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BY EMAIL AND RESS

October 28, 2022

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

Dear Ms. Marconi,

EB-2011-0043-2022 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 2022 Regional Planning Process Annual Status Report, pursuant to the above noted Code section.

Sincerely,

Frank D'Andrea

Frank D'Andrea

Regional Planning Process

Annual Status Report

2022

November 1st, 2022

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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 Nineth 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 2021 and October 2022.

Progress to Date

The first cycle of regional planning for the 21 regions was completed in 2017 as per the process developed by the Planning Process Working Group (PPWG)[2]. The second cycle is currently underway, and the third cycle has also been initiated for some regions. During these regional planning cycles, several lessons were learned to undertake improvements to the process. For instance, improvements were made with respect to replacement of major transmission assets 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 the regional planning load forecast. As part of the OEB Regional Planning Process Advisory Group (RPPAG) Hydro One is involved in developing a load forecast guideline (completed) and a guideline for improving coordination between municipalities and the electricity sector for regional planning purposes (underway). These guidelines will help improve accuracy, consistency, and transparency in the development of the load forecast during the regional planning process. To align with these changes, Hydro One has also updated their internal load forecast template used to gather information from Local Distribution Companies (LDC). In addition, Hydro One has added a new section to the Needs Assessment (NA) report related to Sensitivity Analysis to capture uncertainty in the load forecast as well as variability of drivers such as DG and growing electrification trends. These improvements, described further in Section 3, have been incorporated into the process, thereby significantly enhancing the quality of the planning process and reports. The enhancement related to replacement of major transmission assets was first introduced in the Regional Infrastructure Planning (RIP) report of the first cycle (February 2017). Subsequently, this enhancement was further refined and incorporated by Hydro One into the NA and RIP reports for all regions. The first NA report to include the Sensitivity Analysis section is the Burlington to Nanticoke Region Needs Assessment (NA) report of the third regional planning cycle (Sept. 2022). At this time, no significant changes to the prioritization to initiate the third regional planning cycle are proposed except for one region (Greater Ottawa). That said, Hydro One is keeping abreast of the needs in the province on a regional basis and will advance regional planning for regions where necessary.

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

- Regional Infrastructure Planning (RIP) reports for the second cycle completed for fifteen (15) regions, one (1) region underway, and the four (4) remaining regions are expected to initiate the RIP phase in Q4 2022/Q1 2023, following the completion of their respective IRRPs.
- Needs Assessment (NA) reports for the second cycle completed for all twenty (20) regions where Hydro One is the lead transmitter. For the third regional planning cycle one (1) NA was completed and three (3) NA's are underway.

- Integrated Regional Resource Planning (IRRP) reports for the second cycle completed for eleven (11) regions with four (4) currently underway.

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

Table 1. Regional Planning Status Summary

Region	Sub-region	2nd Cycle (2017→)				3rd Cycle (2022→)			
		NA (1)	SA (1)	IRRP (1)(3)	RIP (1)(3)	NA (1)(3)	SA (1)	IRRP (1)	RIP (1)
Burlington to Nanticoke	Brant	May, 2017	Aug, 2017	Feb, 2019	Oct, 2019	Sep, 2022	TBD	TBD	TBD
	Bronte								
	Greater Hamilton								
	Caledonia-Norfolk								
Toronto Area	Central Downtown	Oct, 2017	Feb, 2018	Aug,2019	Mar, 2020	Dec, 2022	TBD	TBD	TBD
	Northern								
Windsor-Essex		Oct, 2017	Mar, 2018	Sep, 2019	Mar, 2020	Feb, 2023	TBD	TBD	TBD
GTA North	York	Mar, 2018	Aug, 2018	Feb, 2020	Oct, 2020	Jul, 2023	TBD	TBD	TBD
	Western								
Greater Ottawa	Ottawa	Jun, 2018	Sep, 2018	Mar, 2020	Dec, 2020	Dec, 2022	TBD	TBD	TBD
	Outer Ottawa								
Kitchener-Waterloo-Cambridge-Guelph		Dec, 2018	May, 2019	May, 2021	Dec, 2021	Apr, 2024	TBD	TBD	TBD
GTA West	Northwestern	May, 2019	Aug, 2019	Jul, 2021	Feb, 2022	Sep, 2024	TBD	TBD	TBD
	Southern								
Greater Bruce/Huron		May, 2019	Sep, 2019	Sep, 2021	Apr, 2022	Sep, 2024	TBD	TBD	TBD
East Lake Superior		Jun, 2019	Oct, 2019	Apr, 2021	Oct, 2021	Oct, 2024	TBD	TBD	TBD
GTA East	Pickering-Ajax-Whitby	Aug, 2019	*Not Required*	*Not Required*	Feb, 2020	Dec, 2024	TBD	TBD	TBD
	Oshawa-Clarington								
Peterborough to Kingston		Feb, 2020	May, 2020	Nov,2021	May, 2022	Jun, 2025	TBD	TBD	TBD
South Georgian Bay/Muskoka	Barrie/Innisfil	Apr, 2020	Nov, 2020	May, 2022	Dec, 2022	Aug, 2025	TBD	TBD	TBD
	Parry Sound/Muskoka								
London Area	Greater London	May, 2020	*Not Required*	*Not Required*	Aug, 2022	Sep, 2025	TBD	TBD	TBD
	Alymer-Tillsonburg								
	Strathroy								
	Woodstock								
	St. Thomas								
Sudbury/Algoma		Jun, 2020	*Not Required*	*Not Required*	Dec, 2020	Oct, 2025	TBD	TBD	TBD

Region	Sub-region	2nd Cycle (2017→)				3rd Cycle (2022→)			
		NA (1)	**SA** (1)	**IRRP** (1)(3)	**RIP** (1)(3)	**NA** (1)(3)	**SA** (1)	**IRRP** (1)	**RIP** (1)
Northwest Ontario	North of Dryden	Jul, 2020	Jan, 2021	Dec, 2022	Jul, 2023	Nov, 2025	TBD	TBD	TBD
	Greenstone-Marathon								
	Thunder Bay								
	West of Thunder Bay								
Chatham/Lambton/Sarnia		Sep, 2021	Dec, 2021	*Not Required*	Aug, 2022	Jan, 2027	TBD	TBD	TBD
Niagara		May, 2021	Aug, 2021	Nov, 2022	Jun, 2023	Sep, 2026	TBD	TBD	TBD
North/East of Sudbury		May, 2021	Aug, 2021	Feb, 2023	Sep, 2023	Sep, 2026	TBD	TBD	TBD
Renfrew		May, 2021	Aug, 2021	Dec, 2022	Jul, 2023	Sep, 2026	TBD	TBD	TBD
St. Lawrence (2)		Sep, 2021	*Not Required*	*Not Required*	Mar, 2022	Jan, 2027	TBD	TBD	TBD
North of Moosonee		*Hydro One Transmission is not the lead transmitter in this region. Status to be provided by lead transmitter.*							

Notes: (1): NA: Needs Assessment; SA: Scoping Assessment; IRRP: Integrated Regional Resource Plan; RIP: Regional Infrastructure Plan
(2): Note that St. Lawrence 2nd cycle NA was initiated two (2) months over the five (5) year period because of an error in oversight.
(3): These are tentative dates of completion based on Regional Planning Process timeline requirements.

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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"[2], 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 Nineth (2022) 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 2021 to October 2022. 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, plans, and projects completed or being undertaken.
- Section 5 provides a brief summary of the 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 NA, a decision is made by the Technical Working Group (TWG) as to whether further regional coordination is necessary to address some or all 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 TWG 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 NA 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 the development of a RIP with input from the TWG 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.

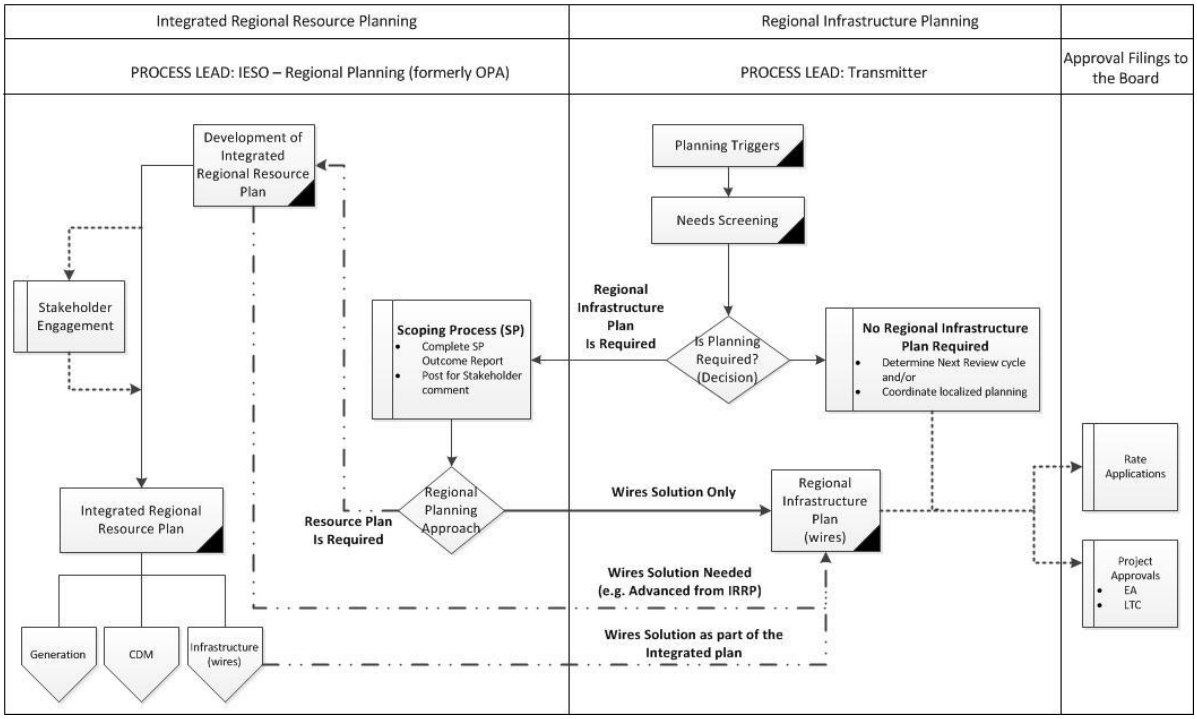

Figure 2-1. Regional Planning Process Flowchart

2.1 Regions

The province has been divided into 21 regions to undertake regional planning. In the first cycle, 21 regions were placed into 3 groups to manage and prioritize regional planning activities. Subsequently, regional planning is 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 Superior[1] and North of Moosonee Regions. For each regional planning activity at the regional or sub-regional level, a Technical Working Group (TWG) is established for each region with representatives from the IESO, Hydro One, and respective LDCs of the area. During the regional planning process, the TWG 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 2-2.

[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.

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

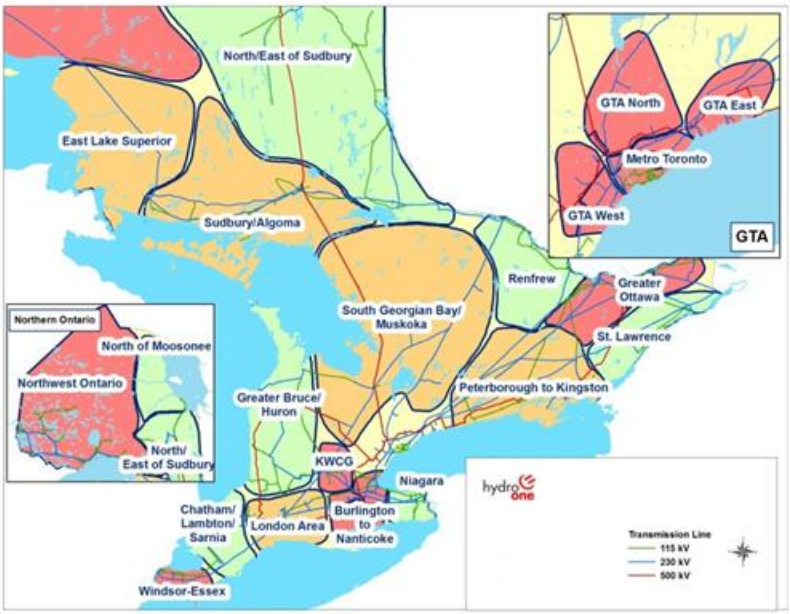

Figure 2-2. Regional Planning Regions

2.2 Conservation & Demand Management (CDM) and Distributed Energy Resources (DER)

CDM is considered 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[4]. 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 and second 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 internal review of the regional planning process, discussions with regional Technical Working Groups (TWG) (consisting of LDCs, IESO, and Hydro One as lead transmitter), and recommendations from the OEB Regional Planning Process Advisory Group ("RPPAG"). Hydro One implemented several measures to improve the existing consultation with TWG members, planning processes, and deliverables. Some of the key improvements since our 2021 Annual Status Report include the following and are described in further detail in the sections below:

- Formalized the process to better address asset replacement needs in the regional planning process;
- Developed a load forecast guideline for regional planning; and,
- Developing a guideline for improving coordination between municipalities and the electricity sector for regional planning purposes

3.1 Better Address Asset Replacement Needs in the Regional Planning Process

Since the end of the first cycle, Hydro One implemented improvements to the planning process related to asset replacement needs by providing better rationale and documentation with respect to "right sizing" of equipment. In 2022, the RPPAG formalized the process and recommended that going forward all transmission asset owners (TAO) provide a 10-year outlook related to their major transmission assets requiring replacement during the Needs Assessment (NA) phase.

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 conductors/cables require specialized expertise to assess and plan replacement. However, sometimes there is a broader planning opportunity and as a result, Hydro One developed an internal process to collect and share best available information on major high voltage transmission equipment planned for replacement within the next 10 years with the Regional Planning TWG. The major high voltage equipment information shared and discussed as part of this process is listed below:

1) 230/115kV autotransformers
2) 230 and 115kV load serving step down transformers
3) 230 and 115kV breakers where:
    - Replacement of six breakers or more than 50% of station breakers, the lesser of the two
4) 230 and 115kV transmission lines requiring refurbishment where:
    - Leave to Construct (i.e., section 92) approval is required for any alternative to like-for-like
5) 230 and 115kV underground cable requiring replacement where:
    - Leave to Construct (i.e., section 92) approval is required for any alternative to like-for-like

The assessment and documentation are first undertaken in the NA phase by the TWG (i.e., Hydro One, IESO, and affected LDCs) for the applicable region. As part of this analysis, different options are evaluated, and a preferred replacement plan is recommended along with its rationale. The TWG reviews the load forecast that considers several inputs such as load growth due to changing customer requirements, CDM, and DER to determine the recommended plan for addressing the asset replacement need(s). 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 economical and practical implementation of incremental CDM/DER 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 asset(s) being assessed are consulted and engaged by the transmitter to obtain input regarding their expected needs before a preferred replacement plan is implemented.

Asset replacement needs that do not require further regional coordination (i.e., SA, IRRP, RIP) following the NA phase are addressed by Hydro One, as a transmitter, in coordination with the affected LDC(s). In doing so, Hydro One coordinates the replacement plan and related outages. Asset replacement needs that do require further assessment and regional coordination include those that provide 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 these needs will be undertaken in the next phase(s) of the regional planning process (i.e., SA, IRRP, and RIP) where the TWG will further review options and develop a preferred replacement plan.

3.2 Load Forecast Guideline

This document was developed to provide guidance to the TWG in the development of the load forecasts used in the various phases of the regional planning process with a focus on the NA and the IRRP. It is meant to enhance clarity, consistency, and transparency in the development of the load forecast and remain flexible to future evolution. The Guideline was finalized and adopted by the RPPAG in October 2022. Hydro One has also updated its internal load forecast template to align with the Guideline and provide further clarity to LDCs in providing their load forecast information.

3.3 Improving Coordination between Municipalities and the Electricity Sector for Regional Planning Purposes

Hydro One is actively involved in the RPPAG Municipal Subgroup to develop a guideline for municipalities to provide more specific information to LDCs, Hydro One and IESO that can be translated into load forecasts that are used in the regional planning process. This will result in better coordination in developing load forecasts which underpin the identification of needs as well as enhance two-way communication through a better understanding among municipalities of LDC information needs. This guideline is expected to be completed in Q4 2022.

3.4 Other Process Improvements

Some of the other process improvements made by Hydro One are listed below:

- Regional Planning Report Templates – various updates including a new section on "Sensitivity Analysis" in the NA report (beginning with third cycle Burlington to Nanticoke Region NA report).
- Utilizing revised local planning guidelines to aid the TWG in determining when specific needs that are local in nature can be more efficiently addressed by Hydro One and affected LDC(s).
- Pre-Regional Planning Input – since the second regional planning cycle, prior to start of the NA and RIP phase, Hydro One 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 TWG 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 TWG 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.

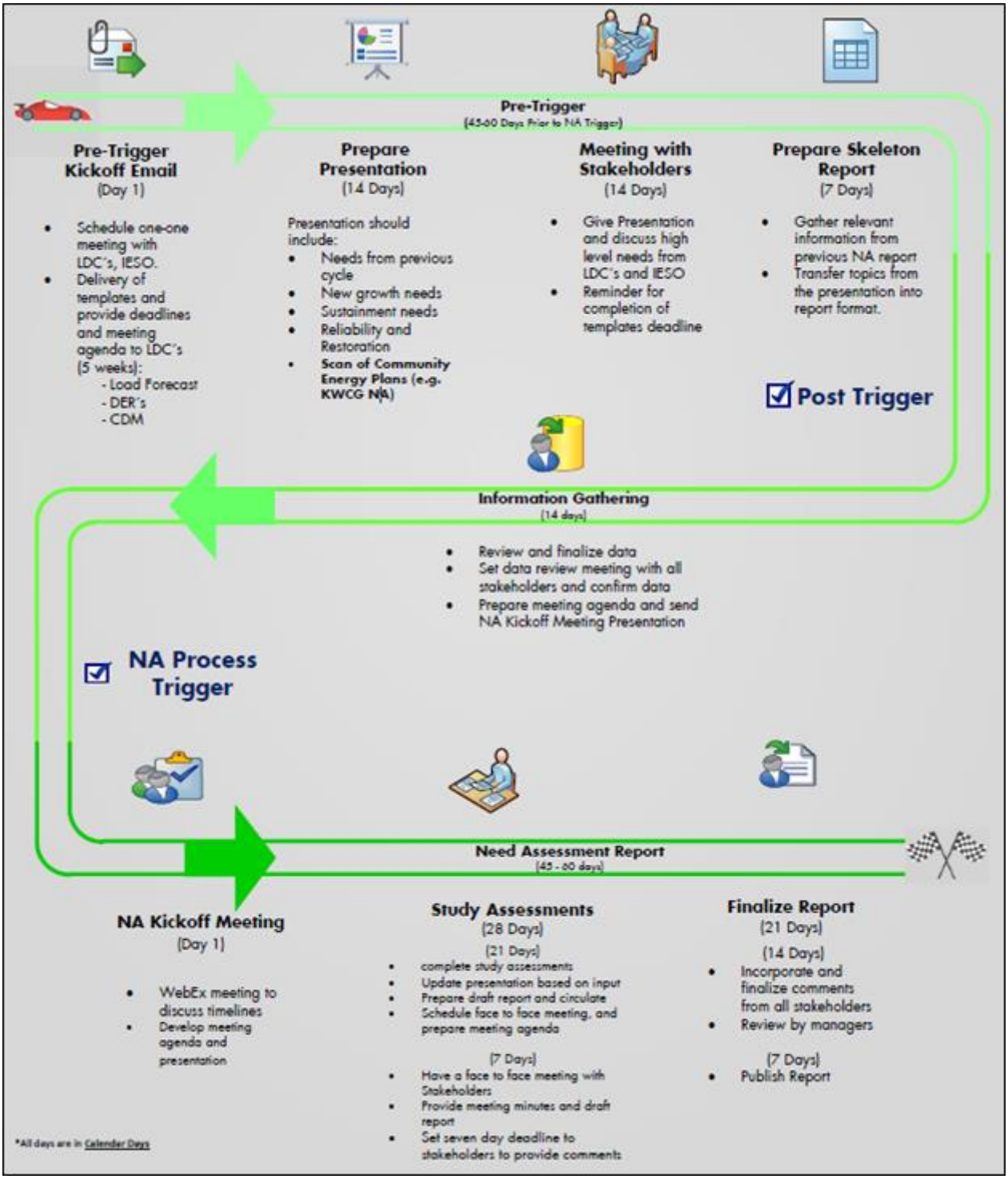

Figure 3-1. Needs Assessment (NA) Phase Diagram

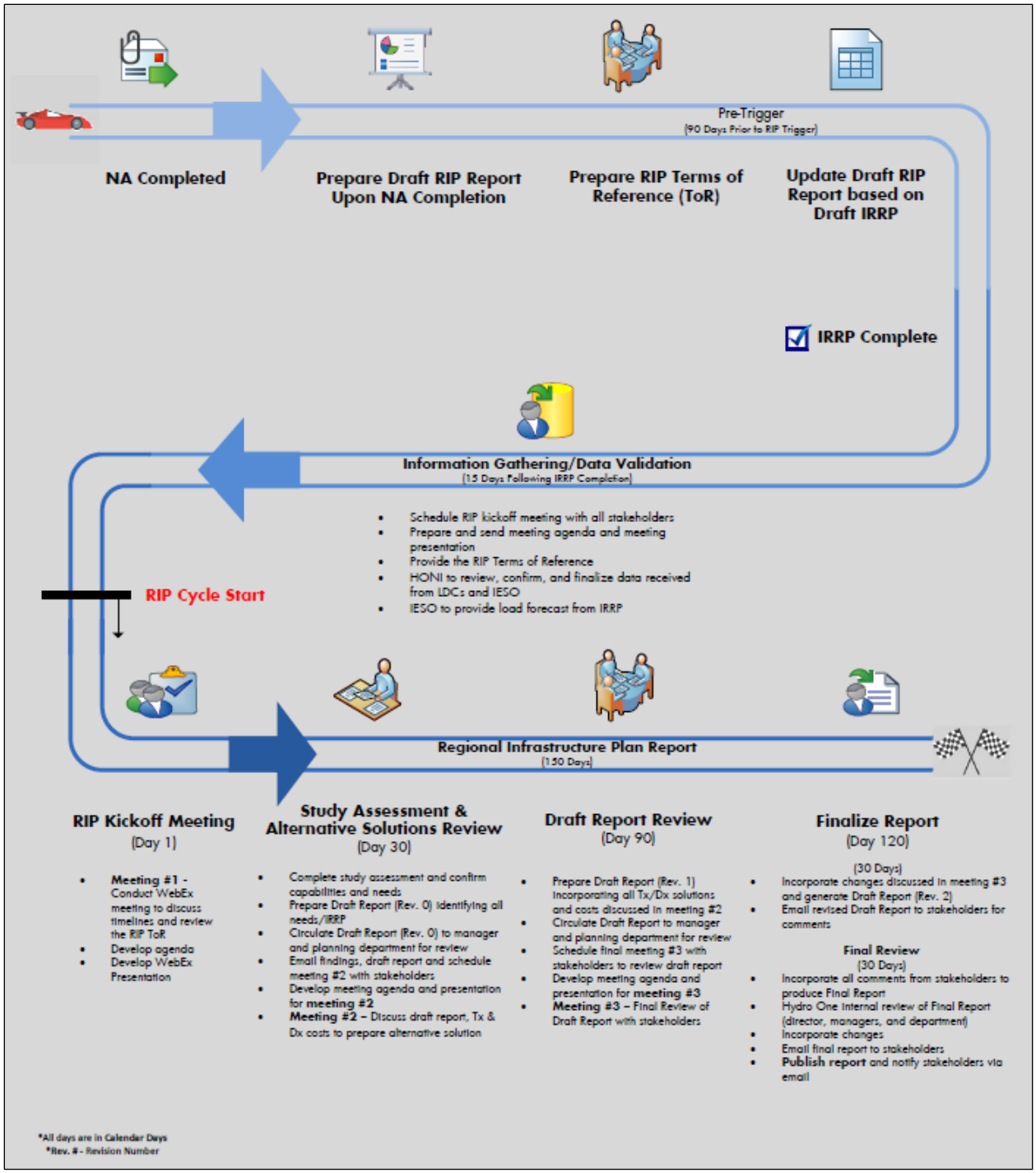

Figure 3-2. Regional Infrastructure Planning (RIP) Phase Diagram

4. STATUS OF REGIONS

Regional Infrastructure Plans (RIP) have been completed for all regions for the first cycle of the Regional Planning Process. For the second regional planning cycle, Hydro One has completed Needs Assessment reports for all twenty (20) regions where Hydro One is the lead transmitter as well as RIP reports for fifteen (15) regions with the five (5) remaining regions expected to be initiated in Q4 2022/Q1 2023, following the completion of their respective IRRPs. In addition, IESO has completed SAs for sixteen (16) regions and IRRP reports for eleven (11) regions with four (4) IRRPs currently underway. Hydro One has also initiated the third regional planning cycle with one (1) NA completed and three (3) NA's underway. These reports are available on the Hydro One's Regional Planning website.

At this time, no significant changes to the prioritization to initiate the third regional planning cycle have been proposed except for one region (Greater Ottawa). That said, Hydro One is keeping abreast of the needs in the province on a regional basis and will advance regional planning for regions as necessary based on emerging needs in the area.

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. The second regional planning cycle was completed with publishing of the RIP report in October 2019.The third regional planning cycle for this region was kicked off in April 2022 beginning with the Needs Assessment and was completed in September 2022. This is the first NA document to include sensitivity analysis to capture uncertainty in the load forecast as well as variability of electric demand drivers to identify any emerging needs and/or advancement or deferment of recommended investments. Updates to the needs and plans recommended in this region are provided below.

Projects completed include:

- Cumberland TS: Power factor correction (completed in 2019).
- 115 kV B3/B4: Refurbishment of line section from Horning Mountain Jct. to Glanford Jct (completed in 2020).
- Elgin TS: Transformers & switchgear requiring replacement (replaced two DESNs with a single DESN in 2020/2021).
- Newton TS: Transformers (T1/T2) requiring replacement (completed in 2020).
- Kenilworth TS: Transformer & switchgear requiring replacement (replaced two DESNs with a single DESN, completed in 2021).

Needs and Plans underway in Burlington to Nanticoke Region:

- **Norfolk Area Supply Capacity**
  Load transfers from Norfolk area to Jarvis TS is planned to be completed by the end of 2022. Additional reactive support at Norfolk TS is planned for 2023-24 timeframe. Upgrade of Jarvis TS and building feeders to pick up Norfolk area loads is planned for 2027-32 timeframe.

- **Refurbishment of 115 kV B7/B8 line section**
  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 based on asset condition assessment it requires replacement. This project is expected to be in-service by Q4 2024.

- **Refurbishment of Gage TS (T3/T4 and T5/T6 DESNs)**
  The TWG recommends Hydro One to reconfigure the station and reduce it from 3 DESNs to 2 DESNs due to poor condition of the existing transformers. Under this plan, the two 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. The switchgear currently supplied by T5/T6 transformers will also be replaced. This project is expected to be in service by Q4 2023.

- **Load Transfer from Dundas TS to Dundas TS #2**
  Dundas TS has two DESNs; one of the two DESNs has loads more than its supply capacity while the other DESN has spare capacity to accommodate these excess loads. Hydro One Distribution is currently planning to build feeders required for load transfers from Dundas TS to Dundas TS #2 by 2023. No new additional work inside Dundas TS #2 is required for these load transfers. The combined supply capacity of both Dundas TS DESNs is sufficient over and beyond the study period.

- **Power Factor Correction at Kenilworth TS**
  At Kenilworth TS the historical loading data indicated that under peak load the power factor is lagging below the ORTAC[5] requirement of 0.9. To address this issue the TWG recommended the installation of a capacitor bank and/or for Alectra Utilities to work with load customers supplied by Kenilworth TS to meet ORTAC[5] power factor requirement of 0.9. The installation of capacitor bank at Kenilworth TS will be initiated after completion of refurbishment of this supply station in Q4 2023.

- **Refurbishment of 115 kV breakers at Newton TS**
  To maintain system reliability and based on asset condition assessment Hydro One has identified an asset replacement need for 115 kV breakers at Newton TS with a planned in-service of 2025.

- **Brant Area Supply**
  The 115 kV Brant area is supplied by two stations, Brant TS and Powerline MTS. A Brant Subregion IRRP was completed by the IESO in 2015 to address the electricity needs of the area over the next 20 years up to 2033. The report recommended installation of a capacitor bank at Power line MTS and building of a new switching station integrating B12 and B13 115 kV circuits from Burlington TS with a single 115 kV circuit B8W supplied from Karn TS. These two measures increased the Load Meeting Capability (LMC) of 115 kV supply system to Brant area to 165MW. The coincident load in the 115 kV Brant area system may exceed the LMC of 165 MW before the end of the study period (2032). Additional analysis is required to better assess the need timeframe. The TWG recommends Hydro One to monitor the loading on the Brant 115 kV supply system and take remedial measures if required. This need will be reviewed during the next phases of third regional planning cycle.

- **Norfolk Area Supply**
  The Norfolk area loads are supplied through Norfolk TS and Bloomsburg DS supplied through two 115 kV circuits from Caledonia autotransformers. In 2020, the IESO carried out an assessment of the supply capability in the Norfolk area when additional load growth was identified by the LDCs. As a result of this assessment, load transfers out of the Norfolk area and additional reactive support at Norfolk TS was recommended. These measures will increase the LMC of supply to Norfolk area from 88MW to 105 MW. In the mid-term the preferred option based on the load forecast at that time was to upgrade Jarvis TS and build four (4) 27.6 kV feeders from this station to Norfolk area to pick up loads limiting the loads supplied from the existing Norfolk area system to within its supply capacity. Based on the current normal growth load forecast the loads are growing at a higher rate than anticipated before. The TWG recommends that Hydro One monitor the loading levels of Norfolk area supply system and take remedial measures if required. This need will be reviewed during the next phases of the third regional planning cycle.

- **Norfolk TS and Bloomsburg DS (Norfolk Area)**
  Norfolk TS and Bloomsburg DS are currently supplying loads of 66 MW and 38 MW Norfolk area loads respectively. The supply capacities of these two stations are 97 MW and 49 MW respectively. The loads at Norfolk TS and Bloomsburg DS are forecasted to exceed their supply capacities in 2030 and 2025 under the normal growth scenario. The current supply capacity of Norfolk area is limited by the capacity two (2) 115kV circuits supplying this area which is about 88 MW much lower than the combined supply capacity of Norfolk TS and Bloomsburg DS. The supply capacity of Norfolk area is currently planned to be addressed mainly through load transfers reducing the loads on Norfolk TS and Bloomsburg DS well below their supply capacities. This need will be reviewed during the next phases of the third regional planning cycle.

- **Caledonia TS Capacity**
  Caledonia TS is currently supplying loads of 44 MW having a supply capacity of 99 MW. The load at Caledonia TS is forecasted to exceed its supply in 2030 under the normal growth load forecast scenario. The TWG recommended Hydro One to monitor the loading at Caledonia TS and this need will be reviewed during the next phases of the third regional planning cycle.

- **Nebo TS Capacity**
  Nebo TS has two DESNs inside the station supplying loads in the city of Hamilton and surrounding areas. T1/T2 is a 27.6 kV DESN with current load of 122 MW having a supply capacity of 178 MW sufficient over the study period. The loads at T3/T4 13.8 kV DESN at Nebo TS had been historically around its supply capacity and is currently marginally overloaded supplying loads of 55 MW against its supply capacity of 51 MW. The loads at this DESN are currently forecasted to grow above and beyond its supply capacity. The TWG recommended that Hydro One and Alectra monitor the loading at Nebo TS T3/T4 DESN and take remedial measures if required until refurbishment of this DESN is completed. This refurbishment is currently planned to be completed in the 2027-2032 timeframe replacing existing 75 MVA nonstandard transformers with Hydro One standard 100 MVA units. This need will be reviewed during the next phases of the third regional planning cycle.

- **Mohawk TS Capacity**
  Mohawk TS is a single DESN station supplying loads in the city of Hamilton. This station is currently supplying 81 MW of load having a supply capacity of 90 MW. The peak load at Mohawk TS had been historically around its current loading levels, however the load at this station is forecasted to exceed its supply in 2024 under normal growth scenario. The TWG recommended that Hydro One and Alectra to monitor the loading Mohawk TS and take necessary actions if required, e.g. load transfers to the neighboring stations. This need will be reviewed during the next phases of the third 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 regional planning cycle RIP was completed in March 2020. The third regional planning cycle for this region was initiated in August 2022 beginning with the Needs Assessment and is currently underway. Updates to the needs and plans recommended in this region are provided below.

Projects completed include:

- Midtown Transmission Reinforcement Project (completed in 2016)
- Clare R. Copeland 115 kV Switching Station and Copeland MTS (completed in 2019)
- West Toronto Area Station and line Capacity (added new DESN at Runnymede TS site and upgraded K1W/ K3W/ K11W/ K12W 115kV circuits, completed in 2018)
- Manby SPS Load Rejection (L/R) Scheme (completed in 2019)
- Southwest Toronto Station Capacity (added new DESN at Horner TS, completed in 2022)

Needs and Plans underway in Toronto Region:

- **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, Phase 2 is expected to be completed by 2023.

- **Richview TS to Manby TS Corridor Reinforcement**
  The Toronto IRRP reconfirmed the capacity need of this corridor based on the changes in assumptions and the up-to-date load forecast. The recommended plan is staged as follows:

  Stage 1: Rebuild existing 115kV idle line to 230kV standards. The new line will operate in parallel with the existing four 230 kV circuits from Richview TS to Manby TS, which will initially be reconfigured to create two “super circuits”. Stage 1 is currently expected to be in-service in 2026.

  Stage 2: Unbundle the super circuits. At Richview TS, the new circuits will be tapped to existing 230 kV circuits V73R and V79R from Claireville TS. The work is planned to be completed coincident with Manby TS EOL refurbishment work, which is planned for completion by 2032.

- **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[5]. 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 T3/T4 Transformer Replacement**
  The TWG recommends that the existing 45/75 MVA 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 2024.

- **Bermondsey TS T3/T4 Transformer Refurbishment**
  The TWG 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 2028.

- **John TS – Transformers, 115 kV breakers, and LV Switchgear Replacement**
  The TWG recommended the replacement of T2, T3, T5, T6 transformers with 60/100 MVA units in a similar connection arrangement as 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. Transformers T1, T2, and T4 have already been replaced (completed in 2019 to 2021) and T5 and T6 are planned for replacement in 2025. Transformer T3 and all associated HV breakers were found to be in fair condition and the timing to replace them is deferred.

- **Manby TS – Replacement of T7, T9, T12 Autotransformers, T13 Step-down Transformer and Rebuild 230kV Yard**
  The TWG recommends replacement of Manby East T7, T9, and Manby West T12 autotransformers with 250 MVA units. Also, Manby T13 DESN transformer will be replaced with 75/93 MVA unit along with 230 kV oil breakers and modification of 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 transformers are planned for replacement in 2029 and the 230kV oil breakers and yard modification are planned after 2030.

- **115kV C5E/C7E Underground Cable Esplanade TS to Terauley TS**
  The TWG recommends refurbishment of the cables with new 230kV rated cables, which have higher insulation and are less prone to failure. The project is expected to be completed by 2026.

- **115 kV Overhead Line H1L/H3L/H6LC/H8LC (Bloor St. JCT to Leaside JCT) Refurbishment**
  The TWG recommends the refurbishment of the overhead section as per current standard. This project is expected to be completed by 2027.

- **115kV L9C/L12C (Leaside TS to Balfour JCT) Refurbishment**
  The TWG recommends the refurbishment of the overhead section as per current standard. This project is expected to be completed by 2026.

The third regional planning cycle for this region was initiated in Aug. 2022 with the NA phase and is currently underway.

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 regional planning cycle was completed with publishing of the RIP report in March 2020. The third regional planning cycle for this region was initiated in October 2022 beginning with the Needs Assessment and is currently underway. Updates to the needs and plans recommended in this region are provided below.

Projects completed include:

- Crawford TS transformer T3 replacement and neutral grounding reactors installation on T3 and T4 (I/S 2017)
- Malden TS breakers replacement (I/S 2018): replacement of two 27.6 kV feeder breakers
- Supply to Essex County Transmission Reinforcement (I/S 2017): Build new 13 km double-circuit 230 kV transmission lines to Leamington area tapped to existing C21J/C22J circuits, and new 75/100/125 MVA Leamington TS and its distribution feeders.
- Reconfiguration of 230 kV and 115 kV circuits and 27.6 kV feeders at Keith TS to accommodate the construction of Gordie Howe International Bridge (I/S 2019)
- Leamington TS expansion: Build the second 75/100/125 MVA DESN at Leamington TS (I/S 2019)
- Kingsville TS transformers replacement: Transformers T2 and T4 replacement with 50/83 MVA T6 (completed in 2018). Transformers T1 and T3 replacement with 50/83 MVA T5 (completed in 2022).
- South Middle Road TS: Build two new DESNs (T3/T4 DESN completed in 2022; second DESN expected I/S 2025)
- Lakeshore TS: Build new switching station at Leamington Junction (completed in 2022)

Needs and Plans underway in Windsor Essex Region:

- Keith TS autotransformers replacement (in progress, I/S 2023): 125 MVA autotransformers T11 and T12 will be replaced by 250 MVA units.
- Tilbury TS decommissioning (in progress, I/S 2024): Decommissioning of station due to end-of-life and transfer serviced load to Tilbury West DS supply.
- Keith TS transformer T1 decommissioning (expected I/S 2024).

- **J3E/J4E Load Restoration**
  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 TWG further assessed the load restoration need in IRRP phase and confirmed that existing transmission reconfiguration options are sufficient to restore the interrupted load. Hence, there are no additional load restoration requirements during the study period of the second regional planning cycle.

- **Keith TS T11/T12 Autotransformers Replacement**
  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 2023.

- **Lauzon TS T5/T6 Transformer Replacement & 115kV Subsystem Supply Capacity**
  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 125MVA units by 2026. Step-down transformers T7 and T8, and autotransformers T1 and T2 are expected to be replaced by 2029.

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

- **Supply Capacity to Kingsville-Leamington Area**
  The TWG recommends building a new switching station at Leamington Junction (to be known as Lakeshore TS, two new DESNs at a station called South Middle Road TS (to be built in close proximity to Lakeshore TS), and building new 230 kV double-circuit transmission line between Chatham SS and the new Lakeshore TS. The Lakeshore TS and one DESN at South Middle Road TS were completed in 2022. The planned in-service date for the second DESN at South Middle Road TS and the new line between Chatham SS and the new Lakeshore TS is planned for 2025.

- **Kent TS Station Capacity**
  The TWG recommended to further evaluate this need as part of the Chatham-Kent/Lambton/Sarnia regional planning process. The TWG for the Chatham-Kent/Lambton/Sarnia RIP recommends a new station (proposed to be named Dresden TS) on the Lambton by Chatham corridor subject to the confirmation of the load materializing in the Dresden Area. Due to the existing limitations on the L28C/L29C circuits the construction of the new Dresden TS would be aligned with the construction of the new Lambton by Chatham transmission

line with the intention of being ready connect new customers at the same time that the new double-circuit line is planned for completion (2028). The immediate capacity needs of new customers can be supplied by the limited capacities available at Kent TS (T1/T2 DESN) and Wallaceburg TS until the proposed Dresden TS is placed in service. The need for Dresden TS may possibly be delayed if the Lambton by Chatham routing results in additional capacity becoming available at Wallaceburg TS.

- **Belle River TS Station Capacity**
  The TWG recommends monitoring load growth and re-evaluating the need in the next regional planning cycle.

The third regional planning cycle for this region was initiated in Oct. 2022 with the NA phase which is currently underway.

4.4 GTA North

The GTA North Region is approximately bounded by the Regional Municipality of York, and includes parts of the Cities of Toronto, Brampton, and Mississauga. The second regional planning cycle was completed with publishing of the RIP report in October 2020. Updates to the needs and plans recommended in this region are provided below.

Projects completed include:

- Vaughan #4 MTS (completed in 2017)
- Holland breakers, disconnect switches and special protection scheme (completed in 2017)
- Inline switches on the Parkway Belt (V71P/V75P) at Grainger Jct. (completed in 2018)

Needs and Plans underway in GTA North Region:

- **Vaughan MTS Transformation Capacity**
  The TWG recommends building a new Vaughan #5 MTS by 2030 to address the need for additional transformation capacity for Vaughan area stations.

- **Markham MTS Transformation Capacity**
  In the first cycle RIP, the TWG 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 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). During the second cycle, the TWG recommended building the new station at Buttonville TS and connecting to the P45/P46 circuits. Alectra will be building the station and Hydro One will be building the line tap connection from P45/P46. The new Markham MTS#5 is expected to be built by 2025. and upgrading the supply capability of 230 kV circuits P45/P46 is expected to be completed by 2027.

- **Transmission Line Uprate – P45/P46**
  The connection of the new Markham MTS#5 to the Parkway TS x Buttonville TS P45/P46 circuits will increase the loading on these circuits. The transmission capacity is thermally limited by an approximately 1.1 km long section between Parkway TS and Markham #4 Jct. Loading is expected to exceed the rating by 2029. It is expected that the thermally limiting section of this line can be increased by changing the conductor to be capable of supplying the forecasted load on these circuits. It is also prudent to consider uprating these circuits before the need date to reduce the amount of load at risk during construction outages. Completing this upgrade in time for the Markham MTS#5 in service date will also allow for the LDC to make full use of this facility's capacity to manage distribution operations including restoration, optimizing feeder loading, and accommodating maintenance.

- **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 was reaffirmed in the second cycle and the TWG recommends that the IESO and Capital Power (York Energy Centre's operator and 50% owner) proceed to identify and consider options for a new station service supply arrangement. Any new configuration should allow for continuous York Energy Centre operation following the simultaneous loss of H82/83V (total loss of distribution supply from Holland TS) or the loss of B88H (loss of transmission supply point).

- **Northern York Area Transformation Capacity**
  The TWG identified the need for additional transformation capacity in the Northern York Area for the areas supplied by Armitage TS and Holland TS, along with associated transmission capacity. Based on the latest load forecast the transformer stations capability (Holland TS/Armitage TS) will be needed by 2027. It is anticipated that the new station will be supplied by circuits B88H/B89H which are in the vicinity of the forecasted load growth. The TWG recommends that further discussions between Hydro One and the LDCs take place to determine the final location and connection point to meet an in-service date of 2027.

- **Load Restoration for 230 kV Circuits V43/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[5] may not be met. During the second cycle, the TWG agreed that no further action is required at this time and the need be reviewed during the next regional planning cycle. The Kleinburg to Kirby option to address the supply capacity needs in the long term would improve the load restoration capability for these circuits. Based on the long term forecast the supply capacity needs will arise between 2030 and 2035. Until a preferred long-term solution is identified for the Claireville to Minden corridor, the TWG determined that there is no need to pursue other alternatives.

- **Improve Load Security on the Parkway to Claireville Line**
  The Parkway to Claireville line (V71P/V75P) is located on the Parkway Belt and supplies five load stations with a combined load of approximately 700 MW based on latest summer peak load conditions. The load security criteria in ORTAC[5] limits the amount of load that can be interrupted due to the loss of two elements (e.g.: a double circuit line outage) to 600 MW under peak load. On the Parkway to Claireville line, that limit is exceeded. The installation of inline switches on the V71P/V75P circuits at the Vaughan MTS #1 junction (completed in 2018) do not reduce the amount of load that is interrupted, however the project enables Hydro One to quickly isolate the problem and allow the resupply of load to occur expeditiously. The TWG recommends that no further action is required at this time since the switches permit quick restoration of the load.

- **Woodbridge TS Transformer T5 Replacement**
  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 has been identified to be in poor condition and requiring replacement. The TWG recommended to replace the 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 TS and Lindsay TS 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 TS and Lindsay TS are dispatched under heavy load. The TWG recommends switching LV caps manually at Beaverton TS and Lindsay TS to mitigate high voltages when required.

It is expected that the third regional planning cycle for this region will be initiated in 2023, beginning with the NA phase.

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.
The second regional planning cycle was completed with publishing of the RIP report in December 2020. The third regional planning cycle for this region was initiated in August 2022 beginning with the Needs Assessment and is currently underway. Updates to the needs and plans recommended in this region are provided below.

Projects completed include:

- King Edward TS station capacity (replaced with new Transformer T3 with higher capacity 60/100 MVA in 2021)
- Hawthorne TS exceeded LTR (replaced T7 & T8 transformers in 2019 and T5 & T6 in 2021 with higher rated 150 MVA transformers)
- A4K supply capacity (new A6R Tap project was completed in 2019).

- Cambrian MTS and South Nepean Transmission reinforcement: The section of S7M (single circuit 115 kV line) from Hunt Club road (STR673JCT) to Manotick JCT, and from Manotick JCT to Cambrian Road was rebuilt as a double circuit 230 kV line. At STR673JCT, the new double circuit connects both S7M (to continue the supply to the area stations) and to E34M to supply the new Cambrian MTS. The two circuits were extended for about 1.3km along Cambrian road to supply the new MTS. This project was completed in 2022.

Needs and Plans underway in Greater Ottawa Region:

- **Circuit L2M Supply Capacity**
  L2M is a 115 kV circuit supplying Limebank MTS and Marionville DS. The circuit is thermally limited to approximately 86 MW. Based on the study results, the 7.8km line section between Merivale TS and Limebank MTS is expected to reach its thermal capacity limit in the medium term by 2029. The TWG recommends monitoring the load at Limebank MTS and implement load transfers to Cambrian MTS when L2M reaches its thermal capacity. With the ongoing Gatineau Corridor EOL study, network changes could occur which would alleviate the thermal capacity need of L2M. This need will be re-evaluated in the next regional planning cycle when the Gatineau Corridor EOL study results are known.

- **Merivale TS T22 Transformation Capacity**
  The need for additional 230/115kV auto-transformation capacity at Merivale TS was assessed by the TWG. It is recommended to replace transformer T22 at Merivale TS with a like-for-like unit (in situ) by 2025 as a first step to address the need for increased supply to the 115 kV system. The on-going studies can impact this timing based on their recommendations and necessary approvals including SIA. The TWG recommends Hydro One monitor the health of all aging assets at the station and develop a plan to address both sustainment and development needs following completion of the studies.

- **Bilberry Creek TS Refurbishment**
  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. The TWG recommends that Hydro One proceed with the like-for-like refurbishment of Bilberry Creek TS (planned in-service date is 2028), with expansion to accommodate two additional breaker positions for Hydro Ottawa's load transfers and possible growth in the area (planned in service date is 2024).

- **Hawkesbury MTS Capacity Upgrade**
  Hydro Hawkesbury is supplied from two transformer stations, Hawkesbury MTS and Longueuil TS. Currently Hawkesbury MTS has a 15 MVA transformers and a 7.5 MVA transformer to supply their load. Hydro Hawkesbury plans to replace their 7.5 MVA transformer with a new 15 MVA transformer. This is planned to be in service in 2026. This upgrade will increase the station capacity and improve customer reliability such that if a transformer must be taken out of service, the entire station load can be supplied without interruptions.

- **Lincoln Heights TS Transformer T1/T2 Replacement**

Lincoln Heights TS is an indoor DESN station housing two 40-45 years old 45/60/75 MVA transformers. The station is supplied by two 115 kV circuits F10MV and C7BM and supplies electricity to Hydro Ottawa customers. Since the existing transformers are at end of life, the TWG recommended for these transformers to be replaced with new standard 45/60/75 MVA units. These transformers are planned to be in service in 2023.

- **Russell TS T1/T2 and Component Replacement**
  Russell TS is supplied by two 115 kV circuits A5RK and A6R and supplies electricity to Hydro Ottawa customers. The two 45/60/75 MVA transformers T1 and T2 were installed in 1975 and 1971 respectively and they need to be replaced. The TWG suggested to replace these transformers with new standard 45/60/75 MVA or with 60/80/100 MVA units to optimize the LTR of the station following the studies and anticipated load at this station. The project is expected to in-service by late 2026.

- **Overbrook TS Station Capacity**
  Overbrook TS is 115/13.8 kV transformer station in east of the Ottawa downtown core. A review of the station's LTR indicate that the 13.8 kV cables from the transformers to the 13.8 kV switchgear are limiting the transformation capacity of the station. The TWG recommends that Hydro One to review the capacity of the 13.8 kV cables to determine the cause of the limitation in 2021. The findings will be discussed between Hydro One and Hydro Ottawa to determine next steps, which could include LV cable upgrades or implementation of new feeder ties to transfer load out of the station. The plan should be implemented by 2026 when station is expected to reach its capacity.

- **Hawthorne TS Station Capacity**
  The study group identified that the DESN station at Hawthorne TS will be overloaded in 2026 by approximately 2 MW and reaches 32 MW by the end of the study period. It is recommended to install a new station on circuit L24A to relieve the stations in the south area of any overloads, including Hawthorne TS. Once the new station on L24A is in service it will alleviate the overloading experienced at Hawthorne TS.

- **Orleans TS Station Capacity**
  Orleans TS was placed in service in 2015 that supplies Hydro One Distribution and Hydro Ottawa. Based on the forecast, the station's transformation capacity is expected to reach its limit in the near term and overloaded by approximately 15 MW within the next 10 years.
  Hydro One Distribution has confirmed that transfer capability is available to nearby stations Bilberry Creek TS, Wilhaven DS, and Navan DS. To accommodate Hydro Ottawa load transfers, two new feeder breakers may be required at Bilberry Creek TS by 2024. The TWG recommends managing any overload at Orleans TS by load transfers to neighboring stations.

- **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 TWG recommended that Hydro Ottawa continue with the 13.8kV switchgear replacement plan. The station is expected to be in-service by 2024.

- **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.
  Hydro Ottawa's new station, Cambrian MTS, will implement a scheme to remove the station load from circuit E34M and move it to its alternate supply S7M in the event of a line end open (LEO). A LEO at Merivale TS can results in load loss at Almonte TS and Terry Fox MTS. Terry Fox MTS is part of the Ottawa Area under voltage load rejection scheme ("UVLS"). This scheme is designed to shed the station load if the 230 kV supply voltage to the station drops below 204 kV when it is activated. The combined load of both stations is less than 150 MW and can be restored within 8 hours as mandated by the ORTAC[5]. As the load restoration criteria can be met, no further action is recommended by the TWG.

- **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 TWG, to replace conductors, wood poles, insulators, and other components. The refurbishment is expected to be completed in Q2 2023.

- **Albion TS – T1/T2, Switchgear and Circuit Breakers Replacement**
  Albion TS is a 230/13.8/13.8kV station connected to 230kV M30A and M31A circuits, supplying Hydro Ottawa. The existing transformers T1 and T2 are rated at 75MVA each, were built in the 1970s, and have been identified for replacement due to their poor condition. As per the recommendation from Needs Assessment and further assessed in the IRRP, Albion T1 and T2 are scheduled to be replaced with new closest standard size 60/80/100 MVA units. All existing Hydro One owned circuit breakers will be replaced with breakers of similar rating. This replacement project is scheduled to be in-service by late 2026. No increase in the transformation capacity is recommended.

- **M50A/M31A Circuit Upgrade**
  The 230 kV circuits M30A and M31A between Hawthorne TS and Merivale TS are scheduled to be replaced with twin-bundled conductors to increase the circuit ratings. This work is expected to increase the interface limit from 648 MW to 1080 MW and to be completed in 2024.

- **Slater TS Transformers T1/T2/T3 Replacement**
  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 T2 and T3 with new 100MVA units. 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 equipment is expected to be completed by 2023.

- **Arnprior TS – Transformers T1/T2 Replacement and Rebuilding DESN**
  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 life. The TWG recommended to replace these transformers with like-for-like units and build a new 44kV switchyard to supply the station load. The replacement of this equipment is expected to be completed by 2023.

- **Longueuil TS Transformers T3/T4 Replacement**
  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. The TWG recommended these transformers to be replaced with either new 83.3MVA or 125MVA units. Final coordination about the size of new transformers will be taken in coordination with Hydro One Distribution based on anticipated load at the station. The replacement of these equipment is expected to be completed by late 2024.

- **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 is reviewed during the RIP phase and studied confirmed that the area and stations supplied by the 79M1 circuit is within the limits of ORTAC[5] for the near term. Hydro One continues to monitor the loading in the area and voltage on the line and if required this need to be reassessed in the next regional planning cycle.

The third regional planning cycle for this region was initiated in August 2022 with the NA phase which is currently underway.

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 second regional planning cycle was completed with publishing of the RIP report in December 2021. Updates to the needs and plans recommended in this region are provided below.

Projects completed include:

- 115kV system supply capacity (GATR project): Two new 230/115kV autotransformers at Cedar TS to reinforce supply to both 115kV sub-systems in the region (completed in 2016).
- 230kV load restoration needs (GATR project): Two new 230 kV in-line switches on D6V/D7V circuits to improve restoration capability of Waterloo-Guelph 230 kV sub-system (completed in 2016). Also, two new 230kV in-line switches on M20D/M21D circuits to improve restoration capability of the Cambridge-Kitchener 230 kV sub-system (completed in 2017).
- Station short circuit (Arlen MTS): Install 13.8 kV series reactors to mitigate LV bus short circuit levels (LDC project, completed in 2016).
- Campbell TS: Replaced vintage T1 (completed in 2018) and T2 transformers (completed in 2019).

- Detweiler TS: Replaced 230 /115 kV Auto Transformers T2 (completed in 2020) and T4, AC station service and components (completed in 2021).
- Refurbished tower 157 near Freeport SS for D7F / D9F 115 kV (completed in 2020/2021).

Needs and Plans underway in KWCG Region:

- **Hanlon TS Transformers T1/T2 Replacement**
  Hanlon TS is located south of the city of Guelph supplying Alectra loads. Hanlon TS is a single T1/T2 DESN station of 33 MVA nonstandard transformers having a LTR of 48 MVA (43 MW @ 0.9 PF). This station is currently supplying about 27.5 MW of peak load. The T1/T2 transformers were built in 1955-56 and in poor condition requiring replacement. The TWG recommended Hydro One to replace these transformers with standard size of 42 MVA units. These transformers are planned to be in service in 2022-2023.

- **Kitchener MTS#5 Transformers T9/T10 Replacement**
  Kitchener MTS #5 is in the city of Kitchener supplying Kitchener-Wilmot Hydro Inc. loads. The existing 83MVA nonstandard transformers T9 and T10 are supplying 67 MW of peak load. The loads at Kitchener MTS #5 are currently forecasted to grow at about 15% over the entire study period and approaches the supply capacity of this station by 2028. The T9/T10 transformers at this station have been identified as approaching end of life requiring replacement. The TWG recommends replacing the T9/T10 with standard units of similar or greater size, that can provide higher LTR for station capacity to be sufficient beyond study period. Kitchener-Wilmot Hydro Inc. and Hydro One will coordinate the replacement plan of these transformers. This investment is expected to be completed by 2023-2024.

- **Scheifele MTS Transformers T1/T2 Replacement**
  Scheifele MTS is in the city of Waterloo supplying Waterloo North Hydro Inc. loads. Scheifele MTS has four 230/13.8 kV transformers T1 and T2 of 69 MVA, and T3 and T4 of 110 MVA supplying 145 MW of peak loads. The total supply capacity of Scheifele MTS is 161 MW expected to be sufficient over the study period, except marginal overloading in 2041. The T1/T2 are approaching end of life and required to be replaced by 2025-2026. The TWG recommends that Waterloo North Hydro continue monitoring the condition of these T1/T2 transformers at Scheifele MTS and if required, proceed with replacement plan otherwise this need may be reassessed in the next regional planning cycle.

- **B5C/B6C Circuit Refurbishment**
  The 115 kV B5C/B6C circuits consist of about 45 km of double circuit line and 15 km of single circuit line supplying South-Central Guelph 115 kV loads. About 12 km of double circuit line section from Burlington TS to Harper's Jct. and 15 km B5C 115 kV line tap from Harper's Jct. to a Westover Jct. require refurbishment. The refurbishment of the 27 km 115 kV B5C/B6C line sections from Burlington TS to a CTS is currently under execution and the work is planned to be completed by the end of year 2025.

- **Preston TS Transformers T3/T4 Replacement**
  Preston TS is in the city of Cambridge supplying Energy+ loads and contains two 125MVA transformers, T3/T4. The T3/T4 transformers are almost 50 years old and are in poor condition requiring replacement. This station is currently supplying about 92 MW of peak load. The loads at Preston TS are currently forecasted to peak at about 120 MW during the study period. The TWG recommends replacing the existing 125 MVA T3/T4 transformers with 125 MVA standard units. The project is expected to be completed by 2026-2027.

- **Cedar TS Transformers T7/T8 Replacement**
  Cedar TS is in the city of Guelph supplying Alectra loads and has two 115/13.8 kV DESN units T1/T2 and T7/T8 of 75 MVA with a LTR of 115 MVA and 37 MVA with a LTR of 44 MVA supplying 67 MW and 36 MW of peak loads respectively. The T7/T8 DESN 38 MVA nonstandard transformers were built in 1958 and have been identified for replacement due to poor condition. The T1/T2 transformers were built in early 1990s. The station cannot be downsized or eliminated because there is no nearby supply station/s to Cedar TS having surplus capacity where this station's loads can be transferred therefore the TWG recommends replacing these nonstandard transformers with standard units of 42 MVA in 2026-2027.

- **Fergus TS Transformers T3/T4 Replacement**
  Fergus TS is in the township of Fergus and has two 125MVA transformers T3 and T4 supplying 90 MW of peak loads. The total supply capacity of Fergus TS is 154 MW expected to be more than adequate over the study period. Condition assessment has identified that both 50 years old T3/T4 transformers as well as the feeder breakers are at their EOL requiring replacement. The TWG recommends that Hydro One continue monitoring the condition of these T3/T4 transformers and other components at Fergus TS and if required proceed with the replacement plan by 2028-2029 or otherwise this need may be reassessed in the next regional planning cycle.

- **Galt TS Breakers and Component Replacement**
  Galt TS is in the city of Cambridge supplying Energy + loads in the KWCG region and has two 230/ 125MVA transformers, T7 and T8, supplying 112 MW of peak loads. The total supply capacity of Galt TS is 169 MW, expected to be more than adequate over the study period. The T7/T8 transformers are new but the breakers and other component at the station are almost 50 years old. Condition assessment has identified that these components are at EOL, requiring replacement. The TWG recommends that Hydro One continue monitoring the condition of these EOL components at Galt TS and if required proceed with the replacement plan by 2028-2029 or otherwise this need may be reassessed in the next regional planning cycle.

- **Campbell TS Breakers and Component Replacement**
  Campbell TS is in the city of Guelph supplying Alectra loads. Campbell TS has four 100 MVA transformers, T1/T2 and T3/T4. Campbell TS is supplying about 89 MW and 47 MW loads via its two DESNs. Two feeder breakers and a tie breaker for T1/T2 DESN are in poor condition and requires replacement. The TWG recommends implementing replacement plan by 2028-2029.

It is expected that the next planning cycle for this region will be initiated in 2023 or earlier, beginning with the NA phase.

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 second regional planning cycle was completed with publishing of the RIP report in February 2022. Updates to the needs and plans recommended in this region are provided below.

Projects completed include:

- Halton Hills Hydro MTS (completed in 2018)
- Tremaine TS: Add 4 x 27.6 kV feeders (completed in 2020)

Needs and Plans currently underway in GTA West Region:

- **Palermo TS T3/T4 Replacement**
  The TWG identified a need for additional transformation capacity at Palermo TS. The peak station demand was about 124 MW in summer 2021 as compared to the station 10-day LTR of 110 MW. The T3/T4 transformers at Palermo TS are also in poor condition and require replacement. The transformers are planned for replacement by Q4 2026. The earlier NA and IRRP reports had identified the need for adding a second DESN at Halton TS by 2022 and that the capacity on Tremaine TS would be exceeded by 2033. The IRRP had also identified upsizing the Palermo TS transformers as a more cost-effective alternative to replacing the transformers like- for-like. During the second cycle RIP, Milton Hydro reviewed their load forecast and now plan to utilize the increased capacity at Palermo TS, thereby deferring the need for a second DESN at Halton TS to 2033. The Palermo TS upgrade also defers the need for providing relief for Tremaine TS to 2039. The TWG recommends that Palermo TS T3/T4 transformers be replaced with larger size 230/27.6kV, 75/125MVA units as it provides capacity to meet future load growth, removes the restriction on DER to connect to the station, maintains reliable supply to the customers in the area while increasing system resiliency and flexibility.

- **Station Capacity – DESN stations exceeding LTR**
  The TWG reviewed the step-down transformation capacity for the stations within the GTA West Region. The NA and IRRP studies had previously indicated that a second Halton TS DESN would be required by summer 2022. Subsequent to those studies, and as part of the discussions for second cycle RIP, Milton Hydro provided a revised load forecast with new load being supplied from Glenorchy MTS #1, Halton Hills MTS, and Palermo TS. As a result of this update, the need for the second Halton TS DESN has been deferred to 2033. The loading on the DESN stations – Erindale TS T1/T2, Pleasant TS T1/T2, Cardiff TS T1/T2, Erindale T5/T6 - is expected to exceed their station LTR during the 2021-2031 study period.
  The capacity need for Erindale TS T1/T2 was addressed in the 2019 GTA West Region NA Report where the TWG recommended that the need be managed by Alectra and no transmission upgrades are required. The loading issues at the Pleasant TS T1/T2, Cardiff TS T1/T2, and the Erindale TS T5/T6 are similar to those of Erindale T1/T2. The TWG recommends that these

loading issues be managed at the distribution level in the near term and review the station loadings again in the next regional planning cycle.

- **H29/H30 Transmission Circuit Supply**
  The TWG identified a thermal capacity need for circuits H29/H30 in the medium-term and recommended that the line conductor be upgraded. Hydro One is planning to replace the existing conductor with a higher ampacity conductor to reinforce the supply to Pleasant TS by Q2 2027.

- **Section of R19TH/R21H Overloaded**
  The loads at Jim Yarrow MTS and Pleasant TS are supported by the 230 kV line V41H/V42H from Claireville and the R19TH/R21TH line. Under certain outage conditions all loads at Pleasant TS and half the load on Jim Yarrow MTS can end up on one of the R19TH or the R21TH section between Hanlan Jct. and Hurontario SS. The IRRP had considered a number of alternatives to address this issue ranging from a local load rejection scheme at Pleasant TS to reinforcing the supply to Hurontario SS. Given that the possibility of the overlapping outages is rare, manual operator action can be taken to relieve the line overloads and will be adequate over the near to medium-term (till 2030). Hydro One has implemented an operating procedure under which Jim Yarrow MTS load is transferred to R21TH if V41H or H30 are out of service pre-contingency and to R19TH if V42H or H29 are out of service pre-contingency. The TWG recommends that the loading on the R19TH/R21TH and the performance of the manual scheme be monitored. The timing (currently forecast to be around 2030) and the preferred option for the LR scheme will be reviewed in the next planning cycle.

- **Load Security – 230kV circuits T38B/T39B**
  Due to the lower than expected load at Halton TS and Milton Hydro supplying some of the projected area load from the upsized Palermo TS, the loads connected to the 230 kV circuits T38B/T39B are not expected to exceed the 600 MW ORTAC[5] supply security limit until summer 2030. As such the TWG recommends that Hydro One continue to monitor the load and that the need be reviewed in the next regional planning cycle.

- **Load Restoration**
  The TWG identified that there are a number of lines that do not meet the IESO criteria of the restoration of all load above 250 MW in 30 minutes. However, given the high cost for mitigation measures, the low probability of the event happening and the ability to restore load within 4 hours, the TWG agreed that no further action is required.

- **Richview X Trafalgar Transmission Circuit Capacity**
  Loading limitations on 230 kV circuits between Richview TS and Trafalgar TS was assessed as part of the IESO-led Bulk System Planning study. The work is underway on reconductoring these circuits with new conductors and is planned to be in-service by Q2 2026.

- **Northwest Greater Toronto Area (NWGTA) Electricity Corridor**
  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. The Ministry of Energy and the IESO have been working on the proposal to identify and protect a corridor of land for the future transmission corridor. The TWG supports the initiative for the development of the new corridor as it will be essential to meet the future area growth. The progress of corridor development will be reviewed in the next regional planning cycle.

- **Asset Replacement for Major HV Transmission Equipment**
  Hydro One has identified the need for replacement of major HV transmission assets over the next ten years at a number of GTA West Region Hydro One stations including Bramalea TS, Tomken TS and Lorne Park TS. The TWG recommendations for asset replacement plans have taken "right sizing" into consideration. At Bramalea TS the TWG recommends replacement of the 230/44kV, 50/83MVA transformers, T3 and T4 with larger size 230/44kV, 75/125MVA units (planned in-service date is 2028). At Tomken TS the TWG recommends like-for-like replacement of 230/44kV, 75/125 MVA transformers T1 and T2 (planned in-service date is 2029). Finally, at Lorne Park TS the TWG recommends like-for-like replacement of 230/27.6kV, 50/83MVA transformer T2 (planned in-service date is 2030).

It is expected that the next planning cycle for this region will be initiated in 2024 or earlier, beginning with the NA phase.

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. With increased load requests in the region, the second regional planning cycle was triggered in early 2019.

The second cycle RIP report was completed in April 2022. Updates to the needs and plans recommended in this region are provided below:

Projects completed include:

- Centralia TS: Replaced three (3) existing transformers with two (2) 25/42 MVA transformer arrangement and other associated equipment (completed in 2019).
- Detweiler TS: Replaced T2 and T4 autotransformers and other associated equipment (completed in 2021).
- Stratford TS: Replaced T1 transformer and other associated equipment (completed in 2021).

Needs and Plans underway in Greater Bruce/Huron Region:

- **115kV L7S Circuit Capacity Increase**
  L7S is a single 115 kV circuit transmission line operated radial from Seaforth TS to St. Mary's TS, suppling municipalities of Bluewater, South Huron, Lambton Shores, Lucan Biddulph, Middlesex Centre, North Middlesex, Thames Centre, Zorra, Perth South, Town of St. Mary's, and West Perth. No capacity needs were identified during the study period, however, the recent connection

requests at Grand Bend East DS have triggered a re-assessment of the L7S section between Seaforth TS and Kirkton JCT to address the sub-standard clearances that are limiting the circuit's capacity. The TWG recommends that Hydro One proceed with the re-assessment of the limiting section of L7S, to increase the limiting spans' sag temperature from 83°C to 125°C. Addressing these sub-standard clearances will result in an L7S capacity increase of more than 10 MW. Strengthening L7S will be sufficient for supplying load connected to L7S load for the study period and into the long-term.

- **Customer Delivery Point Performance of L7S circuit**
  The performance of delivery points supplied from circuit L7S, specifically Centralia TS, Grand Bend East DS, St. Mary's TS and the 4 industrial customer connections, were reviewed. In 2021, remotely operated switches were installed at three locations on the L7S circuit, at Kirkton JCT, Biddulph JCT, and St. Mary's TS. These switches will reduce the outage duration and improve restoration by quickly isolating the problematic sections while resupplying the healthy sections of the line. Hydro One's line sustainment and wood pole replacement programs will continue to assess the condition of this circuit to determine where deteriorating components exist and refurbish the sections of concern to improve the integrity of the circuit. Hydro One will continue to monitor the delivery point performance to determine whether further improvement is required.

- **Seaforth TS T5/T6/T1/T2 and Component Replacement**
  Seaforth TS consists of two 150/200/250 MVA autotransformers supplied by 230 kV circuits B22D and B23D. The 115 kV yard from Seaforth TS supplies nearly 200 km of single circuit supply along the circuits L7S and 61M18. Seaforth TS also consists of two 25/33/42 MVA transformers and supplies Hydro One Distribution and embedded LDCs. The TWG recommended to replace autotransformers T5, T6, transformers T1, T2, the capacitor breaker and several HV and LV switches that are at EOL. The planned in-service date for the project is 2024.

- **Hanover TS T2 and Component Replacement**
  Hanover TS consists of two 75/100/125 MVA autotransformers supplied by 230 kV circuits B4V and B5V. The 115 kV yard has connectivity to Detweiler TS via 115 kV transmission circuit D10H with a normally open point at Palmerston TS. Another 115 kV transmission circuit S1H connects to Owen Sound TS. Hanover TS also consists of two, 50/67/83 MVA transformers supplying Hydro One Distribution and embedded LDCs. The scope of this project includes the replacement of 230 kV motorized switches, step-down transformer T2 and associated equipment, 115 kV motorized switches, surge arrestors, auto-ground switches, and potential transformers. This work was planned to be completed in 2028, however due to a recent transformer tap changer failure, T2 and its associated transformer switch are being replaced immediately and are expected in-service by the end of 2022. The remaining component replacements that were planned as part of the T2 work will be bundled with the replacement of T1 and have an expected in-service date of 2031.

- **Wingham TS T1/T2 and Component Replacement**
  Wingham TS was built in 1965. This station has two 50/67/83 MVA transformers connected to the 230 kV circuits B22D and B23D and supplies Hydro One Distribution. Based on asset condition assessment, the current scope of this project is to replace transformers T1 and T2 and associated

surge arrestors. Based on the load forecast, similar equipment ratings are required for the EOL replacement. This project is underway and the planned in-service date is 2023.

- **Other Asset Replacements of Major HV Transmission Equipment**
  Hydro One has identified the need for replacement of major HV transmission assets over the next ten years at a number of Greater Bruce/Huron stations as shown below. The TWG recommendations for asset replacement plans have taken "right sizing" into consideration.
  - **Bruce A TS:** Replacement of 230 kV circuit breakers and switches, uprating of station strain buses and protection & control relay building (planned in-service date is 2030).
    Replacement of 500 kV circuit breakers and switches, 2 500/230 kV autotransformers and upgrading of protection & control equipment (planned in-service date is 2027)
  - **Bruce B SS:** Replacement of 500 kV circuit breakers and switches (planned in-service date is 2024)
  - **Bruce HWP B TS:** Replacement of T7/T8 transformers and associated switches, replacement of low voltage transformer breakers & replacement of Protection and Control systems (planned in-service date is 2028)
  - **Douglas Point TS:** Replacement of T3/T4 transformers and associated switches, low voltage circuit breakers & switches and Protection & Control systems (planned in-service date is 2028)
  - **Owen Sound TS:** Replacement of T4/T5 transformers and associated switches, low voltage circuit breakers, switches, and Protection & Control systems (planned in-service date is 2028)
    Replacement of T3 transformer and associated switches & replacement of low voltage transformer breaker (planned in-service date is 2031)

It is expected that the next planning cycle for this region will be initiated in 2024 or earlier, beginning with the NA phase.

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 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.

The second regional planning cycle was completed with publishing of the RIP report in October 2021. Updates to the needs and plans recommended in this region are provided below.

Projects completed include:

- Wood Pole Replacements:
  Multiple wood pole replacement projects were completed on a number of 115kV and 230kV circuits. These circuits consisted of wood pole structures that were assessed at being at their end

of life and in need of replacements. The following circuits have their end of life wood pole structures replacement completed between 2014 to 2019:

- No.2 and No.3 Algoma (completed in 2014)
- Northern Ave 115kV circuit (completed in 2014)
- No.1 Gartshore (completed in 2015)
- Hogg (completed in 2015)
- P21G (completed in 2019)

- Hwy 101 TS: Installed a new control building completed with new protection relays, batteries, chargers, automatic transfer schemes and RTU to replace components such as electro-mechanical relays and batteries (completed in 2015).
- Anjigami TS: Performed electrical and civil upgrade, including the installation of a new 44kV breaker, redundant battery and chargers, and replacement of protection equipment and other outdated AC/DC system. It also includes ground grid improvements (completed in 2017).
- Third Line Instantaneous Load Rejection Scheme: Eliminated/Minimized manual communication between IESO and OGCC by enabling remote arming of Third Line Instantaneous Load Rejection Scheme via ICCP line between IESO's EMS and HONI's NMS (completed in 2021).

Needs and Plans underway in East Lake Superior Region:

- **Third Line TS Protection Replacement**

  Third Line TS is a major transformer station in the region and it consists of two (2) 230/115kV, 150/200/250MVA autotransformers supplied by 230kV circuits K24G, P21G and P22G. Based on an asset condition assessment, P21G's and P22G's line protections are approaching end of life. Further, due to legacy reasons, P21G's and P22G's line protection do not meet standard physical separation requirement. It is recommended that the existing end-of-life protection will be replaced with new protection relay consistent with Hydro One standard. This alternative will also implement 'A' and 'B' protection separation, which will bring these protection be in compliance with reliability standards, addresses the end-of-life assets need, minimizes losses and maintains reliable supply to the customers in the area and expected to be completed by 2024.

  Among the 2 autotransformers, T2 is at end of life based on asset condition assessment. Based on long term load forecast, units with similar ratings are required for the end of life autotransformer T2 replacement. It is recommended to replace T2 with a unit that has equivalent rating and is expected to be completed by 2025.

- **Patrick St. TS 115kV Breaker Replacement**

  Patrick St. TS is an 115kV switching station that consists of thirteen (13) 115kV breakers. It connects to Third Line TS – 115kV station yard via 115kV Algoma No. 1, No. 2, and No. 3 circuits. It also connects to Clergue TS via 115kV Clergue No. 1 and No. 2 circuits. The station supplies major industrial customers in the Sault Ste. Marie area. Based on IESO IRRP findings, upon a breaker failure of breaker 214, or a contingency on either Algoma No.2 or Algoma No.3 circuit, followed by another contingency on the remaining circuit, Algoma No.1 will be overloaded beyond its short term emergency (STE) rating during peak load. At present, a manual load shedding scheme is implemented as an interim solution until a more permanent solution is available. It is recommended to implement automatic load rejection upon the loss of Algoma No. 2 and Algoma

No. 3 to reject load blocks and respect the existing long term emergency (LTE) rating of Algoma No. 1 circuit (to be completed in 2023). Based on asset condition assessment, breakers 208, 211, 214 and 217 are minimum oil live tank breakers require replacement. The TWG recommends replacing the breakers as it addresses the end-of-life asset needs and maintains reliable supply to customers connected at Patrick St TS by reducing the risk of breaker failure and reducing on-going maintenance costs associated with obsolete breaker technology. The project is expected to be completed by 2024.

- **Echo River TS – Transmission Supply Reliability and Breaker Replacement**
  Echo River TS is a 230kV load supply station. The station consists of a single 230/115/34.5kV autotransformer and a single 230kV circuit breaker (556) to supply two (2) 34.5 kV customer feeders. Historically, load at Echo River TS can be transferred to Northern Ave TS 34.5 kV feeders via the API's distribution system in case of outages at Echo River TS, such as transformer maintenance or failure. It has been identified that the existing back up from Northern Ave TS can no longer provide adequate voltage support at peak load during a transformer outage at Echo River TS. The TWG recommends installing "Hot" spare 230kV transformer and replacing end-of-life 230kV breaker. The spare transformer is planned for replacement by 2023, while the breaker replacement work is planned for completion in 2024.

- **115kV Sault No.3 Structure and Conductor Replacement**
  Built in 1929, Sault No.3 is a 90 km long 115kV transmission circuit that runs from MacKay TS 115kV station yard to Third Line TS 115kV station yard. This circuit provides an alternative path for local generation to reach load centers close to the Sault Ste. Marie area. Based on asset condition assessment, approximately 70km of the circuit's conductor from Goulais TS (str # 129) to MacKay TS is the original conductor is in poor condition as it has multiple component (sleeves) failures. The TWG recommends that the existing conductor and wood pole that are end-of-life be replaced with new 115 kV rated line and structures. This alternative will also allow Sault No.3 to return to its network configuration. The project is planned to be completed in 2024.

- **Batchawana TS and Goulais TS Refurbishment**
  Batchawana TS and Goulais Bay TS are load supply stations with single transformer to supply to the Batchawana Bay and Goulais Bay areas. Goulais Bay TS is about 30 km North of Sault Ste. Marie, while Batchawana TS is about 47 km North of Sault Ste. Marie along Hwy 17. Both are connected to 115kV No.3 Sault circuit. Based on asset condition assessment, both stations are at end-of-life with obsoleted equipment including power transformers, protections (fuse), batteries, chargers, steel structure foundations and remote terminal units. Both stations are also built with legacy design standards and do not provide adequate clearance to today's standard. Depending on the choice of distribution voltage, there are two (2) different scenarios (12.5kV vs 25kV) for each option above. Evaluation of alternatives was completed by HOSSM and API as documented in the 2021 East Lake Superior Regional Local Planning Report. As per recommendation, HOSSM is proceeding to refurbish both Goulais Bay TS and Batchawana TS using a new 115kV, 3–phase power transformer, with provision for a 115kV Mobile Unit substation (MUS) connection facility in each station. Refurbishment for both stations are expected to be completed in 2024.

- **Northern Ave TS Transformer T1 Replacement**
  Northern Ave TS is a 115kV load supply station that is connected to Third Line TS via 115kV Northern Ave circuit. Northern Ave Transformer T1 is a 115/34.5kV, 20/26.7MVA step down transformer that supplies Algoma Power Inc. via one (1) 34.5kV feeder. Transformer T1 is at end-of-life. The TWG recommends replacing T1 with a 'like for similar' unit that has a smaller MVA rating compared to existing T1 and would be adequate for Northern Ave's long-term load forecast. It is expected to be completed by 2025.

- **Anjigami/Hollingsworth TS Transformer Overload**
  Anjigami TS is a 115kV/44kV load supply station with a single transformer. Hollingsworth TS is a 115kV/12.5kV/44kV station that supplies load on 44kV and connected to Hollingsworth CGS on the 12.5kV. Anjigami's and Hollingsworth's 44kV feeders are connected to each other with a 10km long 44kV line to supply LDC load on No.4 circuit. Based on the load forecast, the load increase on the 44kV system by end of 2024 will exceed transformer capacity in both Anjigami TS and Hollingsworth TS when the companion station is out of service. The TWG recommends building a new 115/44kV station in the vicinity of Hollingsworth TS and tap off from 115kV Hollingsworth circuit to supply new loads as well as existing load that are presently supplied by Anjigami/Hollingsworth 44kV system. The project is expected to be completed by 2025.

- **Clergue TS Switchgear Replacement**
  Clergue TS is a 115kV station that connects Clergue Generating Station and LSP co-generation station to the HOSSM system via two (2) 115kV circuits emanating from Patrick St TS. Based on asset condition assessment, the existing 12 kV minimum-oil metal-clad switchgear is at end-of-life and it is recommended to replace the existing minimal oil metal clad switch gear with SF6 metal clad switch gear. The project is expected to be completed by 2026.

- **Hollingsworth TS Protection Replacement**
  Hollingsworth TS is a 115kV station that connects Hollingsworth Generating Station and is supplied by Hollingsworth 115kV circuit. Majority of protection relay equipment in Hollingsworth TS were in-serviced 2005. Based on asset condition assessment, the existing protection relay will approach end-of-life by 2025. The TWG recommends replacing the identified items as per current standards. The project is expected to be completed by 2025.

- **Watson TS Switchgear Replacement**
  DA Watson TS is a 115kV load supply station that also has connectivity with three (3) local hydro generating stations. The station has two 45/60/75 MVA transformers and nine 34.5kV feeders using metal clad switch gear. Based on an asset condition assessment, the existing minimal oil metal clad switch gear are at end of life and it is recommended to replace existing minimal oil metal clad switch gear with SF6 metal clad switchgear. The project is expected to be completed by 2026.

It is expected that the next planning cycle for this region will be initiated in 2024 or earlier, beginning with the NA phase.

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 second cycle of Regional Planning was initiated by Hydro One in 2019, with the NA report published in August 2019. The second cycle NA concluded that there were no additional needs other than h asset replacement work in the region. The TWG determined that no further regional coordination was required to address the following needs. It was recommended that the implementation and execution for the replacement of the transmission assets be coordinated by Hydro One and the affected LDCs and/or customers.
The second cycle RIP report was completed in February 2020. Updates to the needs and plans recommended in this region are provided below.

Projects completed include:

- Enfield TS: Installed a new 230kV/44kV Enfield TS with six (6) 44kV feeder breaker positions with provision for two (2) additional 44kV future feeder breaker positions (completed in 2019).
- Clarington TS: Built a new 500/230kV autotransformer station to increase transmission supply capacity to the GTA East Region, eliminate the overloading of Cherrywood TS autotransformers that may result after the retirement of Pickering NGS, and improve supply reliability to the region (completed in 2018).
- Thornton TS T3/T4: Replaced end-of-life transformers. Also installed LV neutral grounding reactors to reduce line-to-ground short circuit fault levels to facilitate DG connections (completed in 2016).
- Wilson TS T1/T2 DESN1: Installed LV neutral grounding reactors to reduce line-to ground short circuit fault levels to facilitate DG connections (completed in 2015).

Needs and Plans underway in GTA East Region:

- **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 LV Switchyard Refurbishment**
  The LV DESN switchyard, except for step-down transformers T7 and T8, at Cherrywood TS is at end-of-life due to poor 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 assets is expected to be completed by 2024.

- **Seaton MTS**
  The construction of the MTS is in progress and is expected to be in service by end of 2022.

It is expected that the next planning cycle for this region will be initiated in 2024 or earlier, beginning with the NA phase.

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 second cycle NA was completed 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 second regional planning cycle was completed with publishing of the RIP report in August 2022. Updates to the needs and plans recommended in this region are provided below.

Projects completed include:

- Aylmer TS transformers and low-voltage switchyard replacement (competed in 2017).
- Strathroy TS failed transformer T1 and low-voltage switchyard replacement (completed in 2019).
- Wonderland TS failed transformer T6 was replaced (completed in 2019).
- St. Thomas TS was decommissioned and 115 kV circuit W14 re-termination work (completed in 2020).
- Sarnia Scott TS to Buchanan TS 230 kV circuits N21W/N22W tower structures refurbishment (completed in 2021).
- Tillsonburg TS new low-voltage capacitor banks (completed in 2021) and switchyard component replacement project to be completed in 2022.

Needs and Plans underway in London Area Region:

- **Nelson TS** station refurbishment project will be completed in 2022.

- **Longwood TS** protection and control replacement project to be completed in 2023.

- **Edgeware TS** protection and control replacement project to be completed in 2024.

- **Buchanan TS Transformer Replacement**
  Buchanan TS is a major 230/115 kV transformer station in the area that supplies load stations in London Area. Two of the 3 auto transformers, T2 and T3 are 48 and 54 years old respectively, are in poor condition, and approaching end-of-life. To address poor equipment performance of deteriorating equipment, Hydro One plans to replace two 230kV autotransformers, spill

containment pits, AC and DC station service equipment, as well as some obsolete protection, control, and telecom equipment. The expected completion date is 2028.

- **Clarke TS Transformer Replacement**
  Clarke TS is a DESN station located in the northern part of the London Area. The two 230/27.6 kV 50/83 MVA transformers T3 and T4 are 55 years old, in poor condition, and approaching end-of-life. Some of the protection equipment is also found to be obsolete. To address the assets in poor condition and end-of-life, the TWG recommends replacing step-down transformers like-for-like, associated disconnect switches, 27.6 kV switchyard components including breakers, station services, capacitors, and protections. The replacement plan will be closely coordinated with affected LDCs. The expected completion date is 2028.

- **Talbot TS Transformer Replacement**
  Step-down transformers T3 and T4 have been in-service from 1979 and are in poor condition and approaching end-of-life. A number of 27.6 kV breakers and protection equipment have also been identified for replacement. According to the regional non-coincident net load forecast in the study period, Talbot TS T1/T2 DESN is expected to exceed its station capacity throughout the study period and Talbot TS T3/T4 DESN will exceed its capacity in 2029. The station capacity need was primarily driven by temporary load transfer from neighboring station (Nelson TS) which was refurbished in December 2018. London Hydro confirmed load will be transferred back to Nelson TS as more 27.6 kV distribution feeders becomes available in downtown London. Therefore, additional transformation capacity is not required at this time. The TWG recommends Hydro One to proceed with like-for-like replacement of T3 and T4 at Talbot TS. The expected completion date is 2028. In addition, Hydro One will look for opportunities to coordinate this project with London Hydro for the metal clad switchgear replacement.

- **Wonderland TS EOL Replacement**
  Wonderland TS is a DESN station located in the western part of the London Area. The 50/83 MVA T6 power transformer was replaced in 2004 due to failure. The companion transformer, T5, failed in July 2019 and was subsequently replaced. The existing air insulated 27.6 kV switchgear, majority of which are original installations have reached end-of-life due to deteriorated condition and has limited availability of parts for ongoing support and maintenance. All site protection and control equipment, consisting of first generation electro-mechanical relaying are deemed end-of-life, obsolete and require replacement. To address the end-of-life need, Hydro One plans to replace the Wonderland 27.6 kV switchyard. The replacement plan will be closely coordinated with affected LDCs and the expected completion date is 2026.

- **London Area East OPGW Infrastructure**

- **M31W/ M32W (Salford Junction x Ingersoll)**
  M31W and M32W are 230 kV network circuits that connect Buchanan TS and Middleport Port TS. To improve the reliability of power system telecom network, Hydro One plans to install 9km of OPGW fiber from Salford Junction to Ingersoll TS and remove the existing licensed microwave link connects Ingersoll TS to Buchanan TS. The project is expected to be completed in 2027.

- **W36/W37/W5 NL/W6NL/W2S/ N21W**
  To improve the reliability of power system telecom network, Hydro One plans to establish a geographically diverse and fully redundant fiber optic network for protection and SCADA applications. A combination of Hydro One's existing and new OPGW-based fiber and two leased third-party fiber links would be utilized. The existing metallic cable will be removed, and the project is expected to be completed in 2029.

It is expected that the next planning cycle for this region will be initiated in 2025 or earlier, beginning with the NA phase.

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, Hasting County, North Humber land County, Peterborough County, and Prince Edward County and related municipalities.

The second regional planning cycle was completed with publishing of the RIP report in May 2022. Updates to the needs and plans recommended in this region are provided below.

Projects completed include:

- Load transfer from Gardiner TS DESN 1 to Gardiner TS DESN 2 to provide transformation capacity relief at Gardiner TS DESN 1 (completed in 2019).
- Connect Napanee GS– A 910 MW gas turbine (Napanee GS) was connected to the 500 kV bus in the Lennox TS switchyard (completed in 2017)

Needs and Plans underway in Peterborough to Kingston Region:

- **Cataraqui TS Line Reinforcement**
  Cataraqui TS supplies the 115kV stations in the Eastern sub region of the region through two 230/115kV auto transformers. It is forecasted that in 2023 the coincidental loading of the stations in the sub region will reach the supply capacity of the Cataraqui TS auto transformers. The current limitation of the Cataraqui TS auto transformers is due to a short span of copper conductors connected the secondary side of the auto transformers within the station. Upgrading the conductors will allow the long-term emergency to increase by 35 MW and resolve this need in the near term. The work is expected to be complete by 2023.

- **Gardiner TS DESN1 Capacity**
  Gardiner TS DESN 1 is supplied by 230 kV circuits X2H and X4H. The Gardiner TS DESN1 has exceeded its Summer 10-Day LTR which is 125 MW. To address the situation Hydro One distribution has confirmed that a permanent additional 11 MW load transfer from Gardiner TS DESN1 to Gardiner TS DESN2 is possible by reconfiguring its distribution system which is much faster and will be completed by the end of 2022. Also, in Q4 2022 Hydro One Transmission will address the current capacity limit at Gardiner TS DESN1 and will provide an update to the TWG

for refurbishment with new standard 75/125 MVA transformers that will increase the LTR to about 160 MW and address the load growth at DESN up to 2033. It is planned to be in service by 2028.

- **Frontenac TS Capacity**
  Based on the submitted load forecast, the Frontenac TS will be loaded more than the station LTR by year 2028. The TWG 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.

- **Otonabee TS Capacity**
  Based on the 2020 net load forecast, the loading on Otonabee TS 44kV is exceeding its Summer 10-Day LTR today. Hence, there is a need for additional transformation capacity at Otonabee TS 44 kV bus in the near term. To address the situation Hydro One distribution has confirmed that a total of 12MW load can be shifted to nearby station Dobbin TS which has over 50MW of remaining capacity and is not expected to reach its LTR of 160 MW in the long term. Therefore, it will provide enough capacity to address the load growth forecast at Otonabee TS 44 kV bus until 2030 and the urgent need of upgrade is eliminated.

- **Port Hope TS Transformer Replacement**
  The T3/T4 transformers were built in 1959 and have been identified as has reached the end of service life and requiring replacement. T3/T4 currently supplies about 70 MW of load and the long-term forecast is well within the current LTR. The scope of this project is to replace T3/T4 step-down transformers, associated spill containment structure and majority of assets within 44 kV BY switchyard with the equipment of similar ratings. The targeted in-service is in year 2025.

- **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. The Belleville TS T1/T2 transformer replacement is currently underway, with an expected in-service date of 2022, but this refurbishment is not expected to result in any significant improvement to the station's capacity and does not solve the voltage limitation issue. To address the situation Hydro One (Transmission and Distribution) and Elexicon have started development of a new DESN with two 75/125 MVA transformers with two 32 MVAR Capacitor banks with an expected in-service date of 2026. This will increase the supply capacity to the region and will resolve the capacity need at Belleville TS in the near and midterm. However, the TWG will continue monitoring the load growth at Belleville TS and revisit the capacity need in the next regional planning cycle to re-assess whether/when a transmission line reinforcement to Belleville is required in the long term.

- **Picton TS Transformer Replacement**
  Picton TS is a 230/44kV transformer station serving Hydro One Distribution. The station comprises two 50/83MVA transformers, T1/T2. Transformers T1 and T2 are currently about 60

years old and are planned for similar standard units based on their asset condition assessment and taking "right sizing" into consideration. The planned in-service date is 2026.

- **Dobbin TS Transformer Replacement**
  Dobbin TS is located near the city of Peterborough, Ontario and supplies Peterborough to Quinte loads. Dobbin TS consists of three 230/115 kV auto transformers. T1 is rated at 150/250 MVA and T5 is rated at 115 MVA. T2 is rated at 36/78 MVA and currently out of service. During the previous planning cycle, T2 and T5 were planned to be replaced with one 150/250 MVA unit. However, as T1 has also reached the end of service life, it would be more efficient and cost effective to replace all three transformers with two 150/250 MVA units. The work is expected to complete in the year 2029.

It is expected that the next planning cycle for this region will be initiated in 2025 or earlier, beginning with the NA phase.

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 in April 2020.

The IRRP was later completed in June 2022. The RIP report is currently underway. Updates to the needs and plans recommended in this region are provided below.

Projects completed include:

- Barrie TS: Transformer supply capacity will be exceeded, and consequently result in thermal violation of the radial supply circuits (E3B/E4B) and majority of EOL equipment resulted in creation of the Barrie Area Transmission Reinforcement (BATU) project which is presently underway.
- M6E and M7E circuits (at Orillia TS): installed 230 kV motorized disconnect switches in 2021.
- Minden TS: Replaced 230/44kV 42MVA (T1/T2) transformers with new 230/44kV 83MVA units in 2021.

Needs and Plans underway in South Georgian Bay/Muskoka Region:

- **Parry Sound TS Capacity**
  Transformer supply capacity has been exceeded, and transformers have also been assessed at being end of life and in need of replacement due to asset condition. Hydro One will be installing new 230/44kV 83MVA transformers to address both end of life and supply capacity needs. The in-service is scheduled for 2024.

- **Orangeville TS EOL Replacement**
  Replace and upgrade existing 230/44kV 83MVA transformers (T3/T4) with new 125MVA units. Replace and upgrade existing nonstandard three winding 230/44/27.6 125MVA transformers (T1/T2) with new dual winding 230/27.6 83MVA units. Reconfigure low voltage equipment and transfer existing 44kV feeders from T1/T2 DESN to the T3/T4 DESN. These transformers and associated low voltage equipment have been assessed at being end of life and in need of replacement due to asset condition. This is presently underway with an In-Service scheduled for 2023.

- **Everett TS Capacity**
  Everett TS peak demand forecast will exceed its rating by 2025. The recommended solution for this need is to adjust the CT ratio of the transformer breakers. This will provide the ability to utilize the full supply capability of the transformers at Everett TS and alleviate the need. The need is expected to be addressed before Everett TS reaches its summer 10-day LTR (2025) with an approximate cost of 0.5M.

- **Barrie TS Capacity**
  Transformer supply capacity will be exceeded and consequently result in thermal violation of the radial supply circuits (E3B/E4B). Most of the equipment at Barrie TS as well as the Essa TS 115kV yard have also been assessed at being end-of-life and in need of replacement due to asset condition. This resulted in creation of the Barrie Area Transmission Reinforcement (BATU) project to address these needs. This investment in presently underway. Barrie TS is also expected to reach its summer 10-day LTR by 2027. Also, there is a supply constraint on the distribution level at the 44 kV feeder starting in 2025. For this distribution level need, minor capacity increases can be accommodated on the 44 kV system, but only on an emergency basis. The TWG recommends constructing a new 230/27.6 kV transformer substation which would connect to the upgraded circuits E28B/E29B (that will be available post BATU). The project is expected to be completed by 2025.

- **E8V/E9V EOL Replacement**
  Sections of circuits E8V/E9V will reach end-of-life by 2027. The TWG recommends like-for-like replacement of these assets. It is expected that the replacement will be completed in 2027.

- **M6E/M7E Supply Capacity**
  There is a thermal capacity need on one MxE 230 kV circuit section between Essa and Midhurst for the loss of the companion MxE circuit starting in 2034. While this need is expected to arise in the longer-term, potential options were contemplated to inform future plans. The TWG recommends monitoring demand growth in the area; consider CDM options in next cycle of regional planning as a means of deferring transmission upgrade with a schedule to be done by 2034.

- **Midhurst TS Capacity**
  Midhurst TS is expected to reach capacity by 2035. Given the timing of the need, no firm recommendation is required at this time. The TWG will continue monitoring demand growth in the area and revisit these needs in the next cycle of regional planning.

- **Alliston TS Capacity**
  Alliston TS is expected to reach summer 10-day LTR by 2037. Given the timing of the need, no firm recommendation is required at this time. The TWG recommends monitoring demand growth to ensure load supplying capability is maintained and revisit the need in the next cycle of regional planning.

- **Essa TS Thermal Capacity**
  A thermal capacity need on one of the Essa 500/230 kV autotransformers for loss of the companion autotransformer arising in 2022 is identified. This will be further studied as part of Essa Bulk Study led by IESO.

- **Minden TS Capacity**
  Minden TS is expected to have station capacity need by 2038. Given the timing of the need, no firm recommendation is required at this time. The TWG recommends monitoring the load growth in the area and providing enough lead time to capture changes into the next cycle of regional planning where these needs can be revisited.

- **Waubaushene TS Capacity**
  Waubaushene TS transformers are approaching end-of-life in 2030 and was planned for replacement at this time; however, current needs show an earlier replacement is required. Waubaushene TS will be over its 10-day summer LTR in 2027. It is recommended to consider incremental, cost-effective CDM to defer the need arising in 2027 until the EOL transformers are replaced. If by 2024 there are no commitments for incremental, cost-effective CDM, implement alternative solution such as advancing the end-of-life replacement of the transformers. The second cycle RIP will further explore this backstop solution.

- **M6E/M7E (Minden x Copper) System Capacity**
  M6E section Minden TS to Cooper Falls JCT TS will exceed its LTE rating for a failure of breaker HL7 at Minden HL7 starting in 2038. Also, with M7E already out of service, for loss of Essa T3, M6E is at 133% of its LTE in 2040. The TWG considered a number of options including incremental cost-effective CDM and storage, even though this is a longer-term need. This analysis showed that incremental cost-effective CDM is a potentially well-suited for deferring this need. As such, the TWG should continue to consider incremental, cost-effective CDM in between cycles and in the next cycle of regional planning in the region.

- **D1M/D2M & M6E/M7E (Orillia x Copper) Replacement**
  No violations were identified for the identified circuits in system studies and a like-for-like replacement with the closest available standard was recommended and can best address the end-of-life needs at sections of D1M/D2M and M6E/M7E. The replacement is expected to be completed by 2028 and 2024 respectively.

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. The second cycle Needs Assessment was completed in June 2020.

The NA determined that identified needs in the region can be addressed directly by Hydro One along with relevant LDCs, and therefore the SA and IRRP were not required. The second regional planning cycle was completed with publishing of the RIP report in December 2020. Updates to the needs and plans recommended in this region are provided below.

Projects completed include:

- Espanola TS: Replaced 115/44 kV 15MVA (T1) and 42MVA (T2) transformers with new 115/44 kV 42 MVA units (completed in 2016).
- Larchwood TS: Replaced 110/44 kV 20 MVA (T2) transformer with a new 115/44kV 42MVA unit (completed in 2015).
- Martindale TS: Replaced (T21, T22 & T23) autotransformers with 125MVA 230/115kV units, five (5) 230kV breakers and disconnect switches (completed in 2022).
- Manitoulin TS: A CT ratio setting on the low voltage bushing of the transformer breaker was modified to allow full transformer LTR capability (completed in 2021).
- Algoma TS: The EOL T5 and T6 autotransformers were replaced with standard 125 MVA units (completed in 2022).
- Due to the removal of the Coniston TS its load was planned to be transferred to a newly built Hanmer TS DESN, but due to customers' changing system needs, this plan was reviewed and it evolved into the removal of the station in concurrence with the conversion of the legacy 22kV loads to 27.6kV and their transfer onto one of the feeders originating from Martindale TS (completed in 2021).

Needs and Plans underway in Sudbury/Algoma Region:

- **Hanmer TS to Martindale TS decoupling**
  With either X25S or X26S out of service, the loss of the companion circuit may result in voltage declines at Martindale 230kV and 115kV buses below acceptable ORTAC[5]. The scope of this project aims to decouple one of the two circuits (X25S or X26S) into its own position at both Hanmer TS and Martindale TS. Hydro One initiated this project as per IESO's recommendation provided via a letter dated October 19, 2018. The expected in-service date is 2023.

- **Martindale TS EOL Replacement**
  Martindale TS is a 230/115kV BES classified station which also includes a 230kV/44kV DESN station located in Sudbury that supplies both LDCs identified in the Sudbury/Algoma region. The DESN station is comprised of two (2) – 125 MVA 230/44kV power transformers. These power transformers as well as select 44 kV equipment are approaching their EOL and the TWG recommends they are replaced with Hydro One standard equipment of similar size and capabilities. The replacement is expected by 2028.

- **Clarabelle TS EOL Replacement**
  Clarabelle TS is a 230/44kV transformer station located in the Sudbury/Algoma region. The station features two 230/44kV 125 MVA step down transformers that supply both identified LDCs in the Sudbury/Algoma region. The power transformer at Clarabelle TS as well as select station equipment are approaching their EOL and the TWG recommends they are replaced. The replacement is expected by 2027.

- **Elliot Lake TS Transformer Replacement**
  Elliot Lake TS is a Hydro One transformer station located west of Sudbury. The station consists of two (2) 115/44kV 42 MVA transformers (T1 and T3) alongside one 115kv/44kV 19 MVA transformer (T2). A station asset condition assessment has identified T1 and T2 for replacement within the mid-term horizon. Concurrently, recent supply need assessment at the station has deemed T2 no longer necessary to maintain supply reliability and adequacy at the station. The LDC supplied from Elliot Lake TS further concurred that T2 can be removed from Elliot Lake TS without impacting their supply reliability and adequacy. As such, this project will see the like-for-like replacement of T1 transformer, the removal of T2 transformer and the reconfiguration of the station to a near standard Jones DESN design. The TWG recommends proceeding with removal of T2 and replacement of the end-of-life assets as per existing station refurbishment and reconfiguration plans at Elliot Lake TS.

It is expected that the next planning cycle for this region will be initiated in 2025 or earlier, beginning with the NA phase.

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.

The second cycle Needs Assessment was completed in July 2020. The IRRP work is in progress and expected to be completed by December 2022. The second cycle RIP will follow when the IRRP is completed. Updates to the needs and plans recommended in this region are provided below.

Projects completed include:

- E1C (Ear Falls TS x Crow River DS): The new 230kV Watay connection between Pickle Lake SS and Dinorwic Jct. to provide relief to the capacity constraint on E1C (completed in 2022).
- Red Lake Sub-System: New 230kV Watay connection between Pickle Lake SS and Dinorwic Jct. which provided relief to E4D &E2R (completed in 2022).
- Birch TS: HV Breaker, Disconnect Switch, and Insulator replacement (completed in 2020).
- Dryden TS: Three existing (3) non-standard 115/44kV step-down transformers were replaced by two (2) new standard 115/44kV step-down transformers (completed in 2020).
- Alexander SS: EOL HV Breakers and Line disconnect switches replaced (completed in 2022).
- Ear Falls TS: EOL HV breakers replaced (completed in 2022).

Needs and Plans underway in North-west Ontario Region:

- **Pine Portage SS:** EOL HV Breaker, Disconnect Switch and Protection & Control facilities replacement to be completed in 2024.

- **Ring of Fire Sub-System**
  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. 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).

- **Dryden TS Supply Capacity**
  The West of Thunder Bay IRRP from the previous planning cycle indicated that under high load growth scenario, additional capacity of 50MW will be required on the Dryden 115kV Sub-System by mid-2020s. The IRRP indicated that the Dryden 115kV Sub-System can provide up to 240MW of continuous supply to Dryden 155kV Sub-System and North of Dryden Sub-Region. As per the current load forecast, the Dryden 115kV Sub-System is forecasted to be 80MW, and the North of Dryden Sub-Region is forecasted at 97MW. The total demand from these two systems is 177MW, and this is a significant decline from the IRRP forecast of 310MW. The TWG recommends further regional coordination to study different growth scenarios for the Dryden 115kV Sub-System and the resulting impact they may present.

- **Kenora MTS Capacity**
  Kenora MTS is a 115kV load station owned by Synergy North and its forecasted load growth is anticipated to reach 23MW by year 2027, which is also the station's Winter 10-Day Limited Time Rating ("LTR"). The TWG recommends expanding/modifying Kenora MTS to accommodate load growth past 2027 by Synergy North in co-ordination with Hydro One as part of Local Planning. However, this need may be revisited later should additional findings during subsequent phases of regional planning trigger the TWG to reconsider the recommendation made in the NA phase.

- **Marathon TS Load Growth**
  With the sizable load increase in the Greenstone-Marathon Sub-Region, under loss of both autotransformers at Marathon TS contingency, Marathon Sub-Region system experiences voltage collapse. The TWG recommends further regional coordination and assessment during the next phases of regional planning to address this issue.

- **Port Arthur TS Transformation Capacity**
  The limiting low voltage equipment at Port Arthur is being replaced and upgraded with expected completion by 2025. This upgrade will 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.

- **Lakehead TS Capacity**
  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 TWG recommends further regional coordination and assessment during the next phases of regional planning to address this issue.

- **Sapawe DS Capacity**
  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. The TWG recommends that the Sapawe DS capacity need be addressed as part of Local Planning.

- **Sam Lake DS Capacity**
  The station is the sole supply for Sioux Lookout Hydro and this embedded LDC is anticipating having a 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. The TWG recommends that the Sam Lake DS capacity need be addressed as part of Local Planning.

- **Asset Replacement for Major HV Transmission Equipment**
  Hydro One has identified the need for replacement of major HV transmission assets over the next ten years at a number of stations in this region as shown below. The TWG recommendations for asset replacement plans have taken "right sizing" into consideration.
  - **A4L:** Refurbishment of Beardmore Jct x Longlac TS section (planned in-service date is 2025)
  - **E1C:** Ear Falls TS x Slate Falls DS section and Etruscan Jct x Crow River DS section have been prescribed for line refurbishment (planned in-service date is 2025)
  - **Fort Frances TS:** The two (2) 230/115 kV step-down autotransformer and 115 kV breakers at the station are reaching EOL (planned in-service date is 2027)
  - **Kenora TS:** The existing step-down autotransformer, as well as HV breakers and switches are reaching EOL (planned in-service date is 2025)
  - **Lakehead TS:** The existing HV breakers, switches, and Protection & control facilities at the station are approaching EOL (planned in-service date is 2025)
  - **Mackenxie TS:** The existing 230/115 kV autotransformer as well as HV breakers and line disconnect switches are near EOL (planned in-service date is 2024)
  - **Marathon TS:** The existing HV breakers at this station is approaching EOL (planned in-service date is 2024)
  - **Moose Lake TS:** The existing two (2) 115/44kV step-down transformer and LV breakers are near EOL (planned in-service date is 2024)

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. The second cycle NA was completed in September 2021. The NA determined that the identified needs in the region are local in nature and can be addressed directly by Hydro One and affected LDCs, and therefore no further regional coordination is required.
The second regional planning cycle was completed with publishing of the RIP report in August 2022. Updates to the needs and plans recommended in this region are provided below.

Projects completed include:

- Chatham SS: 230 kV capacitor bank replaced (completed in 2020).
- Wanstead TS: Refurbished with 50/66/83MVA transformers and its supply was upgraded from a single 115kV connection to a double 230kV connection (completed in 2018).

Needs and Plans underway in Chatham/Lambton/Sarnia Region:

- Chatham SS Component Replacement, mainly to replace capacitor SC21 and the associated breaker and is planned to be completed by 2023.
- St. Andrews TS T3, T4 & Switchyard Refurbishment is planned to be completed by 2025. The current scope includes both transformers and breaker replacement.
- Sarnia Scott TS T5 & Component Replacement, which includes autotransformer T5, breaker, and other components is planned to be completed by 2024.
- New Lambton by Chatham transmission line is currently under development with a projected in-service date in 2028.
- Lambton TS switchyard is currently undergoing major station refurbishment work with a projected in-service date in 2023.

- **Circuits L28C/L29C Transmission Circuit Capacity**
  The L28C/L29C double-circuit transmission line will start to experience capacity issues and voltage violations in the medium term due to significant capacity needs in the neighboring Windsor-Essex region and new connections in Dresden Area. To address the potential need for additional capacity and improved voltage performance along this corridor, Hydro One has agreed with IESO's recommendation to construct the new 230kV double-circuit transmission line which is expected to be in-serviced in 2028. The selection of the preferred route for the new double-circuit line is anticipated in Q2 2023.

- **Wallaceburg TS and Kent TS Area (Dresden Area) Transformation Capacity**
  There is potentially a strong need for capacity in the Dresden Area which is currently supplied by Wallaceburg TS and Kent TS. Hydro One to move forward with IESO's recommendation of constructing a new station (proposed to be named Dresden TS) on the Lambton by Chatham corridor. Due to the existing limitations on the L28C/L29C circuits the construction of the new

Dresden TS would be aligned with the construction of the new Lambton by Chatham transmission line with the intention of being ready to connect new customers when the new double-circuit line is completed in 2028. The immediate capacity needs of new customers can be supplied by the limited capacities available at Kent TS (T1/T2 DESN) and Wallaceburg TS until the proposed Dresden TS is placed in-service. The need for Dresden TS may possibly be delayed if the Lambton by Chatham routing results in additional capacity becoming available at Wallaceburg TS.

- **St. Andrews TS Capacity**
  St. Andrews TS will reach its LTR in 2024 from which point it will continue to grow at an average rate of less than 0.5% towards the end of the study period. As the station is expected to slowly start exceeding its LTR, additional capacity is required. Hydro One is planning to replace the older transformer unit with a new one with higher LTR, adding 20 MVA to provide sufficient capacity for the long-term. The replacement of the transformer is expected to be completed in 2025.

- **Forest Jura HVDS**
  Forest Jura HVDS is expected to reach its LTR in 2030. If the forecast materializes as expected, additional capacity will be required in the long-term. To address the potential capacity need at Forest Jura HVDS, the TWG recommends that Hydro One Distribution monitor the loading and determine a plan to ensure the station can meet the capacity demand.

- **Circuit N5K Voltage Performance**
  Assuming large load growth at Wallaceburg TS in the absence of the proposed Dresden TS, there would be voltage violations on the 115kV N5K circuit. This violation is mitigated with the new Dresden TS in place and Wallaceburg loaded within its LTR. It is recommended to maintain loading at Wallaceburg within its capacity limit and wait for the completion of Lambton by Chatham line anticipated in Q2 2023, which will determine if the supply voltage to Wallaceburg TS is increased to 230kV.

- **Circuits L28C/L29C Bulk System Performance**
  Accounting for needs in neighboring Windsor-Essex Region, there is a bulk system need to reinforce the 230kV corridor between Lambton and Chatham. There are several large-scale combined-cycle gas plants in this area whose output could vary depending on broader system conditions such as expected load growth and availability of other generation resources. The IESO undertook a study to assess the bulk system adequacy for the West of London area, under different system conditions. As a result, the need to reinforce the Lambton-by-Chatham corridor was identified. Hydro One will proceed with the recommendation of IESO to construct a new double-circuit transmission line between Lambton and Chatham to address bulk system reinforcement needs. The project is expected to be completed in 2028.

- **Asset Replacement for Major HV Transmission Equipment**
  Hydro One has identified the need for replacement of major HV transmission assets over the next ten years at a number of stations in this region as shown below. The TWG recommendations for asset replacement plans have taken “right sizing” into consideration.

- **Lambton TS:** Replacement of T7/T8 auto-transformers and associated switches, replacement of T5/T6 DESN transformers and associated switches & replacement 27.6kV switchyard and associated equipment (planned in-service date is 2023)
- **Scott TS:** Replacement of T5 auto-transformer, replacement of 115kV switchyard and associated equipment (planned in-service date is 2024)
- **St. Andrews TS:** Replacement of T3/T4 DESN transformers and associated switches & replacement of 27.6kV switchyard and associated equipment (planned in-service date is 2025)
- **Kent TS**: Replacement of T2 DESN transformers and associated switch, complete 27.6kV switchyard and associated equipment (planned in-service date is 2027)
- **N1S/N4S:** Refurbishment of circuit section between Scott TS and Vidal JCT (planned in-service date is 2027)
- **N6C/N7C:** Refurbishment of circuit section between Scott TS and St. Andrews TS (planned in-service date is 2027)
- **S2N:** Refurbishment of circuit section between Scott TS and Adelaide JCT (planned in-service date is 2025)
- **N5K:** Refurbishment of circuit section between Scott TS and Kent TS* (planned in-service date is 2027)

It is expected that the next planning cycle for this region will be initiated in 2026 or earlier, beginning with the NA phase.

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 was also included in the Niagara Region.

The second cycle NA was completed in May 2021. The IRRP is currently underway with tentative completion in November 2022. The RIP will follow once the IRRP is completed. Updates to the needs and plans recommended in this region are provided below.

Projects completed include:

- Upgrade Sir Adam Beck SS #1 x Portal Junction section of 115kV circuit Q4N (completed in 2019).

Needs and Plans underway in Niagara Region:

- **Beamsville TS Capacity**
  Beamsville TS has a summer 10-day LTR of 60.3MW and will exceed its normal supply capacity by 2027 based on the summer demand forecast. Between 2019 and 2020, there has been a 12% surge (6.6MW) in load between the historical peak demand. It is uncertain if this temporary increase is a result of the pandemic with more residents working from home, as the 10-year load forecast is only expecting a modest 5% growth (3.1MW). The TWG recommends that Hydro One coordinate with the connected LDCs and their embedded customers (as needed) to address

the immediate supply capacity constraints that may appear within 2027. Hydro One will further monitor the load growth and see if any load transfers to nearby stations are required. Solution(s) will require further regional coordination to verify if non-wires options would be beneficial. All identified wire options will be best addressed through local planning led by Hydro One.

- **Crowland TS Capacity**
  Crowland TS presently has a 10-Day LTR of 102MW which will exceed its normal supply capacity in the year 2026 based on the summer demand forecast. The Crowland TS project to replace the two EOL transformers T5 and T6 is currently underway. The two new 115/27.6kV 83MVA transformers are expected to increase the station supply capacity to at least 107 MW based on minimum 10-day LTR capability of new transformers. With the new units installed, station LTR will be exceeded in the summer 2028 and additional supply capacity will be required. Although capacity does appear to be available for the near and mid-term, Welland Hydro and Hydro One distribution also see a supply capacity constraint at the 27.6kV feeder level by 2028. The TWG will further evaluate a new station east of the Welland Canal if nearby transformer stations cannot alleviate the demand of the new area load.

- **Power Factor Correction at Thorold TS**
  On HV side of Thorold TS, only a few instances (<54 hours/year) of power factor below 0.9 (between 0.89 - 0.9) were observed, so the TWG recommended Hydro One to continue monitoring the power factor with LDC decided.

- **Asset Replacement for Major HV Transmission Equipment**
  Hydro One has identified the need for replacement of major HV transmission assets over the next ten years at a number of stations in this region as shown below. The TWG recommendations for asset replacement plans have taken "right sizing" into consideration.
  - **Port Colborne TS:** Complete station refurbishment that will replace all assets including transformers T61, T62, medium voltage switching facilities and station protection and control equipment (planned in-service date is 2022)
  - **Thorold TS:** Replace T1 transformer with a new 45/60/75 MVA unit and the existing low voltage (LV) E/Q and B/Y metalclad switchgear (planned in-service date is 2024)
  - **Crowland TS:** Replace transformers T5 and T6 with 50/66.7/83.3 MVA units (planned in-service date is 2024)
  - **D1A/D3A:** Line refurbishment of 2.6km route length between Gibson JCT x Thorold TS (planned in-service date is 2024)
  - **Q2AH:** Line refurbishment of 11.2km between Rosedene JCT X St. Anns JCT (planned in-service date is 2025)
  - **Murray TS:** Replacement of T13 and T14 power transformers and metalclad at Murray TS (planned in-service date is 2025)
  - **Bunting TS:** Replacement of transformer T3, all station medium voltage switching facilities considered legacy and non-standard along with deploying a new protection and control protocol for all station protection and control equipment (planned in-service date is 2026)

- **Carlton TS:** Replace existing H/K metalclad switchgear & B/Y switchyard with current Hydro One standard indoor air insulated (AIS) metalclad switchgear (planned in-service date is 2026)
- **Glendale TS:** Replace the existing 45/60/75 MVA T1 & T2 transformer with new 45/60/75 MVA units and Replace and reconfigure the LV switching facilities with current Hydro One standard air insulated (AIS) metalclad switchgear (planned in-service date is 2027)
- **Vansickle TS:** Replacement of the 14.2kV BY metalclad (planned in-service date is 2027)
- **Murray TS:** Replacement of T11 and T12 power transformers at Murray TS (planned in-service date is 2029)

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.
In the first regional planning cycle, Hydro One completed the RIP report in April 2017. The TWG at the time determined that no further regional coordination was required. The second cycle NA and SA reports were completed in May 2021 and August 2021 respectively. The IRRP is currently underway with a tentative completion in February 2023. The second cycle RIP will follow once IRRP is completed. Updates to the needs and plans recommended in this region are provided below:

Needs identified from the previous cycle were addressed as part of a local plan with area LDCs. The TWG did not recommended any additional system investments as an outcome of the LP and agreed to continue monitoring the identified performance issues and take corrective action as required.

Needs and Plans underway in North/East of Sudbury Region:

- **Area Voltage Control**
  Both Hydro One and IESO continue to experience operating challenges in maintaining acceptable voltages at high voltage station buses in the region. A specific concern is the management of high voltages for buses at Hunta, Porcupine, Pinard and Kapuskasing during planned maintenance and outage conditions. Existing operating procedures employ the use of various shunt voltage controlling devices in the system and will be reviewed to ensure continued effectiveness. The TWG recommended further regional coordination and assessment during the next phases of regional planning.

- **Thermal Limits**
  This region has received significant interest in customer connections in the Kirkland Lake/Dymond and Timmins/Porcupine area. Post contingency load rejection will allow customers to connect in this region; however, increasing loads beyond the applications that presently exist will further stress system capability and thermal limits in the region. System operations also experience increasing challenges in maintaining area circuits within thermal limits during planned outages to the 500kV circuits P502X and D501P. These outages require daily switching of the 500kV circuits affecting customers, and exposes transmission equipment to stresses, which can cause premature failure. Existing operating procedures should be reviewed in conjunction with the available equipment to ensure system operations can continue

to maintain thermal limits during outage conditions. The TWG recommended further regional coordination and assessment during the next phases of regional planning.

- **Asset Replacement for Major HV Transmission Equipment**
  Hydro One has identified the need for replacement of major HV transmission assets over the next ten years at a number of stations in this region shown below. The TWG recommendations for asset replacement plans have taken "right sizing" into consideration.
  - **Porcupine TS**: Replace 1-360MVA 500kV/230kV autotransformer (T8), and 2-225MVA 500kV/115kV autotransformers (T3/T4) with units of similar size and voltage ratings (planned in-service date is 2025)
  - **Kapuskasing TS:** Replace high and low voltage circuit breakers (planned in-service date is 2026)
  - **Otto Holden TS**: Replace 2 – 60MVA 230 kV/115 kV autotransformers (T3/T4) with a new 125MVA 230kV/115kV unit, high voltage breakers (planned in-service date is 2026)
  - **Timmins TS:** Replace 1-83MVA 115/27.6kV transformer (T2) with a unit of similar size and voltage rating (planned in-service date is 2027)
  - **Crystal Falls TS:** Replace 2-42MVA 230/44kV transformers (T5/T6) with units of similar size and voltage ratings (planned in-service date is 2028)
  - Trout Lake TS: Replace 2 – 125MVA 230/44 kV transformers (T3/T4) with units of similar size and voltage ratings (planned in-service date is 2028)
  - K4: Kirkland Lake TS X Matachewan JCT (planned in-service date is 2023)
  - A8K/A9K: Ansonville TS x Kirkland Lake TS (planned in-service date is 2023)
  - T61S: Timmins TS x Shiningtree JCT (planned in-service date is 2023)
  - K2: Kirkland Lake TS x American Barrick JCT (planned in-service date is 2024)
  - D2H/D3H*: Pinard TS x Hunta SS (planned in-service date is 2025)
  - A4H/A5H*: Tunis JCT x Fournier JCT (planned in-service date is 2027)
    *Replacement of the assets for D2H/D3H and A4H/A5H identified above, will require further regional coordination.

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.

The second cycle of Needs Assessment and Scoping Assessments for this region were done in May 2021 and August 2021 respectively. The second cycle IRRP is currently underway and tentative completion is December 2022. The RIP will follow once the IRRP is completed. Updates to the needs and plans recommended in this region are provided below.

Projects completed include:

- Chenaux TS: T3 & T4 transformers along with regulators TR3 and TR4, 115 kV oil circuit breakers 4X6 and 4X2Y, and protection and control equipment were replaced (completed in 2021).

Needs and Plans underway in Renfrew Region:

- **Pembroke TS Line/Station Capacity**
  The 2019 summer peak loading on Pembroke TS was 48 MW, which is above its 10-day summer LTR of 47 MW. Based on the load forecast, Pembroke TS will be loaded to 52 MW by 2029. Load relief is required at Pembroke TS in the near term. The TWG recommends that Hydro One Distribution undertake load transfer studies to alleviate Pembroke TS overloading concerns in the near term. Alternatively, Hydro One Distribution may also assess the option of building a new distribution transformer station to manage Pembroke TS overloading and to serve future load growth in the area.

- **Asset Replacement for Major HV Transmission Equipment**
  Hydro One has identified the need for replacement of major HV transmission assets over the next ten years in this region as shown below. The TWG recommendations for asset replacement plans have taken "right sizing" into consideration.
  - D6 Circuit: Circuit D6 is a 98.2 km, 115 kV, single circuit, wood pole transmission line that provides connection between Des Joachims TS and Pembroke TS. Between Des Joachims TS and Pembroke TS, this circuit also provides connecting taps to distribution stations Craig DS, Deep River DS and Petawawa DS. The 76.8 km line sections between Des Joachims TS and Petawawa/Craig DS contain multiple ACSR conductor segments that have been verified through testing to have reached end-of-life. As the other assets along this line are of original vintage and therefore beyond expected service life, this confirmed sustainment need has triggered the complete line refurbishment of transmission circuit D6 between Des Joachims TS and Petawawa/Craig DS. The goal of this refurbishment project is to completely renew all end-of-life assets along circuit D6. Currently, the work is in progress and the expected in-service for this project is end of 2022.

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.

The second cycle Needs Assessment for this region was completed in September 2021. The NA determined that the 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 second cycle RIP was completed in March 2022. Updates to the needs and plans recommended in this region are provided below.

Projects completed include:

- Chesterville TS: Replaced 25/33/42 MVA, 115/44 kV step down transformers with new 25/33/42 MVA, 115/44 kV (completed in 2014).
- St. Lawrence phase shifting transformer PS33 replaced (completed in July 2022).

Needs and Plans underway in St. Lawrence Region:

- **L22H: Replacement of Conductor, Shield wire, Insulator and Tower Work**
  A total of 65 km of 230 kV circuit L22H between Easton JCT X Hinchinbrook North JCT requires refurbishment. The work includes the replacement of conductors, shield wire, insulators, and refurbishment of lattice steel structures. The TWG recommends that refurbishment of L22H between Easton JCT X Hinchinbrook North JCT does not require further regional coordination. The implementation and execution plan for this need will be coordinated by Hydro One and affected LDCs. The work is expected to be completed in 2026. No other needs have been identified and further assessment of the St. Lawrence region will be undertaken by the TWG in the next regional planning cycle.
- **St Lawrence Phase Shifting Transformers**
  Replace failed phase shifting transformer PS33 and its companion PSR34. These transformers are used to regulate the power exchanged over the Ontario-New York interconnection at St Lawrence TS. The phase shifting transformer PS33 was replaced in 2022 and PSR34 is planned for replacement in 2023.

It is expected that the next planning cycle for this region will be initiated in 2026 or earlier, beginning with the NA phase.

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 August 2017 and the second regional planning cycle is currently underway. In the second cycle, regional planning for some regions had to be advanced due to emerging needs. The third cycle of regional planning was initiated in 2022 with completion of one (1) Needs Assessment (NA) and three (3) NA's underway.

Representatives from Hydro One transmission, the IESO, and LDCs actively participated on regional Technical Working Groups (TWG) during the various phases of the regional planning process. The TWGs were able to undertake the appropriate level of planning based on the needs and make efficient and effective decisions. For example, during the NA phase the TWG identifies needs, assesses options to address them, and finally recommends a preferred plan and/or further assessments as part of the next phases of the regional planning process, namely, SA, IRRP, and/or RIP. In addition, the concept of Local Planning is utilized for further assessment by a smaller TWG in cases where needs are local in nature and straightforward wires-only options are the appropriate solution. Accordingly, assessments for these needs do not require further regional coordination and are directly planned and coordinated for implementation by Hydro One Transmission and affected LDC(s) (or customers). Frequently, wires planning is also initiated in parallel with the IRRP phase when the TWG 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 TWG 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 were 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 and third cycle to date:

- Regional Infrastructure Planning (RIP) reports completed for fifteen (15) regions (Burlington to Nanticoke, Toronto, Windsor-Essex, GTA North, Greater Ottawa, East Lake Superior, GTA East, Sudbury/Algoma, Kitchener-Waterloo-Cambridge-Guelph, GTA West, Greater Bruce/Huron, London Area, Peterborough to Kingston, Chatham/Lambton/Sarnia and St. Lawrence), one (1) RIP is underway (Southern Georgian Bay/Muskoka) and RIP reports for the remaining four (4) regions (Northwest Ontario, Niagara, North/East of Sudbury and Renfrew) will be completed following the completion of their respective IRRPs.
- Needs Assessment (NA) reports completed for twenty (20) regions. (Refer to Table 1). Note that St. Lawrence NA was initiated two (2) month over the five (5) year period because of an error in oversight. The third cycle of regional planning was also initiated in 2022 with completion of one (1) NA (Burlington to Nanticoke) and three (3) NAs are underway (Greater Ottawa, Toronto, and Windsor-Essex).
- Integrated Regional Resource Planning (IRRP) reports for eleven (11) regions (Burlington to Nanticoke, Toronto Area, Windsor-Essex, GTA North, Greater Ottawa, Kitchener-Waterloo-Cambridge-Guelph, GTA West, Greater Bruce/Huron, East Lake Superior, Peterborough to

Kingston, South Georgian Bay/Muskoka, Chatham/Lambton/Sarnia,), with four (4) currently underway (Northwest Ontario, Niagara, North/East of Sudbury and Renfrew).

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 wires infrastructure plan. Specifically, the RIP report documents all the identified needs and wires infrastructure plans in the region including a consolidated account of needs and wires plans developed during earlier phases, i.e. NA, 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] "Planning Process Working Group Report to the Board – The Process for Regional Infrastructure Planning in Ontario". March 13, 2013. Last Revised May 17, 2013.

[3] Ontario Energy Board. "Distribution System Code". Last Revised October 1, 2022 (Originally Issued on July 14, 2000).

[4] Ontario Energy Board. "Conservation and Demand Management Guidelines For Electricity Distributors". Last Revised December 20, 2021.

[5] 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

In March 2019, IESO received the following two Ministerial directives that include changes to reduce the cost of energy-efficiency program delivery in Ontario. The first directive of March 21, 2019 directed the IESO to centrally deliver energy-efficiency programs in the province by implementing a new Interim Framework to take effect from April 1, 2019 to December 31, 2020. The second, also received March 21, 2019 directed the IESO to discontinue and wind-down the 2015-2020 Conservation First Framework (CFF) and the Industrial Accelerator Programs.

By Ministerial Directives dated June 22, 2020 and June 10, 2021, the 2015-2020 CFF wind-down period was extended until June 30, 2021 and December 31, 2021 respectively to provide IESO the ability to assist entities delivering CDM programs impacted by COVID-19.

On September 30, 2020 the IESO received a Ministerial directive to implement a new 2021-2024 CDM Framework, which follows the conclusion of the 2019-2020 Interim Framework. The new 2021-2024 CDM Framework focuses on cost-effectively meeting the needs of Ontario's electricity system, including by focusing on the achievement of provincial peak demand reductions, as well as targeted approaches to address regional and/or local electricity system needs.

The table below shows the estimated 2021 peak demand offsets resulting from energy efficiency projects reported to occur within the respective regions.

Table 3. Conservation Status Update

Region	Verified 2021 Peak Demand Savings (MW)
South Georgian Bay/Muskoka	**2.43**
Burlington to Nanticoke	**3.39**
Northwest Ontario	**0.718**
London Area	**5.40**
KWCG	**3.88**
GTA West	**8.48**
Greater Ottawa	**2.75**
GTA East	**1.806**
Toronto	**18.09**
Windsor-Essex	**7.21**
GTA North	**8.47**
East Lake Superior	**0.325**
Greater Bruce Huron	**0.999**
Peterborough to Kingston	**2.26**

Note: Results have been mapped to planning region, and more granular results by sub-region and/or TS are not available.

A.2 Distribution Energy Resources

The table below shows the total installed and effective capacity of IESO Distributed Energy Resources ("DER") 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, 2021.

Table 4. DER Status Update

Sub region	Station	Installed Capacity (MW)	Effective Capacity (MW)	Base Year
Barrie/Innisfil	No new contracted Distributed Generation			2020 Peak
Brant	BRANT TS	9.80	2.20	2015 Peak
	BRANTFORD TS	3.80	0.80	
	POWERLINE MTS	1.80	0.40	
	TOTAL	**15.40**	**3.4**	
Bronte	BRONTE TS	2.07	0.45	2014 Peak
	CUMBERLAND TS	2.39	0.52	
	BURLINGTON DESN	1.62	0.36	
	PALERMO TS	0.00	0.00	
	TRAFALGAR DESN	0.00	0.00	
	TREMAINE TS	1.67	0.37	
	GLENORCHY MTS	1.32	0.29	
	OAKVILLE #2 TS	1.04	0.23	
	TOTAL	**10.11**	**2.21**	
Toronto	AGINCOURT TS	0.00	0.00	2019 Peak
	BASIN TS	0.00	0.00	
	BATHURST TS	0.00	0.00	
	BERMONDSEY TS	0.00	0.00	
	BRIDGMAN TS	0.00	0.00	
	CARLAW TS	0.00	0.00	
	CAVANAGH MTS	0.00	0.00	
	CECIL TS	0.00	0.00	
	CHARLES TS	0.00	0.00	
	COPELAND TS	0.00	0.00	
	DUFFERIN TS	0.00	0.00	
	DUPLEX TS	0.00	0.00	
	ELLESMERE TS	0.00	0.00	
	ESPLANADE TS	0.00	0.00	
	FAIRBANK TS	0.00	0.00	

	FAIRCHILD TS	0.00	0.00	
	FINCH TS	0.00	0.00	
	GERRARD TS	2.73	2.73	
	GLENGROVE TS	0.00	0.00	
	HORNER TS	0.00	0.00	
	JOHN TS	0.00	0.00	
	LEASIDE TS	0.00	0.00	
	LESLIE TS	0.00	0.00	
	MAIN TS	0.00	0.00	
	MALVERN TS	0.00	0.00	
	MANBY TS	0.00	0.00	
	REXDALE TS	0.00	0.00	
	RICHVIEW TS	0.00	0.00	
	RUNNYMEDE TS	0.00	0.00	
	SCARBORO TS	0.00	0.00	
	SHEPPARD TS	0.00	0.00	
	STRACHAN TS	0.00	0.00	
	TERAULY TS	0.00	0.00	
	WARDEN TS	0.00	0.00	
	WILTSHIRE TS	0.00	0.00	
	WOODBRIDGE TS	0.00	0.00	
	TOTAL	**2.73**	**2.73**	
Greenstone-Marathon	BEARDMORE DS # 2	0.000	0.000	2014 Peak
	JELLICO DS # 3	0.000	0.000	
	LONGLAC TS	0.010	0.000	
	MANITOUWADGE DS	0.000	0.000	
	MANITOUWADGE TS	8.010	8.000	
	MARATHON DS	0.000	0.000	
	PIC DS	0.000	0.000	
	SCHREIBER WINNIPEG DS	0.000	0.000	
	WHITE DOG DS	0.000	0.000	
	TOTAL	**8.02**	**8.00**	
Greater London	Buchanan TS	0.77	0.28	2015 Peak
	Clarke TS	2.77	1.48	
	Commerce Way	0.35	0.13	
	Edgeware TS	3.38	1.25	
	Highbury TS	1.26	0.47	
	Ingersoll TS	2.29	1.15	
	Nelson TS	17.96	14.86	
	Strathroy TS	1.01	0.37	
	Talbot TS	0.53	0.19	
	Tillsonburg TS	1.59	0.59	
	Wonderland TS	1.29	0.48	
	Woodstock TS	0.18	0.07	

	TOTAL	**33.37**	**21.33**	
Hamilton Burlington to Nanticoke	Dundas TS #2 (T5/T6)	0.10	0.04	2016 Peak
	Dundas TS (T1/T2)	9.59	8.68	
	Newton TS	0.02	0.01	
	Elgin TS	1.98	1.94	
	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)	0.02	0.01	
	Beach TS (T5/T6)	0.54	0.21	
	Lake TS (T1/T2)	0.00	0.00	
	Lake TS (T3/T4)	0.37	0.14	
	Winona TS	0.64	0.24	
	Horning TS (T1/T2)	0.53	0.20	
	Horning TS (T3/T4)	0.00	0.00	
	Mohawk TS	0.56	0.21	
	Nebo TS (T1/T2)	1.21	0.46	
	Nebo TS (T3/T4)	0.79	0.30	
	TOTAL	**16.70**	**12.57**	
KWCG	ARLEN MTS	0.00	0.00	2018 Peak
	CAMBRIDGE #1	0.00	0.00	
	CAMPBELL TS	0.00	0.00	
	CEDAR TS	0.00	0.00	
	DETWEILER TS	0.00	0.00	
	ELMIRA TS	0.00	0.00	
	FERGUS TS	0.00	0.00	
	GALT TS	0.00	0.00	
	HANLON TS	0.00	0.00	
	KITCHENER #1	0.00	0.00	
	KITCHENER #3	0.00	0.00	
	KITCHENER #4	0.00	0.00	
	KITCHENER #5	0.00	0.00	
	KITCHENER #6	0.00	0.00	
	KITCHENER #7	0.00	0.00	
	KITCHENER #8	0.00	0.00	
	KITCHENER #9	0.23	0.09	
	PRESTON TS	0.00	0.00	
	PUSLINCH DS	0.00	0.00	
	RUSH MTS	0.00	0.00	

	SCHEIFELE TS	0.01	0.00	
	WATERLOO #3	0.22	0.08	
	WOLVERTON DS	0.50	0.19	
	TOTAL	0.96	0.36	
North of Dryden	No new contracted Distributed Generation			2014 Peak
West GTA	No new contracted Distributed Generation			2019 Peak
Ottawa	ALBION TS	0.4	0.1	2018 Peak
	BILBERRY CREEK TS	0.1	0.0	
	BRIDLEWOOD MTS	0.0	0.0	
	CARLING TS	0.0	0.0	
	CENTRE POINT MTS	0.0	0.0	
	CUMBERLAND DS	0.0	0.0	
	CYRVILLE MTS	0.0	0.0	
	ELLWOOD MTS	0.0	0.0	
	FALLOWFIELD DS	0.1	0.0	
	GREELY DS	0.5	0.1	
	HAWTHORNE TS	0.1	0.0	
	HINCHEY TS	27.0	18.9	
	KANATA MTS #1	0.0	0.0	
	KING EDWARD TS	0.0	0.0	
	LIMEBANK MTS	0.1	0.0	
	LINCOLN HEIGHTS TS	0.2	0.0	
	LISGAR TS	12.0	8.4	
	MANORDALE MTS	0.3	0.1	
	MANOTICK DS	0.0	0.0	
	MARCHWOOD MTS	0.0	0.0	
	MARIONVILLE DS	0.3	0.3	
	MERIVALE MTS	0.0	0.0	
	MOULTON MTS	0.0	0.0	
	NAVAN DS	0.0	0.0	
	NEPEAN TS	0.2	0.0	
	NEPEAN EPWORTH MTS	0.0	0.0	
	OVERBROOK TS	0.0	0.0	
	RICHMOND MTS	0.0	0.0	
	RIVERDALE TS	0.0	0.0	
	RUSSELL DS	0.0	0.0	
	RUSSELL TS	0.0	0.0	
	Slater TS	0.0	0.0	
	SOUTH GLOUCESTER DS	0.0	0.0	
	SOUTH MARCH TS	0.5	0.1	
	TERRY FOX MTS	0.1	0.0	
	UPLANDS MTS #2	0.0	0.0	
	WILHAVEN DS	0.0	0.0	
	WOODROFFE TS	0.3	0.1	

	TOTAL	**42.3**	**28.2**	
GTA East 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	No new contracted Distributed Generation			2020 Peak
Thunder Bay Northwest Ontario	BIRCH TS	0.536	0.001	2014 Peak
	FORT WILLIAM TS	0.293	0.000	
	MURILLO DS	0.326	0.000	
	NIPIGON DS	0.000	0.000	
	PORT ARTHUR TS	0.049	0.000	
	RED ROCK DS	1.000	0.001	
	TOTAL	**2.204**	**0.002**	
Windsor-Essex	No new contracted Distributed Generation			2018 Peak
West of Thunder Bay	AGIMAK DS	0.000	0.000	2014 Peak
	BARWICK TS	25.000	0.025	
	BURLEIGH DS	0.000	0.000	
	CLEARWATER BAY DS	0.000	0.000	
	CRILLY DS (STURGEON FALLS CGS)	0.000	0.000	
	DRYDEN TS	10.010	0.010	
	ETON DS	1.250	1.250	
	FORT FRANCES MTS	0.000	0.000	
	KEEWATIN DS	0.000	0.000	
	KENORA DS	0.000	0.000	
	KENORA MTS	0.045	0.000	
	MARGACH DS	0.000	0.000	
	MINAKI DS	0.000	0.000	
	MOOSE LAKE TS	0.010	0.000	
	NESTOR FALLS DS	0.000	0.000	
	SAM LAKE DS	0.000	0.000	
	SAPAWE DS	0.000	0.000	
	SHABAQUA DS	0.000	0.000	
	SIOUX NARROWS DS	0.000	0.000	
	VALORA DS	0.000	0.000	
	VERMILLION BAY DS	3.600	3.600	
	WHITERIVER DS	0.000	0.000	
	TOTAL	**39.915**	**4.885**	
North York/ GTA North	Holland TS	1.25	0.27	2017 Peak
	Armitage TS	0.61	0.13	
	Brown Hill TS	0.98	0.21	
	Buttonville TS	0.17	0.04	
	Markham 1 MTS	0.07	0.02	

	Markham 2 MTS	0.20	0.04	
	Markham 3 MTS	0.30	0.07	
	Markham 4 MTS	0.05	0.01	
	Richmond Hill MTS	0.17	0.04	
	Vaughan 1 MTS	0.33	0.07	
	Vaughan 2 MTS	0.07	0.02	
	Vaughan 3 MTS	0.31	0.07	
	Vaughan 4 MTS	-	-	
	TOTAL	**4.51**	**0.99**	
East Lake Superior	ECHO RIVER TS	0.00	0.00	2019 peak
	BATCHAWANA TS	0.00	0.00	
	GOULAIS BAY TS	0.00	0.00	
	PATRICK ST TS	0.00	0.00	
	ST. MARY'S MTS	0.00	0.00	
	TARENTORUS MTS	0.00	0.00	
	CHAPLEAU DS	0.00	0.00	
	DA WATSON TS	0.00	0.00	
	ANDREWS TS	0.00	0.00	
	MACKAY TS	0.00	0.00	
	NORTHERN AVE. TS	0.00	0.00	
	TOTAL	**0.00**	**0.00**	
Peterborough to Kingston	Ardoch DS	0.00	0.00	2018 peak
	Battersea DS	0.00	0.00	
	Belleville TS	0.00	0.00	
	Dobbin DS	0.00	0.00	
	Dobbin TS	0.00	0.00	
	Frontenac TS	0.50	0.005	
	Gardiner TS (T1/T2)	0.00	0.00	
	Gardiner TS (T3/T4)	0.00	0.00	
	Harrowsmith DS	0.00	0.00	
	Havelock TS	11.00	4.07	
	Hinchinbrooke DS	0.25	0.0025	
	Lodgeroom DS	0.00	0.00	
	Napanee TS	0.50	0.005	
	Northbrook DS	0.00	0.00	
	Otonabee TS	2.25	0.0225	
	Picton TS	2.00	0.00	
	Port Hope TS	3.60	0.036	
	Sharbot DS	0.00	0.00	
	Sidney TS	0.00	0.00	
	CTS	0.00	0.00	
	Total	**20.1**	**4.141**	

A.3 Other Initiatives

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

Sub region	Other Electricity System Initiatives
Hamilton	The addendum to the Hamilton IRRP has been postponed due to updated asset condition information provided by Hydro One.
Ottawa	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 ratepayer's province-wide, these offerings are also expected to help reduce the reliability risk due to heavily loaded stations in Kanata-Stittsville. 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 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. The IESO has directed increased efforts and investment to the Ottawa area these past several years, to encourage the adoption of energy efficiency process and technologies in businesses and communities. As part of the 2021-2024 CDM Framework, the IESO was directed to deliver a new competitive program to address regional and/or local system needs. The Local Initiative Program is now one tool that is available to target the delivery of additional CDM savings at specific areas of the province with identified system needs. The IESO is currently working with Hydro Ottawa to develop a local initiative program procurement to begin targeting the incremental savings opportunities described above and previously highlighted in the 2020 Ottawa IRRP. As part of the as part of the 2021-2024 CDM Framework Mid-Term Review, the IESO is also reviewing new opportunities for CDM to be targeted to address regional or local needs and available tools to do so. As part of this effort, the IESO should continue to explore opportunities to target savings in the Ottawa and Peterborough to Quinte regions to help address these emerging bulk and regional system needs.

Windsor-Essex	The IESO continued planning for the Windsor-Essex region and surrounding area, with an IRRP addendum published in February 2022 and a West of London bulk study published in September 2021. The next planning cycle will begin in October 2022 with Hydro One leading the Needs Assessment. Development work for the recommended transmission reinforcements is ongoing. The IESO's Grid Innovation Fund and OEB's Innovation Sandbox issued a joint call for proposals to support research and demonstration projects that test the capabilities of distributed energy resources. One successful proponent included a proposed local electricity market in the Leamington area, proposed by Essex Powerlines, NODES, Essex Energy Corp., and Utilismart Corp. More information can be found at the IESO's website. The IESO continues offering an incentive for LED grow lights through the Retrofit program to help greenhouses in the Windsor-Essex and Chatham-Kent areas reduce their energy use.
Greenstone-Marathon / North of Dryden	The IESO is studying supply options to the Ring of Fire to inform government policy. This study will proceed in parallel with the ongoing IRRP.
East Lake Superior	The IESO initiated a Northeast Bulk planning study in 2021 to address the potential impact of high industrial load growth in this region on the bulk transmission system. Based on the conclusions of this study in relation to the impending need in the IRRP, the IESO is coordinating with the IRRP Working Group members on next steps to address this need.
West of Thunder Bay/ Northwest Ontario	The IESO will continue to monitor developments in the Region and provide the targeted in-service date for Phase 2 of the Waasigan Transmission Line Project. The IESO is in the process of updating and validating the mining demand forecast for Q1 2023 with an external consultant.
West GTA	The IESO and Ministry of Energy are conducting the NWGTA Transmission Corridor Identification Study to identify and protect a corridor of land for future transmission infrastructure.

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 2021:

- Milton Hydro
- Hydro One Networks Inc. (Orillia Power Distribution Corporation service area)
- Hydro One Networks Inc. (formerly Peterborough Distribution Inc. service area)