

GREATER OTTAWA REGION SCOPING ASSESSMENT OUTCOME REPORT

SEPTEMBER 12, 2018



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Greater Ottawa Study Team

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

Scoping Assessment Outcome Report Summary

Region: Greater Ottawa

Start Date: June 18, 2018

End Date: September 12, 2018

1. Introduction

This Scoping Assessment Outcome Report is part of the Ontario Energy Board's ("OEB" or "Board") Regional Planning process. The Board endorsed the Planning Process Working Group's Report to the Board in May 2013 and formalized the process and timelines through changes to the Transmission System Code and Distribution System Code in August 2013.

The first cycle of the regional planning process for the Greater Ottawa Region was completed in December 2015. A number of needs were identified to arise in the near- and medium-term timeframes. Solutions were recommended to address the near-term needs, while a reconfirmation of the medium-term needs with better information in the next planning cycle was recommended.

The new cycle of the regional planning process for the Greater Ottawa Region was triggered in February 2018. This cycle was triggered early to accommodate the timelines and information requirements needed for Hydro Ottawa's next transmission rate application in 2019. The earlier start of the new planning cycle also provides an opportunity to reconfirm the timing of the medium-term needs identified in the last cycle.

The Needs Assessment ("NA") is the first step in the regional planning process and was carried out by the Study Team lead by Hydro One Networks Inc. ("Hydro One") for the Greater Ottawa Region. This report was issued on June 15, 2018 and concluded that a number of needs did not require regional coordination. The need information from the Needs Assessment will be input into the scoping process to determine the nature of the planning process to address the identified needs.

During the Scoping Assessment, the participants reviewed the nature and timing of all the known needs in the Region to determine the most appropriate planning approach going forward. This process also determines the best geographic grouping of the needs in order to efficiently study the needs. The planning approaches considered include an Integrated Regional Resource Plan ("IRRP") – where non-wires options have potential to address needs; a Regional Infrastructure Plan ("RIP") – which considers wires-only options; or a local plan undertaken by the transmitter and affected local electricity distribution company ("LDC") – where no further regional coordination is needed.

Additional information on selecting a planning approach can be found in Appendix B.

This Scoping Assessment report:

- Lists the needs requiring more comprehensive planning, as identified in the Needs Assessment report;
- Reassesses the areas that need to be studied and the geographic grouping of the needs;
- Determines the appropriate regional planning approach and scope for each sub-region where a need for regional coordination or more comprehensive planning is identified;

- Establishes a term of reference for an IRRP if an IRRP is required;

Establishes the composition of the Technical Working Group (“Working Group”) for the IRRP.

2. Team

The Scoping Assessment was carried out with the following Regional Participants:

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

3. Categories of Needs, Analysis and Results

3.1 Overview of the Region

The Greater Ottawa Region is located in eastern Ontario and covers the municipalities bordering the Ottawa River from Stewartville in the west to Hawkesbury in the east and north of Highway 43. At the center of this region is the Ottawa Area, comprising the City of Ottawa, including Kanata, Nepean and Orléans. The Greater Ottawa Region lies within the traditional territory of the Algonquin peoples, including the Algonquins of Pikwakanagan and nine other communities. All ten are represented for the purposes of consultation and engagement by the Algonquins of Ontario Consultation Office.

This region includes all or part of the following Counties and Districts: the City of Ottawa and Clarence-Rockland, the Towns of Arnprior, Carleton Place, Mississippi Mills, and Townships of East Hawkesbury, Champlain, Alfred and Plantagenet, Russell, Beckwith, Drummond/North Elmsley, Tay Valley, North Frontenac, Lanark Highlands, McNab/Braeside, Greater Madawaska and the Municipality of The Nation. For electricity planning purposes, the planning region is defined by electricity infrastructure boundaries, not municipal boundaries.



Figure 1: Electricity Infrastructure in the Greater Ottawa Region

The Ottawa Area sub-region is shown in Figure 2 and comprises primarily the City of Ottawa. It is supplied by two (2) 230/115 kV autotransformer stations (Hawthorne TS and Merivale TS, eight (8) 230 kV and thirty-three (33) 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.

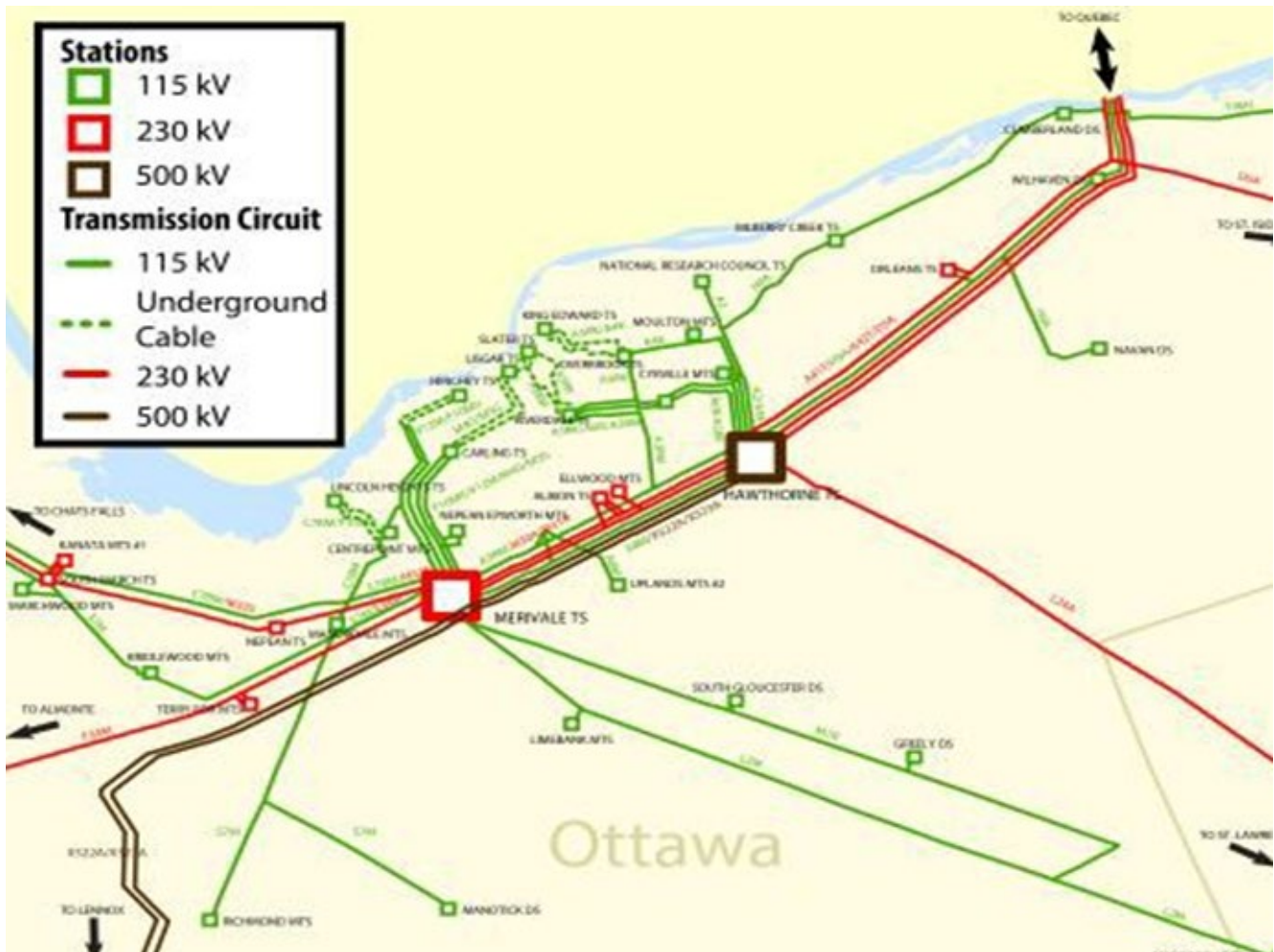


Figure 2: Electricity Infrastructure in the Ottawa Area Sub-Region

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 East sub-region is shown in Figure 3 and is served by three (3) 230 and five (5) 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 including embedded LDC Hydro 2000 Inc. It also includes a large industrial customer in L’Orignal, Ontario.

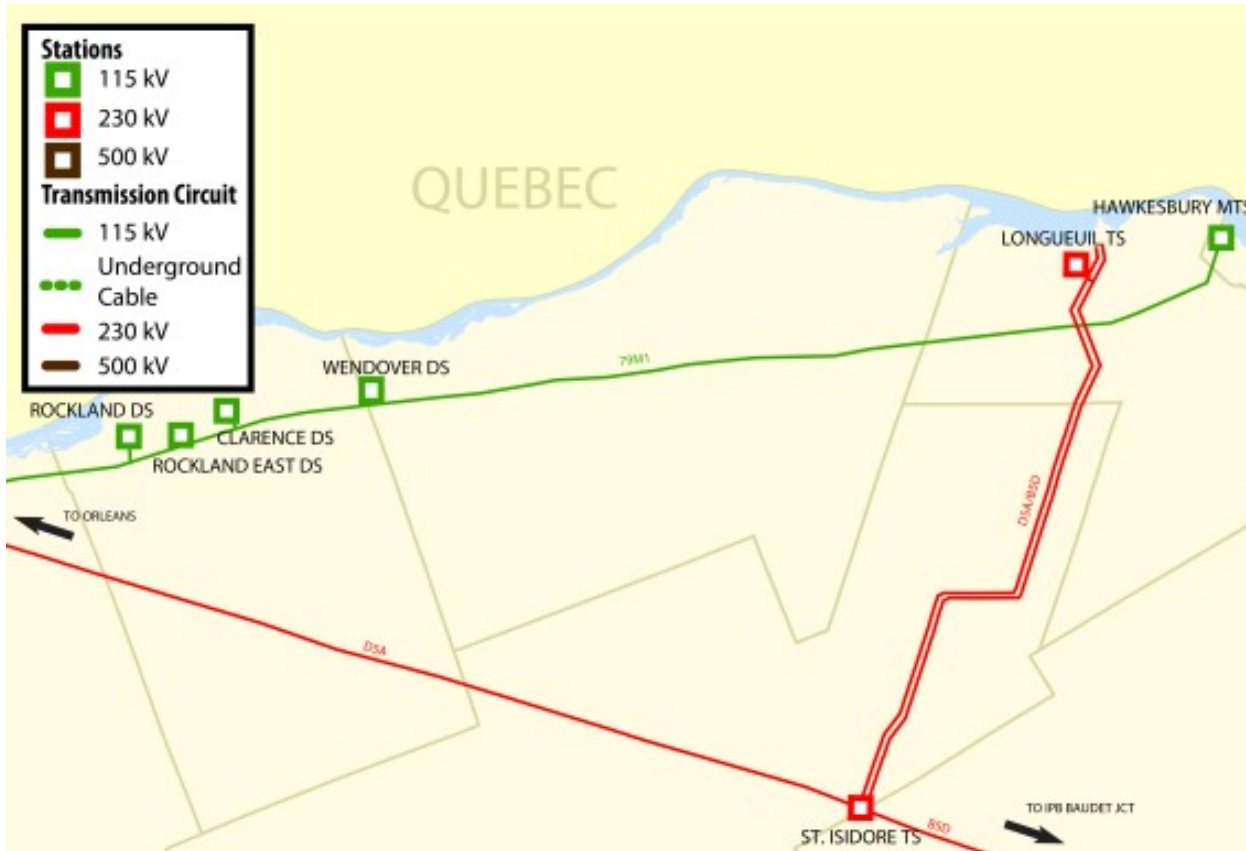


Figure 3: Electricity Infrastructure in the Other Ottawa East Sub-Region

The Outer Ottawa West sub-region is shown in Figure 4, and is served by one (1) 230 kV and two (2) 115 kV step-down transformer stations. Hydro One Distribution is the LDC that supplies end use customers for these stations including embedded LDCs Ottawa River Corporation and Renfrew Hydro. The area includes the following generating stations: Barret Chute GS, Chats Falls GS and Stewartville GS with a peak generation capacity of about 450 MW.

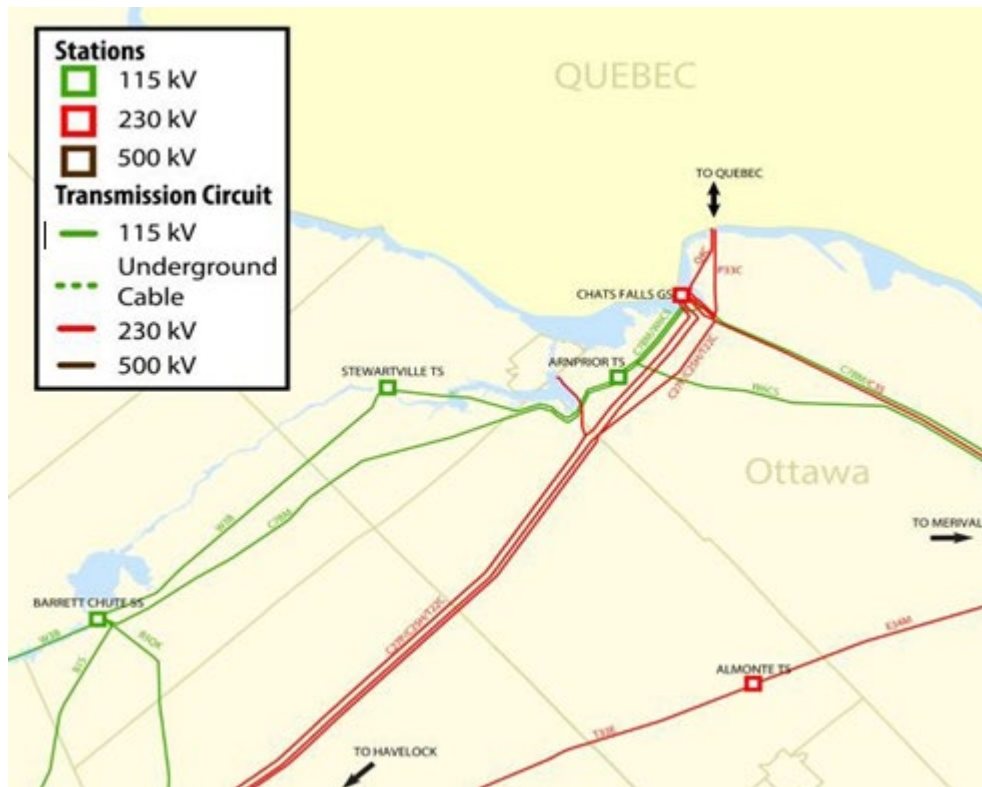


Figure 4: Electricity Infrastructure in the Outer Ottawa West Sub-Region

3.2 Background of the Previous Planning Process

The regional planning process was formalized by the OEB in August 2013. To prioritize and manage the process, Ontario was organized into 21 regions, each of which was assigned to one of three groups where Group 1 regions were being reviewed first. Greater Ottawa became one of the Group 1 planning regions. At that time, planning work for the Ottawa Area was already underway; the IRRP for Ottawa Area sub-region was carried out in parallel with the Needs Assessment (“NA”) for the remainder of the Region, i.e. Outer Ottawa sub-region.

In July 2014, Hydro One Transmission published the first NA report. The scope of the report included a review of system capability, reliability assessment and asset sustainment timelines for the Outer Ottawa sub-region. The report concluded, and the Regional Participants agreed that there was no need for further integrated planning for the sub-region and that localized wires only plans be developed for the needs identified.

The first IRRP report for the Ottawa sub-region was published in April 2015. The IRRP used a 20-year outlook to allow the long-term trends in a region to be considered while implementing near-term actions. To address near- and mid-term needs in the first 10 years of the forecast, the former Ontario Power Authority (“OPA”) provided a letter to Hydro One in June 2014 to initiate work on four transmission reinforcement projects. The achievement of conservation and demand targets in the area

was accounted for before recommending the wires options.

The transmission reinforcement projects recommended were:

- Replacing two (2) 230/115 kV transformers at Hawthorne TS, which were approaching end-of-life, with higher rated transformers.
- Installing an in-line circuit breaker on 230 kV circuit M29C at Almonte TS to reduce interruptions to loads connected to M29C, including Terry Fox MTS.
- Increasing the rating of the section of circuit S7M supplying Fallowfield DS, Manotick DS and Richmond DS.
- Rebuilding the section of circuit A5RK between Overbrook TS and the junction with circuit A6R near Riverdale TS into a double-circuit line and reconfiguring Overbrook TS to being supplied from A5RK/A6R.

In addition to the above recommendations, the OPA also recommended that a transmission and distribution plan be developed to supply the load served by Bilberry Creek TS, a station that was identified for a 2020 end of life (“EOL”) date. Additional information received during the first IRRP identified that a decision on the station could be made around 2020 as end of life of the station was determined be 2023.

In addition to the projects identified in the first hand-off letter, the IRRP also identified an immediate need to supply demand growth in the South Nepean area, and the longer-term need to reinforce the 115 kV supply capability in the broader West Ottawa area. To address these needs, a second hand-off letter in April 2016, issued by the Independent Electricity System Operator (“IESO”) recommended that it would be beneficial to commence early planning work for a new TS and 230kV connection line to address the near-term need for capacity in the South Nepean area. The two needs are linked and adding a new 230 kV supplied station to the area will take some of the pressure off the West Ottawa 115 kV system and allow time to develop a longer-term solution.

The “Power South Nepean” project lead by Hydro Ottawa and Hydro One commenced in April 2016 in response to this recommendation. Hydro One and Hydro Ottawa are in the midst of development work for the project.

Following the IRRP, a regional infrastructure plan (“RIP”) was published in December 2015 to address transmission needs identified in the needs assessment and the IRRP. The plans to address some of these needs were further developed in the RIP. Some of the needs that were in the medium- to longer-term time frame were to be confirmed in the next regional planning cycle.

This second regional planning cycle started with the NA report published by Hydro One in June 2018. The needs identified in this report from the basis of the analysis for this scoping assessment and are discussed in further detail in section III.

3.3 Needs Identified

Hydro One’s needs assessment identified a number of needs in the Greater Ottawa Region based on their most up to date sustainment plans and a 10-year demand forecast. Needs identified for the Greater Ottawa Region have been outlined below and include: a summary of the current projects and plans underway to respond to existing needs, and needs to be addressed.

Projects and Plans Underway

The NA completed recently by Hydro One listed needs that were identified in the previous planning cycle and that are currently being addressed or work is planned to occur in the near future. Table 1-1 below lists these needs and the related plans to address these needs. The plans in Table 1-1 provide a basis for future assessments of the region and should be accounted for in the next planning cycle

Table 1-1: Projects and Plans Underway (Ottawa Area sub-region)

Facilities	Need	Plans
Hawthorne TS T5 and T6, T7 and T8	Station Capacity-LTR exceeded	Replacement work is currently under execution. T6 has been replaced. T7 and T8 are expected to be in service in 2019. T5 is expected to be replaced by 2021
King Edward TS	Capacity-LTR exceeded	T3 replacement is scheduled to be in service for 2022
A4K Circuit	Supply Capacity	New A6R tap project will relieve this capacity needs. I/S 2019
South West Area	Area Capacity	The new 230 kV connection line and station project (“Power South Nepean”) to provide capacity in this area is undergoing an environmental assessment. Target I/S year is 2022

Restoration Needs

Load restoration needs for the following scenarios were identified in the NA report:

- 30 minute load restoration for M32S/C3S and South March A1A2 contingency
- 4-hour load restoration for South March L6L7; M4G/M5G; D6A/B5D contingencies

For each of these contingencies, Hydro One has confirmed that the load restoration criteria cannot be guaranteed for every possible scenario. The contingencies involving D5A/B5D were also the focus of a local planning report.

This position should be reconfirmed based on the latest data and in the context of the broader work ongoing in the region.

Needs to be Addressed in the new Planning Cycle

Facilities	Need	Comments
Almonte TS/Terry Fox MTS	Voltage Regulation	Adequate voltage support cannot be provided under radial supply at peak conditions from the Toronto end/Clarington TS
S7M Circuit	Supply Capacity	Supply capacity of this circuit beyond year 2026 needs to be addressed
S7M Circuit	Reliability	Reliability of load supplied from this circuit in the event of a contingency to be assessed
S7M Circuit	EOL	Portions of the circuit has been identified to be at or near EOL-
Merivale TS T22	Station Capacity	Station capacity at Merivale to be assessed as part of the broader south west area need for capacity
Ottawa Downtown 115 kV Area	Station Capacity	Downtown station capacity needs to be reassessed within the context of an updated forecasts, EOL stations upgrades and feeder ties
Slater TS	EOL	Transformer T1 ongoing emergency replacement Transformers T2/T3 2022-2023
Albion TS	EOL	Switchgear, breakers 2028-2029
Merivale DS	EOL	Rebuild 2017-2020

Riverdale TS	EOL	Switchgear 2021-2023
Limebank MTS	EOL	Transformers 2021-2024
Bilberry Creek TS	EOL	Station 2023
Orléans TS	Reliability	Supply configuration at Orléans TS needs to be reassessed (impacted by Bilberry Creek TS EoL decision)
79M1 Circuit	Voltage Regulation	Low voltages observed at Hawkesbury TS-needs to be reassessed with an updated load forecast
Arnprior TS	EOL	Transformers T1/T2 2023-2024
Longueuil TS	EOL	Transformers T3/T4 2024-2025

There are a number of cables (underground circuits) in the Ottawa Region, specifically in downtown Ottawa. Some of these cables provide radial supply while others provide connections between parts of downtown. Due to the critical nature of load that is supplied in the downtown as well as the challenges of restoring cables in the event of an outage, the age, condition, and utilization of these cables needs to be studied in the next planning cycle in the context of downtown capacity assessment.

3.4 Analysis of Needs and Planning Approach

The Regional Participants have discussed the needs in the Greater Ottawa Region and have identified the planning approach as well as reassessed the region’s geographical breakdown.

The majority of needs to be addressed listed in the table above are in Hydro Ottawa’s territory. The assessment of these needs will benefit from an integrated view as the transmission and distribution aspects are tied together. Additionally, the solutions to address the needs in the Ottawa area have the potential to impact network facilities. There are potential opportunities to assess wires and non-wires solutions to meet the needs in the area, as well as coordination of end of life needs within the context of updated forecast data. The Regional Participants recommend that these needs be grouped and studied together into the existing Ottawa Area sub-region by way of an IRRP.

The IRRP should approach the study by breaking the area up into a number of manageable pockets, in the west, east and downtown. It should then take a broader view and study the intra area transmission capability across the three pockets. The Terms of Reference for the IRRP in Appendix A of this report provides more details on the scope and timeline of the IRRP.

The remaining needs in the Region are singular in nature, with no common utilities and no common rate base and limited upstream impact. Local planning process is recommended to address these

needs, as there is limited opportunity to reconfigure and resize the facilities to align with other regional needs. The Regional Participants recommend that those needs be studied as part of the Outer Ottawa sub-region and can be dealt with by way of local planning between the transmitter and the impacted LDCs.

Table 1-2 below lists each of the needs and its relevant geographical grouping, as well as the recommended regional planning process to address the need.

Table 1-2: Needs and relevant planning process

Ottawa Area Sub-Region

Facility	Need	Planning Process
Almonte TS/Terry Fox MTS	Voltage Regulation	IRRP-Ottawa Area
S7M Circuit	Supply Capacity	IRRP-Ottawa Area
S7M Circuit	Reliability	IRRP-Ottawa Area
S7M Circuit	EOL	IRRP-Ottawa Area
Merivale TS T22	Station Capacity	IRRP-Ottawa Area
Ottawa Downtown 115 kV Area	Station Capacity	IRRP-Ottawa Area
Ottawa Downtown 115 kV Area	Aging underground cables	IRRP-Ottawa Area
Slater TS* (see note below)	EOL-Transformers	IRRP-Ottawa Area
Albion TS	EOL-switchgear, breakers	IRRP-Ottawa Area
Limebank MTS	EOL-Transformers	IRRP-Ottawa Area
Bilberry Creek TS	EOL-station	IRRP-Ottawa Area
Orléans TS	Reliability	IRRP-Ottawa Area
Slater TS	EOL-Transformer T1	Local Planning
Riverdale TS	EOL-Switchgear	Local Planning
Merivale MTS	EOL-Rebuild	Local Planning

Outer Ottawa Sub-Region

Facility	Need	Planning Process
79M1 Circuit * (see note below)	Voltage Regulation	IRRP-Ottawa Area
Arnprior TS	EOL-Transformers T1/T2	Local Planning
Longueil TS	EOL-Transformers T3/T4	Local Planning

Note:

EOL of Slater TS – Transformer T1

Recently, T1 failed and Hydro One is working on the emergency replacement of the transformer. In consultation with Hydro Ottawa, it was decided the transformer would be upgraded to a 100 MVA unit. While T1 has to be replaced in order to provide reliable supply, there is an opportunity to manage the EOL of the other two transformers within the context of the Ottawa Area IRRP.

Circuit 79M1

The voltage regulation need on this circuit is dependent on the amount of load being supplied by the circuit, which in turn is impacted by load supplied by circuit H9A that is within the Ottawa Area sub-region. Consequently, this voltage regulation needs although physically is within the Outer Ottawa sub-region, will be reviewed as part of the Ottawa Area IRRP.

Restoration Needs

Hydro One's preliminary indication is that restoration needs can be met in the Region, however, the restoration ability in selected areas will be reconfirmed in the IRRP because of the criticality of certain areas, for example, downtown Ottawa.

3.5 Related Transmission System Studies

The IESO is currently undertaking two studies that include the broader Ottawa Region. One study is reviewing the refurbishment of circuits that connect hydro generation in the Ottawa area to the GTA; the other study is reviewing the 500 kV supply to the Ottawa area. The information from these studies will be shared amongst each other for example, the load forecast.

4. Conclusion

The Scoping Assessment concludes that:

- An IRRP be undertaken to address the previously identified and new needs in the Ottawa Area sub-region.
- Additional needs identified in the needs assessment (outlined below) will be addressed through local planning between the transmitter and relevant LDC:
 - Slater TS-replacement of T1 transformer
 - Riverdale TS-switchgear replacement
 - Merivale DS-rebuild
 - Arnprior TS-EoL replacements of T1/T2 transformers
 - Longueil TS-EoL replacements of T3/T4 transformers
- The work to implement recommendations from previous planning cycle should continue.
-

The draft Terms of Reference for the Ottawa IRRP is attached in Appendix A.

List of Acronyms

CDM	Conservation and Demand Management
DG	Distributed Generation
FIT	Feed-in-Tariff
IESO	Independent Electricity System Operator
IRRP	Integrated Regional Resource Plan
kV	kilovolt
LAC	Local Advisory Committee
LDC	Local Distribution Company
MW	Megawatt
NA	Needs Assessment
NERC	North American Electric Reliability Corporation
NPCC	Northeast Power Coordinating Council
OEB	Ontario Energy Board
ORTAC	Ontario Resource and Transmission Assessment Criteria
RIP	Regional Infrastructure Plan
RPP	Regional Planning Process
SA	Scoping Assessment
TS	Transformer Stations

Appendix A: Draft Terms of Reference

Ottawa Area IRRP Terms of Reference

1. Introduction and Background

These Terms of Reference establish the objectives, scope, key assumptions, roles and responsibilities, activities, deliverables and timelines for an Integrated Regional Resource Plan (“IRRP”) for the Ottawa Area sub-region.

Based on the forecasted load growth, capacity, restoration and asset sustainment needs identified (including a number of transmission cables at or near its expected-service-life), and opportunities for coordinating demand and supply options, the Scoping Assessment recommended an integrated regional resource planning approach for this sub-region.

Ottawa Area Sub-region

The Ottawa Area sub-region encompasses the City of Ottawa which includes the Greenbelt, Kanata, Nepean and Orleans areas. Bulk electrical supply to the sub-region is provided through the 500/230kV autotransformers at Hawthorne TS, a network of 230kV and 115kV transmission lines, and two 230/115kV autotransformer stations at Hawthorne TS and Merivale TS. Local generation in the area comprises of the Ottawa Health Science Non-Utility Generator located near downtown and a number of hydro generation stations on the Ottawa River and the St. Lawrence River. Loads in the area are supplied by eight (8) 230kV and thirty-three (33) 115kV transformer stations stepping down to a lower voltage. Two Local Distribution Companies (LDC) – Hydro Ottawa and Hydro One Distribution - provide retail electricity service to load customers in the area.

The approximate geographical boundaries of the sub-region are shown in Figure A-1.

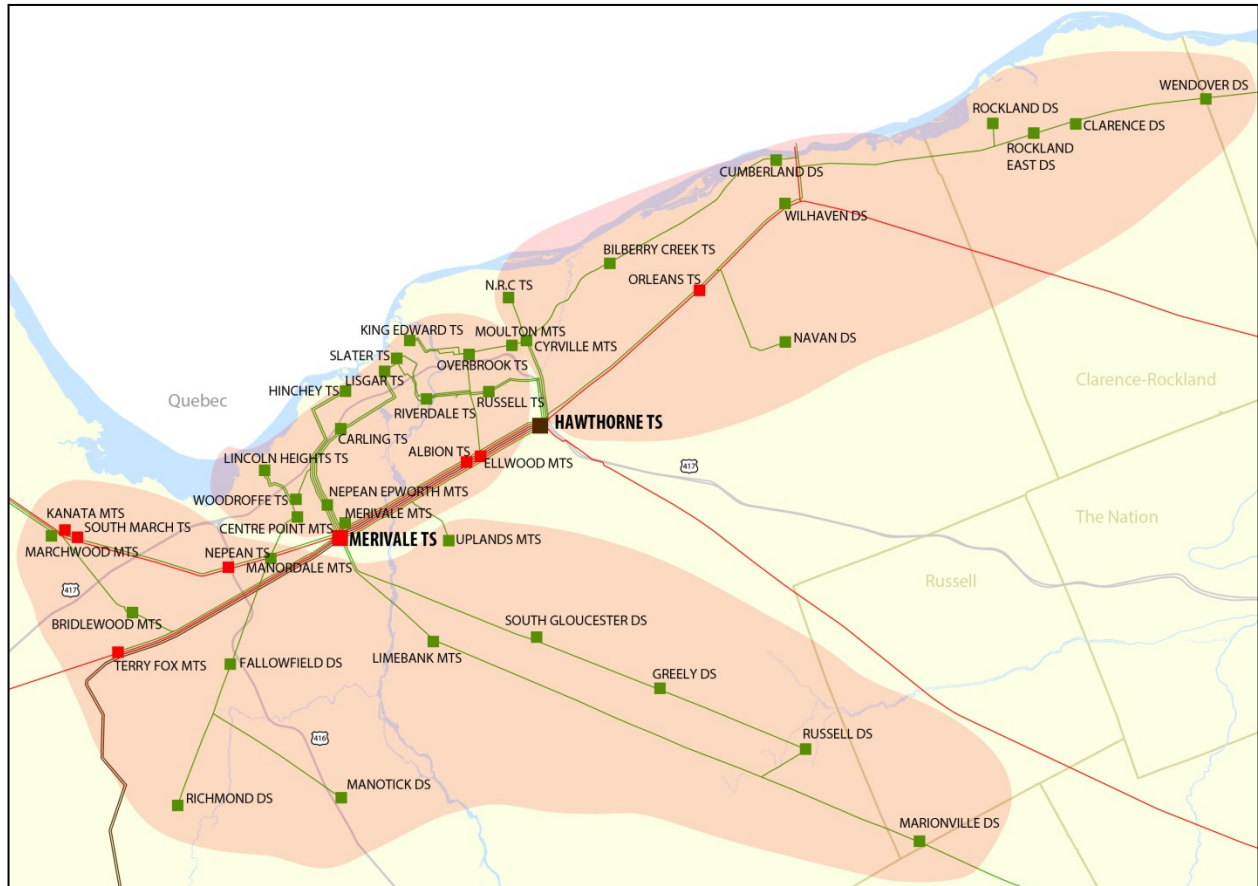


Figure A-1: Electricity Infrastructure in the Ottawa Area Sub-region¹

Background

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 over the near, medium and long term (5 year, 10 year, and 20 year respectively). The assessments consider the existing electricity infrastructure in the area, forecasted load growth, and impacts from conservation demand management and distributed generation. Various options are developed to address the identified needs in the sub-region. These options are evaluated and actions are recommended to ensure a cost effective and reliable electricity supply.

Regional planning has been conducted on an as needed basis in Ontario for many years. In 2012, as part of the “Renewed Regulatory Framework for Electricity: A Performance-based Approach” the Ontario Energy Board convened the Planning Process Working Group (“PPWG”) to develop a more structured, transparent, and systematic regional planning process.

¹ The sub-region is defined by electricity infrastructure; geographical boundaries are approximate.

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 Ontario Energy Board, setting out the new regional planning process. 21 electricity planning regions in the province were identified in the Working Group Report and a phased schedule for completion of regional planning was outlined.

The Greater Ottawa area was one of the first regions to undergo the new planning process, with a Needs Assessment published by Hydro One in July of 2014, an Integrated Regional Resource Plan (“IRRP”) published by IESO in April 2015, and subsequently a Regional Infrastructure Plan (“RIP”) published by Hydro One in December 2015.

Hydro One completed the Needs Assessment for the Greater Ottawa Region in June of 2018, identifying a number of capacity, restoration and sustainment needs in the Ottawa Area sub-region. The Scoping Assessment led by the IESO with Hydro One and LDCs in the region has concluded an integrated regional resource plan (“IRRP”) be undertaken to address the needs in this area.

2. Objectives

The Ottawa Area IRRP will assess the adequacy of electricity supply to customers in the sub-region and will develop a set of recommended actions to maintain reliability of supply to the Region over the next 20 years (2018-2038). Specifically, this IRRP will:

- Assess the adequacy of electricity supply to customers in the Ottawa Area sub-region over the next 20 years.
- Determine whether there is a need to initiate development work or to fully commit infrastructure investments (wires or non-wires) in this planning cycle
- Assess potential risks and uncertainties over the longer term and identify near-term actions to manage/mitigate these risks, where applicable
- Develop an implementation plan that maintains flexibility in order to accommodate changes in key assumptions over time. The implementation plan should identify actions for near-term needs, preparation work for mid-term needs, and the planning direction for long-term needs.

The outcomes from the Ottawa Area IRRP should help inform Hydro Ottawa’s rate filing.

3. Scope

This IRRP will develop and recommend an integrated plan to meet the needs of the Ottawa Area sub-region. The plan is a joint initiative involving Hydro Ottawa, Hydro One Distribution, Hydro One Transmission, and the IESO, and will also incorporate input from community engagement activities. Although the plan will assess all the capacity, restoration and sustainment needs in the area, there are some previously identified needs to reconfirm an address as follows:

- Assess the capacity need timing to accommodate the forecasted growth in the Nepean/Kanata area and to provide further clarification on the upstream connection of new transmission station and connection line in the South Nepean area.
- Assess auto transformation capacity needs at Merivale TS to accommodate forecasted load growth on the 115 kV system west of Merivale.
- Address end of life of Bilberry TS (115 kV/27.6kV)
- Assess transformer station capacity needs in Ottawa Center and integrating with end of life needs in the area.
- Assess end of life needs for transmission cables supplying Ottawa Center

In its analysis of options for identifying/confirming any capacity or restoration needs, and addressing end-of-life needs, the plan will integrate forecast electricity demand growth, conservation and demand management (“CDM”) in the area with transmission and distribution system capability, relevant community plans, other bulk system developments, and distributed energy resources (“DER”) uptake. The scope of the Ottawa Area IRRP includes the infrastructure shown in Figure A-2:

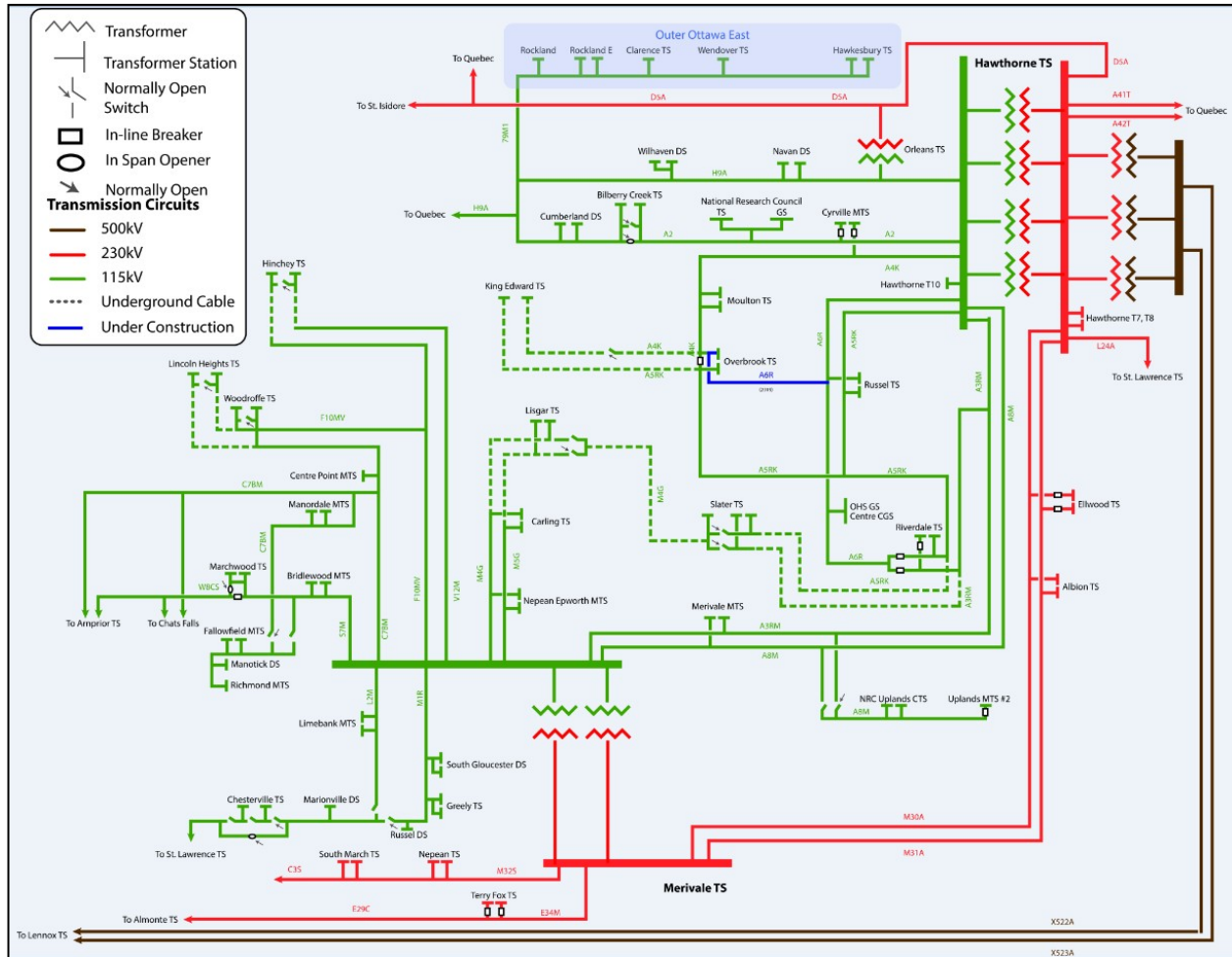


Figure A-2: Ottawa Area Single Line Diagram

A number of related bulk system transmission studies (bulk system supply to Ottawa, and end of life needs on a number of 230 kV circuits between Toronto area and Ottawa area) are being carried out in parallel with the Ottawa Area IRRP. Information will be shared and incorporated between the studies as appropriate

Based on the identified needs, the Ottawa Area IRRP process will consist of the following activities:

- 1) Creation of an updated 20-year demand forecast for the Ottawa Area sub-region.
- 2) Confirming the adequacy of transformer station ratings and the area's load meeting capability and reliability.
 - a. Identify the transformer station capacity needs and sufficiency of the area's load meeting capability for the study period using the updated load forecast.
 - b. Confirm identified restoration needs using the updated load forecast.

- c. Collect information on any known reliability issues and load transfer capabilities from the LDCs.
- 3) For confirmed needs, carry out an assessment of options. Options are evaluated using decision making criteria included, but not limited to, technical feasibility, economics, reliability performance, and environmental and social factors. The options analysis has been divided into groupings based on the priority/timing of the needs, any known lead time information, and the depth of analysis required.
 - a. Phase 1:
 - i. Issue a hand-off letter to Hydro One and Hydro Ottawa, recommending a preferred option for addressing capacity needs in South Nepean
 - ii. Identify the options for transformer station capacity needs
 - b. Phase 2:
 - i. Identify options for end-of-life Albion TS T1/T2, Slater TS T2/T3, Limebank MTS T1/T2, Bilberry Creek TS,
 - ii. Determine if there are restoration need on S7M, C7BM, L2M, M1R, H9A/79M1 and E34M within the study period when load transfer capability is accounted for.
 - iii. Initiate a local achievable potential study for stations with an identified capacity need within the study period
 - c. Phase 3:
 - i. Develop the Working Group's long-term recommendations to address station capacity needs, transmission line capacity needs (Ottawa Center, Nepean/Kanata), restoration needs, and end of life needs (Albion TS T1/T2, Slater TS T2/T3, Bilberry Creek TS)
- 4) Development of the long-term recommendations and the implementation plan.
- 5) Completion of the IRRP report documenting the near-, mid-, and long-term needs and recommendations.

In order to efficiently carry out this scope of work, the sub-region will be divided into three pockets for study purposes: Kanata/Nepean, Ottawa Center and Orleans. This breakdown is the same as that of the previous IRRP cycle (Figure A-1).

The Working Group will consider the data and assumptions outlined in section 4 below for the study.

4. Data and Assumptions

The plan will consider the following data and assumptions:

- Demand Data
 - Historical coincident and non-coincident peak demand information for the sub-region
 - Historical weather correction, for median and extreme conditions
 - Gross peak demand forecast scenarios by sub-region, TS, etc.
 - Coincident peak demand data including transmission-connected customers
 - Identified potential future load customers

- Conservation and Demand Management
 - LDC CDM plans
 - Incorporation of verified LDC results and progression towards OEB targets, and any other CDM programs/opportunities in the area
 - Long-term conservation forecast for LDC customers, based on sub-region's share of the Long Term Provincial Conservation target of 30 TWh by 2032.
Conservation potential studies, if available
 - Potential for CDM at transmission-connected customers' facilities
 - Load segmentation data for each TS based on customer type (residential, commercial, industrial)

- Local resources
 - Existing local generation, including distributed generation ("DG"), district energy, customer-based generation, non-utility Generators and hydroelectric facilities as applicable
 - Existing or committed renewable generation from Feed-in-Tariff ("FIT") and non-FIT procurements
 - Future district energy plans, combined heat and power, energy storage, or other generation proposals

- Relevant local plans, as applicable
 - LDC Distribution System Plans
 - Community Energy Plans and Municipal Energy Plans
 - Municipal Growth Plans
 - Any transit plans impacting electricity use

- Criteria, codes and other requirements
 - Ontario Resource and Transmission Assessment Criteria ("ORTAC")
 - Supply capability
 - Load security
 - Load restoration requirements

- NERC and NPCC reliability criteria, as applicable
 - OEB Transmission System Code
 - OEB Distribution System Code
 - Reliability considerations, such as the frequency and duration of interruptions to customers
 - Other applicable requirements
- Existing system capability
 - Transmission line ratings as per transmitter records
 - System capability as per current IESO PSS/E base cases
 - Transformer station ratings (10-day LTR) as per asset owner
 - Load transfer capability for restoration during transmission system outages and/or as options for any transmission level capacity needs
 - Technical and operating characteristics of local generation
- End-of-life asset considerations/sustainment plans
 - Transmission assets
 - Distribution assets
- Other considerations, as applicable

5. Technical Working Group

The core Technical Working Group (“Working Group”) will consist of planning representatives from the following organizations:

- Independent Electricity System Operator (*Team Lead for IRRP*)
- Hydro One Transmission
- Hydro Ottawa
- Hydro One Distribution

When discussing assets which are utilized by, or impact, only one LDC the discussions can be limited to the impacted LDC, Hydro One Transmission and the IESO – at the impacted LDC’s request. However, any recommendations will be shared with the full Working Group prior to IRRP posting.

Authority and Funding

Each entity involved in the study will be responsible for complying with regulatory requirements as applicable to the actions/tasks assigned to that entity under the implementation plan resulting from this IRRP. For the duration of the study process, each participant is responsible for their own funding.

5. Engagement

Integrating early and sustained engagement with communities and stakeholders in the planning process was recommended to, and adopted by, the provincial government to enhance the regional planning and siting processes in 2013. These recommendations were subsequently referenced in the 2013 Long-Term Energy Plan. As such, the Working Group is committed to conducting plan-level engagement throughout the development of the Ottawa Area IRRP.

The first step in engagement will consist of meetings with municipalities and Indigenous communities within the planning area, Indigenous communities who may have an interest in the planning area and the Métis Nation of Ontario to discuss regional planning, the development of the Ottawa Area plan, and integrated solutions.

Municipal engagement will continue throughout the development and completion of the plan.

6. Activities, Timeline and Primary Accountability

Table A-1 Summary of IRRP Timelines and Activities

	Activity	Lead Responsibility	Deliverable(s)	Timeframe
1	Commence IRRP Process <ul style="list-style-type: none"> - Prepare terms of reference considering stakeholder input - Kick-off meeting with working group members 	<i>IESO</i>	- Finalized Terms of Reference	June – July 2018
2	Develop the Planning Forecast for the sub-region			
	- Establish historical coincident and non-coincident peak demand information	<i>IESO</i>	- Long-term planning forecast scenarios	January – July 2018
	- Establish historical weather correction, median and extreme conditions	<i>IESO</i>		
	- Establish gross peak demand forecast and high/low growth scenarios	<i>LDCs</i>		
	- Establish existing, committed and potential DG	<i>LDCs</i>		
	- Establish near- and long-term conservation forecasts based on LDC CDM plans and LTEP CDM targets	<i>IESO</i>		

	Activity	Lead Responsibility	Deliverable(s)	Timeframe
	- Develop planning forecast scenarios - including the impacts of CDM, DG and extreme weather conditions	<i>IESO</i>		
3	Provide information on load transfer capabilities under normal and emergency conditions – for the purpose of analyzing transmission system needs and identifying options for addressing needs	<i>LDCs</i>	- Load transfer capabilities under normal and emergency conditions	Q2/Q3 2018
4	Provide and review relevant community plans, if applicable	<i>LDCs and IESO</i>	- Relevant community plans	Q2/Q3 2018
5	Complete system studies to identify needs over a twenty-year period - Obtain PSS/E base case, include bulk system assumptions as identified in the key assumptions - Apply reliability criteria as defined in ORTAC to demand forecast scenarios - Confirm and refine the need(s) and timing/load levels	<i>IESO</i>	- Summary of needs based on demand forecast scenarios for the 20-year planning horizon	Q3 2018
6	Develop Options and Alternatives		- Develop flexible planning options for forecast scenarios - Deliverables staged according to the three phases outlined in section 3	Q4 2018
	Develop conservation options	<i>IESO and LDCs</i>		
	Develop local generation options	<i>IESO and LDCs</i>		
	Develop transmission (see Action 7 below) and distribution options	<i>Hydro One, and LDCs</i>		
	Develop options involving other electricity initiatives (e.g., smart grid, storage)	<i>IESO/ LDCs with support as needed</i>		
	Develop portfolios of integrated alternatives	<i>All</i>		
	Technical comparison and evaluation	<i>All</i>		
7	Early Wires Planning			
	Identify potential wires options to address end-of-life and local capacity needs	<i>Hydro One Transmission</i>	- Cost, feasibility and reliability performance of potential wires options	Q4 2018
	Provide information on cost, feasibility and reliability performance of		- Detailed option	

	Activity	Lead Responsibility	Deliverable(s)	Timeframe
	identified wires options for the purpose of developing integrated solutions		development - Deliverables staged according to the three phases outlined in section 3	
8	Plan and Undertake Community & Stakeholder Engagement			
	- Early engagement with local municipalities and Indigenous communities within study area, First Nation communities who may have an interest in the study area, and the Métis Nation of Ontario	<i>All</i>	- Community and Stakeholder Engagement Plan - Input from local communities	Q3 2018
	- Develop communications materials	<i>All</i>		Q1 2019
	- Undertake community and stakeholder engagement	<i>All</i>		
	- Summarize input and incorporate feedback	<i>All</i>		
9	Hand off Wires Component of Integrated Solution			
	South Nepean area capacity needs	<i>IESO</i>	- Hand-off letter to Hydro One and Hydro Ottawa	Q1 2019
10	Develop long-term recommendations and implementation plan based on community and stakeholder input	<i>IESO</i>	- Implementation plan - Monitoring activities and identification of decision triggers - Hand-off letters - Procedures for annual review	Q1 2019
11	Prepare the IRRP report detailing the recommended near, medium and long-term plan for approval by all parties	<i>IESO</i>	- IRRP report	Q1/Q2 2019

Appendix B: Selecting a Regional Planning Approach

Needs identified through the Needs Assessment (NA) will be reviewed during the Scoping Assessment to determine whether a Local Plan (LP), Regional Infrastructure Plan (RIP), or Integrated Regional Resource Plan (IRRP) regional planning approach is more appropriate. Where multiple sub-regions are identified, each will be considered individually. It is possible that a combination of LP, RIP and IRRP planning approaches could be selected in different sub-regions, although if the need for wires-type solution is urgent, it will typically trigger a hand-off letter instead.

The three potential planning outcomes are designed to carry out different functions, and selection should be made based on the unique needs and circumstances in each area. The criteria used to select the regional planning approach within each sub-region are consistent with the principles laid out in the PPWG Report to the Board², and are discussed in this document to ensure consistency and efficiency throughout the Scoping Assessment.

IRRPs are comprehensive undertakings that consider a wide range of potential solutions to determine the optimal mix of resources to meet the needs of an area for the next 20 years, including consideration of conservation, generation, new technologies, and wires infrastructure. RIPs focus instead on identifying and assessing the specific wires alternatives and recommend the preferred wires solution for an area and are thus narrower in scope. LPs have the narrowest scope, and only consider simple wires solutions that do not require further coordinated planning. A LP process is recommended when needs are:

- a) local in nature (only affecting one LDC or customer)
- b) limited investments of wires (transmission or distribution) solutions
- c) does not require upstream transmission investments
- d) does not require plan level stakeholder engagement and
- e) does not require other approvals such as Leave to Construct (S92) application or Environmental Approval.

If it is determined that coordinated planning is required to address identified needs, either a RIP or IRRP may be initiated. A series of criteria have been developed to assist in determining which planning approach is the most appropriate based on the identified needs. In general, an IRRP is initiated:

²http://www.ontarioenergyboard.ca/OEB/Documents/EB-2011-0043/PPWG_Regional_Planning_Report_to_the_Board_App.pdf

- Wherever a non-wires measure has the potential to meet or significantly defer the needs identified by the transmitter during the Needs Assessment
- Community or stakeholder engagement is required, or
- The planning process or outcome has the potential to impact bulk system facilities

If it is determined that the only feasible measures involve new/upgraded transmission and/or distribution infrastructure, with no requirement for engagement or anticipated impact on bulk systems, a RIP will be selected instead.

Wires type transmission/distribution infrastructure solutions refer, but are not limited, to:

- Transmission lines
- Transformer/ switching stations
- Sectionalizing devices including breakers and switches
- Reactors or compensators
- Distribution system assets

Additional solutions, including conservation and demand management, generation, and other electricity initiatives can also play a significant role in addressing needs. Because these solutions are non-wires alternatives, they must be studied through an IRRP process.

Determining the feasibility of non-wires alternatives to meet identified needs should also consider issues such as timelines for implementing solutions. For instance, if a need has been identified as immediate or near-term, non-wires solutions that rely on lengthy development and roll-out periods may not be feasible.