South and Central Bulk Plan

August 20, 2026

Connecting Today.
Powering Tomorrow.

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List of Abbreviations

APO	Annual Planning Outlook
BES	Bulk Electric System (NERC Definition)
BESS	Battery Energy Storage System
BLIP/NBLIP	Buchanan-Longwood Input/Negative Buchana-Longwood Input
BPS	Bulk Power System (NPCC Definition)
CLAN	Claireville North
CLAS	Claireville South
DER	Distributed Energy Resources
DG	Distributed Generation
DR	Demand Response
DS	Distribution Station
DVS	Dynamic Voltage Support
ELT1	Expedited Long-Term 1 RFP
ESS	Energy Storage System
EWTW	East West Tie West
FABCW	Flow Away from Bruce Complex and Wind
FALS	Flow Away from Lambton-Sarnia
FETT	Flow East Towards Toronto
FIT	Feed-in-Tariff
FN	Flow North
FS	Flow South
G/R	Generating Rejection
GS	Generation Station
GTA	Greater Toronto Area
HV	High Voltage
HVDC	High Voltage Direct Current

IBR	Inverter-Based Resources
IEP	Integrated Energy Plan
IESO	Independent Electricity System Operator
IRRP	Integrated Regional Resource Plan
I/S	In Service
kV	Kilovolt
LDC	Local Distribution Company
LMC	Load Meeting Capability
L/R	Load Rejection
LT1	Long-Term 1 RFP
LT2	Long-Term 2 RFP
LT3	Long-Term 3 RFP
LTE	Long-Term Emergency
LV	Low Voltage
MECP	Ministry of Environment, Conservation and Parks
MVA	Megavolt ampere
Mvar	Megavolt ampere reactive
MW	Megawatt
NERC	North American Electric Reliability Corporation
NPCC	Northeast Power Coordinating Council
NPV	Net Present Value
N-1	Contingency involving the loss of a single element
N-2	Contingency involving the simultaneous loss of two elements
N-1-1	Contingency involving the sequential loss of two elements
N-1-2	Contingency involving the sequential loss of one then two elements
OEB	Ontario Energy Board
ORTAC	Ontario Resource and Transmission Assessment Criteria
O/S	Out of Service
PEC	Portlands Energy Centre

POG	Powering Ontario’s Growth
PTO	Provincial Territorial Organizations
QFW	Queenston Flow West
RFP	Request for Proposals
RIP	Regional Infrastructure Plan
SIA	System Impact Assessment
SS	Switching Station
STE	Short-Term Emergency
TG	Transmission-connected Generation
TS	Transformer Station
TWG	Technical Working Group
WOC	West of Chatham

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Executive Summary

A reliable and affordable electricity system underpins economic development across Ontario. With electricity demand forecast to rise, the bulk transmission system requires new investments to support growing communities and expanding industries in every corner of the province.

Through a collaborative and robust planning process, the Independent Electricity System Operator (IESO) is driving and guiding the sector's future with a series of recommendations for transmission infrastructure.

The South and Central Bulk Plan was initiated to identify near-term actions and longer-term options to ensure the transmission system can meet forecast demand growth. The IESO also evaluated the grid's ability to enable the connection of potential future generation resources — including new nuclear — and to reliably supply emerging demand across the Greater Toronto Area (GTA) and the Windsor to Hamilton corridor.

Ratepayer cost was a primary consideration through the IESO's analysis, and the Plan considered demand forecasts based on the Annual Planning Outlook, resource procurement outcomes and scenarios, and policy decisions. Transmission reinforcements were assessed to address identified system needs and combined into integrated portfolios — and co-ordinated with the IESO's regional planning activities and corridor preservation work within the study area to ensure integration and alignment of solutions across planning activities. Portfolios were evaluated against criteria including reliability and economic performance, system operability and resilience, stakeholder feedback, and implementation complexity. Actions also complement significant efforts in recent years to strengthen the electricity system in southern and central Ontario. This includes transmission lines recommended in the 2024 Central-West and 2021 West of London Bulk Plans to increase transfer capability and serve agricultural sector growth; and the 2025 Northern Ontario Bulk Plan to strengthen connection between northern and southern Ontario.

Based on this work, the IESO's latest set of recommendations consist of a phased sequence of cost-effective transmission investments that secures long-term reliability and affordability while maintaining flexibility so the system can effectively respond to a range of future scenarios. By taking a phased approach, the Plan addresses near-term needs that support growth in the short term while aligning larger future expenditures with the progression and confirmation of need. This ensures the province can support reliability and growth while reducing the risk of building too early and adding additional costs to ratepayers.

Early Actions

Early actions targeting known transmission bottlenecks were identified and advanced during the development of the Plan, because they were needed under the full range of scenarios. Given the long development timelines typically associated with bulk transmission infrastructure, these actions have already been initiated to mitigate schedule risk. They were identified as common actions across multiple development portfolios earlier in the study and determined to be critical for timely implementation.

This includes reconductoring a line between Orangeville and Barrie to increase transfer capability, as well as support economic development and load growth, in-service by 2029; and a new line from Bowmanville to the eastern GTA that enables new small modular reactors at Darlington Nuclear Generation Station, as well as a greater flow of supply from other resources in eastern Ontario into the GTA, in-service by 2032.

These early actions, highlighted in *Energy for Generations: Ontario's Integrated Plan to Power the Strongest Economy in the G7*, have also been designated as high-priority projects with Hydro One proceeding with implementation.

Implementation-Ready

Implementation-ready actions are recommendations required by the early- to mid-2030s to improve reliability and enable near-term demand growth. These actions should proceed to immediate development and implementation given that transmission infrastructure development timelines range between 5–7 years.

To increase the amount of electricity supplied to the surrounding areas, support electrification initiatives, and allow for greater residential and industrial development, the IESO recommends five new or upgraded stations in Milton, Barrie, Vaughan, Puslinch, and Guelph that will increase the amount of electricity supplied to the surrounding areas, support electrification initiatives, and allow for greater residential and industrial development.

To increase transfer capability and allow for new sources of supply to connect to the grid in high-growth regions and deliver more electricity, the IESO recommends new lines between Vaughan and Toronto; Strathroy-Caradoc and Guelph; and Guelph and Puslinch.

Recognizing the long lead times associated with transmission development and construction, the IESO also recommends this work proceed on a timeline that reflects the urgency and the critical nature of needs, with in-service dates beginning as soon as 2030 and no later than 2034.

Future-Consideration

Future-consideration actions are potential reinforcements associated with longer-term demand growth, future generation development, and evolving policy direction. While these recommendations are not immediately required, they offer flexibility and responsiveness to future system needs as they develop without overcommitting ratepayer expenditure before the need arises or other conditions materialize. The IESO will continue to monitor system conditions, co-ordinate with regional planning, and trigger the recommendations as conditions evolve.

For the South and Central Bulk Plan, this includes a new transformer station in the London area to enable potential economic development; nearly 400 km of new transmission lines to deliver up to 4,800 MW of new nuclear generated by the proposed Bruce C Project across all regions of the province; and a transmission line between London and Lakeshore to meet increased demand in the southwest driven by greenhouses, large industrial loads, and economic development.

Staged Investment

The estimated investment to implement the recommended transmission plan in full is approximately $8 billion: $550 million for early actions; $2.3 billion for implementation-ready actions; and $5 billion for future-consideration actions.

The IESO's recommendations — deliberately staged to align with the timing and certainty of needs — are prudent and risk-aware so the system stays ahead of demand and is ready to support long-term economic development. This sequencing supports timely delivery of critical infrastructure, aligns with Ontario's long-term goals, and protects against overbuilding.

Given that the IESO is targeting the early-2030s for implementation-ready actions, project timelines are an important consideration. While this Plan focuses on identifying necessary infrastructure investments, the approach for selecting a developer and constructing the projects — which could include designating a transmitter or a competitive procurement — will be confirmed following completion of this Plan.

Engagement

With the significant scale and scope of recommendations in the South and Central Bulk Plan, the IESO sought insights from a diversity of audiences, each with unique perspectives. Throughout the Plan's development, the IESO purposefully engaged with Indigenous communities, municipalities, sector stakeholders, and interested parties through targeted meetings and public webinars. Feedback received throughout the process focused on the options evaluated and regional impacts — and submissions informed final recommendations.

Impact

The South and Central Bulk Plan is a flexible and cost-effective approach to transmission planning. The Plan recommendations will strengthen system resilience and improve reliability — allowing more electricity to flow across the high-voltage grid. Through targeted upgrades and new infrastructure, Ontario's electricity system will be set to connect additional generation resources if demand for more electricity materializes. Proposed reinforcements can also lower the overall reliance on gas-fired generation — though not eliminate their need and operational value to the system — and prepare the system for a range of future supply options.

A second phase of the South and Central Bulk Plan will extend the planning horizon and assess longer-term transmission system needs. This will include evaluation of longer-lead time resources, such as the potential development of new nuclear at the Wesleyville site near Port Hope, where sufficient information is available regarding their scope, timing, and geographic location, ensuring alignment between transmission development and future supply integration.

Summary of Recommendations

Table 1 | Early Actions

Recommendation	Solution Type	Needs Addressed	Expected In-Service
Essa TS to Orangeville TS Reinforcement	Existing 230 kV Double-Circuit Transmission Upgrade	Enable economic development in the area and connection of new resources	2029
Bowmanville SS towards Cherrywood TS Line	New 500 kV Double-Circuit Transmission	Enable SMRs integration and supply from Eastern Ontario	2032

Table 2 | Implementation-Ready Actions

Recommendation	Solution Type	Needs Addressed	Expected In-Service
Kleinburg 500/230 kV Transformer Station	New Bulk Station	Provide a new supply capacity point to serve growth throughout northern York and Peel Regions	2031-2032
Kleinburg TS to Claireville TS Line	New 500 kV Single-Circuit Transmission	Required to enable and supply the new Kleinburg TS	2031-2032
Guelph North 500/230 kV Transformer Station	New Bulk Station	Provide additional supply to the Kitchener-Waterloo-Cambridge-Guelph (KWCG) region to enable urgent economic growth, electrification, and municipal development	2031
Guelph North TS to Wellington TS Line	New 500 kV Single-Circuit Transmission	Required to enable electricity supply to the KWCG region and support bulk transmission interfaces from southwest Ontario to the rest of the province	2031
Milton 500 and 230 kV Transformer Station	New Bulk Station	Provide additional supply to GTA West/Halton and Peel Regions. Additional regional investments to enable use of new supply to be identified through GTA West IRRP	2033

Longwood TS to Guelph North TS Line	New 500 kV Single-Circuit Transmission	Required to enable electricity supply to the KWCG region and support bulk transmission interfaces from southwest Ontario to the rest of the province	2034

Table 3 | Future-Consideration Actions

Recommendation	Solution Type	Needs Addressed	Expected In-Service
St. Thomas 500/230 kV Transformer Station	New Bulk Station	Provide supply capacity to enable industrial and residential growth in the London Area **Trigger:** London Area load growth	Late 2030s
Bruce SS to Longwood TS Line	New 500 kV Double-Circuit Transmission	Enable Bruce C NGS to southwestern Ontario **Trigger:** Bruce C Project	2040s
Bruce SS to Essa TS Line	New 500 kV Double-Circuit Transmission	Enable Bruce C NGS to GTA and northern Ontario **Trigger:** Bruce C Project	2040s
Essa TS to Kleinburg TS Line	New 500 kV Single-Circuit Transmission	Enable Bruce C NGS to GTA and northern Ontario **Trigger:** CLAN/CLAS needs, or Bruce C Project (whichever is first)	2040s (or sooner)
Lakeshore TS to St. Thomas TS Line	New 500 kV Single-Circuit Transmission and tertiary reactor at Lakeshore TS	Provide supply capacity to enable significant industrial and residential growth in the Windsor-Essex region **Trigger:** Load Growth in Windsor-Essex and Chatham-Kent regions	2045+

Map of Recommendations

1. Introduction and Planning Context

1.1 Purpose of the Plan

The South and Central Bulk Plan (the "Plan" or the "Study") was initiated in 2024 to identify a series of near-term actions and longer-term options to ensure the transmission system is equipped to meet emerging challenges and opportunities.

The Study was developed in response to rapidly growing demand drivers that are expected to materially increase electricity demand over the next 10 to 20 years, placing sustained pressure on an already constrained and complex transmission system in southern Ontario. The Plan supports Ontario's long-term energy and capacity needs as identified in the IESO's Annual Planning Outlook (APO), while ensuring compliance with reliability standards and criteria established by the North American Electric Reliability Corporation (NERC), the Northeast Power Coordinating Council (NPCC), and the IESO through the Ontario Resource and Transmission Assessment Criteria (ORTAC).

This Plan represents the first of two phases. The first phase, documented in this Plan, focuses on system needs based on a demand and resource outlook spanning the next 10 to 15 years, to identify reinforcements that must be initiated in the near- to medium-term period. A second phase to be subsequently initiated will consider longer-term needs to approximately 2050.

1.2 Planning Context and Framework

Independent planning and analysis for electricity generation and storage, demand-side management, conservation, and transmission in Ontario is conducted by the IESO. Regional planning is carried out in accordance with a planning process endorsed and monitored by the Ontario Energy Board (OEB), while bulk planning addresses provincial system issues, including the capability of the transmission system to move power reliably across Ontario.

Bulk planning is informed by several key provincial policy and planning documents, including:

- *Powering Ontario's Growth: Ontario's Plan for a Clean Energy Future*
- The Minister's July 10, 2023 letter to the IESO
- *Energy for Generations: Ontario's Integrated Plan to Power the Strongest Economy in the G7*

Together, these drivers emphasize reinforcing the transmission system to enable new generation resources, including nuclear and non-emitting resources, while accommodating higher demand associated with economic development, manufacturing, data centres, agriculture, urban expansion, and electrification.

1.3 Study Area and System Overview

1.3.1 Geographic Study Area

The South and Central Ontario Bulk Plan study area extends from Windsor in the west to Durham Region in the east (excluding the Niagara Peninsula), includes Bruce Nuclear Generating Station (NGS) and Essa Transformer Station (TS) near Barrie to the north and Nanticoke TS in the south. The Niagara Peninsula is out of scope and will be assessed separately through its own bulk transmission plan. The study area is shown in Figure 1.

Figure 1 | Geographic Diagram Illustrating South and Central Bulk Plan Study Area

For analytical purposes, the study area was divided into four modules based on system topology and key transmission interfaces:

- **Bruce Area**: focuses on delivering new nuclear supply to load centres.
- **Southwestern Ontario**: assesses supply to several major concentrated load centres in the growing industrial and agricultural corridor.
- **Greater Toronto Area (GTA)**: assesses reliability to the largest growing load centre.
- **East of Toronto**: focuses on integrating SMRs and east-to-west flows.

The modules are described in Section 1.5.

1.3.2 Transmission System Overview and Transmission Interfaces

The bulk transmission system in south and central Ontario consists of a complex network of 500 kV and 230 kV infrastructure, connecting major generation resources to large and growing load centres. Bulk supply to major load centres is delivered through key transformer stations such as Claireville TS and Cherrywood TS in the GTA, Longwood TS and Lakeshore TS in the southwest, and others across the system.

When planning and operating the bulk electricity system, the IESO manages power flows to ensure that reliability standards and criteria are met and that undesirable outcomes, such as equipment damage, uncontrolled cascading outages, or widespread system separation, are prevented. To support this objective, transmission interfaces are used in planning to represent the maximum allowable transfer of power between different areas of the power system.

A transmission interface generally represents a defined grouping of transmission circuits, transformers, and associated facilities that connect one portion of the system to another. Rather than assessing individual lines in isolation, interfaces provide a practical way to evaluate system performance under a wide range of operating conditions, including peak demand, low demand, different generation profiles, and transmission contingencies.

In the south and central Ontario system, the use of interfaces is particularly important due to the scale and complexity of the transmission network, the geographic separation between major generation sources and concentrated load centres, and the increasing variability of both supply and demand. Large quantities of generation are in areas such as Bruce, Eastern Ontario, and Sarnia-Lambton, while demand growth is concentrated in the GTA, the Kitchener-Waterloo-Cambridge-Guelph (KWCG) region, and along the Windsor–London corridor. This spatial mismatch requires significant transfer capability across the bulk transmission system and places increasing reliance on key interfaces to deliver power reliably.

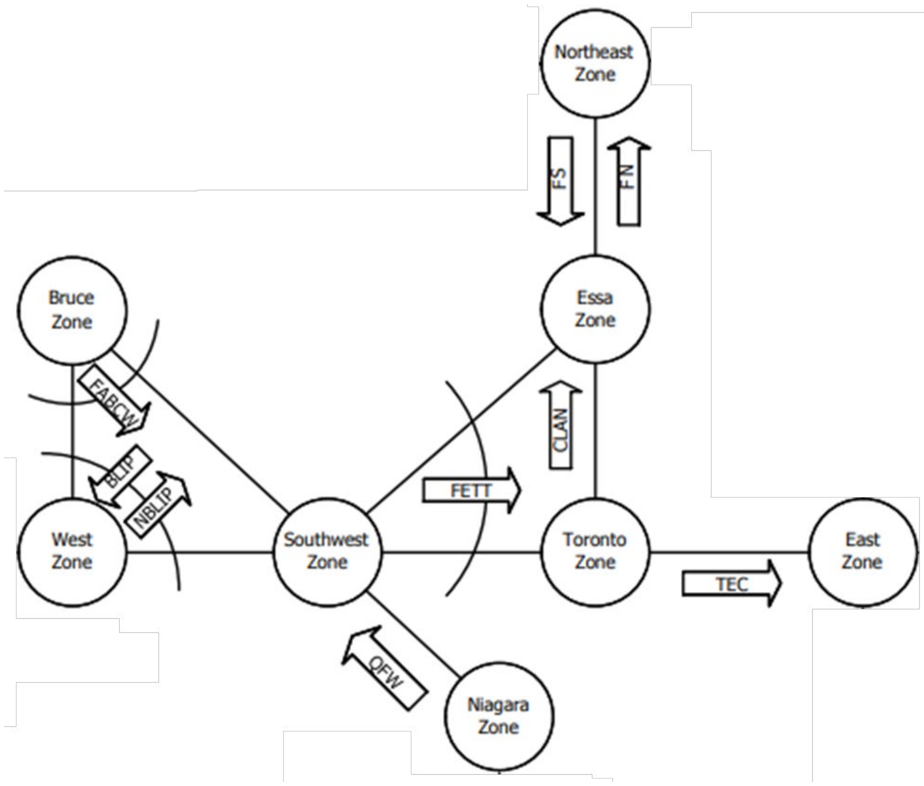
As a result, interface limits in this system are not driven solely by thermal capability, but also by voltage performance, system stability, system operability, and, in highly interconnected areas such as the GTA, short circuit constraints. These characteristics underscore the importance of a coordinated, system-wide assessment of bulk transmission capability.

For the purposes of this Plan, the key interfaces that were used to represent key transmission pathways between major supply regions and load centres across the study area are shown in Figure 2 and include:

- **Buchanan–Longwood Input / Negative Buchanan–Longwood Input (BLIP/NBLIP):** representing transfer capability into the West transmission zone from the Southwest and Bruce transmission zones (BLIP), and flow in the opposite direction (NBLIP).
- **Queenston Flow West (QFW):** representing transmission capability between Niagara and Southwest transmission zones
- **Flow Away from Bruce Complex and Wind (FABCW):** representing the transmission capability to deliver generation from the Bruce area to major load centres.

- **Flow North and Flow South (FN/FS)**: representing transfer capability between northern Ontario and southern Ontario near Essa TS.
- **Claireville North and South (CLAN/CLAS)**: representing key transfer paths within the GTA and between northern and southern portions of the Toronto transmission zone.
- **Flow East Towards Toronto (FETT)**: representing the transfer of power into the GTA, eastern and northern Ontario from western supply sources.

Figure 2 | Diagram Illustrating Transmission Zones and Key Interfaces Considered



Together, these interfaces provide the basis for assessing both regional and system-wide transmission capability, including the ability to deliver generation to load centres and to accommodate future growth and resource development. Additional minor interfaces were also modeled. More detailed interface definitions, including circuit composition and geographic diagrams, are provided in the relevant sections of this Plan and supporting appendices.

1.3.3 Load Centres and System Drivers

Electricity demand across the study area is growing rapidly, driven by a combination of economic development, electrification, population growth, large industrial and commercial loads, data centres, and agricultural loads. The major load centres within the study area include:

- Windsor-Essex, including Chatham-Kent-Sarnia-Lambton
- London Area
- Kitchener-Waterloo-Cambridge-Guelph (KWCG)
- Burlington to Nanticoke corridor

- The GTA, including GTA North, GTA West, and the city of Toronto.

Regional planning processes provide more granular insights into the location and timing of demand growth. These locational drivers are critical for bulk system planning, as concentrated demand can significantly impact transmission interface capability and system performance.

The location of new loads relative to existing infrastructure is particularly important in constrained areas such as southern Ontario and the GTA, where even modest localized growth can trigger bulk system limitations. In load centres across southern Ontario, new demand is typically more concentrated in proximity to existing bulk supply points due to land availability near the existing infrastructure. In the GTA, where urban boundaries are expanding to accommodate new high-density development and industries, new demand is forced to locate further away from the existing infrastructure. This means there is an absence of bulk supply points to support the regional transmission needed to service community expansion.

More details about the specific system drivers in each of these load centres is provided in Section 2.2.

1.4 Plan Objectives and Scope

1.4.1 Objectives

The Study objectives were informed by system needs identified through other planning processes and provincial policy direction. These include:

- Identifying transmission required to enable new generation resources, including small modular reactors (SMRs) at Darlington NGS and expanded nuclear at Bruce NGS.
- Exploring opportunities to reduce reliance on emitting resources over the long-term, including existing gas generation in the GTA.
- Ensuring reliable supply under high demand growth and electrification scenarios.
- Identifying opportunities to expand or preserve transmission corridors for future needs.

In addition, this Plan aimed to:

- Support and enable economic development within the study area.
- Improve system operability and resilience.
- Support broader long-term policy objectives.

1.4.2 Scope

The Plan focuses on the bulk transmission system, which in southern Ontario primarily consists of the 500 kV and 230 kV networks and a series of 500 kV/230 kV autotransformer stations throughout the study area that serve as bulk supply points. Transmission facilities whose primary purpose is to supply local area demand (such as 115 kV and radial 230 kV systems) were generally considered out of scope as they are assessed in regional planning processes.

However, this study was co-ordinated with local area needs as identified through regional planning. This co-ordination is described in Section 1.9.2 and local area transmission needs are defined throughout this report. The Study considered demand growth scenarios and resource development assumptions, but determining specific customer connection arrangements was out of scope.

1.5 Study Approach

The demand and supply resource outlook for the year 2035, as developed for the 2025 APO, formed the baseline planning assumptions for this Plan.[1] This information was augmented by data and insights obtained through the regional plan forecasts and further by system needs and recommendations as identified through regional planning.

Where information was known, insights regarding the potential for new customer load growth informed the assumptions used in the Study so that the bulk implications of the potential load increases could be considered (i.e., need for bulk system reinforcements). Local needs are typically reviewed and addressed through regional planning, and individual customer connection requirements are determined through the IESO's Connection Assessment process.

Certain longer lead time resources, such as the expansion at Bruce NGS (Site C), were assessed to identify the required transmission for deliverability of the resource. The assumed need date for any resulting reinforcements is the anticipated in-service date of the resource, using the best information available at the time of Plan publication.

Given the large scale and scope of this Plan, a modular approach was used to carry out the technical studies. Four geographic study modules were defined based on the existing transmission system topology and the major transmission interfaces within the study area. This approach allowed for deeper consideration of the demand and supply drivers and constraints unique to each geographically defined module in an analytically efficient manner. Power flow simulations were carried out to determine system needs and potential solution options for each study module, while considering interdependencies with regional plans as well as the broader interconnected grid. Individual solution options were developed, tested, and assembled into three alternative solution portfolios that were then evaluated together covering all four modules with the goal of resolving all the identified transmission system needs (Section 5.1). Portfolio performance was evaluated according to a set of criteria as described in Section 5.4.

The four modules scoped for the South and Central Bulk Plan are described further in the following subsections.

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[1] Section 2.1 discusses the 2025 APO demand forecast as compared to the 2026 APO demand forecast.

1.5.1 Bruce Area Module

The Bruce module was scoped around the 500 kV and 230 kV transmission paths between the Bruce transmission zone and Essa TS near Barrie, Longwood TS southwest of London, and Claireville TS in the GTA. The planning objective of the Bruce module was to assess the capability of the transmission system to deliver new supply resources from the Bruce Area, including up to 4,800 MW of new generation from Bruce NGS and other potential resources from the Bruce area to load centres.

The Bruce module study area is shown in Figure 3.

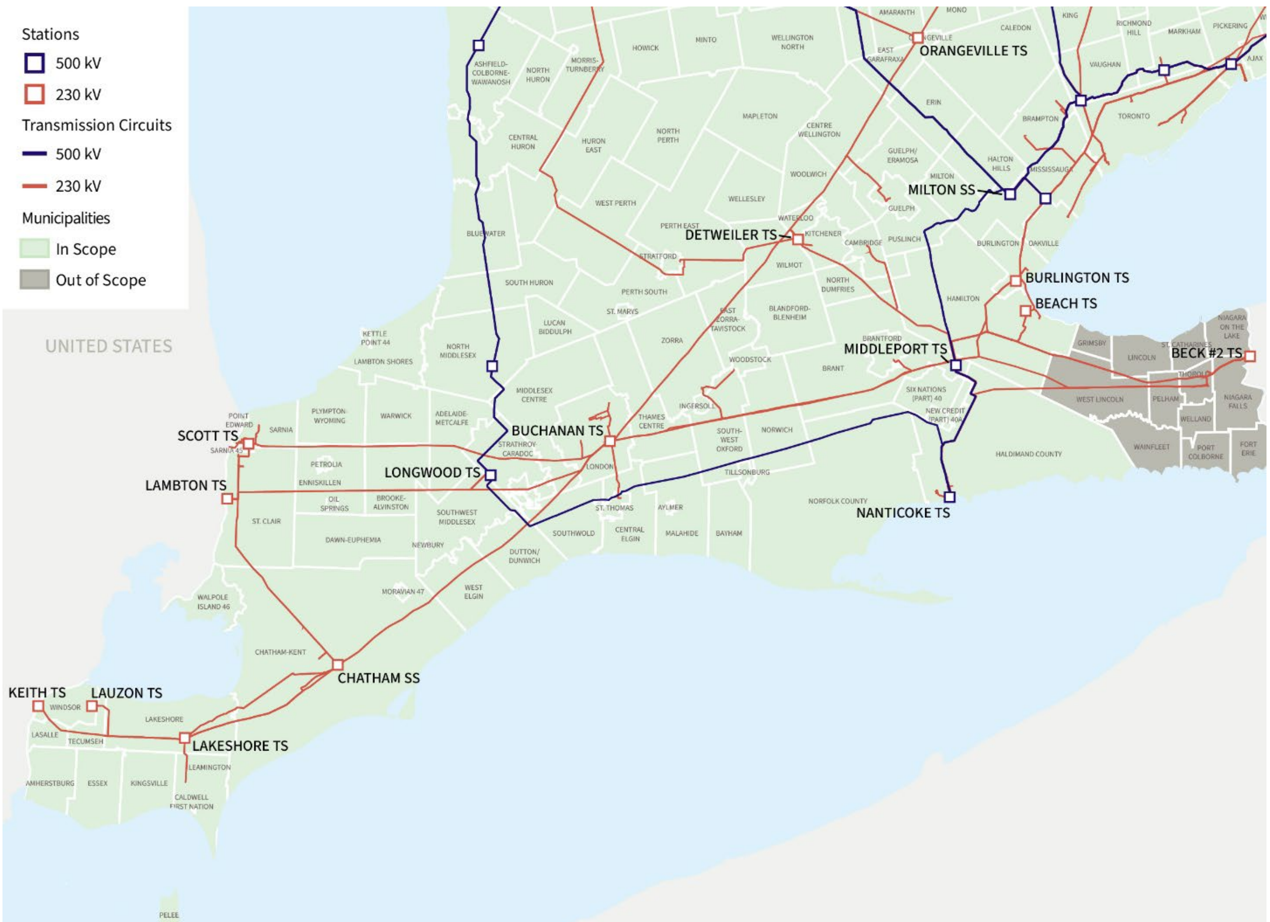
Figure 3 | Geographic Diagram Illustrating Bruce Module Study Area

1.5.2 Southwestern Ontario

The Southwest Ontario module was scoped around the 500 kV and 230 kV bulk transmission systems supplying Keith TS and Lauzon TS (supply into the western portion of the County of Essex and the City of Windsor), Lakeshore TS (supply into the Windsor-Essex region), Lambton TS (City of Sarnia), Beach TS (City of Hamilton), Nanticoke TS (southern Haldimand County), Detweiller TS (the tri-city area), and Buchanan TS (City of London). Electricity demand in southwestern Ontario is forecasted to increase due to the expanding agricultural sector, new manufacturing, data centres, and electrification. Accordingly, this module assessed the capability of the transmission system to reliably supply increasing demand across the area and to enable load growth in load centres throughout this area. It included the West and Southwest transmission zones.

The Southwest Ontario module study area is shown in Figure 4.

Figure 4 | Geographic Diagram Illustrating the Southwest Module Study Area



Previous bulk plans have established a baseline of transmission reinforcements across southwestern Ontario that were needed to support continued growth. These reinforcements were included in this study:

- The new Lakeshore TS and the 230 kV double-circuit line between Chatham SS and Lakeshore TS recommended in the 2019 Windsor-Essex Bulk Plan. These reinforcements are now in-service.
- The 230 kV double-circuit line between Lambton TS and Chatham SS, the 500 kV single-circuit line between Longwood TS and Lakeshore TS, in addition to the procurement and re-contracting of generation resources in the West transmission zone, as recommended in the 2021 West of London Bulk Plan.
- Reconductoring a section of 230 kV line between Middleport TS and Buchanan TS and proactive monitoring of demand growth across southwestern Ontario, as recommended in the 2024 Central-West Bulk Plan.

1.5.3 Greater Toronto Area (GTA)

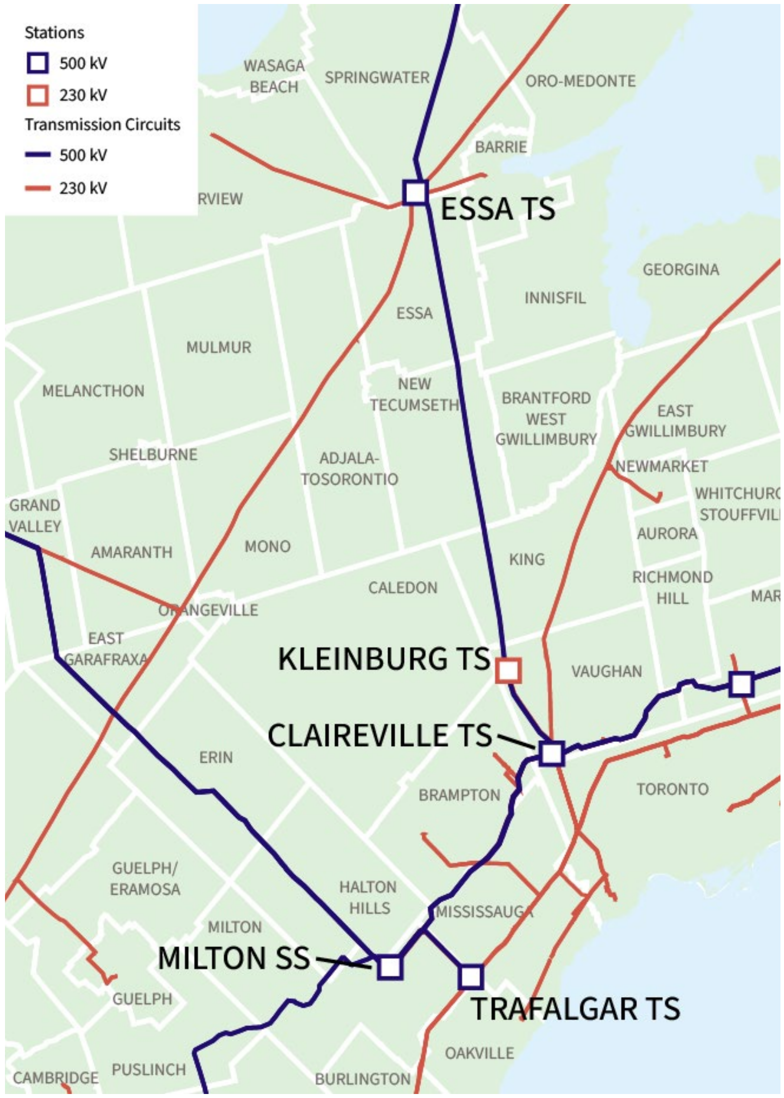
The GTA module was scoped to include the 500 kV and 230 kV systems between Milton SS, Essa TS, Claireville TS and Parkway TS. Included in this module were the City of Toronto, GTA North (York Region), and GTA West regional planning regions. The easternmost part of the Toronto zone including Cherrywood TS was not considered in this module, as it was considered part of the East of Toronto module.

As the largest load centre in Ontario, supply to the GTA is closely co-ordinated with system changes in neighbouring other parts of the province as the GTA is both heavily reliant on the transmission system to deliver electricity generated elsewhere in the province into the load centre, and the transmission infrastructure within the GTA is also used to transport power through the GTA to reach other load centres.

This module focused on ensuring that the bulk system can support the regional infrastructure to supply local demand growth, as identified in the Toronto, GTA North, and GTA West IRRPs. The growth pressures of the GTA are unique because the electrical infrastructure is heavily utilized in the built-up urban areas, and new growth is expanding the urban boundary into areas where undeveloped land is available, but there is little to no high voltage infrastructure to support growth in that specific area. The growth is concentrated along the northern and northwestern urban boundaries.

The GTA study area is shown in Figure 5.

Figure 5 | Geographic Diagram Illustrating GTA Module Study Area



1.5.4 East of Toronto

The East of Toronto module was scoped to include the 500 kV and 230 kV systems between Bowmanville Switching Station (SS), Clarington TS, and Cherrywood TS, excluding radial load pockets supplying the city of the eastern GTA and city of Toronto, which are evaluate through the regional plans. The planning objective of the East of Toronto module was to assess the capability of the transmission system to deliver new supply resources from the east, including up to 1,200 MW of new generation from new SMRs at Darlington NGS. The studies undertaken for this area also evaluated system needs based on a range of potential resource development scenarios from eastern Ontario in addition to the SMRs.

The East of Toronto study area is shown in Figure 6.

Figure 6 | Geographic Diagram Illustrating East of Toronto Module Study Area

1.6 Early Actions Identified in This Study

Powering Ontario's Growth: Ontario's Plan for a Clean Energy Future and the Minister's subsequent July 10, 2023 letter to the IESO outlined a series of policy priorities for the transition of the electricity system, building upon the earlier *2022 Pathways to Decarbonization* report prepared by the IESO.

The Minister prioritized Early Actions to be initiated ahead of completion of this South and Central Bulk Plan based on their urgency and confidence in their need and public benefit. Following the release of *Energy for Generations: Ontario's Integrated Plan to Power the Strongest Economy in the G7*, the Ministry of Energy and Mines consulted on two proposals to prioritize transmission lines ahead of the publication of this Plan. These policy consultations concluded with the government of Ontario issuing Orders in Council under Section 96.1 of the *Ontario Energy Board Act* to declare two transmission lines as priority projects. These lines include:

1. A new 500 kV double-circuit transmission line from Bowmanville towards Toronto[2].
2. Reconductoring a portion of the existing transmission lines from Orangeville TS to Essa TS near Barrie, using advanced conductors.

These Early Actions are reiterated in the recommendations within this Plan, and for the purpose of developing this Plan they were assumed in-service according to their implementation timeline and co-ordination/alignment with other plan recommendations.

[2] This Plan focused on identifying the preferred termination point for this line. See Section 5.2.4.

1.7 Staging of Recommended Actions

The solution development process for this Plan considered timing and forecast certainty of identified system needs. Plan recommendations were categorized into two main categories:

- **Implementation-Ready:** reinforcements required in the near term to enable growth and reliability, or reinforcements required across multiple planning scenarios with clearly defined near-term need dates. Given the typical 5–7-year development lead times for transmission infrastructure, a recommendation to proceed to development and implementation requires immediate commitments to ensure the system is sufficient for meeting these anticipated and relatively certain needs.
- **Future-Consideration:** potential transmission reinforcements linked to longer-term growth, future supply decisions, or emerging policy objectives direction, such as export pathways. While there may be uncertainty related to timing, scope, or level of commitment at this time, drivers and sensitivities to be monitored as well as next steps have been identified to inform future planning, and to ensure commitment decisions, and system readiness as conditions evolve.

1.8 Planning Criteria

The assessments carried out for this Plan were conducted in accordance with applicable reliability standards and criteria, including:

- North American Electric Reliability Corporation (NERC) standards,
- Northeast Power Coordinating Council (NPCC) criteria, and
- Ontario Resource and Transmission Assessment Criteria (ORTAC).

These criteria are used to determine the performance of the bulk power system in the study area under both all-elements-in-service and under various applicable outage conditions. Reliability needs arise when the system cannot meet these criteria.

Detailed criteria, assumptions, and methodological parameters are documented in the supporting appendices.

1.9 Co-ordination with Other Planning Activities

Several other power system planning processes informed the scope and assumptions used in the South and Central Bulk Plan. The development of this plan was closely co-ordinated with the Annual Planning Outlook, eight IRRPs that were either recently completed or active, and two other bulk transmission plans — the Northern Ontario Bulk Study and Eastern Ontario Bulk Plan.

1.9.1 The Annual Planning Outlook

The APO is the reporting vehicle that summarizes bulk system reliability issues that are anticipated to emerge over the next 20 years. Within the APO, a Schedule of Planning Activities provides a snapshot of the IESO’s workplan for priority bulk system transmission plans to be initiated covering a three-year rolling window. If conditions evolve, for example, if generation or demand outlook assumptions change, then the need, scope and/or timing for proposed planning studies may be revised.

This phase of the bulk plan drew from the assumptions defined in the 2025 APO as a starting point, and included adjustments for sensitivities and new information and policy direction that arose during the study period. Details about the APO demand forecast are discussed further in Section 2.

1.9.2 Regional Planning

Co-ordination between this bulk plan and regional plans was approached in different ways, described as follows.

Co-ordination between plan scopes

Both bulk and regional planning consider demand forecasts across similar geographic areas. However, transmission studies for local area infrastructure needs that supplies distribution systems directly and the larger bulk system infrastructure needs typically fall under the different planning processes. Co-ordination between these related planning processes provided a more holistic review of system performance and upgrades required between the upstream bulk system and downstream customer delivery points.

In the Study, bulk and regional planning were delineated by keeping bulk planning focused on the ability to deliver the required power into a new or existing bulk supply point (e.g., 500 kV/230 kV autotransformer station), while specific local supply needs and locational drivers were determined through the relevant regional plan. For example, several regional planning studies determined that local area or regional transmission was needed to supply local growth, which triggered bulk supply needs that were evaluated in the scope of this bulk plan.

Alignment of demand forecast and system assumptions

Both regional and bulk planning rely on system models with long-term demand forecasts to evaluate system needs and make recommendations. While bulk planning draws on the APO demand outlook, regional planning relies on demand forecast information directly from LDCs, informed by local knowledge. Co-ordination between these two demand forecasts provided insights into bulk system needs at a more localized, granular level. This co-ordination also allowed for alignment in resource assumptions, including assumed demand side management savings between the bulk and regional plans.

Co-ordination between bulk and regional solutions

As an integrated grid, system upgrade recommendations from one plan can affect the needs and recommendations in another plan. In some cases, a single reinforcement can resolve needs at both the regional and bulk planning levels. In other cases, a regional planning recommendation triggers a need for a bulk reinforcement, or a bulk reinforcement can open up new options for regional supply. As transmission system reinforcements identified in regional planning can often depend on the availability of upstream bulk system capacity, the timing of bulk system upgrades may be established based on local needs, especially in concentrated high growth pockets, rather than broader provincial or zonal demand. For example, the Toronto Third Line, a high-voltage direct current transmission line that will provide a new bulk supply point into downtown Toronto was recommended in the Toronto

IRRP and assumed as committed in this Plan. This project will supply planned growth and electrification in Toronto while also delivering benefits to the broader bulk transmission system.

Regional plans considered in this Plan include:

- Windsor-Essex
- London Area
- Kitchener-Waterloo-Cambridge-Guelph (KWCG)
- Burlington to Nanticoke
- Chatham-Kent/Lambton/Sarnia
- GTA North (York Region)
- GTA West
- Toronto

1.9.3 Other Bulk System Plans

This Plan was also developed in co-ordination with adjacent bulk system plans, including the Eastern Ontario and Northern Ontario Bulk Plans, to ensure a consistent and integrated assessment of transmission system needs across the province. In particular, the South and Central Bulk Plan focused on transmission capability to deliver power to major load centres such as the GTA, while considerations related to generation development and longer-term transfer capability in adjacent regions are addressed through those respective bulk plans. This co-ordinated approach ensured that planning scopes remained complementary and non-overlapping, while together maintaining a coherent view of system-wide reliability, operability, and future expansion needs.

1.10 Organization of this Plan

This Plan is organized as follows:

- Section 1 provides an overview and the purpose of the Plan, background and the study approach.
- Section 2 details the demand forecast assumptions.
- Section 3 presents the resource assumptions used in the Plan.
- Section 4 details transmission system needs, transfer capabilities and congestion considerations.
- Section 5 provides an overview of the portfolios of transmission reinforcement projects considered to meet the needs of the bulk system.
- Section 6 recaps engagement activities to date and moving forward for the south and central area.
- Section 7 summarizes the recommendations for the south and central area and outlines subsequent planning activities.

2. Demand Forecast

This section describes the electricity demand outlook across the south and central study area over the study period, including the magnitude, location, and timing of projected growth.

In bulk transmission planning, both the scale and location of demand growth are important. Concentrated increases in demand, particularly from large industrial loads, greenhouses, data centres, and electrification in dense urban areas, can significantly impact transmission interfaces and bulk supply capability, even where overall system demand growth appears manageable. As a result, this Plan places particular emphasis on the geographic distribution of demand and its interaction with existing supply points and transmission corridors.

The demand outlook described in this section reflects a co-ordinated view of provincial and regional forecasts, incorporating available information on committed developments as well as potential growth trends. This combined approach ensures that the transmission system is assessed against a realistic range of future conditions and that identified needs reflect both broad system requirements and localized pressures on the grid. The APO electricity demand forecast was used as a starting point. This provincial forecast was augmented by information and locational insights from various regional planning activities across the study area.

2.1 Provincial Demand Forecast Co-ordination and Context

The IESO's APO provides a comprehensive long-term forecast of electricity demand in Ontario and is used as the foundation for bulk transmission planning. The APO reflects a range of possible futures through scenario-based forecasting, incorporating uncertainties related to economic growth, electrification, industrial activity, and public policy direction. This forecast is used to identify provincial resource adequacy needs, inform actions to address those needs, including resource procurement targets, and identify the need for future transmission planning activities.

Given the complexity and time required to prepare transmission system models and to carry out transmission studies, demand forecast assumptions need to be set early in the development of a transmission plan. For the purposes of this Plan, the 2025 APO demand forecast was used as the primary planning basis. While an updated forecast has since been published, the overall direction and magnitude of demand growth remain consistent.[3] The APO forecast was therefore considered an appropriate representation of future provincial electricity demand conditions within the study period. The APO forecast, data tables and supporting methodologies can be found on the IESO website.

However, while the APO provides a robust provincial forecast of electricity demand, bulk transmission planning also benefits from incorporating more detailed, region-specific insights. Incorporating these insights from regional planning processes helps to better capture the location, scale, and timing of

[3] While 2026 APO the reference demand forecast was slightly less than the 2025 APO forecast, the 2025 forecast still falls within the range of uncertainty as expressed through the 2026 APO high- and low-demand scenarios.

demand, which are key factors in assessing transmission system capability. This is especially true for the south and central study area, which is comprised of several load centres supplied by a mix of centralized and distributed generation resources both within the area and into the area from other parts of the province.

2.2 Regional Context for Demand Growth

Regional planning forecasts are developed by LDCs using locally sourced information, including customer connection requests, municipal growth projections, and economic development trends.

These are particularly important for transmission planning, as demand growth is often concentrated in specific locations and driven by large developments. These facilities can introduce significant, localized increases in demand that influence how electricity must be delivered across the transmission system. Unless otherwise stated below, IRRP forecasts were not used directly in the bulk study, given the potential to overestimate aggregate impacts from different forecast assumptions, timelines, and coincidence points across a larger area. Instead, consideration was often given to incorporate recommendations from the various IRRPs into the bulk plan, to ensure upstream bulk needs from these projects are addressed.

The following sections summarize the demand outlook and key growth drivers across the major regions within the study area.

2.2.1 Windsor-Essex Region

Electricity demand in the Windsor-Essex region has experienced rapid growth and is expected to grow significantly over the study period, driven primarily by expansion in the agricultural and greenhouse industries, industrial development, and continued residential and commercial development. The region is characterized by a strong winter peak, reflecting the large number of greenhouse operations that require significant lighting and heating during colder months.

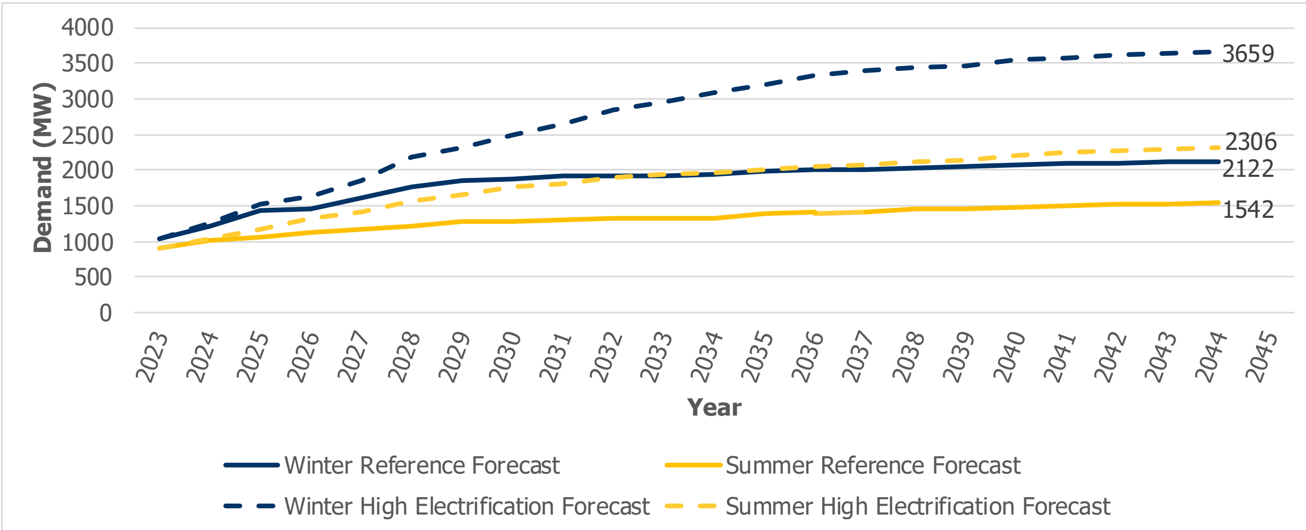
Based on the 2025 Windsor-Essex IRRP forecast, electricity demand is expected to increase substantially over the next 20 years under the reference case, with additional potential upside growth under the high forecast scenario.

Demand growth in this region is concentrated where large customer developments are located. As a result, growth in this region is expected to influence how electricity is delivered into the area and how power flows are distributed across the broader system.

To ensure that the transmission system interfaces were assessed under a range of potential future conditions, higher demand scenarios were considered. Based on the Windsor-Essex IRRP high forecast scenario, an additional 1,300 MW of load was studied in the Windsor-Essex area beyond the 2035 forecasted demand at major bulk supply stations, including Keith TS and Lauzon TS (representing supply to West Essex and Windsor) and Lakeshore TS (representing bulk supply into the region). This sensitivity was studied to assess the capability of the bulk transmission system to accommodate additional future demand in Windsor-Essex.

The IRRP demand forecast for Windsor-Essex is shown in Figure 7.

Figure 7 | Windsor-Essex Region IRRP Demand Forecast



2.2.2 Chatham-Kent/Lambton/Sarnia Region

While co-ordinated regional planning has not been recently completed for the Chatham-Kent/Lambton/Sarnia region, demand growth is expected to occur as a result of industrial activity, electrification, and local economic development. An updated demand forecast will be developed for the next regional planning cycle for this region that will begin in late-2026.

The region includes both significant generation and local demand, which influences how future growth affects the transmission system. In some cases, local supply may help offset increases in demand; however, the location and magnitude of growth remain important factors in determining overall system impacts.

The transmission system interfaces were assessed under a range of potential future conditions, including higher demand scenarios. Based on potential for new developments to emerge in the region, additional load up to 500 MW beyond the 2035 APO demand forecast in the Chatham-Kent/Lambton/Sarnia region was assumed at major bulk supply stations (Lambton TS) to represent a range of potential future connections. This sensitivity was studied to assess the capability of the bulk transmission system to accommodate additional future demand.

2.2.3 London Area Region

The London Area IRRP is currently underway and is expected to be published in Q4 2026. Electricity demand in the London Area is expected to increase significantly over the study period, primarily driven by industrial development and continued residential growth. Near-term demand increases are largely associated with firm customer connections and committed projects, while longer-term growth reflects broader economic expansion and electrification trends.

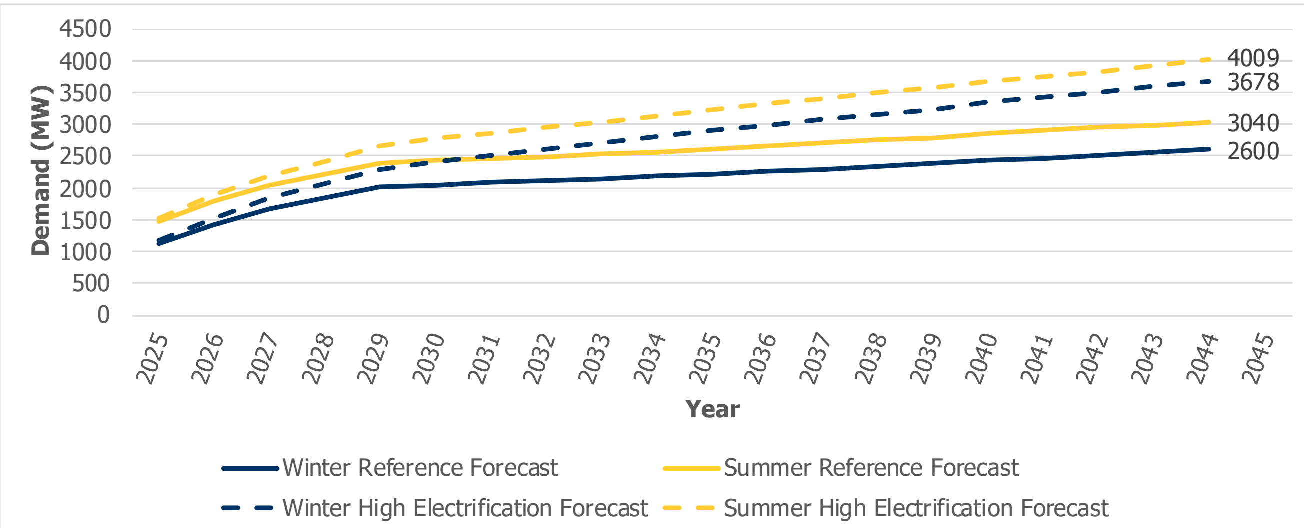
Forecasts indicate sustained increases in both summer and winter peak demand over time. While the region is expected to remain summer-peaking, winter demand growth is also notable as electrification continues to expand.

Demand growth is generally concentrated around established supply areas, reflecting the existing transmission network and key development zones within the region. As a centrally located load centre within the broader study area, growth in the London region can influence how electricity is delivered across multiple parts of the system.

To ensure that the transmission system interfaces were assessed under a range of potential future conditions, beyond the 2035 APO demand forecast was also considered. Based on the potential for additional developments to emerge in the London Area, up to 800 MW of additional load beyond the 2035 APO demand forecast was assumed at major bulk supply stations (Buchanan TS), representing a range of potential future connections. This sensitivity was studied to assess the capability of the bulk transmission system to accommodate additional future demand in the London Area.

The regional demand forecast for the London Area is shown in Figure 8.

Figure 8 | London Region Demand Forecast



2.2.4 Kitchener-Waterloo-Cambridge-Guelph Region

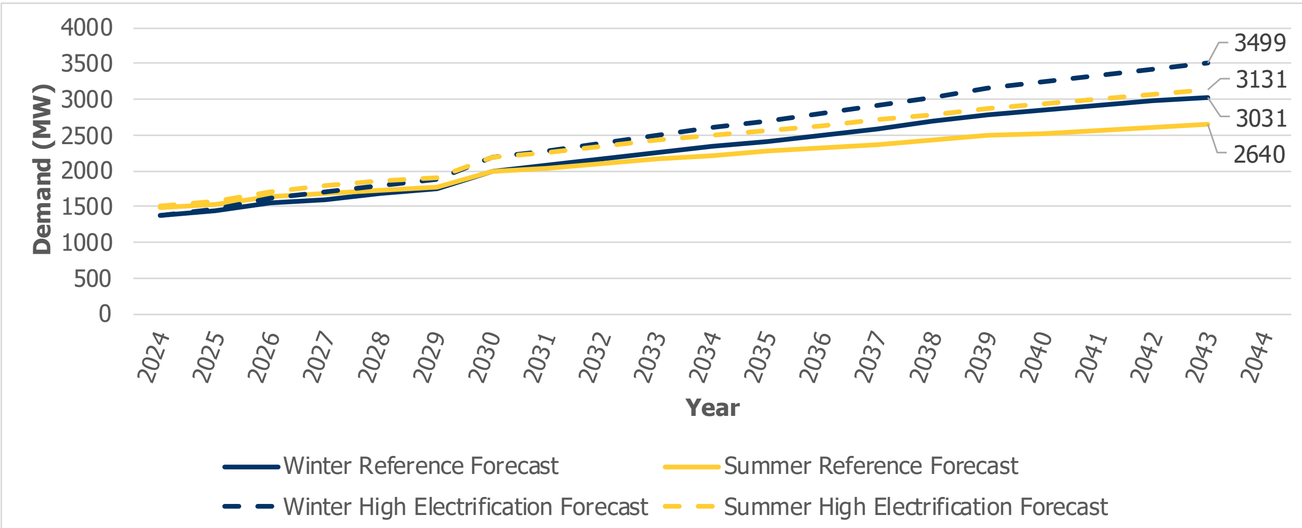
Electricity demand in the KWCG region is expected to grow rapidly over the study period, driven by residential development, industrial expansion, new customer connections, and electrification. Growth is supported by sustained economic activity and development of large-scale projects and increasing adoption of electric technologies across multiple sectors, including heating and transportation.

Regional forecasts indicate strong increases in both summer and winter peak demand, with winter demand growth becoming more prominent over time due to electrification of heating. While there is some uncertainty associated with the timing and scale of large customer developments, overall demand growth in the region is expected to be substantial.

To ensure that the transmission system interfaces were assessed under a range of potential future conditions, higher demand scenarios were also considered. Based on the potential for additional developments to emerge in the KWCG region, an additional load of 1,300 MW beyond the 2035 APO forecast was assumed in the KWCG area at major bulk supply stations (Detweiler TS). This sensitivity was studied to assess the capability of the bulk transmission system to accommodate additional future demand in KWCG.

The IRRP demand forecast for the KWCG region is shown in Figure 9.

Figure 9 | KWCG Region IRRP Demand Forecast



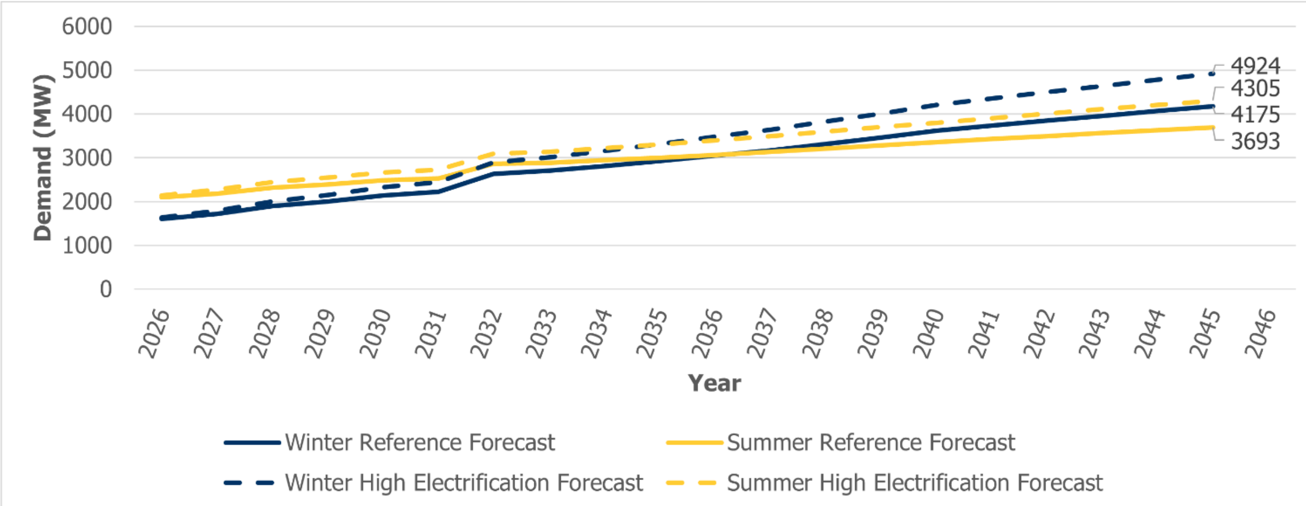
2.2.5 Burlington to Nanticoke Region

Electricity demand in the Burlington to Nanticoke region is expected to increase over the study period, driven by industrial expansion, residential development, and broader decarbonization initiatives. Based on the findings of the 2024 Burlington to Nanticoke IRRP, growth rates vary across the region, with stronger increases in areas experiencing industrial and community development. Demand is forecasted to increase by approximately 50 per cent in Brant, 80 per cent in Hamilton, and up to 180 per cent in Caledonia-Norfolk by 2042. This region will continue to be evaluated and assumptions updated as part of the Hamilton Addendum to the Burlington to Nanticoke IRRP and the Niagara Bulk Plan.

To ensure that the transmission system interfaces were assessed under a range of potential future conditions, higher demand scenarios beyond the 2035 APO demand forecast were considered. Based on potential developments in the region, 1,400 MW of additional load in the Hamilton subregion and 1,500 MW in the Nanticoke subregion beyond the 2035 APO demand forecast were assumed at major bulk supply stations (Beach TS and Nanticoke TS, respectively).

The regional demand forecast for the Burlington to Nanticoke region is shown in Figure 10.

Figure 10 | Burlington to Nanticoke Region Demand Forecast



2.2.6 GTA North (York Region)

Electricity demand in GTA North is expected to grow rapidly over the study period, driven by new customer connections, population growth, economic development, electrification, and strong interest from large electricity consumers such as data centres. An IRRP was completed for GTA North in October 2025, with the regional forecast indicating substantial increases in both summer and winter peak demand. Growth is particularly concentrated in areas north of existing urban development, where transmission infrastructure is more limited.

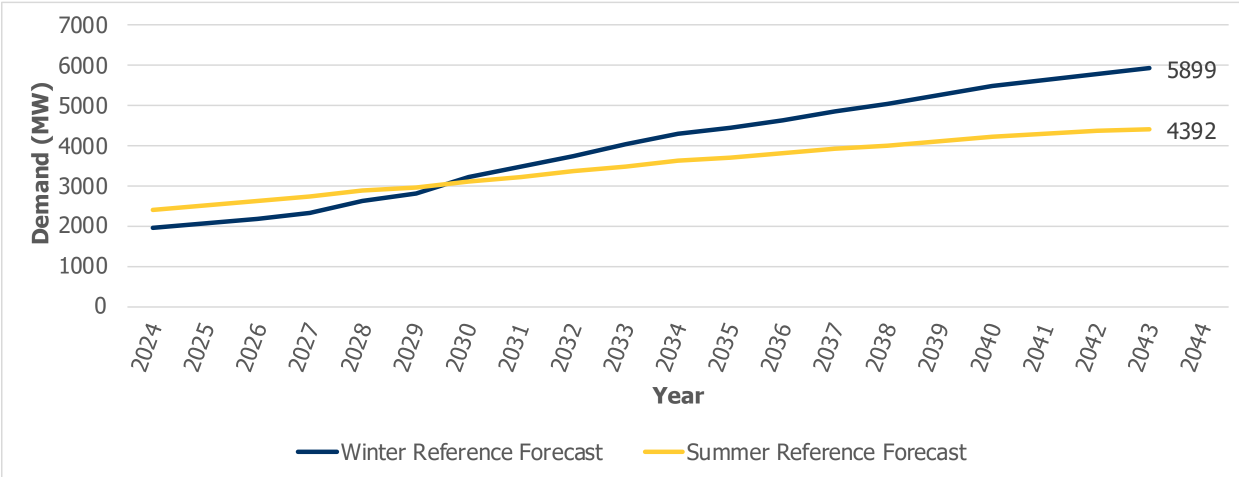
Because LDCs had developed the forecast by adopting municipal and regional targets related to employment, population and electrification, different forecast scenarios were not developed by the participating LDCs. Instead, the IESO used the summer peak demand forecast as the reference case, and the winter peak demand forecast represented a potential higher-growth sensitivity case, as it relied on customer behaviour and technology uptake which has not yet been observed.

The spatial distribution of growth presents a key planning consideration, as new development is occurring further from existing infrastructure, increasing reliance on bulk supply to enable expansion of the regional system. A significant amount of new development is anticipated in the northern sections of York Region, where there is limited existing transmission infrastructure.

The bulk study did not directly apply any regional forecast assumptions used in the IRRP, instead relying on the aggregate bulk system forecast assumptions already described in Section 2.1. Instead, alignment between these two processes was carried out by assuming regional transmission upgrades already recommended through regional plans in the base bulk system model, as described in Section 1.9.2. This allowed for the bulk system implications of regional upgrades to be evaluated, ensuring that recommendations from both levels of planning were fully aligned.

The demand forecast for the GTA North IRRP is shown in Figure 11.

Figure 11 | GTA North Region Demand Forecast



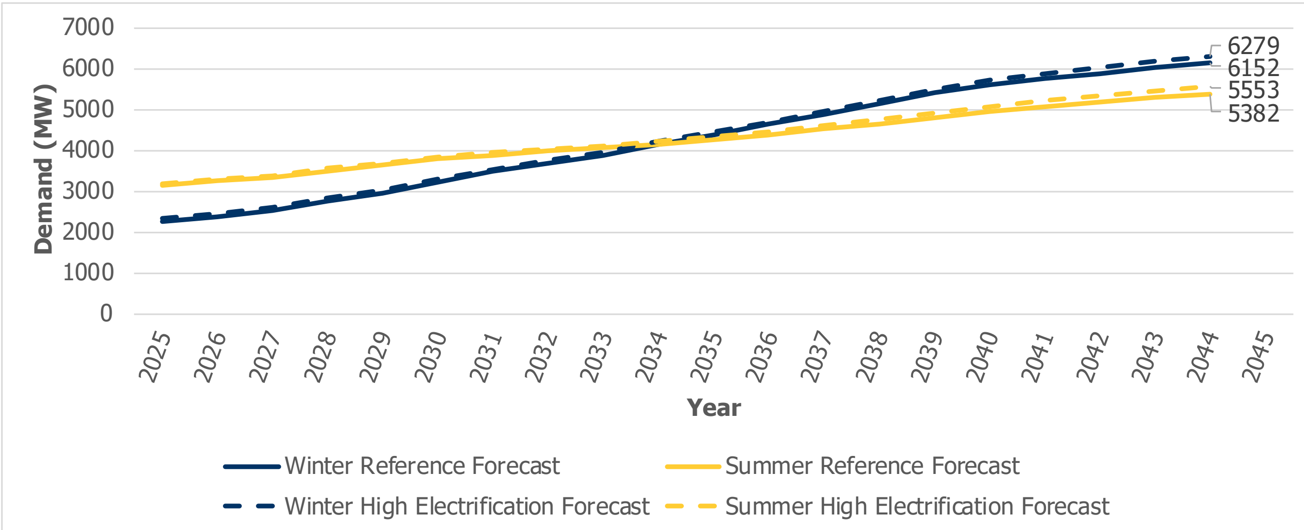
2.2.7 GTA West Region

Electricity demand in the GTA West region is expected to increase significantly over the study period, driven by residential, commercial, and industrial development, as well as ongoing electrification. Growth in the region is influenced by expanding urban areas, industrial corridors, and major infrastructure developments such as transportation hubs. Expected developments include major new community-scale mixed use developments in Mississauga, Brampton, Milton and Caledon with high-rise residential and commercial areas planned throughout the region, expansion of Pearson International Airport, new hospital load, and electrification of both transportation and buildings. As the demand is distributed across multiple developing areas, evolving patterns of electricity use may evolve over time.

Regional planning work for this area is ongoing, with an IRRP currently under development. The South and Central Bulk Plan aligns with the regional study by accounting for anticipated system updates to be recommended to meet local customer demand. This ensures that the upstream bulk system will be able to supply the necessary capacity to these upgrades without risking system reliability.

The demand forecast for GTA West is shown in Figure 12.

Figure 12 | GTA West Region Demand Forecast



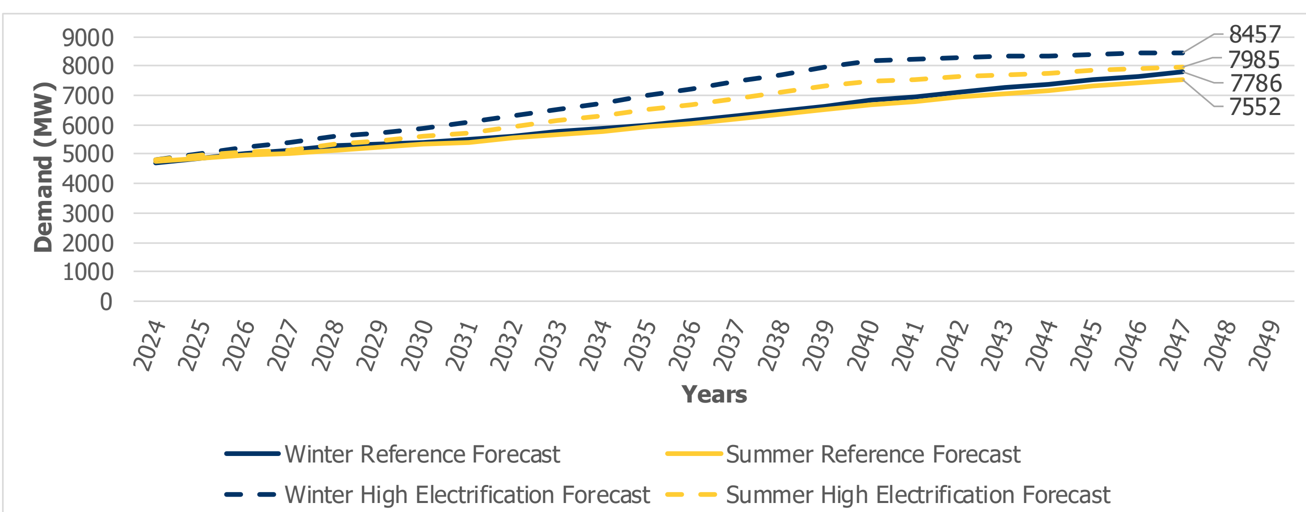
2.2.8 Toronto Region

The main drivers of forecasted demand growth in the Toronto region, comprising City of Toronto boundaries, are population growth, economic development, new community developments, and electrification. Additionally, Toronto is an area of high interest from large load connections including data centres. A high electrification scenario was developed for the Toronto IRRP to reflect the impact of data centres and higher rates of vehicle and building electrification driven by the City of Toronto's net-zero by 2040 strategy.

Regional demand forecasts provided key insights into the scale and timing of growth in the city, which were used to inform the transmission system assessment.

The Toronto IRRP demand forecast is shown in Figure 13.

Figure 13 | Toronto Region Demand Forecast



3. Resource Assumptions

This section describes the electricity supply resources assumed in the South and Central Bulk Plan and the key characteristics of generation resources that influence the performance of the transmission system. Together with the demand outlook described in Section 2, these assumptions form the basis for assessing system capability, identifying transmission needs, and evaluating potential reinforcement options.

The resource assumptions used in this Plan are aligned with the IESO's APO and reflect existing generation, committed resources, and known government policy direction at the time of study. Where appropriate, additional assumptions were applied to represent longer-term developments and to assess system performance under a range of potential future conditions.

In addition to defining the available supply, this section also describes how different resource types are assumed to behave under the planning conditions used in the study, including their location, operating characteristics, and contribution to meeting system demand. These factors are important for assessing power flows across the transmission system and the ability to reliably deliver electricity to major load centres.

3.1 APO Context

The APO provides a consistent provincial outlook on electricity supply and demand and serves as the foundation for transmission planning in Ontario. It reflects the best information available on existing generation, committed resources, and expected system conditions, and is updated regularly to reflect evolving economic and policy drivers.

For this Plan, resource assumptions were based on the 2025 APO, with adjustments made where necessary to reflect updated information and study-specific considerations. This approach ensures consistency with provincial planning while allowing for appropriate representation of resource characteristics relevant to the south and central Ontario transmission system.

The supply assumptions underpinning the APO reflect existing resources through the end of their contract term, as well as resources committed through IESO procurements or established government policy at the time of development. Nuclear and hydroelectric generation continue to represent a significant portion of the base supply mix. By the mid-2030s, a substantial portion of currently contracted resources, particularly natural gas-fired generation in the GTA, are expected to reach the end of their contract terms, which influences the overall supply outlook considered in this Plan.

The Plan considered a range of existing, committed, and potential future resources that could realistically serve south and central Ontario, both to replace resources that may no longer be available in the future and to supply forecast demand growth. Future resource assumptions were based on the APO planning assumptions.

3.2 Supply Assumptions Used in the Plan

For the purposes of this Plan, the supply outlook reflects both existing generation resources and future resource developments relevant to the assessment of the transmission system. These assumptions are important because the location and operational characteristics of new resources influence interface flows and the capability of the system to deliver electricity to load centres.

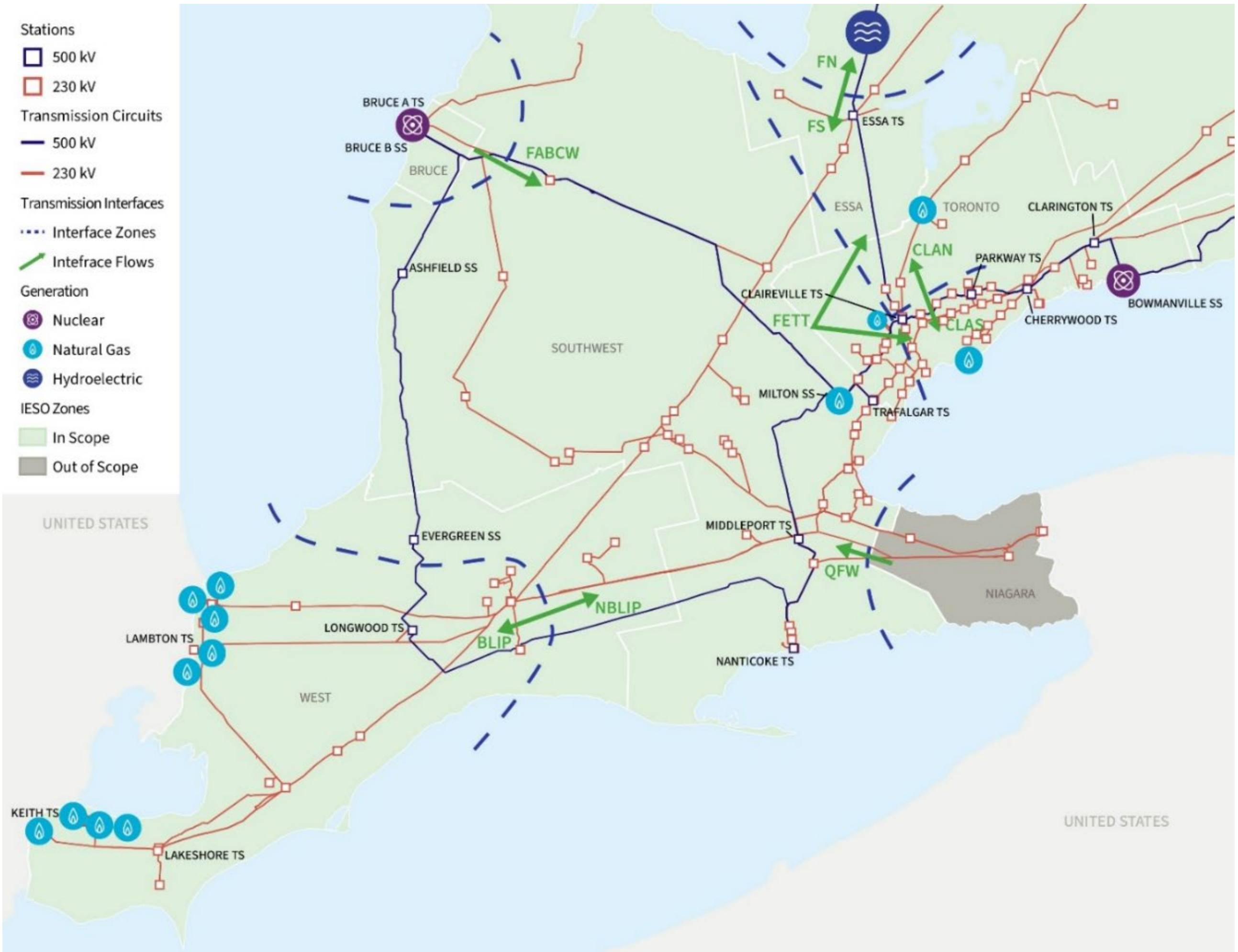
Over the last decade, prevailing power flows on the bulk system have been east toward the GTA, driven by gas generation located in Sarnia–Lambton and nuclear generation at Bruce NGS. Power has also historically flowed west from Darlington NGS toward the GTA. However, with changing demand patterns across southwestern Ontario and the potential development of new resources across the province, power flows are expected to become increasingly bi-directional as new load centres and generation sources emerge.

To establish required transfer capabilities and assess transmission system performance, this Plan used resource assumptions aligned with the 2025 APO for the 2035 forecast. Existing and committed generation resources were modeled in accordance with the IESO's Transmission Security Outlook Methodology and applicable provincial policy direction. These assumptions were used to assess the performance of the bulk transmission system under a range of credible future conditions.

For the congestion assessments work described in Section 4.3, an energy modeling approach was applied using PLEXOS economic dispatch model. The resource modeling framework for this work is aligned with the energy assessments method outlined in the 2025 APO Resource Adequacy and Energy Assessments Methodology document.

The geographic distribution of generation resources across the study area is shown in Figure 14.

Figure 14 | Geographic Distribution of Generation Resources in the Study Area



3.2.1 Nuclear Generation

Nuclear generation represents a significant portion of Ontario's supply mix and is treated as a firm, baseload resource in transmission planning studies. Due to its high capacity and continuous operation, nuclear generation has a strong influence on power flows across the bulk transmission system.

Major nuclear facilities relevant to the study area include the Darlington NGS, Bruce Power site, and Pickering NGS. These facilities serve as key sources of supply to major load centres and drive large-scale transfers of electricity across the system.

Existing nuclear units were modeled in accordance with their planned refurbishment schedules and assumed continued operation. In addition, new nuclear generation was incorporated into the study assumptions, including SMRs at Darlington NGS and potential future expansion at the Bruce Power site.

Consistent with provincial policy, four SMRs were assumed at the existing Darlington NGS. The first SMR was assumed to begin operation by 2029 and the remaining SMRs were assumed to be in-service by 2035.

The four SMRs were assumed to connect into the 500 kV Bowmanville SS as outlined in the IESO report *Connection Approach for Small Modular Nuclear Reactors at the Existing Darlington Nuclear Generation Station*, published in 2024.

Additionally, this study assessed a planning scenario including up to 4,800 MW of new nuclear generation from the proposed Bruce Power's Bruce C project at the existing Bruce Power site. Although Bruce C is a longer-lead time potential resource, not expected to be in service until at least 2040, this Plan assessed the Bruce C project to identify the required transmission for deliverability of the resource.

All Pickering B units were assumed to return to service following their refurbishments, while all Pickering A unit were assumed to shut down in alignment with APO timeline assumptions.

3.2.2 Natural Gas-Fired Generation

Natural gas-fired generation provides dispatchable and flexible supply that supports system reliability, particularly during peak demand conditions and periods of reduced availability of other resources.

For the purposes of this Plan, gas-fired generation facilities were modeled in alignment with APO assumptions, with resources assumed to be available through the duration of their existing contracts. Where necessary to represent realistic system conditions, additional assumptions were applied to reflect the continued availability of key resources that support system operability. New gas generation was not assumed in the base assumptions for this Plan, unless it had been committed to at the time the study assumptions were developed.

Gas-fired generation is located primarily in southwestern Ontario, including the Sarnia–Lambton area, and within the GTA. Its contribution to the transmission system varies depending on its location and dispatch. Generation in southwestern Ontario has historically supported eastward power flows toward major load centres, while gas-fired resources within the GTA contribute to meeting local demand and reducing reliance on transfers from other regions.

As demand patterns evolve and new resources are introduced, the role of gas-fired generation in influencing transmission flows may also change. These dynamics are reflected in the system conditions assessed in this Plan. The GTA currently has four major gas-fired generation plants that directly support local supply needs and broader bulk system demand: Halton Hills Generation Station (GS); Sithe Goreway GS; York Energy Centre; and Portlands Energy Centre. All four facilities' contracts are scheduled to expire before summer 2035 and would normally have been assumed out of service for this bulk system study. However, over the course of the 2025 GTA North (York Region) IRRP process, local stakeholders indicated a strong preference to pursue long-term supply options for northern York Region that minimized the need to convert land from agricultural to transmission use. As a result, the longer-term supply assumptions in this Plan for northern York Region include continued availability of local dispatchable generation to support reliability and operational flexibility under a range of future system conditions. For the purposes of transmission system studies, the Plan assumed continued availability of York Energy Centre.

Table 4 | GTA Gas Generation Operation Assumptions

Facility	Size	Operation assumption in 2035 base model
Halton Hills GS	746 MW	Out of service
Sithe Goreway GS	919 MW	Out of service
York Energy Centre	464 MW	In service
Portlands Energy Centre	613 MW	Out of service

Gas-fired generation facilities in the southwestern Ontario also have the potential to impact local reliability and bulk system capacity. Facilities are assumed to come out of service following the expiry of existing contracts, consistent with assumptions in the APO.

3.2.3 Wind, Solar, and Distributed Energy Resources

Wind, solar, and distributed energy resources (DERs) are represented in this Plan in accordance with APO assumptions and form an increasing share of Ontario's electricity supply mix. These resources are generally non-dispatchable and exhibit variability depending on weather conditions and time of day.

The contribution of these resources varies across operating conditions, with output levels influenced by environmental factors. While their availability during peak demand periods may be uncertain, they are included in the analysis to reflect their contribution to overall system supply and their impact on system operation under a range of conditions by assuming their effective capacity contribution. Hourly simulations done for energy modeling assume renewable resource output based on median hourly profiles.

The location of renewable generation influences transmission system performance, particularly in areas with higher concentrations of wind and solar resources.

3.2.4 Demand-Side Resources

Demand-side resources, including demand response, energy efficiciency and managed electric vehicle charging are incorporated into the demand forecast in accordance with APO assumptions. These resources reduce overall system demand and can influence system loading under certain operating conditions such as during peak demand periods.

For the purposes of this Plan, demand-side resources are represented as a reduction in demand rather than as standalone supply-side resources. Their contribution is therefore embedded within the demand assumptions used for transmission system analysis.

While demand-side resources can affect the magnitude and timing of system demand, their impact on transmission system performance is evaluated through the demand forecast applied in this Plan.

3.2.5 Energy Storage

Energy storage resources, including battery energy storage systems and pumped storage, are considered as part of the supply outlook where relevant to the study assumptions. These resources provide operational flexibility by shifting energy across time periods and supporting system balancing under varying demand and generation conditions.

The operation of storage resources, including charging and discharging behaviour, can influence transmission system flows depending on system conditions. In periods of high demand, storage can contribute to supply, while during lower demand periods it may increase system loading through charging.

Where applicable, storage resources were included in the analysis to represent their potential impact on system performance, with the facilities assumed in accordance with APO assumptions.

Pumped Storage

The Plan assessed the potential for the Ontario Pumped Storage Project to connect in the Bruce area as a sensitivity case due to the size of the facility, reflecting the general uncertainty around the development of this long-lead time resource.

3.3 Resource Mix Characteristics Relevant to Transmission

The location and operating characteristics of generation resources influence how electricity flows across the bulk transmission system. In south and central Ontario, several major sources of supply are geographically separated from key load centres, resulting in significant transfers of electricity across the network.

Large baseload generation, particularly from nuclear facilities in the Bruce and Eastern Ontario regions, drives sustained transfers toward high-demand areas such as the GTA. Dispatchable resources, including natural gas-fired generation, can influence these flows depending on their location and operation, while variable renewable generation introduces additional variability under different system conditions.

Together, the demand and resource assumptions described above establish the system conditions used to evaluate transmission system performance and identify bulk system needs in the following section.

4. Transmission System Needs

This section presents the transmission system needs identified in the Study. These needs are based on the demand and resource assumptions described in Sections 2 and 3.

The needs identified in this section represent conditions where the transmission system does not meet applicable planning criteria or where limitations in transfer capability restrict the efficient use of available resources. System performance was evaluated using two complementary types of analysis: **reliability** assessment and **congestion** assessment.

- The reliability assessment evaluated whether the transmission system meets applicable reliability standards and planning criteria (NERC standards, NPCC criteria and ORTAC) under both system intact conditions and contingency (outage) scenarios. Details on planning criteria are provided in Appendix A. The assessment considered thermal loading, voltage performance, and system operability to identify conditions where the system does not meet required performance standards.
- The congestion assessment evaluated limitations in transfer capability that may restrict the efficient utilization of available generation under expected operating conditions. While congestion cannot be eliminated, it can increase overall system costs and system losses by limiting access to lower-cost generation. These impacts were assessed using production cost simulations that account for transmission constraints over time. The results help identify where transmission reinforcements may improve system efficiency by reducing congestion and associated costs.

4.1 Process for Needs Identification

The needs identification process evaluated the timing and magnitude of required transmission capability under the demand and supply assumptions.

The analysis used the 2035 base case reflecting APO demand forecasts, planned transmission facilities, and resource assumptions. System performance was then assessed using:

- **Power flow and contingency analysis** to identify reliability needs, which are evaluated against established planning criteria[4] and are generally pass/fail conditions.
- **Production cost simulations** to identify congestion-related system limitations, which arise when transmission constraints prevent more economic generation from being fully utilised, resulting in increased system operating costs and inefficiencies.

Short-circuit limitations were also evaluated as part of solution development (Section 5.1), but not as a primary driver of initial needs identification.

[4] Details about required system performance and planning criteria applicable to Bulk Transmission Studies are provided in Appendix A.

Close co-ordination and alignment with regional planning-informed demand growth assumptions and allowed for a more comprehensive review of system needs by considering both bulk system capability and local infrastructure needed to deliver power to customers. Additional details on the regional planning processes affecting these load centres, and how local demand forecasts have been integrated into these bulk system assessments is described in Section 2.2.

4.2 Reliability Needs by Area

The transmission system needs are presented by major system areas. Each need is associated with a specific transmission interface or facility and is based either on detailed assessment of system performance as described in Section 4.1 or a system need that has been identified through previous regional planning activities. Regional needs have not been reassessed in the scope of this Plan and are assumed here for the purpose of identifying bulk system needs triggered by them.

Figure 15 shows the major interfaces and generation resources considered and impacted based on the objectives of the South and Central Bulk Plan across all modules that are referenced in throughout this section. The subsections that follow describe the system needs in terms of observable system limitations, policy and regional planning drivers.

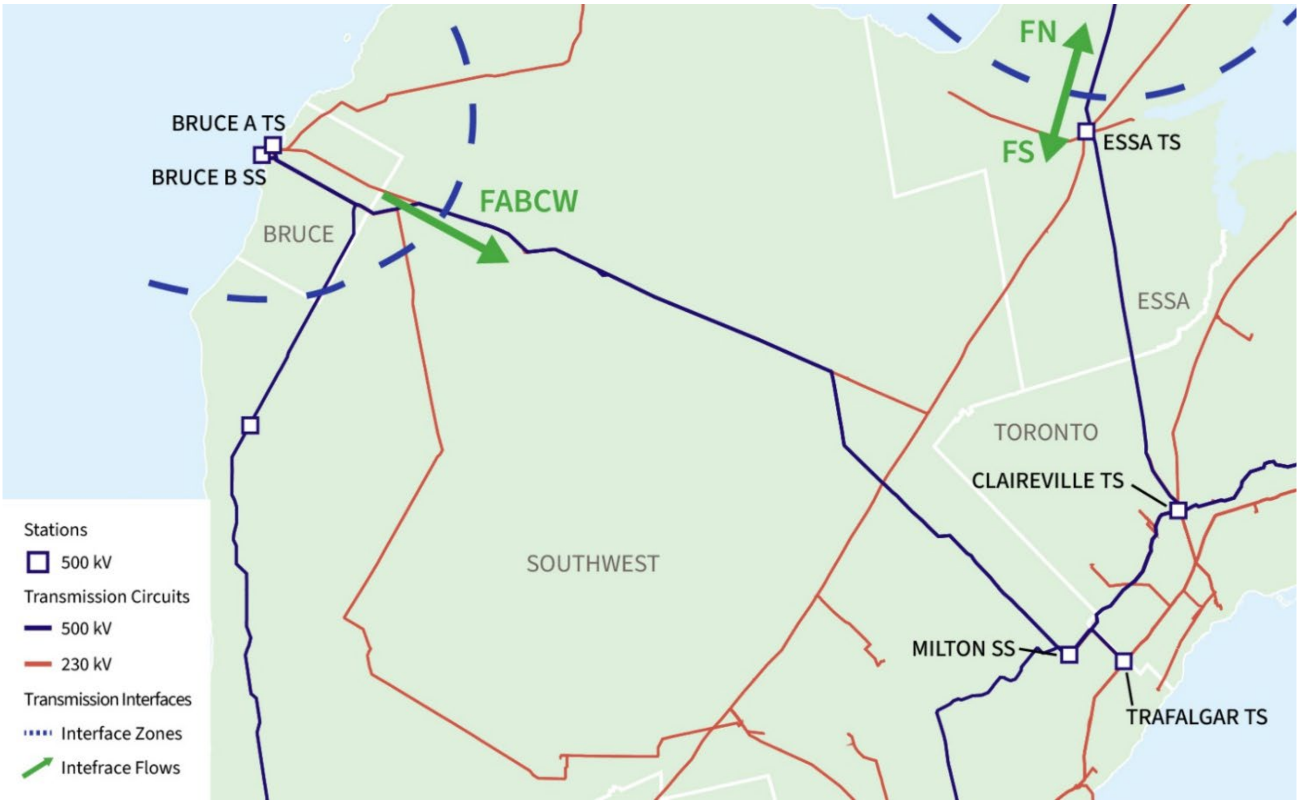
Figure 15 | Major Interfaces and Generation Considered in This Study

4.2.1 Bruce Area

The Bruce area is a major source of generation in the system and plays a key role in supplying load centres in southwestern Ontario and the GTA. Under conditions of high generation output, significant power transfers occur across transmission interfaces connecting the Bruce area to other areas of the province. This Plan assessed the transmission requirements needed to fully deliver output from an expanded Bruce NGS (Bruce C). The key interfaces relevant to this area, shown in Figure 16, are:

- Flow Away from Bruce Complex and Wind (FABCW).
- Flow North (FN) and Flow South (FS) from the perspective of determining the impacts of transmission reinforcements as they overlap with the Northern Ontario Bulk Study.

Figure 16 | Major Interfaces in Bruce Module



The Study first considered the capability of the existing transmission system, with the Bruce A and Bruce B switching stations electrically connected under normal operating conditions. The second stage of the analysis considered an alternative operating configuration with Bruce A and Bruce B electrically separated to alleviate short circuit limitations. In both stages, the generation at Bruce C could not be fully dispatched while also respecting the limitations on the FABCW transmission interface, resulting in system needs for this area.

4.2.1.1 Capability of the Existing Transmission System to Deliver Power from Bruce

The ability to transfer generation from the Bruce Power site is limited by transmission constraints at multiple points in the 500 kV network within the Bruce, GTA, and West zones. To determine the maximum amount of generation that could be transferred out of the Bruce complex, demand was increased at two major bulk supply stations, Claireville TS in the GTA and Longwood TS in the West, while incrementally increasing new supply from the Bruce NGS through the Bruce A and Bruce B transmission switching stations until limitations were reached.

The transmission system reaches its allowable limits under contingency conditions. Thermal overloads were observed on 500 kV circuits between Milton SS and Claireville TS and between Bruce A and Bruce B, and voltage limitations were observed at Longwood TS.

These constraints limit the transfer capability away from the Bruce Power site to approximately 9,000 MW and 11,000 MW, depending on generation dispatch and system conditions and with all elements in service. Under outage conditions, transfer capability would be reduced below this level.

This level of transfer capability is insufficient to accommodate approximately 12,000 MW of generation output under the Bruce C development scenario assessed in this study.

This limitation restricts the ability to transfer additional nuclear generation from the Bruce area to load centres and indicates a need to increase transmission capability from the Bruce transmission zone.

4.2.1.2 Short-Circuit Limitations at Bruce Switching Stations

The addition of new generation at the Bruce Power site increases fault current levels at the Bruce A and Bruce B transmission switching stations beyond the allowable ratings of the existing station equipment. Short-circuit levels exceed the interrupting capability of station equipment, preventing the full integration of additional generation in the existing configuration where Bruce A and Bruce B are electrically connected.

While opening the bus tie could potentially alleviate the short circuit constraint, it would further reduce the total amount of generation that could be delivered out from the Bruce NGS to between 7,000 MW and 10,000 MW, depending on generation dispatch and load conditions. The limiting factors did not change compared to in the previous assessment.

This limitation further constrains the ability to connect and operation new nuclear generation at the Bruce Power site and represents a bulk system need to increase transfer capability from the Bruce transmission zone while addressing short circuit constraints.

The options to address these needs are reviewed in Section 5. They included new 500 kV circuits to Longwood TS and Essa TS to enable transfer of supply from the Bruce Power site to major load centres in the GTA and southwestern Ontario.

4.2.2 Southwestern Ontario

Southwestern Ontario is a major load region that relies on bulk power transfers from the broader transmission system, as well as local supply within the region. Under peak demand conditions, increasing load and generation patterns result in high power flows across key interfaces and transmission corridors supplying the region.

Transmission system needs in southwestern Ontario are sensitive to system assumptions related to the size and location of future load connections affecting electricity demand, as well as the location of new generation resources. There is also significant customer interest to locate new large step loads in load centres throughout the area. These types of loads concentrate large changes in demand at a single location, in contrast to organic load growth that is more distributed and gradual.

4.2.2.1 Key Interface Capabilities and Needs in Southwest Ontario

Power generally flows from west to east, toward the GTA load centre; however, the direction of power flow across some interfaces can reverse depending on system loading and generation dispatch. This is particularly true for the areas west of London (i.e., west of Buchanan TS), as Windsor-Essex remains a large load centre while the Lambton–Sarnia area hosts a large amount of dispatchable generation.

Major transmission interfaces in southwestern Ontario can constrain generation dispatch and/or load growth under certain system conditions. Additional generation in the southwest has the potential to further stress these interfaces, while new customer demand sited close to sources of generation can help offset these issues by reducing the amount of power transferred across an interface. Significant load growth sited directly at or near an interface can degrade the interface performance.

The key southwest interfaces,[5] shown in Figure 17, are:

- Buchanan Longwood Input (BLIP) and Negative Buchanan Longwood Input (NBLIP);
- Flow Away from Bruce Complex and Wind (FABCW);
- Queenston Flow West (QFW);
- Flow Away from Lambton-Sarnia (FALS); and
- West of Chatham (WOC).

[5] As defined in APO's module: Overview of Ontario's Transmission Interfaces

Figure 17 | Major Interfaces in Southwestern Ontario

The BLIP/NBLIP interface is a two-way interface between the West and Southwest transmission zones. Comprising this interface are three 500 kV circuits connecting into the Longwood TS and five 230 kV circuits into Buchanan TS near the city of London. BLIP transfer capability is important for supplying the demand in the West zone and facilitating exports from Ontario to Michigan. NBLIP transfer capability is important for delivering supply to the Southwest zone as well as delivering power imported from Michigan to the rest of the province. Both BLIP and NBLIP transfers are generally thermally limited by the transmission circuits to the west of Buchanan TS that form part of the FALS interface. The area west of the BLIP/NBLIP interface is commonly referred to as the "West of London" system. The transmission system in this area has generally been designed to accommodate both high BLIP flow and high NBLIP flows.

The FABCW interface (as defined in Section 4.2.1.1) is not normally limited when all transmission facilities are in-service and under outage conditions; today they are effectively managed through the Bruce Remedial Action Scheme even under multiple transmission outages conditions.

The QFW interface is comprised of four 230 kV circuits out of Beck 2 TS and three 230 kV circuits into Middleport TS that connect the Niagara and the Southwest transmission zones. QFW transfer capability is important for delivering supply from Niagara and imports from New York at Niagara to the rest of the province. QFW transfers can be thermally limited at times, but they are not expected to be restrictive under typical conditions, such as during normal weather conditions when all transmission elements are in service. QFW flows are important because the flow across the QFW interface can impact the capability across both the NBLIP and FABCW interfaces.

Two additional sub-zonal interfaces are important for power flows within the West transmission zone: FALS and WOC. The FALS interface includes two 230 kV lines from Lambton TS to Longwood TS, two 230 kV lines from Scott TS to Buchanan TS, three 230 kV lines from Lambton TS to Chatham SS, and one 230 kV line from Lambton TS to Clay Creek SS. The FALS interface can limit the amount of generation output from Lambton-Sarnia. The WOC interface includes the six 230 kV lines from Chatham SS to Lakeshore TS and the one 500 kV line from Longwood TS to Lakeshore TS. These transmission lines can limit power supplied to Windsor-Essex.

While the system needs were studied for all planning system conditions and events, to determine transfer limits for the energy modelling, the interfaces were studied with all transmission elements in-service (see Section 4.3). Among these five interfaces, NBLIP and FALS are the most limited – both in terms of today's flows and the ability to accommodate future demand growth under different generation scenarios – in particular, during high generation dispatch in the West transmission zone. These limitations are exacerbated by load growth in the southwest, especially in the London area (modeled at Buchanan TS). Table 5 summarizes the interface limits for NBLIP and FALS under the 2035 base case forecast. NBLIP flows are limited to 1670 MW and FALS flows are limited to 2630 MW, with all transmission elements in-service. Both interfaces were determined to be constrained due to thermal violations observed on the 230 kV circuits west of Buchanan TS.

Table 5 | NBLIP/FALS Interface Limits (All Transmission Elements In-Service)

Interface	2035 Interface Limit (MW) at Base Case	2035 Interface Limit (MW) with +200 MW at Buchanan TS
NBLIP	1,670	1,210
FALS	2,630	2,600

The sensitivity of these interfaces to demand growth in the London area, as modelled at Buchanan TS, are also shown in Table 5. To assess the sensitivity, a 200 MW load increase at Buchanan TS relative to the 2035 base case reduces the NBLIP interface capability from 1,670 MW to 1,210 MW. The same load increase assumption at Buchanan TS reduced the FALS interface capability from 2630 MW to 2600 MW, meaning the FALS interface is largely unaffected by growth at Buchanan TS. Based on the present-day capability of NBLIP which is thermally limited to 1,600 MW with all elements in-service, demand growth in the London area would be constrained to only 30 MW above the 2035 forecasted demand. Outage conditions would be more restrictive. This represents a material need for transmission reinforcement to increase the capability of the NBLIP interface to accommodate demand growth past 2035 in the London area. The transmission reinforcements evaluated to address NBLIP are presented in Section 5.

4.2.2.2 Windsor-Essex Region

As introduced in Section 2.2.1, electrical demand in the Windsor-Essex region has been increasing steadily and this trend is expected to continue, especially during the winter. To date, near-term measures such as Remedial Action Schemes and targeted eDSM, and medium-term transmission reinforcements are being implemented to accommodate demand growth. These transmission system investments include the planned 500 kV single-circuit line between Longwood TS and Lakeshore TS and the planned 230 kV double-circuit line between Lakeshore TS and Lauzon TS.

This Plan considered longer-term supply capabilities into the Windsor-Essex region under winter peak demand conditions. Two separate growth scenarios were assessed: load growth concentrated at Lakeshore TS representing bulk supply into the region; and load growth concentrated at Lauzon TS and Keith TS representing bulk supply further west within the County of Essex and the City of Windsor.

Lakeshore TS is the main bulk supply point into the region, which currently has six 230 kV circuits connecting it to Chatham SS and a 500 kV circuit from Longwood TS under development. In addition to power flow continuing to Keith TS and Lauzon TS, there are 230 kV radial supply lines connected to Lakeshore TS. When the load growth in the region is assumed at Lakeshore TS instead, post-contingency thermal violations are observed between Chatham SS and Spence SS at 240 MW beyond the APO’s 2035 demand forecast with the new 500 kV supply into Lakeshore TS out of service. This signals a future need dependent on the location, magnitude, and timing of load growth in the Windsor-Essex region, which will continue to be monitored through the regional planning process.

Within the region, bulk power is transferred further west to Keith TS and Lauzon TS at 230 kV via four existing circuits and the two future circuits from Lakeshore TS. Both stations step power down to 115 kV and have their own dual-element spot networks (DESNs) for local supply. Keith TS is also an interconnection point between Ontario and Michigan. With one circuit between Lakeshore TS and Keith TS out of service, power transfer from Lakeshore TS into Lauzon TS and Keith TS is limited to 690 MW beyond the APO’s 2035 demand forecast due to thermal violations between Keith TS and Lakeshore TS following the loss of two circuits between Lakeshore TS and Lauzon TS.

The options to address this need are discussed in Section 5. Since bulk supply into Lakeshore TS was the more limiting phenomenon, options to increase the supply into Lakeshore TS were explored first. The Lakeshore TS 230 kV switchyard is physically constrained, whereas the 500 kV switchyard has been designed to accommodate future terminations; thus, options for a new 500 kV supply into Lakeshore TS were considered more technically feasible. The studied options are:

1. 500 kV single-circuit transmission line between Longwood TS and Lakeshore TS; and
2. 500 kV single-circuit transmission line between a new autotransformer station – St. Thomas TS – and Lakeshore TS.

4.2.2.3 Chatham-Kent/Lambton/Sarnia Region

Based on anticipated connections in the Sarnia area, bulk transfer into Sarnia was assessed with Lambton TS representing the bulk supply point for Sarnia. Lambton TS connects to Longwood TS, Chatham SS, and Scott TS, all at 230 kV and has its own DESN for local supply. Critically, Lambton TS has two interconnection ties to Michigan and connects to local generation resources.

This is a strong load centre with ample local generation to help meet load growth up to the 500 MW transfer tested beyond the 2035 forecast. During an outage to the 500 kV circuit between Nanticoke TS and Longwood TS, there are some violations outside of the load centre that are addressed for the KWCG and London Area regions.

As a result, bulk transmission reinforcements into the Chatham-Kent/Lambton/Sarnia region were not assessed further in the South and Central Bulk Plan. However, co-ordinated regional planning for this region will kick off later this year.

4.2.2.4 London Area Region

Since the London Area is connected right to the circuits forming the BLIP/NBLIP interface, incremental growth here disproportionately stresses this interface, which is already at times operating at or near its capability. As a result, capability of the system to reliably supply incremental demand growth in the London area is limited. Interim measures such as introducing a Remedial Action Scheme to automate load rejection under all-in-service conditions can support immediate growth in the region until transmission reinforcements can be implemented.

Buchanan TS is the main supply point for the London Area, which connects to Scott TS, Longwood TS, Chatham SS, Spence SS, Middleport TS, and Detweiler TS through 230 kV transmission circuits. In addition to being a critical 230 kV node in the region, there are radial 230 kV supply circuits and power is stepped down to 115 kV for local supply. When power flows out of the West zone through the NBLIP interface, demand growth in the London area is thermally limited along the 230 kV circuits between Buchanan TS, Longwood TS and Chatham SS during contingencies.

When power flows into the West zone through the BLIP interface, the most limiting condition occurs during an outage of two 500 kV lines into Longwood TS, when the third Longwood TS 500 kV line is out of service. Under these conditions, thermal limits are exceeded on the Detweiler-Buchanan and Buchanan-Middleport corridors at demand levels less than the 2035 forecast, indicating that the system cannot support forecasted growth under outage conditions. Excessive voltage decline occurs 310 MW beyond the APO’s 2035 demand forecast, leading to voltage collapse 450 MW beyond the APO’s 2035 demand forecast.

Additional limitations are also observed on the Scott–Buchanan corridor associated with the Flow Away from Lambton-Sarnia (FALS) interface even under pre-contingency conditions. At higher demand levels, these thermal constraints can lead to voltage instability.

These constraints limit the ability to supply incremental demand in the London area and restrict power transfers across the BLIP/NBLIP interface, indicating a need to increase transmission capability in the London area, including reinforcement of the BLIP/NBLIP interface and associated 230 kV network supplying Buchanan TS.

The options to address these needs are reviewed in Section 5. Three options were identified to support higher NBLIP flows and load growth in the London area, including:

- A second 500 kV line between Longwood TS and Nanticoke TS;
- A new 500 kV line between Longwood TS and a new 500 kV station in the KWCG region (designated as Guelph North TS), along with a new 500 kV station in the London Area region (designated as St. Thomas TS); and
- A new 500 kV station in the London Area region (designated as St. Thomas TS) and a second 500 kV line between St. Thomas TS and Nanticoke TS.

4.2.2.5 Kitchener-Waterloo-Cambridge-Guelph Region

As introduced in Section 2.2.4, KWCG is a high-growth region and the KWCG IRRP identified a near-term need for a new 500/230 kV autotransformer station (Wellington TS) connecting to the two existing 500 kV circuits between Middleport TS and Milton SS via a new 500 kV switchyard. The IRRP also recommended associated reinforcements to the local KWCG 230 kV system to supply increasing demand. This bulk plan considered the medium-term and long-term bulk supply capabilities into the KWCG region under summer peak demand conditions.

Detweiler TS is the main supply point into the KWCG region, which connects to Bruce A TS, Orangeville TS, and Middleport TS through 230 kV transmission lines. In addition to being a critical 230 kV network node, power is stepped down to 115 kV at Detweiler TS for local supply. Under generation and demand conditions that create high BLIP flows (i.e., high demand and low generation dispatch in the West zone), the 230 kV supply into the KWCG is thermally limited. The limiting condition occurs during the outage of one of the transmission circuits between Orangeville TS and Detweiler TS, following the loss of 500 kV circuits into Longwood TS. Under these conditions, the remaining Orangeville-Detweiler circuit exceeds its thermal rating.

This constraint results in a requirement to reduce approximately 700 MW of load in region to maintain system performance within allowable limits. When considering the local load growth informed by the 2026 KWCG IRRP, the need for bulk reinforcements into the region arises in 2031.

At higher demand levels, additional issues were observed, including violations of Short-Term Emergency (STE) ratings and voltage instability. This limitation restricts the ability to supply load within the KWCG region and indicates a need to increase transmission capacity into the area.

The options to address this need are discussed in Section 5. They included 230 kV circuit upgrades between Orangeville TS and Detweiler TS (specifically between Orangeville TS and Fergus Junction), and adding a second 500 kV supply point into the KWCG region, referred to as Guelph North TS. This new TS would connect to the existing Longwood TS and the planned Wellington TS and support load growth in the KWCG area in co-ordination with the broader IRRP recommendations.

4.2.2.6 Burlington to Nanticoke Region

The Burlington to Nanticoke region is divided into two distinct load centres: Nanticoke and Hamilton.

The Nanticoke load centre is located near the shores of Lake Erie at the border of Haldimand County and Norfolk County, close to the decommissioned coal-fired Nanticoke GS. Several industrial and large commercial customers are in this area. Because the transmission in this area was originally designed to accommodate large generation, the transmission supply is generally more robust than other areas in the southwest. Supply to this area can be limited by the circuits in the Detweiler and Buchanan load centres, which are addressed in those respective sections.

The main connection point for the Nanticoke area is Nanticoke TS, which is connected by one 500 kV circuit from Longwood TS and two 500 kV circuits from Middleport TS, and steps power down to 230 kV. Considering the existing capability of the transmission system within the Nanticoke area, the first criteria violation at Nanticoke was observed at 1,200 MW beyond the 2035 forecast. This was a post-contingency voltage violation affecting the local 115 kV system when the Nanticoke to Longwood 500 kV circuit is out of service.

The representative connection point for the Hamilton load centre is Beach TS, which is connected to Burlington TS, Middleport TS, and Beck #2 TS, all at 230 kV. In addition to being a critical 230 kV node in the region, there are 230 kV radial circuits and power is stepped down to 115 kV for local supply. The Hamilton load centre was found to be sensitive to interface assumptions, as it is situated near the QFW and FETT interfaces. Like Nanticoke, Hamilton also benefits from a transmission system designed to supply heavy industrial loads. Limitations were identified only under multiple outage conditions: with one 230 kV circuit between Burlington TS and Beach TS out of service, thermal violations were observed along its companion circuit following a double contingency of two of the circuits connecting Beach TS to Beck #2 TS and Middleport TS at demand levels 300 MW beyond the 2035 forecast.

Since these needs are less imminent than those identified for the Windsor-Essex, London Area, and KWCG regions, bulk transmission reinforcements into the Burlington to Nanticoke region were not assessed further in this Plan. However, supply into this region under high QFW flow conditions will be assessed separately as part of the upcoming Niagara Bulk Plan.

4.2.3 Greater Toronto Area

The GTA is a major load centre supplied through bulk transmission interfaces and a limited number of key 500/230 kV autotransformer stations, including Claireville TS, Parkway TS, and Trafalgar TS[6]. These stations provide bulk supply to the regional 230 kV network and are a critical component of the transmission system supplying west, north, and central GTA. Additional discussion on interfaces and needs affecting east GTA are in Section 4.2.4.

Demand in the GTA is increasing rapidly, with significant growth occurring in areas north and west of the existing transmission network. As this growth extends beyond the footprint of current infrastructure, supply is increasingly delivered over longer transmission paths, placing additional loading on both bulk interfaces and the regional network. This challenge has been documented

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[6] Cherrywood TS and Clarington TS are also major transformer stations supplying the GTA but are considered geographically East of Toronto

throughout recent regional planning, namely in the recently completed GTA North (York Region) IRRP and the ongoing GTA West IRRP.

At the same time, changes in the supply mix, including reduced reliance on local dispatchable generation over time, increase the dependence of the GTA on bulk power transfers through interfaces such as CLAN/CLAS and FETT. This increases the importance of transfer capability into and within the GTA to maintain system performance under peak demand and contingency conditions.

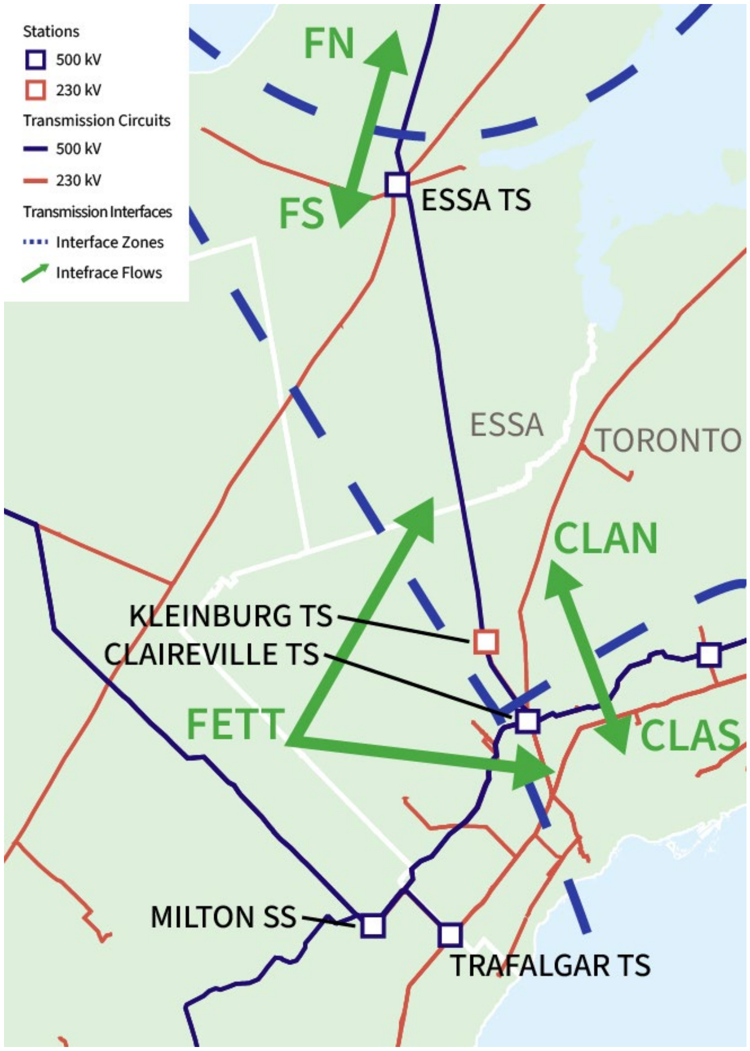
Under these combined conditions, the existing transmission system is increasingly constrained in its ability to supply new demand and accommodate changing power flows, resulting in the need for additional bulk supply capability.

While the regional plans have indicated significant new needs to supply increasing demand, new regional transmission lines and step-down stations would not be technically viable without new bulk supply points. With the need for regional transmission system reinforcement already defined in the IRRPs, including their timing and location, this Plan focuses on bulk supply needs required to enable them.

The key interfaces in the GTA affecting the west, north, and central GTA needs, as shown in Figure 18, are:

- Flow East to Toronto (FETT) which transfers power into Toronto from the West and the North;
- Claireville North and South (CLAN/CLAS) which transfers power between Toronto at Claireville TS and northern Ontario; and
- FN/FN which transfers power between northern Ontario and southern Ontario near Essa TS, considered from the perspective of determining the impacts of transmission reinforcements as they overlap with the Northern Ontario Bulk Study.

Figure 18 | Major Interfaces in GTA Module



4.2.3.1 GTA North (York Region)

Electrical demand within northern York Region is already at risk of exceeding system capabilities. Under summer peak demand conditions, the transmission system supplying northern York Region is limited by thermal loading and voltage performance on the H82 and H83 circuits supplying load from Claireville TS. The limiting condition occurs under N-1 event, where the loss of one circuit results in overload of the remaining circuit and voltage performance is outside acceptable limits. Under these conditions, demand levels approaching the 2035 forecast cannot be reliably supplied without violating thermal or voltage criteria.

Thermal limitations on equipment under outage conditions are currently being managed through operational measures such as load rejection during the summer peak demand period. Other near-term measures to supply strong local demand growth and improve regional reliability were recommended in the 2025 GTA North (York Region) IRRP.

These measures include the development of a new 230 kV transmission line from Kleinburg TS to provide a new transmission path into Northern York Region (the Kleinburg-Kirby link). This transmission line will bypass and provide relief to the existing transmission lines supplying the area from Claireville TS and is expected to be sufficient to supply an additional step-down station needed in the near-term. However, additional load increases in the area forecast in the longer term, or resulting from new economic development in the near term, will require further transmission investment to maintain reliable supply. The IRRP also recommended that action be taken to reconfigure the station service to York Energy Centre to improve the reliability of this existing flexible generation resource in the area under contingency conditions.

This bulk plan considered these needs to ensure that bulk system capacity is adequate to reliably supply regional growth. The Kleinburg-Kirby link cannot be incorporated into the existing transmission system without expanding the existing Kleinburg TS into a new bulk transmission supply point. In the absence of a new supply point, connecting this project would shift the risk of thermal overloads from H82/83V to the V43/44 circuits.

Kleinburg TS, currently a local supply station, is a strong candidate for a future bulk supply point in northern GTA. This is due to its proximity to both the 500 kV and 230 kV networks, and because it is located at one of the most northern points of the 230 kV system in the GTA. When originally designed, sufficient space was accounted for at the station site to enable expansion to incorporate 500/230 kV autotransformers. The benefits of the expansion of Kleinburg TS are further discussed in Section 5.2.3.1.

4.2.3.2 CLAN and CLAS Interface

One of the key transmission interfaces facilitating power flows into GTA North is the CLAN/CLAS interface located between the Toronto zone and the Essa zone to the north. It consists of several transmission circuits; most significant are the two 500 kV circuits connecting Claireville TS to Essa TS. The development of Kleinburg TS will divide this line into two separate sections: Clareville-Kleinburg and Kleinburg-Essa. Because CLAN/CLAS is closely linked to the FN/FS interface between northern and southern Ontario, power typically flows northward along CLAN when demand in Essa and Northern Ontario exceeds local generation and flows southward along CLAS when generation in Essa and Northern Ontario exceeds local demand. Stress along this interface can worsen in either direction whenever there is a mismatch in supply and demand, particularly in Northern Ontario.

The ability to transfer power along CLAN is limited by thermal constraints along alternative Claireville TS to Essa TS 230 kV paths, in the event of a loss of both Claireville-Essa 500 kV circuits. These constraints are present today, and limit both the system's ability to accommodate generation in parts of southern Ontario, and the ability to supply demand in Northern Ontario via the FN interface. Likewise, generation in northern Ontario has the potential to become constrained along this path through flows injected from the FS interface. Transmission reinforcements have been recommended to reinforce the transmission system around CLAN/CLAS interface and are defined through ERO 025-0657 and the Northern Ontario Bulk Study. These reinforcements include:

- Conductor replacement on 230 kV double-circuit lines (E8V and E9V) between Essa TS and Orangeville TS, planned for 2029; and
- Adding a third 500 kV line between Essa TS and Hanmer TS, planned for 2032.

Table 6 summarizes new interface capabilities for CLAN and CLAS after these committed upgrades compared to the existing capability of the interface (CLAN). These all-in-service limits are also applied in energy modeling.

Table 6 | CLAN/CLAS Interface Limits (all-in-service conditions)

Interface	Condition	Limit (MW)
CLAN	Existing	2,530
CLAN	Post - committed upgrades	2,830
CLAS	Post - committed upgrades	2,370

Although CLAN transfer limits are improved following these upgrades, additional limitations emerge under the future demand and system conditions assessed following the development of Kleinburg TS. This is further discussed in section 5.2.3.2. New generation procurement may also further stress this interface, depending on where it is located, as discussed in section 5.2.3.3.

4.2.3.3 GTA West Region

Electrical growth in the GTA West planning region faces challenges similar to those seen in York Region. These include strong and continuing demand growth driven by new customers and increasing electricity use, along with an urban boundary that is steadily expanding away from the existing transmission system. As a result, supply to communities in northern Halton and Peel regions is increasingly reliant on extending transmission from the existing network, placing additional loading on existing bulk supply points and associated transmission facilities.

Without a new supply point to connect to this expanding network, extending existing high-voltage transmission lines into northern Halton and Peel regions would result in thermal overloads and load security limitations under contingency conditions.

The existing transmission system in this area is limited by the availability of bulk supply and the capability of the upstream transmission network to support additional transfers. Under these conditions, the system cannot support continued expansion of the regional network to accommodate new demand without exceeding thermal limits or creating unacceptable system conditions under outage scenarios.

Milton SS is located near the outer edge of the existing 230 kV supply network in proximity to both the 500 kV and 230 kV transmission systems, which is a suitable location with land available to accommodate its expansion into a 500 kV / 230 kV bulk supply point. This option is further discussed in Section 5.2.

4.2.3.4 FETT Interface

Previous studies have closely monitored the performance of the FETT interface in GTA West, as this interface has often been at risk of becoming constrained, especially as GTA demand or southwestern Ontario generation increases, or generation in the GTA and east of the GTA decreases. Under the study assumptions, the FETT limit is not expected to be constraining under the base case scenario.

This is in part due to recent FETT upgrades, and timelines for return of Pickering B generation east of the GTA. However, the capability of the FETT interface will continue to be monitored closely as changes to distribution of generation and demand assumptions are possible, particularly in the longer term.

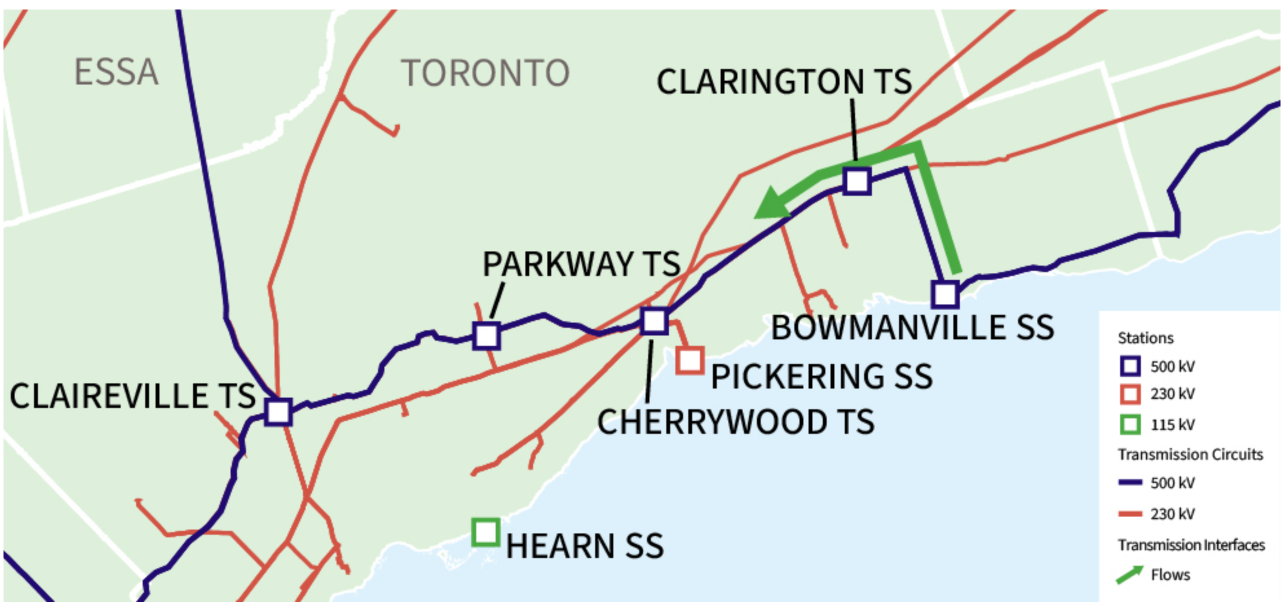
4.2.4 Enabling Small Modular Reactors and Flow from Eastern Ontario into the GTA

The background on the need for new 500 kV double-circuit transmission line in this area and the IESO-recommended solution to enable the connection of the new SMRs at Darlington NGS was previously identified in a February 2024 IESO report: Connection Approach for Small Modular Nuclear Reactors at the Existing Darlington Nuclear Generation Station.

With approximately 4,500 MW of nuclear generation located at Darlington NGS, and the assumed addition of four SMR units to be incorporated at Darlington NGS, the Bowmanville SS to Cherrywood TS circuits were confirmed to be the most limiting transmission elements in the area, when considering flow west into Toronto (Figure 19). This transmission path would constrain the integration of the SMRs as well as any additional new resources in eastern Ontario.

The development of this line was identified as a Priority Project in the *Energy for Generations: Ontario's Integrated Plan to Power the Strongest Economy in the G7* and was designated to Hydro One for development in October 2025. The scope of the recommendation is further discussed in Section 5.2.4.

Figure 19 | Flow west from Bowmanville towards GTA in East of Toronto Module



4.3 Congestion Assessments

The transmission reliability assessments presented in the South and Central Bulk Plan identified key transmission system needs in the previous section. Section 5 presents alternative portfolios of transmission reinforcement options to address these needs. These portfolios may also contribute to reducing overall system congestion. A congestion assessment was conducted to evaluate how effectively each portfolio alleviates congestion and improves economic efficiency of the system.

Congestion was evaluated using province-wide, hourly economic dispatch simulations for meeting the forecasted demand in each transmission zone, while respecting transmission interface limits, which could restrict the ability to transfer lower-cost energy between zones. Because congestion reflects the interaction of zonal demand, resource availability, and transmission system constraints, it is assessed on a provincial basis to capture system-wide economic impacts. This approach differs from the transmission reliability assessments, which were conducted within region-specific modules using power flow analysis.

There are several control actions that the operator can take to manage congestion, such as deploying Remedial Action Schemes to increase transfer limits, and manually constraining generation and electricity storage up or down. However, these actions do not eliminate underlying structural limitations on the system.

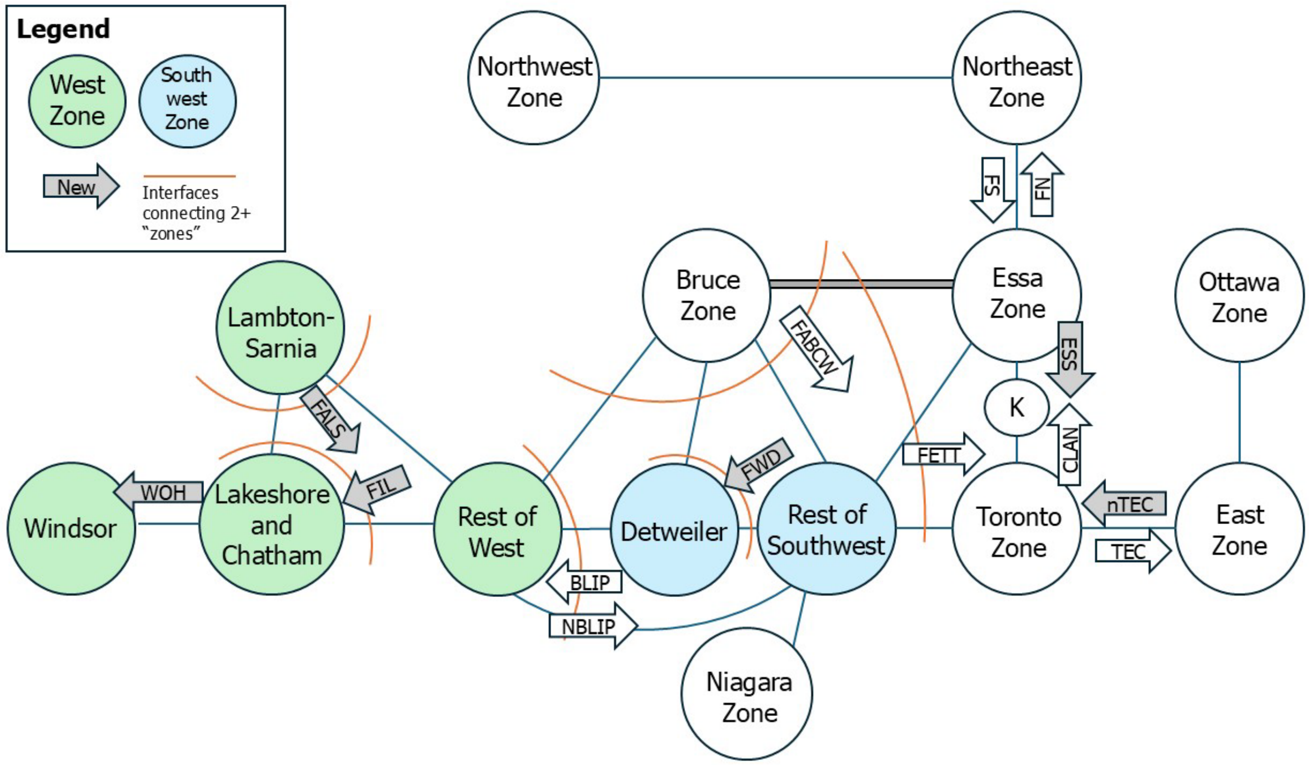
This assessment supplements the evaluation of portfolios by helping to identify options that could deliver the most congestion relief and, consequently, the greatest improvement in economic efficiency of the power system. The results of this assessment help inform recommendations aimed at minimizing future congestion and support the selection of the preferred set of options.

4.3.1 Approach to the Energy Model

The energy production cost simulation was built on the 2025 APO Capacity Expansion Scenario, Costs, and Emissions Module, with enhancements to reflect additional sub-zones and transmission interfaces relevant to the South and Central Bulk Plan study area. Supply assumptions in the model were aligned with APO 2025, and the APO capacity expansion resource build-out results were allocated across the zones considered in the plan. Three locational resource scenarios were explored: High East, High West, and High North. These scenarios were used to assess congestion during the study period under the APO 2025 demand forecast to determine whether the transmission system can support the quantity of resources assumed in each locational resource build-out scenario. Note that these new resource buildouts were conceptual in nature and were intended to illustrate potential resource types that could address the future supply gap. All committed generation, including 1,200 MW of SMRs at Darlington NGS, 4,800 MW Bruce C NGS, and resources secured through the LT1 RFP, were treated as part of the existing/committed supply mix and were not included in these new buildouts. The resource modeling framework is consistent with the energy assessment methodology outlined in the 2025 APO Resource Adequacy and Energy Assessments Methodology.

The model was expanded from 10 zones to 15 zones to better reflect the bulk system topology considered in this plan, primarily by subdividing the existing West, Southwest, Toronto, and Essa zones. Figure 20 depicts a simplified model of Ontario's transmission system, with each interzonal connection shown as a single tie line. Interfaces, which in the real world may represent aggregated flows across multiple transmission facilities, were simulated using defined upper and lower flow limits.

Figure 20 | Zone and Interfaces in the Energy Model



The three resource scenarios were developed with the following assumptions: no new gas generation in the Toronto zone to reflect constraints such as land availability and broader considerations related to societal acceptance; most new wind capacity allocated to the Northeast and Northwest zones where suitable land and wind resource potential exists; additional demand response and new storage resources distributed across each zone proportionally by peak demand; new pumped storage in the Bruce zone; new hydro-electric capacity in the Northeast and Northwest zones based on resource potential. The primary differences between scenarios are driven mainly by the geographic distribution of different resource types across the zones according to each scenario. Three new-build resource scenarios for the year 2046 were "High East," "High West," and "High North." This assessment also assumed a longer planning time horizon, to the year 2046, for the simulation.

Demand forecasts used in the model were aligned with 2025 APO. The model incorporated existing and committed resources, as well as three resource scenarios representing potential new capacity expansion. Proposed and committed transmission upgrades were reflected by applying appropriate upper and lower limits to key transmission interfaces, based on their assumed or expected in-service dates over the study horizon. Note that the transmission interface limits used in this study were based on an all-in-service configuration of the system.

Two complementary metrics were used to assess congestion. The first is congestion duration, which measures the total number of hours during which an interzonal interface is binding (i.e., operating at its transmission limit). The second is transfer magnitude, which represents the total energy exchanged across each interface over the study horizon. In general, higher congestion duration indicates more frequent limiting constraints and reduced transfer capability, while higher transfer magnitude indicates greater utilization of available transfer capacity. Together, these metrics help assess congestion and therefore, the scale of opportunity to improve bulk system efficiency.

A chronological production cost simulation was performed over the study horizon of 15 years from 2032 to 2046 at an hourly resolution. For each interface, congestion duration and transfer magnitude were calculated, with higher congestion hours indicating more frequent binding constraints and greater limitations on interzonal power transfers. The results were used to evaluate the effectiveness of the proposed portfolio of transmission enhancements in reducing bulk system congestion. The result of this analysis is presented in Section 5.4.2.

5. Design and Evaluation of Solution Portfolios

Transmission system needs identified in Section 4 were addressed through an integrated portfolio-based approach. Rather than evaluating solutions independently by region, this approach enabled assessment of how combinations of transmission reinforcements perform at a broader system level, recognizing that upgrades in one area can materially affect conditions in others.

Three portfolios (A, B, and C) were developed, each representing a set of technical solutions that together meet all reliability needs under the demand and resource assumptions described in Sections 2 and 3. A set of baseline actions were identified as common to all portfolios, while each portfolio contained additional reinforcements that differentiate performance, particularly in terms of their ability to enable demand growth across the different southwestern Ontario load centres and other factors discussed in Section 5.4.

5.1 Development of Portfolios

Technically viable transmission reinforcements were first identified to address the system needs described in Section 4. These options were grouped into portfolios based on:

- Ability to resolve multiple needs simultaneously;
- Alignment in timing considering development lead times; and
- Expandability and staging potential.

This grouping ensured that each portfolio represents a coherent development pathway capable of supporting projected system conditions.

Portfolios were iteratively refined through system studies. During evaluation, interactions between reinforcements were assessed and configurations adjusted as needed until all portfolios satisfied applicable reliability and planning criteria.

Short circuit performance was evaluated following portfolio development using detailed system models. These assessments identified additional study requirements beyond the scope of this Plan, as discussed in Section 7.2.1.

5.2 Baseline Actions

Baseline Actions are transmission reinforcements that are common to all portfolios because they address needs that are consistently identified across scenarios.

These actions form the core set of recommended investments, including projects that have already been identified through regional planning processes or government policy direction (Early Actions, discussed in Section 1.5). In some cases, an earlier recommendation was subject to further refinement through the system studies carried out for this Plan.

Each Baseline Action directly addresses one or more system needs identified in Section 4.2.

5.2.1 Transmission to Enable Bruce Nuclear Expansion

As described in Section 4.2.1, the existing transmission system is limited in its ability to accommodate additional generation from the Bruce area due to constraints at multiple points in the 500 kV network. These limitations, coupled with short circuit constraints, restrict the maximum generation that can be transferred to load centres in southwestern Ontario and the GTA, particularly under outage conditions.

To address these constraints, transmission reinforcements are required to increase transfer capability from the Bruce transmission zone and enable the delivery of additional generation under the assumed resource outlook. A range of options was explored, including changes to the normal operating configuration at Bruce NGS and reinforcements to the bulk transmission supply out of the Bruce Power site. These options were assessed incrementally to identify the minimum level of investment required. Three Baseline Actions were identified to enable potential future Bruce nuclear expansion should Bruce C project proceed:

- 500 kV double-circuit line from Bruce NGS to Essa TS;
- 500 kV double-circuit line from Bruce NGS to Longwood TS; and
- 500 kV single-circuit line from Essa TS to Kleinburg TS.

Collectively, these reinforcements increase west-to-east transfer capability and support the delivery of generation from the Bruce area to major load centres should future resource development proceed.

As established in the needs assessments in Section 4.2.1.2, short circuit limitations prevent new generation from being added to the existing Bruce NGS. As a result, this study assumes a new station, Bruce C SS, will be installed as part of the requirements to connect Bruce C to the transmission system.

Studies indicate that a minimum of four new transmission circuits are needed to connect the Bruce C SS to the rest of the transmission system, as well as two ties between the Bruce C SS and the existing Bruce NGS, in order to meet NPCC Directory #1 planning criteria. These criteria require the bulk transmission system to demonstrate acceptable performance both with all elements in service and with a critical system element out of service, following a range of events, including single- and multiple-element contingencies.

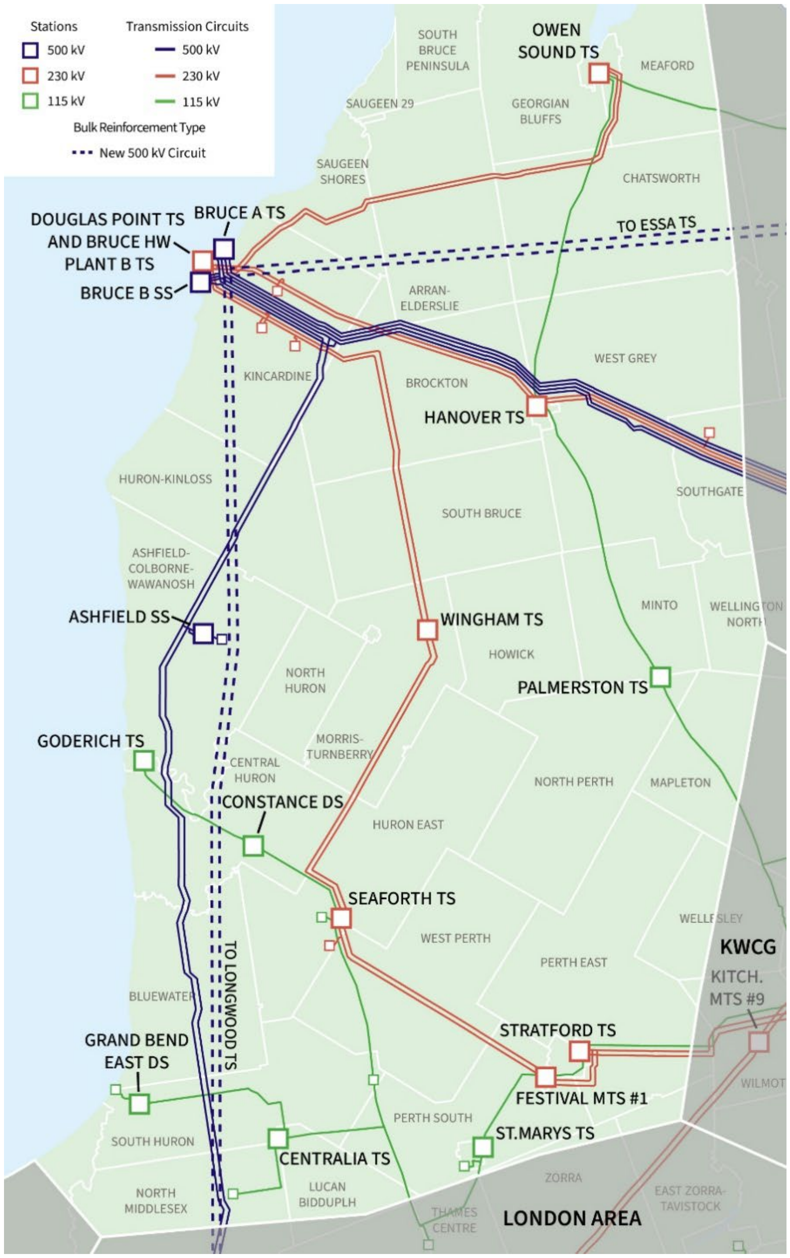
The two recommended double-circuit lines connecting directly into the Bruce NGS satisfy this requirement. Double-circuit transmission lines share common tower structures, and consequently require less land, and cost less overall compared to separate single-circuit transmission lines. However, double-circuit transmission lines also have the potential for common-mode failure risk due to sharing the same towers. This risk was assessed against planning criteria and found to demonstrate acceptable performance. As a result, double-circuit transmission lines were selected over single-circuit transmission lines.

With one end of the new circuits fixed at the assumed Bruce C SS, the IESO considered options for the receiving ends of those circuits. Longwood TS and Essa TS were ultimately identified as the preferred termination points. Connecting into Longwood TS, when Bruce C is in service, would strengthen the ability to transfer additional power into the West transmission zone over the BLIP interface. This will be beneficial as demand continues to grow in the Windsor-Essex and London Area planning regions.

Essa TS is recommended for three reasons. First, it is one of the closest 500 kV stations to the Bruce Power site, minimizing circuit length. Second, a line to Essa TS will reinforce supply to the Northeast transmission zone from Bruce zone by increasing supply towards the FN interface, particularly after new FN interface capability is strengthened following completion of the recently recommended Barrie to Sudbury transmission line. Third, a new transmission line from Bruce NGS to Essa TS provides an opportunity to also connect the Ontario Pumped Storage Project to the grid. The lines are illustrated in Figure 21.

In addition to increasing transfer capability from the Bruce NGS, the Essa TS to Kleinburg TS reinforcement provides broader system benefits. By establishing an additional 500 kV pathway into the GTA, the line will improve transfer capability across the CLAN/CLAS interface, as discussed in Section 4.2.3.2. The current targeted in-service timing is aligned with the assumed timing of the Bruce C project used in this study, as it forms part of the integrated transmission development that would be required to accommodate that additional generation should it proceed. However, this timing may need to be revisited and potentially advanced if evolving generation and demand patterns increase stress on the CLAN and CLAS interfaces earlier than anticipated, independent of Bruce C generation, particularly as northern supply and demand conditions evolve over time. These conditions will continue to be monitored through future bulk system planning updates and related system assessments.

Figure 21 | Recommendations to Enable Bruce Nuclear Expansion



Note: these diagrams do not reflect any potential routing of new circuits only the start and end points.

5.2.2 Addressing Load Growth in Southwestern Ontario

As described in Section 4.2.2, transmission system constraints in southwestern Ontario are driven by increasing load growth, limited transfer capability across key interfaces, and a lack of bulk supply points close to emerging load centres.

The following Baseline Actions address these needs by enabling the system to accommodate forecast demand growth while maintaining compliance with planning criteria.

5.2.2.1 Wellington 500/230 kV Autotransformer Station

As identified in the KWCG IRRP, a new 500/230 kV autotransformer station (Wellington TS) is required in the KWCG region by 2031 to provide sufficient bulk supply capacity to meet forecast load growth.

The preferred location of Wellington TS, shown in Figure 22, was established through the KWCG IRRP,[7] developed concurrently with this Plan. The station is planned to serve as a major new bulk supply point to the region and is therefore considered an integral component of the overall bulk system solution. The recommended configuration includes:

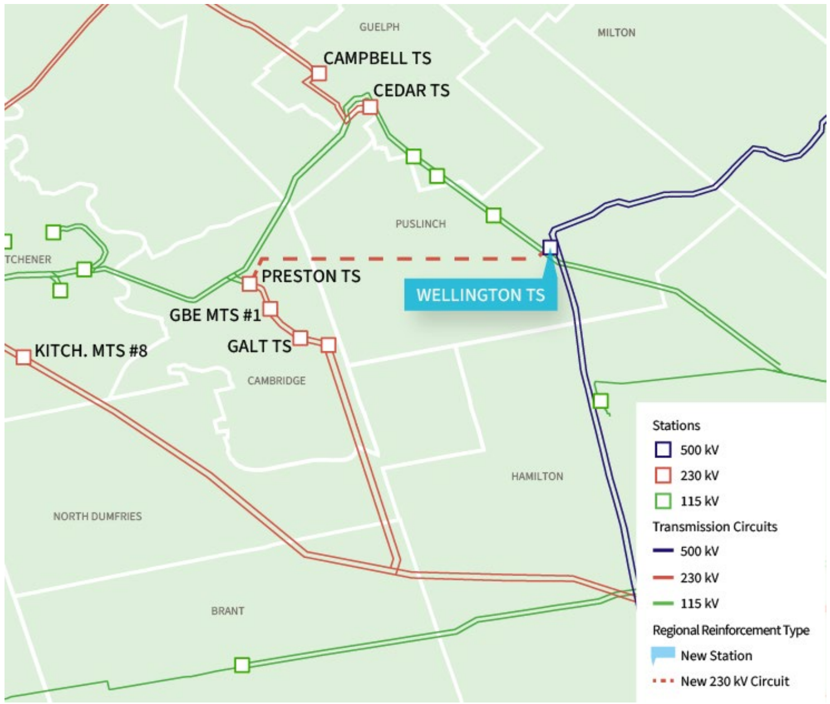
- a 500 kV switchyard accommodating four circuits and two new autotransformers; and
- a 230 kV switchyard enabling future 230 kV connections including two new circuits to connect into the existing radial 230 kV system at Preston TS.

To integrate Wellington TS into the bulk network, the Middleport TS – Milton SS and Middleport TS – Claireville TS 500 kV circuits will be sectionalized at the Puslinch junction.

While Wellington TS primarily addresses regional supply needs in City of Cambridge, City of Kitchener, County of Brant, and City of Brantford as identified in the KWCG IRRP, it was assessed within this Plan in the context of broader system requirements, including support for the Detweiler load centre. Its development contributes to both regional load supply and overall bulk system reinforcement.

[7] Wellington TS is part of a set of transmission projects required to meet near-term demand growth, specified through an urge letter.

Figure 22 | Wellington TS Location



Note: these diagrams do not reflect any potential routing of new circuits only the start and end points.

5.2.3 Addressing GTA Load Growth

The Baseline Actions in the GTA are designed to accommodate continued load growth by increasing bulk transfer capability into the region and expanding supply infrastructure within key load centres. As demand increases across the GTA, particularly in northern and western areas, the existing transmission system is increasingly constrained by limited transfer capability and the availability of bulk supply points.

The following sections describe Baseline Actions to address these needs by strengthening critical interfaces and establishing new supply nodes within the GTA. These consist of:

- Kleinburg TS, a new autotransformer station in GTA North.
- A third 500 kV line between Claireville TS and Kleinburg TS.
- A third 500 kV line between Essa TS and Kleinburg TS.
- Milton TS, a new autotransformer station in GTA West.
- Orangeville to Essa transmission line, as previously recommended.

5.2.3.1 Kleinburg TS

Regional planning studies, including the 2025 GTA North (York Region) IRRP and active GTA West IRRP, have identified the need for significant transmission system upgrades to accommodate growing electricity demand in northern York and Peel regions. These regional supply requirements will, in turn, require additional capacity from the bulk system.

As described in Section 4.2.3, the GTA North (York Region) IRRP recommended Kleinburg TS as the preferred location for a new bulk supply point to support this growth. The initial station configuration includes three 500/230 kV autotransformers, with provisions to add a fourth autotransformer in the future as needed. The station can be integrated into the 500 kV system by sectionalizing the existing E510/511V circuits, creating two independent segments: Essa–Kleinburg and Kleinburg–Claireville.

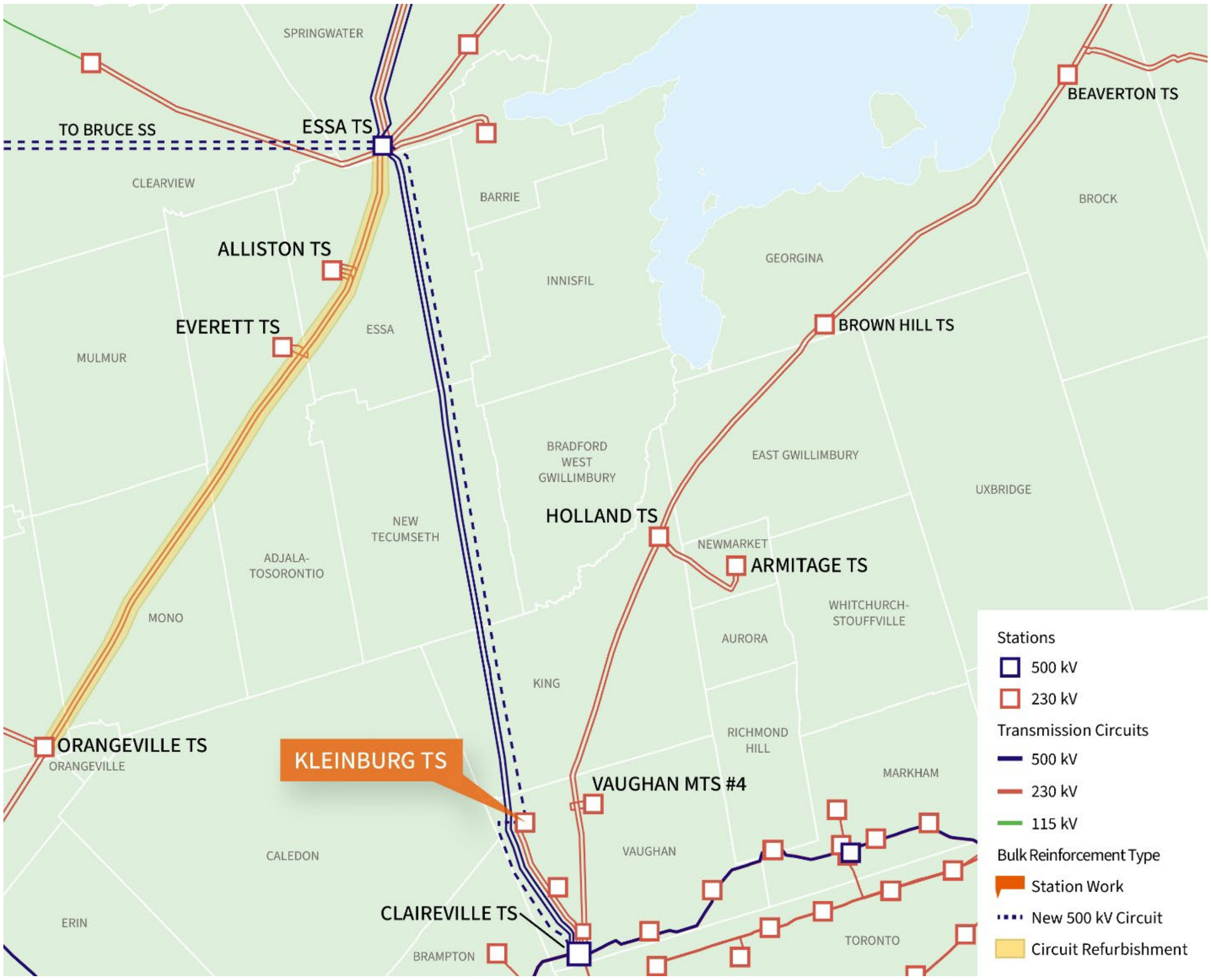
To mitigate operational and short circuit issues associated with low-impedance parallel 230 kV and 500 kV paths, the 230 kV circuits between Claireville TS and Kleinburg TS will be opened. This new operating configuration will establish a defined 230 kV load pocket supplied primarily from Kleinburg TS, with supplementary support from the Essa–Minden–Kleinburg path.

An additional benefit of this configuration is the redistribution of approximately 750 MW of load currently supplied by Claireville TS and moving it to Kleinburg TS. With additional loading capacity made available to the Claireville 500/230 kV autotransformers, the system becomes less dependent on nearby generation such as Sithe Goreway GS to meet local reliability needs on the 230kV system. This supports the longer-term objective of improving supply flexibility by providing an alternate source of supply and reducing reliance on specific local generation facilities.

Kleinburg TS is targeted for an in-service date of 2032, aligned with the GTA North (York Region) IRRP recommendation for the Kleinburg–Kirby transmission line and for new step-down stations in northern York Region to supply community growth. Additional upgrades recommended in the IRRP, including enhancements to the York Energy Centre station service configuration, will also be required to fully utilize this added capacity.

The addition of autotransformers at Kleinburg TS represents a critical first step in enabling longer-term bulk system expansion to support sustained load growth in northern York and Peel regions. These recommendations are shown in Figure 23. Further refinement of Kleinburg TS design, including layout, switching configuration, and 230 kV system open points, will be undertaken through a joint IESO-Hydro One GTA short circuit study (see Section 7.2.1).

Figure 23 | Kleinburg TS Development and GTA North Transmission Recommendations



Note: these diagrams do not reflect any potential routing of new circuits only the start and end points.

5.2.3.2 Claireville TS to Kleinburg TS 3rd 500 kV line

The CLAN interface is expected to become increasingly limiting over time as load continues to grow in the Essa, Northeast and Northwest zones. The addition of Kleinburg TS and the sectionalizing of the existing Claireville to Essa 500 kV circuits further increases reliance on the existing CLAN interface, as load served from Kleinburg TS must now be supplied through that interface. This effect is compounded by the required opening of the 230 kV system between Claireville and Kleinburg, impacting the CLAN transfer capability.

As discussed in section 5.2.3.5, several near-term upgrades have been committed in the Essa area, including the reconductoring of the Essa to Orangeville circuits. This is being done to enable local customer connections, and it will also have the benefit of improving CLAN limits in the near term, as shown in Table 7. However, these improvements are expected to be insufficient once Kleinburg TS in incorporated into the Claireville to Essa system.

To address these outstanding needs, the preferred solution was identified as the addition of a third 500 kV circuit between Claireville TS and Kleinburg TS, approximately 10 km in length along the existing right-of-way (Figure 23). This upgrade not only resolves the identified constraint by significantly increasing CLAN transfer capability, but it also strengthens the connection between Claireville TS and Kleinburg TS, improving system robustness under a range of future demand and generation scenarios. The improvement to the CLAN interface is summarized in Table 7.

Table 7 | CLAN Interface Limits after committed upgrades and 3rd 500 kV Line

Interface	Condition	Limit (MW)
CLAN	Existing	2,000
CLAN	Post - committed upgrades	2,800
CLAN	Post – Claireville-Kleinburg 3rd Circuit	3,600

The limiting constraint following the addition of the third Claireville to Kleinburg 500kV line becomes the loss of one remaining circuit between Essa and Kleinburg while a second is on outage (N-1-1), as described in the following section.

5.2.3.3 Essa TS to Kleinburg TS 3rd 500 kV line

Following the sectionalization of the corridor through Kleinburg TS, and the implementation of the Claireville–Kleinburg third circuit and other committed reinforcements,[8] the Essa–Kleinburg 500 kV segment becomes the remaining two circuit 500kV section of an otherwise three circuit 500kV corridor between northern Ontario and the GTA. This makes it a potentially limiting point of transfer, and the definition of the CLAN/CLAS interface is shifted slightly northward between Kleinburg and Essa. This allows for better monitoring and evaluation of needs along this link.

Future constraints on the revised CLAN/CLAS interface may emerge depending on demand and supply conditions. Higher-than-forecast demand in northern Ontario or Essa transmission zones and/or availability or absence of new generation in those zones to supply local demand could constrain CLAN, and alternatively, more generation and lower demand in northern Ontario or Essa zones could constrain CLAS.

To address these potential constraints, a third 500 kV circuit between Essa TS and Kleinburg TS is recommended along the existing corridor (approximately 55 km). Together with the Claireville–Kleinburg reinforcement, this would effectively expand the corridor from two to three circuits while enabling supply segmentation through Kleinburg TS.

The timing for this upgrade is less certain and will depend on future system developments. Its current targeted in-service date is aligned with the assumed timing of Bruce C used in this study, since this reinforcement forms part of the broader transfer path that would be required to move additional generation into the GTA should that project proceed. However, that timing may need to be revisited and potentially advanced if generation and demand conditions evolve in a way that increases stress on the CLAN or CLAS interfaces earlier than expected. Higher-than-forecast demand

[8] The transmission reinforcement between Essa TS and Hamner TS.

or lower-than-expected local generation in northern Ontario or the Essa transmission zone could increase stress on CLAN, while stronger generation and lower demand in those areas could increase stress on CLAS. This timing will be refined following the results of the IESO procurement processes, with ongoing monitoring described in Section 7.2.2. The various regional planning processes in the area, including South Georgian Bay Muskoka and GTA North, will also continue to monitor actual load growth through the IRRP process and ongoing annual review.

5.2.3.4 Milton TS

Significant load growth is being identified through the currently active GTA West IRRP, and the scale and timing of that forecasted growth indicates that need for a new regional transmission line and bulk supply point in the near-term. In response, this bulk plan assessed the upstream bulk system implications of adding that new supply point. The identification of Milton TS as the preferred bulk supply location is being developed in co-ordination with the GTA West IRRP, expected to be finalized in November 2026.

Milton SS has long been identified as strong candidate for expansion for several reasons:

- Existing access to both 500 kV and 230 kV networks;
- Available land for additional infrastructure; and
- Proximity to the expanding edge of the GTA West regional system.

The expansion of Milton SS would include new 500 kV and 230 kV switchyards, two 500/230 kV autotransformers, and space for two additional autotransformers in the future. The detailed station layout and operating configuration will be finalized through follow-on design, regional planning, and short circuit studies.

The target in-service date for Milton TS is 2033, aligned with expectations around the need for regional transmission expansion in GTA West, including development associated with the Highway 413 corridor. The timing of these regional supply needs is being refined through the GTA West IRRP.

Milton TS will also assist in reducing reliance on Halton Hills GS by providing an alternative bulk supply source. Halton Hills GS is located close to the future 230 kV yard of Milton TS, which means the new autotransformers will be able to provide reliable, continuous supply into an area which is currently supported by dispatchable gas generation. This means that Milton TS will also help reduce the regional reliance on Halton Hills GS, whose contract is scheduled to expire in 2035.

Integration of Milton TS into the broader network will also require additional regional transmission infrastructure so that the new bulk supply can be effectively distributed across GTA West, while improving system flexibility and load-serving capability. These downstream upgrades will be identified and recommended through the GTA West IRRP, and are expected to include new 230 kV transmission along the existing Meadowvale to Hurontario transmission corridor (part of the Parkway Belt West lands), and reconfiguration of the 230 kV system in the vicinity of Hurontario SS.

5.2.3.5 Essa TS to Orangeville TS Reinforcements and Essa Autotransformer Upgrade

Load growth in the Essa region introduces thermal and voltage stability constraints under contingency conditions, particularly involving outages of the Essa TS to Claireville TS 500 kV circuits.

Key issues include:

- Thermal overloads on the E8V/E9V 230 kV double-circuits circuits between Essa TS and Orangeville TS; and
- Voltage instability following outages of Essa autotransformers T3 and T4.

To address these constraints, upgrades have been recommended as defined through ERO 025-0657, as part of the connection requirements for new load connections,[9] and through the active regional planning process for the South Georgian Bay Muskoka IRRP. These upgrades include uprating of E8V and E9V circuits and installation of a third 500/230 kV autotransformer (T5) at Essa TS.

5.2.4 Enabling Small Modular Reactors and Flow from Eastern Ontario into Toronto

The need for a new 500 kV double-circuit transmission line between Bowmanville SS and Toronto had already been established prior to this Plan to enable the connection of SMRs at Darlington NGS. This plan focused on determining the preferred termination point for that transmission line within the GTA system. Three main termination options were assessed under various planning scenarios, including Cherrywood TS, Parkway TS, and Claireville TS. Both the Cherrywood TS and Claireville TS options were screened out because they would create unacceptable limitations related short circuit performance at those stations.

Terminating the new 500 kV lines at Parkway TS was found to be technically viable, as the station could accommodate the line connections, a new 500 kV bus, and an additional autotransformer. This option would substantially improve system performance by enabling up to 2,600 MW of additional supply into Toronto from the east. However, the additional autotransformer would worsen short circuit issues at Parkway TS and Cherrywood TS, and the analysis did not demonstrate a need for additional autotransformer capacity at Parkway TS to meet the 2035 load forecast.

After considering the Toronto Third Line recommendation from the Toronto IRRP, which also adds supply into Toronto from the east, the Parkway option was refined to avoid adding a new 500 kV bus and autotransformer at Parkway TS. Instead, the analysis assessed the feasibility of terminating the new 500 kV circuits from Bowmanville onto existing circuits between Cherrywood TS and Parkway TS. This alternative enables approximately 1,950 MW of additional flow from the east into Toronto, in addition to the SMRs and is sufficient to maintain system performance and reliability supply for the 2035 load and generation scenario at a lower cost, requiring less new transmission infrastructure.

[9] Including CAA ID: 2024-789 and CAA ID: 2025-839

Figure 24 | East of Toronto Baseline Actions

Note: these diagrams do not reflect any potential routing of new circuits only the start and end points.

This solution enables the connections of the SMRs and supports additional supply resources from eastern Ontario, while being appropriately sized for the system needs identified for 2035. It also preserves flexibility to expand Parkway TS in the future if additional transfer capability is needed. This is further described in Section 7.2.3.1.

5.2.5 Summary of Baseline Actions

Table 8 | Baseline Actions

Recommendations	Scope	Need/Trigger	Timeframe
Essa TS to Orangeville TS Reinforcement (early action already under development by Hydro One)	Reconductor existing 230 kV double-circuit transmission line	Enable economic development in the area, as directed by policy	2029
Kleinburg 500/230 kV Transformer Station	Sectionalize two existing Essa to Claireville circuits Add 500 kV bus for 5 lines and 3 autotransformers, with space for expansion Add 230 kV bus for 6 lines, 1 DESN	Provide a new supply capacity point to serve growth throughout GTA North and West	2031-2032

Recommendations	Scope	Need/Trigger	Timeframe
	taps, and 2 autotransformers, with space for expansion		
Kleinburg TS to Claireville TS Line	New 500 kV single-circuit transmission line using existing right-of-way Add one new breaker at Claireville TS	Required to enable Kleinburg TS	2031-2032
Bowmanville SS towards Cherrywood TS Line (early action already under development by Hydro One)	Two existing Parkway-Cherrywood circuits are connected to new 500 kV double-circuit transmission line to Bowmanville at junction outside of Cherrywood TS Add one new 500 kV termination on existing Bowmanville A SS, one new 500 kV termination on Bowmanville B SS to be developed	Enable SMRs integration and supply from Eastern Ontario	2032
Milton 500 and 230 kV Transformer Station	Expand Milton TS 500 kV by one diameter and add two autotransformers. Add new 230 kV bus with two diameters: four circuits allocated for 230 kV. Additional regional projects required to enable use of new capacity – to be identified in GTA West IRRP	Provide additional supply to GTA West/Halton and Peel Regions	2033
Essa TS to Kleinburg TS Line	New 500 kV Single-Circuit Transmission Line	Enable Bruce C NGS to GTA and Northern Ontario	2040s (or sooner)
Bruce SS to Longwood TS Line	New 500 kV Double-Circuit Transmission Add one new diameter at Longwood TS	Enable Bruce C NGS to southwestern Ontario	2040s
Bruce SS to Essa TS Line	New 500 kV Double-Circuit Transmission Add two 500 kV breakers to new diameter at Essa TS (two new diameters total at Essa TS)	Enable Bruce C NGS to GTA and northern Ontario	2040s

The general locations of Baseline Actions are shown in Figure 25.

Figure 25 | Baseline Transmission Upgrades

Note: these diagrams do not reflect any potential routing of new circuits, only the start and end points.

5.3 Portfolio Options

The portfolios presented in this section represent three alternative development pathways for addressing the transmission system needs identified in Section 4. Each portfolio builds on the common set of Baseline Actions, which form the foundational reinforcements required across all scenarios.

The portfolios differ in how additional transmission reinforcements are configured, particularly in southwestern Ontario, to address remaining needs, improve system performance, and accommodate future uncertainties. These variations allow for comparison of different approaches to meeting reliability requirements, supporting load growth, and enhancing system operability and flexibility.

5.3.1 Portfolio A

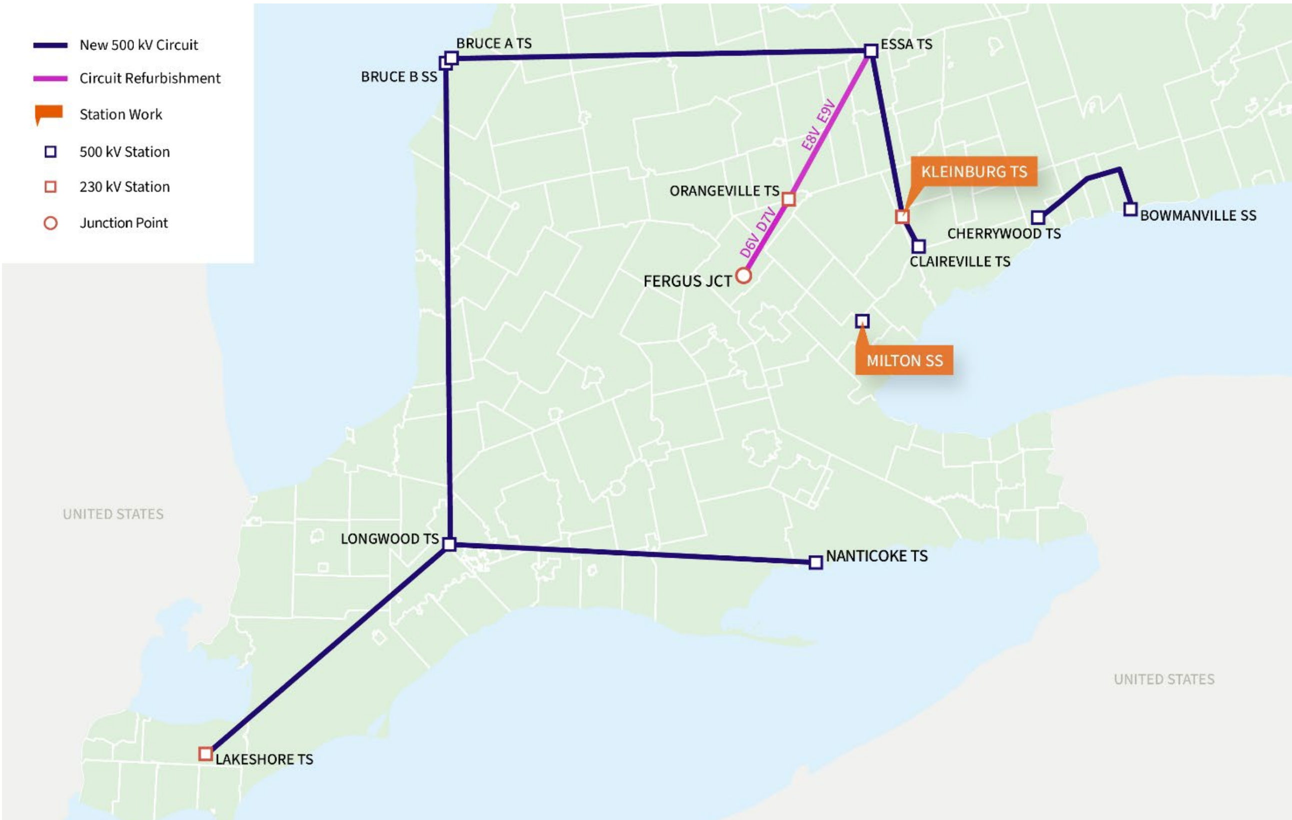
Portfolio A concentrates the southwestern Ontario reinforcements around a single central bulk supply node at Longwood TS. In addition to the Bruce NGS to Longwood TS double-circuit line discussed in the Baseline Actions, this portfolio adds:

1. A second 500 kV single-circuit line between Longwood TS and Nanticoke TS, supporting high NBLIP flow and load growth in the London Area region; and
2. A second 500 kV single-circuit line between Longwood TS and Lakeshore TS, supporting load growth in the Windsor-Essex region as well as a reactor on autotransformer tertiary at Lakeshore TS.

Together, these reinforcements support high NBLIP flow, Bruce nuclear expansion, and Windsor-Essex regions, and the addition of a reactor on the autotransformer tertiary at Lakeshore TS.

In addition, reinforcements are also required between Orangeville TS and the Fergus Junction to support load growth in the KWCG region. The general locations of transmission in Portfolio A are shown in Figure 26.

Figure 26 | Portfolio A Transmission Upgrades



Note: these diagrams do not reflect any potential routing of new circuits, only the start and end points.

In Portfolio A, the additional 500 kV connections from Longwood TS to Nanticoke and Lakeshore would result in Longwood TS becoming a critical bulk supply point in southwestern Ontario. The advantage of this transmission buildout is that power flows can be more predictable under a range of outage conditions. This portfolio also avoids further 500 kV reinforcements to the KWCG region, with upgrades instead on existing 230 kV lines between the Fergus Junction and Orangeville TS.

The lack of transmission path diversity under this portfolio can make accommodating new loads or generation at multiple load centres more challenging. Another potential drawback to Portfolio A is that it does not include the addition of a new bulk supply point at St. Thomas, located southeast of London, instead building out 500 kV supply to the London Area region at Longwood TS. While overall transmission system needs (identified in Section 4.2) are met through Portfolio A, less connection capacity is offered to the London Area region compared to Portfolio B and C.

Table 9 summarizes the need/trigger for the three reinforcements that are specific to Portfolio A. Note that the baseline actions – including the 500 kV double-circuit line between Bruce NGS and Longwood TS – are not summarized here since they are common to all three portfolios.

Table 9 | Summary of Portfolio A Options

Portfolio A Option	Scope	Need/Trigger	Timeframe
Longwood TS to Nanticoke TS	New 500 kV single-circuit transmission line	NBLIP flow; London Area load	2035
Longwood TS to Lakeshore TS (second circuit)	New 500 kV single-circuit transmission line and one reactor on autotransformer tertiary at Lakeshore TS	Windsor-Essex load	2045
Orangeville TS to Fergus Junction Reconductoring	Existing 230 kV Double-circuit transmission Uprate	KWCG load	2032

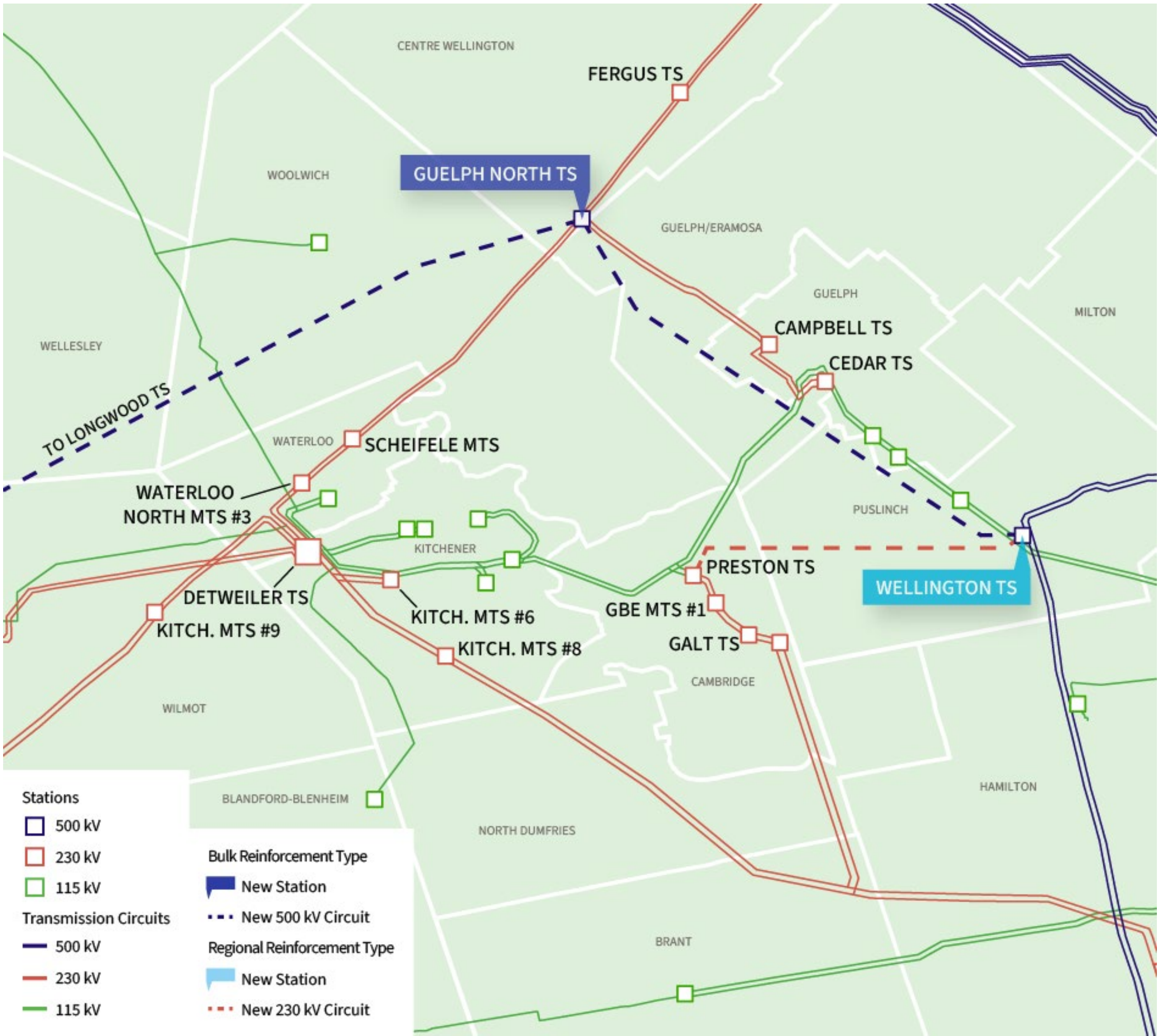
5.3.2 Portfolio B

Portfolio B proposes two new 500 kV bulk supply points in southwestern Ontario to address projected load growth and system needs:

1. A new 500 kV station north of the city of Guelph — designated as Guelph North TS — connected into the 500 kV system through new 500 kV single-circuit lines to Longwood TS in the west and Wellington TS in the east, supporting high NBLIP flow and load growth in the KWCG region in co-ordination with the KWCG IRRP; and
2. A new 500 kV station southeast of the city of London designated as St. Thomas TS, which sectionalizes the existing Longwood-to-Nanticoke 500 kV single-circuit line, supporting load growth in the London region in co-ordination with the London Area IRRP.

Guelph North TS is assumed to have two 500/230 kV autotransformers and two 100 MVar shunt capacitors connected to the 230 kV switchyard. The 230 kV switchyard sectionalizes the existing Detweiler-to-Orangeville circuit into six sections: two from Detweiler TS to Guelph North TS, two from Guelph North TS to Cedar TS, and two from Guelph North TS to Orangeville TS. Based on the KWCG IRRP demand forecast, the target in-service date for Guelph North TS and the 500 kV single-circuit line from Guelph North TS to Wellington TS line is expected to be 2031. The 500 kV line between Longwood TS to Guelph North TS is subsequently needed to continue to support high NBLIP flow and further high growth in the KWCG region.

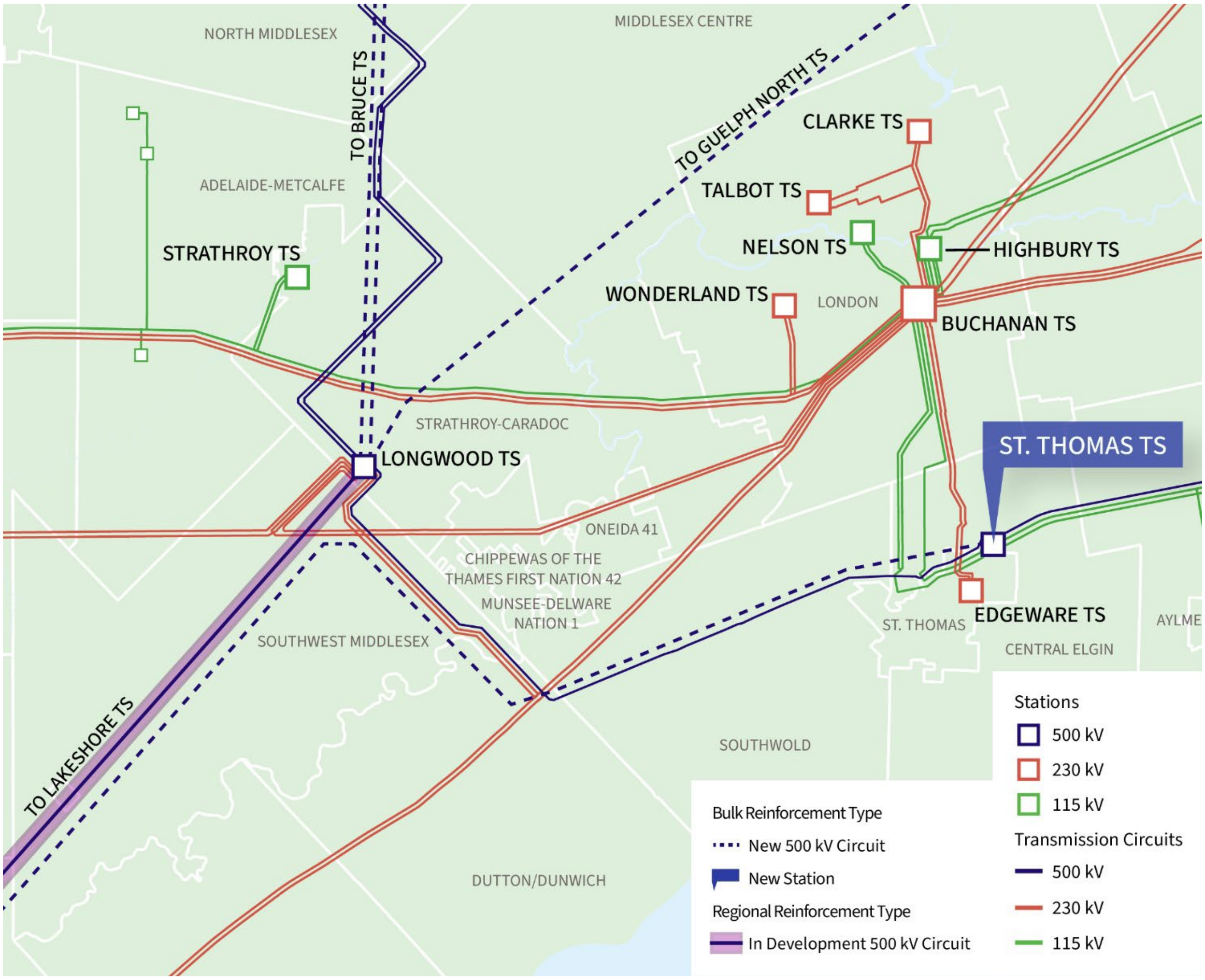
Figure 27 | Guelph North TS Location



Note: these diagrams do not reflect any potential routing of new circuits only the start and end points.

The initial configuration of St. Thomas TS would include two 500 kV circuits, two autotransformers, and four 230 kV outgoing circuits. The station should also be designed to accommodate a longer-term buildout of up to four 500 kV circuits, three autotransformers, and ten 230 kV outgoing circuits to support continued growth in the area. Integrating this facility will require sectionalizing the existing Longwood-to-Nanticoke 500 kV circuit. The timing of the autotransformers and configuration of the 230 kV switchyard will continue to be refined through the ongoing London Area IRRP. Based on the London Area IRRP demand forecast, the targeted in-service date is expected to be in the late-2030s, which may need to be advanced if the magnitude, pace or location of load growth shifts.

Figure 28 | St. Thomas TS Location

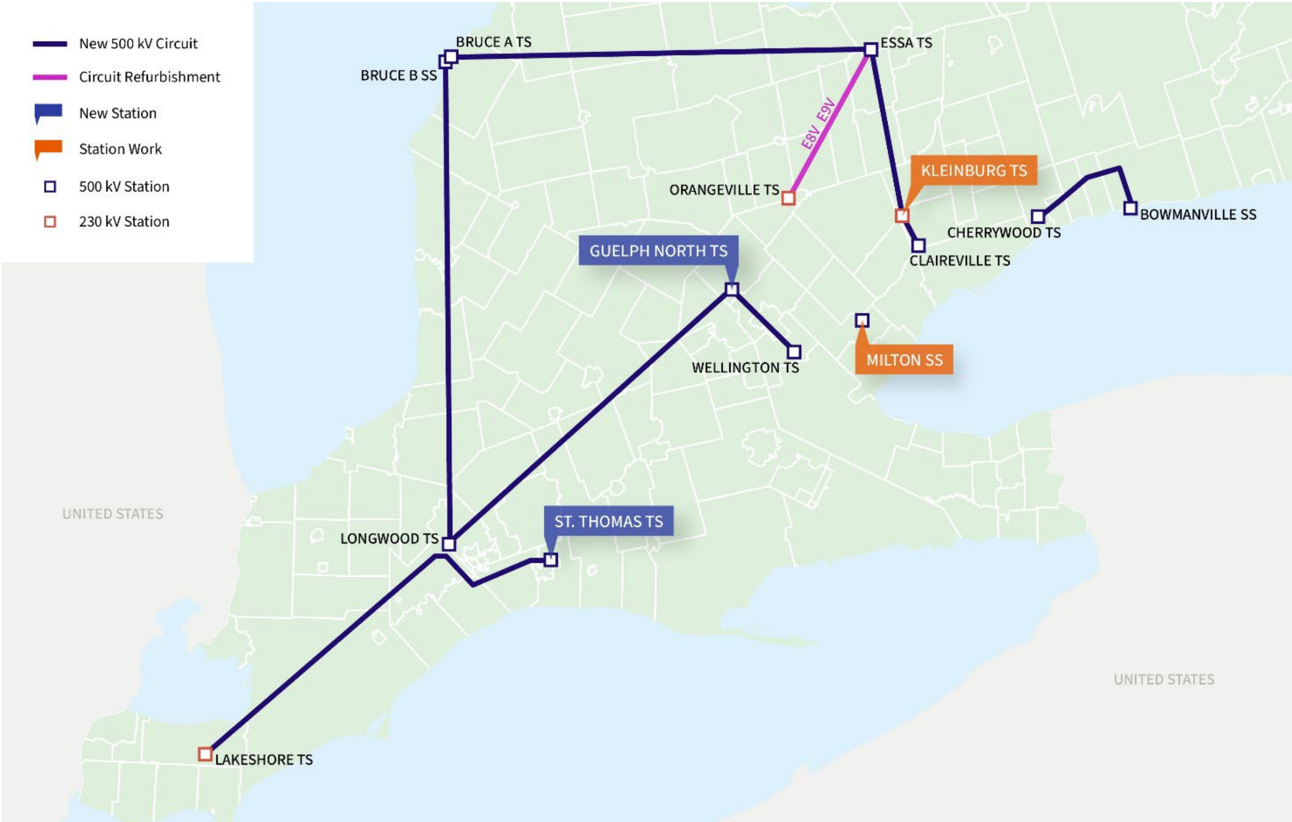


Note: these diagrams do not reflect any potential routing of new circuits only the start and end points.

This portfolio also includes a new 500 kV circuit between St. Thomas TS and Lakeshore TS to support load growth in both the Windsor-Essex and London Area regions. In Portfolio B, this line is preferred over directly adding a second Longwood-to-Lakeshore 500 kV circuit because it provides a third 500 kV supply to St. Thomas TS; significantly increases supply into the London Area; improves resiliency through greater diversification away from Longwood TS; and addresses space constraints at Longwood TS. This should be viewed as part of the broader St. Thomas to Longwood to Lakeshore transfer path, with Longwood lying along that corridor rather than acting as a direct termination point for this line. In that sense, the recommendation continues to leverage the value of the ongoing Longwood-to-Lakeshore development work while better supporting the needs identified in this portfolio.

Additional 500 kV lines can cause high voltages during periods of low demand and the vacuum building outages at the Bruce Power site. To mitigate this, shunt reactors are recommended on tertiaries of 500/230 kV autotransformers at Lakeshore TS and St. Thomas TS.

Figure 29 | Portfolio B Transmission Upgrades



Note: these diagrams do not reflect any potential routing of new circuits, only the start and end points.

Table 10 summarizes the need/trigger for the five reinforcements that differentiate Portfolio B. Note that the baseline actions are not summarized here since they are common to all three portfolios.

Table 10 | Summary of Portfolio B Options

Portfolio B Option	Scope	Need/Trigger	Timeframe
500/230 kV autotransformer station at Guelph North junction (Guelph North TS)	500 kV switchyard with two 500 kV circuits, two 500/230 kV autotransformers, and room for expansion 230 kV switchyard sectionalizing the existing two Detweiler-to-Orangeville circuits into six circuits with room for expansion	KWCG load	2031
Guelph North TS to Wellington TS	New 500 kV single-circuit transmission line One termination at Wellington TS to accommodate the line	KWCG load; NBLIP flow	2031
Longwood TS to Guelph North TS	New 500 kV single-circuit transmission line	KWCG load; NBLIP flow	2034
500/230 kV autotransformer station southwest of London (St. Thomas TS)	500 kV switchyard with two 500 kV circuits, two 500/230 kV autotransformers, and room for expansion. 230 kV switchyard with four 230 kV circuits and room for expansion	London Area load; NBLIP flow	Late 2030s
Lakeshore TS to St. Thomas TS	New 500 kV single-circuit transmission line potentially utilizing 500 kV corridor to Lakeshore TS under development from Longwood TS Shunt reactors on autotransformer tertiary windings at Lakeshore TS and St. Thomas TS	Windsor-Essex load; London Area load	2045

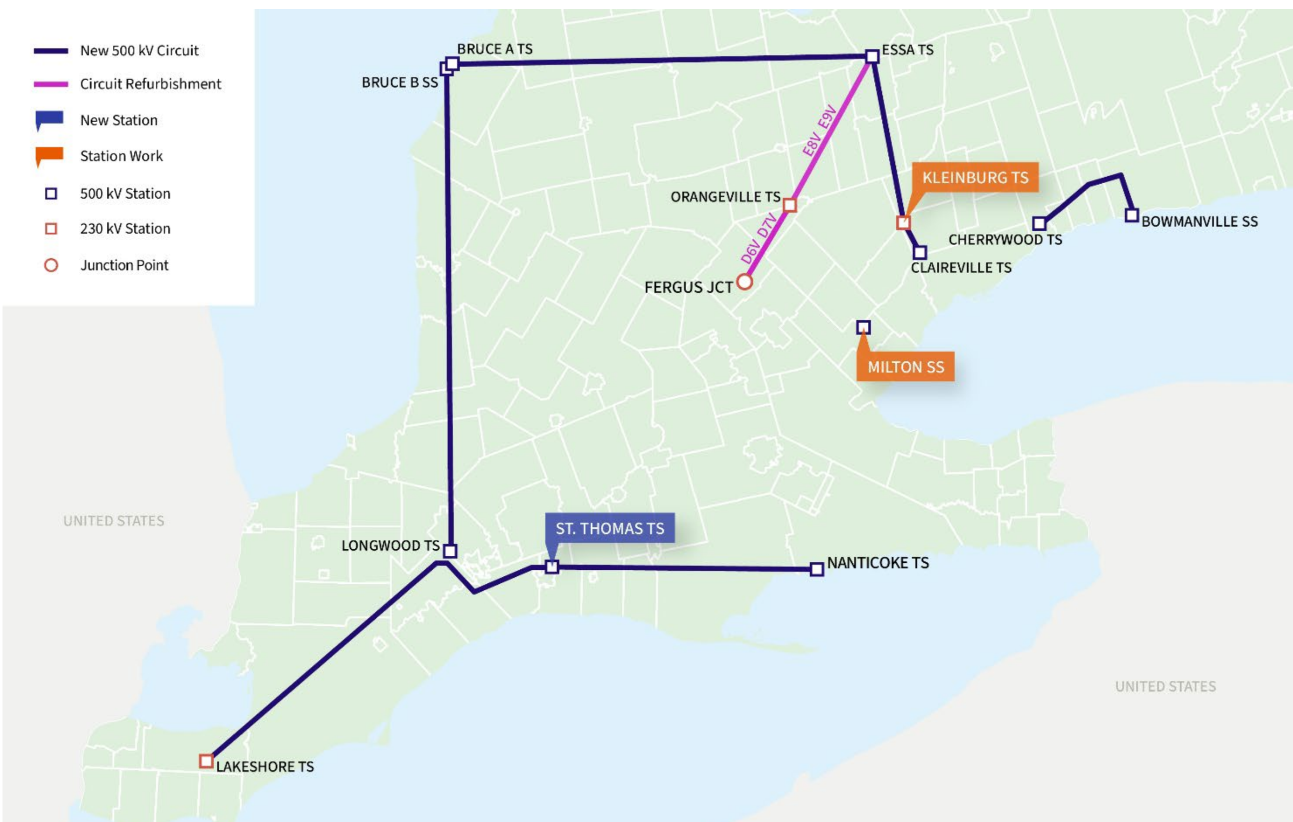
5.3.3 Portfolio C

Excluding the baseline Bruce NGS to Longwood TS 500 kV double circuit line, Portfolio C focuses on expanding the 500 kV bulk transmission system in southwestern Ontario via the new St. Thomas TS. This portfolio includes:

1. A new 500 kV station southeast of the city of London designated as St. Thomas TS, which sectionalizes the existing Nanticoke-to-Longwood 500 kV single-circuit line, supporting load growth in the London Area region;
2. A second 500 kV single-circuit line between St. Thomas TS and Nanticoke TS, supporting high NBLIP flow and load growth in the London Area region; and
3. A 500 kV single-circuit line between St. Thomas TS and Lakeshore TS, including shunt reactors on the autotransformer tertiary windings at Lakeshore TS and St. Thomas TS, supporting load growth and mitigating against high voltages in the Windsor-Essex and London Area regions.

In addition to the St. Thomas-centred 500 kV reinforcements, Portfolio C also relies on reinforcements between Orangeville TS and the Fergus Junction to support load growth in the KWCG region.

Figure 30 | Portfolio C Transmission Upgrades



Note: these diagrams do not reflect any potential routing of new circuits, only the start and end points.

Portfolio C performs similarly to Portfolio B in terms of supply capability to the London area, since both include a St. Thomas autotransformer station — something that is not possible when Longwood TS is leveraged as the main supply point (as in Portfolio A). However, unlike Portfolio B, Portfolio C does not rely on a new transmission link to the KWCG region, as it instead, like Portfolio A, reinforces supply between St. Thomas and Nanticoke.

Table 11 summarizes the need/trigger for the four reinforcements that differentiate Portfolio C. Note that the baseline actions — including the double-circuit 500 kV line between Bruce NGS and Longwood TS — are not summarized here since they are common to all three portfolios.

Table 11 | Summary of Portfolio C Options

Portfolio C Option	Scope	Need/Trigger	Timeframe
500/230 kV autotransformer station southwest of London (St. Thomas TS)	500 kV switchyard with two 500 kV circuits, two 500/230 kV autotransformers, and room for expansion. 230 kV switchyard with four 230 kV circuits and room for expansion.	London Area load; NBLIP flow	Mid-2030s
Orangeville TS to Fergus Junction Reconductoring	Existing 230 kV double-circuit transmission upgrade	KWCG load	2032
St. Thomas TS to Nanticoke TS	500 kV single-circuit transmission line	NBLIP flow; London Area load	Mid-2030s
St. Thomas TS to Lakeshore TS	500 kV single-circuit transmission line and one reactor on autotransformer tertiary at Lakeshore TS.	Windsor-Essex load; London Area load	2045

5.4 Portfolio Evaluation Results

This section evaluates Portfolios A, B, and C against the objectives of the South and Central Bulk Plan. The assessment considered reliability, operability, economic efficiency, system flexibility, implementation considerations, and stakeholder input. While each portfolio includes common baseline reinforcements, the evaluation focuses on the differentiating elements in southwestern Ontario, where the most significant impacts occur. The criteria used to evaluate the performance of each portfolio are described as follows.

- **Reliability performance** — Ability to supply forecast demand in accordance with established reliability standards and criteria for electric power systems.
- **Economic performance** — Contribution to overall transmission network efficiency across a range of possible future resource scenarios and capital cost of the package of portfolio options.
- **System operability and resilience** — Impact on real-time system operations and ability to withstand or recover from major events.
- **Stakeholder feedback** — Alignment with feedback received from communities and stakeholders.
- **Implementation complexity** — Consideration of a broad range of implementation challenges including pacing of reinforcement build-out.

5.4.1 Reliability Performance

All three portfolios satisfy the required reliability performance criteria and are technically viable options for addressing the identified regional reliability needs. The evaluation of the portfolios considered the 2035 summer and winter peak demand forecast scenarios from the 2025 APO. Supply to the Windsor-Essex region was assessed under winter peak conditions, while the London Area, KWCG, Burlington to Nanticoke, and Chatham-Kent/Lambton/Sarnia were assessed under summer peak conditions.

Without the contemplated transmission reinforcements, the reliability of supply to the London Area, KWCG, and Windsor-Essex regions becomes constrained under all-in-service and contingency conditions approaching 2035. Supply to Burlington to Nanticoke is comparatively less constrained and supply to Chatham-Kent/Lambton/Sarnia remains unconstrained under the study assumptions.

The portfolios provide differing levels of reliability improvement from the perspective of being able to supply differing levels of demand growth across the major load centres. Performance was assessed based on the incremental load that can be supplied to the London Area while respecting the 1,600 MW thermal limit of the NBLIP interface under all-in-service conditions. In this respect, Portfolio B provides the greatest support for new growth, enabling an increase of between 1,270 MW and 1,700 MW to the London Area. This equates to being able to supply approximately 95% of the high growth forecast over the study period. Portfolio C follows with an increase of 770 MW (supplies approximately 80 per cent of the high growth forecast), and Portfolio A has the least benefit with a 210 MW increase over the existing system's capacity (supplies approximately 70 per cent of the high growth forecast).

Overall, Portfolio B provides the strongest reliability performance, followed by Portfolio C, with Portfolio A offering more limited incremental benefit.

5.4.2 Economic Performance – Congestion Assessment Results

As described in Section 4.3, three resource scenarios (High East, High West, and High North) were created to test the performance of the transmission portfolios under various possible resource futures. These three resource scenarios expanded upon the resource build-out identified in the 2025 APO Capacity Expansion Scenario, Costs, and Emissions Module, which did not explicitly specify geographical/zonal resource locations. A production cost model was used in the Pan to assess each transmission portfolio's ability to deliver power to loads across the province under the three resource scenarios and compare potential economic efficiency gains from reduced congestion.

Cumulative energy flows across key transmission interfaces (see Figure 15) were evaluated over the 2032–2046 study period.[10] For each transmission portfolio, energy flows were assessed under the three resource scenarios and compared against those of the existing transmission system. Portfolio B demonstrated the highest total interface utilization at approximately 8,136 TWh, followed closely by Portfolio C and A at approximately 8,130 TWh and 8,100 TWh, respectively. All portfolios significantly outperformed the existing system without any transmission reinforcements, which resulted in a total energy flow of about 7,600 TWh. An increase in cumulative energy flows resulting from transmission investments indicated higher utilization of the interface transfer capabilities. In this instance, energy flow was calculated using the absolute value of interface flow (i.e., magnitude only).

Congestion performance was also assessed by calculating number of hours during which transmission interface experienced congestion across all resource scenarios. An hour was classified as congested whenever an interface flow is at its limit, irrespective of flow direction. Each constraint was counted separately — for instance if the TEC flow is limited in an hour, it is recorded as one congestion hour, and if the nTEC flow is limited in another hour, it is counted as an additional congestion hour.

The cumulative energy flows across key interfaces, along with corresponding total duration of congestion, are shown in Table 12. Portfolio B provided the greatest congestion relief, reducing congestion by over 267,000 hours compared to the existing transmission system.

Portfolio B showed increased interface energy transfers and reduced congestion hours; however, its overall performance gain compared Portfolio C was relatively modest. Both Portfolios B and C demonstrated comparable performances in the High East scenario, Portfolio B stood out by outperforming in the High North and High West scenarios. Furthermore, its strong performance under the High West scenario suggested a clear advantage in supporting new resource development in the West and Southwest zones. Theses results were considered alongside other factors such as reliability, cost, operability, and stakeholder feedback when evaluating the portfolios.

[10] 2032 was the starting year for the production cost model because no project considered in any of the three portfolios are expected to be in-service before 2032.

Table 12 | Cumulative Energy Flow and Congestion Duration Across Interfaces, 2032-2046

Transmission Configuration	Resource Scenario	Cumulative Energy Flow on Interfaces [TWh]	Congestion Duration [Hours]
Existing Transmission	High East	2,600 TWh	190,747
Existing Transmission	High West	2,498 TWh	332,199
Existing Transmission	High North	2,529 TWh	214,762
Portfolio A	High East	2,782 TWh	109,091
Portfolio A	High West	2,608 TWh	242,251
Portfolio A	High North	2,706 TWh	120,107
Portfolio B	High East	2,782 TWh	108,882
Portfolio B	High West	2,649 TWh	241,444
Portfolio B	High North	2,705 TWh	119,553
Portfolio C	High East	2,782 TWh	108,801
Portfolio C	High West	2,642 TWh	242,673
Portfolio C	High North	2,706 TWh	119,968

Overall, Portfolio B demonstrated the highest interface utilization and marginally better congestion performance, with Portfolio C performing comparably.

5.4.3 Economic Performance – Portfolio Cost

Capital cost estimates were developed for each portfolio based on planning-level costs for each individual project comprising the portfolio. As Baseline Actions account for most projects in each portfolio, the resulting capital costs are similar across the portfolios. All estimates carry a high degree of uncertainty (-50/+100%).[11] A summary of portfolio costs and net-present value calculations is provided in Table 13.

[11] Typical expected accuracy range (low/high) for evaluating projects at a planning, or conceptual stage of project definition.

Table 13 | Portfolio Costs, Net-Present Value

Portfolio	Expected Capital Cost ($B 2026 / NPV)	Lower Range of Capital Cost ($B 2026 / NPV)	Upper Range of Capital Cost ($B 2026 / NPV)
A	7.2 / 6.6	3.6 / 3.3	14.4 / 13.3
B	7.8 / 7.4	3.9 / 3.7	15.7 / 14.7
C	7.2 / 6.7	3.6 / 3.3	14.5 / 13.4

Overall, costs are comparable across portfolios, with Portfolio B slightly higher due to additional reinforcements but not materially different at a planning level of maturity. Cost estimates per project and portfolio are detailed in Appendix B.

5.4.4 System Operability and Resilience

Operability reflects the system's ability to be managed in real-time securely, reliably and efficiently under normal operating conditions and during credible contingencies. As system complexity increases, operability considerations become more critical to ensuring reliable and secure operations in the future. Two aspects of operability were assessed:

- System operations performance; and
- System resilience.

5.4.4.1 System Operations Performance

To operate the electricity system, a range of real-time control actions are employed to respond to changing operating conditions. System operators rely on a suit of control actions, including resource scheduling, load transfers, switching actions, and remedial action schemes, which automatically adjust generation, load or system configuration in response to changing system states and contingencies. These actions often require close co-ordination with Market Participants, as well as advance preparation of operating procedures and tools.

A key consideration in evaluating operability performance is balance between operational flexibility and system complexity. While additional control actions can provide flexibility and allow the system to respond to a broader range of conditions, increasing reliance on complex or time-sensitive actions can introduce operational risks, including human error, protection system mis-operation, and challenges with real-time execution.

The operability assessment was informed by engagement with IESO's Operations staff to identify key bulk system concerns, incorporate those insights into portfolio design and evaluate performance. This engagement helped ensure that the assessment reflected practical operating considerations and that the recommended portfolio was aligned with system needs. Several cross-cutting operability factors were considered in the evaluation, as follows:

RAS complexity and reliance: Preference for minimizing reliance on complex remedial action schemes under normal operating conditions.

Feasibility of real-time actions: Preference for reduced dependence on time-sensitive actions such as large load transfers or generation redispatch.

Performance across system conditions: Preference for portfolios that can improve ability to operate the system reliably across a range of operating conditions and under varying flow scenarios (e.g., high and low FN/FS).

Alignment with existing operational constraints: Consistency with known system operational limitations and operating practices (e.g., equipment constraints, voltage control challenges, and special operating conditions).

Key operational challenges in southwestern Ontario include:

1. High BLIP flow and high NBLIP flows;
2. Post-contingency voltage performance in KWCG; and
3. High-voltage conditions in Windsor-Essex.

Reinforcements in the Baseline Actions address BLIP flows and Windsor-Essex voltage concerns. The portfolios are therefore differentiated primarily on NBLIP capability and voltage performance in the KWCG region.

Portfolio B performed the best, delivering the greatest improvement in NBLIP transfer capability, and the strongest post-contingency voltage support to the KWCG region. Portfolio C performed moderately well, while Portfolio A provided the least improvement.

5.4.4.2 System Resilience

The resilience of the electricity system is an increasingly important planning consideration, particularly in the context of climate change. The system is exposed to more frequent and severe weather events, including heat waves, high winds and flooding, as well as longer-term shifts in climate patterns These stressors affect both transmission infrastructure and supply resources. For example, extreme heat can reduce transmission equipment ratings and increase cooling requirements, while drought conditions can materially impact hydroelectric generation. The increasing likelihood of compound events further heightens system uncertainty and operational risk.

Planning for resilience ensures that the system can withstand disturbances, limit the magnitude and duration of service interruptions, and recover efficiently following major events. As part of this assessment, the portfolios were evaluated against a set of key resilience considerations that reflect both current risks and future expected system conditions.

Key considerations included:

Concentration of transmission infrastructure: Portfolios were reviewed for the degree to which they concentrate transmission capacity at major 500 kV stations (e.g., Milton, Claireville, Longwood). While increasing capacity at existing hubs can improve system capability, excessive concentration can increase vulnerability to extreme events or cascading outages. Resilient portfolios reduce reliance on any single station, corridor, or transmission element by introducing geographic diversity in both supply sources and transmission pathways. This includes additional stations, alternative termination points, and network configurations that distribute flows more evenly across the system, thereby reducing the risk and impact of single points of failure.

Ability to maintain secure system posture under extreme contingencies: Resilient system design requires the ability to maintain safe operation following the loss of critical transmission elements, including multiple or sequential contingencies. Portfolios were qualitatively evaluated based on their ability to contribute to sustained system security under these conditions, particularly in southern Ontario where major station or corridor outages can have widespread impacts.

Preservation and enhancement of voltage and reactive support resources: The availability and access to voltage control and reactive support resource, including capacitors, reactors, and dynamic reactive devices, are critical to system performance under both normal and stressed operating conditions. Portfolios that maintain or enhance access to these resources, rather than limiting their effectiveness through design choices such as splitting busses, are preferred because they are better able to support system stability during extreme events and recovery periods.

Adaptability to evolving system conditions: Given increasing variability in generation and flow patterns, portfolios were qualitatively evaluated for their ability to accommodate evolving operating conditions without requiring significant operational workarounds or additional interventions.

Overall, Portfolio A exhibited the greatest vulnerability under scenarios involving major corridor or station loss, reflecting its more limited level of network reinforcement and supply diversification. Portfolios B and C both provided improved resilience, driven by increased transmission capability and more diversified supply configurations. Their performance is broadly comparable, with both options providing a meaningful improvement over Portfolio A.

5.4.5 Stakeholder Feedback

Stakeholder feedback was a key component of the portfolio development and evaluation, ensuring that the recommended plan reflects regional priorities, supports anticipated growth, and is informed by practical implementation considerations. Engagement on the draft portfolios began in May 2025, with input gathered through public meetings and subsequent submissions. The options were further refined through subsequent public and targeted community and stakeholder meetings. The feedback received demonstrated clear differentiation in stakeholder perspectives across the three portfolios, particularly regarding their completeness and ability to meet long-term system needs.

- **Portfolio A** received mixed and limited support. Stakeholders noted that it excludes several transmission investments identified as priorities, including key station upgrades and reinforcements required to support regional growth. Only one municipality expressed an explicit preference for this portfolio, and no utilities identified it as their preferred option. The feedback suggests that Portfolio A is viewed as insufficient to address long-term electricity demand and evolving system requirements.
- **Portfolio B** received broadly positive feedback and was not opposed by any communities or stakeholders. Responses highlighted its system benefits and alignment with regional planning priorities. Feedback on shared infrastructure elements did not raise concerns specific to this

portfolio and no stakeholder identified material gaps or deficiencies. One provincial entity maintained a neutral position, expressing general support for all portfolios.

- **Portfolio C** received the strongest support overall, with the highest number of stakeholders expressing explicit preference. It was generally viewed as the most comprehensive option and best aligned with high-growth scenarios. Feedback emphasized the value of expanded transfer capability, backbone grid reinforcements, and enhanced system resilience. Submissions also highlighted the importance of long-term transmission expansion and clear implementation timelines, which were seen as well reflected in this portfolio. No stakeholders expressed opposition or identified significant shortcomings. As with Portfolio B, one provincial entity maintained a neutral position.

Overall, stakeholder feedback indicated a preference for a comprehensive and forward-looking solution. Portfolio C was perceived as the most robust and future-ready option, while Portfolio B was viewed as a balanced and broadly supported alternative. Portfolio A was generally regarded as less capable of meeting long-term system needs.

5.4.6 Implementation Complexity

Implementation complexity reflects the practical challenges associated with delivering each portfolio, including the pace, sequencing, coordination of transmission reinforcements, supply chain and labour constraints, and permitting timelines. Given the scale and long lead times for bulk transmission infrastructure, implementation risk is a notable consideration in assessing overall feasibility.

Transmission development requires extensive activities, including routing studies, environmental assessment, engagement, engineering design, procurement, and construction. The ability to sequence these activities effectively in a manageable and coordinated manner is therefore critical to minimizing risk of delays and aligning in-service dates aligned with evolving system needs.

Portfolios were qualitatively evaluated based on the following considerations:

- **Phasing and pacing**: Portfolios that spread development over time reduce delivery risk and ease pressure on supply chains, labour, and regulatory processes.
- **Project co-ordination**: Concurrent projects with shared dependencies (e.g., stations, corridors, outages) increase scheduling complexity and execution risk.
- **Constructability and site constraints**: Expansions at existing facilities may face space and outage limitations, while new sites introduce additional siting and permitting requirements.
- **Regulatory and permitting**: New corridors and greenfield developments typically require longer approval timelines and more extensive consultation.
- **Flexibility**: Portfolios that support incremental implementation allow investments to align with demand and resource growth, reducing the risk of overbuilding.

Clear differences emerged across the portfolios. Portfolio B provided the most balanced implementation profile, with reinforcements phased from the early 2030s through the early 2040s. This approach supports manageable execution, reduces peak resource demands, and aligns with evolving system needs.

In contrast, Portfolios A and C are more back-end loaded, concentrating major projects in the late-2030s and early-2040s, increasing exposure to supply chain constraints, labour availability risks, and co-ordination challenges. Portfolio C's broader scope further increased complexity, while Portfolio A did not materially reduce these risks despite its smaller scope.

Overall, Portfolio B was preferred from an implementation perspective, offering a more phased, flexible, and deliverable approach to infrastructure development.

5.5 Summary of Portfolio Performance

Based on the evaluation described above, Portfolio B demonstrated the strongest overall performance across the key assessment criteria. Portfolio A performed the least as it did not provide the reliability, resilience and operability value and benefits for the investment costs of the portfolio itself. Portfolio C performed strongly and was broadly comparable to Portfolio B in performance. However, it does not provide the value in reliability performance and operability as Portfolio B.

The recommended portfolio is **Portfolio B** based on the balance of cost against its ability to achieve the objectives of the South and Central Bulk Plan in enabling economic development and generation dispatch across southern and central Ontario. Reliability and economic performance, system operability and resilience, broader system impacts, and implementation complexity. Portfolio performance is summarized in Table 14, on the next page. While the portfolio represents a harmonized set of transmission reinforcements to achieve the study objectives, each individual reinforcement should be triggered according to the pace of development of economic growth and generation resources, as described in Section 7.

Table 14 | Portfolio Evaluation Summary

	Portfolio A	Portfolio B	Portfolio C
Reliability performance	Meets all applicable reliability criteria. Provides the least improvement for major system interfaces and serves approximately 70% of high growth forecast scenario over the study period	Meets all applicable reliability criteria. Provides the most improvement for major system interfaces and serves approximately 95% of high growth forecast scenario over the study period	Meets all applicable reliability criteria. Provides a moderate improvement for major system interfaces and serves approximately 80% of high growth forecast scenario over the study period
Estimated Capital Costs in $B CAD (2026)[12]	7.2	7.8	7.2
Broader system impacts	Compared to the existing system, the reinforcements enable an additional 470 TWh of energy flow through transmission interfaces across three resource scenarios over 2032-2046 period.	Compared to the existing system, the reinforcements enable an additional 509 TWh of energy flow through transmission interfaces across three resource scenarios over 2032-2046 period.	Compared to the existing system, the reinforcements enable an additional 504 TWh of energy flow through transmission interfaces across three resource scenarios over 2032-2046 period.
System Operability and Resilience	Improves operability through key system interfaces the least. Has the highest impact of total corridor and station loss in major events as compared to Portfolios B and C.	Improves operability through key system interfaces the most. Has the same impact of total corridor and station loss in major events as compared to Portfolio C and lower impact as compared to Portfolio A.	Improves operability through key system interfaces moderately as compared to Portfolio A. Has the same impact of total corridor and station loss in major events as compared to Portfolio B and lower impact as compared to Portfolio A.
Stakeholder Feedback	Received mixed support, with feedback noting the omission of several priority transmission investments needed to support regional growth; broader feedback suggested it is insufficient to meet long-term system needs.	Received generally positive and unopposed feedback, with feedback highlighting system benefits and alignment with regional priorities; no significant gaps or concerns were identified.	Received the strongest support, with feedback identifying it as the preferred option due to its comprehensive and growth-oriented approach; viewed as best positioned to meet long-term demand, with no opposition or identified shortcomings.
Implementation complexity	Build out skewed towards late-2030s and early-2040s that may be more susceptible to supply chain and labour resources shortages risks.	Build out spread out over 10 years between early-2030s and early-2040 that allows gradual implementation – less susceptible to supply chain and labour resources shortages risks.	Build out skewed towards late-2030s and early-2040s that may be more susceptible to supply chain and labour resources shortages risks.

[12] Range up to -50% to +100%, typical expected accuracy range for evaluating projects at a planning, or conceptual stage of project definition.

6. Community and Stakeholder Engagement

The goal of the IESO's engagement activities is to help build awareness and understanding of the electricity planning process and offer opportunities for input, which is a critical part of ensuring recommended actions meet the needs of not just the provincial electricity system, but of communities across the province. Providing stakeholders and communities with opportunities for input into the planning process enables the IESO to better understand their views and perspectives, helping lay the foundation for sound decision-making and successful implementation of plan recommendations.

As part of the planning process, the IESO engages with key audiences such as Indigenous communities, municipalities, market participants, customers, sector stakeholders, and other interested parties.

The IESO uses a formalized process for bulk system planning to enhance transparency and provide opportunities for purposeful engagement and input. As part of that work, defining how communities and stakeholders can participate in the electricity planning process and be kept informed has been identified as a critical component of the process design. This section outlines the engagement principles and the activities that were employed along the development path of the South and Central Bulk Plan.

6.1 Engagement Principles

The IESO's External Relations Engagement Framework is built on a series of key principles that respond to the needs of the electricity sector, communities and the broader economy. These principles ensure that diverse and unique perspectives are valued in the IESO's processes and decision-making. The IESO is committed to engaging with purpose with external audiences to foster trust and build understanding about the critical work to ensuring Ontario's electricity system remains reliable, affordable and sustainable.

- The IESO applies the following principles to every engagement, ensuring that we honour our commitment to partners:
- Purposeful – Initiate meaningful conversations that move the sector forward
- Inclusive – Invite many voices and diverse perspectives to the table
- Timely – Seek input and insight when it can have the most impact
- Accessible – Ensure we meet people where they are on their energy journey
- Traceable – Allow everyone to follow the path that is being taken
- Transparent – Show how engagement helped shape the final outcome

6.2 Engagement Approach

To build awareness and understanding with stakeholders and communities about these planning activities, the IESO implemented a broad range of tactics, including:

- a dedicated engagement webpage on the IESO's website to make information widely available related to the South and Central Bulk Plan (i.e., engagement opportunities, meeting materials, webinar recordings, feedback submissions and responses);
- quarterly public webinars with notices published in the weekly IESO Bulletin;
- targeted meetings with Indigenous communities throughout the development of the plan to share preliminary options, answer questions, and invite feedback;
- targeted meetings with municipalities to understand local perspectives; and
- feedback opportunities were regularly made available and, where feasible, suggestions were incorporated into the plan — to help ensure transparency, the IESO provided responses to submitted feedback and posted it to the engagement webpage

6.3 Engagement Activities: Stakeholders, Municipalities, and Indigenous Communities

The following provides an overview of the formal engagements with stakeholders, municipalities and Indigenous Communities over the course of the development of the plan:

Date	Engagement
	Q2 2024
June 19, 2024	**Public Engagement Webinar #1** — to provide participants with information about the Plan including scope, objectives and timeline.
July 10, 2024	**Indigenous Community Webinar** — to provide participants with information about the Plan including scope, objectives and timeline.
	Q3 2024
Sept. 24, 2024	**Public Engagement Webinar #2** — to provide a recap of the work to-date, provide generation assumptions, and provide a preview of the Niagara bulk plan.
	Q4 2024
Nov. 20, 2024	**Public Engagement Webinar #3** — to provide a revised schedule, draft early actions (Bowmanville to GTA, Corridor Studies within the GTA,), aggregate modelling, cost modelling. Targeted meetings were held with key municipalities encompassed in the bulk plan, including the City of Toronto, municipalities in the GTA West and North, and communities in and around Kitchener, Waterloo, Cambridge and Guelph.

Date	Engagement
	Q2 2025
May 29, 2025	**Public Engagement Webinar #4** — to share preliminary portfolios of transmission options as part of the South and Central Bulk Plan, including third supply line. Targeted meetings were held throughout June with municipalities within the plan to discuss the options as they could influence these communities, and to gather feedback and comments for consideration.
	Q3 2025
Sept. 30, 2025	**Public Engagement Webinar #5** — recap of objectives, early actions, and development of preliminary portfolios, communicated that portfolio refinements are underway as well as energy modelling and data sets will be shared for input. Targeted meetings we held throughout September with communities that would be influenced by portfolio refinements.
	Q4 2025
Oct. 8, 2025	**Indigenous Community Webinar** — recap of objectives, early actions, and development of preliminary portfolios, communicated that portfolio refinements are underway as well as energy modelling and data sets will be shared for input.
Dec. 12, 2025	**Public Engagement #6** — to share refined portfolios and draft recommendations for GTA Module, East of Toronto Module) and opportunity for feedback. Targeted meetings were held throughout October and November with municipalities to share the refined portfolios and early actions, and to gather feedback for consideration.
	Q2 2026
April 30, 2026	**Public Engagement Webinar #7** — to share the draft recommendations and opportunity for feedback before issuing the Final Report. Targeted meetings were held in March and April with study area municipalities to present draft recommendations to those most directly affected, and to gather feedback for consideration.

The IESO's engagement efforts received strong participation from stakeholders, municipalities, and Indigenous communities, with close to 1,000 attendees participated in one or more engagement activities across the development of the plan. Through these engagements, 18 formal feedback submissions were received, and dozens of questions were answered within the public webinars, helping to shape the plan's recommendations.

Key themes that emerged from this feedback included:

- demand forecasting, growth scenarios and uncertainty
- transmission options, portfolios, and system configuration
- timing, early actions, and development risks
- non-wires alternatives, and resource mix
- data transparency and modelling assumptions
- engagement, Indigenous participation, and process clarity

Through these engagement activities, stakeholders and communities were able to deepen their understanding of the process, including policy direction, constraints, considerations, and options. For more details about how feedback has been incorporated, reference Section 5.4.5.

All background information, including engagement meeting presentations, recorded webinars, detailed feedback submissions, and responses to comments are available on the IESO's South and Central Bulk Planning engagement webpage.

6.4 Engaging With Indigenous Communities

The IESO remains committed to ongoing, effective dialogue with Indigenous communities to help shape long-term planning across Ontario. This engagement was part of a broader commitment to fostering respectful relationships, ensuring transparency, and supporting informed participation in bulk electricity system planning. Throughout the development of this plan, the IESO's engagement with Indigenous communities included targeted meeting discussions (virtual or in-person) and webinars that were held on: June 19, 2024; July 10, 2024 (Indigenous-Focused); September 24, 2024; November 20, 2024; May 29, 2025; September 30, 2025; October 8, 2025 (Indigenous-Focused); December 12, 2025; and April 30, 2026.

To share information about the bulk planning activities and invite participation in the engagement process, outreach was made to the following Indigenous communities:

- Aamjiwnaang First Nation
- Alderville First Nation
- Algonquins of Ontario
- Algonquins of Pikwakanagan First Nation
- Beausoleil First Nation
- Caldwell First Nation
- Chippewas of Georgina Island First Nation
- Chippewas of Kettle and Stony Point First Nation
- Chippewas of Nawash Unceded First Nation

- Chippewas of Rama First Nation
- Chippewas of the Thames First Nation
- Curve Lake First Nation
- Eelŭnaapeewi Lahkéewiit (Delaware Nation)
- Hiawatha First Nation
- Kawartha Nishnawbe First Nation
- Mississaugas of Scugog Island First Nation
- Mississaugas of the Credit First Nation
- Mohawk Council of Akwesasne
- Mohawks of the Bay of Quinte First Nation
- Munsee-Delaware Nation
- Oneida Nation of the Thames
- Saugeen First Nation
- Six Nations of the Grand River as represented by Six Nations Elected Council as well as the
- Haudenosaunee Confederacy Chiefs Council
- Walpole Island First Nation

The following Tribal Councils and Provincial Territorial Organizations (PTOs) were invited to participate in engagement activities, including webinars:

- Anishinabek Nation, Union of Ontario Indians
- Association of Iroquois and Allied Indians (AIAI)
- Chiefs of Ontario

The following Métis communities were invited to participate in engagement activities, including webinars:

- Métis Nation of Ontario

6.4.1 Indigenous Engagement Feedback

Detailed non-confidential feedback submitted to the IESO and the IESO's responses can be viewed on the South and Central Bulk Planning webpage. At a high level, the IESO received the following feedback from the following Indigenous communities:

- Chippewas of the Thames First Nation (COTFN) raised concerns that proposed transmission expansion will exacerbate already severe cumulative impacts on its heavily disturbed lands and rights, calling for early, rights-based consultation, Indigenous-led impact assessments, greater transparency, adherence to UNDRIP principles, and meaningful economic participation.

- Mississaugas of the Credit First Nation (MCFN) expressed concerns about advancing recommended planning initiatives without adequate environmental and archaeological analysis, emphasizing that treaty rights and resource protections should be treated as core considerations. In addition, MCFN seeks equity participation in any energy projects developed within its lands.
- Saugeen Ojibway Nation (SON) raised environmental, cultural, and governance concerns about energy development impacts within its territory and surrounding areas, particularly from the Bruce NGS and cumulative infrastructure effects. SON emphasized its stewardship role and the need for early, meaningful decision-making authority consistent with applicable land and resource agreements.
- The London District Chiefs Council expressed concerns about potential health risks from transmission infrastructure, particularly cumulative electromagnetic field (EMF) exposure from co-located lines, and is seeking clearer information on impacts to human, wildlife, and animal health.
- The Mississaugas of Scugog Island First Nation (MSIFN) emphasized potential impacts of the proposed HVDC line along the bed of Lake Ontario and implications for Williams Treaty nations. The MSIFN also raised concerns about evaluating the cumulative impacts of multiple transmission and related generation projects in the region.

6.5 Indigenous Participation and Engagement in Transmission Development Engagement Principles

Indigenous engagement during the bulk planning process assists the IESO in its assessment of various options to address future power system needs. By conducting bulk planning, the IESO determines the most reliable and cost-effective option after it has engaged with Indigenous communities and stakeholders and publishes those recommendations in the applicable bulk planning report. Where the IESO determines that the recommended solutions require immediate action, the IESO may provide those recommendations ahead of the publication of a planning report, such as through a hand-off letter to the lead local transmitter in the region, for example.

If a recommendation is made in a bulk planning report to proceed with a transmission solution, the transmission project proponent, not the IESO, will be responsible for obtaining applicable regulatory approvals from the provincial and/or federal governments, including an Environmental Assessment (EA). Where an EA is required, Indigenous consultation will be undertaken as part of the EA process. Other regulatory processes may also trigger the duty to consult. The relevant Crown entity is responsible for consultation but will delegate certain aspects of consultation to the proponent to carry out. In addition to fulfilling these delegated consultation obligations, project proponents are encouraged to engage early with Indigenous communities on ways to enable participation in particular projects.

In addition to the EA process, a project proponent will need to submit a Leave to Construct (LTC) application to the Ontario Energy Board prior to starting construction. The *Ontario Energy Board Act, 1998* limits the scope of the Ontario Energy Board's determination on whether the project is in the public interest to a consideration of price, reliability, and quality of electricity service. Accordingly, it is not within the Ontario Energy Board's purview to assess whether the Crown's duty to consult has been satisfied in respect of the transmission project.

7. Recommendations and Next Steps

The South and Central Bulk Plan was carried out to identify transmission reinforcements required to reliably supply growing electricity demand while enabling the integration of new generation across southern Ontario.

The assessment of needs affecting the transmission system concluded that, under the forecast demand and resource outlook, the existing bulk transmission system is not sufficient to:

- supply rapidly growing load centres in the GTA and southwestern Ontario;
- deliver increasing volumes of generation from major supply regions; and
- maintain reliable and flexible system operation under credible system events conditions.

Addressing these needs requires a coordinated set of transmission reinforcements that increase transfer capability, establish new supply points, and improve overall system operability.

The plan identifies several transmission reinforcements that are ready for implementation and require near term action to address pressing reliability needs. Given the urgency of several of these projects, timely advancement will be a key consideration in determining the appropriate implementation approach. While this report sets out the recommended investments, the specific implementation approach, which may include designation or competitive transmission procurements, will be determined following completion of the plan.

7.1 Recommended Plan

Based on the assessment of transmission system needs, evaluation of alternative development portfolios, and input received through stakeholder engagement, the IESO recommends a phased transmission development strategy to support electricity demand growth across south and central Ontario.

Three alternative portfolios were developed and assessed to address identified reliability needs, enable load growth, and improve system performance under a range of future demand and resource scenarios. These portfolios were evaluated against a consistent set of criteria, including reliability performance under contingency conditions, ability to accommodate regional demand growth, impacts on system congestion and economic efficiency, system operability and resilience, stakeholder feedback, and implementation feasibility.

Among the portfolios assessed, Portfolio B is identified as the preferred plan. Portfolio B provides the best overall balance of reliability performance, flexibility to accommodate growth across multiple regions, reduction in system congestion, improved system operability and resilience, and a practical and phased implementation approach. While the other portfolios resolve core system needs, Portfolio B offers greater adaptability to evolving demand patterns and resource development while effectively managing both implementation risk and long-term system costs.

Figure 31 | Recommendations with Existing Infrastructure

Note: these diagrams do not reflect any potential routing of new circuits, only the start and end points.

The recommended plan is structured as a phased set of transmission reinforcements that distinguishes between near-term investments required with a high degree of certainty and longer-term investments that are dependent on evolving system conditions. This approach ensures timely advancement of critical infrastructure while preserving flexibility to adapt to uncertainties related to demand growth, resource procurement outcomes, policy direction, and technological developments. The IESO recommends proceeding with the following actions to address identified transmission system needs.

7.1.1 Implementation-Ready Actions

Implementation-ready actions represent the set of transmission reinforcements required in the near to medium term to meet identified needs over the next ten years. Given the typical development timelines for bulk transmission infrastructure, advancement of these projects is required in the near term to ensure system readiness.

These actions address critical constraints identified through the analysis, including limitations in bulk transfer capability into the GTA, supply constraints in the KWCG and southwestern Ontario regions, and the need to integrate new generation resources such as SMRs at Darlington NGS.

Table 15 | Implementation-Ready Actions

Recommendation	Scope	Need/Trigger	Timeframe
Essa TS to Orangeville TS Reinforcement (identified as an early action)	Reconductor existing 230 kV double-circuit transmission line	Enable economic development in the area, as directed by policy	2029
Kleinburg 500/230 kV Transformer Station	Sectionalize two existing Essa to Claireville circuits Add 500 kV bus for 5 lines and 3 autotransformers, with space for expansion Add 230 kV bus for 6 lines, 1 DESN taps, and 2 autotransformers, with space for expansion	Provide a new supply capacity point to serve growth throughout GTA North and West	2031-2032
Kleinburg TS to Claireville TS Line	New 500 kV single-circuit transmission line using existing right-of-way Add one new breaker at Claireville TS	Required to enable Kleinburg TS	2031-2032
500/230 kV autotransformer station at Guelph North junction (Guelph North TS)	500 kV switchyard with two 500 kV circuits, two 500/230 kV autotransformers, and room for expansion. 230 kV switchyard sectionalizing the existing two Detweiler-to-Orangeville circuits into six circuits with room for expansion.	KWCG load	2031
Guelph North TS to Wellington TS	New 500 kV single-circuit transmission line	KWCG load; NBLIP flow	2031
Bowmanville SS towards Cherrywood TS Line (identified as an early action)	Two existing Parkway-Cherrywood circuits are connected to new 500 kV double-circuit transmission line to Bowmanville at junction outside of Cherrywood TS Add one new 500 kV termination on existing Bowmanville A SS, one new 500 kV termination on Bowmanville B SS to be developed	Enable SMRs integration and supply from Eastern Ontario	2032
Milton 500 and 230 kV Transformer Station	Expand Milton TS 500 kV by one diameter and add two autotransformers Add new 230 kV bus with two diameters: four circuits allocated for 230 kV	Provide additional supply to GTA West/Halton and Peel Regions	2033

Recommendation	Scope	Need/Trigger	Timeframe
	Additional regional projects to be identified in GTA West IRRP		
Longwood TS to Guelph North TS	New 500 kV single-circuit transmission line	KWCG load; NBLIP flow	2034

7.1.2 Future-Consideration Actions

Future-consideration actions represent transmission reinforcements that may be required to address longer-term system needs, including continued demand growth, future generation development, and evolving policy direction. While these reinforcements, summarized in Table 16, are not required to proceed immediately, they are important to ensure that the transmission system can continue to expand in a co-ordinated and efficient manner as conditions evolve.

These actions are associated with key uncertainties, including the timing and scale of large industrial and commercial load connections, the development of potential generation resources such as Bruce C, and the geographic distribution of future demand growth across southwestern Ontario, in particular London and Windsor-Essex, as well as the GTA. Execution of these actions should be triggered when specific thresholds or conditions are met, including confirmed large load connections, advancement of major generation projects, or emerging system constraints identified in future planning studies, as discussed in Section 7.2

Table 16 | Future-Consideration Actions

Recommendation	Scope	Need/Trigger	Timeframe
500/230 kV autotransformer station southwest of London (St. Thomas TS)	500 kV switchyard with two 500 kV circuits, two 500/230 kV autotransformers, and room for expansion. 230 kV switchyard with four 230 kV circuits and room for expansion	London Area load	Late 2030s
Bruce SS to Longwood TS Line	New 500 kV Double-Circuit Transmission Add one new diameter at Longwood TS	Enable Bruce C NGS to southwestern Ontario	2040s
Bruce SS to Essa TS Line	New 500 kV Double-Circuit Transmission Add two 500 kV breakers to new diameter at Essa TS (two new diameters total at Essa TS)	Enable Bruce C NGS to GTA and northern Ontario	2040s
Essa TS to Kleinburg TS Line	New 500 kV Single-Circuit Transmission Line	Enable Bruce C NGS to GTA and northern Ontario	2040s (or sooner)
Lakeshore TS to St. Thomas TS	New 500 kV single-circuit transmission line potentially utilizing 500 kV corridor to	Windsor-Essex load; London Area load	2045

	Lakeshore TS under development from Longwood TS Shunt reactors on autotransformer tertiary windings at Lakeshore TS and St. Thomas TS

7.2 Sensitivities and Next Steps in Study

While the recommended plan provides a robust and flexible pathway to address identified system needs, several uncertainties remain that could influence the timing, scope, and prioritization of future transmission reinforcements. These uncertainties are inherent to long-term electricity system planning, and the phased structure of the recommended plan is designed to manage these uncertainties by advancing critical near-term investments while preserving optionality for future development.

Several outstanding planning needs have been identified, which will be addressed through separate planning processes, monitored and updated as new information becomes available, or identified as opportunities for co-ordination, for example, with transmission developers as part of design and integration of new facilities.

7.2.1 Short Circuit Requirements in the GTA

The expansion of bulk supply infrastructure in the GTA, including the development of new autotransformer stations such as Kleinburg TS and Milton TS, introduces additional complexity related to short circuit performance in an already highly interconnected system. Short circuit strength on the system can impact the safe operation of the electrical grid if certain conditions cause short circuit levels to exceed equipment ratings.

Preliminary assessments indicate that future system configurations may approach or exceed equipment short circuit ratings under certain operating conditions, especially at the higher operating voltage levels. In the short-term, operational measures can reduce potential exposure to high short circuit levels, but this is not a permanent solution. As a result, further detailed studies are required to assess fault levels, confirm equipment capabilities, and identify any mitigation measures that may be required to maintain system operability and safety.

The IESO, in co-ordination with Hydro One, will undertake detailed short circuit studies focused on the GTA bulk transmission system. This study will focus on long term operational, configuration, and layout decisions across the GTA, with particular focus on 500 kV bulk supply stations. This study should be completed before site design work is finalized for the new Kleinburg TS and Milton TS bulk supply stations. The results may inform refinements to station design, switching configurations, and system operating strategies.

7.2.2 Resource Expansion and Procurement Outcomes

The APO identifies system needs through integrated adequacy and energy assessments that consider forecasted demand growth, resource availability, transmission deliverability, and reliability criteria.

Key drivers of these needs include economic development, population growth, policy objectives, electrification, generator retirements, and evolving system operability requirements. The IESO addresses the resource needs through competitive procurement mechanisms outlined in the Resource Adequacy Framework. These mechanisms are designed to provide flexibility and maximize ratepayer value. As outlined in the 2026 APO, planned procurement initiatives —including windows 2–4 of the second Long-Term RFP, the Long Lead-Time RFP, the third Medium-Term RFP, Capacity Auction, and other supporting programs —are expected to meet emerging energy and capacity needs in the near to medium term through mid-2030s. Beyond this period, system needs remain dependent on evolving demand trends, procurement outcomes, and policy direction.

While the 2025 APO Capacity Expansion Scenario, Costs, and Emissions module provides an illustrative view of a potential future supply mix, it neither reflects the geographic distribution of resources nor accounts for transmission constraints or the expansions required to support resource integration. However, to ensure reliable system operation, all procured resources must satisfy deliverability requirements, confirming that adequate transmission capacity exists to integrate new resources while minimizing risks of congestion and curtailment.

While this plan enables additional resource siting across the province through new transmission reinforcements, continued assessment of transmission system adequacy is required, given the uncertainty associated with future procurement outcomes, resource siting, and policy developments. This includes identifying and addressing potential constraints that may limit the integration and deliverability of new resources. As the timing, location, and scope of required transmission enhancements are sensitive to these factors, it will be monitored and refined through future planning processes to maintain alignment between transmission capability and emerging resource integration.

7.2.3 Monitoring Longer-Term System Needs

7.2.3.1 Parkway TS and Surrounding GTA 230 kV system

The addition of the Toronto Third Line allows the deferral of the Parkway Bus build-out. As load grows in GTA North and Toronto, Parkway TS may still need to be expanded to accommodate more transformation for step down stations. The configuration recommended above allows for the eventual extension of the double circuit to Parkway TS and the build out of the bus to result in the Parkway 500 kV bus configuration discussed.

Based on the 2035 base case, no 230 kV system upgrades are needed in the GTA to enable new resources from the east. However, as loads in the GTA will eventually grow and resources are expanded in eastern Ontario, several 230 kV circuits will observe an overload in certain contingencies conditions. Namely, 230 kV circuits between Cherrywood and Richview TS, Cherrywood and Parkway TS and Parkway and Richview TS should be monitored and included as part of future feasibility studies for resources east of Cherrywood TS, such as the potential development of the Wesleyville site near Port Hope, and through regional planning as loads grow in local areas.

Under the recommended configuration, during a common tower contingency of the new double from Bowmanville, the two 500/230kV autotransformers at Parkway TS are lost and more power must flow through the Toronto zone's 230kV network. Despite the loss of two autotransformers, the results indicates that the 230kV network can take on additional flow and serve the 2035 load while enabling additional flow from the East. If new bulk developments materialize and system performance is constrained by the 230 kV network ability to take on flow, additional auto transformation or a 500kV bus at Parkway can be implemented to address limiting contingencies after addressing the short circuit performance as discussed in Section 7.2.1.

7.2.3.2 St. Thomas TS

The recommended portfolio includes the development of a new 500kV / 230 kV autotransformer station close to St. Thomas. This upgrade enables load growth in the London Area, particularly manufacturing loads and electrification. The pace, magnitude and location of demand growth in the London Area will determine the timing and need date for St. Thomas TS. Given the sensitivity to large, manufacturing loads, the ongoing London Area regional planning process is the preferred vehicle for monitoring conditions in the area, with continued engagement with transmitters and LDCs crucial for understanding emerging drivers and refining the urgency as needed.

7.2.3.3 Lakeshore to St. Thomas

The recommended portfolio of long-term transmission upgrades includes the development of a 500 kV corridor between Lakeshore TS and St. Thomas TS, with the possibility to utilize the 500 kV corridor currently under development between Longwood TS and Lakeshore TS. This upgrade primarily enables load growth in the Windsor-Essex region — including from municipal development, electrification, and large load expansion (primarily greenhouses) — and has the added benefit of also enabling load growth in the London Area region. Based on existing demand forecasts for the Windsor-Essex region, the need for this upgrade is not forecast until the mid-2040s. However, given the potential for large loads to emerge rapidly as technology and economic conditions change, this need date should continue to be closely monitored and may be revised as needed. Given the sensitivity to local growth rates and individual customer connections, the Windsor-Essex regional planning process is the preferred vehicle for monitoring conditions in the area, with continued engagement with transmitters and LDCs crucial for understanding emerging drivers.

7.2.3.4 Essa to Kleinburg

As discussed in Section 5.2.3.3, the existing 500 kV double-circuit connection between Essa TS and the future Kleinburg TS is expected to require an upgrade to a three-circuit connection to address future CLAN and CLAS interface needs. The exact need date is dependant on the actual distribution of new generation resources and load centres. In particular, more significant mismatches between supply and demand in northern and southern Ontario or the GTA will advance the need date for this upgrade.

The latest possible need date for this upgrade is assumed to be 2040, or no later than the coincident in-service dates of both Bruce C, and the Bruce to Essa transmission upgrade described in Section 5.2.1. After these upgrades are complete, the additional supply into the Essa region could potentially become bottlenecked unless supply southward to the GTA is enhanced.

Earlier need dates are also possible. In particular, high generation uptake in northern Ontario, without comparable sized demand increases or with only night peaking loads typical for mining operations, could cause constraints on the CLAS interface. High demand increases throughout Essa zone or northern Ontario, without comparable sized generation, could also trigger CLAN needs. High or variable daytime generation, combined with high nighttime loads, could also create conditions where both CLAN and CLAS are limiting at different times of the day or year.

Since there are numerous potential generation and demand scenarios with different levels of CLAN and CLAS needs, the preferred approach identified for this study has been to await results of the LT2 procurement program, and reevaluate potential interface needs once the location and in service dates of these new resources are known. This evaluation will be undertaken with consideration for 8760 duration profiles of existing and forecast northern Ontario loads, and typical output scenarios for new and existing generation by resource type.

Results of this procurement program are expected in Q2 2026, shortly before the publication date of this report. Based on the typical timelines to model and evaluate system impacts of these facilities, revised need dates for the Essa to Kleinburg 500 kV third line are expected by the end of 2026.

7.3 Conclusion

This Plan defines a co-ordinated and implementable path forward to strengthen the transmission system across south and central Ontario in response to accelerating demand growth, electrification, and system transformation. By advancing a set of near-term investments while preserving flexibility for future development, the Plan establishes a foundation for maintaining reliability and affordably enabling continued economic growth, while allowing for a staged implementation approach.

As system conditions evolve, including changes in demand patterns, resource development, and policy direction, further planning will be required to assess longer-term transmission needs. A subsequent Phase 2 of the South and Central Bulk Plan will extend this analysis to a longer planning horizon and will refine the timing, scope, and sequencing of future reinforcements identified in this study. Phase 2 will also include an assessment of longer-lead time resources, where information is available regarding their scope, timing, and geographic location, to ensure that transmission planning remains aligned with potential future supply development.

Together, this phased approach ensures that the transmission system is both prepared for near-term requirements and positioned to adapt to the evolving needs of Ontario’s electricity system over the long term.

Appendix A — Planning Assessment Criteria

In developing this bulk plan, the IESO followed a number of steps including:

- Data gathering, including development of electricity demand forecasts.
- Conducting technical studies to determine electricity needs and the timing of these needs.
- Developing potential options.
- Evaluating and comparing potential options.
- Preparing a recommended plan including actions for the near and longer term.

Throughout this process, engagement was carried out with stakeholders interested in the area, in the form of public webinars and targeted discussions with the affected communities, local distribution companies and transmitters.

This Plan documents the inputs, findings and recommendations developed through the process described above and provides recommended actions for the various entities responsible for plan implementation. The Plan helps ensure that recommendations to address near-term needs are implemented, while maintaining the flexibility to accommodate changing long-term conditions.

The overall objectives of planning are consistent among both regional and bulk planning, which are the following:

- Ensure reliability and service quality
- Enable economic efficiency
- Support sector policy and decision making

There are various reliability standards that, as the electricity system planner and operator, the IESO is obliged to meet. NERC and NPCC require that the bulk system be planned to consider specific operating conditions, such as peak and light load, and a set of contingencies to ensure the bulk system is planned reliably and meets standards. Additionally, the IESO is required to demonstrate its adherence to these standards through compliance reporting.

The Ontario Resource and Transmission Assessment Criteria (ORTAC) define the planning performance criteria for Ontario, which are more specific and/or more stringent standards than NERC/NPCC. The IESO also considers operational issues and solutions that simultaneously consider bulk system reliability needs, regional needs, and assets reaching end of life, as appropriate.

The study used the planning criteria in accordance with events and performance as detailed by: NERC TPL-001 "Transmission System Planning Performance Requirements" (TPL-001), NPCC Regional Reliability Reference Directory #1 "Design and Operation of the Bulk Power System" (Directory #1), and IESO ORTAC.

In addition to meeting established criteria and standards, the IESO also seeks to enable economic efficiency and support sector policy. Bulk system planning has a role in ensuring policy objectives can be incorporated with maximum benefit to ratepayers, and in identifying opportunities for improving overall system economics, especially in a competitive environment. This includes seeking economic opportunities, such as reducing losses, congestion, or other service costs, facilitating intertie/trade requirements, and providing timely and relevant information to market participants to enhance their participation and decision-making leading to greater market efficiency and competition. It also includes supporting policy implementation affecting the power grid, such as sensitivity analysis of the economic impact of carbon pricing policies on congestion costs, as well as considering community energy plans and goals.

A.1 Thermal Criteria

Table 17 shows the thermal criteria used for the South and Central studies. Post-contingency loadings up to the STE ratings is allowed only if the operator confirms they can manually resolve the thermal violations within 15 minutes. For a breaker-failure contingency, the operator can generally isolate the failed breaker and restore the unfaulty elements within an acceptable time and reduce the impact to single-element, post-contingency loadings up to the STE ratings are considered acceptable.

Note that the STE rating of a line should be recalculated for outage conditions if the pre-contingency loading of the line is larger than its continuous rating. The STE ratings that are normally provided were calculated for pre-contingency flows equal to the continuous ratings.

Table 17 | Thermal Criteria – Applicable Ratings

Condition	Pre-Contingency	Single-element Contingency	Common-tower Contingency	Breaker-failure Contingency
All In-service	Continuous	LTE	STE	STE
Outage	LTE	STE*	STE*	STE*

* **STE rating must be recalculated for any element whose pre-contingency flow is larger than the continuous rating. The STE ratings that are normally provided were calculated for pre-contingency flows equal to the continuous ratings.**

A.2 Voltage Criteria

Table 18 shows the voltage criteria based on ORTAC. Note that only main stations at 115 kV and higher voltage levels are monitored and tapped junctions and buses in the middle of circuits are not.

Table 18 | Voltage Criteria - ORTAC

Criterion	Nominal Voltage 500 kV	Nominal Voltage 230 kV	Nominal Voltage 115 kV
Maximum pre/post-contingency voltage	550 kV	250 kV	127 kV
Limited-time maximum post-contingency voltage*	575 kV	263 kV	133 kV
Minimum pre-contingency voltage	490 kV	220 kV	113 kV
Minimum post-contingency voltage	470 kV	207 kV	108 kV

Criterion	Nominal Voltage 500 kV	Nominal Voltage 230 kV	Nominal Voltage 115 kV
Maximum post-contingency absolute voltage deviation	10%	10%	10%

*** Applicable only if voltages can be brought below their steady state post-contingency maximum limits within 30 minutes.**

A.3 Arming Remedial Action Schemes

With any one element out of service, arming an existing Remedial Action Scheme is allowed only to account for local generation outages. Not more than a total 150 MW of load can be interrupted by configuration and load rejection.

With any two elements out of service, arming an existing Remedial Action Scheme beyond 150 MW is allowed only to account for local generation outages. Not more than a total 600 MW of load can be interrupted by configuration and load rejection.

Note that locally controlled voltage-based schemes such as Under Voltage Load Shedding and reactor/capacitor switching schemes are not Remedial Action Schemes and can be used without restriction.

A.4 Respected Contingencies

Transfer capabilities, if reached, were derived based on single-element and common-tower contingencies. Breaker-failure contingencies were not included in the initial transfer studies but were evaluated with the transmission reinforcement option and resource scenarios in order to identify further needs. The rationale for not including breaker-failure contingencies in the initial transfer analysis is as follows:

- A breaker-failure contingency in a station usually removes two circuits on two different paths from that station. This should not be more limiting than the common-tower contingencies which removes two circuits on the same path.
- An operator can normally isolate the failed breaker and restore the unfaulty elements within an acceptable timeframe and reduce the event to a single-element contingency.
- The contingency assessment used for the selected outages should identify voltage collapse scenarios encompass or exceed those resulting from a breaker-failure contingency.

Also, based on the study and based on the engineering judgment, contingencies in regions not relevant to the interfaces under study may be excluded.

Appendix B — Economic Assessment Assumptions

The following is a list of the assumptions made in the economic analysis:

- The net present value (NPV) of the cash flows is expressed in 2026 CAD.
- The NPV analysis was conducted using a four per cent real social discount rate.
- A long-term annual inflation rate of two per cent is assumed. A near-term (2023–2024) annual inflation rate of four per cent was assumed.
- The assessment was performed from an electricity consumer perspective and included all costs incurred by project developers, which were assumed to be passed on to consumers.
- The NPV study period for the options analysis term extended from the start of 2027, the first year after this plan is published, to the end of 2098, when a transmission asset replacement decision would be required.
- The life of the transmission line was assumed to be 70 years. Cost of asset replacements were included where necessary to ensure the same NPV study period.
- Capital costs for the transmission options were determined based on a $50 million to $200 million per autotransformer, $5 million to $20 million per kilometre estimates for a new 500 kV double circuit line, $3 million to $10 million per kilometre estimates for a new 500 kV single circuit line, $2 million to $9 million per kilometre estimates for a new 230 kV double circuit line, $10 million to $40 million per 500 kV circuit position, and $7 million to $30 million per 230 kV circuit position. This was informed by inputs from Hydro One and estimates developed independently by the IESO.

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