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Vice President, Reliability Standards and Chief Regulatory Officer

BY EMAL BY RESS

November 2, 2020

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

Dear Ms. Long,

EB-2011-0043 – 2020 Regional Planning Status Report of Hydro One Networks Inc.

Section 3C.3.3 of the Transmission System Code requires transmitters to submit an annual report to the Ontario Energy Board, on November 1st of each year, that identifies the status of regional planning for all regions.

Please find attached Hydro One Networks Inc.'s 2020 Regional Planning Process Annual Status Report, pursuant to the above noted Code section.

Sincerely,

A handwritten signature in cursive script that reads "Frank D'Andrea".

Frank D'Andrea



Regional Planning Process

Annual Status Report

2020

November 1st, 2020

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EXECUTIVE SUMMARY

Transmitters are required under Section 3C.3.3 of the Transmission System Code^[1] (TSC) to submit an annual report to the Ontario Energy Board (OEB or Board) on November 1st of each year which identifies the status of the regional planning for their respective regions. This is the seventh Annual Status Report produced by Hydro One Networks Inc. (Hydro One) and provides an update to the status of regional planning activities, recommended regional plans and accomplishments between November 2019 and October 2020.

Progress to Date

The first cycle of the regional planning for the 21 regions was completed in 2017 as per the process developed by the Planning Process Working Group (PPWG)^[2]. During the first regional planning cycle, several lessons were learned to undertake improvements to the process with respect to replacement of major transmission assets at or near their end of life (EOL) to include justification and documentation with respect to “right sizing” of equipment. Another area where Hydro One has improved the process is with respect to engagement and consultation with key stakeholders such as Local Distribution Companies (LDCs) through one on one pre-Regional Planning meetings to better understand their emerging needs and collect relevant information. In addition, as a Lead Transmitter, Hydro One also sent formal communications to LDCs to seek feedback on prioritization and scheduling of regional planning for the regions, as well as seeking suggestions for enhancements in the second cycle of regional planning. These enhancements, described further in Section 2, have been incorporated into the process, thereby significantly enhancing the quality of the planning process and reports. At this time, no significant changes to the prioritization to initiate regional planning were proposed by the stakeholders or required. However, Hydro One is keeping abreast of the needs in the province on a regional basis and has advanced regional planning for several regions based on emerging needs in these areas. The enhancements mentioned above were first introduced in the Regional Infrastructure Planning (RIP) report of the first cycle (February 2017) and the Needs Assessment (NA) report of the second cycle (May 2017) of the regional planning process for the Burlington to Nanticoke Region. Subsequently, these enhancements were further refined and incorporated by Hydro One into the NA and RIP reports for all regions.

Since the beginning of the second cycle of regional planning process, the following are the significant milestones that have been accomplished (see Table 1):

- Regional Infrastructure Planning (RIP) reports completed for five (5) regions with a sixth currently underway.
- Needs Assessment (NA) reports completed for fifteen (15) regions, with five (5) expected to commence in 2021 which will initiate the 2nd cycle of the regional planning process for those regions.
- Integrated Regional Resource Planning (IRRP) reports for five (5) regions, with five (5) currently underway.

The status of regional planning for each region is summarized in Table 1.

Table 1. Regional Planning Status Summary

Region	Sub-region	1st Cycle (2013-2017)				2nd Cycle (2017→)			
		NA (2)	SA (2)	IRRP (2)	RIP (2)	NA (2)	SA (2)	IRRP (2)	RIP (2)
Burlington to Nanticoke	Brant	May, 2014	Sep, 2014	Apr, 2015	Feb, 2017	May, 2017	Aug, 2017	Feb, 2019	Oct, 2019
	Bronte			Jun, 2016					
	Greater Hamilton			Not Required					
	Caledonia-Norfolk			Not Required					
Toronto Area	Central Downtown	Jun, 2014	Note1	Apr, 2015	Jan, 2016	Oct, 2017	Feb, 2018	Aug, 2019	Mar, 2020
	Northern		Not Required	Not Required					
Windsor-Essex			Note1	Apr, 2015	Dec, 2015	Oct, 2017	Mar, 2018	Sep, 2019	Mar, 2020
GTA North	York	Jun, 2014	Note1	Apr, 2015	Feb, 2016	Mar, 2018	Aug, 2018	Feb, 2020	Oct, 2020
	Western		Not Required	Not Required					
Greater Ottawa	Ottawa	Jul, 2014	Nov, 2014	Apr, 2015	Dec, 2015	Jun, 2018	Sep, 2018	Mar, 2020	Feb, 2021
	Outer Ottawa		Not Required	Not Required					
Kitchener-Waterloo-Cambridge-Guelph			Note1	Apr, 2015	Dec, 2015	Dec, 2018	Apr, 2019	Q1, 2021	
GTA West	Northwestern	May, 2014	Sep, 2014	Apr, 2015	Jan, 2016	May, 2019	Aug, 2019	Q1, 2021	
	Southern			Not Required					
Greater Bruce/Huron		May, 2016	Not Required	Not Required	Aug, 2017	May, 2019	Sep, 2019	Q2, 2021	
East Lake Superior		Dec, 2014	Not Required	Not Required	Dec, 2014	Jun, 2019	Oct, 2019	Q1, 2021	
GTA East	Pickering-Ajax-Whitby	Aug, 2014	Dec, 2014	Jun, 2016	Jan, 2017	Aug, 2019	Not Required	Not Required	Feb, 2020
	Oshawa-Clarington			Not Required					
Peterborough to Kingston		Feb, 2015	Not Required	Not Required	Jul, 2016	Feb, 2020	May, 2020	Q4,2021	
South Georgian Bay/Muskoka	Barrie/Innisfil	Mar, 2015	Jun, 2015	Dec, 2015	Aug, 2017	Apr, 2020	Q4, 2020		
	Parry Sound/Muskoka			Dec, 2015					
London Area	Greater London	Apr, 2015	Aug, 2015	Jan, 2017	Aug, 2017	May, 2020	Not Required	Not Required	
	Alymer-Tillsonburg			Not Required					
	Strathroy			Not Required					
	Woodstock			Not Required					
	St. Thomas			Not Required					
Sudbury/Algoma		Mar, 2015	Not Required	Not Required	Jun, 2016	Jun, 2020	Not Required	Not Required	
Northwest Ontario	North of Dryden	Note1	Jan, 2015	Jan, 2015	Jun, 2017	Jul, 2020	Q1, 2021		
	Greenstone-Marathon			Jun, 2016					
	Thunder Bay			Dec, 2016					
	West of Thunder Bay			Jul, 2016					
Chatham/Lambton/Sarnia		Jun, 2016	Not Required	Not Required	Aug, 2017	2nd cycle expected to commence in 2021			
Niagara	Apr, 2016	Not Required	Not Required	Mar, 2017					
North/East of Sudbury	Apr, 2016	Not Required	Not Required	Apr, 2017					
Renfrew	Mar, 2016	Not Required	Not Required	Jul, 2016					
St. Lawrence	Apr, 2016	Not Required	Not Required	Jul, 2016					
North of Moosonee		Hydro One Transmission is not the lead transmitter in this region. Status to be provided by lead transmitter.							

Notes: (1): The planning activity in the region was already in progress prior to the commencement of the regional planning process; hence the NA/SA was deemed to be already completed by the Study Team.

(2): NA: Needs Assessment; SA: Scoping Assessment; IRRP: Integrated Regional Resource Plan; RIP: Regional Infrastructure Plan

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1. INTRODUCTION

The process for electric power system planning in the Province of Ontario underwent a procedural change in 2013. A new regional planning process, which enables transparent, coordinated and cost-effective planning of regional transmission and distribution systems, was mandated by the Ontario Energy Board (OEB or Board) on August 26, 2013 through amendments to both the Transmission System Code^[1] (TSC) and the Distribution System Code^[3] (DSC). This process is outlined in the Planning Process Working Group's (PPWG) Report to the Board, titled "The Process for Regional Infrastructure Planning in Ontario"^[4], revised May 17, 2013.

As per Section 3C.3.3 of the TSC, transmitters are required to submit an annual report to the Board on November 1st of each year, which identifies the status of the regional planning process and its deliverables in their respective regions. This seventh (2020) Annual Status Report, produced by Hydro One Networks Inc. (Hydro One), provides an update to the accomplishments and progress status of the regional planning activities from November 2019 to October 2020. It also identifies plans and projects already in execution to address new and previously identified needs.

The Report is structured as follows:

- Section 2 provides a brief overview of the regional planning process.
- Section 3 identifies lessons learned and improvements made to the regional planning process.
- Section 4 discusses the various regional planning activities and plans or projects completed or being undertaken.
- Section 5 provides a brief summary of the current status of regional planning and its accomplishments over the last year.
- Section 6 lists all reference documentation.

2. REGIONAL PLANNING PROCESS OVERVIEW

Bulk System Planning, Regional Planning and Distribution Planning are the three levels of planning for the electricity system in Ontario. Bulk system planning typically looks at issues that impact the system on a provincial level, and requires longer lead time and larger investments. Comparatively, planning at the regional and distribution levels look at issues on a more regional or localized level. Typically, the most essential and effective regional planning horizon is the near- to medium-term (1-10 years), whereas long-term (10-20 years) regional planning mostly provides a future outlook with little details about investments because the needs and other factors may vary over time. On the other hand, bulk system plans are developed for the long term because of the larger magnitude of the investments.

The regional planning process begins with a Needs Assessment (NA) which is led by the transmitter to identify, assess and document which of the needs a) can be addressed directly between the customer and the transmitter along with a recommended plan, and b) that require further regional coordination and identification of Local Distribution Companies (LDCs) to be involved in further regional planning activities for the region.

At the end of the Needs Assessment, a decision is made by the Study Team as to whether further regional coordination is necessary to address some or all of the regional needs. If no further regional coordination is required, recommendation to implement the recommended option and any necessary investments are planned directly by the LDCs (or customers) and the transmitter. The Region's Study Team can also recommend to the transmitter and LDCs to undertake a local planning process for further assessment when needs a) are local in nature, b) require limited investments in wires (transmission or distribution) solutions, and c) do not require upstream transmission investments.

If coordination at the regional or sub-regional levels is required for identified regional needs, then the Independent Electricity System Operator (IESO) initiates the Scoping Assessment (SA) phase. During this phase, the IESO, in collaboration with the transmitter and impacted LDCs, reviews the information collected as part of the Needs Assessment phase, along with additional information on potential non-wires or resource alternatives, e.g., Conservation and Demand Management (CDM), Distributed Generation (DG), etc., in order to make a decision on the most appropriate regional planning approach including Local Plan (LP), Integrated Regional Resource Plan (IRRP) and/or Regional Infrastructure Plan (RIP).

The primary purpose of the IRRP is to identify and assess both resource and wires options at a higher or macro level, but sufficient to permit a comparison of resource options vs. wire infrastructure to address the needs. Worth noting, the LDCs' CDM targets as well as contracted DG plans provided by IESO and LDCs are reviewed and considered at each step in the regional planning process.

If and when an IRRP identifies that resource and/or wires options may be most appropriate to meet a need, resource/wires planning can be initiated in parallel with the IRRP or in the RIP phase to undertake a more detailed assessment, develop specific resource/wires alternatives, and recommend a preferred wires solution.

As a final step of the regional planning process, Hydro One as the lead transmitter undertakes to develop a RIP with input from the Study Team for the region and publishes a RIP report. The RIP reports include a complete discussion of all options and recommended plans and wire infrastructure investments within each region identified in earlier phases. As a result, RIP reports are also referenced as supporting evidence in a cost of service or Leave-to-Construct approval application.

Figure 1 illustrates the various steps of the regional planning process that include NA (also known as Needs Screening), SA (also known as Scoping Process), LP, IRRP, and RIP.

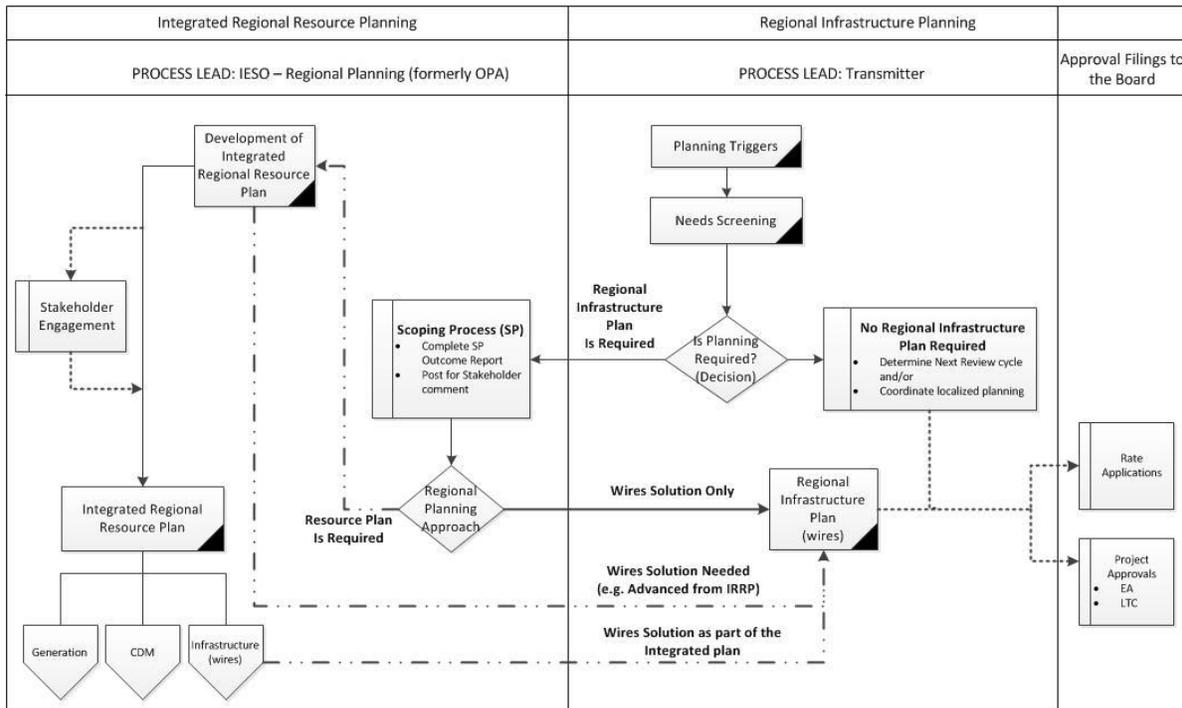


Figure 1. Regional Planning Process Flowchart

2.1 Regions

The province has been divided into 21 regions to undertake regional planning. In first cycle, 21 regions were placed into 3 groups to manage and prioritize regional planning activities. Moving forward, regional planning will be initiated every five (5) years, or earlier if required to meet emerging needs.

Hydro One is the lead transmitter in all regions, except the East Lake Superior¹ and North of Moosonee Regions. For each regional planning activity at the regional or sub-regional level, a Study

¹ Hydro One Sault Saint Marie, an affiliate of Hydro One Networks, is the lead transmitter for East Lake Superior. This Report includes the status of the regional planning activities in the East Lake Superior Region.

Team is established for each region with representatives from the IESO, Hydro One, and respective LDCs of the area. During the regional planning process, the Study Team may further divide a region into two or more sub-regions based on electrical characteristics, contiguity and for efficient and effective assessment.

The planning regions are listed in Table 2 and shown pictorially in Figure 2.

Table 2. Regional Planning Regions

Burlington to Nanticoke	Northwest Ontario	Chatham/Lambton/Sarnia
Greater Ottawa	Windsor-Essex	Greater Bruce/Huron
GTA East	East Lake Superior	Niagara
GTA North	London Area	North of Moosonee
GTA West	Peterborough to Kingston	North/East of Sudbury
KWCG	South Georgian Bay/Muskoka	Renfrew
Toronto	Sudbury/Algoma	St. Lawrence

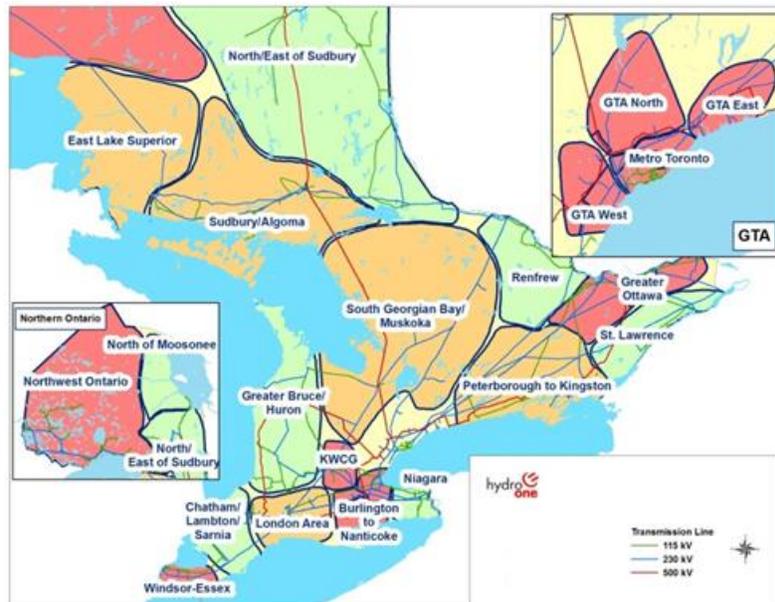


Figure 2. Regional Planning Regions

2.2 Conservation & Demand Management (CDM) and Distributed Generation (DG)

CDM is taken into account at each step of the regional planning process. It is based on input from municipalities, requirements of individual LDCs to comply with conservation targets that are to be achieved through the provision of CDM programs to each customer segment in their service territories^[5]. The CDM information is provided by the IESO and prepared jointly by the LDCs for regional planning assessments.

Consistent with Section 21.2.2 (g) of the IESO License and Section 3C.3 of the TSC^[1], the IESO provides peak demand offsets resulting from LDCs' CDM programs. It is worth noting that peak demand offsets resulting from LDCs' CDM programs are the total offsets to be achieved by the LDC within its service territory and hence may not be limited to or reflective of offsets within the specific region. The IESO also provides total installed and effective capacity of the IESO contracted DG projects which are either in service or are under development for regions or sub-regions for which an IRRP is completed. The CDM and DG summary provided by the IESO is attached in [Appendix A](#).

Both, CDM and DG information is used to develop a net forecast from the gross load forecast provided by the LDCs.

3. LESSONS LEARNED AND PROCESS IMPROVEMENTS

During the first cycle of the regional planning process, several lessons and opportunities for improvement were identified pertaining to the regional planning process and its deliverables following a thorough review of the regional planning process, discussions with regional Study Teams consisting of LDCs and IESO, and input from the OEB Regional Planning Process Advisory Group (“RPPAG”). Hydro One implemented several measures to improve the existing consultation, planning processes and deliverables. Based on the feedback and lessons learned, Hydro One developed and implemented several improvements to the planning process to address end-of-life (EOL)² needs of major high voltage equipment, data gathering, consultation processes and reports in the NA and RIP phases.

Information regarding End of Life (EOL) Major High Voltage Transmission Equipment

Managing the replacement of transmission and distribution infrastructure is the primary accountability of asset owners for its safe, secure and reliable operation. Major assets such as, transformers, breakers, and cables, require specialized expertise to assess and plan replacement. However, sometimes there is a broader planning opportunity and as a result, Hydro One has developed an internal process to collect and share best available information of Major High Voltage Transmission Equipment with the Regional Planning Study Team. The major high voltage equipment assessed as part of regional planning is listed below, that are identified to be replaced over the next 10 years or sometimes beyond for upcoming Regional Planning or Bulk System Planning process.

- 1) Autotransformers;
- 2) Load serving step down transformers;
- 3) Replacement of more than six HV breakers at a station;
- 4) HV transmission line requiring refurbishment where:
 - a) Refurbishment may have another planning option or,
 - b) Uprating of line may be required to address growth needs
- 5) HV underground cable requiring replacement where:
 - a) Replacement may have another planning option or,
 - b) Uprating of cable is required to address growth needs

The data associated with the above equipment will include - asset identification (e.g. station name, line/cable length and associated to/from that are approaching end-of-life), and expected year of refurbishment or replacement. The technical Study Team for each region will review, assess, discuss planning options, and recommend “right sizing” during each phase of the regional planning process, namely during NA, IRRP and RIP, or as required.

The assessment and documentation is first undertaken in the NA phase by the Study Team (i.e., Hydro One, IESO and affected LDCs) for the applicable region. As part of this analysis, different options are

² Generally defined as the likelihood of failure or loss of an asset’s ability to provide the intended functionality, where the failure or loss of functionality would cause unacceptable consequences. Depending on the equipment, an EOL replacement is determined based on condition assessment that includes test results, performance history, and age.

evaluated and a preferred replacement plan is recommended along with its rationale. The Study Team reviews load forecasts for growth that takes into account changing customer requirements and the impact of new technologies as well as non-wires options (e.g., CDM and DG) to inform the appropriate approach for addressing equipment approaching its EOL. The assessment includes, but is not limited to: downsizing/eliminating equipment by transferring load to other existing facilities; replacing equipment with similar equipment of same or higher ratings; and, consideration of economic and practical implementation of incremental CDM to defer or eliminate the need while maintaining safe and reliable service to customers. The underlying goal is to “right size” the replacement asset. Consistent with the regional planning process, all affected transmission customers (e.g., LDCs, industrial, etc.) directly connected to the EOL asset(s) being assessed are consulted and coordinated by the transmitter to obtain input regarding their expected needs before a preferred replacement plan is implemented.

Many EOL equipment needs do not require regional coordination (i.e. SA, IRRP, RIP) following the NA phase based on the discussion above. In such cases, they are addressed by Hydro One as a transmitter in coordination with the affected LDC(s) and its customers. In doing so, Hydro One coordinates the replacement plan and related outages.

There are also EOL equipment needs that do require further assessment and/or regional coordination. For example, where EOL equipment provides an opportunity for cost effective reconfiguration (e.g. significant rebuild of a station), greater reliability, or better capacity planning to address a broader regional need(s). In such cases, further assessment of the EOL equipment need will proceed to the next phase(s) of the regional planning process where the Study Team will further review options and develop a preferred replacement plan.

Pre Regional Planning Input

Another area where Hydro One has improved the process is with respect to engagement and consultation. Prior to start of the NA and RIP phase, Hydro One has implemented one on one pre-Regional Planning meetings with key stakeholders such as LDCs to better understand their emerging needs and collect relevant information. These meetings have resulted in enhanced collaboration and efficiency during regional planning meetings with Study Team members by having a head start in determining emerging needs, discussing specific LDC issues and concerns that may have an impact on regional planning, and overall report quality enhancements. For example, a pre-Regional Planning meeting held with a Study Team member in the Peterborough to Kingston region resulted in advance information collection on emerging needs in the region, which helped deliver a timely and quality report during the NA phase.

The Figures below show in detail how the pre-Regional Planning steps are integrated into the NA and RIP phases:

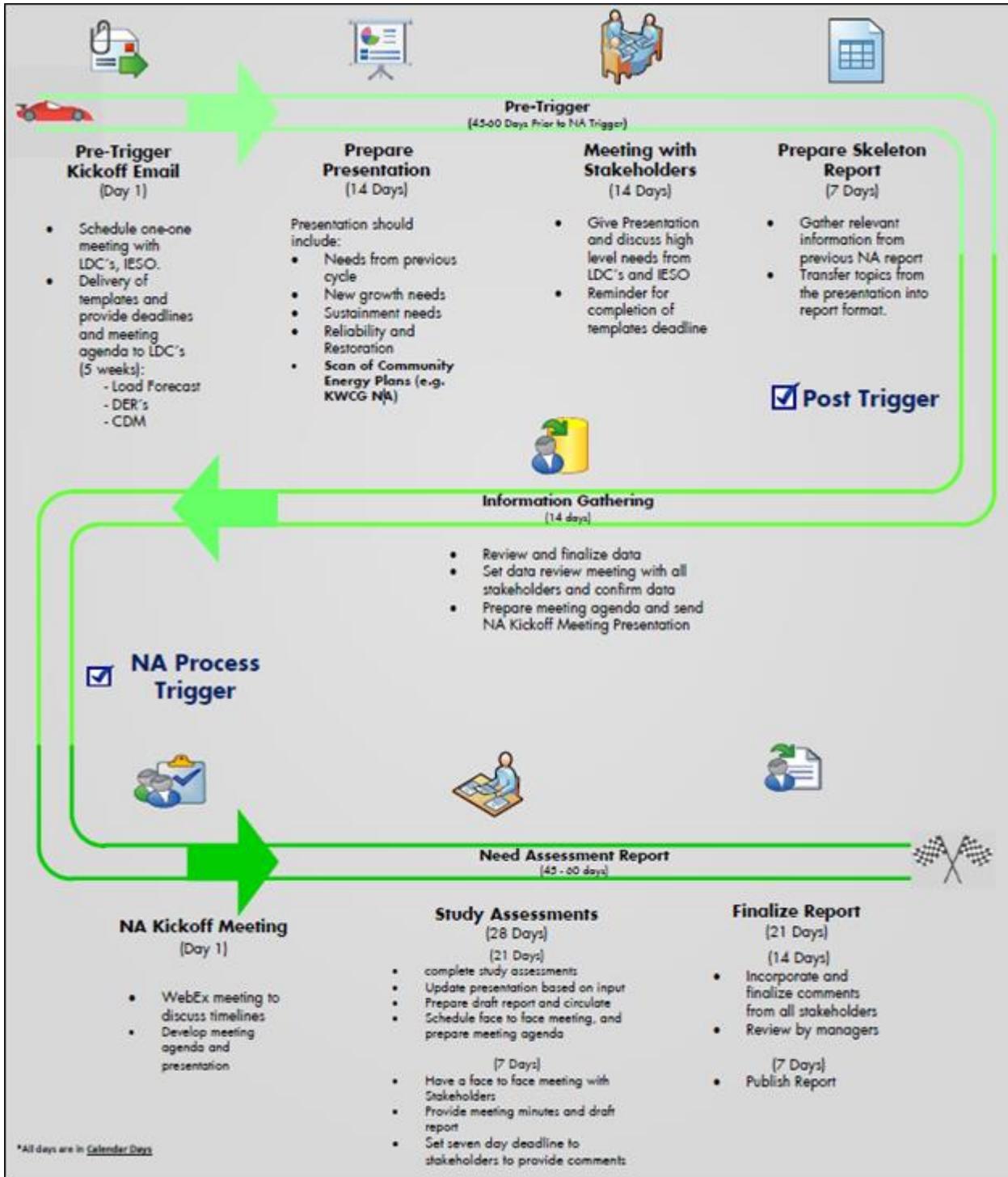


Figure 3. Needs Assessment (NA) Phase Diagram

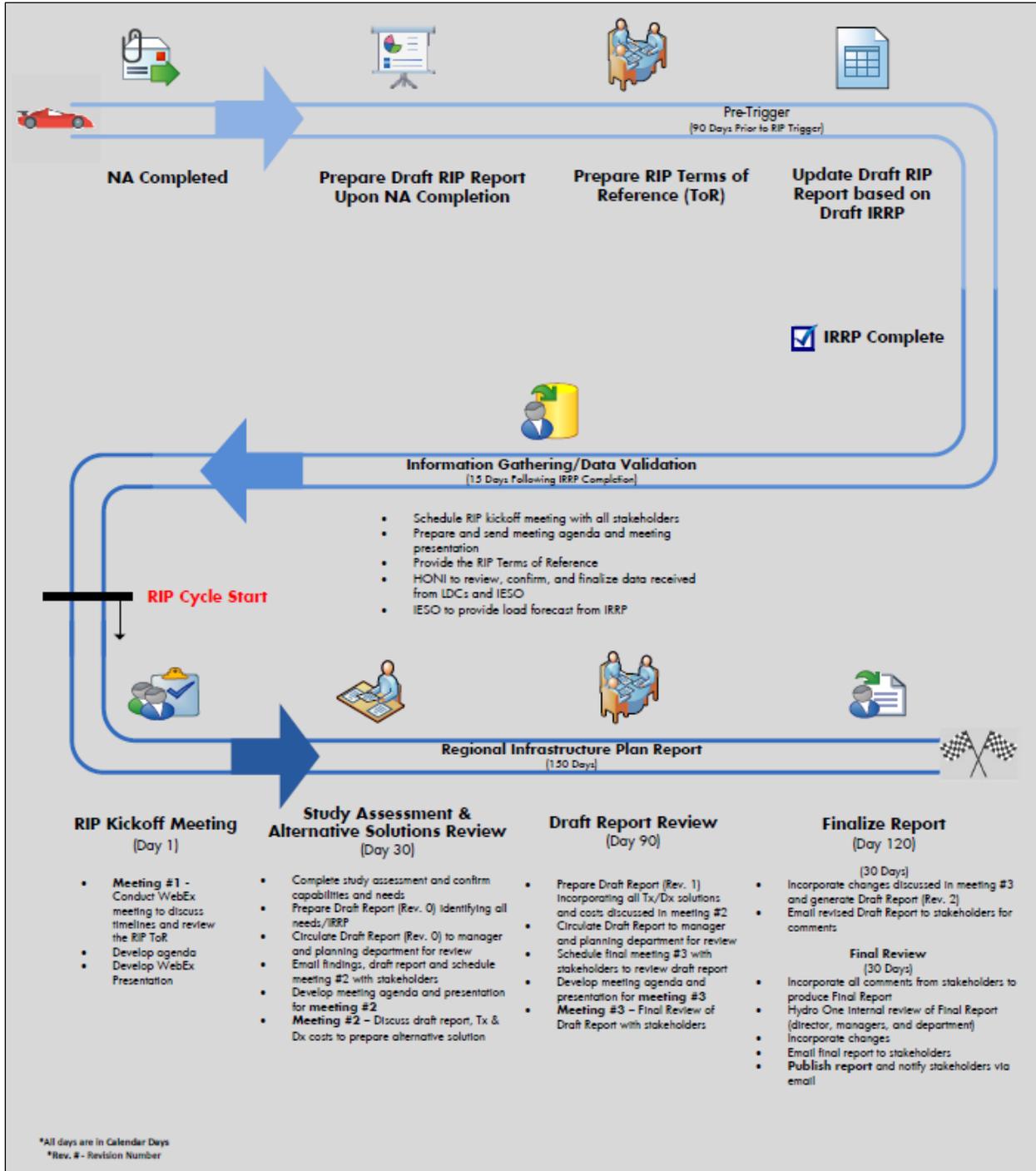


Figure 4. Regional Infrastructure Planning (RIP) Phase Diagram

Other Process Improvements:

- Data gathering templates: A clear and consistent approach when requesting data from Study Team members to receive data in a timely manner with accurate information. Advance emails are sent to LDCs to prepare the information.
- Load forecast methodology and development is continuously discussed in light of CDM and Distributed Energy Resource (DER) penetration along with electric vehicle (EV) in

coordination with IESO and LDCs to improve data accuracy (retrieving actual load, new technology, basis of extreme weather correction factor, forecasting methodology, applying CDM and DG).

- Regional planning report templates – various updates including new section on EOL equipment replacement assessment and a complete RIP report for all regions.
- Utilizing revised local planning guidelines to aid the Study Team in determining when specific needs that are local in nature can be more efficiently addressed by Hydro One and affected LDC(s).
- Provided input to the Long Term Energy Plan (LTEP) directive to the IESO and OEB to enhance Regional Planning Process.

4. STATUS OF REGIONS

Regional Infrastructure Plans (RIP) have been completed for all regions for the first cycle of the Regional Planning Process. During the first regional planning cycle, several lessons were learned to undertake improvements to the process, assessment and documentation with respect to replacement of major transmission assets at or near EOL with rationale for “right sizing” the equipment. Another area where Hydro One improved the process is with respect to engagement and consultation with key stakeholders such as Local Distribution Companies (LDCs) through one on one pre-Regional Planning meetings to better understand their emerging needs and collect relevant information. In addition, as a Lead Transmitter, Hydro One also sent formal communication to the LDCs to seek feedback on prioritization of regions to undertake regional planning and suggestions for enhancements in the second cycle. These enhancements have been incorporated in the process and planning reports. LDCs did not suggest any changes to the prioritization to initiate regional planning. However, Hydro One undertook advance regional planning in several regions based on discussions with the LDCs with regard to emerging needs in various parts of the province.

The Needs Assessment (second cycle – May 2017) and RIP (first cycle – Feb 2017) for the Burlington to Nanticoke region were the first reports to include some of these enhancements, which were duly incorporated in the second cycle of the regional planning process. Each subsequent Needs Assessment (NA) and/or RIP reports (Burlington to Nanticoke, Toronto, Windsor-Essex, GTA North, Greater Ottawa, Kitchener-Waterloo-Cambridge-Guelph, GTA West, Greater Bruce/Huron, East Lake Superior, GTA East, Peterborough to Kingston, South Georgian Bay/Muskoka, London Area, Sudbury/Algoma, and Northwest Ontario) led and developed by Hydro One on behalf of the Study Team have incorporated these changes. These reports are available on the Hydro One’s [Regional Planning website](#). The second cycle of regional planning is currently underway, with NAs for fifteen (15) regions, SAs for ten (10) regions, IRRPs for five (5) regions, and RIPs for five (5) regions completed to date.

4.1 Burlington to Nanticoke

Burlington to Nanticoke Region comprises the municipalities of Burlington, Hamilton, Oakville, Brantford, and the Counties of Brant, Haldimand, and Norfolk. Within the context of regional planning, the region is divided into four sub-regions: Brant, Bronte, Greater Hamilton, and Caledonia-Norfolk sub-regions.

The second cycle Needs Assessment phase was completed in May 2017. The Study Team determined that an IRRP was required for the Hamilton sub-region. Following the completion of the Hamilton sub-region IRRP, the Study Team completed and published a RIP report in October 2019. Updates to the regional plans for each sub-region are discussed below.

4.1.1 Brant Sub-region

Brant sub-region encompasses the County of Brant, City of Brantford and surrounding areas. The electricity supply to this area is provided by Brant TS, Powerline MTS, and Brantford TS. There were no new needs identified in this sub-region during the second cycle of regional planning. Updates to previously identified needs are as follows:

- **115 kV B12/B13 – Transmission Line Capacity**

Brant IRRP and the RIP for the region identified an immediate need for additional transmission supply capacity in the Brant-Powerline 115 kV subsystem. The 2017 SA recommended this to be addressed directly between Hydro One and the LDC, as non-wires options were not feasible. The preferred option involves construction of a new switching facility that consists of three (3) new 115 kV breakers and associated disconnect switches. This will provide approximately 61 MW of additional supply capacity by providing a third 115 kV supply circuit (B8W) from Karn TS. The project was put in-service in August 2019.

4.1.2 Bronte Sub-region

Bronte sub-region includes the area served by Bronte TS in Oakville, supplied by 115 kV circuits B7/B8 circuits and two 230 kV supply stations of Burlington TS and Cumberland TS. Updates to identified needs in this sub-region are as follows:

- **Bronte TS - T5/T6 Transformers and Switchgear End-Of-Life**

The recommended plan is to replace end of life (EOL) T5/T6 93 MVA transformers with standard 83.3 MVA units and refurbish EOL low voltage switchgear. This will address the needs at Bronte TS by maintaining the station's operability and reliability of supply. The project is expected to be in-service by Q4 2020.

- **115 kV Circuit B7/B8 End-Of-Life Section (Burlington TS x Nelson JCT)**

The 115kV double circuit line B7/B8 supplies around 130 MW to Burlington and Oakville area loads through Bronte TS. The line section from Burlington TS to Nelson junction (approximately 2.3 km) was built in 1920's and it was assessed that the conductor on this line section has reached its end of life. This project is expected to be in-service by Q4 2023.

- **Cumberland TS - Power Factor**

The power factor at Cumberland TS under peak load conditions is lagging slightly below the requirement of 0.9. Burlington Hydro has installed capacitor banks on the distribution system supplied by Cumberland TS to improve power factor. Hydro One and Burlington Hydro will continue monitoring the power factor at this station and will take appropriate actions as required.

- **Burlington TS – T12 Autotransformer and LV Switchgear End-Of-Life**

Burlington TS is a major switching and transformer station in the city of Burlington. The facilities at this station include a 230 kV switchyard, four 230/115 kV autotransformers, a 115 kV switchyard and a 230/27.6 kV DESN. Hydro One has identified that the autotransformer T12 and its DESN's LV Metalclad switchgear are approaching their EOL. The DESN LV switchgear and the T12 autotransformer are currently planned to be replaced by 2026 and 2030 respectively.

4.1.3 Greater Hamilton Sub-region

The Greater Hamilton Sub-region encompasses the City of Hamilton and surrounding areas. Following is an update to the identified needs in this sub-region:

- **Beach TS - T3/T4 Transformers End-Of-Life**

The recommended plan was for Hydro One to proceed with reconfiguring the 115 kV T3/T4 DESN to a 230 kV configuration by replacing the existing EOL non-standard transformers with standard 100 MVA 230/13.8 kV units. The project was put in-service in Q3 2018.
- **Horning TS - T1/T2 Transformers and LV Switchgear End-Of-Life**

The recommended plan was for Hydro One to proceed with replacement of EOL T1/T2 transformers with similar 100 MVA 230/13.8 kV units and refurbishing EOL low voltage metalclad switchgears. The project was put in-service in Q4 2018.
- **Mohawk TS - Station Capacity and T1/T2 Transformers End-Of-Life**

The recommended plan was for Hydro One to proceed with replacement of the existing non-standard EOL supply transformers at Mohawk TS with standard 75 MVA units to address the issue of EOL assets and providing sufficient station supply capacity. The project was put in-service in Q4 2018.
- **115 kV Circuit B3/B4 End-Of-Life Section (Horning Mountain Jct. to Glanford Jct.)**

The 115 kV B3/B4 line supplies Hamilton sub-region loads including Dundas TS (T1/T2 DESN) and Mohawk TS. The 11 km long section of this line from Horning Mountain Jct. to Glanford Jct. is approximately 100 years old and at its end of useful life. The recommended plan is to refurbish this EOL line section from Horning Mountain Jct. to Glanford Jct. This refurbishment project is expected to be in service by Q4 2020.
- **Elgin TS - T1/T2/T3/T4 Transformers and LV Switchgear End-Of-Life**

The recommended plan is for Hydro one to reconfigure the station and replace the four smaller EOL transformers with two larger units supplying two switchgears. Under this plan, the EOL T1/T2 and T3/T4 DESNs will be replaced by a single T5/T6 DESN with two 100 MVA 115kV-14.2/14.2kV standard units and a single new MVGIS switchyard. This project is expected to be in service by Q4 2021.
- **Newton TS - T1/T2 Transformers End-Of-Life**

The recommended plan in the first and second cycle RIP was for Hydro One to proceed with the replacement of the existing non-standard EOL T1/T2 transformers at Newton TS with new standard 75 MVA units. Recently the transformer T2 failed and is being replaced on an emergency basis and transformer T1 replacement has been accelerated and is expected to be replaced by Q1 2021. To maintain system reliability in 2020 Hydro One initiated preliminary cost estimation activities relating to an investment at Newton TS that will address end-of-life HV breakers with a planned in-service date by Q4 2025.
- **Kenilworth TS - Transformers and Switchgears End-Of-Life and Power Factor**

The recommended plan is for Hydro One to proceed with the reconfiguration of the station reducing from two DESNs to a single DESN with two transformers supplying two switchgears. The recently replaced transformer and one of the existing metalclad switchgear will be utilized while one transformer and switchgear will require to be replaced. The new transformer will be a unit similar to standard unit replaced in 2014. This refurbishment project is expected to be in service by 2021.

The power factor at Kenilworth TS is also lagging below the requirement of 0.9. The LDC is addressing this need by installing a capacitor bank at Kenilworth TS following the completion of above Kenilworth TS refurbishment and reconfiguration work in 2021. The power factor correction project is currently planned to be in service by 2022.

- **Dundas TS - Load Transfers**

Dundas TS has two DESN units; one of the two units has loads in excess of its supply capacity while the other DESN has spare capacity to accommodate these excess loads. The recommended plan is for the LDC to balance the load between the two Dundas TS DESNs. This project is currently planned to be completed by 2021.

- **Gage TS - T3/T4/T5/T6 Transformers and LV Switchgear End-Of-Life**

The recommended plan for Hydro One is to reconfigure the station and reduce it from 3 DESNs to 2 DESNs. Under this plan, the two EOL DESNs, T3/T4 and T5/T6 made up of 56 MVA transformers will be replaced by a single T10/T11 DESN with two 100 MVA standard units, and switchgear currently supplied by T5/T6 transformers will also be replaced. This project is expected to be in service by 2021.

- **Birmingham TS – T1 Transformer and LV Switchgears End-Of-Life**

The recommended plan is to replace EOL T1 transformer with a similar unit and the three EOL 13.8 kV LV metalclad switchgears at Birmingham TS to meet the unique connection needs of the customer at this station. This refurbishment project is expected to be in service by 2025.

- **Nebo TS – T3/T4 Transformers End-Of-Life**

Nebo TS has two DESN units T1/T2 and T3/T4 supplying Hamilton area loads at 27.6 kV and 13.8 kV respectively. The T3/T4 transformers at this station have been identified as approaching end of life in the 2025- 2029 timeframe and requiring replacement. The current tentative plan is to replace these non-standard 75 MVA transformers with 100 MVA standard units. Since the transformer replacement need is not imminent, the Study Team recommends reviewing these needs again in the next regional planning cycle.

- **115 kV Cables in Hamilton Sub-Region - HL3/HL4, K1G/K2G, H5K/H6K End-of-Life**

Underground cables in Hamilton sub-region (listed below) are expected to be approaching their EOL over the next 10 years.

- 115 kV H5K/H6K Cable (Beach TS to Kenilworth TS)
- 115 kV K1G/K2G Cable (Kenilworth TS to Gage TS)
- 115 kV HL3/HL4 Cable (Newton TS to Elgin TS to Stirton TS)

Given that the replacement of high voltage underground cables will be very challenging and costly, it is required that alternatives be developed and assessed ahead of time. Hydro One has developed tentative options to address these mid-term EOL cable replacement needs. The Study Team recommends that the options developed by Hydro One in the second cycle RIP be further assessed by Hydro One and the IESO to develop a recommended plan.

- **Beach TS - T1/T7/T8 Autotransformers and T5/T6 Transformers End-Of-Life**

Beach TS is a major switching and transformer station in East Hamilton. Station facilities include a 230 kV switchyard, three 230/115 kV autotransformers (T1/T7/T8), a 115 kV switchyard and two 230/13.8 kV DESNs. Hydro One has identified that the autotransformers T1, T7 and T8; and the T5/T6 DESN transformers are approaching their EOL, requiring replacement by 2027. The Study Team recommends that the replacement of autotransformers to be assessed as part of the Middleport area bulk transmission planning study by the IESO in coordination with Hydro One. Since the DESN transformer replacement need is not imminent, the Study Team recommends reviewing this need again in the next regional planning cycle.

- **Lake TS - T1/T2 Transformers and LV Switchgears End-Of-Life**

Lake TS is located in the city of Hamilton, and has two DESN: T1/T2 and T3/T4, supplying Hamilton sub-region loads at 27.6 kV and 13.8 kV respectively. The T1/T2 230/27.6 kV transformers and both 13.8 kV and 27.6 kV LV switchgears are at their EOL and have been identified requiring replacement by 2027. Since the replacement need is not imminent, the Study Team recommends reviewing these needs again in the next regional planning cycle.

4.1.4 Caledonia-Norfolk Sub-region

This sub-region includes the Haldimand and Norfolk Counties, and covers the southern part of Burlington to Nanticoke Region. Several new needs were identified in this sub-region.

- **115 kV C9/C12 – Norfolk Area Supply Capacity**

Norfolk area is currently supplied by Norfolk TS and Bloomsburg DS through 115 kV double circuit supply (C9/C12) from Caledonia TS autotransformers. The area supply capacity is limited by voltage decline limit in the event of loss of one the two (C9 or C12) supply circuits. This area has recently seen a significant interest from greenhouse developers and loads in this area are expected to grow significantly. The Study Team recommends in the near term the load growth need will be met through load transfers from Norfolk area to Jarvis TS and by installing capacitor bank(s) at Norfolk TS. Hydro One plan is to have the capacitor bank connected in 2023.

Hydro One has developed options to address the forecasted needs in the mid-to long term. The Study Team recommends further assessment be carried out by the IESO and Hydro One to review the options identified above and/or other non-wires solutions, to address the capacity needs for the Norfolk Area in advance of the next planning cycle.

- **Norfolk TS - LV Switchgear End-Of-Life**

The recommended plan is to refurbish the Norfolk TS LV switchgear which is at its EOL. This project is currently expected to be in service in 2029.

- **Caledonia TS (T1) and Jarvis TS (T3/T4) Transformer End-Of-Life**

The Caledonia TS T1 and Jarvis TS T3/T4 transformers are approaching end of life in the 2025- 2029 timeframe. Since these transformer replacement needs are not imminent, the Study Team recommends reviewing these needs again in the next regional planning cycle.

4.2 Toronto

The Toronto (formerly referred to as Metro Toronto) Region comprises the area within the municipal boundary of the City of Toronto. In the first regional planning cycle, the region was divided into two sub-regions: Central Toronto and Northern Toronto sub-regions. In the second Regional Planning cycle, the Toronto Region was assessed as a whole and no sub-regions were created.

The second cycle Needs Assessment report for this region was completed and published by Hydro One in October 2017. An IRRP was completed by the Study Team and report was published in August 2019. The second cycle RIP was completed in March 2020. Updates to the needs and plans recommended in this region are provided below.

The following active projects were developed to address near- and medium-term needs identified in the first cycle of RIP:

- **West Toronto Area Station and Line Capacity**

This project was completed and the station was in service in Q4 2018. This project includes adding a new 115/27.6kV DESN at the Runnymede TS site and upgrading the respective 115kV circuits, K1W/K3W/K11W/K12W.

- **Southwest Toronto Station Capacity**

The planned in-service date is currently scheduled for Q1 2022. This project includes adding a new 230/27.6kV DESN at the Horner TS site. New distribution feeder ties are also required to be built between Manby TS and Horner TS by THESL to accommodate load transfer out of Manby TS to Horner TS as the loading at Manby TS exceeds its capacity.

- **Downtown District Station Capacity (Copeland MTS)**

Phase 1 has been in service since Q1 2019. Phase 2 of the project includes adding a second 115/13.8kV DESN at the Copeland MTS site. Based on the station capacity consideration for the Downtown District stations, the need date for Phase 2 is in the medium to long term and shall be completed by 2024.

- **Richview TS to Manby TS Corridor Line Capacity**

Reinforcement of the Richview TS to Manby TS 230 kV corridor based on changes in assumptions and up to date load forecast. The recommended plan is staged as follows:

Stage 1: Rebuild existing 115kV idle line to 230kV and reconfigure two existing circuits R2K and R15K into “Super-circuits”. Stage 1 is currently expected to be in-service in Q3 2023.

Stage 2: Unbundle the super-circuits and tap them to the existing VxR circuits to Claireville at Richview TS, and terminate the circuits at Manby TS (3 new breakers). The work shall be completed coincident with Manby TS EOL replacement work, both of which are planned for completion in Q3 2025.

- **Manby TS SPS Load Rejection (L/R)**

This project was completed in 2019. The breaker failure contingency at Manby TS caused outage of two of the three autotransformers. The purpose of this investment was to ensure

that loading on in-service equipment at Manby TS is not exceeding the Short Term Emergency (STE) rating for loss of two out of three autotransformers in the Manby TS East and West switchyards.

Below are the updates for the new needs identified in the second cycle Needs Assessment, IRRP and RIP reports:

- **East Harbor / Port Lands Area Transformation Capacity**
The LDC has identified an emerging area of load growth in the East Harbor and Port Lands in Toronto. The current load in the area is supplied from Esplanade TS and Basin TS. Transformation capacity in the area is sufficient with present day loading; however, due to the potential growth in area load, there may be a need for increased capacity around 2030+. This need will be further assessed in the next regional planning cycle to review options and to develop a preferred plan.
- **Load Restoration – C14L+C17L, C5E+C7E, and K3W+K1W**
For the loss of circuits, C14L+C17L, C5E+C7E, and K3W+K1W, the load interrupted by configuration can exceed 150 MW and/or 250 MW and are required to be restored within the prescribed timelines as described in the ORTAC^[6]. This need has been assessed in the IRRP phase, which determined that there is sufficient low voltage load transfer and switching capabilities to meet the load restoration requirements.
- **Main TS End of Life Transformers**
The Study Team recommends that the existing 45/75 MVA end of life transformers be replaced by larger 60/100 MVA transformer units, given the longer term potential of load growth and additional system resiliency and flexibility provided. The replacement is expected to be completed by the end of 2021.
- **Bermondsey TS – End of Life T3/T4 Transformers**
The Study Team recommends that Hydro One proceed with the refurbishment of the T3/T4 DESN of Bermondsey TS as per current standard. The refurbishment is expected to be completed by 2025.
- **John TS – End of Life Transformers, 115 kV breakers, and LV Switchgear**
Replacement of the end of life transformers with 60/100 MVA units in a similar connection arrangement was determined to be the most feasible and economic solution. Existing oil filled breakers will be replaced with SF6 breakers. The transformers and breakers replacement will be coordinated with Toronto Hydro's work to replace their LV switchgear in several stages. This project is expected to be in service by 2026.
- **Manby TS – T7, T9, T12 autotransformers, T13 step-down transformer, and, rebuild 230kV yard**
The Study Team recommends replacement of Manby East T7, T9, and Manby West T12 autotransformers with 250 MVA units. Also, Manby T13 DESN transformers will be replaced with 75/93 MVA unit along with end-of-life 230 kV oil breakers and modify 230 kV

switchyard. Three new breakers will be installed to accommodate the new circuits to Richview TS (as part of the Richview TS to Manby TS Corridor Reinforcement). The project is expected to be completed by 2025.

- **115kV C5E/C7E underground cable Esplanade TS to Terauley TS**
The refurbishment of end-of-life sections of the 115 kV underground cables C5E/C7E is expected to be completed by 2024.
- **115 kV overhead line H1L/H3L/H6LC/H8LC (Bloor St. JCT to Leaside JCT), and L9C/L12C (Leaside TS to Balfour JCT)**
The Study Team recommends the refurbishment of the end-of-life overhead section as per current standard. These projects are expected to be completed by 2023.

4.3 Windsor-Essex

The Windsor-Essex region includes the most southerly portion of Ontario, extending from Chatham southwest to Windsor. It consists of the City of Windsor, the Municipality of Leamington, the Town of Amherstberg, the Town of Essex, the Town of Kingsville, the Town of Lakeshore, the Town of LaSalle, the Town of Tecumseh, and the Township of Pelee, as well as the western portion of the Municipality of Chatham-Kent.

The second cycle of regional planning was triggered in 2017 and the Needs Assessment report for the region was completed and published by Hydro One in October 2017. The IRRP was completed and report was published by IESO in September 2019. The RIP was completed and RIP report was published by Hydro One in March 2020.

Implementation plans to address some of these needs are already completed or are underway. Since the first regional planning cycle, the following projects have been completed and underway:

- **J3E/J4E Load Restoration**
During the first cycle, it was identified that SECTR project might not fully address the load restoration challenges in the J3E/J4E sub-system following the loss of C23Z/C24Z. The Study Team has further assessed load restoration need in IRRP and confirmed that existing transmission reconfiguration options are sufficient to restore the interrupted load. Hence there are no additional load restoration requirements for the study period of the second cycle of Regional Planning.
- **Supply to Essex County Transmission Reinforcement:** Build new 13 km double-circuit 230 kV transmission lines to Leamington area tapped to existing C21J/C22J circuits, the project was completed in 2017.
- **Leamington TS Capacity**
Since the completion of the Needs Assessment, the updated load forecast shows that by 2021 the load demand in the Leamington area will exceed the capacity of the existing Leamington TS by about 200 MW. As a consequence, Hydro One built the second DESN at Leamington TS

with the addition of 2 x 75/125 MVA, 230/27.6 kV transformers. The project was completed in Q4 2019. Additional SPS component was added to the project scope and that portion is expected to be completed in Q1 2021. The recommended SPS is intended for use during system restoration following the loss of any of the following circuits: L28C, L29C, W44LC, W45LS or S47C. The SPS would monitor the status of these circuits and trip load, as required, at Leamington TS, Aphria CTS and Mastron II CTS following the loss of any one of the circuits. The implementation of this SPS would avoid the need for load curtailment at these stations during this system restoration.

- **Kingsville TS – T1/T2/T3/T4 Transformers End-Of-Life**

As the result of significant load increase in the Kingsville area, consistent with the recommendations in the NA and IRRP, Hydro One is planning to replace the existing 4x42MVA units with 2x83MVA units. The first 83MVA unit was in service in 2018, while the second unit is expected to be in service in Q4 2021.

- **Keith TS – T11/T12 Autotransformers End-Of-Life**

T11 and T12 are to be replaced with larger 250MVA units to improve load supply and restoration capability for the 115kV J3E/J4E subsystem. This work is currently planned to be completed by 2024.

- **Keith TS- Reconfiguration of 230 kV and 115 kV circuits and 27.6 kV feeders**

To accommodate the construction of Gordie Howe International Bridge reconfiguration on station equipment within Keith TS was required. In addition reconfiguration on transmission circuits J5D (230 kV), C21J/C22J (230 kV), J3E/J4E (115 kV), connection facilities for customer owned circuit J2N (115 kV), and Distribution feeders 23M3, 23M4, and 23M5 (27.6 kV) was performed. The project was completed in 2019.

- **Crawford TS – T3 Transformer End-Of-Life**

T3 was replaced with similar 83MVA unit in May 2018.

- **Lauzon TS Transformers End-Of-Life**

At Lauzon TS, there are two autotransformers T1/T2, and two DESNs – DESN #1 supplied by step-down transformers T5/T6, and DESN #2 supplied by step-down transformers T7/T8. T5 and T6 are currently planned for replacement with larger size units by 2024. End of life step-down transformers T7 and T8, and end of life autotransformers T1 and T2 are currently expected to be replaced by 2029.

- **Tilbury TS decommissioning**

Decommissioning of station due to end-of-life and transfer serviced load to Tilbury West DS supply is in progress and it is expected to be completed by 2024.

- **Lakeshore SS & South Middle Road TS**

The recommended plan to address supply capacity need to the Kingsville-Leamington area includes building a new switching station at Leamington Junction (Lakeshore TS), and a new DESN station (South Middle Road TS), and building 230 kV double-circuit transmission line from Chatham SS to the new Lakeshore TS. The planned in-service date for this project is in 2025.

The second cycle RIP has concluded that the following needs require further assessment:

- Capacity needs at Kent TS, install new feeder positions to supply load growth at Kent TS, and further evaluate the plan for a new DESN south of Chatham as part of the Chatham-Lambton-Sarnia regional planning process
- Belle River TS station capacity, monitor load growth and re-evaluate the need in the next regional planning cycle

The RIP has confirmed K6Z, and C23Z/C24Z can meet the load security and restoration needs and no further actions are required.

4.4 GTA North

The GTA North Region is approximately bounded by the Regional Municipality of York, and also includes parts of the Cities of Toronto, Brampton, and Mississauga. For the purpose of regional planning, the region was divided into two sub-regions: York and Western sub-regions.

The Needs Assessment led by Hydro One for the second cycle was completed and the report was published in March 2018. The IRRP was then completed and the report was published by IESO in February 2020. The RIP has also been completed and the report was published by Hydro One in October 2020.

4.4.1 York Sub-region

This sub-region is further classified into Southern York and Northern York areas to reflect the layout of the electricity infrastructure. Southern York area includes the municipalities of Vaughan, Markham, and Richmond Hill; while the Northern York area encompasses the municipalities of Aurora, Newmarket, King, East Gwillimbury, Whitchurch-Stouffville and Georgina, as well as some load in Simcoe County that is supplied from the same electricity infrastructure.

Below are updates to the York Sub-region needs identified during the first cycle of Regional Planning:

- **Load Security on V71P/V75P – Parkway to Claireville**

In the first planning cycle, the Study Team recommended the installation of in-line switches at the Vaughan MTS #1 junction in order to improve the capability of the system to restore load in the event that both 230 kV circuits V71P/V75P are lost (700MW at summer peak loading). Though this will improve load restoration, this does not address the load security need on V71P/V75P.

During the second cycle the Study Team accepted that the load security criteria is not met, but agrees that no further action is required at this time since the switches permit quick restoration of the load. Hydro One completed this project in 2018.

- **Vaughan MTS Transformation Capacity**

Based on the current extreme summer weather non-coincident peak net load forecast, the need for additional transformation capacity was identified beyond 2027. During the second cycle RIP the Study Team recommended to build a new Vaughan #5 MTS, by 2030.

- **Markham MTS Transformation Capacity**

In the first cycle RIP, the Study Team recommended to continue the assessment of wires and non-wires options to address the need for additional transformation capacity in the Markham-Richmond Hill area and to refine the need timing. Based on the latest extreme summer weather non-coincident peak net load forecast, the need for additional transformation capacity is projected to be in 2025. The IESO has issued a letter of support to Hydro One Transmission and Alectra to begin wires planning for a new 230/27.6kV DESN (Markham MTS#5). Hydro One and Alectra are currently in the process of selecting a preferred location to connect to 230 kV circuits P45/P46. During the second cycle, the Study Team also identified a need to increase the thermal capacity of the existing lines by changing the conductors. The new Markham MTS#5 is expected to be built by 2025 and upgrading the supply capability of 230 kV circuits P54/P46 is expected to be completed by 2029.

- **Station Service Supply to York Energy Centre**

In the first cycle RIP, a need for addressing station service supply to York Energy Centre (currently supplied from Holland TS) in the event of a (i) low-voltage breaker failure at Holland TS; or (ii) double circuit 230 kV contingency, was identified. These events can result in an interruption to the station service supply to York Energy Centre and therefore the loss of all generation output until the station service can be restored from the alternate source. This need has been reaffirmed in the second cycle and currently the IESO and Study Team are pursuing alternative station service configurations at YEC as soon as possible to enable faster restoration of load on H82V/H83V, consistent with the load restoration criteria.

- **Northern York Area Transformation Capacity**

In the first cycle RIP, the study team recommended the need for additional transformation capacity in the Northern York Area, along with associated transmission capacity. The latest electricity demand growth forecast shows that the transformer stations capability (Holland TS/Armitage TS) will be exceeded post 2027.

Additional step down transformation capacity is needed for the areas supplied by Armitage TS and Holland TS. There is transfer capability between these stations, so their combined LTR of 485 MW is used to determine the need. Based on the load forecast, it is expected that additional step down transformation capacity will be needed by 2027.

The second cycle of NA and RIP has identified the following new needs in the York Sub-region:

- **Woodbridge TS Transformer T5 End-Of-Life**

Woodbridge TS supplies both Alectra and THESL. Woodbridge TS comprises one DESN unit, T3/T5 (75/125 MVA), with two secondary winding voltages at 44 kV and 28 kV. T5 is currently about 46 years old and has been identified to be replaced. The study team recommended to replace the end of life transformer with a similar type and size unit as per current standard. Replacement will be led by Hydro One and coordinated with the affected LDCs and no further regional co-ordination is required. Currently, Transformer T5 is expected to be replaced in 2027.

- **High Voltages on M80B/M81B**

Post-contingency voltages on M80B/M81B may exceed 250 kV during future high load conditions. High voltages at Beaverton and Lindsay may occur following contingencies that leave these stations radially connected to Minden TS. These high voltages are observed when low voltage capacitor banks at Beaverton and Lindsay are dispatched under heavy load. The IRRP recommends identifying and implementing the solution no later than 2025 to mitigate the voltage rise issue. Two alternatives were explored during the second cycle by the Study Team – manual remote operator switch of the LV capacitor banks and SPS modification to automatically remove capacitor banks at Lindsey TS and Beaverton TS. The Study Team agreed that Alternative 1 would meet the need as the system can withstand the expected voltages and manual action is adequate.

4.4.2 Western Sub-region

This sub-region comprises the Western portion of the City of Vaughan, roughly bordered geographically by Highway 407 on the south, King-Vaughan Road on the north, Highway 50 on the west, and Islington Avenue on the east.

Below is an update on Western Sub-region needs identified during the first cycle RIP:

- **Load restoration for 230 kV circuit V43 and V44**

V43 and V44 circuits supply Woodbridge TS, Vaughan #3 MTS, and Kleinburg TS. The need was identified in 2016 during the first cycle Needs Assessment for the GTA North – Western Sub-Region because the load restoration timelines as per the ORTAC [6] may not be met. During the second cycle, the Study Team agreed that no further action is required at this time. The Kleinburg to Kirby option to address the supply capacity needs in the long term would improve the load restoration capability for these circuits. Until a preferred long-term solution is identified for the Claireville to Minden corridor, the Study Team determined that there is no need to pursue other alternatives.

4.5 Greater Ottawa

Greater Ottawa Region covers the municipalities bordering the Ottawa River from Stewartville in the West to Hawkesbury in the East and North of Highway 43. For the purpose of regional planning, the region is divided into two sub-regions: Ottawa Area and Outer Ottawa.

Following the completion of the RIP for the Greater Ottawa Region in December 2015, the second cycle Needs Assessment led by Hydro One was initiated in February 2018. The Needs Assessment report was completed and published in June 2018. The IRRP was completed and report was published by IESO in March 2020. The Hydro One led RIP will be completed and the report published in Q1 2021, after the publishing of the IRRP report. Updates for the two sub-regions are discussed below:

4.5.1 Ottawa Area Sub-region

The Ottawa Area sub-region covers the central part of the Greater Ottawa Region and includes the City of Ottawa and the surrounding municipalities. Updates to previously identified needs from the last Regional Planning cycle are as follows:

- **Merivale TS T22 – LTR Exceeded**
 The need for additional 230/115kV auto-transformation capacity at Merivale TS was assessed by Study Team as part of the broader South West Area’s need for capacity (described below) in the IRRP phase. Hydro One will replace transformer T22 at Merivale TS with one that is approximately equal to T21 as a first step to address the need for increased supply to the 115 kV system. The current plan is to have the replacement completed by 2025-2026.
- **South West Area – Capacity**
 To reinforce electricity supply to southwest Ottawa: a 230 kV in-line breaker at Almonte TS was installed (2015), a section of the S7M circuit was upgraded (2017), and development work for a new South Nepean MTS and 230 kV connection line ensued, expected in-service date is 2022. A double circuit 230kV line (1.3km) from Cambrian JCT to Cambrian MTS to supply the new MTS will be built by Hydro Ottawa.
- **Hawthorne TS T5 and T6 – LTR Exceeded**
 To reinforce the overall regional supply: end-of-life Hawthorne transformers T5/T6 are in the process of being replaced with higher rated transformers, T6 has been completed, T5 is expected to be completed in 2021.
 Transformers T7/T8 at Hawthorne TS were replaced with higher rated (125 MVA) transformers in 2019.
- **Ottawa Center 115kV Area – Station Capacity**
 Ottawa downtown stations (including Russell TS, Riverdale TS, and Overbrook TS) capacity needs are being currently reassessed within the context of updated forecasts, EOL stations upgrades and feeder ties by Study Team and will be addressed in the RIP.
- **Russell TS and Riverdale TS (Part of Ottawa Center 115kV Area – Station Capacity)**
 The loading on these stations will be kept within equipment limits through the construction of feeder ties by Hydro Ottawa to transfer excess loads to other area stations.
- **Overbrook TS (Part of Ottawa Center 115kV Area – Station Capacity)**
 To reinforce electricity supply to central Ottawa and address equipment EOL at Overbrook TS, transformers were replaced and reconfigured in 2018. The station transformers have been replaced with standard sized units that resulted in an increase in the station capacity from 72MW to 130MW.
- **Riverdale TS 13.8kV Switchgear Replacement**
 Riverdale TS is a 115/13.8kV station connected to 115kV circuits A3RM, A5RK, and A6R. Switchgears on Riverdale TS 13.8kV side have been identified approaching their end of

service life. The Study Team recommended that Hydro Ottawa continue with the 13.8kV switchgear replacement plan. The work is expected to be completed between 2021 and 2023.

- **Bilberry Creek TS – Refurbishment & Orleans TS – Reliability**

Bilberry Creek TS consists of a 115/27.6 kV step-down transformer in East Ottawa, supplying up to 85 MW of load 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. A decision on whether to refurbish the station and keep the load on the 115 kV systems or to retire the station and move the load over to the 230 kV systems by supplying it from the newly built Orleans TS was made during the second cycle IRRP process. The Study Team recommends that Hydro One proceed with the like-for-like refurbishment of Bilberry Creek TS, with expansion to accommodate two additional breaker positions to supply Hydro Ottawa customers. The two options that were considered have similar estimated costs, however only the refurbishment option results in sufficient capacity to supply the combined demand forecast at Bilberry Creek TS and Orleans TS.

- **King Edward TS – Station Capacity**

The capacity at King Edward TS is limited to 71MW. Station assessment identified station equipment that is at end of life and requires replacement, including the replacement of the T3 power transformer, protection, control and telecom (PCT) equipment along with disconnect switches. The T3 power transformer is being replaced with a larger size unit rated 115-14.2-14.2kV, 60/80/100MVA that is similar with the companion T4 unit ratings. The project is currently under execution, and the expected in-service date is Q1 2022.

- **Almonte TS/Terry Fox MTS – Voltage Regulation**

Circuit E34M/T33E is a 290 km line between Clarington TS in Oshawa, and Merivale TS in Ottawa. If the circuit E34M is open at the Merivale TS end, Terry Fox MTS and Almonte TS will need to be supplied radially by Clarington TS. However, studies have shown that Clarington TS will not be able to provide adequate support for Almonte TS and Terry Fox MTS during peak loading period, which would in turn result in voltages below the minimum allowable levels. This is currently being assessed during the IRRP with the consideration of the upcoming South Nepean project. Based on the findings, it will be further addressed in the RIP phase and the Study Team will recommend a preferred plan.

- **A4K Supply Capacity**

This need is to be addressed by providing an additional supply to Overbrook TS from a tap to circuit A6R. Riverdale JCT x Overbrook TS: Build New A6R Tap project was completed and in-service in Q2 2019.

The second cycle Needs Assessment report has identified new needs in the Ottawa Area Sub-region that require further regional co-ordination. The following needs were also confirmed in the IRRP phase:

- **S7M 115kV Line Refurbishment**

The 115 kV conductors, spread across multiple S7M line sections totaling 6.5 km, have been identified at or near their end of service life. As suggested by Hydro One, refurbishment of

these line sections is recommended by the Study Team, to replace conductors, wood poles, insulators, and other components. The refurbishment is expected to be completed between 2021 and 2022.

- **Albion TS – EOL T1/T2, Switchgears, Breakers**

Albion TS is a 230/13.8/13.8kV station connected to 230kV M30A and M31A circuits, supplying Hydro Ottawa. The transformers T1 and T2 rated at 45MVA each, were built in the 1970s, and have been identified to be approaching end of their life. As per the recommendation from Needs Assessment and further assessed in the IRRP, Albion T1 and T2, along with associated metal-clad switchgears and breakers are currently scheduled for replacement by 2026. No increase in the transformation capacity is recommended.

The Needs Assessment identified that the following new EOL needs in the Ottawa Area Sub-region do not require further regional coordination:

- **Slater TS – EOL Transformers T1/T2/T3**

Slater TS is an 115/13.8/13.8kV station connected to 115kV A3RM, M4G, and A5RK circuits, supplying Hydro Ottawa. The station has three transformers T1, T2, and T3, rated at approximately 65MVA each, built in the 1960s. In 2018 T1 failed and was replaced with a 100MVA unit. Currently Hydro One is in process of replacing and upsizing the remaining EOL T2 and T3. This additional LMC would provide Hydro Ottawa with flexibility to transfer load from other stations in the downtown Ottawa area, where there are limited options for siting new supply stations. The replacement of the EOL equipment is expected to be completed by 2023.

4.5.2 Outer Ottawa Sub-region

The Outer Ottawa sub-region includes the eastern and western parts of the Greater Ottawa Region. The eastern part extends from the city of Clarence-Rockland, municipality of Casselman and eastward to Champlain Township. Along the Ottawa River there are several LDC-owned distribution stations supplied by the 115 kV circuit 79M1. The western part covers the area west of Kanata.

Previously identified needs during the first cycle RIP phase are re-affirmed in the second cycle Needs Assessment and IRRP. Updates are as follows:

- **Voltage Regulation at Stewartville TS**

The load on the Stewartville TS was previously expected to increase significantly as a result of the connection of a large utility load forecasted for 2018. However, the most recent Outer Ottawa Sub-region forecast revealed that loading on Stewart TS is expected to remain at around 25MW over the next 10 years. No further actions are required at this time.

- **79M1 Circuit – Voltage Regulation**

There is low voltage observed on this circuit and the voltage regulation is dependent on the amount of load being supplied by the circuit. In addition, it is impacted by load supplied by 115kV circuit H9A within the Ottawa Area sub-region. This voltage regulation need is being reviewed during the IRRP phase along with load forecast for stations supplied by 79M1 and will also be addressed in the RIP.

The following newly emerged EOL needs identified in the second cycle Needs Assessment for the Outer Ottawa Sub-region do not require further regional co-ordination:

- **Arnprior TS – EOL Transformers T1/T2**

Arnprior TS is a 115/44 kV DESN connected to W6CS and C7BM 115 kV circuits, supplying Hydro One Distribution. Transformers T1 and T2, built in 1960 and 1957, respectively, rated at 42MVA each, have been identified to be at the end of their service life. The Study Team recommended that this need is to be addressed by Hydro One Transmission and Distribution to co-ordinate the replacement plan. The replacement of the EOL equipment is expected to be completed by 2023-2024.

- **Longueuil TS – EOL Transformers T3/T4**

Longueuil TS is a 230/44kV DESN connected to 230kV B5D and D5A circuits, supplying Hydro One Distribution. Transformers T3 and T4, built in 1965 and 1964, respectively, are rated at 93MVA each, and they have been identified to be at EOL. Considering the relatively flat load growth rate at the station, replacing the EOL transformers with similar size units is recommended in the Needs Assessment. The Study Team recommended that this need is to be addressed by Hydro One and Hydro One Distribution to coordinate the replacement plan. The replacement of the EOL equipment is expected to be completed by 2024.

4.6 Kitchener-Waterloo-Cambridge-Guelph (KWCG)

The KWCG region includes the municipalities of Kitchener, Waterloo, Cambridge and Guelph, as well as portions of Perth and Wellington Counties and the Townships of Wellesley, Woolwich, Wilmot and North Dumfries.

The first RIP was completed in December 2015 and recommended regional plans are being monitored by Hydro One for timely completion. Needs Assessment phase was completed and the report was published in December 2018. The IRRP phase will be completed and the report published by IESO in Q1 2021. The second cycle RIP will be completed subsequently.

The following needs were identified in the NA report:

- **Waterloo North Hydro – Step-down Transformation Capacity**

During the first regional planning cycle a need for a new MTS #4 DESN was identified in the 2024 timeframe. The current load forecast defers this need beyond the study period of the current Regional Planning cycle.

- **Energy+ MTS #2**

Energy+ initially identified a future need for a new DESN station (MTS #2) in the city of Cambridge near Preston TS. This station need is due to a potential new load center growth in their service territory. The additional supply capacity due to EOL transformer replacement and available new feeder positions at Preston TS, will defer this new MTS need beyond the study period of current regional planning cycle.

- **Waterloo North Hydro – Supply Reliability at Elmira TS**
Hydro One, in consultation with Waterloo North Hydro, has developed a supply reliability improvement plan for Elmira TS loads. The plan to improve supply reliability of Elmira TS loads will be included in the second cycle RIP report.
- **Campbell TS T3/T4 DESN Overloading**
At Campbell TS, there are two DESNs – T1/T2 DESN and T3/T4 DESN. The T3/T4 DESN is expected to exceed its supply capacity during the study period. After replacement of T1 transformer and addressing the secondary equipment limitations there will be sufficient spare supply capacity on T1/T2 DESN to accommodate T3/T4 DESN excess loading. Hydro One and Alectra Utilities will work together to balance loads between the two Campbell TS DESNs, when required.
- **End-of-Life Transformers Replacement**
The implementation and execution plan for these needs will be coordinated by Hydro One with affected LDCs:
 - Campbell TS (T1/T2)
 - Hanlon TS (T1/T2)
 - Cedar TS (T7/T8)
 - Kitchener MTS #5
 - Preston TS (T3/T4)
 - Detweiler TS (T4 Auto Transformer)
- **Refurbishment of EOL line sections:**
 - 115 kV lines B5C/ B6C and D7F/ D9F
 - 230 kV lines D6V/D7V
 Hydro One will coordinate and proceed with refurbishment of these line sections with affected LDCs and customers.

Hydro One will continue working closely with LDCs to develop preferred plans to address these needs in the second cycle RIP.

4.7 GTA West

The GTA West Region covers the Regional Municipalities of Halton and Peel, and comprises the municipalities of Brampton, South Caledon, Halton Hills, Mississauga, Milton, Oakville and parts of Burlington.

The first cycle of regional planning for this region was completed in January 2016. The second cycle of Regional Planning for the GTA West Region is currently underway. The Needs Assessment Report was completed and published in May 2019. The IRRP is currently underway, and is expected to be completed by Q1 2021. An update based on GTA West NA findings is provided below:

- **Additional Station Capacity need at Halton TS**
Halton TS supplies Halton Hills Hydro and Milton Hydro. The recommendations were to build two new step-down stations as follows: Halton Hills Hydro to construct, own and operate a new step-down station at the Halton Hills Gas Generation facility with an anticipated in-

service year of 2020. In parallel, Hydro One is developing Halton TS #2, at the site of the existing Halton TS. Engineering work for Halton TS #2 project has commenced in 2020, with an anticipated in-service date of 2022.

- **H29/H30 Transmission Circuit Supply**

There is a thermal capacity limitation for circuits H29/H30 in the medium-term As identified in first cycle RIP report & 2nd cycle NA report, Hydro One is planning to replace the existing conductor with a larger size conductor with targeted in-service date of 2024.

- **T38B/T39B – Thermal Capacity Limitations**

Circuits T38B/T39B supplies Halton TS, Trafalgar TS, Meadowvale TS, and Tremaine TS and provides connection to upcoming Halton Hills MTS. The supply security and thermal capacity limitations in the medium-term of circuits T38B/T39B under a single-circuit contingency with Halton Hills GS out of service is being addressed in the second cycle GTA West regional planning. This need is being assessed in the IRRP phase and will be further followed in the RIP to develop a preferred plan.

- **Richview X Trafalgar Transmission Circuit Capacity**

Loading limitations on 230 kV circuits between Richview TS and Trafalgar TS are being assessed as part of the IESO-led Bulk System Planning study. IESO's Bulk system planning has not yet taken place and the regional planning Study Team will be provided an update by the IESO on the outcome of the assessment.

- **Northwest Greater Toronto Area (NWGTA) Electricity Corridor Need**

In February 2018, the IESO and the Ministry of Transportation have announced a joint corridor identification study on a proposed land corridor in the Northwest Greater Toronto Area (NW GTA). The purpose of this study was to identify land to be protected for future multi-purpose linear infrastructure (such as transmission lines and transportation infrastructure) to ensure it can be accommodated when the need arises. This long-term need will continue to be studied as part of the second cycle of Regional Planning.

- **End-of-Life Equipment Replacement**

The implementation and execution plan for these needs will be coordinated by Hydro One and affected LDCs:

- Halton TS - PCT and Component Replacements (2024)
- Pleasant TS - Breakers, PCT and Component Replacements (2026)
- Bramalea TS - PCT and Component Replacements (2026)
- Trafalgar TS - Component Replacement (2022)
- Erindale TS - PCT and Component Replacements (2025)
- Palermo TS - T3 / T4 Supply Transformer (2025)

4.8 Greater Bruce/Huron

The Greater Bruce/Huron area is located to the west of the Kitchener-Waterloo region in southwestern Ontario. The region includes the municipalities of Arran-Elderslie, Brockton, Kincardine, Northern Bruce Peninsula and South Bruce. It also includes the township of Huron-Kinloss.

Hydro One completed the first cycle for the region with the publishing of the RIP report in August 2017. At the time the Study Team determined that no regional coordination was required for the identified needs. However, with increased load requests in the region, regional planning was triggered in early 2019. The second cycle Needs Assessment report was published in May 2019 by Hydro One. This was followed by a Scoping Assessment report published by IESO in September 2019. The IRRP for this region is currently underway and is expected to be completed by Q2 2021.

In the current regional planning cycle, the Study Team has reaffirmed the needs identified in the first cycle along with identifying new needs associated with EOL assets in the region. Below is an update to the needs reaffirmed or identified during the current cycle Needs Assessment:

- **115kV L7S Circuit – Capacity Increase**

L7S is a single 115 kV circuit transmission line operated radial from Seaforth TS to St. Mary's TS, supplying municipalities of Bluewater, South Huron, Lambton Shores, Lucan Biddulph, Middlesex Centre, North Middlesex, Thames Centre, Zorra, Perth South, Town of St. Marys, and West Perth. It is approaching its thermal loading limits during peak load conditions.

Under contingency, L7S is overloaded. Options to mitigate the near-term need of upgrading the emergency thermal ratings of L7S are outlined in the Local Plan, prepared in the last Regional Planning cycle. Hydro One Transmission and the LDCs will revisit and assess the viability of the options proposed in the Local Plan.

Based on the current load forecast, overloading of 115 kV circuits L7S (all in-service condition) continuous rating will be exceeded by 2027, and emergency rating under contingency (with one element D8S out) will be exceeded by 2022. Further assessment in the IRRP phase is required for the limited capacity of circuit L7S. In the IRRP phase, the Study Team will assess possible wires and non-wires options to develop a recommendation to address expected load growth in the sub-region supplied by the circuit. The RIP will follow and will reconfirm the need and develop a preferred plan.

- **End-of-Life Assets**

The Study Team determined that no further regional coordination was required to address the following EOL needs. It was recommended that the implementation and execution for the replacement of these EOL transmission assets be coordinated by Hydro One and the affected LDCs and/or customers, where required.

- Wingham TS – T1/T2, PCT and Component Replacement (2022)
- Stratford TS – T1 and Component Replacement (2023)
- Seaforth TS – T1/T2/T5/T6, PCT & Component Replacement (2023)
- Hanover TS – T2 and Component Replacement (2024)

4.9 East Lake Superior

Hydro One has completed the acquisition of transmission assets from the former Great Lake Power Transmission on Oct 31, 2016 under the new name Hydro One Sault Ste. Marie, and therefore became the lead transmitter in the East Lake Superior (ELS) Region. The second cycle of Regional Planning was initiated by Hydro One in 2019, with the NA report published in June 2019 and the IRRP is

currently underway, and is expected to be completed in Q1 2021. The ELS Region includes all of Hydro One Sault Ste. Marie's 560km of high-voltage transmission lines as well as ties to the rest of the provincial grid at Wawa TS in the northwest and Mississagi TS in the northeast. The region also includes Hydro One's 115kV W2C circuit supplying the Town of Chapleau from Wawa TS. During the first cycle of regional planning (led by the former Great Lakes Power Transmission), only local needs were identified and they did not require further regional coordination.

The 2019 NA Report and the Scoping Assessment identified the following needs and recommendations:

- **Third Line TS Station & Transmission Supply Capacity**

Based on planning criteria, following the loss of one autotransformer at Third Line TS, the second autotransformer is expected to exceed its 10-day limited time rating (LTR) by 2022. This need is exacerbated by the poor condition of the 115 kV circuit Sault No. 3, which is currently operated open until the conductor is replaced. The conductor is expected to be replaced by 2022 allowing it to be operated closed. This will defer the need at Third Line TS by reducing loading on the autotransformers to below their 10-day LTR. Further study is recommended for the overload scenario in the IRRP phase of the Regional Planning.

- **115kV No.1 Algoma Circuit Overload**

No.1 Algoma is one of three 115 kV circuits supplying Patrick St TS from the Third Line 115 kV bus. Based on existing load, the loss of circuits No.2 Algoma and No.3 Algoma, or a breaker failure at Patrick St TS, can result in flows on No.1 Algoma exceeding the long-term emergency rating of the line. Further analysis to address this issue will be undertaken in the upcoming IRRP and RIP phases of Regional Planning.

- **Load Restoration**

Load restoration time at the following stations might not meet the ORTAC^[6] guidelines:

- Andrew TS
- Batchawana TS
- Goulais TS
- Echo River TS

During the Scoping Assessment, the Study Team determined that Hydro One and impacted LDC(s) will further examine load restoration time and possible mitigation measures through local planning.

Later a potential load security need in the Sault Ste. Marie sub-system following the loss of both autotransformers at Third Line TS was identified. This will be further studied in the IRRP and RIP phases of the Regional Planning process.

- **End-Of-Life Assets**

The Study Team determined that no further regional coordination was required to address the following EOL needs. It was recommended that the implementation and execution for the replacement of the following EOL transmission assets be coordinated by Hydro One Sault Ste. Marie and the affected LDCs and/or customers, where required.

- Echo River TS – Breaker Replacement (2021)
- No. 3 Sault Conductor and Structure Replacement (2022)
- Third Line TS – Autotransformer T2 & Protection Replacement (2024)
- Patrick St TS – HV Breaker Replacement (2024)

- Batchawana TS / Goulais Bay TS – Station Refurbishment (2024)
- Northern Ave TS – Transformer T1 Replacement (2024)
- DA Watson TS – Metalclad Switchgear Replacement (2025)
- Clergue TS – Switchgear Replacement (2026)

4.10 GTA East

GTA East Region comprises the municipalities of Pickering, Ajax, Whitby, Oshawa, and parts of Clarington and other parts of Durham Region.

The first cycle RIP for GTA East Region was completed in January 2017 and recommended regional plans are being monitored by Hydro One for timely completion. The second cycle RIP was completed and report published in February 2020. The report identified ongoing work at Seaton MTS with targeted in-service date of June 2020 and completed work of new Enfield TS in 2019. Furthermore, the second cycle NA concluded that there were no additional needs other than the EOL replacement work in the region.

The Study Team determined that no further regional coordination was required to address the following EOL needs. It was recommended that the implementation and execution for the replacement of the EOL transmission assets be coordinated by Hydro One and the affected LDCs and/or customers, where required.

Below are the updates of previously identified needs:

- **Cherrywood TS 230kV & 500kV Breaker Replacements**
Cherrywood TS is a major Bulk Electricity System (BES), Northeast Power Coordination Council (NPCC) station, located at east end of Greater Toronto Area (GTA). The existing 500kV and 230kV Air Blast Circuit Breaker (ABCBs), with an average age of 48 years are obsolete and at end of life. The age, condition and lack of parts present significant difficulties in maintaining these breakers and the associated high pressure air system. The project has been divided into multiple phases. Phase 1 of this project is currently underway. The whole project is expected to be completed by 2027.
- **Cherrywood TS MV Switchyard Refurbishment**
The MV DESN switchyard, with the exception of step-down transformers T7 and T8, at Cherrywood TS is at end of life due to age and condition. This project is expected to be in-service in 2025.
- **Wilson TS T1/T2 & Switchyard Refurbishment**
Wilson TS is located in Oshawa and it contains 4 X 75/100/125 MVA, 230/44 kV, transformers that supplies city of Oshawa through Oshawa Power feeders and surrounding areas of Oshawa through Hydro One Distribution owned feeders. The T1 and T2 transformers and majority of assets within 44 kV BY switchyard have reached end of life. Replacement of these EOL assets is expected to be completed by 2022.
- **Seaton MTS**
The construction of the MTS is in progress and is expected to be in service by 2021.

4.11 London Area

The London Area includes the Cities of Woodstock, London and St. Thomas as well as the Counties of Middlesex, Elgin and Oxford. The RIP for the region was completed in August 2017. The second cycle NA was completed and report published in May 2020. The NA determined that identified needs in the region are local in nature and can be addressed directly by Hydro One and affected LDCs, and therefore further regional coordination is not required.

The London Area region was divided into five sub-regions based on electrical supply boundaries for further regional planning purposes:

4.11.1 Greater London Sub-region

The Greater London sub-region is a summer-peaking area that includes the City of London, and customers in surrounding municipalities supplied from Buchanan DESN, Clarke, Highbury, Nelson, Talbot, and Wonderland transformer stations (TS). This sub-region includes customers of London Hydro and Hydro One Distribution.

In 2017, condition assessment of Wonderland TS identified it as in poor condition and assessment of replacement is being done in consultation with LDC load forecast. It will be replaced with a similar unit to match the ratings of transformer T6. The project is currently underway, and the expected completion date is Q3 2022.

In addition, two load restoration needs were identified in this sub-region:

- **Loss of W36/W37 (Clarke TS and Talbot TS)**
For the loss of W36/W37, the Study Team recommended the implementation of automated switching devices on distribution feeders and feeder extensions on the distribution system to improve the load restoration capability.
- **230 kV Transmission Lines**
Under peak load condition and with standard power factor assumption of 0.9, for (N-1) contingency of W36/W37 and breaker failure contingencies at Buchanan TS that involve loss of either W36 or W37, the companion circuit will be loaded close to its LTE rating (96% to 99%) by the end of study period. The circuit loadings improve when power factor of 0.97 as provided by London Hydro is assumed for the transformer stations connected to W36 and W37, namely Talbot TS and Clarke TS. The Study Team recommended that the load restoration need following the loss of W36 and W37 be further assessed as part of Local Planning by Hydro One and the affected LDC(s).

The remaining 230 kV circuits supplying the London Area have adequate capacity over the study period for the loss of a single 230 kV circuit in the Region.

4.11.2 Aylmer-Tillsonburg Sub-region

Aylmer-Tillsonburg sub-region includes city of Aylmer, city of Tillsonburg and surrounding areas within service territories of Erie Thames Powerlines, Tillsonburg Hydro, and Hydro One Distribution, supplied by Aylmer TS and Tillsonburg TS.

The Needs Assessment identified the following:

- Voltage constraint at Tillsonburg TS
- Thermal constraints at 115kV circuit W8T (Buchanan TS x Edgeware JCT)
- Sub-standard customer delivery performance at Tillsonburg TS.

As per the Study Team recommendation, Hydro One completed cost and feasibility assessments of different alternatives to above needs, and in June 2019, the Study Team agreed to proceed with decoupling supply to Tillsonburg TS and Aylmer TS by reconfiguring existing normally open points as well as installing two new low-voltage capacitors at Tillsonburg TS. The project is currently undergoing detail cost estimating and expected to be in service in 2022.

4.11.3 Strathroy Sub-region

This sub-region includes Strathroy TS that supplies the Middlesex County and townships of Adelaide-Metcalf, Warwick, Strathroy-Caradoc via Entegrus and Hydro One Distribution.

The Study Team determined that there were no needs and/or no further regional coordination was required for the sub-region.

4.11.4 Woodstock Sub-region

Woodstock region includes town of Ingersoll, City of Woodstock and rest of northern part of Oxford County, supplied by Ingersoll TS, Woodstock TS, Commerce Way TS, and Karn TS.

A load restoration need was identified in this sub-region as the result of simultaneous loss of 230kV circuit M31W/M32W and this need has been further assessed in a Local Plan completed in May 2017. Based on load forecast and transfer capability information, it was determined that there is sufficient transfer capability in the existing system, and therefore no further action is required.

4.11.5 St. Thomas Sub-region

This sub-region includes city of St. Thomas and surrounding areas supplied by Edgeware TS and St. Thomas TS via distribution network of St. Thomas Energy Inc., London Hydro, and Hydro One Distribution. As recommended in the first Regional Planning cycle St. Thomas TS will be decommissioned, work is underway but is currently on hold due to COVID- 19, re-termination work is currently planned to be completed in Q4 2020.

The Study Team determined that there were no needs and/or no further regional coordination was required for the sub-region.

EOL Assets and Replacement Plan

During the second cycle the following EOL assets were identified for replacement:

- The existing 115 kV switchyard in Buchanan TS will be replaced on a like-for-like basis and is scheduled to be completed in 2025.
- The existing Clarke TS DESN transformers will be replaced on a like-for-like basis and is scheduled to be completed in 2025.
- The existing Wonderland TS 27.6 kV switchyard will be replaced on a like-for-like basis and is scheduled to be completed in 2023.
- Protection equipment replacement projects will take place at Edgeware TS, Longwood TS, and Tillsonburg TS.

4.12 Peterborough to Kingston

The Peterborough to Kingston Region includes the area roughly bordered geographically by the municipality of Clarington on the West, North Frontenac County on the North, Frontenac County on the East and Lake Ontario on the South. The region includes Frontenac County, Hastings County, Northumberland County, Peterborough County, and Prince Edward County and related municipalities.

The first cycle of Regional Planning was concluded with a RIP report published in July 2016. During the first cycle, there were no major needs identified in the region that required coordinated regional planning.

The second cycle of Needs Assessment was completed and report was published in February 2020. The second cycle IRRP is currently underway with expected completion date of Q4 2021. The RIP will follow.

During the first cycle Needs Assessment, the Study Team identified that the load supplied by Gardiner TS DESN 1 exceeded its summer 10 day LTR of 125 MW. As recommended in the first cycle NA, Hydro One Distribution has completed the transfer of load from DESN 1 to lightly loaded DESN 2 with excess capacity resulting in a load relief for Gardiner TS DESN 1.

The following needs were identified by the Study Team in the second cycle Needs Assessment:

- **Overloading at Frontenac TS**
Based on the submitted load forecast, the Frontenac TS will be loaded more than the station LTR by year 2028. The study team recommended Hydro One Transmission to coordinate with Hydro One Distribution and Kingston Hydro to undertake distribution load transfer between Gardiner TS and Frontenac TS over the near term.
- **Belleville TS load connection inquiries**
The summer peak loading on Belleville TS is close to its 10-day summer LTR of 161 MW. In addition to normal load growth in the area, Elexicon Energy Inc. has recently received approximately 30 MW of load connection inquiries to be connected at the Belleville TS. There is insufficient existing capacity in the area to supply the potential future connections. Hydro One plan is to replace these transformers with the similar size transformers, the maximum available standard units. The targeted in-service for transformer T2 is year 2021 and transformer T1 is in year 2025.

To address the future capacity requirements two options are assessed at the moment, to add a third unit, or to add a full new DESN station. During the IRRP and RIP phases, a preferred plan will be recommended.

EOL Assets and Replacement Plan

During the second cycle, the following EOL assets were identified for replacement:

- I. Lennox TS – 230kV & 500kV Breaker Replacements (2020)
- II. Port Hope TS: Transformer Replacement (2023)
- III. Havelock TS: Transformer Replacement (2027)
- IV. Belleville TS: Transformer Replacement (2021/2025)

An IRRP and RIP will be undertaken for the Peterborough to Kingston region to further assess the needs in the region.

4.13 South Georgian Bay/Muskoka

The geographical area of the South Georgian Bay/Muskoka Region is the area roughly bordered by West Nippising on the North-West, the Algonquin Provincial Park on the Northeast, Scugog on the South, Erin on the South-West and Grey Highlands on the West.

The second cycle Needs Assessment of this region was completed and report was published in April 2020. The Scoping Assessment is currently in progress with expected completion date of Q4 2020.

The region was divided into the following two sub-regions during scoping phase: Barrie/Innisfil and Parry Sound/Muskoka sub-regions.

4.13.1 Barrie/Innisfil Sub-region

The Barrie/Innisfil sub-region includes the areas supplied by Midhurst TS, Barrie TS, Everett TS, and Alliston TS, and transmission circuits E8V/E9V, E3B/E4B, and M6E/M7E. Updates to the previously identified needs are as follows:

- **Transformation Capacity Need in Barrie/Innisfil Sub-Region**

Barrie/Innisfil sub-region is forecasted to experience significant load growth, limiting station and line capacity and the end of life equipment replacements. As per the first cycle of regional planning, the Study Team recommended to rebuild and uprate Barrie TS as the best solution to meet the transformation capacity need in the Sub-Region. Hydro One is currently executing this plan, named 'Barrie Area Transmission Upgrade project'. The plan includes uprating 115kV lines E3/4B to 230 kV, upgrading existing DESN transformers from 115/44 kV, 55/92 MVA to 230/44 kV, 75/125 MVA. The project is planned for an expected in-service in June 2022.

- **Transformation Capacity Need at Uprated Barrie TS**

The Barrie Area Transmission Project (BATU) will be completed in 2022, and help to address existing capacity, and end of life issues that have been identified in the first regional planning cycle. Although supply capacity appears to be available post- BATU, Hydro One Distribution and its embedded LDC (InnPower) will be constrained at the 44kV feeder supply level in

2025. A plan is required to address the supply capacity need for InnPower beyond what Barrie TS can provide. The Study Team continues to develop supply capacity solution(s) to address this need in the next phases of the second regional planning cycle.

4.13.2 Parry Sound/Muskoka Sub-region

The Parry Sound / Muskoka sub-region includes the areas supplied by Parry Sound TS, Waubaushene TS, Orillia TS, Bracebridge TS, Muskoka TS, and Minden TS, and transmission circuits M6E/M7E and E26/E27. Updates to the previously identified needs are as follows:

- **Transformation Capacity Need in Parry Sound/Muskoka Sub-Region**

Based on the load forecasts, additional transformation capacity relief is required for both Parry Sound TS and Waubaushene TS to accommodate the load growth.

Parry Sound TS: As per the first cycle of regional planning, the Study Team has determined that replacing both transformers at Parry Sound TS with two standard 50/83MVA units will address the capacity need as well as EOL component needs at the station. The project is currently in execution, and expected to be in-service in Q4 2022.

Waubaushene TS: This station will exceed its normal supply capacity at the end of 2020 based on the summer demand forecast. An immediate solution is required to address the summer loading concern and shall be coordinated with a permanent solution to address long-term supply capacity needs. As well, the transformers are expected to be at the end of the study period and require replacement by 2030.

Everett TS: Load growth at this station is restricted due to a setting on a limiting component within the low voltage yard. This setting will be adjusted by 2026 to allow load to continue growing as per demand forecast.

- **M6/7E Load Restoration**

For the loss of M7E/M6E transmission lines, the load interrupted with the existing circuit configuration during peak periods will not be able to meet load restoration criteria as described in the ORTAC^[6]. Study Team recommended to install motorized disconnect switches at the Orillia TS JCT in order to address this need. This project is currently in the execution phase, and expected to be in-service date in Q1 2022.

- **Minden TS – End-of-Life Assets**

Since the first cycle of regional planning, Minden T1 and T2 EOL transformers are being replaced with standard 50/83 MVA units. The project is expected to be in service in 2021.

- **Orangeville TS – End-of-Life Assets**

Orangeville TS has two DESN switchyards 230/44kV and 230/27.6kV, station transformers and associated low voltage equipment has been assessed at being end of life and in need of replacement due to asset condition. To address both the condition and the capacity needs, existing 230/44kV 83MVA transformers (T3/T4) will be replaced and upgraded with new 125MVA units. Also the existing nonstandard three winding 230/44/27.6 125MVA transformers (T1/T2) will be replaced and upgraded with new dual winding 230/27.6

83MVA units. Reconfiguration of the low voltage equipment and feeders will be transferred from T1/T2 DESN to the T3/T4 DESN to maximize the load capacity. The project is expected to be completed by 2023.

Needs identified during the second cycle include lines that require refurbishment over the next few years. These lines include 230 kV transmission lines D1M/D2M, E8V/E9V, and M6E/M7E. Currently the work is planned to be completed from 2023 (M6E/M7E) to 2028 (D1M/D2M).

4.14 Sudbury/Algoma

The Sudbury/Algoma region includes the municipalities of Greater Sudbury and Espanola and surrounding areas. There are municipal LDCs serving each of those municipalities and Hydro One Distribution serves the remainder of the Region. The area is supplied from transformer stations Clarabelle TS, Coniston TS, Elliot Lake TS, Larchwood TS, Manitoulin TS and Martindale TS.

Hydro One had developed and published a RIP report in June 2016. The Study Team at the time determined that no further regional coordination was required.

The second cycle of Needs Assessment was completed in June 2020. The NA has determined that identified needs in the region can be addressed directly by Hydro One along with relevant LDCs, and therefore Scoping Assessment and/or IRRP is not required.

Needs Identified from the First Regional Planning Cycle and Implementation Plan

- **Coniston TS** - The majority of the equipment was assessed to be at the end of life and in need of replacement. Upon decommissioning of Coniston TS, the existing 22kV customers will be converted to 44kV and connected to the M6 feeder out of Martindale TS. This project is presently underway with an in-service date scheduled for Q4 2020.
- **Espanola TS** - Transformers T1 and T2 115/44kV 15MVA units were replaced and upgraded with new 115/44kV 42MVA units. This project was successfully carried out and in serviced in Q4 2016.
- **Martindale TS** - 230/115kV 115MVA T21 and T23 autotransformers are being replaced with new 230/115kV 125 MVA units. This investment is currently underway with a planned in service date scheduled in Q4 2020.
- **Manitoulin TS** - Voltage Regulation - pre-contingency voltages at Manitoulin TS 115kV can at times be below the ORTAC criteria of 113kV. Hydro One and the LDC reviewed this need as part of a local plan, and agreed to monitor supply voltages and take corrective action if needed.

The following needs were identified by the Study Team in the second cycle Needs Assessment:

- **Manitoulin TS** - Full utilization of the station transformer capacity is restricted by a setting of a series limiting component and will need to be addressed as soon as practically feasible. A CT ratio setting on the low voltage bushing of the transformer breaker can be modified to allow full transformer LTR capability. Hydro One will address this need directly in

collaboration with the LDCs as soon as practically feasible. Further regional coordination is not required.

- **Martindale TS** – This station will exceed its normal winter supply capacity in 2028. Hydro One is planning to replace the two 230/44kV 125MVA (T25/T26) power transformers in 2028 with new 230/44kV 125MVA units to address end of life needs. A plan is required to address the supply capacity need beyond what the new transformers units will be able to provide. Should the need materializes sooner than anticipated at Martindale TS, a station specific needs assessment will be carried out to determine the best course of action for meeting the station supply capacity needs.

4.15 Northwest Ontario

The Northwest Ontario region encompasses a large geographic area, stretching from the town of Marathon to the western and northern borders of the province, with diverse characteristics. This region is divided into four sub-regions for regional planning purposes: North of Dryden, Greenstone-Marathon, Thunder Bay and West of Thunder Bay.

The first cycle RIP for this region was completed in June 2017 with the publication of the RIP report. The second cycle Needs Assessment was completed and the report was published in July 2020. Scoping Assessment was triggered in October 2020, and it is anticipated for completion in Q1 2021.

4.15.1 North of Dryden Sub-region

This sub-region includes the portion of the Northwest Ontario Region that sits north of cities of Dryden and Kenora, which includes Township of Ear Falls, Municipality of Red Lake and Township of Pickle Lake. The sub-region has residential, commercial and mining loads, as well as hydroelectric generation. This sub-region will provide supplies to the Remote Communities in the near future and has the potential for supplying the future Ring of Fire mining load.

Planning for the North of Dryden sub-region started prior to the implementation of the new regional planning process. The IRRP report in January 2015 identified a potential need for increased capacity to meet the anticipated increased demand from the mining sector, including the potential for supply to the Ring of Fire, and connection of the Remote Communities. Currently, there is one transmission infrastructure investment being developed to meet the near-term electricity needs north of Dryden:

- **230kV Watay Line between Pickle Lake SS and Dinorwic Jct (Developed by Wataynikaneyap Power Limited Partnership (WPLP))**

This project involves building a new 230 kV transmission line from a new 230kV switching station at Dinorwic Junction in the Dryden area to Pickle Lake SS, a new 230/115kV transformer station, along with a radial network of 115 kV system to be developed by WPLP in order to connect the Remote Communities north of Pickle Lake. Hydro One will connect these facilities to the existing transmission system through a new junction on the 230 kV transmission line D26A at Dinorwic and a new 115 kV switching station at Pickle Lake.

This project will off-load the existing 115 kV transmission lines E4D and E1C (which are currently supplying the Pickle Lake area load), resulting in increased capacity for supply in the Red Lake area, without the need for upgrade to E4D at this time.

WPLP is also developing a network of 115 kV system to connect the Remote Communities north of Red Lake. Hydro One will connect these facilities to the existing transmission system through a new junction on the 115 kV transmission line E2R in the Red Lake area.

The Board has granted Leave-to-Construct for the Pickle Lake and Red Lake projects. Hydro One is in the process of design and construction of its new facilities to connect the new WPLP transmission facilities to Hydro One's transmission system. The anticipated in-service date is Q3 2021.

- **Ring of Fire Sub-System Need**

The North of Dryden IRRP indicated that since the Ring of Fire area is remote from the existing transmission system, any additional capacity needs would require new facilities. It indicated that transmission system connection, either from Pickle Lake or from the Marathon area, is the most economic option when compared to diesel generation. Development in the area is still in the early stages and no firm recommendations are made at this time.

4.15.2 Greenstone-Marathon Sub-region

This sub-region covers the southeastern portion of the Northwest Ontario Region. The sub-region has distribution and light industrial loads, with proposals for future potential mines. The first cycle IRRP report was published in June 2016.

To meet the forecast demand from LDCs, as reported in 2016, with the cancellation of the Energy East pipeline project and the current plans of new mine for embedded generation to meet their supply requirements, no new system enhancements were identified. Accordingly, new industrial and/or mining loads will be monitored and investments will be initiated once formal connection requests are received from the customer(s).

The second cycle Needs Assessment identified new needs in the sub-region:

- **Marathon TS**

With the sizable load increase in the Greenstone-Marathon Sub-Region, under loss of both auto-transformers at Marathon TS contingency, Marathon Sub-Region system experiences voltage collapse. The Study Team recommends moving forward to the SA phase of Regional Planning in order to determine a suitable approach, IRRP and/or RIP, to address this issue.

4.15.3 Thunder Bay Sub-region

This sub-region includes the city of Thunder Bay and its vicinity. The sub-region has residential, commercial and industrial load, as well as dispatchable and embedded generations, supplied by the distribution and transmission facilities.

The first cycle IRRP for the region identified the need to upgrade the thermal rating of circuit R2LB and the work has been completed. Other projects in the sub-region include:

- **Port Arthur TS - Transformation Capacity**

The limiting low voltage equipment which is at EOL at Port Arthur is being replaced and upgraded and shall be completed by 2025. This upgrade would bring the total station capacity up to 59 MW from the current 55MW, sufficient to meet the demand beyond 2029. Port Arthur TS load growth will be actively monitored, and potential supply options will be re-evaluated in the next regional planning cycle. No further actions are required at this time.

The second cycle Needs Assessment identified new needs in the sub-region:

Due to projected growths in Thunder Bay and Greenstone-Marathon Sub-Regions, the forecasted load in the Thunder Bay 115kV System has exceeded the IRRP's High Scenario forecast from the first planning cycle and has therefore escalated the need.

- **Lakehead TS Capacity Need**

With the projected sizable load growth and substantial decrease in dependable generation output assumption in the Thunder Bay Sub-Region, voltage support will be required, while at the same time mitigation is required to prevent overloading of the 115kV circuits A5A, A1B, and T1M under loss of T7 and T8 outage condition. The Study Team recommends moving forward to the SA phase of Regional Planning in order to determine a suitable approach, IRRP and/or RIP, to address this issue.

4.15.4 West of Thunder Bay Sub-region

This sub-region includes the portion of the Northwest Ontario region from of the western boundary of Thunder Bay sub-region up to and including the cities of Dryden and Kenora in the north. The sub-region has residential, commercial and mining load, as well as biomass and hydroelectric generation. It supplies the North of Dryden sub-region, when the generation in that sub-region is insufficient to meet the demand. Several LDCs serve the customers in this sub-region.

In the 2017 RIP and the IRRP, additional capacity was anticipated on the Dryden 115kV Sub-System by mid-2020s. In reviewing the Second Cycle Needs Assessment growth assumption, the Load Meeting Capability ("LMC") is sufficient to meet the demand of this sub-system. Further regional coordination will be required in order to study different growth scenarios and the resulting impact they may have on the Dryden 115kV Sub-System.

The second cycle Needs Assessment identified new needs in the sub-region:

- **Sapawe DS**

This station is a 115/12.5kV distribution station owned by Hydro One Distribution. The station is anticipated to reach its winter and summer Planned Loading Limit (PLL) levels by year 2028 and 2026 respectively. Sapawe DS capacity need will be addressed as part of the Local Planning (LP).

- **Sam Lake DS**

The station is the sole supply for Sioux Lookout Hydro, and this embedded LDC is anticipating to have significant load increase up to 35MW throughout the next 10 year period. The existing transformation facility at Sam Lake DS has already reached its Winter 10-Day LTR, and various options including adding an additional step-down transformer or having a brand new station built in the vicinity are being considered. Due to the significant load increase, additional voltage support will also be needed at this station. Sam Lake DS capacity need will be addressed as part of the Local Planning (LP).

4.16 Chatham/Lambton/Sarnia

The Chatham-Lambton-Sarnia region is located to the west of the Greater Toronto Area in southwestern Ontario. The region includes the municipalities of Lambton Shores and Chatham-Kent. It also includes the Townships of Petrolia, Plympton-Wyoming, Brooke-Alvinston, Dawn-Euphemia, Enniskillen, St. Clair, Warwick and the Villages of Oil Springs and Point Edward.

Hydro One developed and published a RIP in August 2017. The next cycle of Regional Planning for this region is currently anticipated to commence in 2021.

The Study Team determined that no further regional coordination is required. However, several needs that are local in nature were identified in the first cycle RIP, and updates are provided below:

- **Chatham SS – Component Replacement**

This investment is targeted towards EOL components at Chatham SS. Due to operational requirements, capacitor SC21 and the associated breaker were needed to be replaced. The replacement was completed in Q2 2020.

- **St. Andrews TS – T3, T4 & Switchyard Refurbishment**

This investment is targeted at EOL components due to outage constraint and considering available real estate. The investment will include a complete air insulated switchyard rebuild and transformer replacement by Q4 2025.

- **Sarnia Scott TS – T5 & Component Replacement**

This investment includes replacing EOL Transformer T5, and new 115 kV switchyard. The expected completion date is Q4 2024.

- **Lambton TS End-of-Life Assets**

This investment includes replacing EOL 231kV transformers T7/T8, selected 230kV equipment, and transformers T5/T6 and their associated LV switchyard. The expected completion date is Q4 2023.

4.17 Niagara

The Niagara Region comprises the municipalities of City of Port Colborne, City of Welland, City of Thorold, City of Niagara Falls, Town of Niagara-On-The-Lake, City of St. Catharines, Town of Fort Erie, Town of Lincoln, Township of West Lincoln, Town of Grimsby, Township of Wainfleet, and Town of Pelham. Haldimand County has been included in the Niagara Region Group 3 for Needs Assessment.

Hydro One developed and published the RIP report in March 2017, and the next cycle of Regional Planning for this region is currently anticipated to commence in 1 due to emerging needs in the region.

Below are updates to the needs identified by the Study Team:

- **Thermal Overloading on 115kV Q4N**

Under high generation scenarios at Sir Adam Beck GS #1, the loading on Q4N (Beck #1 SS x Portal Jct) can exceed circuit ratings. The potential overloading issue will be addressed under sustainment project that is scheduled for completion in 2021.

4.18 North/East of Sudbury

The geographical area of the North/East of Sudbury Region is the area roughly bordered by Moosonee on the North, Hearst on the North-West, Ferris South and Kirkland Lake on the East.

Hydro One developed and published a RIP in April 2017. The Study Team at the time determined that no further regional coordination was required.

The second cycle of Regional Planning for this region is currently anticipated to commence in Q1 2021.

4.19 Renfrew

The Renfrew Region includes all of Renfrew County that is made up of 17 municipalities and City of Pembroke. The rough boundaries of this Region are Ottawa River on the North-East, Algonquin Provincial Park on the West, and Route 508 on the South.

Hydro One led Study Team developed and published a NA followed with a RIP report in July 2016. There were no needs in the region that required regional coordination.

The second cycle of Regional Planning for this region is currently anticipated to commence in Q1 2021.

4.20 St. Lawrence

The St Lawrence Region covers the southeastern part of Ontario bordering the St Lawrence River. The region starts at Gananoque on the eastern end of Lake Ontario and extends to the inter-provincial boundary with Quebec. The City of Cornwall is supplied by Fortis Ontario with transmission lines from Quebec and is not included in this Region.

Hydro One developed and published a NA report followed by RIP report in July 2016. There were no needs in the region that required regional coordination.

The next cycle of Regional Planning for this region is currently anticipated to commence in Q3 2021.

4.21 North of Moosonee

The lead transmitter for the region is Five Nations Energy Inc. The regional planning status will be provided by the lead transmitter.

5. CONCLUSION

The first regional planning cycle was successfully completed in Aug 2017, and the second regional planning cycle is currently underway. In the second cycle, Regional Planning for several regions had to be advanced due to emerging needs.

Members from the IESO, LDCs and Hydro One transmission are represented and actively participated on Study Teams during the various phases of the regional planning process. The Study Team has been able to undertake the appropriate level of planning based on the needs and able to make efficient and effective decisions. For example, in the Needs Assessment phase, the Study Team identifies needs and options to address them, and recommends plan for one or more of the needs and/or further assessments as part of IRRP or RIP. In addition, the concept of Local Planning is also utilized for further assessment by a smaller Study Team in cases where needs are local in nature, and straightforward wires only options are the obvious and appropriate solution. Accordingly, assessments for these needs do not require further regional coordination and are directly planned for implementation by Hydro One Transmission and affected LDC(s) (or customers). Other needs are further assessed by the Study Team during the IRRP and RIP phases of the regional planning process. Frequently, 'wires' planning is also initiated in parallel with IRRP when the Study Team determines that a wires approach is the best alternative to address a need and allows for efficiencies in the process by starting the planning prior to triggering the RIP phase.

The sharing of information by Study Team members and publishing of reports and other relevant information on Hydro One and IESO websites allows stakeholders to be aware of current and future plans that may influence their planning strategies. This transparency and stakeholder engagement was intended as one of the hallmarks of the regional planning process as envisioned by the Board.

Since the beginning of the second cycle of the regional planning process, Hydro One, LDCs, and the IESO have been able meet mandatory timelines to complete each of the regional planning phases. To summarize, below are significant milestones that have been accomplished in the second cycle:

- Regional Infrastructure Planning (RIP) reports completed for five (5) regions (Burlington to Nanticoke, Toronto, Windsor-Essex, GTA East, and GTA North) with a sixth currently underway (Greater Ottawa).
- Needs Assessment (NA) reports completed for fifteen (15) regions, with five (5) expected to commence in 2021 which will initiate the 2nd cycle of the regional planning process for those regions (refer to Table 1).
- Integrated Regional Resource Planning (IRRP) reports for five (5) regions (Burlington to Nanticoke, Toronto, Windsor-Essex, GTA North, and Greater Ottawa), with five (5) currently underway (Kitchener-Waterloo-Cambridge-Guelph, GTA West, Greater Bruce/Huron, East Lake Superior, and Peterborough to Kingston).

From a wires infrastructure perspective, the RIP report for a region is the most important document as it provides a complete picture of the regional wire infrastructure plan. Specifically, the RIP report provides a report for the region to address all the identified needs in the regions including a consolidated account of wires infrastructure plans developed during earlier phases i.e. Needs Assessment, LP and IRRP for the region.

6. REFERENCES

- [1] Ontario Energy Board. "Transmission System Code". Last Revised December 18, 2018 (Originally Issued on July 14, 2000).
- [2] Hydro One Networks Inc. "Regional Planning Process – Annual Status Report". November 1, 2016.
- [3] Ontario Energy Board. "Distribution System Code". Last Revised March 1, 2020 (Originally Issued on July 14, 2000).
- [4] "Planning Process Working Group Report to the Board – The Process for Regional Infrastructure Planning in Ontario". March 13, 2013. Last Revised May 17, 2013.
- [5] Ontario Energy Board. "Conservation and Demand Management Requirement Guidelines For Electricity Distributors". Last Revised August 11, 2016.
- [6] Independent Electricity System Operator. "Ontario Resource and Transmission Assessment Criteria (ORTAC)". Issue 5.0. August 22, 2007.

APPENDIX A. CONSERVATION, DISTRIBUTED GENERATION, AND OTHER INITIATIVES

A.1 Conservation Achievement

The IESO received two Ministerial directives on March 21, 2019, that include changes to reduce the cost of energy-efficiency program delivery in Ontario. The 2015-2020 Conservation First Framework (CFF) has been discontinued; a new Interim Framework took effect April 1, 2019. The IESO will centrally deliver a reduced suite of energy-efficiency programs from April 1, 2019, to December 31, 2020.

The table below shows the estimated 2019 peak demand offsets resulting from energy efficiency projects reported to occur within the respective regions due to the delivery of the Interim Framework. Savings for programs that could not be mapped to the planning regions were not included as a part of this estimate. Conservation First Framework & framework wind-down savings are examples of savings impacts that are not included.

Table 3. Conservation Status Update

Sub region	Region	Verified 2019 Net Peak Demand Savings (MW)*
Barrie/Innisfil Parry Sound/Muskoka	South Georgian Bay/Muskoka	0.002
Brant Bronte Hamilton	Burlington to Nanticoke	4.3
Greenstone-Marathon North of Dryden Thunder Bay West of Thunder Bay	Northwest Ontario	0.001
Greater London	London Area	0.002
KWCG	KWCG	0.001
Northwest GTA	GTA West	0.001
Ottawa	Greater Ottawa	1.5
Pickering-Ajax-Whitby	GTA East	0.001
Toronto	Toronto	0.004
Windsor-Essex	Windsor-Essex	2.9
York	GTA North	0.001

Note *: This peak demand savings value was estimated based on verified 2019 conservation activity within the respective regions for the Interim Framework only. Results have been mapped to planning region, and more granular results by sub-region and/or TS are not available.

A.2 Distribution Generation

The table below shows the total installed and effective capacity of IESO Contracted Distributed Generation (“DG”) projects which have come into service or under development since the base year of the region/sub region load forecast. This does not include net or behind the meter generation. This table does not include projects which had already been in service prior to this date, except in cases where a new contract was formed to account for incremental capacity of a facility.

The equivalent effective capacity for these new generation sources is based on capacity factors consistent with the zonal assumptions applied in the region/sub region load forecast. Data is based on the IESO contract list as of August 31, 2020.

Table 4. DG Status Update

Sub region	Station	Installed Capacity (MW)	Effective Capacity (MW)	Base Year
Barrie/Innisfil	BARRIE TS	1.1	0.25	2014 Peak
	MIDHURST TS	24	5.3	
	EVERETT TS	2.4	0.5	
	ALLISTON TS	2.4	0.5	
	TOTAL	29.9	6.6	
Brant	BRANT TS	10.7	4.3	2012 Peak
	BRANTFORD TS	7.1	2.8	
	POWERLINE MTS	2.5	1	
	TOTAL	20.3	8.1	
Bronte	BRONTE TS	2.13	0.72	2014 Peak
	CUMBERLAND TS	3.23	1.1	
	BURLINGTON DESN	2.24	0.76	
	PALERMO TS	0	0	
	TRAFALGAR DESN	0	0	
	TREMAINE TS	1.7	0.58	
	GLENORCHY MTS	1.14	0.39	
	OAKVILLE #2 TS	0	0	
	TOTAL	10.44	3.55	
Toronto	AGINCOURT TS	0		2019 Peak (Summer)
	BASIN TS	0	0	
	BATHURST TS	0	0	
	BERMONDSEY TS	0	0	
	BRIDGMAN TS	0	0	
	CARLAW TS	0	0	
	CAVANAGH MTS	0	0	
	CECIL TS	0	0	
	CHARLES TS	0	0	
	COPELAND TS	0	0	
	DUFFERIN TS	0	0	

	DUPLEX TS	0	0	
	ELLESMERE TS	0	0	
	ESPLANADE TS	0	0	
	FAIRBANK TS	0	0	
	FAIRCHILD TS	0	0	
	FINCH TS	0	0	
	GERRARD TS	2.73	2.73	
	GLENGROVE TS	0	0	
	HORNER TS	0	0	
	JOHN TS	0	0	
	LEASIDE TS	0	0	
	LESLIE TS	0	0	
	MAIN TS	0	0	
	MALVERN TS	0	0	
	MANBY TS	0	0	
	REXDALE TS	0	0	
	RICHVIEW TS	0	0	
	RUNNYMEDE TS	0	0	
	SCARBORO TS	0	0	
	SHEPPARD TS	0	0	
	STRACHAN TS	0	0	
	TERAULY TS	0	0	
	WARDEN TS	0	0	
	WILTSHIRE TS	0	0	
	WOODBRIIDGE TS	0	0	
	TOTAL	2.73	2.73	
Greenstone-Marathon	LONGLAC TS	0.01	0.004	2014 Peak
	TOTAL	0.04	0.004	
Greater London	CLARKE TS	2.96	1.57	2016 Peak
	TALBOT TS	0.48	0.18	
	BUCHANAN DESN	0	0	
	HIGHBURY TS	1.4	0.53	
	NELSON TS	17.9	17.54	
	WONDERLAND TS	1.62	0.62	
	TOTAL	24.36	20.45	
Hamilton	Dundas TS #2 (T5/T6)	0.75	0.28	2016 Peak
	Dundas TS (T1/T2)	5.30	4.02	
	Newton TS	0.043	0.016	
	Elgin TS	0.040	0.015	
	Stirton TS	0.34	0.13	
	Gage TS (T3/T4)	0.00	0.00	
	Gage TS (T5/T6)	0.00	0.00	
	Gage TS (T8/T9)	0.00	0.00	
	Birmingham TS (T1/T2)	0.00	0.00	

	Birmingham TS (T3/T4)	0.00	0.00	
	Kenilworth TS (T1/T4)	0.00	0.00	
	Kenilworth TS (T2/T3)	0.00	0.00	
	Beach TS (T3/T4)	0.020	0.008	
	Beach TS (T5/T6)	0.56	0.21	
	Lake TS (T1/T2)	0.00	0.00	
	Lake TS (T3/T4)	0.65	0.24	
	Winona TS	0.70	0.27	
	Horning TS (T1/T2)	1.16	0.44	
	Horning TS (T3/T4)	0.00	0.00	
	Mohawk TS	0.76	0.29	
	Nebo TS (T1/T2)	1.44	0.55	
	Nebo TS (T3/T4)	1.14	0.43	
	TOTAL	12.90	6.90	
KWCG	ARLEN MTS	0.10	0.04	2010 Peak (July 7, 2010)
	CAMBRIDGE #1	5.62	2.13	
	CAMPBELL TS	7.70	2.93	
	CEDAR TS	0.23	0.09	
	DETWEILER TS	0.00	0.00	
	ELMIRA TS	5.56	3.95	
	FERGUS TS	47.31	8.11	
	GALT TS	5.62	2.44	
	HANLON TS	1.00	0.38	
	KITCHENER #1	0.30	0.11	
	KITCHENER #3	1.77	0.67	
	KITCHENER #4	1.46	0.56	
	KITCHENER #5	2.09	0.79	
	KITCHENER #6	2.58	0.98	
	KITCHENER #7	1.13	0.43	
	KITCHENER #8	0.28	0.11	
	KITCHENER #9	2.15	0.82	
	PRESTON TS	2.75	1.04	
	PUSLINCH DS	1.33	0.51	
	RUSH MTS	0.00	0.00	
	SCHEIFELE TS	3.99	1.52	
	WATERLOO #3	1.03	0.39	
	WOLVERTON DS	0.70	0.26	
	TOTAL	94.70	28.25	
North of Dryden	DRYDEN TS	0.001	0.0005	2014 Peak
	TOTAL	0.001	0.0005	
Northwest GTA	BRAMALEA TS	8	3.04	2012 Peak
	GOREWAY TS	10.98	4.17	
	HALTON TS	4.07	1.55	
	JIM YARROW MTS	6.14	2.33	

	KLEINBURG TS	6.23	4.31	
	PLEASANT TS	14.43	5.48	
	TREMAINE TS	1.73	0.66	
	WOODBIDGE TS	0.6	0.23	
	TOTAL	52.18	21.77	
Ottawa	ALBION TS	0.37	0.14	2017 Peak
	BILBERRY CREEK TS	0.11	0.04	
	BRIDLEWOOD MTS	0.02	0.01	
	CARLING TS	0.05	0.02	
	CENTERPOINT MTS	0	0	
	CUMBERLAND DS	0.02	0.01	
	CYRVILLE MTS	0	0	
	ELLWOOD MTS	0	0	
	FALLOWFIELD DS	0.09	0.03	
	GREELY DS	0.53	0.2	
	HAWTHORNE TS	0.12	0.04	
	HINCHEY TS	0.06	0.02	
	KANATA MTS	0	0	
	KING EDWARD TS	0.03	0.01	
	LIMEBANK MTS	0.08	0.03	
	LINCOLN HEIGHTS TS	0.2	0.08	
	LISGAR TS	12.02	4.09	
	MANORDALE MTS	0.27	0.1	
	MANOTICK DS	0.01	0	
	MARCHWOOD MTS	0.04	0.02	
	MARIONVILLE DS	0.25	0.25	
	MERIVALE MTS	0.02	0.01	
	MOULTON MTS	0.02	0.01	
	NAVAN DS	0	0	
	NEPEAN TS	0.25	0.1	
	NEPEAN EPWORTH TS	0	0	
	OVERBROOK TS	0.06	0.02	
	RICHMOND MTS	0	0	
	RIVERDALE TS	0.06	0.02	
	RUSSELL DS	0	0	
	RUSSELL TS	0.03	0.01	
	SLATER TS	0.03	0.01	
	SOUTH GLOUCESTER DS	0	0	
	SOUTH MARCH TS	0.58	0.22	
	TERRY FOX MTS	0.1	0.04	
	UPLANDS MTS #2	0	0	
	WILHAVEN DS	0.03	0.01	
	WOODROFFE TS	0.27	0.1	
	TOTAL	15.7	5.63	

Pickering-Ajax-Whitby	THORNTON TS	0.26	0.088	2016 Peak
	WHITBY TS	0.7122	0.242	
	WILSON TS	19.48	1.69	
	TOTAL	20.45	2.02	
Parry Sound/Muskoka	BRACEBRIDGE TS	0	0	2014 Peak (Winter)
	MIDHURST TS DESN1	22.1	0	
	MIDHURST TS DESN2	1.9	0	
	MINDEN TS	6.3	1.5	
	MUSKOKA TS	13.6	1.8	
	ORILLIA TS	33.3	0.5	
	PARRY SOUND TS	6.8	0	
	WAUBAUSHENE TS	21.2	0	
	TOTAL	105.2	3.8	
Thunder Bay	BIRCH TS	0.89	0.036	2014 Peak (January 20, 2014)
	FORT WILLIAM TS	0.62	0.025	
	MURILLO DS	0.32	0.013	
	NIPIGON DS	0	0	
	PORT ARTHUR TS	0	0	
	RED ROCK DS	0	0	
	TOTAL	1.83	0.073	
Windsor-Essex	BELLE RIVER TS	0	0	2018 Peak (Summer)
	CRAWFORD TS	0	0	
	ESSEX TS	0	0	
	KEITH TS	0	0	
	KINGSVILLE TS	0	0	
	LAUZON TS DESN1	0	0	
	LAUZON TS DESN2	0	0	
	MALDEN TS	0	0	
	TILBURY TS	0	0	
	TILBURY WEST TS	0	0	
	WALKER TS #1	0	0	
	WALKER TS #2	0	0	
	LEAMINGTON TS	0	0	
TOTAL	0	0		
West of Thunder Bay	AGIMAK DS	0	0	2014 Peak (January 20, 2014)
	BARWICK TS	25	1	
	BURLEIGH DS	0	0	
	CLEARWATER BAY DS	0	0	
	DRYDEN TS	0	0	
	ETON DS	1.3	0.5	
	FORT FRANCES MTS	0	0	
	FORT FRANCES TS	0	0	
	KEEWATIN DS	0	0	
KENORA DS	0	0		

	KENORA MTS	0.3	0.01	
	MARGACH DS	0	0	
	MINAKI DS	0	0	
	MOOSE LAKE TS	0	0	
	NESTOR FALLS DS	0	0	
	SAM LAKE DS	0	0	
	SAPAWA DS	0	0	
	SHABAQUA DS	0	0	
	SIOUX NARROWS DS	0	0	
	VALORA DS	0	0	
	VERMILLION BAY DS	0	0	
	TOTAL	26.6	1.51	
York	HOLLAND TS	1.3	0.4	2017 Peak (Summer)
	ARMITAGE TS	0.6	0.2	
	BROWN HILL TS	1.0	0.3	
	BUTTONVILLE TS	0.17	0.056	
	MARKHAM 1 MTS	0.087	0.030	
	MARKHAM 2 MTS	0.54	0.18	
	MARKHAM 3 MTS	0.64	0.22	
	MARKHAM 4 MTS	0.051	0.017	
	RICHMOND HILL MTS	0.29	0.097	
	VAUGHAN 1 MTS	0.33	0.11	
	VAUGHAN 2 MTS	0.080	0.027	
	VAUGHAN 3 MTS	0.31	0.11	
	VAUGHAN 4 MTS	-	-	
	TOTAL	5.1	1.6	

A.3 Other Initiatives

Other Electricity System Initiatives, as identified by the IESO, include:

Table 5. Other Electricity System Initiatives

Sub region	Other Electricity System Initiatives
Barrie/Innisfil	A Barrie TS Local Achievable Potential Study was conducted by Guidehouse Canada Ltd. (formerly Navigant Consulting, Inc.) to explore the potential of non-wires alternatives to address Barrie TS needs identified in the 2016 Barrie/Innisfil IRRP.
Central Toronto	Please refer to the Toronto IRRP Report in the link above for all electricity system initiatives in the Toronto area.
Hamilton	An addendum to the Hamilton IRRP is expected to be available in Q1 2021.

<p>Ottawa</p>	<p>There is a Local Achievable Potential Study being developed in the Ottawa area to explore the potential of demand side options to help address the needs identified in regional planning. These studies are a part of the continued efforts to explore non-wires options as part of the integrated solutions to manage identified needs. In addition, the City of Ottawa is developing a comprehensive community energy strategy called Energy Evolution.</p> <p>In 2019, in consultation with IESO staff, Hydro Ottawa submitted two proposals to Save On Energy's Local Program Fund (the "Fund"), a program application stream which allows LDCs to continue to design and deliver energy efficiency programs that serve the needs of their specific customers. Programs approved through the Fund must demonstrate cost-effectiveness based on the resulting net benefit when comparing the program investment (cost) against the provincial average avoided costs of providing electricity (benefit). So while these investments will benefit ratepayers province-wide, these offerings are also expected to help reduce the reliability risk due to heavily loaded stations in Kanata-Stittsville.</p> <p>The IESO approved both of Hydro Ottawa's proposed programs for delivery in 2020, which include the Kanata North Retrofit+ Program and the Kanata North Smart Thermostat Program. Both of these programs leverage the existing delivery infrastructure of current electricity and natural gas province-wide programs, which reduces administrative costs, streamlines customer experiences, and avoids market duplication and confusion. These local programs are an example of using system cost-effective energy efficiency to help address local system needs, and can inform similar approaches in the future. It is forecasted that these two initiatives could combine to offset more than 3 MW or 50% of the near-term peak load growth in the Kanata North area. In doing so, these programs could help address the 60 MW of capacity need in the Kanata-Stittsville region and support reliable supply until a long-term solution for the area is implemented.</p>
<p>Pickering-Ajax-Whitby</p>	<p>The Ontario government is supporting a plan by Ontario Power Generation (OPG) to safely extend the life of the Pickering Nuclear Generating Station. Under its proposed plan, Ontario Power Generation (OPG) will keep Pickering's units 1 and 4 operating until the end of 2024 and units 5 to 8 operating until the end of 2025, allowing for the safe, sequential shutdown of all units while maximizing the economic benefits of the generation station in the community.</p>
<p>Parry Sound/Muskoka</p>	<p>A Parry Sound TS and Waubaushene TS Local Achievable Potential Study is being developed in the Parry Sound/Muskoka area to explore the potential of demand side options to help address the needs identified in regional planning. These studies are a part of the continued efforts to explore non-wires options as part of the integrated solutions to manage identified needs.</p>
<p>Windsor-Essex</p>	<p>The IESO has issued a call for proposals through the Grid Innovation Fund to support projects that have the potential to cost-effectively reduce electricity demand from indoor agricultural facilities during local and provincial peak periods. The successful proponents will help accelerate the adoption of cost-effective demand-side solutions by greenhouse growers, demonstrate the efficacy of demand-side options to address local capacity needs, and explore unknowns in the operationalization of demand-side options and the impact on greenhouse productivity. More information can be found at the IESO's website.</p> <p>The IESO is also offering an increased incentive for enhanced LED grow lights through the Retrofit program to help greenhouses in the Windsor-Essex and Chatham-Kent areas reduce their energy use.</p> <p>The IESO released the Greenhouse Energy Profile Study, which summarizes how energy is used across the sector and provides insight into how greenhouses can utilize energy efficiency and innovative solutions to help their businesses grow.</p>

<p>York</p>	<p>The IESO, with support from Natural Resources Canada, is undertaking a demonstration in York Region to explore market-based approaches to secure energy and capacity services from distributed energy resources (DERs) for local needs, while coordinating across the electricity system. A key objective of the IESO York Region Non Wires Alternatives Demonstration Project is to better understand the potential of using DERs in place of traditional infrastructure by enabling them to operate in real-world applications. The demonstration will leverage both existing and new resources in southern York Region, where electricity demand is growing and is expected to exceed system capability over the next 10 years. Further information on this initiative, including supporting white papers, is available on the IESO's website.</p>
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APPENDIX B. PLANNING STATUS LETTERS

The TSC requires that letters be issued by the transmitter as per Section 3C.2.2 item (h):

(h) within 45 days of receipt of a request to do so, provide a letter to a licensed distributor or a licensed transmitter confirming the status of regional planning for a region, including any Regional Infrastructure Plan that is being developed for the region that includes the distributor's licensed service area or within which the requesting transmitter's transmission system is located, suitable for the purpose of supporting an application proposed to be filed with the Board by the distributor or requesting transmitter.

In compliance with this requirement, Hydro One has provided Planning Status Letters to the following LDCs since November 2019:

- North Bay Hydro Distribution Ltd.
- Halton Hills Hydro Inc.
- Oshawa PUC Networks Inc.
- Waterloo North Hydro Inc.