolution of its land acquisition arrangements, Hydro One has also offered to pay certain incentives to the Owner on the terms and conditions set out in this Compensation and Incentive Agreement and as shown on the Calculation Sheet.

F. Any capitalized terms not defined in this Compensation and Incentive Agreement shall have the meaning ascribed to them in the Option Agreement.

NOW THEREFORE, the parties agree as follows:

1. **VALUATION**

Hydro One has retained an external, independent AACI designated appraiser to determine the fair market value of the Easement Lands and any applicable amount of IA Compensation, if any, as of **XXXXX** and to prepare a report in respect thereof (the "**HONI Appraisal**"). The Owner acknowledges receiving a copy of the HONI Appraisal, and agrees to accept the amounts set out in the HONI Appraisal as a fair evaluation of the market value of the Owner's fee simple interest in the Easement Lands as of the date of the HONI Appraisal.

2. **WAIVER**

The Owner waives the right to be reimbursed by Hydro One for the reasonable costs the Owner incurs for a third party independent appraisal report and/or legal review of the HONI Appraisal, the Option Agreement and this Compensation and Incentive Agreement, up to the amount of Seven Thousand Five Hundred Dollars ($7,500.00) and hereby accepts the Second Incentive Payment as defined in 3(b) below.

3. **INCENTIVE PAYMENTS**

(a) Upon execution of the Option Agreement and this Compensation and Incentive Agreement by all parties thereto, Hydro One shall pay to or to the order of the Owner the Option Payment in the amount of **Five Thousand Dollars ($5,000.00)** (may be referred to herein as the "**First Incentive Payment**") as set out on the Calculation Sheet.

(b) On the Closing Date, Hydro One shall make a further incentive payment to or to the order of the Owner in the amount of **XXXXX ($XXXXX)**, such amount being Four Thousand Dollars ($4,000.00) or an amount equal to 10% of the combined total of the appraised fair market value of the Owner's fee simple interest in the Easement Lands and IA Compensation if applicable (the "**Second Incentive Payment**") as set out on the Calculation Sheet.

(c) On the Closing Date, Hydro One shall make a further incentive payment to or to the order of the Owner in the amount of **XXXXX ($XXXXX)**, such amount being equal to 40% of the appraised fair market value of the Owner's fee simple interest in the Easement Lands (the "**40% Premium Payment**") as set out on the Calculation Sheet.

4. **IA COMPENSATION**

Upon the exercise of the Option, Hydro One agrees to pay to or to the order of the Owner on the Closing Date (as defined in the Option Agreement) the IA Compensation, if applicable, in the amount of **XXXXX ($XXXXX)** as set out on the Calculation Sheet.

5. **PAYMENT DUE ON CLOSING**

Hydro One shall pay to or to the order of the Owner the total amount due on the Closing Date.

6. **CONVEYANCING**

Hydro One agrees to reimburse the Owner for reasonably incurred legal fees, if any, associated with the review of applicable conveyancing documents.

7. **TENANTS**

The Owner agrees to indemnify and save harmless Hydro One from all actions, suits, costs, losses, charges, demands, claims and expenses for and in respect of any claims any person having a possessory interest in the Easement Lands.

8. NOTICES

Notices to be given to either party shall be in writing, personally delivered or sent by registered mail (except during a postal disruption or threatened postal disruption), telegram, electronic facsimile or other similar means of prepaid recorded communication to the applicable address set forth below (or to such other address as such party may from time to time designate in such manner):

HYDRO ONE:

Hydro One Networks Inc.
Real Estate Services
1800 Main Street East
Milton, Ontario L9T 5B9

Attention: Aaron Fair
Tel.: 416-919-6962

with a copy to its solicitors,

Barriston LLP
90 Mulcaster Street
Barrie, ON L4M 4Y5

Attention: Jim McIntosh
Fax: 705-721-4025

OWNER:

with a copy to their solicitors,

Notices personally delivered shall be deemed to have been validly and effectively given on the day of such delivery. Any notice sent by registered mail shall be deemed to have been validly and effectively given on the fifth (5^{th}) business day following the date on which it was sent. Any notice sent by telegram, electronic facsimile or other similar means of prepaid recorded communication shall be deemed to have been validly and effectively given on the Business Day next following the day on which it was sent. "Business Day" shall mean any day which is not a Saturday or Sunday or a statutory holiday in the Province of Ontario.

9. ASSIGNMENT OF AGREEMENT BY OWNER

The Owner shall not assign all or any part of its interest in this Compensation and Incentive Agreement or any of the rights, privileges and benefits accruing to the Owner hereunder without the consent of the Hydro One, which consent may not be unreasonably withheld or delayed. Upon and to the extent of such assignment, this Compensation and Incentive Agreement shall thenceforth be construed as if originally made with such assignee or assignees instead of the Owner and the Owner shall, to the extent of such assignment, thereupon be relieved of all liabilities and obligations whatsoever arising out of this Compensation and Incentive Agreement.

The Owner and, if applicable, the Spouse, each covenant and agree that if they transfer, assign, charge, lease or otherwise dispose of all or any part of their interest in the Lands (collectively, a "**Transfer**") they will obtain an agreement from such Transferee assuming and agreeing to be bound by all of the terms of this Compensation and Incentive Agreement as if the Transferee had been an original signatory to this Compensation and Incentive Agreement.

10. NOTICE OF AGREEMENT

Hydro One may, in its sole discretion and at its sole expense register this Compensation and Incentive Agreement or notice thereof on title to the Lands.

11. NO MERGER

The parties hereto agree that any representations or covenants contained in this Compensation and Incentive Agreement shall not merge on closing, but survive and continue in full force and effect thereafter, but only as to the accuracy of the representation or covenant as at the date of completion of this Compensation and Incentive Agreement.

12. **ENTIRE AGREEMENT**

The parties hereto acknowledge that there are no covenants, representations, warranties, agreements or conditions, express or implied, collateral or otherwise, forming part of or in any way affecting or relating to this Compensation and Incentive Agreement save as expressly set out in this Compensation and Incentive Agreement and that this Compensation and Incentive Agreement and all Schedules hereto constitute the entire agreement between the parties and may not be modified except as expressly agreed between the parties in writing.

13. **SEVERABILITY**

Any provision or provisions of this Compensation and Incentive Agreement is declared illegal or unenforceable, it or they shall be considered separate and severable from this Compensation and Incentive Agreement and the remaining provisions shall remain in force and be binding upon the parties hereto as though the said provision or provisions had never been included.

14. **GOVERNING LAW**

This Compensation and Incentive Agreement shall be governed by and construed in accordance with the laws of the Province of Ontario.

15. **SPOUSAL CONSENT**

The Owner represents that, except to the extent such consent has been obtained, spousal consent to this transaction is not necessary under the provision of the *Family Law Act*, R.S.O. 1990.

16. **SUCCESSORS AND ASSIGNS**

This Compensation and Incentive Agreement shall enure to the benefit of and be binding upon the parties hereto and their respective heirs, attorneys, guardians, estate trustees, executors, trustees, successors and permitted assigns.

17. **EXECUTION AND DELIVERY**

This Compensation and Incentive Agreement may be executed and delivered in counterparts by original, facsimile or scanned e-mail copy and each Compensation and Incentive Agreement shall constitute and be deemed to be the entire agreement notwithstanding that all copies of this Compensation and Incentive Agreement may not have all signatures.

18. **FURTHER ASSURANCES**

The parties hereto agree to do, make and execute, if necessary, at no further cost or condition to the other except payment of reasonable out-of-pocket costs, such other instruments, plans, documents, acts, matters and things and take such further action as may reasonably be required by the other party in order to effectively carry out the true intent of this Compensation and Incentive Agreement.

19. **AGE**

The Owner represents that the Owner is at least 18 years of age.

IN WITNESS WHEREOF the parties hereto have duly executed this Compensation and Incentive Agreement as of the Agreement Date.

WITNESS:

Name:

Address:

OWNER:

l/s

Name: **[INSERT LEGAL NAME OF OWNER]**

The spouse of [INSERT LEGAL OWNER NAME] hereby consents to this Compensation and Incentive Agreement

WITNESS:

SPOUSE OF OWNER:

l/s

Name:

Name: **[INSERT SPOUSE OF OWNER]**

Address:

HYDRO ONE NETWORKS INC.

Per:

Name:

Title:

I have authority to bind the Corporation

HYDRO ONE
HST 870865821RT0001

File: N

SCHEDULE “A”

LANDS

[Note to Draft: Insert legal description of Lands]

SCHEDULE “B”

CALCULATION SHEET

OPTION AGREEMENT - FEE SIMPLE CORRIDOR

THIS OPTION AGREEMENT made as of the _____ day of _____, 2019 (the "**Agreement Date**").

B E T W E E N:

[INSERT FULL LEGAL NAME OF OWNER]

(hereinafter collectively called the "**Owner**")

OF THE FIRST PART

- and -

HYDRO ONE NETWORKS INC.

(hereinafter called "**Hydro One**")

OF THE SECOND PART

- and -

[INSERT NAME OF SPOUSE, IF APPLICABLE]

(hereinafter called the "**Spouse**")

OF THE THIRD PART

RECITALS:

A. The Owner is the owner of the lands and premises described in Schedule "A" attached hereto (the "**Lands**");

B. The Owner has agreed to grant to Hydro One for the consideration and on the terms and conditions set out herein and attached hereto as Schedule "B" (the "**Standard Terms and Conditions**") an option to purchase that portion of the Lands described on Schedule "A-1" attached hereto (the "**Corridor Lands**") on the terms and conditions set out herein and attached hereto as Schedule "C" (the **"Agreement of Purchase and Sale"**).

C. Hydro One has entered into an agreement with the Owner having a date the same as this Option Agreement (the **"Compensation and Incentive Agreement"**) whereby Hydro One has offered to compensate the Owner for injurious affection damages, if applicable, in accordance with the terms and conditions contained therein.

D. Hydro One has offered, on the terms and conditions set out in the Compensation and Incentive Agreement, to compensate the Owner for injurious affection damages, if applicable (the "**IA Compensation**") in respect of that portion of the Lands which are not part of the Corridor Lands and which may be subject to an existing easement in favour of Hydro One which existing easement will be released by Hydro One. Such injurious affection damages are calculated as shown on the calculation sheet attached to the Compensation and Incentive Agreement as Schedule "B" (the "**Calculation Sheet**").

NOW THEREFORE, the parties hereby agree as follows:

1. GRANT OF OPTION

In consideration of the sum of **Five Thousand Dollars ($5,000.00)** of lawful money of Canada paid by Hydro One to the Owner, the receipt and sufficiency of which is hereby acknowledged by the Owner, (the **"Option Payment"**) the Owner hereby grants to Hydro One the an irrevocable option (the "**Option**"), to purchase the Owner's fee simple interest in the Corridor Lands upon and subject to the terms and conditions set out herein, the Standard Terms and Conditions and the Schedules hereto.

2. **PURCHASE PRICE**

Upon closing of the transaction of purchase and sale pursuant to the Agreement of Purchase and Sale and in accordance with the terms and conditions set out herein, Hydro One agrees to pay to or to the order of the Owner the amount of **XXXXX, ($XXXXX)** (the **"Purchase Price"**).

IN WITNESS WHEREOF the parties hereto have duly executed this Option Agreement as of the Agreement Date.

WITNESS:

Name:

Address:

OWNER:

l/s

Name: **«PropertyOwnerName1»**

The spouse of the Owner hereby consents to this Option Agreement

WITNESS:

Name:

Address:

SPOUSE OF OWNER:

l/s

Name: **«SpouseName1»**

HYDRO ONE NETWORKS INC.

HYDRO ONE
HST 870865821RT0001

Per:

Name:

Title:

I have authority to bind the Corporation

SCHEDULE "A"
LEGAL DESCRIPTION

[Note to Draft: Insert legal description of Lands]

SCHEDULE "A-1"
CORRIDOR LANDS

[Note to Draft: Insert Legal Description of Corridor Lands]

SCHEDULE "B"
STANDARD TERMS AND CONDITIONS

1. **EXERCISE OF OPTION**

The Option shall be open for exercise at any time from the Agreement Date until the 3rd anniversary of the Agreement Date, as same may have been extended in accordance with the terms hereof, (the "**Option Term**"), by providing written notice to the Owner (the "**Exercise Notice**"), after which time, subject to Section 2, this Option Agreement shall be null and void and no longer binding upon either of the parties. If the Option is exercised within the Option Term, then this Option Agreement shall become a binding agreement for the purchase and sale of the Corridor Lands and this Option Agreement shall be completed on the terms set out herein.

2. **EXTENSION OF OPTION TERM**

At any time during the Option Term, Hydro One may, by written notice delivered to the Owner prior to the expiration of the Option Term, as same may have been extended, extend the Option Term with respect to the Lands for two (2) additional periods of one (1) year each, provided that upon each such election, Hydro One pays to the Owner the amount of $1,500.00 in consideration for each such one (1) year extension of the Option Term.

3. **PURCHASE PRICE**

Hydro One shall pay the Purchase Price to or to the order of the Owner by way of a single payment by uncertified cheque or electronic funds transfer on the Closing Date (as hereinafter defined).

The Owner acknowledges receipt of an appraisal report commissioned by Hydro One and, prepared by an external, independent appraiser with the Accredited Appraiser Canadian Institute ("AACI") designation, (the "**HONI Appraisal**").

4. **CLOSING**

The transaction of purchase and sale contemplated by this Option Agreement shall be completed on the date that is ninety (90) days after Hydro One delivers the Exercise Notice to the Owner or on such other date as may be agreed by the parties (the "Closing Date"). If the Closing Date is a date on which the Land Registry Office (the "Land Registry Office") in which the Lands are registered is closed, the Closing Date shall be on the next following day when such Land Registry Office is open.

5. **AGREEMENT OF PURCHASE AND SALE**

The Owner and, if applicable, the Spouse, acknowledge and agree that execution of this Option Agreement shall constitute execution of the Agreement of Purchase and Sale attached as Schedule "C" to this Option Agreement.

6. **RIGHT TO TRANSFER AND TITLE**

The Owner covenants and agrees with Hydro One that he/she/they has/have good and marketable title to the Corridor Lands and has the full and exclusive power to convey the fee simple interest in the Corridor Lands to Hydro One free and clear of any financial encumbrances, and that Hydro One will quietly possess and enjoy the Corridor Lands.

7. **INSPECTION PERIOD**

The Owner agrees and consents to Hydro One, its respective officers, employees, agents, contractors, sub-contractors, surveyors, workers and permittees or any of them entering on, exiting and passing and repassing in, on, over, along, upon, across, through and under the Corridor Lands and so much of the Lands as may be reasonably necessary at all reasonable times from the Agreement Date until the later of the expiration of the Option Term (as same may be extended) and the Closing Date, with or without all plant, machinery, material, supplies, vehicles, and equipment, for all purposes necessary or convenient to conduct such inspections, tests, audits, reports as Hydro One sees fit in connection with the acquisition, exercise or enjoyment of the Corridor Lands. Hydro One shall restore the Lands to their prior condition so far as reasonably possible following such inspections, tests, audits and reports.

8. **SURVEY/REFERENCE PLAN**

Hydro One agrees to obtain and register, at its sole expense, any new Reference Plan with respect to the Corridor Lands that may be required by Hydro One for completion of this Option Agreement.

9. **INCOME TAX ACT**

The Owner represents and warrants and covenants that the Owner is not now and on Closing will not be a non-resident of Canada within the meaning of the *Income Tax Act (Canada).*

10. **HARMONIZED SALES TAX**

The Owner and Hydro One acknowledge and agree that the transfer of the fee simple of the Corridor Lands which is proposed under this Option Agreement constitutes a purchase and sale transaction of an interest in real property, and therefore, in conformance with subsections 221(2) and 228(4) of the *Excise Tax Act* R.S.C. 1985, c E-15, as amended ("the Act"), Hydro One shall report and pay to the Receiver General for Canada the Harmonized Sales Tax ("HST") applicable to the purchase and sale of the Corridor Lands. For the purposes of this section 11, Hydro One shall warrants that it is an HST registrant in good standing under the Act, that its HST registration number is 870865821RT0001, and that it is acquiring the Corridor Lands for use primarily in the course of its commercial activities.

11. **NOTICE OF OPTION**

Hydro One may, in its sole discretion and at its sole expense register this Option Agreement or notice thereof on title to the Lands.

12. **NO OTHER RIGHTS**

The Owner covenants and agrees with Hydro One that the Owner shall not grant, create or transfer any easement, right, covenant, restriction, privilege, permission, or other agreement in, through, under, over or in respect of the Corridor Lands prior to the registration of the Closing of the transaction contemplated herein without the prior written consent of Hydro One.

13. **PRIOR ENCUMBRANCES**

The Owner hereby grants Hydro One permission, should Hydro One elect in its sole discretion, to approach any encumbrancer having an interest in the Corridor Lands in priority to the Option Agreement and to obtain (in registrable form) and register all necessary consents, postponements or subordinations from all current and future encumbrancers having an interest in the Corridor Lands in priority this Option Agreement consenting, postponing or subordinating such encumbrance and their respective rights, title and interest to the Corridor Lands and this Option Agreement or to place the this Option Agreement in first priority on title to the Corridor Lands.

14. **TIME OF ESSENCE**

Time shall in all respects be of the essence hereof; provided, however, that the time for doing or completing any matter provided for herein may be extended or abridged by an agreement in writing between the parties or their respective counsel.

15. **NOTICES**

Notices to be given to either party shall be in writing, personally delivered or sent by registered mail (except during a postal disruption or threatened postal disruption), telegram, electronic facsimile or other similar means of prepaid recorded communication to the applicable address set forth below (or to such other address as such party may from time to time designate in such manner):

HYDRO ONE:

Hydro One Networks Inc.
Real Estate Services
1800 Main Street East
Milton, Ontario L9T 5B9

with a copy to its solicitors,

Barriston LLP
90 Mulcaster Street
Barrie, ON L4M 4Y5

Attention:	Aaron Fair	Attention:	Jim McIntosh
Tel.:	416-919-6962	Fax:	(705)-721-4025

OWNER: with a copy to their solicitors,

Notices personally delivered shall be deemed to have been validly and effectively given on the day of such delivery. Any notice sent by registered mail shall be deemed to have been validly and effectively given on the fifth (5^{th}) Business Day following the date on which it was sent. Any notice sent by telegram, electronic facsimile or other similar means of prepaid recorded communication shall be deemed to have been validly and effectively given on the Business Day next following the day on which it was sent. "Business Day" shall mean any day which is not a Saturday or Sunday or a statutory holiday in the Province of Ontario.

16. **ASSIGNMENT OF OPTION BY HYDRO ONE**

Hydro One shall have the right to assign all or any part of its interest in this Option Agreement and any or all rights, privileges and benefits accruing to Hydro One hereunder without the consent of the Owner prior to or on the Closing Date. Upon and to the extent of such assignment, this Option Agreement shall thenceforth be construed as if originally made with such assignee or assignees instead of Hydro One and Hydro One shall, to the extent of such assignment, thereupon be relieved of all liabilities and obligations whatsoever arising out of this Option Agreement.

17. **SURVIVAL OF REPRESENTATIONS**

The parties hereto agree that any representations or covenants contained in this Option Agreement shall not merge on closing, but survive and continue in full force and effect thereafter, but only as to the accuracy of the representation or covenant as at the date of completion of this Option Agreement.

18. **ENTIRE AGREEMENT**

The parties acknowledge that there are no covenants, representations, warranties, agreements or conditions, express or implied, collateral or otherwise, forming part of or in any way affecting or relating to this Option Agreement save as expressly set out in this Option Agreement and that this Option Agreement and all Schedules hereto constitute the entire agreement between the parties and may not be modified except as expressly agreed between the Owner and Hydro One in writing.

19. **SEVERABILITY**

Any provision or provisions of this Option Agreement is declared illegal or unenforceable, it or they shall be considered separate and severable from the Option Agreement and the remaining provisions shall remain in force and be binding upon the parties hereto as though the said provision or provisions had never been included.

20. **GOVERNING LAW**

This Option Agreement shall be governed by and construed in accordance with the laws of the Province of Ontario.

21. **SUCCESSORS AND ASSIGNS**

This Option Agreement shall enure to the benefit of and be binding upon the parties hereto and their respective heirs, attorneys, guardians, estate trustees, executors, trustees, successors and permitted assigns.

22. **EXECUTION AND DELIVERY**

This Option Agreement may be executed and delivered in counterparts by original, facsimile or scanned e-mail copy and each Option Agreement shall constitute and be deemed to be the entire agreement notwithstanding that all copies of this Option Agreement may not have all signatures.

23. **PLANNING ACT**

This Option Agreement is subject to the express condition that it is to be effective only if the provisions of the *Planning Act of Ontario* and amendments thereto are complied with.

24. **FURTHER ASSURANCES**

The Owner covenants and agrees to execute if necessary, at no further cost or condition to Hydro One such other instruments, plans and documents as may reasonably be required by Hydro One to effect the registration of the transfer of the Corridor Lands or notice of this Option Agreement on title to the Lands.

25. **SPOUSAL CONSENT**

The Owner represents that, except to the extent such consent has been obtained, spousal consent to this transaction is not necessary and on closing will not be necessary under the provisions of the *Family Law Act*, R.S.O. 1990.

26. **AGE**

The Owner represents that the Owner is at least 18 years of age.

SCHEDULE "C"
AGREEMENT OF PURCHASE AND SALE

THIS AGREEMENT made as of the _____ day of _____ , 20__ .

B E T W E E N:

[INSERT FULL LEGAL NAME OF OWNER]

(hereinafter collectively called the "**Vendor**")

OF THE FIRST PART

- and -

HYDRO ONE NETWORKS INC.

(hereinafter called the "**Purchaser**")

OF THE SECOND PART

- and -

[INSERT NAME OF SPOUSE, IF APPLICABLE]

(hereinafter called the "**Spouse**")

OF THE THIRD PART

WITNESSETH THAT in consideration of the mutual covenants, agreements and payments herein provided, the parties hereto covenant and agree as follows:

ARTICLE 1
OFFER

1.1 The Vendor, being the owner of the lands and premises more particularly described in Schedule "A" (the "**Lands**") hereby agrees to sell to the Purchaser and the Purchaser agrees to purchase from the Vendor, on the terms and conditions set out in this Agreement, a portion of the Lands more particularly described on Schedule "A-1" attached hereto (the "**Property**") upon and subject to the terms and conditions hereinafter set forth.

1.2 The Vendor acknowledges and understands that upon execution of this Agreement by the Vendor and the Purchaser there shall be a binding agreement of Purchase and Sale between the Purchaser and the Vendor.

1.3 Included in the Purchase Price is the purchase of all of the Vendor's interest in all fixtures, improvements, and appurtenances located on the Property except those listed below which are expressly excluded:

NIL

ARTICLE 2
PURCHASE PRICE

2.1 (a) The total compensation to be paid by the Purchaser to the Vendor for the Property shall be the sum of **XXXXX ($XXXXX)**, (the "**Total Compensation**"), subject to usual adjustments, if any, payable on Closing by uncertified cheque.

(b) The Total Compensation is comprised as follows:

(i)	Purchase Price of the Property (the "Purchase Price"):	**«PurchasePriceFigureNumeric»**
(ii)	Injurious Affection, if applicable, for the portion of the Lands which are not part of the Property (the "IA Compensation").	**«IACompensationNumeric»**
(iii)	First Incentive Payment	**«FirstIncentive»**
(iv)	Second Incentive Payment	**«SecondIncentive»**
(v)	Negotiation Fee	**«NegotiationFee»**
(vi)	15% Premium Incentive Payment	**«SecondIncentivePaymentNumeric»**
	TOTAL COMPENSATION	**«TotalCompensation»**
	(ROUNDED TO)	**«TotalCompensationRounded»**

2.2 The Vendor acknowledges receipt of an appraisal report and update, if any, prepared by an external, independent AACI accredited appraiser commissioned by the Purchaser.

2.3 The Purchaser agrees to obtain and register, at its sole expense, any new Reference Plan with respect to the Property that may be required by the Purchaser for completion of this Agreement of Purchase and Sale.

2.4 The calculation of the Total Consideration is shown on the calculation sheet attached hereto as Schedule "C" (the **"Calculation Sheet"**).

ARTICLE 3
CLOSING

3.1 The closing of this transaction shall take place at 10:00 a.m. on _____ _____or such earlier or later time and at such place as shall be agreed in writing by the parties hereto (the "Closing"). If the Closing is to take place on a date on which the Land Registry Office (the "Land Registry Office") in which the Lands are registered is closed, the Closing shall take place on the next following day when such Land Registry Office is open.

3.2 On Closing,

(a) Vacant possession of the Property shall be given to the Purchaser;

(b) The Purchaser shall pay the Total Compensation to the Vendor in accordance with section 2.1 of this Agreement;

(c) If applicable, rents, realty taxes, local improvement charges, water and unmetered utility charges and the cost of fuel as applicable shall be apportioned and allowed to the date of completion (the day itself to be apportioned to the Purchaser);

(d) In conformance with subsections 221(2) and 228(4) of the *Excise Tax Act* R.S.C. 1985, c E-15, as amended ("the Act"), Purchaser shall report and pay to the Receiver General, the Harmonized Sales Tax ("HST") applicable to the purchase and sale of the Property. For the purposes of this clause 3.2(b), the Purchaser warrants that it is an HST registrant in good standing under the Act, that its HST registration number is 870865821RT0001, and that it is acquiring the Property for use primarily in the course of its commercial activities.

ARTICLE 4
INSPECTION PERIOD

4.1 The Purchaser shall be allowed thirty (30) days from the date of this Agreement (the **"Inspection Period"**) to satisfy itself with respect to all matters respecting the Property including its present state of repair and condition and any structures thereon, all encumbrances and all regulations and by-laws governing the Property and the Vendor grants to the Purchaser the right to enter upon the Property and to conduct such inspections, surveys and tests as the Purchaser, acting reasonably, deems necessary in this regard, provided the Purchaser takes all reasonable care in the conduct of such inspections, surveys and tests and restores the Property to its prior condition so far as reasonably possible following such inspections and tests. The Vendor assumes no responsibility for and the Purchaser shall indemnify and save harmless the Vendor from and against all claims, demands, costs, damages, expenses and liabilities whatsoever arising out of its presence on the Property or of its activities on or in connection with the Property during the Inspection Period.

4.2 If for any reason, the Purchaser, acting reasonably, is not satisfied with respect to such matters arising from its activities in Section 4.1, it may deliver a notice (the **"Notice of Termination"**) to the Vendor prior to the expiry of the Inspection Period indicating that it is not satisfied with respect to such matters and desires to terminate this Agreement and release the Vendor from any further obligations. Upon delivery by the Purchaser of a Notice of Termination to the Vendor, and this Agreement shall be at an end and neither Party shall have any further obligation to the other respecting the Agreement.

ARTICLE 5
TITLE

5.1 The Purchaser shall be allowed thirty (30) days from the date of this Agreement to investigate title to the Property at its own expense (the "Title Search Period"), to satisfy itself that there are no outstanding encumbrances, or liens save and except those listed in Schedule "B" attached hereto and until the earlier of: (i) thirty (30) days from the later of the last date of the title search period or the date or which the conditions in this Agreement are fulfilled or otherwise waived or; (ii) five (5) days prior to completion, to satisfy itself that there are no outstanding work orders or deficiency notices affecting the property. Vendor hereby consents to the Municipality or other governmental agencies releasing to the Purchaser details of all outstanding work orders affecting the Property and the Vendor agrees to execute and deliver such further authorizations in this regard as Purchaser may reasonably require.

5.2 Provided that the title to the Property is good and free from all registered restrictions, charges, liens and encumbrances except those listed in Schedule "B" attached hereto, if within the Title Search Period, any valid objection to title is made by the Purchaser in writing to the Vendor together with documentary verification thereof, and which the Vendor shall be unwilling or unable to remove and which the Purchaser will not waive, this Agreement, notwithstanding any intermediate acts or negotiations in respect of such objections, shall be at an end and the Vendor shall not be liable for any costs or damages and the Vendor and the Purchaser shall be released from all obligations hereunder, and the Vendor shall also be released from all obligations under this Agreement, save and except those covenants of the Purchaser expressly stated to survive Closing or other termination of this Agreement. Save as to any valid objection to title made in accordance with this Agreement and within the Title Search Period, and except for any objection going to the root of title, Purchaser shall be conclusively deemed to have accepted Vendor's title to the Property.

5.3 The Vendor and Purchaser agree that there is no condition, express, or implied, representation or warranty of any kind that the future intended use of the Property by the Purchaser is or will be lawful except as may be specifically stipulated elsewhere in this Agreement.

5.4 The Vendor agrees to provide to the Purchaser any existing survey of the Property, within Fifteen (15) days from the date of this Agreement.

ARTICLE 6
PURCHASER'S INVESTIGATION RESULTS

6.1 Purchaser shall, at its own cost, forthwith make such investigation as the Purchaser deems appropriate of the Property and Vendor's title as provided for in this Agreement and shall notify the Vendor of any objection to title, together with a complete copy of any documents and other material information related thereto prior to the expiry of the Title Search Period.

ARTICLE 7
INSURANCE

7.1 The Vendor covenants and agrees that the Property and all structures or fixtures being purchased are insured, and that such insurance will remain in force until closing. The Property and all structures or fixtures being purchased shall be and remain at the risk of the Vendor until Closing.

7.2 Pending completion, Vendor shall hold all insurance policies and the proceeds thereof in trust for the parties as their interests may appear and in the event of substantial damage to the Property the Purchaser may either terminate this Agreement and have all monies paid by the Purchaser returned to the Purchaser without interest or deduction or else take the proceeds of any insurance and complete the purchase.

ARTICLE 8
PLANNING ACT

8.1 This Agreement is subject to the express condition that it is to be effective only if the subdivision control provisions of the *Planning Act* R.S.O. 1990, as amended are complied with prior to Closing. The Vendor shall forthwith make any application to the local Committee of Adjustment or Land Division Committee for any consent that may be required pursuant to the *Planning Act*. In the event that any such application for consent is denied, or any condition imposed by such body is unacceptable to the Vendor, this Agreement shall be terminated.

ARTICLE 9
ADDITIONAL PROVISIONS

9.1 The Transfer/Deed of Land (the "Transfer"), and the Land Transfer Tax Affidavit, shall be prepared in registrable form by the Purchaser, and the Purchaser covenants at its cost to register the Transfer on Closing. If requested by Purchaser, Vendor covenants that the Transfer Deed to be delivered on completion shall contain the statements contemplated by s. 50(22) of the *Planning Act*, R.S.O. 1990

9.2 Time shall in all respects be of the essence hereof provided that the time for doing or completing of any matter provided for herein may be extended or abridged by an agreement in writing signed by the Parties or by their respective solicitors who are specifically authorized in that regard.

9.3 Any tender of documents or money hereunder may be made upon the Parties or their respective solicitors on the day set for Closing. Money may be tendered by bank draft or uncertified cheque.

9.4 Notices to be given to either party shall be in writing, personally delivered or sent by registered mail (except during a postal disruption or threatened postal disruption), telegram, electronic facsimile or other similar means of prepaid recorded communication to the applicable address set forth below (or to such other address as such party may from time to time designate in such manner):

HYDRO ONE:

Hydro One Networks Inc.
Real Estate Services
1800 Main Street East
Milton, Ontario L9T 5B9

Attention: Aaron Fair
Tel.: 416-919-6962

with a copy to its solicitors,

Barriston LLP
90 Mulcaster St
Barrie, ON L4M 4Y5

Attention: Jim McIntosh
Fax: (705) 721-4025

OWNER:

with a copy to their solicitors,

Notices personally delivered shall be deemed to have been validly and effectively given on the day of such delivery. Any notice sent by registered mail shall be deemed to have been validly and effectively given on the fifth (5^{th}) business day following the date on which it was sent. Any notice sent by telegram, electronic facsimile or other similar means of prepaid recorded communication shall be deemed to have been validly and effectively given on the Business Day next following the day on which it was sent. "Business Day" shall mean any day which is not a Saturday or Sunday or a statutory holiday in the Province of Ontario.

9.5 The parties acknowledge that there are no covenants, representations, warranties, agreements or conditions, express or implied, collateral or otherwise, forming part of or in any way affecting or relating to this Agreement save as expressly set out in this Agreement and that this Agreement and all Schedules hereto constitute the entire agreement between the parties and may not be modified except as expressly agreed between the Vendor and Purchaser in writing. This Agreement shall be read with all changes of gender or number required by the context

9.6 If any provision or provisions of this Agreement be declared illegal or unenforceable, it or they shall be considered separate and severable from the Agreement and its remaining provisions shall remain in force and be binding upon the parties hereto as though the said provision or provisions had never been included.

9.7 No act or omission or delay in exercising any right or enforcing any term, covenant or agreement to be performed under this Agreement shall impair such right or be construed as to be a waiver of any default or acquiescence in such failure to perform, unless such waiver shall be given or acknowledged in writing.

9.8 This Agreement to Purchase shall be governed by and construed in accordance with the laws of the Province of Ontario.

9.9 This Agreement to Purchase shall enure to the benefit of and be binding upon the parties hereto and their respective heirs, attorneys, guardians, estate trustees, executors, trustees, successors and permitted assigns.

9.10 The Vendor warrants that, except to the extent such consent has been obtained, spousal consent is not necessary to this transaction and on Closing will not be necessary under the provision of the *Family Law Act*, R.S.O. 1990.

9.11 The Purchaser may, in its sole discretion and at its sole expense register this Agreement to Purchase or notice thereof on title to the Lands.

9.12 Where each of the Vendor and the Purchaser retain a solicitor to complete this Agreement and where the transaction contemplated herein will be completed by electronic registration pursuant to Part III of the *Land Registration Reform Act*, R.S.O.

1990, and any amendments thereto, the Vendor and the Purchaser acknowledge and agree that the delivery of documents and the release thereof to the Vendor and the Purchaser may, at the solicitor's discretion; (a) not occur contemporaneously with the registration of the Transfer/Deed of Land (and other registrable) documentation), and (b) be subject to conditions whereby the solicitor receiving documents and/or money will be required to hold them in trust and not release them except in accordance with the terms of a written agreement between the solicitors

9.13 The provisions of the attached Schedules "A", "A-1", "B" and "C" shall form part of this Agreement as if set out herein.

9.14 The Vendor represents and warrants and covenants that it is not now and on Closing will not be a non-resident of Canada within the meaning of the *Income Tax Act (Canada)*.

9.15 The Purchaser shall have the right to assign all or any part of its interest in this Agreement and any or all rights, privileges and benefits accruing to the Purchaser hereunder without the consent of the Vendor prior to or on the Closing. Upon and to the extent of such assignment, this Agreement shall thenceforth be construed as if originally made with such assignee or assignees instead of the Purchaser and the Purchaser shall, to the extent of such assignment, thereupon be relieved of all liabilities and obligations whatsoever arising out of this Agreement.

9.16 The parties hereto agree that any representations or covenants contained in this Agreement shall not merge on closing, but survive and continue in full force and effect thereafter, but only as to the accuracy of the representation or covenant as at the date of completion of this Agreement.

9.17 This Agreement may be executed in one or more counterparts, each of which shall be deemed an original and together shall constitute one and the same agreement. Counterparts may be executed either in original or by electronic means, including, without limitation, by facsimile transmission or by electronic delivery in portable document format (".pdf") or tagged image file format (".tif") and the parties shall adopt any signatures received by electronic means as original signatures of the Parties; provided, however that any party providing its signature in such manner shall promptly forward to the other party an original signed copy of this Agreement which was so delivered electronically.

9.18 The Vendor covenants and agrees to execute if necessary, at no further cost or condition to the Purchaser except payment of the Vendor's reasonable out-of-pocket costs, such other instruments, plans and documents as may reasonably be required by the Purchaser to effect the registration of any right or interest transferred hereunder or notice of this Agreement on title to the Lands.

9.19 The Purchaser agrees to pay the Vendor's reasonable legal costs in connection with this transaction.

9.20 The Vendor represents that the Vendor is at least 18 years of age.

IN WITNESS WHEREOF the parties hereto have duly executed this Agreement as of the date first written above.

SIGNED, SEALED AND DELIVERED
In the presence of

) **VENDOR**
)
)
_____) _____(seal)
Print Name of Witness:) Print Name:
Address:

)
SIGNED, SEALED AND DELIVERED) Consent Signature & Release of
In the presence of) Vendor's Spouse, if non-owner.
)
)
_____) _____(seal)
Print Name of Witness:) Print Name:
Address:

HYDRO ONE NETWORKS INC.

Per: _____
Print Name:
Title:

I have authority to bind the Corporation

SCHEDULE “A”

LEGAL DESCRIPTION OF LANDS

[Note to Draft: Insert legal description of Lands]

SCHEDULE “A-1”

LEGAL DESCRIPTION OF PROPERTY

[Note to Draft: Insert Legal Description of the Property]

SCHEDULE “B”

PERMITTED ENCUMBRANCES

NIL

SCHEDULE “C”

CALCULATION SHEET

COMPENSATION AND INCENTIVE AGREEMENT – FEE SIMPLE

THIS COMPENSATION AND INCENTIVE AGREEMENT made as of the _____ day of _____, 2019 (the "**Agreement Date**").

B E T W E E N:

[INSERT FULL LEGAL NAME OF OWNER]

(hereinafter collectively called the "**Owner**")

OF THE FIRST PART

- and -

HYDRO ONE NETWORKS INC.

(hereinafter called "**Hydro One**")

OF THE SECOND PART

- and –

[NAME OF SPOUSE, IF APPLICABLE]

(hereinafter called the "**Spouse**")

OF THE THIRD PART

RECITALS:

A. The Owner is the Owner of the lands and premises described in Schedule "A" attached hereto (the "**Lands**").

B. Hydro One desires to purchase a portion of the Lands (the "**Corridor Lands**"), as more particularly described in an Option Agreement between the parties hereto and having a date the same as this Compensation and Incentive Agreement (the "**Option Agreement**"), upon the terms and conditions set out in the Option Agreement.

C. Hydro One has offered to pay the Option Payment to the Owner upon execution of the Option Agreement and upon closing to purchase the Corridor Lands from the Owner for the Purchase Price (collectively, the "**Corridor Compensation**").

D. Hydro One has offered to compensate the Owner for injurious affection damages, if any, (the "**IA Compensation**") in respect of that portion of the Lands which are not part of the Corridor Lands and which are not subject to any existing easement in favour of Hydro One on the terms and conditions set out herein and calculated as shown on the calculation sheet attached hereto as Schedule "B" (the "**Calculation Sheet**").

E. To achieve a timely resolution of its land acquisition arrangements, Hydro One has also offered to pay certain incentives to the Owner on the terms and conditions set out in this Compensation and Incentive Agreement and as shown on the Calculation Sheet.

F. Any capitalized terms not defined in this Compensation and Incentive Agreement shall have the meaning ascribed to them in the Option Agreement.

NOW THEREFORE, the parties agree as follows:

1. **VALUATION**

Hydro One has retained an external, independent AACI accredited appraiser to determine the fair market value of the Corridor Lands and any applicable amount of IA Compensation, if any, as of **XXXXX** to prepare a report in respect thereof (the "**HONI Appraisal**"). The Owner acknowledges receiving a copy of the HONI Appraisal, and update, if any and agrees to accept the amounts set out in the HONI Appraisal as a fair evaluation of the market value of the Owner's fee simple interest in the Corridor Lands as of the date of the HONI Appraisal.

2. **INCENTIVE PAYMENTS**

(a) Upon execution of the Option Agreement and this Compensation and Incentive Agreement by all parties thereto, Hydro One shall pay to or to the order of the Owner the amount of **Five Thousand Dollars ($5,000.00)** (may be referred to herein as the "**First Incentive Payment**") as set out on the Calculation Sheet.

(b) On the Closing Date, Hydro One shall make a further incentive payment to or to the order of the Owner in the amount of **XXXXX ($XXXXX)**, such amount being Four Thousand Dollars ($4,000.00) or an amount equal to 10% of the combined total of the appraised fair market value of the Owner's fee simple interest in the Corridor Lands and IA Compensation if applicable (the "**Second Incentive Payment**") as set out on the Calculation Sheet.

(c) On the Closing Date, Hydro One shall make a further incentive payment to or to the order of the Owner in the amount of **XXXXX**, such amount being equal to 15% of the appraised fair market value of the Owner's fee simple interest in the Corridor Lands (the "**15% Premium Payment**") as set out on the Calculation Sheet.

3. **WAIVER**

The Owner waives the right to be reimbursed by Hydro One for the reasonable costs the Owner incurs for a third party independent appraisal report and/or legal review of the HONI Appraisal, the Option Agreement and this Compensation and Incentive Agreement, up to the amount of Seven Thousand Five Hundred Dollars ($7,500.00) and hereby accepts the Second Incentive Payment as defined in 2(b) above.

4. **IA COMPENSATION**

Upon the exercise of the Option, Hydro One agrees to pay to or to the order of the Owner on the Closing Date (as defined in the Option Agreement) the IA Compensation, if applicable, in the amount of **XXXXX ($XXXXX)** as set out on the Calculation Sheet.

5. **PAYMENT DUE ON CLOSING**

Hydro One shall pay to or to the order of the Owner the total amount due on the Closing Date.

6. **CONVEYANCING**

Hydro One agrees to reimburse the Owner for reasonably incurred legal fees, if any, associated with the review of applicable conveyancing documents.

7. TENANTS

The Owner agrees to indemnify and save harmless Hydro One from all actions, suits, costs, losses, charges, demands, claims and expenses for and in respect of any claims any person having a possessory interest in the Corridor Lands.

8. NOTICES

Notices to be given to either party shall be in writing, personally delivered or sent by registered mail (except during a postal disruption or threatened postal disruption), telegram, electronic facsimile or other similar means of prepaid recorded communication to the applicable address set forth below (or to such other address as such party may from time to time designate in such manner):

HYDRO ONE:

Hydro One Networks Inc.
Real Estate Services
1800 Main Street East
Milton, Ontario L9T 5B9

Attention: Aaron Fair
Tel.: 416-919-6962

with a copy to its solicitors,

Barriston LLP
90 Mulcaster Street
Barrie, ON L4M 4Y5

Attention: Jim McIntosh
Fax: 705-721-4025

OWNER:

with a copy to their solicitors,

Notices personally delivered shall be deemed to have been validly and effectively given on the day of such delivery. Any notice sent by registered mail shall be deemed to have been validly and effectively given on the fifth (5^{th}) business day following the date on which it was sent. Any notice sent by telegram, electronic facsimile or other similar means of prepaid recorded communication shall be deemed to have been validly and effectively given on the Business Day next following the day on which it was sent. "Business Day" shall mean any day which is not a Saturday or Sunday or a statutory holiday in the Province of Ontario.

9. ASSIGNMENT OF AGREEMENT BY OWNER

The Owner shall not assign all or any part of its interest in this Compensation and Incentive Agreement or any of the rights, privileges and benefits accruing to the Owner hereunder without the consent of the Hydro One, which consent may not be unreasonably withheld or delayed. Upon and to the extent of such assignment, this Compensation and Incentive Agreement shall thenceforth be construed as if originally made with such assignee or assignees instead of the Owner and the Owner shall, to the extent of such assignment, thereupon be relieved of all liabilities and obligations whatsoever arising out of this Compensation and Incentive Agreement.

The Owner and, if applicable, the Spouse, each covenant and agree that if they transfer, assign, charge, lease or otherwise dispose of all or any part of their interest in the Lands (collectively, a "**Transfer**") they will obtain an agreement from such Transferee assuming and agreeing to be bound by all of the terms of this Compensation and Incentive Agreement as if the Transferee had been an original signatory to this Compensation and Incentive Agreement.

10. NOTICE OF AGREEMENT

Hydro One may, in its sole discretion and at its sole expense register this Compensation and Incentive Agreement or notice thereof on title to the Lands.

11. NO MERGER

The parties hereto agree that any representations or covenants contained in this Compensation and Incentive Agreement shall not merge on closing, but survive and continue in full force and effect thereafter, but only as to the accuracy of the representation or covenant as at the date of completion of this Compensation and Incentive Agreement.

12. ENTIRE AGREEMENT

The parties hereto acknowledge that there are no covenants, representations, warranties, agreements or conditions, express or implied, collateral or otherwise, forming part of or in any way affecting or relating to this Compensation and Incentive Agreement save as expressly set out in this Compensation and Incentive Agreement and that this Compensation and Incentive Agreement and all Schedules hereto constitute the entire agreement between the parties and may not be modified except as expressly agreed between the parties in writing.

13. SEVERABILITY

Any provision or provisions of this Compensation and Incentive Agreement is declared illegal or unenforceable, it or they shall be considered separate and severable from this Compensation and Incentive Agreement and the remaining provisions shall remain in force and be binding upon the parties hereto as though the said provision or provisions had never been included.

14. GOVERNING LAW

This Compensation and Incentive Agreement shall be governed by and construed in accordance with the laws of the Province of Ontario.

15. SPOUSAL CONSENT

The Owner represents that, except to the extent such consent has been obtained, spousal consent to this transaction is not necessary under the provision of the *Family Law Act*, R.S.O. 1990.

16. SUCCESSORS AND ASSIGNS

This Compensation and Incentive Agreement shall enure to the benefit of and be binding upon the parties hereto and their respective heirs, attorneys, guardians, estate trustees, executors, trustees, successors and permitted assigns.

17. EXECUTION AND DELIVERY

This Compensation and Incentive Agreement may be executed and delivered in counterparts by original, facsimile or scanned e-mail copy and each Compensation and Incentive Agreement shall constitute and be deemed to be the entire agreement notwithstanding that all copies of this Compensation and Incentive Agreement may not have all signatures.

18. FURTHER ASSURANCES

The parties hereto agree to do, make and execute, if necessary, at no further cost or condition to the other except payment of reasonable out-of-pocket costs, such other instruments, plans, documents, acts, matters and things and take such further action as may reasonably be required by the other party in order to effectively carry out the true intent of this Compensation and Incentive Agreement.

19. AGE

The Owner represents that the Owner is at least 18 years of age.

IN WITNESS WHEREOF the parties hereto have duly executed this Compensation and Incentive Agreement as of the Agreement Date.

WITNESS:

Name:

Address:

OWNER:

l/s

Name: **«PropertyOwnerName1»**

The spouse of [INSERT LEGAL OWNER NAME]hereby consents to this Compensation and Incentive Agreement

WITNESS:

Name:

Address:

SPOUSE OF OWNER:

l/s

Name: **«SpouseName1»**

HYDRO ONE NETWORKS INC.

HYDRO ONE
HST 870865821RT0001

Per:

Name:

Title:

I have authority to bind the Corporation

SCHEDULE "A"

LANDS

[Note to Draft: Insert legal description of Lands]

SCHEDULE “B”

CALCULATION SHEET

File: XX

THIS AGREEMENT made in duplicate the _____ day of _____, 201X.

BETWEEN:

[INSERT FULL LEGAL NAME OF OWNER]

(the **"Owner"**)
OF THE FIRST PART

AND:

HYDRO ONE NETWORKS INC.

(**"HONI"**)
OF THE SECOND PART

WHEREAS:

1. The Owner is the registered owner of lands legally described as **[INSERT LEGAL DESCRIPTION]** (the "Lands")

2. The Owner is agreeable in allowing HONI to enter onto a portion of the Lands highlighted in yellow as shown on the sketch attached hereto as Schedule "A" (the "Strip"), for the purposes of certain construction activities in conjunction with the Power South Nepean Project (the "Project"), which shall include but are not limited to a temporary material storage yard for the purposes of storage of materials and equipment, including but not limited to construction equipment and machinery, requisite to the construction on the Strip subject to the terms and conditions contained herein (collectively the "Activities").

NOW THEREFORE THIS AGREEMENT WITNESSES THAT in consideration of Two Dollars ($2.00) now paid by HONI to the Owner, and the respective covenants and agreements of the parties hereinafter contained and other valuable consideration, the receipt and sufficiency of which are hereby acknowledged by the parties hereto, the parties hereto agree as follows:

1. The Owner hereby grants to HONI and its respective officers, employees, workers, permittees, servants, agents, contractors and subcontractors, with or without vehicles, supplies, machinery, plant, material and equipment, as of the date this Agreement, (i) the right to commence the Activities on the Strip; and (ii) the right to enter upon and exit from, and to pass and repass at any and all times in, over, along, upon, across, and through the Strip and so much of the Lands as may be reasonably necessary.

2. The permission granted herein shall commence as of the date this Agreement (the "Commencement Date") and shall terminate three (3) years from the Commencement Date (the "Initial Term").

3. The Initial Term may be extended upon 60 days prior written notice from HONI to the Owner for an additional two (2) years on the same terms and conditions contained herein save for this right to extend (the "Extended Term").

4. All agents, representatives, officers, directors, employees and contractors and property of HONI located at any time on the Lands shall be at the sole risk of HONI and the Owner shall not be liable for any loss or damage or injury (including loss of life) to them or it however occurring except and to the extent to which such loss, damage or injury is caused by the negligence or willful misconduct of the Owner.

5. Upon execution of this Agreement by all parties, HONI shall pay to the Owner the amount of XXXXX Dollars ($XX,XXX), which is compensation for the permission granted herein.

6. HONI shall repair any physical damage to the Lands resulting from the Activities and, shall restore the Lands to its original condition so far as possible and practicable to the satisfaction of the Owner, acting reasonably.

7. HONI agrees that it shall indemnify and save harmless the Owner from and against all claims, demands, costs, damages, expenses and liabilities (collectively the "Costs") whatsoever arising out of HONI's presence on the Lands or of its activities on or in connection with the Lands arising out of the permission granted herein except to the extent any of such Costs arise out of the negligence or willful misconduct of the Owner.

8. This Agreement does not commit the Owner to enter into any further agreements with HONI in conjunction with the Project.

9. This Agreement shall be governed by and construed in accordance with the laws of the Province of Ontario and the laws of Canada applicable herein. The parties hereto submit themselves to the exclusive jurisdiction of the Courts of the Province of Ontario.

IN WITNESS WHEREOF the Parties have hereunto set their respective hands and seals to this Agreement of Purchase and Sale.

SIGNED, SEALED AND DELIVERED
In the presence of)
)
)
)
)
_____) _____ (seal)
Print Name of Witness ***(INSERT NAME)***

)
)
)
)
)
_____) _____ (seal)
Print Name of Witness ***(INSERT NAME)***

HYDRO ONE NETWORKS INC.

Per: _____
Print Name:
Title:

I have authority to bind the Corporation

SCHEDULE "A"

Damage Claim

THIS MEMORANDUM OF AGREEMENT dated the ____ day of _____, 20____

Between:

[INSERT NAME OF OWNER]

herein called the "**Claimant**"

- and-

Hydro One Networks Inc.

herein called the "**Hydro One**"

Witnesseth:

The Claimant agrees to accept: XXXXXXX ($XXX.XX) in full payment and satisfaction of all claims or demands for damages of whatsoever kind, nature or extent which may have been done to date by Hydro One during the construction, completion, operation or maintenance of the works of Hydro One constructed on [INSERT LEGAL DESCRIPTION] which property the Claimant is the legal owner and which damages may be approximately summarized and itemized as:

[INSERT DESCRIPTION OF DAMAGE]

Area

TOTAL $

.

Subject to Approval by Hydro One Networks Inc.

Witness

_____

Signature

_____

Signature

Temporary Bypass Agreement

THIS AGREEMENT made in duplicate the ___ day of_____ 201•

BETWEEN:

•

(hereinafter referred to as the "Grantor")
OF THE FIRST PART

- and -

HYDRO ONE NETWORKS INC.

(hereinafter referred to "HONI")
OF THE SECOND PART

WHEREAS the Grantor is the owner in fee simple and in possession of certain lands legally described as • (the "Lands").

AND WHEREAS HONI shall require the construction of a temporary transmission line (the "**Temporary Bypass**").

NOW THEREFORE THIS AGREEMENT WITNESSETH that in consideration of the sum of Ten Dollars ($10.00) now by the parties to each other, and the mutual covenants herein contained and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties agree as follows:

1. The Grantor hereby grants, conveys and transfers to HONI in, over, across, along and upon that part of the Lands highlighted in red as on the sketch in Schedule "A" attached hereto (the "Temporary Bypass Lands"), the rights and privileges as follows:

   (a) for the servants, agents, contractors and workmen of HONI at all times with all necessary vehicles and equipment to pass and repass over the Temporary Bypass Lands for the purpose of access to the Temporary Bypass;

   (b) to construct and maintain upon the Temporary Bypass Lands, the Temporary Bypass consisting of pole structures, steel towers, anchors, guys and braces and all such aboveground or underground lines, wires, cables, telecommunications cables, grounding electrodes, conductors, apparatus, works, accessories, associated material and equipment, and appurtenances pertaining to or required by such system (all or any of which are herein individually or collectively called the "**Works**");

   (c) to cut and remove all trees, brush and other obstructions made necessary by the exercise of the rights granted hereunder.

2. The term of this Agreement and the permission granted herein shall be a term of • years commencing on •, 2017, and ending •, 201• (the "**Term**"). HONI may, in its sole discretion, and upon 90 days' notice to the Grantor, extend the Term for up to an additional 3 years, under the same provisions and conditions contained in this Agreement.

3. HONI shall pay to the Grantor an annual fee in the amount of • Dollars ($•.00) (the "Annual Fee"), which Annual Fee shall be paid in advance on the first day of each anniversary of the Term.

4. Upon the expiry of the Term or any extension thereof, HONI shall remove and repair any physical damage to the Temporary Bypass Lands resulting from HONI's use of the Temporary Bypass Lands and the permission granted herein; and, shall restore the Temporary Bypass Lands to its original condition so far as possible and practicable.

5. All agents, representatives, officers, directors, employees and contractors and property of HONI located at any time on the Temporary Bypass Lands shall be at the sole risk of HONI and the Grantor shall not be liable for any loss or damage or injury (including loss of life) to them or it however occurring except and to the extent to which such loss, damage or injury is caused by the negligence or willful misconduct of the Grantor.

6. HONI agrees that it shall indemnify and save harmless the Grantor from and against all claims, demands, costs, damages, expenses and liabilities (collectively the "Costs") whatsoever arising out of HONI's presence on the Temporary Bypass Lands or of its activities on or in connection with the Temporary Bypass Lands arising out of the permission granted herein except to the extent any of such Costs arise out of or are contributed to by the negligence or willful misconduct by the Grantor.

7. Notices to be given to either party shall be in writing, personally delivered or sent by registered mail (except during a postal disruption or threatened postal disruption), telegram, electronic facsimile or other similar means of prepaid recorded communication to the applicable address set forth below (or to such other address as such party may from time to time designate in such manner):

TO HONI:

Hydro One Networks Inc.
Real Estate Services
1800 Main Street East
Milton, Ontario L9T 753

Attention:
Fax:

TO GRANTOR:

Attention:
Fax:

Notices personally delivered shall be deemed to have been validly and effectively given on the day of such delivery. Any notice sent by registered mail shall be deemed to have been validly and effectively given on the fifth (5^{th}) business day following the date on which it was sent. Any notice sent by telegram, electronic facsimile or other similar means of prepaid recorded communication shall be deemed to have been validly and effectively given on the Business Day next following the day on which it was sent. "Business Day" shall mean any day which is not a Saturday or Sunday or a statutory holiday in the Province of Ontario. This Agreement shall be governed by and construed in accordance with the laws of the Province of Ontario and the laws of Canada applicable herein. The parties hereto submit themselves to the exclusive jurisdiction of the Courts of the Province of Ontario.

8. Any amendments, modifications or supplements to this Agreement or any part thereof shall not be valid or binding unless set out in writing and executed by the parties with the same degree of formality as the execution of this Agreement.

9. The burden and benefit of this Agreement shall run with the Lands and everything herein contained shall operate to the benefit of, and be binding upon, the respective heirs, successors, permitted assigns and other legal representatives, as the case may be, or each of the Parties hereto.

IN WITNESS WHEREOF the parties hereto have caused this Agreement to be executed by their duly authorized representatives as of the day and year first above written.

[INSERT FULL LEGAL NAME OF GRANTOR]

Per: _____
Name:
Title:

Per: _____
Name:
Title:

We/I have the authority to bind the Corporation

HYDRO ONE NETWORKS INC.

Per: _____
Name:
Title:

I have the authority to bind the Corporation

[OR IF GRANTOR IS INDIVIDUAL]

IN WITNESS WHEREOF the parties have affixed their hands and seals of as of the year and date first above written.

SIGNED, SEALED AND DELIVERED
In the presence of

_____	)	_____(seal)
Signature of Witness	)	Grantor's Signature
_____	)	_____ (seal)
Signature of Witness	)	Grantor's Signature

SCHEDULE “A”

SKETCH OF TEMPORARY BYPASS LANDS

Filed: 2019-05-28
EB-2019-0077
Exhibit E-1-1
Attachment 10
Page 1 of 10

POWER SOUTH NEPEAN TRANSMISSION PROJECT

LAND ACQUISITION COMPENSATION PRINCIPLES

POWER SOUTH NEPEAN TRANSMISSION PROJECT

I. Introduction

Land Acquisition Compensation Principles

II. Acquisition Process

A. Project Corridor Identification and Selection

B. Introduction and Overview

C. Preparation of Independent Property Appraisal Reports

D. Preparation of Hydro One Property Rights Acquisition Offers

E. Next Steps

III. Compensation Principles

A. General Principles

B. Principles Applicable to the Acquisition of Easement Interests

C. Principles Applicable to the Acquisition of a Fee Simple Interest

D. Summary

Appendix A

Map of 230 kV proposed Transmission Corridor Route
& Proposed MTS Location

I. INTRODUCTION

POWER SOUTH NEPEAN TRANSMISSION PROJECT

LAND ACQUISITION COMPENSATION PRINCIPLES

Hydro One Networks Inc. ("Hydro One") and Hydro Ottawa Limited ("Hydro Ottawa") has initiated planning for the Power South Nepean Transmission Project (the "Project"). The Project entails Hydro Ottawa constructing a new Municipal Transformer Station ("MTS") and Hydro One replacing an existing Hydro One single circuit 115 kilovolt (kV) transmission line to a new double circuit 230 kV transmission line to connect the MTS. The new 230 kV transmission line extends south of West Hunt Club Road to Cambrian Road and Highway 416, the planned location of the MTS. Hydro One is now proceeding with the acquisition of the required property interests for the Project. The property interests are referred to in this document as the "Project Corridor". A map of the Project route is outlined in Appendix A.

Hydro One's goal is to secure voluntary property settlements with affected property owners ("Property Owners") in a timely manner. To facilitate this process, it is important that Hydro One's land acquisition compensation principles are communicated to and understood by Property Owners in advance. Furthermore, it is also important that Property Owners are assured these compensation principles will be applied in a fair, transparent and consistent manner.

These project-specific land acquisition compensation principles are founded upon Hydro One's past experience pertaining to land acquisition matters for new transmission projects. Hydro One's central consideration has been the need for Property Owners to have flexibility and choice while balancing Hydro One's desire to achieve timely acquisition of property interests and its obligation to ensure that expenditures are fair and reasonable to ratepayers.

Adoption and application of these compensation principles provides real value for timely settlements and to otherwise avoid potentially lengthier, less flexible and less certain outcomes associated with the legislated expropriation process.

II. ACQUISITION PROCESS

A. PROJECT NEED, CORRIDOR IDENTIFICATION AND APPROVALS

The need for new electricity transmission facilities in the South Nepean area was identified by the Independent Electricity System Operator (IESO), Hydro One and Hydro Ottawa as part of the Integrated Regional Resource Plan (IRRP) for the Ottawa area. The Project is intended to ensure South Nepean has a safe, reliable and adequate supply of electricity and meets the increased demand for electricity due to the planned residential and commercial developments. For more information on the project please visit **www.PowerSouthNepean.com**

The Project is subject to an Individual Environmental Assessment (EA) under Part II of Ontario's Environmental Assessment Act. Construction of the project will also require approval from the Ontario Energy Board ("OEB"). In the first quarter of 2019, Hydro One expects to submit the necessary application to the OEB for approval.

B. INTRODUCTION AND OVERVIEW

In parallel to the EA and OEB approvals ("Approvals"), Hydro One will proceed with the land acquisition process for the Project. The process will commence with individual meetings between Hydro One's Real Estate Coordinator and Property Owners to review and discuss the process and land acquisition compensation principles, as set out in this document. Property Owners will be provided the necessary time throughout the process to review the materials and complete follow-up meetings and discussions with Hydro One's Real Estate Coordinator.

C. PREPARATION OF INDEPENDENT PROPERTY APPRAISAL REPORTS AND OTHER PROJECT STUDIES

Hydro One and its consultants will collect all pertinent property information in support of the Project. The consultants include accredited independent appraisers who will inspect the properties with the approval of the Property Owners to prepare formal appraisal reports. These reports will quantify the fair market value of each property interest on the Project Corridor along with injurious affection, if applicable.

All appraisers retained by Hydro One have received an Accredited Appraiser Canadian Institute (AACI) designation from the Appraisal Institute of Canada. This ensures that appraisals are conducted in accordance with professional standards established by the Institute.

Hydro One has initiated the process of contracting an external appraisal service provider to complete independent appraisal reports which will be completed in the first half of 2019.

D. PREPARATION OF HYDRO ONE PROPERTY RIGHTS ACQUISITION OFFERS

Hydro One will present each Property Owner with a formal offer based upon the information contained in the independent appraisal report. As part of Hydro One's formal land acquisition offer ("Offer"), Property Owners will be provided with a copy of the appraisal report, together with a sketch plan and/or draft survey plan of the property interest to be acquired.

E. NEXT STEPS

Following receipt and consideration of Hydro One's Offer, the next steps in the process will depend upon whether individual Property Owners consider Hydro One's proposal acceptable. If the Offer is accepted, the acquisition process will proceed and the parties will finalize the transaction.

However, if the Property Owner requires additional assistance to assess/review the Offer, Hydro One will reimburse the Property Owner for reasonably incurred independent review costs up to $7,500.00, which is the expected cost of an additional appraisal report and/or legal review. To be eligible for this reimbursement, the Property Owner must notify Hydro One of its decision to retain independent review services. An independent appraisal carried out for the Property Owner must be conducted by an AACI accredited appraiser and a copy of the appraisal report provided to Hydro One before reimbursement is paid.

Reimbursement of the above-noted independent review costs is in no way intended to bind the Property Owner to voluntarily sell the property interests required by Hydro One.

Hydro One's Offer will remain open for acceptance for a limited period of time. If the parties are unable to complete a voluntary property settlement by the time Hydro One files an application to seek expropriation authority status pursuant to Section 99 of the Ontario Energy Board Act, 1998 ("OEB Act"), then Hydro One's Offer will lapse. However, Property Owners are assured of reasonably sufficient time to consider the Offer, inclusive of the required efforts of independent appraisal and legal reviews as may be initiated by the Property Owners.

In the event the Offer lapses as a result of Hydro One initiating expropriation, a revised compensation offer will be provided to the Property Owner. While the revised offer will comply with the compensation requirements of the Expropriations Act, it will no longer include the compensation incentives (as described further in this document) to achieve the objective of early voluntary property settlement.

III. COMPENSATION PRINCIPLES

A. GENERAL PRINCIPLES

This section describes the general principles Hydro One is committed to follow in respect of the voluntary settlement of property interests for the Project:

Property Owner Choice

Property Owners will be offered the choice of Hydro One acquiring either an easement or the fee simple interest in the lands required for the Project Corridor.

Independent Valuation

Hydro One's Offers will be based upon appraisal reports prepared by external, independent AACI accredited appraisers retained by Hydro One.

Negotiation Fee

At the commencement of individual discussions with Property Owners, a payment of $2,500.00 will be made in recognition of the Property Owners time taken to discuss Hydro One's requirement for permanent property interests related to the Project.

Incentives

Compensation premiums, over and above fair market value, as set out herein will be made available as an incentive to achieve the timely acquisition of required property interests. Incentives will be applied on a fair, transparent and consistent basis.

Construction

Upon acceptance of the Offer by the Property Owner and subject to Approvals, Hydro One will complete the acquisition of the property interests and commence construction activities in accordance to its plans and schedule.

B. PRINCIPLES APPLICABLE TO THE ACQUISITION OF EASEMENT INTERESTS

This section describes more specific compensation principles applicable to the voluntary acquisition of easement interests. Hydro One commits to implementing the following easement compensation principles:

Valuation of Easement Interest

Hydro One's Offer will value all easement interests based upon 75% of the appraised fair market value of the total acreage over which the intended easement applies.

Injurious Affection

Compensation for injurious affection is provided when reductions to the market value of the remaining property interests are estimated to result from Hydro One's use of the interest in the portion of the property required for the Project. This amount is determined as part of the independent appraisal process. The analysis takes into consideration various attributes of the remaining property and whether a loss in market value is likely to result from the construction and operation of the Project.

Hydro One will ensure that all appraisals prepared by Hydro One's independent appraisers consider and, where applicable, make provision for any injurious affection arising to the remaining acreage of the property directly impacted by the Project Corridor that is owned by the Property Owner.

Incentive Compensation
Property Owners who accept Hydro One's Offer to acquire easement interests will be provided with the following incentive compensation amounts:

- a $5,000.00 payment paid at the time the option agreement is registered, providing Hydro One with the option to purchase the interest (referred to in this document as Option Agreements and described in Section III, Part D); plus
- a further payment at time of completing the purchase of (i) $4,000.00 or (ii) 10% of the combined total of the appraised Fair Market Value of the easement area required and any applicable injurious affection; whichever total is greater. Payment of this incentive is conditional to the Property Owner not requesting reimbursement of costs for the independent review of Hydro One's Offer (as described in Section II, Part E); plus
- an additional incentive amount equal to 40% of the appraised fair market value of the acreage over which the property interest will be taken.

Other Compensation
Hydro One commits to reimbursing Property Owners for reasonably incurred transaction costs (such as lawyer's fees) associated with the review and completion of applicable conveyancing documents.

Hydro One will consider on a case-by-case basis whether unique or exceptional circumstances exist which require the payment of additional compensation.

Hydro One further commits to compensating Property Owners for all damages that arise out of the construction related activities by Hydro One and/or its contractors. The types of construction damages could include but are not limited to: rutting of laneways; fence or gate damage; and crop and related agricultural impacts. In addition, Property Owners who grant Hydro One easement interests will be indemnified from all damages and liabilities arising out of the operations of Hydro One.

C. PRINCIPLES APPLICABLE TO THE ACQUISITION OF A FEE SIMPLE INTEREST

This section describes the compensation principles that will be applied when Property Owners prefer to sell to Hydro One the fee simple in the property interests required for the Project Corridor instead of an easement interest. This choice in property interests is subject to all applicable municipal authority requirements that may be applicable for the creation and configuration of any required land severances. In such circumstances, Hydro One will implement the following compensation principles:

Valuation
All fee simple property requirements will be valued at 100% of the appraised fair market value of the total acreage of the fee simple to be acquired.

Injurious Affection
Compensation for injurious affection is provided when reductions to the market value of the remaining property interests are estimated to result from Hydro One's use of the interest in the portion required for the Project. This amount is determined as part of the independent appraisal process. The analysis takes into consideration various attributes of the remaining property and whether a loss in market value is likely to result from the construction and operation of the Project.

Hydro One will ensure that all appraisals prepared by Hydro One's independent appraisers consider and, where applicable,

make provision for any injurious affection arising to the remaining acreage of the property directly impacted by the Project Corridor that is owned by the Property Owner.

Incentive Compensation

Property Owners who accept Hydro One's Offer to acquire a fee simple will be provided with the following incentive compensation amounts:

- a $5,000.00 payment paid at the time the option agreement is registered, providing Hydro One with the option to purchase the interest (referred to in this document as Option Agreements and described in Section III, Part D); plus
- a further payment at time of completing the purchase of (i) $4,000.00 or (ii) 10% of the combined total of the appraised Fair Market Value of the fee simple area required and any applicable injurious affection; whichever total is greater. Payment of this incentive is conditional to the Property Owner not requesting reimbursement of costs for the independent review of Hydro One's Offer (as described in Section II, Part E); plus
- an additional incentive amount equal to 15% of the appraised fair market value of the acreage over which the property interest will be taken.

Other Compensation

Hydro One commits to reimbursing Property Owners for reasonably incurred transaction costs (such as lawyer's fees) associated with the review and completion of applicable conveyancing documents.

Hydro One will consider on a case-by-case basis whether unique or exceptional circumstances exist which require the payment of additional compensation.

In circumstances where the Property Owner seeks to continue to use the newly-acquired Project Corridor lands, Hydro One will make all reasonable efforts to negotiate a licence-back arrangement for the ongoing occupation and use of the Project Corridor in compliance with Hydro One licensing policy and the requirements of the Project.

Hydro One further commits to compensating Property Owners for all damages that arise out of the construction related activities by Hydro One and/or its contractors. The types of construction damages could include but are not limited to: rutting of laneways; fence or gate damage; and crop and related agricultural impacts.

D. SUMMARY

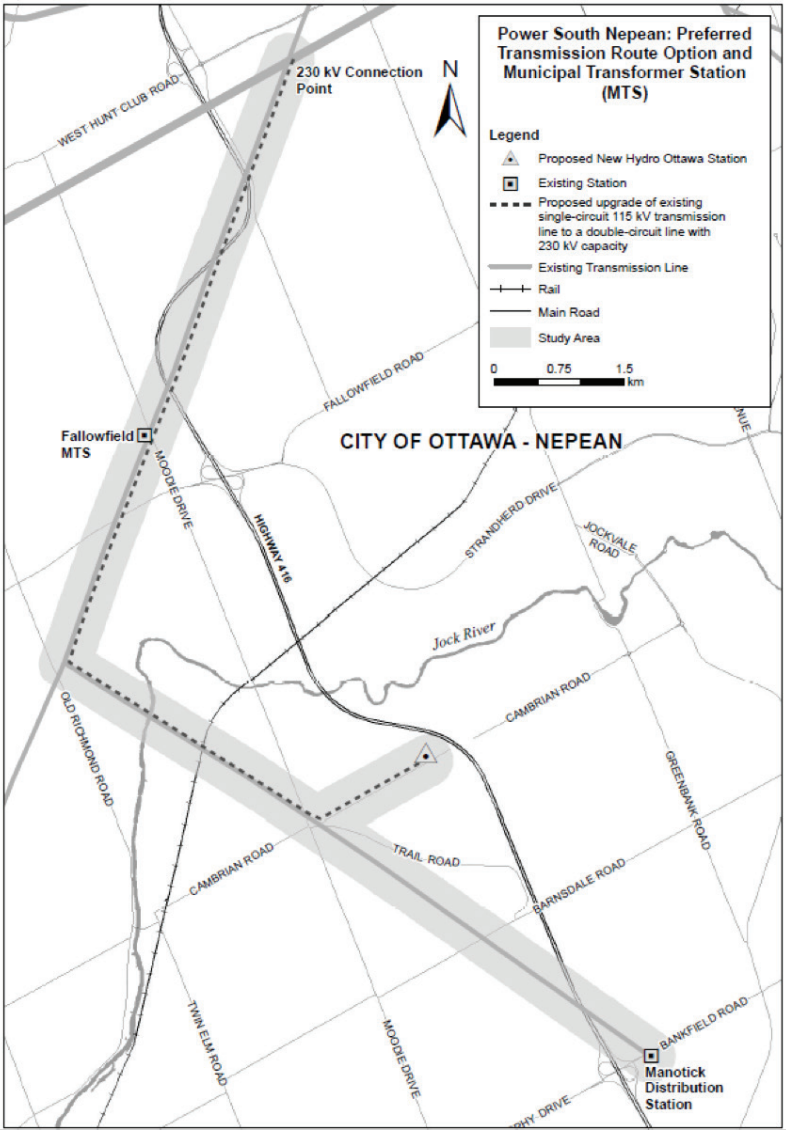
Hydro One aims to enter into Option Agreements with Property Owners to acquire an easement/fee simple interest in the Project Corridor. The land acquisition compensation principles (other than reimbursement of independent review costs as discussed in Section II, Part E of this document) will be incorporated into the terms and conditions of the Purchase Agreements made between Hydro One and the Property Owners, which form part of the Option Agreements.

At the time the Option Agreement is registered, Hydro One will pay Property Owners incentive compensation of $5,000.00. Hydro One will pay the balance of the agreed upon compensation and incentive amounts if and when the Approvals for the Project are obtained and the Option Agreement is exercised by Hydro One.

Hydro One commits to having its Offer remain available to Property Owners until such time as Hydro One decides to seek expropriation authority status pursuant to section 99 of the OEB Act. This step will happen only if and when Approvals for the Project have been obtained.

APPENDIX A

Map of the Proposed 230 kV Transmission Corridor Route & Proposed MTS Location



GET IN TOUCH



info@powersouthnepean.com



www.powersouthnepean.com



1-877-345-6799

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PIN	LEGAL DESCRIPTION	PROPERTY OWNERSHIP TYPE (i) Privately Owned (ii) Municipally Owned (iii) Provincially Owned (iv) Federally Owned	OWNER(S)
046310390	LOT 30 AND N1/2 OF LOT 29, CONCESSION 3 RF, EXCEPT PARTS 1, 2AND 3 ON PLAN 5R10713, EXCEPT PARTS 2, 3, 12 & 13 ON PLAN 5R12980 AND ROAD AS WIDENEDAND SAVE AND EXCEPT PARTS 1 TO 6 PLAN 4R8489 AND PARTS 1 TO 6 PLAN 4R9969 AND PART 1 PLAN 4R10378 AND PART 2 PLAN 5R5510. SUBJECT TO AN EAEMENT IN FAVOUR OF THE HYDRO-ELECTRIC POWER COMMISSION OF ONTARI O AS IN NP41079. SUBJECT TO AN EASEMENT IN FAVOUR OF ONTARIO HYDRO AS AS IN N538962. "DESCRIPTION IN CR456794 AND N417882 MAY NOT BE ACCEPTA BLE IN THE FUTURE"	(iv) Federally Owned	
046310368	PARCEL 28-1 SECTION NEPEAN-3 RF FIRSTLY: THE SLY 1/2 OF LT 29 IN CONC 3 RF, CONTAINING 100 ACRES MORE OR LESS DESCRIBED AS FOLLOWS: COMMENCING AT A POINT IN THE WESTERLY LIMIT OF THE ALLOWANCE FOR ROAD IN FRONT OF SAID CONCESSION WHERE THE CENTRE LINE OF THE SAID LOT INTERSECTS THE SAID WESTERLY LIMIT OF THE ROAD ALLOWANCE, THENCE SOUTH 66 DEGREES WEST ALONG THE SAID CENTRE LINE 100 CHAINS MORE OR LESS TO THE ALLOWANCE FOR ROAD IN THE REAR OF SAID CONCESSION, THENCE SOUTH 16 DEGREES E ALONG THE SAID LAST MENTIONED ALLOWANCE FOR RD 10 CHAINS MORE OR LESS TO THE SLY LIMIT OF SAID LT, THENCE N 66 DEGREES E ALONG THE SAID SLY LIMIT 100 CHAINS MORE OR LESS TO THE SAID WLY LIMIT OF THE SAID ALLOWANCE FOR RD IN THE SAID CON, THENCE N 16 DEGREES W ALONG SAID WESTERN LIMIT 10 CHAINS MORE OR LESS TO POB; SECONDLY: THE E1/2 OF LOT 28 IN CON 3 RF, CONTAINING 100 ACRES MORE OR LESS; EXCEPT PT 1 4R5731 AND PT 2 4R6965, NEPEAN	(iv) Federally Owned	
046310372	FIRSTLY: PT LTS 26, 27 & 28 CON 3 RF AS IN SECONDLY CR456794; EXCEPT PTS 4, 5 &6 5R10713, PT 15 5R12980, PTS 2 & 3 5R13067; SECONDLY: THAT PT OF ORIGINAL RD ALLOWANCE LYING BETWEEN LTS 25 & 26 CON 3 RF AS IN CR456883 AS CLOSED BY BY-LAW CR456882; THIRDLY: PT LTS 21, 22, 23, 24 & 25 CON 3 RF AS IN CR456792; EXCEPT PT 1 4R279, PT 3 4R280, PTS 1 & 24R282, PTS 3, 4 & 5 5R5168, PT 8 5R10713, PT 1 5R10755 & RD AS WIDENED; S/T CR377065, "DESCRIPTION IN CR456794, CR456883 & CR456792 MAY NOT BE ACCEPTABLE IN FUTURE" SUBJECT TO CR690252, NP41304, NP41069A, NEPEAN	(iv) Federally Owned	
046310374	FIRSTLY: THAT PT OF ORIGINAL RD ALLOWANCE BTWN CONS 3 & 4 RF LYING SOUTH OF ROAD ALLOWANCE BTWN LTS 30 & 31 CONS 3 & 4 RF & NORTH OF RD ALLOWANCE BETWEEN LTS 20 & 21 CONS 3 & 4 RF; SECONDLY: PT LTS 21, 22, 23, 24 & 25 CON 4 RF; PTS 1, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 & 17 4R845; THIRDLY: PT LT 25 CON 4 RF, PT 4 5R3974; FOURTHLY: PT LTS 21, 22, 23, 24, 25, 26, 27, 28, 29 & 30 & PT RD ALLOWANCE BETWEEN LTS 25 & 26 CON 3 RF, PTS 1, 2, 3, 4, 5, 6, 7 & 8 5R10713; FIFTHLY: PT LT 25 CON 4 RF PT 2 4R637; SIXTHLY: PT LTS 26, 27, 28, 29, 30 CON 4 RF IN CR568961; SEVENTHLY: PT LT 29 CON 4 RF, PT 5 4R1021 EIGHTLY: PT LT 30 & N1/2 LT 29 CON 3 RF PTS 2, 3, 12 & 13 5R12980; NINETHLY: PT LTS 26, 27 & 28 CON 3 RF PT 15 5R12980 & PTS 2 & 3 5R13067, SUBJECT TO NP41060A, N538962, NEPEAN	(ii) Municipally Owned	
046310405	LOTS 28, 29 AND 30 CONCESSION 4 RIDEAU FRONT, EXCEPT CR568961, CR552308, PART 5 4R1021, PARTS 5, 6, 8 TO 10,14 16 AND 17 PLAN 5R12980EXPECT PART 1 PLAN 5R14864, PART 9 PLAN 4R14822, LOTS 26 AND 27 CONCESSION 4 RIDEAU FRONT EXCEPT CR568961 AND LANDS LYING SOUTH OF THENORTH LIMIT OF 5R13067, "DESCRIPTION MAY NOT BE ACCEPTABLE IN FUTURE" SUBJECT TO NP41085, CR572636, NP41677, N528871. NEPEAN.	(iv) Federally Owned	
046310003	HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF ONTARIO, REPRESENTED BY THE MINISTER OF TRANSPORTATION;	(iii) Provincially Owned	
046310350	THAT PT OF ORIGINAL RD ALLOWANCE LYING BETWEEN LTS 25 & 26 CON 4 RF NEPEAN	(ii) Municipally Owned	
046310414	FIRSTLY: PART OF LOTS 23, 24 AND 25, CONCESSION 4, NEPEAN (RIDEAU FRONT), BEING PARTS 10, 12, 13, 14, 15, 16, 21 AND 23 ON PLAN 5R-13472 ; SECONDLY: PART OF LOT 22, CONCESSION 4, NEPEAN (RIDEAU FRONT), BEING PARTS 5, 6 AND 7 ON PLAN 5R-12515 ; THIRDLY: PART OF LOT 23, CONCESSION 4, NEPEAN (RIDEAU FRONT), BEING PARTS 4 TO 6 ON PLAN N626070 AND PART 31 ON PLAN 5R-13472 AND PARTS 4, 5 AND 7 ON PLAN N626071 ; FOURTHLY: PART OF LOT 25, CONCESSION 4, NEPEAN (RIDEAU FRONT), BEING PARTS 2 AND 4 ON PLAN 5R-13472 AND PARTS 1 TO 3 ON PLAN N626070. CITY OF OTTAWA. TOGETHER WITH RIGHTS AS IN CR557035, CR560510, CR570243. SUBJECT TO AND TOGETHER WITH RIGHTS AS IN CR311068 AND CR311069.	(iii) Provincially Owned	
046310409	PART LOTS 23, 24 AND 25 CONCESSION 4, RIDEAU FRONT, ALL THAT PART OF LANDS AS IN CR550047, CR551175, CR560510, CR557035, CR571216, CR590756, LYING BETWEEN PARTS 4, 5 AND 6 PLAN N626070 AND PARTS 1, 2 AND 3 PLAN N626070 EXCEPT PARTS 1, 2 AND 3 PLAN 4R17250; OTTAWA. S/T CR570243, CR560510, CR557035. SUBJECT TO AN EASEMENT IN GROSS OVER PART LOT 25, CONCESSION 4, RIDEAU FRONT, NEPEAN, PART 1 ON PLAN 4R26224 AS IN OC1424383	(iii) Provincially Owned	
046310363	PT LT 23 CON 4 RF ALL THAT PART OF LANDS AS IN CR551175 LYING SW OF PTS 4,5 & 6 PLAN N626070 NEPEAN	(iii) Provincially Owned	
046310014	PT LT 22 CON 4 RF AS IN CR557198; S/T CR311068. SUBJECT TO AN EASEMENT AS IN LT1085740. CITY OF OTTAWA	(i) Privately Owned	
046310352	FIRSTLY: THAT PT OF ORIGINAL RD ALLLOWANCE BETWEEN CON 4 & 5 RF AS WIDENED LYING N OF EXT OF S LIMIT OF RD ALLOWANCE BETWEEN LTS 20 & 21 CON 4 RF (AS WIDENED) & LYING S OF S LIMIT OF RD ALLOWANCE BETWEEN LTS 30 & 31 CON 4 RF AS WIDENED; SECONDLY: PT LTS 22 & 23 CON 4 RF, PT 13 5R10958, PT 3 4R1154, PT 2 5R8811 AS IN CR550618 & NS59884; S/T CR550618; THIRDLY: PT LTS 22, 24 & 25 CON 5 RF, PT 1 5R13710, PT 1 5R4908, PTS 1 & 2 4R1347, PTS 1 & 2 4R1651; S/T CR685453, N626069, N626071 NEPEAN SUBJECT TO CR311068	(ii) Municipally Owned	
046320207	PART LOT 22 CON 5, R.F. PART 1 ON PLAN 4R-8550 NEPEAN	(ii) Municipally Owned	
046320334	PART OF LOT 22, CONCESSION 5, RIDEAU FRONT (NEPEAN) BEING PARTS 1, 2 AND 3 ON PLAN 4R-23583 SUBJECT TO AN EASEMENT IN GROSS OVER PART 2 ON PLAN 4R-23583 AS IN OC1062525 CITY OF OTTAWA	(ii) Municipally Owned	

PIN	LEGAL DESCRIPTION	PROPERTY OWNERSHIP TYPE (i) Privately Owned (ii) Municipally Owned (iii) Provincially Owned (iv) Federally Owned	OWNER(S)
046320335	FIRSTLY; PART OF LOT 22, CONCESSION 5, RIDEAU FRONT (NEPEAN) AS IN CR554989 AND CR556318 SAVE AND EXCEPT PART 1 ON 4R-8550 AND PARTS 1, 2 AND 3 ON PLAN 4R-23583. S/T CR554989. SECONDLY; PART OF LOT 22, CONCESSION 5, RIDEAU FRONT (NEPEAN) AS IN CR570806 LYING NORTH OF PART 1 5R13788; SUBJECT TO CR570806. CITY OF OTTAWA	(i) Privately Owned	[redacted]
046320072	PT LT 22 CON 5 RF, PT 1 5R13788; S/T N567693 NEPEAN	(ii) Municipally Owned	
046320073	FIRSTLY: PT LTS 21 & 22 CON 5 RF AS IN CR551287 & CR554989; S/T CR551287 & CR554989; SECONDLY: PT LT 22 CON 5 RF AS IN CR570806 LYING S OF PT 1 5R13788; S/T CR570806 "DESCRIPTION IN CR551287, CR570806 & CR554989 MAY NOT BE ACCEPTABLE IN FUTURE" NEPEAN	(iii) Provincially Owned	
046320202	FIRSTLY: PT ORIGINAL RD ALLOWANCE BETWEEN LTS 20 & 21 CON 5 RF AS WIDENED (AKA FALLOWFIELD RD) & PT LT 20 CON 5 RF, PTS 1 & 3 4R278 EXCEPT PTS 1, 2 & 3 4R2612; SECONDLY: PT LT 21 CON 5 RF, PTS 5 & 6 4R838; THIRDLY: PT FORCED RD (STEEPLE HILL CR) PT LT 20 CON 5 RF LYING N OF PT 4 4R278 NEPEAN	(ii) Municipally Owned	
045940078	PT LT 20 CON 5 RF LYING NE OF QUARTER SESSIONS ROAD AS IN CR557199; S/T CR557199 NEPEAN	(iii) Provincially Owned	
045940151	THAT PT OF QUARTER SESSIONS RD CROSSING LTS 13 TO 20 CON 5 RF LYING S OF N LIMIT OF PT 4 4R278 NEPEAN	(ii) Municipally Owned	
045940077	PT LT 20 CON 5 RF LYING SW OF QUARTER SESSIONS ROAD AS IN CR557199; S/T CR557199 NEPEAN	(iii) Provincially Owned	
045940076	PARCEL 6995, SECTION CARLETON PTS LT 19 CON 5 RF, PTS 1, 2 & 3 CAR133; S/T PTS 1 & 3 CAR133 NEPEAN	(iii) Provincially Owned	
045940075	FIRSTLY: PT LTS 17 & 18 CON 5 RF AS IN CR557083; S/T CR557083; SECONDLY: PT LT 18 CON 5 RF AS IN CR558989; S/T CR558989 NEPEAN	(iii) Provincially Owned	
045940070	FIRSTLY: N 1/2 LT 18 CON 5 RF LYING E OF HYDRO LANDS; EXCEPT CR461628, CR558989, CR461629; SECONDLY: PT S 1/2 LT 18 CON 5 RF, LYING E OF HYDRO LANDS;T/W CR557083 "DESCRIPTION IN N309756 MAY NOT BE ACCEPTABLE IN FUTURE" SUBJECT TO CR383677 NEPEAN	(i) Privately Owned	
045940080	PT LT 16 & 17 CON 5 RF, PTS 1, 3 & 4 5R13758 SUBJECT TO CR383677 NEPEAN	(i) Privately Owned	
045940096	PT S1/2 LT 16 CON 5 RF LYING W OF QUARTER SESSIONS ROAD AS IN CR688988 SUBJECT TO CR 631212 NEPEAN	(i) Privately Owned	
045940151	THAT PT OF QUARTER SESSIONS RD CROSSING LTS 13 TO 20 CON 5 RF LYING S OF N LIMIT OF PT 4 4R278 NEPEAN	(ii) Municipally Owned	
045940098	PT S1/2 LT 16 CON 5 RF LYING BETWEEN QUARTER SESSIONS ROAD AND JOCK RIVER AS IN CR688988 SUBJECT TO CR631212 NEPEAN	(i) Privately Owned	
045940156	THAT PT OF RD ALLOWANCE BETWEEN LTS 15 & 16 CON 5 RF BOUNDED BY ELY LIMIT OF 1/4 SESSIONS RD & WLY BANK OF JOCK RIVER NEPEAN	(ii) Municipally Owned	
045940169	PART OF THE NORTH HALF OF LOT 15, CONCESSION 5, RIDEAU FRONT BETWEEN QUARTER SESSIONS ROAD AND JOCK RIVER AS IN CR688988, EXCEPT CR518523 AND EXCEPT PART 1 PLAN 4R11029, NEPEAN. "DESCRIPTION IN CR688988 MAY NOT BE ACCEPTABLE IN THE FUTURE" SUBJECT TO AN EASEMENT IN FAVOUR OF THE HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO AS IN CR631212	(i) Privately Owned	
045940165	THAT PT OF THE JOCK RIVER LYING NE OF N357440 & NS225053 LYING SW OF 5R4750 NEPEAN	(ii) Municipally Owned	
045940101	PT N 1/2 LT 15 CON 5 RF LYING BETWEEN THE BANKS OF THE JOCK RIVER AS IN CR688988 SUBJECT TO CR631212 NEPEAN TOGETHER WITH AN EASEMENT OVER PART OF THE SOUTH * OF LOT 14, CONCESSION 5 RIDEAU FRONT LYING EAST OF CNR & WEST OF JOCK RIVER, DESIGNATED AS PARTS 5 AND 6 ON PLAN 4R-24726 AS IN OC1166714. TOGETHER WITH AN EASEMENT OVER PART OF LOT 14, CONCESSION 5 RIDEAU FRONT DESIGNATED AS PART 7 ON PLAN 4R-24726 AS IN OC1166715.	(i) Privately Owned	
045940107	PT LT 15 CON 5 RF AS IN NS225053 SUBJECT TO CR384131 NEPEAN	(i) Privately Owned	
045940111	PT LT 14 CON 5 RF PTS 4, 5 & 6 4R8758 S/T CR382362 NEPEAN ; SUBJECT TO EXECUTION 60363, IF ENFORCEABLE.	(i) Privately Owned	
045940121	PT S 1/2 LT 14 CON 5 RF LYING E OF JOCK RIVER & W OF CNR ROW SUBJECT TO CR631212 NEPEAN	(i) Privately Owned	
045940147	PT LT 15 CON 5 RF AS IN NP24494; PT LT 14 CON 5 RF AS IN NP24530 & NP24809; PT LT 13 CON 5 RF AS IN NP24909 & NP24532; PT LT 12 CON 5 RF AS IN NP24719 & NP24395; PT LT 11 CON 5 RF AS IN NP24406 & NP29389 NEPEAN	(i) Privately Owned	
045940122	S 1/2 LT 14 CON 5 RF LYING E OF CNR & W OF JOCK RIVER; S/T N486057 SUBJECT TO CR631212 NEPEAN SUBJECT TO AN EASEMENT OVER PARTS 5 AND 6 ON PLAN 4R24726 AS IN OC1166714.	(i) Privately Owned	
045940179	PART OF LOT 13, CON. 5 R.F. BEING PART 11 ON 4R14246, AND PARTS 2 AND 4 ON 5R12584, NEPEAN. SUBJECT TO AN EASEMENT IN FAVOUR OF HYDRO ELECTRIC POWER COMMISSION OF ONTARIO OVER PART 2 ON 5R12584 AS IN CR383447.	(i) Privately Owned	
045940130	PTS LT 12 & 13 CON 5 RF AS IN CR355578, CR402163, CR566944, CR602900 SUBJECT TO CR382357, CR383447 NEPEAN SUBJECT TO AN EASEMENT IN FAVOUR OF THE HYDRO-ELECTRIC COMMISSION OF THE CITY OF NEPEAN OVER PART 7 PLAN 4R14246 AS IN LT1205813. SUBJECT TO A RIGHT OF WAY OVER PART 7 PLAN 4R14246 IN FAVOUR OF PARTS 1, 2 AND 3 PLAN 4R14246 AS IN LT1205814.	(i) Privately Owned	
045940181	PART OF N 1/2 LOT 12, CON. 5. R.F. BEING PARTS 12 AND 15 ON 4R14246, NEPEAN. SUBJECT TO AN EASEMENT IN FAVOUR OF HYDRO ELECTRIC POWER COMMISSION OF ONTARIO OVER PART 15 ON 4R14246 AS IN CR382357.	(i) Privately Owned	

PIN	LEGAL DESCRIPTION	PROPERTY OWNERSHIP TYPE (i) Privately Owned (ii) Municipally Owned (iii) Provincially Owned (iv) Federally Owned	OWNER(S)
045940183	PART S 1/2 LOT 12, CON. 5. R.F. BEING PARTS 4, 5, 6, 13 AND 14 ON 4R14246, NEPEAN. SUBJECT TO AN EASEMENT IN FAVOUR OF THE HYDRO-ELECTRIC COMMISSION OF THE CITY OF NEPEAN OVER PARTS 4, 5 AND 6 ON 4R14246, AS IN LT1205813. SUBJECT TO A RIGHT-OF-WAY OVER PARTS 4, 5AND 6 ON 4R14246 IN FAVOUR OF PARTS 1, 2 AND 3 ON 4R14246 AS IN LT1205814. TOGETHER WITH A RIGHT-OF-WAY OVER PART 3 ON 4R14246 IN FAVOUR OF PARTS 4, 5 AND 6 ON 4R14246 AS IN LT1205814.	(i) Privately Owned	[redacted]
045940137	PT LT 12 CON 5 RF, PTS 1, 2 & 3 5R5941 SUBJECT TO CR434161 NEPEAN	(i) Privately Owned	
045940139	PT N 1/2 LT 11 CON 5 RF, PTS 1, 2 & 3 5R5944 SUBJECT TO CR383296 NEPEAN SUBJECT TO AN EASEMENT IN GROSS OVER PART 1 PLAN 4R27543 AS IN OC1555465	(ii) Municipally Owned	
045940145	ELY 20 ACRES OF SE 1/4 LT 11 CON 5 RF "DESCRIPTION IN NS117188 MAY NOT BE ACCEPTABLE IN FUTURE" SUBJECT TO CR383299 NEPEAN	(i) Privately Owned	
045950074	FIRSTLY: PT RD ALLOWANCE BETWEEN CONS 4 & 5 LYING BETWEEN S LIMIT OF THE JOCK RIVER & N LIMIT RD ALLOWANCE BETWEEN LTS 10 & 11 AS WIDENED (CEDARVIEW RD); SECONDLY: PT FORCED RD AT SW CORNER OF LT 11 CON 4; THIRDLY: PT LT 14 CON 5 RF, PT 1 5R6740; PT LT 12 CON 4 RF, PT 1 4R680; PT LT 14 CON 5 RF, PT 3 4R1165; PT LT 13 CON 4 RF AS IN CR575047; T/W CR663895 NEPEAN	(ii) Municipally Owned	
045950035	PT LT 11 CON 4 RF AS IN N498810; EXCEPT TRAVELLED RD "DESCRIPTION IN N498810 MAY NOT BE ACCEPTABLE IN FUTURE" SUBJECT TO CR387848 NEPEAN	(i) Privately Owned	
045950037	PT LT 11 CON 4 RF, PTS 1, 2, & 3 N480905 NEPEAN	(ii) Municipally Owned	

PIN	LEGAL DESCRIPTION	OWNER(S)
046310390	LOT 30 AND N1/2 OF LOT 29, CONCESSION 3 RF, EXCEPT PARTS 1, 2AND 3 ON PLAN 5R10713, EXCEPT PARTS 2, 3, 12 & 13 ON PLAN 5R12980 AND ROAD AS WIDENEDAND SAVE AND EXCEPT PARTS 1 TO 6 PLAN 4R8489 AND PARTS 1 TO 6 PLAN 4R9969 AND PART 1 PLAN 4R10378 AND PART 2 PLAN 5R5510. SUBJECT TO AN EAEMENT IN FAVOUR OF THE HYDRO-ELECTRIC POWER COMMISSION OF ONTARI O AS IN NP41079. SUBJECT TO AN EASEMENT IN FAVOUR OF ONTARIO HYDRO AS AS IN N538962. "DESCRIPTION IN CR456794 AND N417882 MAY NOT BE ACCEPTA BLE IN THE FUTURE"	
046310368	PARCEL 28-1 SECTION NEPEAN-3 RF FIRSTLY: THE SLY 1/2 OF LT 29 IN CONC 3 RF, CONTAINING 100 ACRES MORE OR LESS DESCRIBED AS FOLLOWS: COMMENCING AT A POINT IN THE WESTERLY LIMIT OF THE ALLOWANCE FOR ROAD IN FRONT OF SAID CONCESSION WHERE THE CENTRE LINE OF THE SAID LOT INTERSECTS THE SAID WESTERLY LIMIT OF THE ROAD ALLOWANCE, THENCE SOUTH 66 DEGREES WEST ALONG THE SAID CENTRE LINE 100 CHAINS MORE OR LESS TO THE ALLOWANCE FOR ROAD IN THE REAR OF SAID CONCESSION, THENCE SOUTH 16 DEGREES E ALONG THE SAID LAST MENTIONED ALLOWANCE FOR RD 10 CHAINS MORE OR LESS TO THE SLY LIMIT OF SAID LT, THENCE N 66 DEGREES E ALONG THE SAID SLY LIMIT 100 CHAINS MORE OR LESS TO THE SAID WLY LIMIT OF THE SAID ALLOWANCE FOR RD IN THE SAID CON, THENCE N 16 DEGREES W ALONG SAID WESTERN LIMIT 10 CHAINS MORE OR LESS TO POB; SECONDLY: THE E1/2 OF LOT 28 IN CON 3 RF, CONTAINING 100 ACRES MORE OR LESS; EXCEPT PT 1 4R5731 AND PT 2 4R6965, NEPEAN	
046310372	FIRSTLY: PT LTS 26, 27 & 28 CON 3 RF AS IN SECONDLY CR456794; EXCEPT PTS 4, 5 &6 5R10713, PT 15 5R12980, PTS 2 & 3 5R13067; SECONDLY: THAT PT OF ORIGINAL RD ALLOWANCE LYING BETWEEN LTS 25 & 26 CON 3 RF AS IN CR456883 AS CLOSED BY BY-LAW CR456882; THIRDLY: PT LTS 21, 22, 23, 24 & 25 CON 3 RF AS IN CR456792; EXCEPT PT 1 4R279, PT 3 4R280, PTS 1 & 24R282, PTS 3, 4 & 5 5R5168, PT 8 5R10713, PT 1 5R10755 & RD AS WIDENED; S/T CR377065, "DESCRIPTION IN CR456794, CR456883 & CR456792 MAY NOT BE ACCEPTABLE IN FUTURE" SUBJECT TO CR690252, NP41304, NP41069A, NEPEAN	
046310405	LOTS 28, 29 AND 30 CONCESSION 4 RIDEAU FRONT, EXCEPT CR568961, CR552308, PART 5 4R1021, PARTS 5, 6, 8 TO 10,14 16 AND 17 PLAN 5R12980EXPECT PART 1 PLAN 5R14864, PART 9 PLAN 4R14822, LOTS 26 AND 27 CONCESSION 4 RIDEAU FRONT EXCEPT CR568961 AND LANDS LYING SOUTH OF THENORTH LIMIT OF 5R13067, "DESCRIPTION MAY NOT BE ACCEPTABLE IN FUTURE" SUBJECT TO NP41085, CR572636, NP41677, N528871. NEPEAN	
045940070	FIRSTLY: N 1/2 LT 18 CON 5 RF LYING E OF HYDRO LANDS; EXCEPT CR461628, CR558989, CR461629; SECONDLY: PT S 1/2 LT 18 CON 5 RF, LYING E OF HYDRO LANDS;T/W CR557083 "DESCRIPTION IN N309756 MAY NOT BE ACCEPTABLE IN FUTURE" SUBJECT TO CR383677 NEPEAN	
045940080	PT LT 16 & 17 CON 5 RF, PTS 1, 3 & 4 5R13758 SUBJECT TO CR383677 NEPEAN	
045940096	PT S1/2 LT 16 CON 5 RF LYING W OF QUARTER SESSIONS ROAD AS IN CR688988 SUBJECT TO CR 631212 NEPEAN	
045940098	PT S1/2 LT 16 CON 5 RF LYING BETWEEN QUARTER SESSIONS ROAD AND JOCK RIVER AS IN CR688988 SUBJECT TO CR631212 NEPEAN	
045940169	PART OF THE NORTH HALF OF LOT 15, CONCESSION 5, RIDEAU FRONT BETWEEN QUARTER SESSIONS ROAD AND JOCK RIVER AS IN CR688988, EXCEPT CR518523 AND EXCEPT PART 1 PLAN 4R11029, NEPEAN. "DESCRIPTION IN CR688988 MAY NOT BE ACCEPTABLE IN THE FUTURE" SUBJECT TO AN EASEMENT IN FAVOUR OF THE HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO AS IN CR631212	
045940165	THAT PT OF THE JOCK RIVER LYING NE OF N357440 & NS225053 LYING SW OF 5R4750 NEPEAN	
045940101	PT N 1/2 LT 15 CON 5 RF LYING BETWEEN THE BANKS OF THE JOCK RIVER AS IN CR688988 SUBJECT TO CR631212 NEPEAN TOGETHER WITH AN EASEMENT OVER PART OF THE SOUTH * OF LOT 14, CONCESSION 5 RIDEAU FRONT LYING EAST OF CNR & WEST OF JOCK RIVER, DESIGNATED AS PARTS 5 AND 6 ON PLAN 4R-24726 AS IN OC1166714. TOGETHER WITH AN EASEMENT OVER PART OF LOT 14, CONCESSION 5 RIDEAU FRONT DESIGNATED AS PART 7 ON PLAN 4R-24726 AS IN OC1166715.	
045940107	PT LT 15 CON 5 RF AS IN NS225053 SUBJECT TO CR384131 NEPEAN	
045940111	PT LT 14 CON 5 RF PTS 4, 5 & 6 4R8758 S/T CR382362 NEPEAN ; SUBJECT TO EXECUTION 60363, IF ENFORCEABLE.	
045940121	PT S 1/2 LT 14 CON 5 RF LYING E OF JOCK RIVER & W OF CNR ROW SUBJECT TO CR631212 NEPEAN	

PIN	LEGAL DESCRIPTION	OWNER(S)
045940147	PT LT 15 CON 5 RF AS IN NP24494; PT LT 14 CON 5 RF AS IN NP24530 & NP24809; PT LT 13 CON 5 RF AS IN NP24909 & NP24532; PT LT 12 CON 5 RF AS IN NP24719 & NP24395; PT LT 11 CON 5 RF AS IN NP24406 & NP29389 NEPEAN	[redacted]
045940122	S 1/2 LT 14 CON 5 RF LYING E OF CNR & W OF JOCK RIVER; S/T N486057 SUBJECT TO CR631212 NEPEAN SUBJECT TO AN EASEMENT OVER PARTS 5 AND 6 ON PLAN 4R24726 AS IN OC1166714.	
045940179	PART OF LOT 13, CON. 5 R.F. BEING PART 11 ON 4R14246, AND PARTS 2 AND 4 ON 5R12584, NEPEAN. SUBJECT TO AN EASEMENT IN FAVOUR OF HYDRO ELECTRIC POWER COMMISSION OF ONTARIO OVER PART 2 ON 5R12584 AS IN CR383447.	
045940130	PTS LT 12 & 13 CON 5 RF AS IN CR355578, CR402163, CR566944, CR602900 SUBJECT TO CR382357, CR383447 NEPEAN SUBJECT TO AN EASEMENT IN FAVOUR OF THE HYDRO-ELECTRIC COMMISSION OF THE CITY OF NEPEAN OVER PART 7 PLAN 4R14246 AS IN LT1205813. SUBJECT TO A RIGHT OF WAY OVER PART 7 PLAN 4R14246 IN FAVOUR OF PARTS 1, 2 AND 3 PLAN 4R14246 AS IN LT1205814.	
045940181	PART OF N 1/2 LOT 12, CON. 5. R.F. BEING PARTS 12 AND 15 ON 4R14246, NEPEAN. SUBJECT TO AN EASEMENT IN FAVOUR OF HYDRO ELECTRIC POWER COMMISSION OF ONTARIO OVER PART 15 ON 4R14246 AS IN CR382357.	
045940183	PART S 1/2 LOT 12, CON. 5. R.F. BEING PARTS 4, 5, 6, 13 AND 14 ON 4R14246, NEPEAN. SUBJECT TO AN EASEMENT IN FAVOUR OF THE HYDRO-ELECTRIC COMMISSION OF THE CITY OF NEPEAN OVER PARTS 4, 5 AND 6 ON 4R14246, AS IN LT1205813. SUBJECT TO A RIGHT-OF-WAY OVER PARTS 4, 5AND 6 ON 4R14246 IN FAVOUR OF PARTS 1, 2 AND 3 ON 4R14246 AS IN LT1205814. TOGETHER WITH A RIGHT-OF-WAY OVER PART 3 ON 4R14246 IN FAVOUR OF PARTS 4, 5 AND 6 ON 4R14246 AS IN LT1205814.	
045940137	PT LT 12 CON 5 RF, PTS 1, 2 & 3 5R5941 SUBJECT TO CR434161 NEPEAN	
045940139	PT N 1/2 LT 11 CON 5 RF, PTS 1, 2 & 3 5R5944 SUBJECT TO CR383296 NEPEAN SUBJECT TO AN EASEMENT IN GROSS OVER PART 1 PLAN 4R27543 AS IN OC1555465	
045940145	ELY 20 ACRES OF SE 1/4 LT 11 CON 5 RF "DESCRIPTION IN NS117188 MAY NOT BE ACCEPTABLE IN FUTURE" SUBJECT TO CR383299 NEPEAN	
045950035	PT LT 11 CON 4 RF AS IN N498810; EXCEPT TRAVELLED RD "DESCRIPTION IN N498810 MAY NOT BE ACCEPTABLE IN FUTURE" SUBJECT TO CR387848 NEPEAN	
045950037	PT LT 11 CON 4 RF, PTS 1, 2, & 3 N480905 NEPEAN	

AGREEMENT OF PURCHASE AND SALE

This Agreement of Purchase and Sale (this **Agreement**) is made as of the _____ day of 20__.

BETWEEN:

VENDOR NAME

(hereinafter referred to as **Vendor**)

HYDRO OTTAWA LIMITED

(hereinafter referred to as **Purchaser**)

- and -

WITNESSES that in consideration of the mutual agreements herein contained, the parties agree as follows:

Article 1
Definitions

1.1 **In this Agreement, unless the context otherwise indicates, the following words or expressions shall have the following meanings:**

(a) **Acceptance Date** means the date of execution of this Agreement in final form by all parties;

(b) **Agreement** means this Agreement of Purchase and Sale and all Schedules hereto;

(c) **Broker** means **BROKER NAME**;

(d) **Business Day** means those days of the year excluding Saturdays, Sundays and statutory holidays;

(e) **Closing** means the completion of the purchase and sale of the Property in accordance with this Agreement;

(f) **Closing Date** means the date established for Closing in accordance with Article 9 of this Agreement;

(g) **Deposit** means the sum of Twenty-Five XXXXXXXXX ($XXXXX.XX) in lawful money of Canada, payable by wire transfer, certified cheque or negotiable bank draft, in accordance with the provisions of Section 3.2(a);

(h) **Government Authority** means any person, body, department, bureau, agency, board, tribunal, commission, branch or office of any federal, provincial or municipal government having or claiming to have jurisdiction over part or all of the Property, the transaction contemplated in this Agreement and/or one or more or all of the parties hereto and shall include a board or association of insurance underwriters;

(i) **Hazardous Material** means all substances including, without limitation, asbestos or any substance containing asbestos, the group of organic compounds known as polychlorinated biphenyls, lead, hydrocarbons, cadmium, flammable explosives, radioactive materials, chemicals known to cause cancer or reproductive toxicity, pollutants, effluents, contaminants, emissions or related materials and any items included in the definition of hazardous or toxic waste, materials or substances under any Hazardous Material Laws;

(j) **Hazardous Material Law(s)** means any laws, statutes or directions of all federal, provincial, municipal, local or other governmental and quasi-governmental authorities now or hereafter having jurisdiction over environmental conditions and industrial hygiene including, without limitation, the *Environmental Protection Act* (Ontario), the *Gasoline Handling Act* (Ontario), the *Pesticides Act* (Ontario), the *Dangerous Goods Transportation Act* (Ontario), the *Land Use Planning Act* (Ontario), the *Water Resources Act* (Ontario), the *Occupational Health and Safety Act* (Ontario), the *Transportation of Dangerous Goods Act* (Canada), the *Environmental Protection Act* (Canada) together with all rules, regulations, guidelines, judgments, orders, policies, approvals, notices, decrees, permits, concessions, grants, franchises, licenses, agreements or any other government restrictions, promulgated under or pursuant to any such laws, all applicable orders and decisions rendered by any regulatory authority; and any other applicable laws, rules, regulations, orders or decisions relating to the environment or occupational safety;

(k) **Municipality** means City of Ottawa and its predecessors and successors;

(l) **Property** means the property described in Schedule B attached hereto.

(m) **Purchase Price** has the meaning ascribed to it in Section 3.1;

(n) **Purchaser's Conditions** means those conditions precedent in favour of the Purchaser set forth in Schedule A attached hereto;

(o) **Vendor's Deliveries** means those items set forth in Section 6.1 of this Agreement.

Article 2
Purchase and Sale

2.1 The Purchaser agrees to purchase and the Vendor agrees to sell all the lands described in the attached Schedule B (herein called the **Property**) on the terms and conditions set out in this Agreement.

Article 3
Purchase Price

3.1 The purchase price for the Property shall be calculated on the basis of XXXXXXXXXX ($XXXXX.XX) of lawful money of Canada per acre of land or part thereof comprising the area of the Property. (the **Purchase Price**). The area of the Property shall be calculated based on a new survey of the Property to be prepared by the Vendor at the Vendor's expense in accordance with the provisions of Section 6.3.

3.2 The Purchase Price shall be payable as follows:

(a) the Deposit shall be paid to the Broker in trust within forty-eight (48) hours of the execution of this Agreement by the Vendor and Purchaser, to be held by the Broker in trust in an interest bearing account or term deposit for the benefit of the Purchaser pending completion or other termination of this Agreement;

(b) the balance of the Purchase Price, subject to the adjustments as hereinafter set forth, shall be paid by wire transfer, certified cheque or draft to the Vendor on Closing;

3.3 The Deposit shall be credited on account of the Purchase Price and any interest thereon shall be paid to the Purchaser within a reasonable time following Closing. The Deposit shall be held by the Broker in trust and shall be returned to the Purchaser with interest and without deduction if this Agreement is not completed for any reason whatsoever, other than the Purchaser's default.

3.4 The parties acknowledge that any HST/GST applicable to the Purchase Price shall be in addition to the Purchase Price, and shall be payable by the Purchaser in accordance with Section 18.1 herein.

Article 4
Adjustments to Purchase Price

4.1 Adjustment shall be made, as of 12:01 a.m. on the Closing Date, for realty taxes and any other items which are usually adjusted in purchase and sale transactions involving similar properties in Ontario. The Closing Date shall be for the account of the Purchaser, both as to income and expense.

4.2 The parties agree, after Closing and within a reasonable time after request, to readjust any item on or omitted from the statement of adjustments if necessary.

Article 5
Planning Act

5.1 The parties agree that this Agreement shall be effective only upon compliance in all respects with the requirements of the subdivision control provisions of the *Planning Act* of Ontario.

Article 6
Vendor's Post Acceptance Deliveries

6.1 Unless otherwise specified, within three (3) business days of the Acceptance Date, the Vendor undertakes and agrees to deliver the following to the extent that such are within the Vendor's possession or control, at no cost to the Purchaser (the **Vendor's Deliveries**):

(a) any site plans of the Property in the Vendor's possession;

(b) soil and geotechnical reports, chemical and soil analysis facts and reports;

(c) environmental audits, studies and assessment reports, appraisal reports, engineering studies and reports or other reports, including, without limitation, all reports of every nature and kind prepared by or on behalf of the Vendor in connection with environmental remediation of the Property and the removal of Hazardous Material therefrom, drainage plans, flood lines and fill lines, minimum distances separations from water courses, easements and rights of way;

(d) zoning information, notices of proposed amendments to existing zoning by-laws or site plan submissions for the Property and for properties adjoining the Property;

(e) development agreement, site plan agreement or draft plan of subdivision agreements affecting the Property or contiguous properties, hydro agreements, engineering agreements and plans, restrictions, easement agreements, leases, title documents/opinion or any other relevant information affecting or relating to the Property;

(f) realty tax bills for the past three years together with assessment notices for current and proposed realty taxes, local improvement or other special levies; and

(g) authorizations from the Vendor addressed to the Municipality and any other Government Authority having jurisdiction authorizing the release to the Purchaser of any and all information in their files relating to the Property.

6.2 The Vendor shall provide the Vendor's Deliveries to the Purchaser within the time stipulated, herein or a statement signed by the Vendor that such documents, or any part thereof not so delivered, are not in the Vendor's possession or control.

6.3 After the waiver or satisfaction of the Purchaser's Conditions and no later than ten (10) Business Days prior to the Closing Date, the Vendor shall cause to be prepared, at the Vendor's sole cost and expense, and shall deliver to the Purchaser, a new survey of the Property prepared by an Ontario Land Surveyor which shall include a calculation of the number of acres of land comprising the area of the Property.

Article 7
Interim Period

7.1 During the period between the Acceptance Date and the Closing Date (the **Interim Period**), the Purchaser, its representatives and advisors shall have full access to the Property and all information relating to the Property that is within the possession or control of the Vendor. During the Interim Period, the Vendor authorizes the Purchaser or the Purchaser's agent to enter upon the Property at any time and from time to time to carry out such tests, including soil tests, environmental investigations and/or audits, inventories of flora and fauna, surveys, measurements and inspections of the Property as the Purchaser, its representatives or advisors may deem necessary, including for the preparation of such plans of development as the Purchaser shall require, which actions shall not deem the Purchaser to have taken possession of the Property. The Vendor agrees to allow the Purchaser to initiate any municipal process required, in the Purchaser's discretion, in order to facilitate site plan approval or zoning change prior to Closing, and further agrees to cooperate with the Purchaser in that respect. No action taken by the Purchaser during the Interim Period pursuant to this Section 7.1, including the initiation of municipal processes, if any, for site plan approval or zoning change, shall constitute a waiver of any of the Purchaser's Conditions.

7.2 During the Interim Period, the Vendor shall not enter into any lease, service contract or other agreement affecting the Property or agree to amend, modify, vary, terminate, surrender, or cancel any existing agreement affecting the Property without the prior written approval of the Purchaser, which approval may be withheld at the Purchaser's sole option. The Vendor shall provide to the Purchaser all information that the Purchaser reasonably determines to be necessary in order to decide whether or not to grant its approval.

Article 8
Vendor's Representations

8.1 The Vendor hereby represents and warrants as follows and hereby acknowledges and confirms that the Purchaser is relying upon such representations and warranties in connection with the offer to purchase the Property. Such representations and warranties shall not merge on completion of this transaction and shall expressly survive such completion for a period of twelve (12) months following Closing:

(a) the Vendor is the registered and beneficial owner of the Property with full right, title and power to sell the same, and the Property is free and clear of any liens, charges and other encumbrances, other than those registered on the parcel abstract for the Property as of

the date hereof, and the Property is not the subject matter of any other agreement of purchase and sale nor any option to purchase, first right of refusal or to the Vendor's knowledge other legal or equitable right or claim capable of resulting in an adverse claim of possession to, or any right in or to the Property.

(b) to the Vendor's knowledge, there are no existing or contemplated expropriation proceedings or other similar public or private proceedings affecting all or any part of the Property.

(c) to the Vendor's knowledge, the Property has access to a validly constituted municipal roadway.

(d) the Vendor is not aware of any litigation, claim which could result in litigation, judicial or administrative action, statutory proceeding, judgement or order which could, in any material manner, affect the Property, the Vendor's interest therein or, following Closing, the use of the Property.

(e) to the Vendor's knowledge, no parts of the Property are affected by any heritage laws or regulations and no part of the Property is designated heritage under the *Heritage Act* of Ontario.

(f) the Vendor has not received notice, and has no knowledge of any pending, contemplated, or threatened litigation or claim for judicial or governmental administrative action relating to the use of the Property by the Vendor or any tenant of the Vendor.

(g) the Vendor is not a non-resident within the meaning of the *Income Tax Act* (Canada); the Vendor is registered under subdivision (d) of Division V of Part IX of the *Excise Tax Act* (Canada).

(h) to the Vendor's knowledge, there are no subdivision, development, maintenance or other agreements affecting the Property entered into by the Vendor, other than those produced as part of the Vendor's Deliveries and registered on title.

(i) all necessary corporate proceedings have been or will be taken whereby the sale contemplated herein is or will be authorized. Neither the execution of this Agreement nor its performance by the Vendor will result in a breach of any term or provision or constitute a default under any agreement or instrument affecting the Property or under any indenture, mortgage, deed of trust or any other agreement to which the Vendor is a party or by which it is bound.

(j) to the Vendor's knowledge, there are no easements or agreements which affect the use or enjoyment of the Property which are not registered upon the title to the Property.

Article 9
Closing Date

9.1 The Closing Date of this transaction shall be the date which is forty-five (45) days after the waiver or satisfaction of the Purchaser's Conditions Precedent, which date shall not, in any event, be later than fourteen (14) months after the Acceptance Date, or such other date as the parties may mutually agree in writing.

Article 10
Possession

10.1 The Vendor shall terminate the occupancy rights, if any, of the present occupant of the Property effective on or before Closing such that the Vendor will be in a position to deliver vacant possession of the Property on Closing.

Article 11
Title

11.1 The Purchaser shall be entitled to, and the Vendor shall convey to the Purchaser, a good and marketable title in fee simple to the Property and every part thereof free from encumbrances, except for encumbrances which the Purchaser has accepted or is deemed to have accepted pursuant to Section 11.2.

11.2 The Purchaser is to be allowed until seven (7) business days prior to the Closing Date to examine the title at the Purchaser's own expense. If within that time, any valid objection to title is made in writing to the Vendor which the Vendor is unable to remedy, and which the Purchaser will not waive, then this Agreement, notwithstanding any intermediate act or negotiations in respect of such objection, shall be null and void and the Deposit and interest earned thereon shall be returned to the Purchaser without deduction. Save as to any valid objection so made within such time, the Purchaser shall be conclusively deemed to have accepted the title of the Vendor to the Property, provided that the Purchaser shall have the right to submit further requisitions arising out of any registration against title or other matters occurring after the expiry of the title search period.

Article 12
Vendor's Closing Deliveries

12.1 The Vendor covenants to execute, where applicable, and deliver the following to the Purchaser at Closing:

(a) a registerable description of the Property satisfactory to the Land Registrar for the Land Titles Division of Ottawa (No. 4) to be prepared at the Vendor's cost and expense;

(b) the Transfer/Deed of Land in registrable form whereby good and marketable title to the Property is conveyed to the Purchaser or as the Purchaser may direct;

(c) the Vendor's undertaking to re-adjust any item on or omitted from the statement of adjustments;

(d) evidence by way of a certificate of an officer of the Vendor confirming that the Vendor is a resident of Canada for purposes of the *Income Tax Act* of Canada;

(e) a certificate of an officer of the Vendor confirming that all the representations, covenants and warranties made by the Vendor in this Agreement are true, accurate and correct on the Closing Date; and

(f) such further documentation relating to the completion of the transaction contemplated hereunder as shall be:

(i) otherwise referred to herein;

(ii) required by law and/or any Government Authority; or

(iii) the usual practice of a purchaser's solicitor in the Province of Ontario to request in completing purchase transactions involving similar properties in Ontario.

Article 13
Purchaser's Closing Deliveries

13.1 The Purchaser covenants to execute, where applicable, and deliver the following to the Vendor at Closing:

(a) a certified cheque, draft or a wire transfer for the balance due on Closing;

(b) the Purchaser's undertaking to re-adjust any item on or omitted from the statement of adjustments; and

(c) such further documentation relating to the completion of the transaction contemplated hereunder as shall be:

(i) otherwise referred to herein;

(ii) required by law and/or any Government Authority; or

(iii) the usual practice of a vendor's solicitor in the Province of Ontario to request in completing purchase transactions involving similar properties in Ontario.

Article 14
Documents

14.1 The Transfer/Deed of Land and all other documents to be delivered by the Vendor shall be prepared by the Vendor at the Vendor's expense in form and content satisfactory to the Purchaser's solicitor, acting reasonably. The Vendor shall provide, at the Vendor's expense, a description of the Property in a form acceptable to the Land Registrar for registration.

14.2 The Vendor and Purchaser acknowledge and agree that the following provisions shall apply in order to complete the transaction under the Teraview Electronic Registration System (the **ERS**):

(a) The parties shall instruct their respective solicitors to enter into an escrow closing agreement substantially in the form published by the Law Society of Upper Canada (hereinafter referred to as the **Escrow Document Registration Agreement**) establishing the procedures for completion of this transaction by means of the ERS;

(b) The delivery and exchange of documents, monies and possession of the Property and the release thereof to the Vendor and the Purchaser, as the case may be, shall not occur contemporaneously with the registration of the transfer/deed of land and other registrable documentation, and shall be governed by the Escrow Document Registration Agreement pursuant to which the Vendor's Solicitors and the Purchaser's Solicitors will hold in escrow all documents, monies received by them and will not release same to their respective clients except in strict accordance with the Escrow Document Registration Agreement; and

(c) Each of the parties hereto agrees that any documents not intended for registration on title to the Property may be delivered to the other party hereto in properly executed form by facsimile transmission or other similar system reproducing the original, provided the party transmitting any such document shall also deliver the original thereof to the recipient

party by overnight courier sent on the Closing Date by such other means and/or within such other time as may be agreed to by the parties' respective solicitors.

Article 15
No Collateral Agreements

15.1 The parties agree that there is no representation, warranty, collateral agreement or condition affecting the foregoing or the Property or supported hereby other than expressed herein in writing.

Article 16
Tender

16.1 Any tender of documents or money hereunder may be made upon the solicitor acting for the party on whom tender is required and it shall be sufficient that a negotiable certified cheque or draft be tendered in lieu of cash or currency. With respect to the Transfer/Deed of Land, it shall be sufficient that a copy of the Transfer/Deed of Land, signed for completeness, along with a copy of the executed Acknowledgement and Direction, be tendered.

Article 17
Notice

17.1 Any notice permitted or required to be given hereby shall be in writing and hand delivered or faxed, if to the Vendor, at:

Address: VENDOR ADDRESS

Attention: XXXXXXXXXXXXX

and if to the Purchaser, at:

Address: 3025 Albion Road North
P.O. Box 8700
Ottawa, ON K1G 3S4

Attention: **INSERT NAME**, Legal Counsel
Fax No. (XXX) XXX-XXXX

and shall be deemed to have been effectively given by hand delivery on the date of such delivery and if by fax on the date of confirmed transmission of such fax. Notices, approvals, waivers and other documents permitted, required or contemplated by this Agreement may also be given to the solicitors for the parties and may be given or delivered by the parties or by their respective solicitors on their behalf.

Article 18
HST/GST

18.1 The parties acknowledge that the Purchase Price does not include Harmonized Sales Tax and/or Goods and Services Tax (HST/GST) or other value added taxes. The Purchaser agrees to provide the Vendor on Closing with evidence that the Purchaser is registered under Subdivision (d) of Division V of Part IX of the *Excise Tax Act*, R.S.C. 1985 c.E-13, as amended, together with an undertaking in writing to self-assess and, if applicable, to remit any applicable tax and indemnify the Vendor in respect of any obligation to pay or remit such tax.

Article 19
Headings

19.1 Section headings herein are for ease of reference only and shall not be considered as part of this Agreement.

Article 20
Counterpart and Facsimile

20.1 The Vendor and Purchaser agree that all offers, counter offers, notices, releases, waivers and other documents with respect to this Agreement may be sent and received by facsimile or email. It is agreed that this Agreement may be executed in counterparts by facsimile or email transmission with original executed copies to be circulated and countersigned as soon as practicable following transmission by fax or email.

Article 21
Successors and Assigns

21.1 This Agreement shall be binding upon and enure to the benefit of the parties hereto and their respective successors and assigns.

Article 22
Purchaser's Conditions

22.1 Subject to any other conditions set forth in this Agreement, completion of this Agreement by the Purchaser is subject to the Purchaser's Conditions having been satisfied or waived at the Purchaser's sole discretion within the time limits specified in Schedule A. The Purchaser's Conditions are for the exclusive benefit of the Purchaser and may be waived by the Purchaser in whole or in part. All of the Purchaser's Conditions are to be satisfied in the sole, absolute and unfettered discretion of the Purchaser. If at any time during the conditional period specified in this Schedule A the Purchaser determines that any of the Purchaser's Conditions have not been fulfilled or satisfied, the Purchaser may elect to terminate this Agreement by delivering written notice of termination to the Vendor. Upon delivery of the written notice of termination, this Agreement shall be terminated and neither party shall be under any further obligation to the other to complete the transaction contemplated by this Agreement and the Deposit, together with all accrued interest thereon, shall be returned to the Purchaser forthwith without deduction. A waiver of any of the Purchaser's Conditions shall only be binding upon the Purchaser if it is in writing and delivered to the Vendor in accordance with the terms of this Agreement and shall be without prejudice to any of the Purchaser's rights of termination in the event of non-fulfillment or non-satisfaction of any other Purchaser's Condition(s) in whole or in part. If the Purchaser fails to deliver written notice to the Vendor notifying the Vendor of the Purchaser's waiver of or satisfaction with each of the Purchaser's Conditions prior to the expiration of the applicable time period for satisfaction of the same, this Agreement shall automatically terminate, in which case neither party shall be under any further obligation to the other to complete the transaction contemplated by this Agreement and the Deposit, together with all accrued interest thereon, shall be returned to the Purchaser forthwith without deduction.

Article 23
Confidentiality

23.1 The Vendor will not disclose the subject matter or terms of this Agreement of Purchase and Sale, the transaction contemplated hereby or the identity of the Purchaser unless written consent is

obtained from the Purchaser, which written consent may be withheld at the Purchaser's sole discretion.

Article 24
Offer and Acceptance

24.1 This Agreement when executed by the Purchaser shall constitute an offer which shall be irrevocable by the Purchaser for five (5) business days from the date of delivery to the Vendor, after which time, if not accepted, this offer shall be null and void.

Article 25
Miscellaneous

25.1 If the Purchaser defaults in the performance of any obligation under this Agreement and such default entitles the Vendor to terminate this Agreement, the Vendor's sole remedy and recourse shall be to retain the Deposit.

25.2 Each Party shall promptly do, execute, deliver or cause to be done, executed and delivered all such further acts, documents and things in connection with this Agreement that the other party may reasonable require, for the purpose of giving effect to this Agreement.

25.3 Time shall be of the essence of this Agreement. Except as expressly set out in this Agreement, the computation of any period of time referred to in this Agreement shall exclude the first day and include the last day of such period. If the time limit for the performance or completion of any matter under this Agreement expires or falls on a day that is not a Business Day, the time limit shall extend to the next following Business Day. This time limit for performing or completing any matter under this Agreement may be extended or abridged by an agreement in writing by the parties or by their respective solicitors.

25.4 During the Interim Period, the Vendor shall not alter, modify or change the condition of the Property without the prior written consent of the Purchaser other than such alterations, modifications or changes in condition as are necessary to ensure that the Property complies with the condition described in the representations and warranties contained in Article 8 of this Agreement.

25.5 During the Interim Period, the Vendor shall abide by all applicable laws, by-laws or any other agreement that relates to the Property.

25.6 The parties acknowledge and agree that the Broker is the sole real estate broker acting in connection with the purchase and sale of the Property as provided for this Agreement. The Vendor shall be responsible to pay the commission owing to the Broker together with harmonized sales tax payable thereon in accordance with and subject to the terms and conditions of the listing or representation agreement entered into between the Vendor and Broker and shall direct that the payment of commission be made to the Broker from the balance of the Purchase Price payable on Closing.

25.7 This Agreement shall be construed in accordance with the laws of the Province of Ontario and the Laws of Canada applicable therein. The parties hereby attorn to the jurisdiction of the courts of the Province of Ontario.

25.8 Schedules A and B attached hereto form an integral part of this Agreement.

[signature page follows]

IN WITNESS WHEREOF the Purchaser has executed this Agreement this _____ day of July, 2018.

HYDRO OTTAWA LIMITED

Per: _____

Name:

Title:

Per: _____

Name:

Title:

(We have authority to bind the Corporation)

The Vendor accepts the above offer.

IN WITNESS WHEREOF the Vendor has executed this Agreement this _____ day of July, 2018.

_____ Witness

_____ **XXXXXXXXXXXX**

SCHEDULE A

PURCHASER'S CONDITIONS

Attached to and forming a part of an Agreement between **Hydro Ottawa Limited** (as Purchaser) and **XXXXXXXXXXXXX** (as Vendor).

1. This Agreement and the obligations of the Purchaser hereunder are subject to the satisfaction of the following conditions for the benefit of the Purchaser, which are to be satisfied within six (6) months from the Acceptance Date, subject to the extension provided for in Section 2 below:

(a) Upon the Purchaser obtaining requisite internal management approvals for the transactions contemplated herein;

(b) Upon the Purchaser obtaining a satisfactory inspection of the Property and a feasibility analysis as to its suitability for the Purchaser's purposes, including:

(i) the Purchaser satisfying itself that it can develop the Property including grid and distribution connection in accordance with its proposed development plans and within its proposed budget;

(ii) the Purchaser satisfying itself that the soils and drainage conditions are suitable for intended uses of the Property contemplated by the Purchaser with standard construction procedures, that there are no special structural requirements in that regard, and that the Property is free from any Hazardous Material or any other environmental contamination;

(iii) the Purchaser being satisfied with the terms, provisions and conditions contained in any agreements, documents and information forming part of the Vendor's Deliveries;

(iv) the Purchaser being satisfied that the zoning of the Property allows for the uses contemplated by the Purchaser and with the status of all other municipal considerations relating to the proposed development of the Property including the nature and status of cost sharing arrangements, if any, for servicing of the Property; and the availability of municipal services for the Property;

(c) Upon the Purchaser satisfying itself that all governmental approvals required for the Purchaser's intended use can be obtained from all relevant Government Authorities so as to permit the Purchaser to make application for and receive permission to proceed with such intended use without extraordinary expenditure or delay including, without limitation, *Environmental Assessment Act* approval and Ontario Energy Board approval;

2. In the event that any of the Purchaser's Conditions provided for in this Schedule A have not been satisfied within six (6) months from the Acceptance Date, the Purchaser shall be entitled to extend the time for satisfaction or waiver of the Purchaser's Conditions for an additional period of six (6) months by notice in writing delivered to the Vendor no later than fifteen (15) days prior to the expiration of the initial six (6) month period.

SCHEDULE B

DESCRIPTION OF PROPERTY

PIN: 04595-0039 (LT)

PT LT 11 CON 4 RF AS IN NS202742; EXCEPT PTS 1, 2, 3, & 4 N568151, PT 1 EXPROP N480905 "DESCRIPTION IN NS202742 MAY NOT BE ACCEPTABLE IN FUTURE" NEPEAN; SUBJECT TO AN EASEMENT IN GROSS OVER PT 1 4R28941 AS IN OC1733841; SUBJECT TO AN EASEMENT IN GROSS OVER PT 2 4R28941 AS IN OC1733842.

System Impact Assessment

Please refer to **Attachment 1** for the draft System Impact Assessment ("SIA") prepared by the Independent Electricity System Operator ("IESO").

The IESO completed a draft SIA for the PSN Project considering load conditions forecast for the period 2022 to 2032. The assessment concludes that the proposed connection of the Project is expected to have no material adverse impact on the reliability of the integrated power system.

At this time the Applicants are filing a draft SIA, and will be updating it with the final version upon completion. This is consistent with the Board's *Filing Requirements For Electricity Transmission Applications Chapter 4*[1] (page 26),

> *"In the absence of a final SIA, the applicant must submit a draft SIA and inform the Board when the final SIA will be available."*

The Applicants expect the final SIA to be available within six weeks after the filing date of this Application.

[1] Issued by the OEB, July 31, 2014.

REPORT

System Impact Assessment Report

CONNECTION ASSESSMENT & APPROVAL PROCESS

2nd Draft Report

CAA ID: **2017-627 and 2017-629**

Project: **South Nepean MTS & South Nepean Transmission Reinforcement**

Connection Applicant:

Hydro Ottawa for 2017-627

Hydro One Network Inc. for 2018-629

Engineering Studies Department

Independent Electricity System Operator

Date: May 22, 2019

Document Name	System Impact Assessment Report
Issue	1.0
Reason for Issue	2nd Draft Report
Effective Date	

Disclaimers

IESO

This report has been prepared solely for the purpose of assessing whether the connection applicant's proposed connection with the IESO-controlled grid would have an adverse impact on the reliability of the integrated power system and whether the IESO should issue a notice of conditional approval or disapproval of the proposed connection under Chapter 4, section 6 of the Market Rules.

Conditional approval of the proposed connection is based on information provided to the IESO by the connection applicant and Hydro One at the time the assessment was carried out. The IESO assumes no responsibility for the accuracy or completeness of such information, including the results of studies carried out by Hydro One at the request of the IESO. Furthermore, the conditional approval is subject to further consideration due to changes to this information, or to additional information that may become available after the conditional approval has been granted, including but not limited to changes to the information available to or system assumptions made by the IESO at the time of the assessment.

If the connection applicant has engaged a consultant to perform connection assessment studies, the connection applicant acknowledges that the IESO will be relying on such studies in conducting its assessment and that the IESO assumes no responsibility for the accuracy or completeness of such studies including, without limitation, any changes to IESO base case models made by the consultant. The IESO reserves the right to repeat any or all connection studies performed by the consultant if necessary to meet IESO requirements.

Conditional approval of the proposed connection means that there are no significant reliability issues or concerns that would prevent connection of the proposed project to the IESO-controlled grid. However, the conditional approval does not ensure that a project will meet all connection requirements. In addition, further issues or concerns may be identified by the transmitter(s) during the detailed design phase that may require changes to equipment characteristics and/or configuration to ensure compliance with physical or equipment limitations, or with the Transmission System Code, before connection can be made.

This report has not been prepared for any other purpose and should not be used or relied upon by any person for another purpose. This report has been prepared solely for use by the connection applicant and the IESO in accordance with Chapter 4, section 6 of the Market Rules. This report does not in any way constitute an endorsement of the proposed connection for the purposes of obtaining a contract with the IESO for the procurement of supply, generation, demand response, demand management or ancillary services.

The IESO assumes no responsibility to any third party for any use, which it makes of this report. Any liability which the IESO may have to the connection applicant in respect of this report is governed by Chapter 1, section 13 of the Market Rules. In the event that the IESO provides a draft of this report to the connection applicant, the connection applicant must be aware that the IESO may revise drafts of this report at any time in its sole discretion without notice to the connection applicant. Although the IESO will use its best efforts to advise you of any such changes, it is the responsibility of the connection applicant to ensure that the most recent version of this report is being used.

Hydro One

The results reported in this report are based on the information available to Hydro One, at the time of the study, suitable for a System Impact Assessment of this connection proposal.

The short circuit and thermal loading levels have been computed based on the information available at the time of the study. These levels may be higher or lower if the connection information changes as a result of, but not limited to, subsequent design modifications or when more accurate test measurement data is available.

This study does not assess the short circuit or thermal loading impact of the proposed facilities on load and generation customers.

In this report, short circuit adequacy is assessed only for Hydro One circuit breakers. The short circuit results are only for the purpose of assessing the capabilities of existing Hydro One circuit breakers and identifying upgrades required to incorporate the proposed facilities. These results should not be used in the design and engineering of any new or existing facilities. The necessary data will be provided by Hydro One and discussed with any connection applicant upon request.

The ampacity ratings of Hydro One facilities are established based on assumptions used in Hydro One for power system planning studies. The actual ampacity ratings during operations may be determined in real-time and are based on actual system conditions, including ambient temperature, wind speed and project loading, and may be higher or lower than those stated in this study.

The additional facilities or upgrades which are required to incorporate the proposed facilities have been identified to the extent permitted by a System Impact Assessment under the current IESO Connection Assessment and Approval process. Additional project studies may be necessary to confirm constructability and the time required for construction. Further studies at more advanced stages of the project development may identify additional facilities that need to be provided or that require upgrading.

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Executive Summary

Hydro Ottawa (the "connection applicant of the project") is planning to build, own and operate a new Municipal Transformer Station (MTS) named South Nepean MTS (the "project") to provide capacity to meet the forecasted load growth. South Nepean MTS will be a dual supply station supplied from either 230 kV circuit E34M or 115 kV circuit S7M. The total load at South Nepean MTS is projected to be 67.5 MW in 2032 and ultimately 79.2 MW in 2035.

There will be two modes of operation for South Nepean MTS, as follows:

- ***E34M In-service Mode of Operation:*** Whenever circuit E34M is in-service, the entire South Nepean load will be supplied by the 230 kV E34M circuit;
- ***E34M Outage Mode of Operation:*** When there is an outage to circuit E34M, the entire South Nepean load will be supplied by the 115 kV S7M circuit.

To facilitate the connection of South Nepean MTS, Hydro One Networks Inc. (the "transmitter") and (the "connection applicant of the connection facilities") are planning to rebuild a section of S7M 115kV line as 230 kV capable circuit to form a 230 kV double circuit line with E34M (the "connection facilities"). The line section to be rebuilt will be from S7M STR 673N Jct. to Manotick Jct. and from Manotick Jct. to the project for a total distance of approximately 12.2 km as shown in Figure 2. One circuit will be connected to 230 kV circuit E34M approximately 5 km from Merivale TS and will provide the 230 kV supply to the project. The other circuit will remain connected to S7M and will be operated at 115 kV to supply the existing S7M loads and to provide the 115 kV supply to the project.

The project, as shown in Figure 1, will include the following equipment:

- One new 230 kV/27.6 kV power transformer;
- One new 115 kV/27.6 kV power transformer;
- One new 230 kV circuit breaker;
- One new 115 kV circuit breaker;
- One 27.6 Bus tie breaker;
- One new 230 kV motorized disconnect switch;
- One new 115 kV motorized disconnect switch.

An automatic fast load transfer scheme is proposed for the project. The proposed scheme will be owned by Hydro Ottawa and will be installed at their facility. When armed, the scheme will detect loss of E34M and line-end-open (LEO) of E34M at Merivale TS and, then, automatically transfer the entire South Nepean load from the 230 kV supply to the 115 kV supply.

The in-service date of the project and its connection facilities is expected to be in Q4-2021.

Conditional Approval for Connection

This assessment concludes that the proposed connection of the project and the connection facilities is expected to have no material adverse impact on the reliability of the integrated power system, provided

that all requirements in this report are implemented. Therefore, the assessment supports the release of the Notification of Conditional Approval for Connection of the project and the connection facilities.

Findings

The project's impact on the reliability of the integrated power system was evaluated, and based on the study results, the following was identified:

1. With all elements in-service, the loss of Merivale transformer T21 will result in post-contingency thermal overloading on Merivale transformer T22. This is an existing issue and the project will not aggravate it.

   Potential overloading of Merivale TS autotransformers was previously identified by the IESO in the Ottawa Area IRRP at item 7 (page 4) that states the need for: "Additional 230/115 kV transformer capacity at Merivale TS". The Ottawa IRRP Working Group is currently in the process of exploring options to address the need on the Merivale TS autotransformers;

2. After the addition of the project, with all elements in-service, the loss of E34M can cause more than 150 MW of load to be interrupted by configuration, which is a violation of Ontario Resource and Transmission Assessment Criteria (ORTAC) load security criteria. With the proposed automatic fast load transfer scheme in-service, the loss of E34M will result in a maximum of 108 MW of load lost by configuration in the year 2032, meeting the ORTAC load security criteria;

3. After the addition of the project, with all elements in-service, E34M LEO at Merivale TS will result in voltage collapse along E34M. With the proposed automatic fast load transfer scheme in-service, the voltage collapse concerns will be mitigated and the system voltage performance will meet the ORTAC criteria;

4. With one Merivale autotransformer outage or S7M LEO at Merivale TS, the proposed automatic fast load transfer scheme needs to be blocked to avoid thermal overload on the remaining Merivale autotransformer and voltage collapse along S7M, respectively. Under these conditions, the project will be disconnected automatically from E34M but the connection of the project to S7M will be done manually by Hydro Ottawa following instructions from the IESO; provided, the operating conditions in Ottawa 115 kV area can accommodate the project. In this case, it is acceptable to interrupt up to 600 MW by configuration as per ORTAC for the loss of E34M or E34M LEO at Merivale TS;

5. Under E34M in-service mode of operation, the incorporation of the project will either result in post-contingency thermal overloading or will aggravate the existing post-contingency thermal overloading condition of the 230 kV circuit M30A following the loss of M31A, and vice versa. Opening circuit M32S at Nepean MTS is an interim solution that can address this issue up to year 2023. This is discussed in more detail in section 4.5.1. Beyond 2023, transmission reinforcement, e.g. uprating circuits M30A and M31A, will be needed;

6. Under E34M outage mode of operation, the loss of Merivale autotransformer T21 will result in thermal overloading of Merivale T22 above its LTE rating, and vice versa. Up to 146 MW of load in the 115 kV system supplied by Merivale TS needs to be disconnected within 15 minutes from the occurrence of the contingency. Assuming it takes the transmission operator (the IESO and Hydro One) 5 minutes to analyze the event and provide instructions to the distributor, the distributor will

have approximately 10 minutes to disconnect the load after receiving those instructions. Interrupting up to 150 MW of load under these conditions is not a violation of the ORTAC load security criteria.

IESO Requirements for Connection

Project Specific Requirements:

The following specific requirements are applicable for the incorporation of the project and its connection facilities. Specific requirements pertain to the level of reactive power compensation needed, operation restrictions, special protection system, upgrading of equipment and any project specific items not covered in the general requirements.

Requirements for Hydro One (the connection applicant of the connection facilities)

The following specific requirements are applicable to Hydro One for the incorporation of the project and its connection facilities:

(1) Hydro One is required to modify the protections at Merivale TS and Almonte TS as per the protection impact assessment (PIA) attached in Appendix C. If Hydro One identifies that further changes to the protection settings are required after this SIA is finalized, those changes must be submitted to the IESO at least six (6) months before any modifications are to be implemented on the existing protection systems;

(2) Hydro One shall work with Hydro Ottawa on the implementation of the proposed automatic fast load transfer scheme. Hydro One shall send a transfer trip (TT) signal to the proposed automatic fast load transfer scheme immediately following the loss of E34M or LEO of E34M at Merivale TS;

(3) In order to provide sufficient supply capacity to support the load growth in Ottawa area, as well as provide maximum flexibility for the seasonal capacity sharing agreement between the IESO and Hydro Quebec Energy Marketing Inc. (HQEM), Hydro One is required to complete the upgrade of the 230 kV circuits M30A and M31A from Hawthorne TS to Merivale TS by 2023, as proposed and assessed in CAA ID 2016-573 and directed by the IESO in the hand-off letter to Hydro One dated February 1, 2019;

(4) Hydro One is required to include the project in the Ottawa area Under Voltage Load Shedding (UVLS) scheme.

Requirements for Hydro Ottawa (the connection applicant of the project)

The following specific requirements are applicable to Hydro Ottawa for the incorporation of the project and its connection facilities:

(1) The connection applicant shall meet all requirements identified by Hydro One in the Protection Impact Assessment (PIA) included in Appendix C of this report;

(2) Hydro Ottawa in conjunction with Hydro One shall install the proposed automatic fast load transfer scheme that will be classified as a Special Protection System (SPS), and it shall operate

without any intentional delay. The SPS facilities must comply with the NPCC Reliability Reference Directory #7 for Type 1 SPSs. In particular, if the SPS is designed to have redundant 'A' and 'B' protection systems at a single location, they must be on different non-adjacent vertical mounting assemblies or enclosures. Two independent trip coils are required on any breakers to be selected for L/R as part of an SPS design.

During the IESO Market Registration process, a new Facility Description Document (FDD) for the proposed SPS must be provided six months prior to the in-service date. The FDD must contain the finalized SPS matrix as well as expected operating times. The actual operating times must be measured during commissioning, documented as a Performance Validation Record, and posted on Hydro One - IESO secured web portal.

If the FDD or performance testing as per the Performance Validation Record indicates a change in design or slower than expected operating times, than what was assumed in this assessment, then further analysis of the project will need to be done by the IESO. This may delay the grant of IESO final approval;

(3) In accordance with Finding #6, Hydro Ottawa must have the capability to disconnect up to 146 MW of load in the 115 kV system supplied by Merivale within 10 minutes from the time it receives direction from the transmission operator (the IESO and Hydro One);

(4) In accordance with Finding #4, the automatic fast load transfer scheme needs to be blocked by the IESO during a Merivale autotransformer outage or S7M LEO at Merivale TS. After the project is automatically disconnected following the loss of E34M or E34M LEO at Merivale TS, Hydro Ottawa will be required to connect the project manually to S7M after receiving instructions from the IESO.

The IESO may identify other conditions, beyond the scope of this SIA, that require the automatic fast load transfer scheme for the project to be blocked. In these situations, Hydro Ottawa shall follow the IESO's instructions;

(5) The project shall participate in the Ottawa area UVLS scheme as described in Requirement #4 for the transmitter. Hydro Ottawa shall work together with Hydro One to implement the project into the scheme.

– End of Section –

1. Project Description

Hydro Ottawa (the "connection applicant of the project") is planning to build, own and operate a new Municipal Transformer Station (MTS) named South Nepean MTS (the "project") to provide capacity to meet the forecasted load growth. South Nepean MTS will be a dual supply station supplied from either 230 kV circuit E34M or 115 kV circuit S7M. The total load at South Nepean MTS is projected to be 67.5 MW in 2032 and ultimately 79.2 MW in 2035.

There will be two modes of operation for South Nepean MTS, as follows:

- ***E34M In-service Mode of Operation:*** Whenever circuit E34M is in-service, the entire South Nepean load will be supplied by the 230 kV E34M circuit;
- ***E34M Outage Mode of Operation:*** When there is an outage to circuit E34M, the entire South Nepean load will be supplied by the 115 kV S7M circuit.

To facilitate the connection of South Nepean MTS, Hydro One Networks Inc. (the "transmitter") and (the "connection applicant of the connection facilities") are planning to rebuild a section of S7M 115kV line as 230 kV capable circuit to form a 230 kV double circuit line with E34M (the "connection facilities"). The line section to be rebuilt will be from S7M STR 673N Jct. to Manotick Jct. and from Manotick Jct. to the project for a total distance of approximately 12.2 km as shown in Figure 2. One circuit will be connected to 230 kV circuit E34M approximately 5 km from Merivale TS and will provide the 230 kV supply to the project. The other circuit will remain connected to S7M and will be operated at 115 kV to supply the existing S7M loads and to provide the 115 kV supply to the project.

The project, as shown in Figure 1, will include the following equipment:

- One new 230 kV/27.6 kV power transformer;
- One new 115 kV/27.6 kV power transformer;
- One new 230 kV circuit breaker;
- One new 115 kV circuit breaker;
- One 27.6 Bus tie breaker
- One new 230 kV motorized disconnect switch;
- One new 115 kV motorized disconnect switch.

An automatic fast load transfer scheme is proposed for the project. The proposed scheme will be owned by Hydro Ottawa and will be installed at their facility. When armed, the scheme will detect loss of E34M and line-end-open (LEO) of E34M at Merivale TS, and then automatically transfer the entire South Nepean load from the 230 kV supply to the 115 kV supply.

The in-service date of the project and its connection facilities is expected to be in Q4-2021.

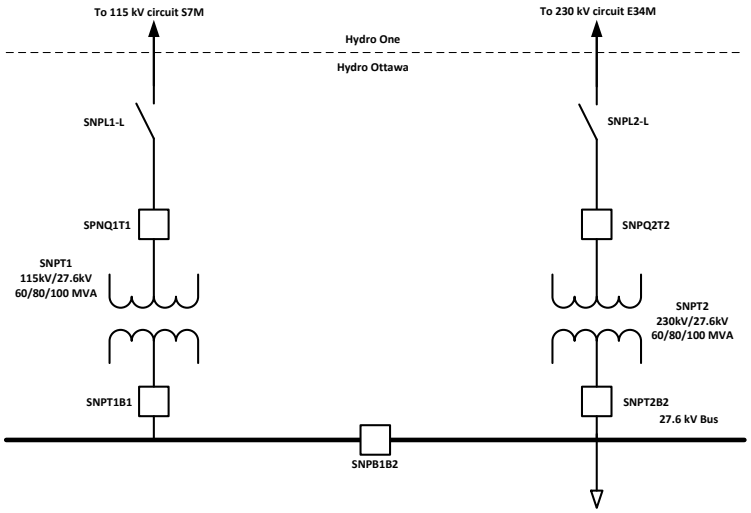


Figure 1: Project configuration

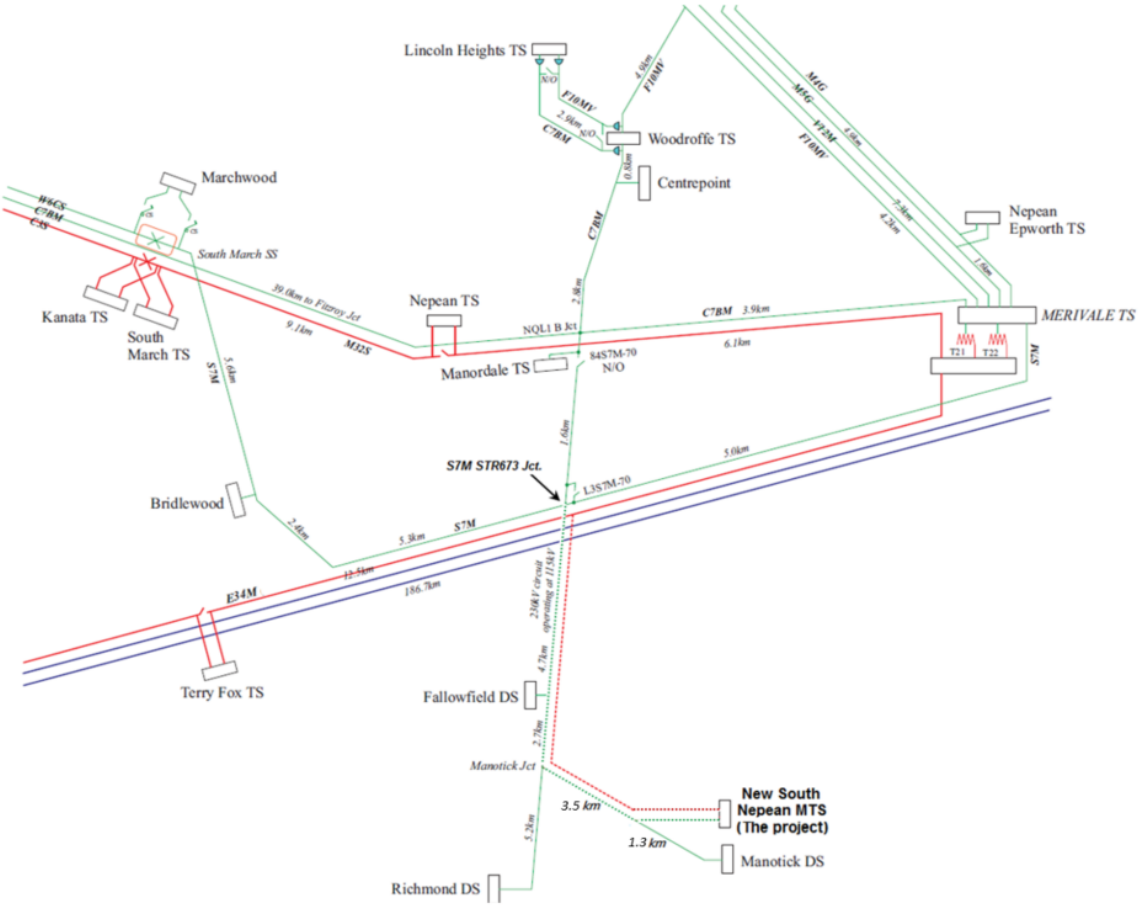


Figure 2: Single line diagram of the project and its connection facilities

2. General Requirements

The connection applicants shall satisfy all applicable requirements specified in the Market Rules, the Transmission System Code (TSC) and reliability standards. This section highlights some of the general requirements that are applicable to the project. Unless indicated explicitly, each requirement is applicable to both connection applicants, Hydro Ottawa and Hydro One.

2.1 Project Changes

Hydro Ottawa and Hydro One must notify the IESO at connection.assessments@ieso.ca as soon as they become aware of any changes to the project scope or data used in this assessment. The IESO will determine whether these changes require a re-assessment.

2.2 Reliability Standards (for Hydro One only)

As currently assessed the project and its connection facilities do not fall within the Northeast Power Coordinating Council's (NPCC) definition of the Bulk Power System (BPS).

Based on the North American Electric Reliability Corporation's (NERC's) definition of the Bulk Electric System (BES), the following equipment installed at the connection facilities will be categorized as BES elements:

- 230 kV circuit E34M;
- 115 kV circuit S7M.

Hydro One shall ensure that the proposed facilities are in compliance with the applicable NERC reliability standards. To determine the standard requirements that are applicable to this project, the IESO provides a mapping tool titled "NERC Reliability Standard Mapping Tool/Spreadsheet," which can be accessed at the IESO's public website:

Applicability Criteria for Compliance with Reliability Requirements

Note, Hydro One may request an exception to the application of the BES definition.
The procedure for submitting an application for exemption can be found in Market Manual 11.4: "Ontario Bulk Electric System (BES) Exception" at the IESO's website:

http://www.ieso.ca/-/media/files/ieso/document-library/market-rules-and-manuals-library/market-manuals/reliability-compliance/rc-ontariobesexception.pdf

The IESO's criteria for determining applicability of NERC reliability can be found in the Market Manual 11.1: "Applicability Criteria for Compliance with NERC Reliability Standards and NPCC Criteria" at the IESO's website:
http://www.ieso.ca/-/media/files/ieso/document-library/market-rules-and-manuals-library/market-manuals/reliability-compliance/ieso-applicability-criteria-for-compliance-with-nerc-standards-and-npcc-criteria.pdf

Compliance with these reliability standards will be monitored and assessed as part of the IESO's Ontario Reliability Compliance Program. For more details about compliance with applicable reliability standards reliability standards, the connection applicant is encouraged to contact orcp@ieso.ca and also visit the following webpage:

http://www.ieso.ca/sitecore/content/ieso/home/sector-participants/system-reliability/ontario-reliability-compliance-program

However, like any other system element in Ontario, the BPS and BES classifications of this project will be periodically re-evaluated as the electrical system evolves.

2.3 Power Factor (for Hydro Ottawa only)

As per Appendix 4.3 of the Market Rules, Hydro Ottawa must have the capability to maintain the power factor within the range of 0.9 lagging and 0.9 leading as measured at the defined meter point of the project.

2.4 Connection Equipment Design

Hydro Ottawa and Hydro One shall ensure that the connection equipment is designed to be fully operational in all reasonably foreseeable ambient temperature conditions. The connection equipment must also be designed so that the adverse effects of its failure on the IESO-controlled grid are mitigated.

2.5 Voltage Levels

Hydro Ottawa and Hydro One must ensure that the project's equipment and the connection facilities' equipment must meet the voltage requirements specified in section 4.2 and section 4.3 of the Ontario Resource and Transmission Assessment Criteria (ORTAC).

2.6 Fault Levels (for Hydro Ottawa only)

As per the TSC, Hydro Ottawa shall ensure the project's 230 kV and 115 kV connection equipment is designed to withstand the fault levels in the area. If any future system changes result in an increased fault level higher than the project's equipment capability, Hydro Ottawa is required to replace that equipment with higher rated equipment capable of withstanding the increased fault level, up to maximum fault level specified in the TSC. Appendix 2 of the TSC establishes the maximum fault levels for the transmission system. For the 230 kV and 115 kV systems, the maximum 3 phase and single line to ground symmetrical fault levels are 63 kA and 50 KA, respectively.

Hydro Ottawa shall ensure that the 230 kV and 115 kV breakers/switchers installed at the project have a rated interrupting time of 3 cycles or less and 5 cycles or less, respectively. Fault interrupting devices installed at the project must be able to interrupt fault currents at the maximum continuous voltage of 250 kV and 127 kV respectively.

2.7 Under Frequency Load Shedding (for Hydro Ottawa only)

Hydro Ottawa has a total peak load at all its owned facilities, including the project, which is greater than 25 MW. According to Section 10.4.6 of Chapter 5 of the Market Rules and Section 11.3 of the Market Manual Part 7.1 – IESO-Controlled Grid Operating Procedures, the connection applicant is required to participate in the automatic Under-Frequency Load Shedding (UFLS) program as follows:

Hydro Ottawa must select 35% of total peak load among its owned facilities for under-frequency tripping, based on a date and time specified by the IESO that approximates system peak, according to section 10.4 of Chapter 5 of the Market Rules.

As Hydro Ottawa has a peak load of 100 MW or greater at all its owned facilities, the UFLS relay connected loads shall be set to achieve the amounts to be shed stated in the following table:

UFLS Stage	Frequency Threshold (Hz)	Total Nominal Operating Time (s)	Load Shed at stage as % of Connection Applicant's Load	Cumulative Load Shed at stage as % of Connection Applicant's Load
1	59.5	0.3	7 – 9	7 – 9
2	59.3	0.3	7 – 9	15 – 17
3	59.1	0.3	7 – 9	23 – 25
4	58.9	0.3	7 – 9	32 - 34
Anti-Stall	59.5	10.0	3 – 4	35 - 37

Capacitor banks connected to the same facility bus as the load should be shed by UFLS relay at 59.5 Hz with a time delay of 3 seconds and should be coordinated in conjunction with the relevant transmitter, if applicable.

The maximum load that can be connected to any single UFLS relay is 150 MW to ensure that the inadvertent operation of a single under-frequency relay during the transient period following a system disturbance does not lead to further system instability.

During the IESO Market Registration process, the connection applicant will need to register as a UFLS Program participant and will need to submit a schedule of under-frequency tripping selections and load amounts to demonstrate that the above targets are met.

2.8 Telemetry (for Hydro Ottawa only)

In accordance with Section 7.5 of Chapter 4 of the Market Rules, Hydro Ottawa shall provide to the IESO the applicable telemetry data listed in Appendix 4.17 of the Market Rules on a continual basis. The data shall be provided in accordance with the performance standards set forth in Appendix 4.22, subject to

Section 7.6A of Chapter 4 of the Market Rules. The whole telemetry list will be finalized during the IESO Market Registration process.

Hydro Ottawa must install monitoring equipment that meets the requirements set forth in Appendix 2.2 of Chapter 2 of the Market Rules. As part of the IESO Market Registration process, the connection applicant must also complete end to end testing of all necessary telemetry points with the IESO to ensure that standards are met and that sign conventions are understood. All found anomalies must be corrected before IESO final approval to connect any phase of the project is granted.

2.9 Revenue Metering (for Hydro Ottawa only)

Hydro Ottawa should be aware that Chapter 6 – Wholesale Metering of the Market Rules must be met. This includes any intermediate project stages such as installation of temporary equipment or the use of mobile transformers. For more details the connection applicant is encouraged to seek advice from their Metering Service Provider (MSP) or from the IESO metering group.

2.10 Protection System

Hydro Ottawa and Hydro One shall ensure that the protection systems are designed to satisfy all the requirements of the Transmission System Code and any additional requirements identified by the transmitter. New protection systems must be coordinated with the existing protection systems. Protection systems within the project shall only trip the appropriate equipment isolating the fault.

BPS elements are deemed by the IESO to be essential to system reliability and security and must be protected by redundant protection systems in accordance with Section 8.2 of the TSC. These redundant protection systems must satisfy all requirements of the TSC, and in particular, they must be physically separated and not use common components, common battery banks, or common instrument transformer secondary windings.

The protection systems for transmission voltage BES elements (whose rated voltage is higher than 100 kV) must be redundant. Redundancy must be present in protective relaying for normal fault clearing and control circuitry associated with protective functions including trip coils of the circuit breakers or other interrupting devices. These redundant protection systems must not use common instrument transformer secondary windings. A single communication system, if used, must be monitored and reported and a single DC supply, if used, must be monitored and reported for both low voltage and open circuit.

As the electrical system evolves, transmission voltage non-BPS or non-BES elements (whose rated voltage is higher than 100 kV) within the project, may be re-classified as BPS elements or BES elements. It is recommended the connection applicant design the protection systems for these elements according to the protection requirements for BPS elements or have adequate provisions for future upgrade to meet those requirements.

2.11 IESO Market Registration Process

Hydro Ottawa and Hydro One must initiate the IESO's Market Registration process at least eight months prior to the commencement of any project related outages.

The connection applicant is required to provide "as-built" equipment data for the project during the IESO Market Registration process to allow the IESO to incorporate this project into IESO work systems and to perform any additional reliability studies.

If the submitted equipment data differ materially from the ones used in this assessment, then further analysis of the project may need to be done by the IESO before final approval to connect is granted.

At the sole discretion of the IESO, performance tests may be required at the project and its connection facilities. The objectives of these tests are to demonstrate that equipment performance meets the IESO requirements, and to confirm submitted data are suitable for IESO purposes. The transmitter may also have its own testing requirements. The IESO and the transmitter will coordinate their tests, share measurements and cooperate on analysis to the extent possible.

Once the IESO's Market Registration process has been successfully completed, the IESO will provide the connection applicant with a Registration Approval Notification (RAN) document, confirming that the project is fully authorized to connect to the IESO-controlled grid. For more details about this process, the connection applicant is encouraged to contact IESO's Market Registration at market.registration@ieso.ca

2.12 Project Status

As per Market Manual 2.10, Hydro Ottawa and Hydro One will be required to provide a status report of its proposed project with respect to its progress upon request of the IESO. The project status report form can be found on the IESO Web site at http://www.ieso.ca/-/media/files/ieso/document-library/market-rules-and-manuals-library/market-manuals/market-administration/caa-f1399-statusreport.doc. Failure to comply with project status requirements listed in Market Manual 2.10 will result in the project being withdrawn.

Hydro Ottawa and Hydro One will be required to also provide updates and notifications in order for the IESO to determine if the project as "committed" as per Market Manual 2.10. A committed project is a project that has demonstrated to the IESO a high probability of being placed into service. A project will be deemed by the IESO to be a committed project if:

(1) Hydro Ottawa and Hydro One provide notification to the IESO specifying a defined and future-dated in-service date for the project, and;

(2) Hydro Ottawa and Hydro One provide notification to the IESO indicating that project is actively being completed (i.e. not declared to be "on hold"), and;

(3) Hydro Ottawa and Hydro One do one of the following:

- provide a notification to the IESO indicating that the connection applicant will be compensated with respect to the project through a power purchase contract, or rates set by the Ontario Energy Board,
- provide a notification to the IESO indicating that a leave to construct approval has been granted by the Ontario Energy Board,
- provide a notification to the IESO indicating that the project has a connection cost recovery agreement (CCRA) in place with the transmitter,

- provide a joint notification with the transmitter to the IESO indicating the project will come into service,
- provide notification through the IESO Facility Registration process that the project has started construction.

-End of Section-

3. Data Verification

3.1 Connection Arrangement

The connection arrangement of the project is shown in Figure 1. The entire load of South Nepean MTS will be normally fed from the 230 kV circuit E34M via the 230 kV/27.6 kV transformer SNPT2. Following the loss of E34M, the entire load will be transferred to the 115 kV circuit S7M and be fed via the 115 kV/27.6 kV transformer SNPT1. To prevent tying the 230kV circuit E34M and the 115kV circuit S7M together through the LV bus of the new station, the LV breaker of transformer SNPT1 will be operated normally open. A fault on any of the two transformers will be cleared by its high voltage and circuit breaker. Each 230 kV, 115 kV and 27.6 kV breaker will have breaker fail protection tripping the upstream breaker. The arrangement is not expected to reduce the level of reliability of the integrated power system and is, therefore, acceptable to the IESO.

3.2 Connection Equipment

The equipment specifications, shown in the following tables, were assessed based on the information provided by the connection applicant.

Table 1: Main Step-Down Transformer Data

Transformer	SNPT1	SNPT2
Configuration	Three phase	Three phase
Transformation (kV)	115/27.6	230/27.6
Winding Configuration	Delta/Wye	Wye/Zig-Zag
Thermal Rating	60.0 MVA ONAN 80.0 MVA ONAF 100.0 MVA OFAF	60.0 MVA ONAN 80.0 MVA ONAF 100.0 MVA OFAF
Continuous Thermal Rating (winter 10°C/summer 35°C)	83.3/83.3 MVA	83.3/83.3 MVA
10-Day Thermal Rating (winter 10°C/summer 35°C)	133/120	133/120
15-MIN Thermal Rating (winter 10°C/summer 35°C)	N/A	N/A
Positive Sequence Impedance	R = 0.4%, X=11.5% on 60 MVA base	R = 0.4%, X=11.5% on 60 MVA base
Under-load tap-changer (ULTC)	HV: ±10% , 33 steps	HV: ±10% , 33 steps
Off-load tap-changer (OLTC)	Tap 1: 120.82 kV Tap 2: 117.87 kV Tap 3: 115 kV Tap 4: 112.12 kV Tap 5: 109.32 kV	Tap 1: 241.5 kV Tap 2: 235.75 kV Tap 3: 230 kV Tap 4: 224.25 kV Tap 5: 218.5 kV
In-service OLTC position	Tap 3: 115 kV	Tap 3: 230 kV

Table 2: 230 kV Circuit Breaker Specifications

Identifier	Maximum continuous rated voltage	Interrupting time	Continuous Current Rating	Short Circuit Symmetrical Interrupting Capability
SNPQ1T1	145 kV	3	2000 A	50 kA
SNPQ2T2	250 kV	3	2000 A	63 kA

The 230 kV circuit breaker meets the maximum continuous voltage rating requirement of 250 kV, the interrupting time required by the TSC and the maximum short circuit symmetrical interrupting capability of 63 kA required by the TSC.

The 115 kV circuit breaker meets the maximum continuous voltage rating requirement of 127 kV, the interrupting time required by the TSC and the maximum short circuit symmetrical interrupting capability of 50 kA required by the TSC.

Table 3: 230 kV Disconnect Switch Specifications

Identifier	Maximum continuous rated voltage	Continuous Current Rating	Short Circuit Symmetrical Rating
SNPL1-L	145 kV	2000 A	50 kA
SNPL2-L	250 kV	2000 A	63 kA

The 230 kV disconnect switch meets the TSC maximum continuous voltage rating requirement of 250 kV and the TSC maximum short circuit symmetrical rating of 63 kA required by the TSC.

The 115 kV disconnect switch meets the TSC maximum continuous voltage rating requirement of 127 kV and the TSC maximum short circuit symmetrical rating of 50 kA required by the TSC.

-End of Section-

4. System Impact Studies

System impact studies were carried out to identify the effect of the project on the thermal loading of transmission circuits and system voltages for pre- and post- contingency events on the IESO-controlled grid in the vicinity of the project.

4.1 Existing System

The project will be connected in the Merivale 230/115 kV area which is part of the Ottawa area where all equipment is classified as part of the Bulk Electricity System ("BES").
The major existing facilities and interfaces are summarized below and depicted in the single line diagram shown in Figure 6 in Appendix B.

Transformer Stations

- Hawthorne TS is the major transmission station that connects the 500kV network to the 230kV system via three 500/230kV autotransformers; and
- Hawthorne TS and Merivale TS are the major 230 kV and 115kV load supplying points for the Ottawa transmission zone.

Generating Stations in the vicinity of Ottawa area

- Lennox GS with an installed capacity of 2160 MW;
- Pickering GS A and Pickering GS B with a combined capacity of 3100 MW;
- Saunders GS with an installed capacity of 1080 MW;
- Barret Chute GS and Stewartsville GS with a total capacity of 176 MW and 182 MW respectively;
- Chats Falls GS with a total capacity of 192 MW; and
- Ottawa Health Science Non-Utility Generator (NUG) with a total of 74 MW located near Ottawa downtown.

Major interfaces

The Flow Into Ottawa (FIO) transmission interface is currently defined as the sum of the active power flows on X522A and X523A out from Lennox TGS, C3S out from Chats Falls GS, 230 kV circuit E34M into Merivale TS, L24A out from St. Lawrence TS, and 230 kV circuit B5D into St. Isidore TS.

4.2 Study Assumptions

In this assessment, the following assumptions were used:

(1) **Study period:** the study period covered in this assessment is up to year 2032, ten years from the proposed in-service date of the project.

(2) **Transmission facilities**: All existing and committed major transmission facilities with 2022 in-service dates or earlier were assumed in-service.

(3) **Load Forecast:** In this study the summer extreme weather load forecast for individual stations in Ottawa area, provided by Hydro One and Hydro Ottawa and attached in Appendix A, was used. The load forecast for the rest of Ontario during the study period was based on the IESO extreme weather coincident summer peak load forecast.

(4) **Load Power Factor:** All loads at facilities in the vicinity of the project were modelled to operate with a 0.9 power factor (lagging) at their respective HV buses.

(5) **Load Modelling:** A constant MVA load model was assumed for all studies except for the pre-ULTC steady state voltage assessment where the voltage dependent load model was used as per Section 2.4 in ORTAC.

(6) **Generation assumption:**

- Local hydro-electric generators were dispatched as follows:
  - A 98% of the time dependable hydroelectric generation dispatch to reflect a low water condition, as required by section 2.6 in the ORTAC, for scenarios with all transmission elements in-service pre-contingency.
  - An 85% of the time dependable hydroelectric generation, based on past planning practice, for scenarios with any one transmission element out of service pre-contingency.
  - Since the generation in Madawaska area normally generates during peak load hours, the dependable hydroelectric generation values listed in Table 4 were obtained using the last 10 years of historical hydroelectric production data during summer peak load hours.
- All major Ontario generators, with the exception of one Darlington unit, were assumed to be in-service.
- Since the study covers the period from 2022 to 2032, Pickering GS was assumed to have been shut down.

Table 4: Local hydroelectric generation dispatch assumptions

Description	Summer 98% Dependable Water	Summer 85% Dependable Water
Chat Falls 115 kV GS	10	20
Chat Falls 230 kV GS	40	60
Barrett Chute GS	0	18
Stewartville GS	0	22

(7) **Study scenarios:**

Two scenarios were developed as follows:

Scenario #1: This scenario was used to determine if Ottawa 230 kV and 115 kV transmission systems have sufficient capability to supply the project under the following assumptions:

- No import/export on the interties with Hydro Quebec;
- No import/export on the interties with New York at St. Lawrence;
- FIO interface at 2000 MW as a result of generation dispatch and load forecast assumptions.

Scenario #2: This scenario was used to determine if Ottawa 230 kV and 115 kV transmission systems have sufficient capability to supply the project under the following assumptions:

- 500 MW import from Quebec on HVDC ties to represent the seasonal Capacity Sharing Agreement between IESO and Hydro Quebec Energy Marketing Inc. (HQEM) signed in May, 2015 (the "Capacity Sharing Agreement") ;
- No import/export on the interties with New York at St. Lawrence;
- FIO interface at 1500 MW as a result of generation dispatch and load forecast assumptions.

4.3 Contingencies

The project will be connected in the Merivale 230/115 kV area where all equipment is classified as part of the BES but not classified as part of the Bulk Power System (BPS). As such, contingencies studied in this assessment are in accordance with NERC TPL-001-4 and the ORTAC. Based on the mode of operation, the lists of the contingencies simulated for thermal and voltage analysis are as follows:

Contingencies for E34M in-service mode of operation:

Table 5 and Table 6 list the contingencies simulated during the E34M in-service mode of operation. The S7M LEO condition, in Table 6, was studied to determine if South Nepean load could be transferred to the 115 kV supply when S7M is LEO at Merivale TS. This condition requires analysis to justify whether the automatic fast load transfer scheme needs to be blocked or not.

Table 5: List of contingencies for the E34M in-service mode of operation with all elements in-service

Single contingencies	Common Tower contingencies	Breaker failure contingencies
Loss of M30A	Loss of T33E+T22C	Merivale PL30 breaker (resulting in loss of 230 kV circuit M30A and 230/115kV Merivale transformer T21)
Loss of Merivale T21 Transformer		
Loss of T33E	Loss of A8M+M30A	Merivale L31L32 breaker (resulting in loss of 230 kV circuits M31A and M32S)
Almonte L33L34 breaker IBO		

Table 6: List of contingencies for E34M in-service mode of operation with one element out of service

Element out of service	Contingency
M31A	Loss of M30A
Merivale K1L34 breaker	Merivale breaker L30L34 IBO
Merivale K1L34 breaker	Merivale breaker PL30 IBO
S7M LEO	E34M

Contingencies for E34M outage mode of operation:

Since the project will be connected to BES and non-BPS equipment, only single element contingencies are simulated with E34M outage (N-1-1 conditions). Table 7 lists the contingencies simulated during the E34M outage mode of operation.

Table 7: List of contingencies for the E34M outage mode of operation

Initial conditions	Single element contingencies
E34M out of service and all 115 kV elements in-service	Loss of Merivale T21 Transformer
	Loss of X523A
	Loss of Hawthorne 230 kV D Bus (resulting loss of Hawthorne 230kV/115kV Transformer T9 and Hawthorne 230 kV shunt capacitor SC22)
	Loss of C7BM
	Loss of W3B
	Loss of W6CS
	Loss of B5QK
	Loss of B1S
	Breaker L6L7 IBO (between S7M and W6CS)

4.4 Monitored elements

Table 8 to Table 10 list the monitored circuits, transformers and buses respectively.

Table 8: List of monitored circuits

Circuit	Voltage level (kV)	From Bus	To Bus	Cont. (A)	LTE (A)	STE (A)
E34M	230	Merivale	Project Tap	840	1090	1400
		Project Tap	Terryfox A	840	1090	1400
		Terryfox A	Terryfox B	1060	1400	1620
		Terryfox B	Didsbury	1060	1400	1620
		Didsbury	Almont_E	600	600	600
		Almont_E	Almont Jct	840	1090	1210
T33E	230	Clarington	Almont_W	600	600	600
		Almont_W	Almont Jct	600	600	600
M30A	230	Hawthorne	Elwood	1350	1800	2170
		Elwood	Albion	1350	1800	2170
		Albion	Merivale	1350	1800	2170
M31A	230	Hawthorne	Elwood	1350	1800	2170
		Elwood	Albion	1350	1800	2170
		Albion	Merivale	1350	1800	2170
M32S	230	Merivale	Nepean	1110	1460	1990
		Nepean	South_Mar	1110	1460	1990
C3S	230	Chat Falls	South_ Mar	1110	1460	2080
S7M	115	Merivale TS	S7M STR 673N Jct.	1040	1370	1600
		S7M STR 673N Jct.	X523A STR 654 Jct.	1040	1370	1600
		X523A STR 654 Jct.	Bridlewood Jct.	590	660	690
		Bridlewood Jct.	Marchwood Jct.	590	720	750
		Marchwood Jct.	South March SS	590	770	830
		S7M STR 673N Jct.	S7M STR R14-R15 Jct.	900	1190	
		S7M STR R14-R15 Jct.	Fallowfield Jct.	900	1190	
		Fallowfield Jct.	Manotick Jct.	900	1190	
		Manotick Jct.	Project Tap point	900	1190	
		Project Tap point	Manotick STR A40 Jct.	260	260	260
C7BM	115	Merivale TS	NQL 1B Jct.	590	770	950
		NQL 1B Jct.	Bellman Jct.	590	720	750
		Bellman Jct.	Fitzory Jct.	590	720	750
		Fitzory Jct.	Arnprior Jct.	480	620	730
		Arnprior Jct.	Barrett Chute	480	620	730
A8M	115	Hawthorne TS	Billings Jct.	1320	1760	2140
		Billings Jct.	Merivale TS	1320	1760	2140
A3RM	115	Hawthorne TS	Ellwood Jct.	1320	1760	2140
		Ellwood Jct.	Billings Jct.	1320	1760	2140
		Billings Jct.	Merivale TS	1320	1760	2140

Table 9: List of monitored transformers

Transformer	Voltage level (kV)	Cont. (MVA)	LTR (MVA)	STE (MVA)
Merivale T21	230/115	250	347.9	429.6
Merivale T22	230/115	250	314.8	429.6

Table 10: List of monitored buses

Hawthorne 500 kV Bus	Hawthorne 230 kV Bus	Merivale 230 kV Bus	Terry Fox 230 kV Bus
Almonte 230 kV Bus	South Nepean 230 kV Bus	Merivale 115 kV Bus	Bridlewood 115 kV bus
South March 155 kV Bus	Stewartville 115 kV Bus	Barrett Chute 115 kV Bus	Fallowfield 115 kV Bus
Manotick 115 kV Buss	Richmond 115 kV Bus	South Nepean 115 kV Bus	

4.5 Thermal Analysis

Section 4.7.2 of the ORTAC specifies the following criteria for thermal loading of transmission facilities:

(1) All line and equipment loadings shall be within their continuous ratings with all elements in-service;
(2) All line and equipment loadings shall be within their long-term emergency ratings with any one element out of service; and
(3) Immediately following contingencies, lines may be loaded up to their short-term emergency ratings where control actions such as re-dispatch, switching, etc. are available to reduce the loading to the long-term emergency ratings. It is assumed that for the bulk power system, loading conditions and control actions are available to reduce the loading to the long-term emergency rating or less within 15 minutes.

Thermal analysis was performed to ensure that the local transmission system meets the above criteria after the project is incorporated.

4.5.1 E34M in-service mode of operation

All elements in-service/one element out of service conditions: pre-contingency

After the incorporation of the project, no pre-contingency thermal violations were identified on the monitored elements listed in Table 8 and Table 9 either with all elements in-service or under studied outage conditions.

All elements in-service/one element out of service conditions: post-contingency

Under scenario #1 and scenario #2 and with all elements in-service, the loss of Merivale transformer T21 resulted in post-contingency thermal overloading on Merivale transformer T22, as shown in Table 11. This is an existing issue and the project does not aggravate it, as with all elements in-service the project load will be supplied entirely from E34M circuit and will have no impact on the power flow on Merivale 115/230 kV transformers.

Potential overloading of Merivale TS autotransformers was previously identified by the IESO in the Ottawa Area IRRP at item 7 (page 4) that states the need for: “Additional 230/115 kV transformer capacity at Merivale TS”. Therefore, there is no further assessment of this issue in this SIA as the Ottawa IRRP Working Group is currently in the process of exploring options to address the need on the Merivale TS autotransformers.

Table 11: Thermal assessment results for the loss of Merivale T21 with all elements in-service pre-contingency

Load forecast year	Flow on Merivale T22 in Scenario 1				Flow on Merivale T22 in Scenario 2			
	Pre-Contingency (MVA)	%Cont.	Post-Contingency (MVA)	%LTE	Pre-Contingency (MVA)	%Cont.	Post-Contingency (MVA)	%LTE
2022	229.2	91.7	341.8	108.6	228.4	91.4	340.8	108.2
2032	258.7	103.5	387	122.9	256.9	102.7	386.1	122.6

Under scenario #1 and after the incorporation of the project, the loss of M30A or M31A circuits resulted in post-contingency thermal overloading on the companion circuit above its LTE rating, as shown in Table 12.

Under scenario #2 and regardless of the project status, the loss of M30A or M31A circuits resulted in post-contingency thermal overloading on the companion circuit above its LTE rating, as shown in Table 12.

The identified post-contingency overloading issues could be addressed by uprating M30A and M31A (CAA ID 2016-572). As an interim solution until the uprating is complete, the transmission operator (the IESO and Hydro One) can relieve the overloading of M30A/M31A by opening, within 15 minutes, the 230 kV circuit switcher M32S-1 and the 44 KV tie breaker JQ at Nepean MTS (the "control action") as shown in Figure 3. This control action will result in supplying South March TS, Kanata MTS and half of Nepean TS load radially from Chats Falls TS, thus relieving the loading on M30A/M31A. As shown in

Table 13, this control action will alleviate the post-contingency thermal overloading of M30A/M31A until 2025 for scenario #1 and 2023 for scenario #2. Therefore, the transmitter is required to complete uprating M30A/M31A (CAA ID: 2016-572) by year 2023.

With M30A out of service and following the control action, the loss of M31A, which is the most critical element under these conditions, was simulated. This was to ensure that the control action will not result in any post-contingency violation of the ORTAC criteria. To do so the output power of Stewartville GS, Barrett Chute GS and Chats Falls GS were ramped up from 98% dependable hydroelectric generation dispatch to 85% dependable hydroelectric generation dispatch, as per assumptions in section 4.2 for one element out of service shown in Table 4. The simulation of the loss of M31A confirmed that there will be no post-contingency violation of ORTAC criteria due to the implementation of the control action.

For the rest of the simulated contingencies, no post-contingency thermal violations were identified on the monitored elements, listed in Table 8 and Table 9.

Table 12: Thermal assessment results for the loss of M30A

Load forecast year	Project status	Flow on M31A in Scenario 1				Flow on M31A in Scenario 2			
		Pre-contingency (A)	%Cont.	Post-contingency (A)	%LTE	Pre-contingency (A)	%Cont.	Post-contingency (A)	%LTE
2022	Not connected	1011	74.8	1784	99	1076	79.7	1923	106.8
	Connected	1051	77.8	1855	103.1	1116	82.7	1995	110.8

Table 13: Thermal assessment results for the loss of M30A following the proposed control action

Load forecast year	Flow on M31A in Scenario 1				Flow on M31A in Scenario 2			
	Pre-contingency (A)	%Cont.	Post-contingency (A)	%LTE	Pre-contingency (A)	%Cont.	Post-contingency (A)	%LTE
2022	1051	77.8	1702	94.5	1116	82.7	1782	99.0
2023	1069	79.1	1723	95.7	1135	84.1	1799	99.9
2025	1086	80.5	1800	100	1159	85.8	1867	103.7

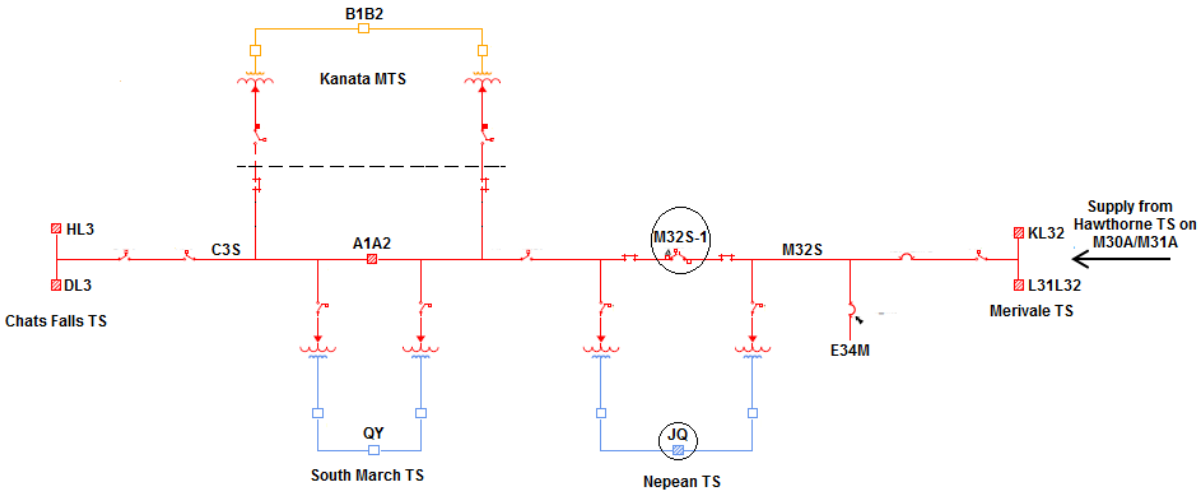


Figure 3: Single line diagram of Merivale to Chats Falls connection

4.5.2 E34M outage mode of operation

Pre-contingency with all elements in-service conditions

After the transfer of the project to be fed from S7M when E34M is on an outage, no pre-contingency thermal violations were identified on all monitored elements listed in Table 8 and Table 9.

Post-contingency with all elements in-service conditions

Under scenario #1 and scenario #2, the loss of Merivale transformer T21 resulted in thermal overloading on Merivale transformer T22, and vice versa, as shown in Table 14. This is an existing issue and the project aggravates it. To address this issue, Hydro Ottawa must disconnect up to 146 MW of load in the 115 kV system supplied by the remaining Merivale transformer, including the project as shown in Table 15. The load must be disconnected within 15 minutes from the occurrence of the contingency. Assuming it takes the transmission operator (the IESO and Hydro One) 5 minutes to analyze the event and provide instructions to the distributor, the distributor will have approximately 10 minutes to disconnect the load after receiving those instructions. Hydro Ottawa confirmed that they have this capability.

Accordingly, under E34M in-service mode of operation, if any of Merivale transformers is on outage, the automatic fast load transfer scheme should be blocked to avoid overloading the remaining Merivale autotransformer. In this case the project will be disconnected automatically from E34M but the

connection of the project to S7M will be done manually by Hydro Ottawa following instructions from the IESO; provided, the operating conditions in Ottawa 115 kV area can accommodate the project.

Table 14: Thermal assessment results for the loss of Merivale transformer T21

Load forecast year	Project status	Flow on Merivale T22 in Scenario 1				Flow on Merivale T22 in Scenario 2			
		Pre-Contingency (MVA)	%Cont.	Post-Contingency (MVA)	%LTE	Pre-Contingency (MVA)	%Cont.	Post-Contingency (MVA)	%LTE
2022	Not connected	229.2	91.7	341.8	108.6	228.4	91.4	340.8	108.2
	Connected	241.6	96.6	359.9	114.3	240.2	96.1	358.9	114.0
2032	Not connected	258.7	103.5	387	122.9	256.9	102.7	386.1	122.6
	Connected	280.0	112	420	133.4	278.3	111.3	418.2	132.8

Table 15: Post-rejection flow on Merivale T22

Load forecast year	Amount of load rejected including the project	Flow on Merivale T22 after load rejection	
		Post-rejection (MVA	%LTE
2022	99	313.5	99.9
2032	146	313	99.9

4.6 Voltage Analysis

Sections 4.2 and 4.3 of the ORTAC state that with all facilities in-service pre-contingency, the following criteria shall be satisfied:

- The pre-contingency voltages on 230 kV buses must be between 220 kV and 250 kV and 115kV buses must be between 113 kV and 127 kV;
- The post-contingency voltages on 230 kV buses must be between 207 kV and 250 kV and 115 kV buses must be between 108 kV and 127 kV; and
- The voltage change following a contingency must not exceed 10% pre-ULTC and 10% post-ULTC on 500 kV, 230 kV and 115 kV buses.

The voltage performance of the IESO-controlled grid was evaluated by examining if pre- and post-contingency voltage levels and post-contingency voltage declines remain within criteria at various locations.

4.6.1 E34M in-service mode of operation

All elements in-service/one element out of service conditions: pre-contingency

Voltages at all monitored buses, listed in Table 10, were found to be within criteria pre-contingency either with all elements in-service or under studied outage conditions.

All elements in-service/one element out of service conditions: post-contingency

Voltages at all monitored buses, listed in Table 10, were found to be within criteria post-contingency for studied contingencies, listed in Table 5 and

Table 6, except for the following two contingencies:

1. L30L34 IBO contingency with Merivale breaker K1L34 outage where the load flow cases diverged due to voltage collapse along E34M. More details are included in Section 4.7.
2. E34M contingency with an S7M LEO at Merivale TS where the load flow cases diverged due to voltage collapse along S7M. More details are in section 4.7.

4.6.2 E34M outage mode of operation

All elements in-service/one element out of service conditions: pre-contingency

Voltages at all monitored buses, listed in Table 10, were found to be within criteria pre-contingency.

Post-contingency with all 115 kV elements in-service conditions

Voltages at all monitored buses, listed in Table 10, were found to be within criteria post-contingency for all studied contingencies listed in Table 7.

4.7 Voltage Stability Assessment

To evaluate the risk of voltage collapse after the connection of the project, a voltage stability assessment was conducted.

As per section 4.5 of the ORTAC, there must be sufficient margin from the power flow at the voltage instability point, with loads modeled as constant MVA, such that the maximum pre-contingency transfer is the lesser of:

- a pre-contingency power transfer that is 10% lower than the power flow corresponding to the voltage instability point of the pre-contingency Power-Voltage (P-V) curve, and
- a pre-contingency power transfer that results in a post-contingency power flow that is 5% lower than the power flow corresponding to the voltage instability point of the post-contingency P-V curve.

4.7.1 E34M in-service mode of operation

The critical contingency was identified to be Merivale breaker L30L34 IBO under the outage to Merivale breaker K1L34, which results in E34M line end open (LEO) condition. In this case, all loads on circuits T33E and E34M, including the project, would be supplied radially from Clarington TS.

The results of the voltage stability study show that following the E34M LEO condition, the maximum load at South Nepean MTS must be limited to 20 MW in 2022 and to 14 MW in 2032 to avoid post-contingency voltage collapse, as shown in Figure 4.

Additionally, Figure 4 also shows in order to meet the ORTAC voltage criteria stated in section 5.6, the maximum load at the project must be further reduced to 12 MW in 2022 and to 4 MW in 2032.

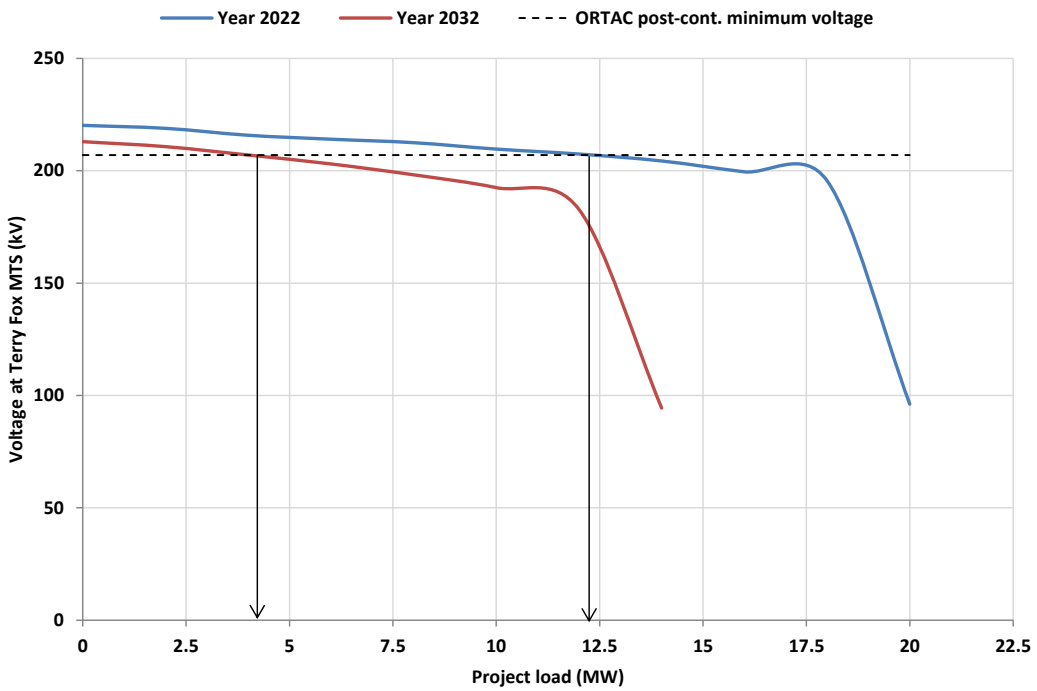


Figure 4: Voltage at Terry Fox MTS during E34M LEO at Merivale TS

The automatic fast load transfer scheme, proposed by Hydro Ottawa, will resolve the above voltage stability issue and voltage change violation by transferring the project to the 115 kV supply (S7M) once the E34M LEO condition is detected.

4.7.2 E34M outage mode of operation

With S7M LEO at Merivale TS, the transfer of the project from E34M to S7M resulted in voltage collapse along S7M. The voltage collapse occurred regardless of the generation levels at Stewartville GS and Barret Chute GS in the Madawaska area.).

Therefore, if S7M is LEO at Merivale TS, the automatic load transfer scheme must be blocked. In this case the project will be disconnected automatically from E34M but the connection of the project to S7M will be done manually by Hydro Ottawa following instructions from the IESO.

4.8 Transient Voltage Stability

This section studies the ability of the voltage along E34M to recover promptly following E34M LEO at Merivale TS condition. E34M LEO condition triggers the operation of the automatic fast load transfer scheme to transfer the project, without any intentional delay, from E34M to S7M.

In this study it was assumed that there will be no intentional delay to disconnect the project from E34M before connecting it to S7M.

The simulation shows that, following E34M LEO condition, the voltage will recover promptly to an acceptable level once the project is disconnection from E34M, as shown Figure 5.

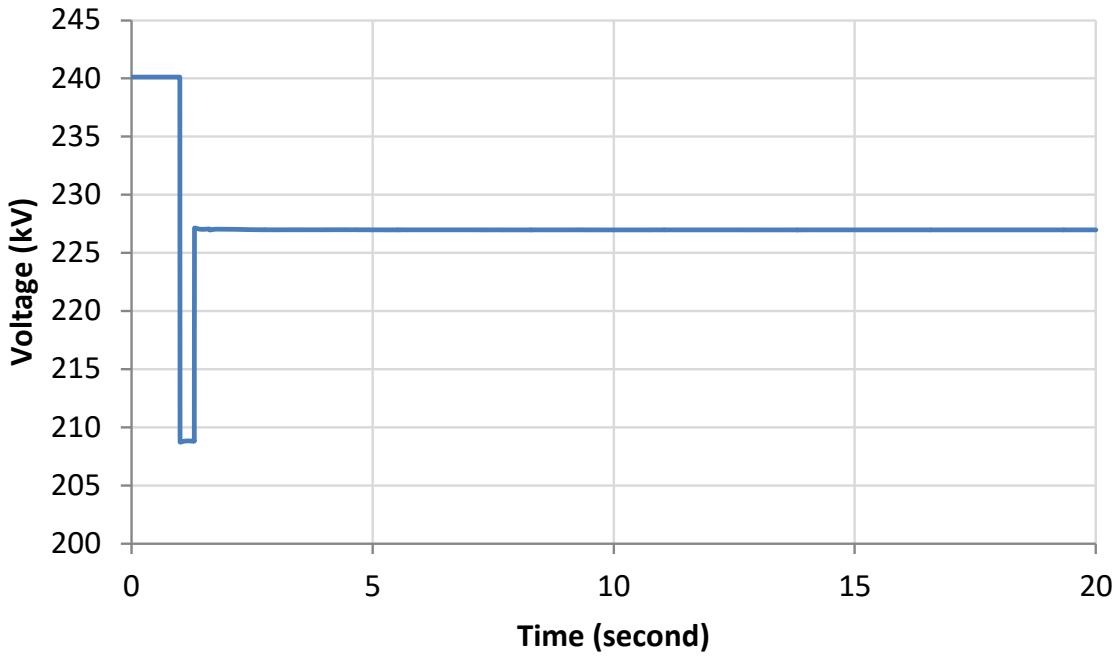


Figure 5: Voltage on Terry Fox 230 kV bus

4.9 Small Signal Stability

The transfer of the project from the 230 kV supply to the 115 kV supply did not result in any small signal stability issues at Stewartville and Barrett Chute generating stations.

4.10 Local Load Security

Sections 7.1 and 7.2 of the ORTAC specify the following criteria for load security and restoration:

a. With one element out of service, not more than 150 MW of load may be interrupted by configuration and by planned load curtailment or load rejection, excluding voluntary demand management. Planned load curtailment or load rejection, excluding voluntary demand management is permissible only to account for local generation outages
b. With two elements out of service, planned load curtailment or load rejection exceeding 150 MW is permissible only to account for local generation outages. Not more than 600 MW of load may be interrupted by configuration and by planned load curtailment or load rejection, excluding voluntary demand management.
c. All loads must be restored within approximately a target of 8 hours. When the amount of load interrupted is greater than 150 MW, the amount of load in excess of 150 MW must be restored within approximately a target of 4 hours. When the amount of load interrupted is greater than 250 MW, the amount of load in excess of 250 MW must be restored within a target of 30 minutes.

E34M in-service mode of operation

The analysis shows that after the incorporation of the project the local transmission system will continue to meet the load security criteria for all studied contingencies except for the loss of E34M where the amount of load that will be interrupted by configuration may exceed 150 MW as shown in Table 16. As the automatic fast load transfer scheme will transfer the project to the 115 kV supply following this contingency, the load loss will be reduced to 108.2 MW by 2032, meeting the ORTAC load security criteria for one element out of service.

E34M outage mode of operation

When the project is supplied by circuit S7M, the loss of S7M will result in a load loss by configuration of 254 MW as shown in Table 17. This meets the ORTAC load security criteria for two elements out of service.

Table 16: Interrupted load by configuration following the loss of E34M

Station	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Net demand forecast with extreme weather conditions without the automatic fast load transfer scheme											
Terryfox MTS	73.0	74.5	75.8	76.9	78.4	79.3	80.3	81.2	82.2	83.2	84.3
Half the load on Almonte TS	23.5	23.8	24.0	24.0	23.9	23.9	23.9	23.9	23.9	23.9	23.9
South Nepean MTS	39.2	43.2	47	49.6	53.2	56.3	58.7	61	63.7	66.1	67.5
Total load on E34M	**135.7**	**141.5**	**146.8**	**150.5**	**155.5**	**159.5**	**162.9**	**166.1**	**169.8**	**173.2**	**175.7**
Net demand forecast with extreme weather conditions with the automatic fast load transfer scheme											
Terryfox MTS	73.0	74.5	75.8	76.9	78.4	79.3	80.3	81.2	82.2	83.2	84.3
Half the load on Almonte TS	23.5	23.8	24.0	24.0	23.9	23.9	23.9	23.9	23.9	23.9	23.9
Total Load on E34M	**96.5**	**98.3**	**99.8**	**100.9**	**102.3**	**103.2**	**104.2**	**105.1**	**106.1**	**107.1**	**108.2**

Table 17: Interrupted load by configuration following the loss of S7M with E34M out of service

Station	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Net demand forecast with extreme weather conditions											
Terryfox MTS	73.0	74.5	75.8	76.9	78.4	79.3	80.3	81.2	82.2	83.2	84.3
Half the load on Almonte TS	23.5	23.8	24.0	24.0	23.9	23.9	23.9	23.9	23.9	23.9	23.9
Bridlewood MTS	14.1	15.0	14.9	15.4	16.8	18.3	18.7	18.4	18.2	18.0	17.8
Fallowfield DS	15.6	18.7	19.1	19.9	26.0	26.8	27.0	28.6	28.9	30.0	29.8
Manotick DS	5.9	5.9	6.0	5.9	5.9	5.7	5.8	5.7	5.8	5.7	5.7
Richmond DS	20.9	23.8	25.4	25.1	26.5	26.2	26.0	25.7	25.5	25.2	25.1
South Nepean MTS	39.2	43.2	47	49.6	53.2	56.3	58.7	61	63.7	66.1	67.5
Total Load on S7M	192.2	204.9	212.2	216.8	230.7	236.5	240.4	244.5	248.2	252.1	254.1

4.11 Under Voltage Load Shedding (UVLS) Scheme

The Ottawa area protection scheme was installed to provide automatic corrective measures such as short term auto reclosing for 230 kV and 500 kV circuits in Ottawa area, capacitor switching and under-voltage load shedding (UVLS) to maintain satisfactory post-contingency voltage levels in Ottawa area primarily during outages.

Adding the new load to Ottawa area increases the likelihood of initiating load rejection signals to the existing loads participating in the scheme. To ensure that the customers already participating in the UVLS will not be exposed to additional risk, the project must participate in the scheme.

-End of Section-

Appendix A: Load Forecast in Ottawa

Table 18: Ottawa loads net demand forecast with extreme weather conditions in MW

Station	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Bridlewood MTS	15.3	16.3	16.2	16.7	19.1	20.9	21.5	21.3	21.2	21.0	20.9
Marchwood MTS	69.8	70.5	71.0	71.3	71.5	70.8	70.2	69.5	68.9	68.5	68.1
Fallowfield DS	16.9	20.3	20.7	21.6	28.2	29.1	29.3	31.1	31.4	32.5	32.3
Manotick DS	10.0	10.8	11.7	11.6	11.7	11.5	11.6	11.4	11.6	11.5	11.5
Richmond DS	22.7	25.9	27.6	27.3	28.8	28.5	28.3	28.0	27.7	27.5	27.3
Manordale MTS	10.1	10.1	10.1	10.1	10.2	10.2	10.3	10.2	10.2	10.3	10.3
Limebank MTS	71.3	72.5	73.5	74.7	75.9	78.0	79.5	81.0	82.6	84.1	85.0
Marionville DS	12.3	12.4	12.4	12.5	12.4	12.3	12.2	12.2	12.1	12.1	12.6
Uplands MTS	44.9	45.2	45.4	45.5	45.5	45.6	46.0	46.5	46.5	46.6	46.7
South Gloucester DS	4.8	4.8	4.8	4.8	4.9	4.8	4.7	4.8	4.8	4.7	4.7
Greely DS	20.5	20.7	20.9	21.0	20.9	20.9	21.0	21.0	20.9	20.9	20.9
Russell DS	4.4	4.4	4.3	4.5	4.4	4.4	4.3	4.3	4.3	4.3	4.3
Centerpoint MTS	16.7	16.7	16.6	16.4	16.3	16.1	16.1	15.9	15.7	15.6	15.5
Merivale TS	20.0	20.2	20.6	20.9	20.8	21.0	21.2	21.0	20.7	20.5	20.3
National Aeronautical CTS	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Kanata MTS	72.5	72.2	71.7	71.3	70.6	70.8	70.7	70.0	69.4	69.0	68.8
South March TS	99.4	99.2	98.1	97.7	97.1	95.7	93.5	91.3	90.0	89.7	96.4
Nepean TS	138.3	137.9	138.0	137.1	135.8	134.4	133.2	132.1	131.0	130.1	129.5
Terry Fox MTS	73.8	75.4	76.8	78.1	79.3	80.4	81.5	82.6	83.6	84.7	85.9
South Nepean TS	39.2	43.2	47.0	49.6	53.2	56.3	58.6	61.0	63.7	66.1	67.5
Almonte	47.0	47.6	48.0	48.0	47.9	47.8	47.8	47.8	47.8	47.8	47.8
Nepean Epworth TS	11.8	11.9	11.8	11.7	11.5	11.4	11.3	11.2	11.0	11.1	11.0
Carling TS	76.4	76.2	80.6	80.4	79.4	78.6	78.0	77.6	76.9	76.2	75.6
Lincoln Hights TS	47.8	47.7	47.5	56.2	55.7	55.1	54.7	54.2	53.7	53.4	53.0
Woodroffe TS	34.7	35.1	51.5	51.1	50.6	50.1	49.6	49.2	48.7	48.4	48.1
Hinchey TS	40.6	42.3	44.9	47.3	48.3	49.3	50.3	51.2	52.2	52.9	54.4
Slater TS	126.7	126.5	125.6	124.6	123.2	121.7	120.3	119.2	118.0	118.0	117.0
Lisgar TS	56.4	56.7	57.6	57.5	57.3	59.7	59.4	59.8	59.5	60.3	73.6
King Edward TS	94.0	94.4	94.5	94.7	94.4	94.1	93.8	93.6	93.5	92.8	93.6
Russell TS	87.1	87.0	86.7	86.0	85.1	84.1	83.2	82.4	81.6	81.0	80.5
Overbrook TS	80.3	82.6	84.4	85.9	86.0	86.2	86.3	86.8	86.7	87.4	87.7
Riverdale TS	91.1	92.1	92.2	92.4	92.2	92.0	91.8	91.7	91.6	92.8	92.8
Albion TS	59.7	59.6	59.3	59.0	58.7	58.3	57.9	57.5	57.1	56.9	56.8
Ellwood TS	42.4	42.9	42.7	42.4	42.0	41.6	41.2	40.9	40.6	40.3	40.0
Bilberry Creek TS	54.5	55.3	54.9	54.5	54.1	53.5	53.0	52.5	52.1	51.8	51.7
Orleans TS	101.1	102.2	102.0	101.6	100.8	100.1	99.6	99.1	98.5	98.2	97.7
Cyrville MTS	42.7	43.6	43.9	44.0	44.6	44.9	45.4	45.8	45.8	45.5	45.2
Moulton MTS	32.1	32.4	32.3	32.0	31.7	31.4	31.1	30.8	30.6	30.3	30.1
Wilhaven DS	3.6	3.5	3.6	3.7	3.6	3.6	3.5	3.6	3.5	3.5	3.8
Navan DS	3.8	3.9	3.9	3.8	4.0	3.9	3.9	3.9	3.9	3.8	4.2
Cumberland DS	5.9	5.9	6.0	5.9	6.1	6.1	6.4	6.3	6.4	6.4	6.5
Hawthorne TS	139.0	140.2	141.0	141.8	141.0	140.8	141.9	140.7	143.6	144.5	144.4
National Research TS	9.1	9.1	9.0	9.0	9.1	9.1	9.2	9.1	9.2	9.2	9.2
Clarence DS	3.0	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Rockland DS	8.4	8.5	8.5	8.5	8.5	8.4	8.4	8.4	8.4	8.3	8.3
Rockland East DS	13.1	13.2	13.2	13.1	13.1	13.0	13.0	13.0	12.9	12.9	12.9
Wendover TS	9.9	10.2	10.2	10.1	10.2	10.3	10.3	10.3	10.3	9.9	10.2
Hawkesbury MTS	12.0	12.0	12.0	12.1	12.1	11.8	11.8	11.8	11.8	11.8	11.8

Appendix B: SLD of Ottawa area

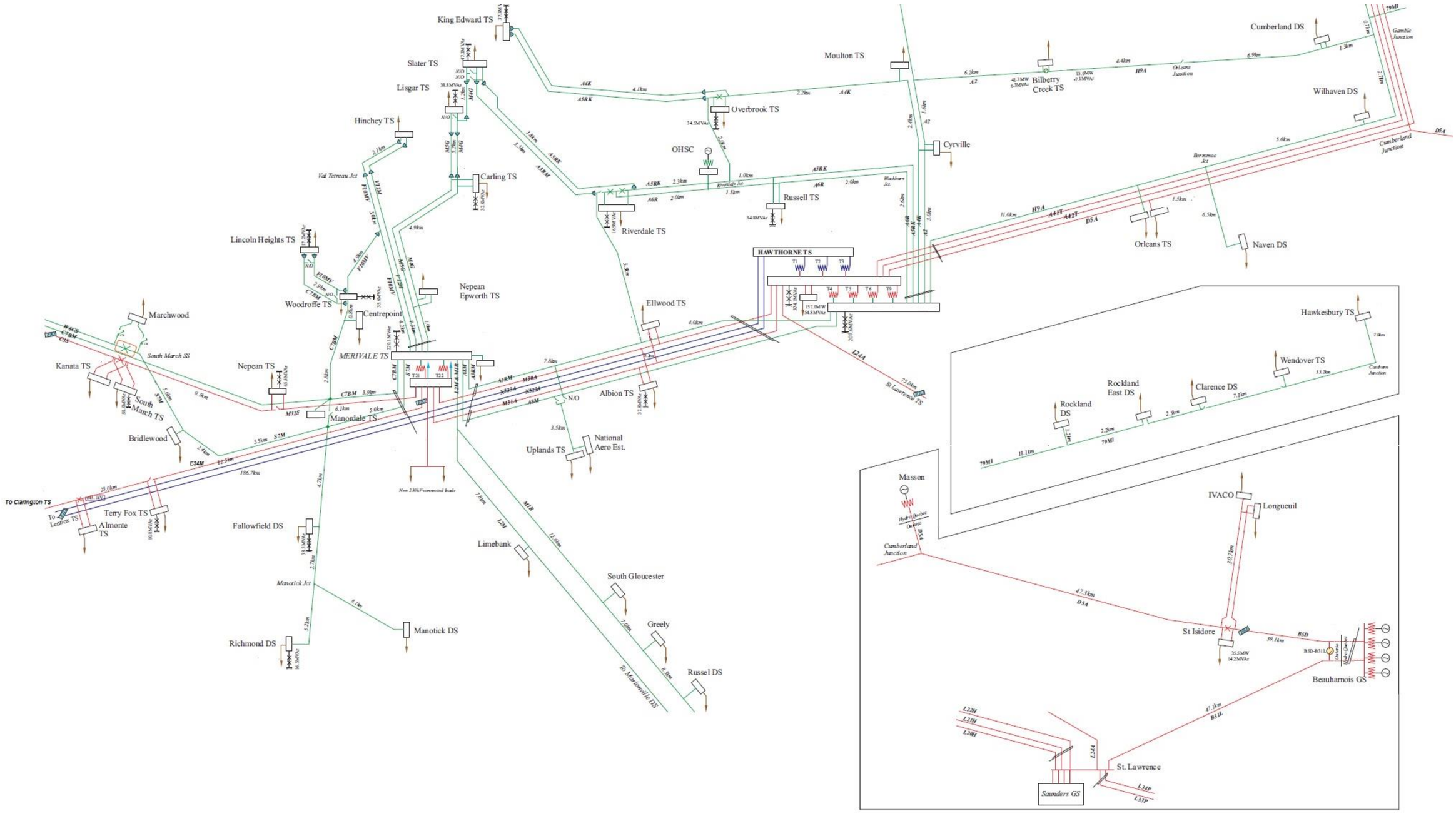


Figure 6: SLD of Ottawa area

Appendix C: Protection Impact Assessment (PIA)

Hydro One Networks Inc.
483 Bay Street
Toronto, Ontario
M5G 2P5

Executive Summary

PROTECTION IMPACT ASSESSMENT

SOUTH NEPEAN TRANSMISSION REINFORCEMENT

HYDRO OTTAWA NEW STATION CONNECTION TO E34M AND S7M CIRCUITS

PCT – 827

REVISION 0

Date: February 15, 2019

Prepared by:

Transmission Asset Management

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Disclaimer

This Protection Impact Assessment has been prepared solely for the IESO for the purpose of assisting the IESO in preparing the System Impact Assessment for the proposed connection of the proposed facility

to the IESO-controlled grid. This report has not been prepared for any other purpose and should not be used or relied upon by any person, including the connection applicant, for any other purpose.

This Protection Impact Assessment was prepared based on information provided to the IESO and Hydro One by the connection applicant in the application to request a connection assessment at the time the assessment was carried out. It is intended to highlight significant impacts, if any, to affected transmission protections early in the project development process. The results of this Protection Impact Assessment are also subject to change to accommodate the requirements of the IESO and other regulatory or legal requirements. In addition, further issues or concerns may be identified by Hydro One during the detailed design phase that may require changes to equipment characteristics and/or configuration to ensure compliance with the Transmission System Code legal requirements, and any applicable reliability standards, or to accommodate any changes to the IESO-controlled grid that may have occurred in the meantime.

Hydro One shall not be liable to any third party, including the connection applicant, which uses the results of the Protection Impact Assessment under any circumstances, whether any of the said liability, loss or damages arises in contract, tort or otherwise.

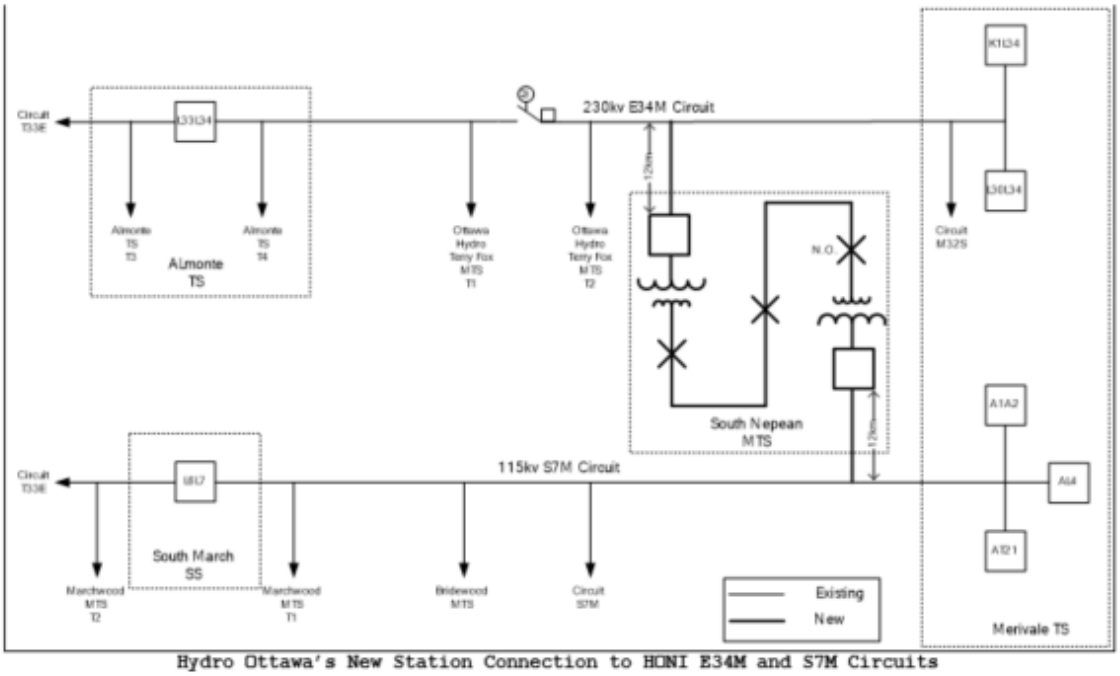
Revision History

Revision	Date	Change
0	February 15, 2019	Initial release.

PIA – Hydro Ottawa New Station Connection to E34M and S7M Circuits
Revision: 0

EXECUTIVE SUMMARY

The installation of the proposed connection is feasible as long as the proposed changes/additions are made in this document and in the future detailed specifications.



Hydro Ottawa's New Station Connection to HONI E34M and S7M Circuits

PROTECTION HARDWARE REQUIREMENTS

Existing Hydro One E34M line protections at Merivale TS and Almonte TS can be retained to facilitate bi-directional transfer trip (TT) and line end open (LEO) signals between South Nepean MTS and Hydro One terminal stations.

Existing Hydro One S7M line protection at Merivale TS needs to be upgraded to facilitate bi-directional transfer trip (TT) and line end open (LEO) signals between South Nepean MTS and Hydro One terminal stations.

Transmission System Code (TSC) compliant redundant transformer protections are required at South Nepean MTS.

PROTECTION SETTING REQUIREMENTS

Existing Hydro One E34M and S7M line protection schemes and settings at Merivale TS, Almonte TS and South March SS will be retained.

Logic for load transfer from/to 230kV system to/from 115kV system needs to be implemented at South Nepean MTS.

PIA – Hydro Ottawa New Station Connection to E34M and S7M Circuits
Revision: 0

Telecommunication Requirements

New telecommunication links between South Nepean MTS and Hydro One terminal stations will be required.

Customer Impact Assessment

Please refer to **Attachment 1** for the Customer Impact Assessment ("CIA") prepared by Hydro One.

Hydro One has completed a draft CIA for the PSN Project. The draft CIA results show that the Project improves the reliability to the area customers and that there are no adverse impacts on short-circuit levels and voltage performance as a result of the Project.

This Application will be updated with the final CIA upon its completion. The CIA is expected to be finalized and submitted to the OEB within 10 days after Hydro One's receipt of the final SIA from the IESO.

Hydro One Networks Inc.
483 Bay Street
Toronto, Ontario
M5G 2P5

CUSTOMER IMPACT ASSESSMENT

SOUTH NEPEAN TRANSMISSION REINFORCEMENT PROJECT

Revision: Draft

Date: **May 24th 2019**

Issued by**:** **System Planning Division**
Hydro One Networks Inc.

Prepared by:

Jean Morneau
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System Planning Division
Hydro One Networks Inc.

Approved by:

Farooq Qureshy
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System Planning Division
Hydro One Networks Inc.

Disclaimer

This Customer Impact Assessment was prepared based on preliminary information available about the South Nepean Transmission Reinforcement Project. It is intended to highlight significant impacts, if any, to affected transmission customers early in the project development process and thus allow an opportunity for these parties to bring forward any concerns that they may have, including those needed for the review of the connection and for any possible application for Leave to Construct. Subsequent changes to the required modifications or the implementation plan may affect the impacts of the proposed connection identified in this Customer Impact Assessment. The results of this Customer Impact Assessment and the estimate of the outage requirements are subject to change to accommodate the requirements of the IESO and other regulatory or municipal authority requirements. The fault levels computed as part of this Customer Impact Assessment are meant to assess current conditions in the study horizon and are not intended to be for the purposes of sizing equipment or making other project design decisions. Many other factors beyond the existing fault levels go into project design decisions.

Hydro One Networks shall not be liable to any third party which uses the results of the Customer Impact Assessment under any circumstances whatsoever, for any indirect or consequential damages, loss of profit or revenues, business interruption losses, loss of contract or loss of goodwill, special damages, punitive or exemplary damages, whether any of the said liability, loss or damages, arises in contract, tort or otherwise.

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CUSTOMER IMPACT ASSESSMENT

PROPOSED SOUTH NEPEAN TRANSMISSION REINFORCEMENT PROJECT

1.0 INTRODUCTION

1.1 Purpose

This Customer Impact Assessment (CIA) study assesses the potential impact of the proposed South Nepean Transmission Reinforcement Project on the transmission customers of the area. This work is being carried out in accordance with Section 6 of the Ontario Energy Board's Transmission System Code ("TSC"), which requires Hydro One Networks Inc. (Hydro One) to carry out a Customer Impact Assessment ("CIA") study to assess the impact of the proposed transmission modification on existing transmission customers in the affected area. This assessment does not evaluate the overall impact of the South Nepean Transmission Reinforcement Project on the bulk electricity system.

This study is intended to supplement the System Impact Assessments (SIA) CAA ID 2017-627 and 2017-629 issued by the IESO.

This draft CIA for the South Nepean Transmission Reinforcement Project is issued for comments from transmission connected customers.

1.2 Background

Hydro Ottawa is proposing to build a new station, South Nepean MTS, in the South Nepean Area to address load growth and existing stations transformation capacity needs. The new station will initially consist of two step-down transformers: one 100MVA 230kV-27.6kV and one 100MVA 115kV-27.6kV. The LV switchyard will consist of 6 feeder positions with associated equipment. The station will be located along Cambrian road, approximately 1.3km from the existing S7M Manotick JCT to Manotick DS right of way.

In order to supply this new station, Hydro Ottawa requested Hydro One to rebuild a section of 115kV single circuit wood pole S7M as a double circuit 230kV line, please see Figure 1. The line will be rebuilt for a distance of approximately 10.9 km from S7M STR 673N JCT to Cambrian Road JCT. At S7M STR 673N JCT, one circuit will be connected to 115kV circuit S7M and will be operated at 115kV to supply the area's existing stations as well as the new station. The other circuit of the double circuit line will connect to 230kV circuit E34M at S7M STR 673N JCT. At Cambrian JCT, both S7M and E34M will be tapped and approximately 1.3km of double circuit 230kV line will be brought to the new station, please see Figure 2.

Hydro Ottawa's new station will be capable of being supplied by either circuit. The station load will be normally supplied by the 230kV circuit with the 115kV circuit used as an alternate supply. The station will be equipped with a transfer switching scheme which will transfer supply from the E34M to the S7M circuit if the E34M circuit is unavailable. Please refer to Figure 2.

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1.3 Connected Customers

The focus of this study is on transmission connected customers fed by circuits S7M and E34M. The area considered by this CIA is shown in Figure 2. The affected stations and customers are shown in Table 1 below:

Table 1. Transmission Connected Customers.

Station	Customer
Almonte TS	Hydro One
Bridlewood MTS	Hydro Ottawa
Fallowfield MTS	Hydro Ottawa
Manotick DS	Hydro One
Marchwood MTS	Hydro Ottawa
Richmond South DS	Hydro Ottawa
Terry Fox MTS	Hydro Ottawa

2.0 STUDY RESULTS

Load flows and short circuit analysis were conducted to access the impact of the proposed South Nepean Transmission Project. The voltages were assessed as per IESO's Market Rules for buses 50 kV and above and CSA 235 for buses below 50 kV as recommended in the Appendix 2 of Ontario Energy Board's Transmission System Code (TSC).

2.1 LOAD FLOW

Load flow results indicate line and transformer loadings are within equipment ratings for all conditions with the new South Nepean MTS supplied from 230kV circuit E34M. In the event of an E34M outage or an E34M line end open (LEO) at Merivale TS (which can result in excessive voltage drop at the station) a protection scheme will be provided to switch the station supply to the 115kV circuit S7M.

The study has indicated under certain extreme conditions – low Madawaska River generation and autotransformer T21 out at Merivale TS – the remaining autotransformer T22 can be overloaded. A protection blocking scheme will be provided at the new station to prevent the transfer of the station from the E34M circuit to the S7M circuit under these conditions. Please refer to IESO document CAA 2017-627/629 for further details.

The CIA also assessed the impact of the project on the area. Under normal operating conditions, no voltage violations were found for the station supplied by either circuit. For the loss of either W6CS or T33E, the voltages were also within limits. Please refer to Table B2 in Appendix B.

2.2 STATION OPERATION

Given the station will be supplied from two different voltage levels; this section lists the special considerations for its operation.

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Reverse Power Flow

To prevent circulating power flow between the 230kV and the 115kV systems through South Nepean MTS transformers, the station will have to be operated with one transformer supplying the entire load. Hydro Ottawa is planning to have the station normally supplied from 230kV circuit E34M, with LV breakers T2B2 and B1B2 normally closed and with T1B1 normally open. When the station is supplied from 115kV circuit S7M, LV breakers T1B1 and B1B2 will be closed and breaker T2B2 will be open.

Change of Supply Circuit and Load Transfer

Some operating conditions may require temporary parallel of E34M and S7M through South Nepean MTS 27.6kV switchgear. The situations considered are as follow:

- Transfer from one supply circuit to the other.
- Transfer of a feeder from one transformer to the other when the LV bus tie B1B2 is opened (both S7M and E34M are supplying the station with the bus tie open).

The parallel of E34M and S7M through South Nepean MTS LV switchgear was studied to determine its magnitude. With both E34M and S7M connected at Merivale TS, up to 22MW was found to be transferred from E34M to S7M. In order to prevent load loss, the temporary parallel of S7M and E34M through the LV switchgear is permitted for these situations. Please also refer to Table B2 in Appendix B.

Please note that both S7M and E34M must be connected at Merivale TS to allow the parallel at South Nepean MTS and that the OGCC be notified.

2.3 SHORT CIRCUIT STUDY

The 115kV and 230kV fault levels at the stations considered by the CIA are not expected to significantly change due to the South Nepean Transmission Reinforcement project. The fault levels at the area stations are shown in Appendix C.

Customers are requested to review the fault levels and ensure that the expect short circuit currents are within their equipment ratings.

3.0 CUSTOMER RELIABILITY

No significant reliability issue is expected to arise as part of this project. For the duration of the construction of the project, a bypass for circuit S7M will be built to ensure continued supply to the existing stations.

4.0 CONCLUSION

This report concludes that the proposed South Nepean Transmission Reinforcement Project will not have any adverse effects on the transmission connected customers of the area provided that the requirements of the SIA and CIA are met.

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5.0 APPENDIX A

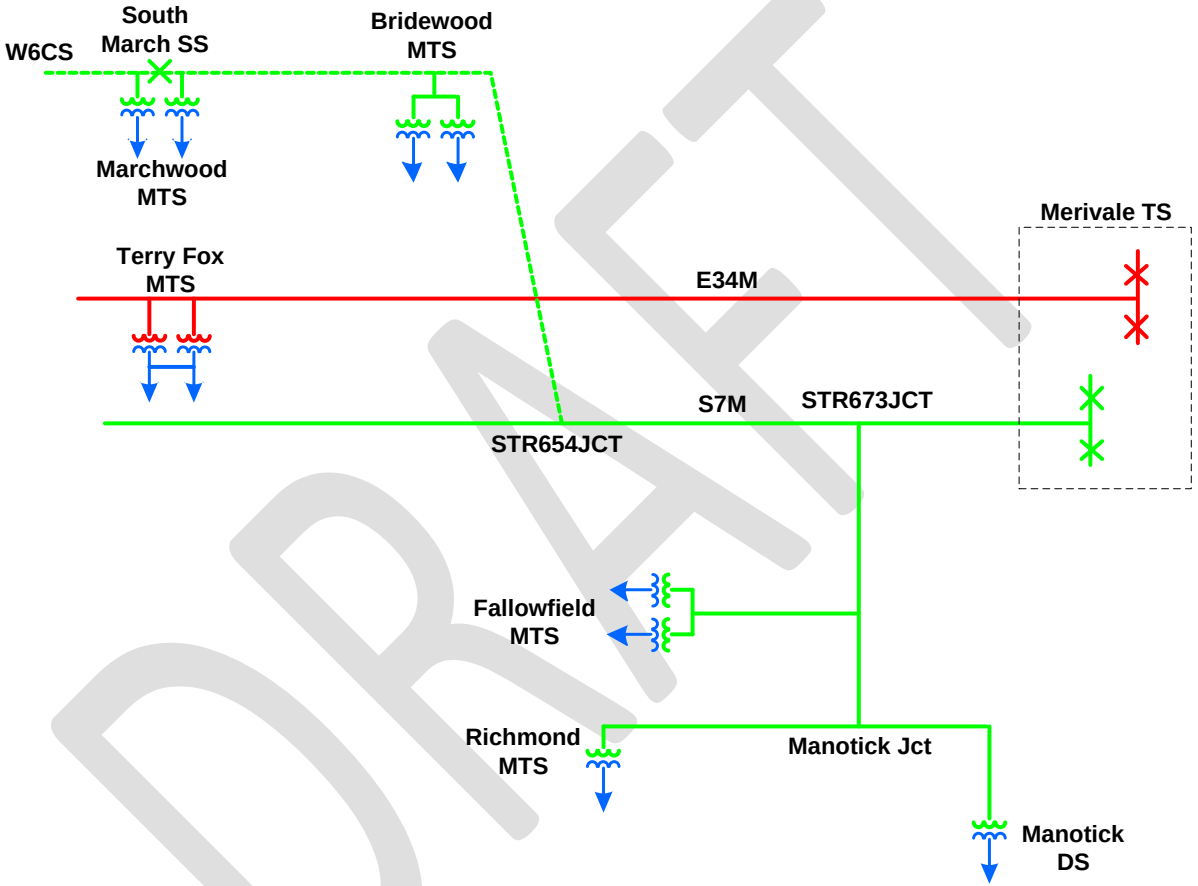


Figure 1. Single line diagram – Existing System

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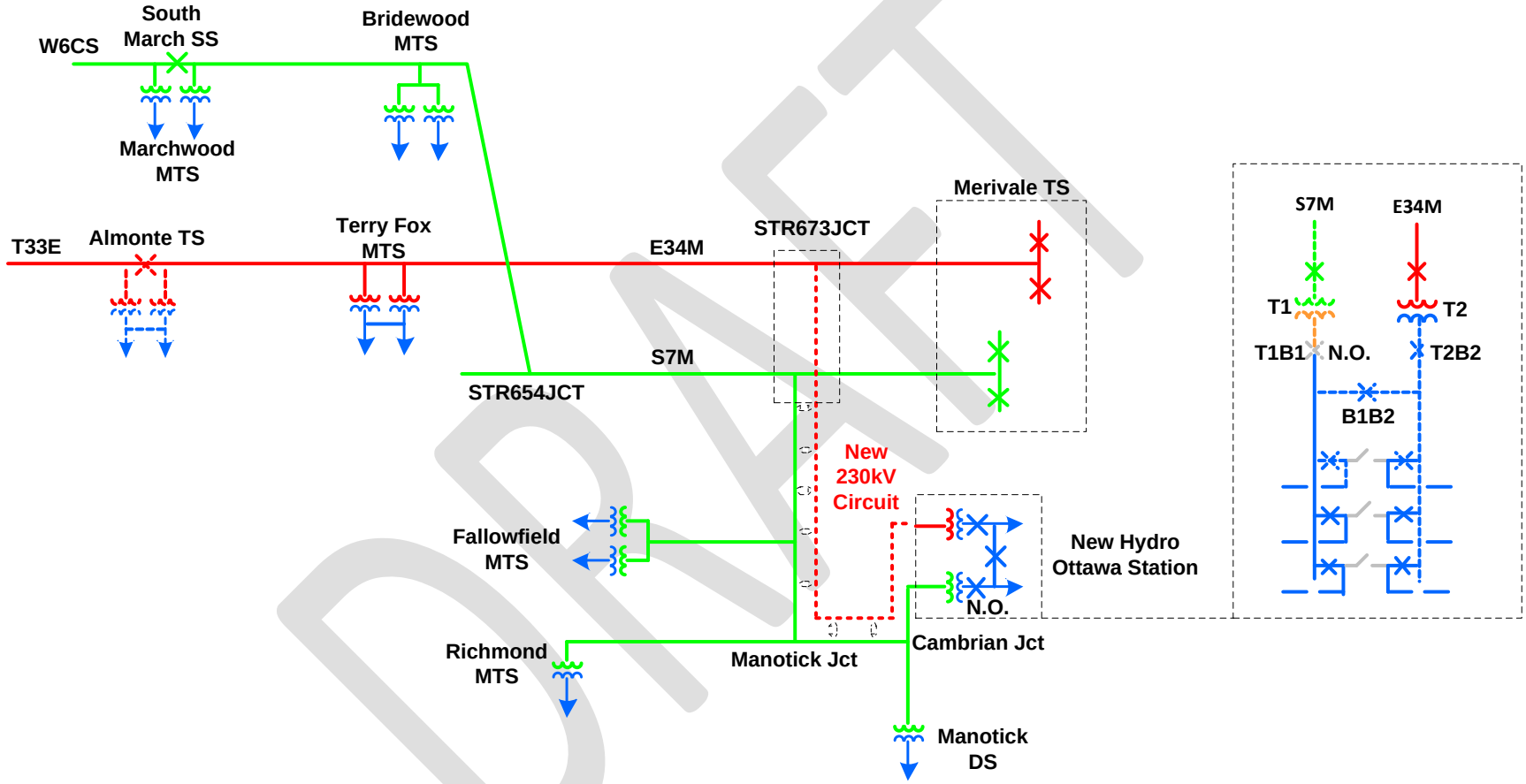


Figure 2. Single line diagram – South Transmission Reinforcement

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6.0 APPENDIX B

The load forecast for the stations considered in this study is shown in Table B1. The load forecast was obtained from the currently ongoing City of Ottawa IRRP summer load forecast developed by the IESO and the LDCs[1].

As mentioned in Section 2.1, the station will be normally operated in a way that will prevent the parallel of E34M and S7M. However there are situations that will require temporary parallels to prevent momentary load interruptions during transfers. The reverse power flow was studied. Please see Table B2, results are shown for the 1st, 10th, and 15th year of the project in service.

The area voltage performance is shown in Table B3 and considers the new station being supplied by either S7M or E34M. Under normal supply condition and for the loss of either W6CS or T33E, no voltage violations were found. Please note for the results presented in Table B3 that the load at Marchwood MTS is limited to the station LTR of 33MW. Solutions to address the transformation capacity need of the area will be addressed as part of the City of Ottawa IRRP.

Load Flow Assumptions:

- Power factor: 0.9
- Load forecast (net forecast, extreme weather) developed by the City of Ottawa IRRP working is used.
- A 98% of the time dependable hydroelectric generation dispatch.

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[1] Load forecast subject to change as the IRRP is not finalized at the moment this CIA is issued.

Table B1. Load forecast from City of Ottawa IRRP. Load is shown in MW

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Bridlewood MTS	15.3	16.3	16.2	16.7	19.1	20.9	21.5	21.3	21.2	21.0	20.9	20.8	20.8	20.8	20.9	20.9
Marchwood MTS	69.8	70.5	71.0	71.3	71.5	70.8	70.2	69.5	68.9	68.5	68.1	67.9	67.9	67.9	67.9	67.9
Fallowfield DS	16.9	20.3	20.7	21.6	28.2	29.1	29.3	31.1	31.4	32.5	32.3	33.1	33.2	33.2	33.2	33.3
Manotick DS	6.5	6.5	6.5	6.4	6.4	6.2	6.4	6.2	6.4	6.2	6.3	6.8	6.9	6.8	6.9	6.8
Richmond DS	22.7	25.9	27.6	27.3	28.8	28.5	28.3	28.0	27.7	27.5	27.3	27.3	27.2	27.1	27.1	27.2
Terry Fox MTS	73.8	75.4	76.8	78.1	79.3	80.4	81.5	82.6	83.6	84.7	85.9	85.7	85.7	85.6	85.6	85.7
South Nepean MTS	39.2	43.2	47.0	49.7	53.2	56.4	58.7	61.1	63.9	66.2	67.7	69.4	72.0	75.2	75.2	75.3
Almonte TS	47.0	47.6	48.0	48.0	47.9	47.8	47.8	47.8	47.8	47.8	47.8	47.8	47.8	47.8	47.8	47.8

Table B2. Reverse power flow on transformer T1 when the 230kV and 115kV network are paralleled through South Nepean MTS 27.6kV.

Year	South Nepean MTS Loading	Transformer T1			Transformer T2		
		MW	MVAr	MVA	MW	MVAr	MVA
2022	Full load	-2.6	10.5	10.8	41.9	11.7	43.5
	Half load	-11.4	6.3	13	31.1	5	31.5
	No load	-20.2	2.4	20.3	20.2	-1.1	20.2
2032	Full load	8.2	15.5	17.6	59.8	24.5	64.6
	Half load	-7.1	7.7	10.5	41	11.8	42.7
	No load	-22.2	0.9	22.2	22.2	0.7	22.3
2037	Full load	11.4	17.3	20.8	64.2	27.9	70
	Half load	-5.5	8.4	10.1	43.3	13.3	45.3
	No load	-22.3	0.8	22.4	22.4	0.8	22.4

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Table B3. Voltage change with South Nepean MTS supplied by S7M or E34M with 2037 load.

	Voltage (kV)	South Nepean MTS supplied by E34M			South Nepean MTS supplied by S7M		
		all	T33E O/S		all	W6CS O/S	
			pre	post		pre	post
Almonte TS T33E	230	244.5			244.5	244.3	244.3
Almonte TS E34M	230	244.5	243.2	243.2	244.5	244.3	244.3
Merivale TS	230	246.3	246.0	246.0	245.7	245.5	245.5
South Nepean MTS E34M	230	243.8	243.3	243.3	245.4	245.2	245.2
Terry Fox MTS	230	244.7	244.0	244.0	244.7	244.5	244.5
Bridlewood MTS	115	122.4	122.2	122.2	119.8	119.3	119.3
Fallowfield MTS	115	123.0	122.8	122.8	118.8	118.5	118.5
Manotick DS	115	122.5	122.3	122.3	116.7	116.3	116.3
Marchwood MTS S7M	115	121.6	121.4	121.4	119.1	118.5	118.5
Marchwood MTS W6CS	115	121.6	121.4	121.4	119.1	-	-
Merivale TS	115	125.9	125.7	125.7	124.5	124.3	124.3
Richmond MTS	115	122.3	122.1	122.1	117.3	117.0	117.0
South Nepean MTS S7M	115	122.7	122.5	122.5	116.5	116.1	116.1
South March SS	115	121.6	121.4	121.4	119.1	118.5	118.5
Almonte TS J Bus	44	46.7	-	-	46.7	46.6	46.6
Almonte TS Q Bus	44	46.7	46.4	46.4	46.7	46.6	46.6
Bridlewood MTS	27.6	27.9	27.8	27.8	27.2	27.1	27.3
Fallowfield MTS J Bus	27.6	27.5	27.5	27.5	27.6	27.5	27.5
Fallowfield MTS Q Bus	27.6	27.6	27.6	27.6	27.6	27.5	27.5
Marchwood MTS B1 Bus	27.6	28.8	28.8	28.8	28.4	25.9	28.4
Marchwood MTS B2 Bus	27.6	28.8	28.8	28.8	28.4	25.9	28.4
South Nepean MTS LV	27.6	28.8	28.8	28.8	28.1	28.0	28.0
Terry Fox MTS J Bus	27.6	27.6	27.5	27.5	27.6	27.6	27.6
Terry Fox MTS Q Bus	27.6	27.6	27.5	27.5	27.6	27.6	27.6
Bridlewood MTS	8.32	8.4	8.4	8.4	8.3	8.2	8.2
Manotick DS B1 Bus	8.32	8.8	8.8	8.8	8.8	8.8	8.8
Manotick DS B2 Bus	8.32	8.9	8.9	8.9	8.8	8.8	8.8
Richmond MTS	8.32	8.6	8.6	8.6	8.6	8.5	8.5

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7.0 APPENDIX C

Table C1. Short Circuit Levels

Station	Voltage	3 Phase (kA)		LG (kA)	
		Pre	Post	Pre	Post
Almonte TS	230	6.3	6.3	4.5	4.5
South Nepean MTS	230		9.0		7.4
Merivale TS	230	18.0	18.0	19.2	19.3
Terry Fox MTS	230	10.6	10.6	9.3	9.4
Bridlewood MTS	115	9.4	9.4	7.1	7.1
South Nepean MTS	115		6.7		4.8
Fallowfield MTS	115	9.9	9.9	7.0	7.7
Manotick DS	115	5.3	5.6	3.5	3.9
Marchwood MTS	115	8.0	8.0	5.6	5.6
Merivale TS	115	24.6	24.6	27.4	27.4
Richmond MTS	115	6.6	6.6	4.1	4.4
South March SS	115	8.0	8.0	5.6	5.6
Almonte TS J Bus	44	6.0	6.0	3.2	3.2
Almonte TS Q Bus	44	5.8	5.8	3.1	3.1
Manotick DS B1 Bus	8.32	5.5	5.6	5.7	5.7
Manotick DS B2 Bus	8.32	5.1	5.1	5.2	5.3

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