JUNE 19, 2024

Bulk Planning Studies Update
Northern Ontario and South & Central Bulk Studies

IESO Transmission Planning

Independent Electricity System Operator

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Objectives of Today's Webinar

- Provide an overview of the bulk planning process and progress to date for active IESO bulk studies.
- Discuss the status of two of the active bulk studies, including soliciting participant feedback on the scope, and review next steps.

1. **South and Central Bulk Study**, will look at supporting future generation connections and demand growth in key areas throughout southern and central Ontario, including the GTA
2. **Northern Ontario Bulk Study**, will look at the bulk transfer capability between Sudbury and the GTA and vice versa

Seeking Input

- Please submit your written comments via email to engagement@ieso.ca by July 10, 2024.

Some key questions for participants to consider when reviewing the active Bulk Studies to inform upcoming feedback of interest to the IESO:

- What feedback do you have regarding the scope of work proposed?
- What other potential growth assumptions or resource scenarios should be considered as we quantify needs?
- What additional information should be taken into account as we develop options?

Overview of the Electricity Planning Process

Electricity Planning in Ontario

Provincial/Bulk System Planning

Addresses provincial electricity system needs and policy directions.

Regional Planning

Addresses local electricity system needs at the transmission system level.

Distribution Planning

Addresses local electricity system needs and priorities at the distribution system level.

Led by local distribution companies.

Integrated Bulk System Planning Process

An integrated bulk system planning process was formalized in 2022, which included the following key enhancements:

- Enhancing overall transparency through regular engagements, communicating planning priorities and providing more planning data
- Developing an integrated plan that incorporates IESO transmission planning assessments into the Annual Planning Outlook (APO) process while providing clarity around how resource acquisition (generation solution) vs. transmission decisions are made

More information on Formalizing the Integrated Bulk System Planning Process

Implementation of the Bulk System Planning Process

The 2024 APO includes the Schedule of Planning Activities (SOPA). This schedule provides a transparent snapshot of the IESO's bulk system planning workplan covering the next three to five years. More detailed updates will be provided for those studies highlighted below.

Study Name	Start - End (Estimate)
Central-West Ontario Bulk Study	2023 to 2024 (complete)
South and Central Ontario Bulk Study	2024 to 2025
Ontario Manitoba Intertie End-of-Life Joint Study	2022 to 2024
Northern Ontario System Bulk Study	2024 to 2026
Northern Ontario Connection Study	2024-2025
Eastern Ontario Bulk Study	2024 to 2026 (launch Q3 est)

For more information, refer to: APO section 9.5

Schedule of Planning Activities (1)

Area	Study Name	Start - End (Estimate)	Scope / Considerations
South and Central Ontario (including the Greater Toronto Area)	Central-West Ontario Bulk Study	2023 to Q1 2024 (complete)	To assess the bulk transmission system from Hamilton to Windsor, considering the significant potential economic development opportunities in the area. Primary focus is on ensuring a reliable power supply to the London area as committed industrial customers and ancillary loads ramp up. A previously anticipated second stage of this work to proactively assess transmission options to accommodate additional large new load connections (if and when they materialize) will be rolled into the scope of a broader South and Central Ontario Bulk Study.

Schedule of Planning Activities (2)

Area	Study Name	Start - End (Estimate)	Scope / Considerations
Northern Ontario	Ontario-Manitoba Intertie End-of-Life Joint Study	2022 to 2024	To proactively plan for the end of life of critical Ontario-Manitoba intertie equipment. Joint study between the IESO, Hydro One, Manitoba Hydro and Minnesota Power. Anticipated to be completed in 2024.
Northern Ontario	Northern Ontario Connection Study	2024-2025	To evaluate transmission options for enabling growth and development in remote northwestern Ontario
Eastern Ontario (including Ottawa)	Eastern Ontario Bulk Study	2024 to 2026	To examine bulk system transmission supply to Ottawa, the Lennox Area 230 kV system supplying the municipalities of Belleville and Kingston and a number of other industrial loads, the potential shutdown of natural gas-fired generation in the area, potential for new and/or expanded interties, and opportunities to address other system operability concerns in the area.

Linkage to P2D and POG reports

- The South and Central Ontario and Northern Ontario System Bulk Studies are a continuation of the investigations first undertaken through the IESO's Pathways to Decarbonization (P2D) study, and later refined through the Ministry of Energy's Powering Ontario's Growth (POG) plan.
- These studies will review the capability of the bulk system to support future generation connections and demand growth in key areas throughout the province, to enable a decarbonized power system in the future. This work will also consider opportunities to preserve new or expanded corridors for future transmission development.
- Actions recommended through these studies will focus on early, "no regrets" actions to be taken, while longer term direction will focus on actions to preserve options.

Southern and Central Ontario Bulk Study

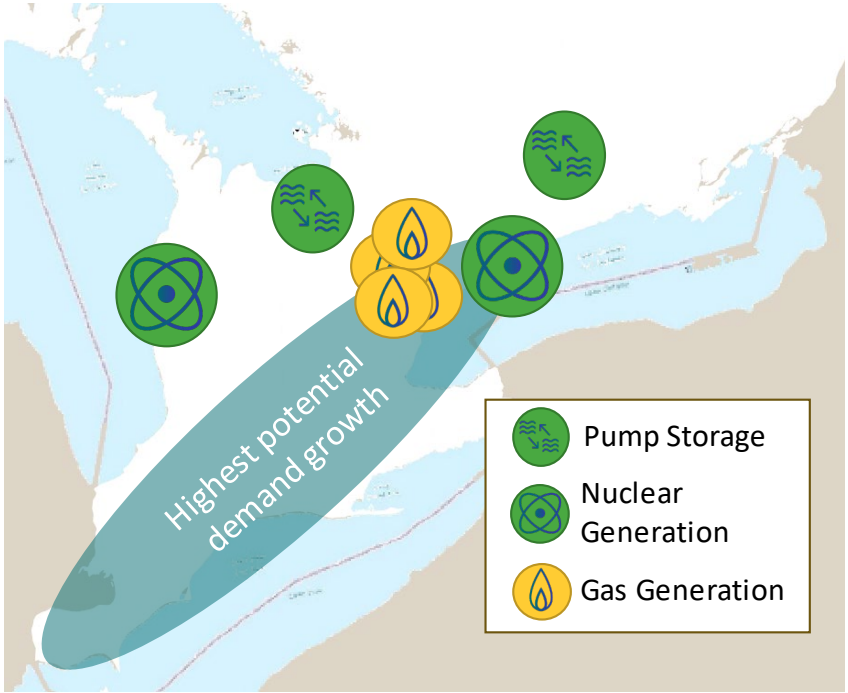
Drivers for Study

Growth in Demand, particularly along Windsor to Hamilton corridor, and within GTA:

- Electrification and fuel switching
- Data centres
- Other Large Load Centers (e.g. Automotive Manufacturing)

Transitioning to decarbonized generation:

- New small modular reactors at Darlington
- Potential new nuclear at Bruce C
- Phase-out of gas generation
- Potential Meaford Pump Storage
- Potential Marmora Pump Storage



Objectives of Study

Confirm transmission reinforcements required to enable the connection of:

- Small modular reactors at the existing Darlington nuclear GS
- Expanded nuclear at Bruce NGS
- While considering potential pumped storage at Meaford and Marmora

Determine transmission required to enable decreased reliance on emitting resources, specifically:

- York Energy Center in York Region; Portlands Energy Center in city of Toronto; Halton Hills GS in GTA West; Sithe Goreway GS in GTA West

Determine transmission required to enable reliable supply under various long-term high growth/ economic development/ electrification scenarios within key growth areas:

- Greater Toronto Area
- Windsor to Hamilton corridor

Ensure transmission reinforcements recommended through the Northern Ontario Bulk Study are coordinated with and bulk system improvements in the GTA.

Scope of Study

Use of Modules

- Given large scope of study, including range of geography and types of needs under consideration, study will be carried out as a series of independent modules studied in parallel.
- Options and recommendations will be integrated back from the modules into a full system snapshot, and module/system studies iterated, as required, before final recommendations are made.

Forecast Scenarios

- Two forecast snapshots will be considered, using similar timelines and assumptions as in the Pathways to Decarbonization study:
  1. A 2035 Summer peak scenario, based on the latest assumptions used in the Annual Planning Outlook
  2. A 2050 Winter peak scenario, based on higher rates of electrification assumed in the P2D forecast

Module Assumptions

Generation Assumptions

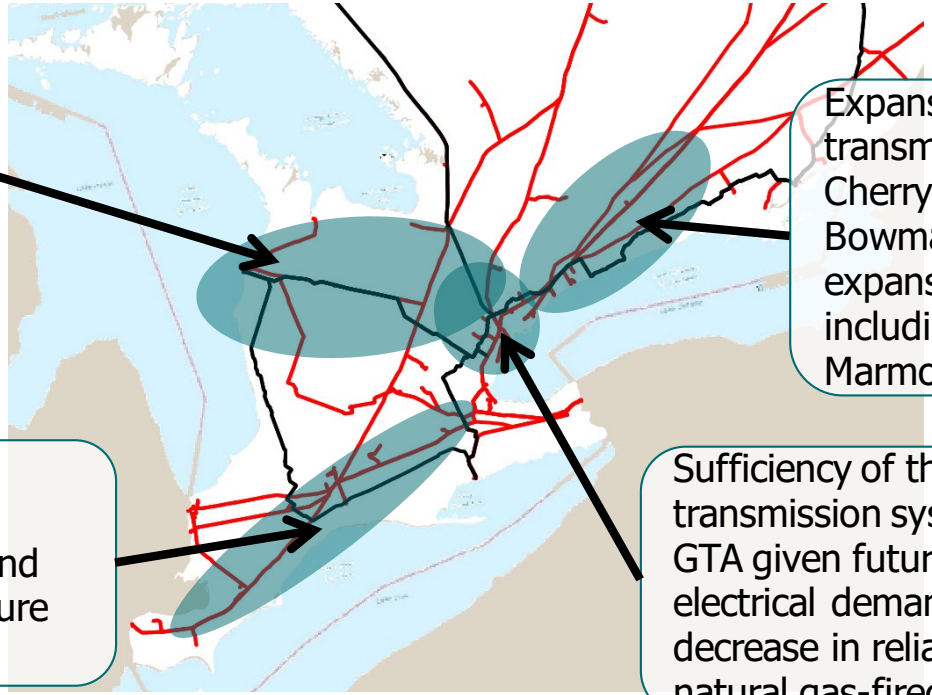
- For the 2035 case, new generators defined in the study scope will only be included within their respective module. This holds even if the generator is unlikely to be in service by 2035. YEC and Portlands are out of service, other gas will be assumed out of service if it is in proximity to the module of study or contract has expired.
- For the 2050 case, all new nuclear facilities will be assumed in service for all modules, while pumped storage facilities will only be assumed in service for their respective modules. All gas generation will be out of service.

Load Assumptions

- Major loads which have expressed interest to connect, but which do not currently have an SIA, will be included within modules studying needs associated with high electrification/ economic development. Specifically, they will be included within the Windsor to Hamilton and GTA modules.
- Capacity factors will be applied for projects with longer timelines or less confidence in proceeding. To preserve customer information, loads will be aggregated and rounded to the nearest 500 kV point.

Draft Modules for Study

Transmission expansion to enable Bruce C NGS, considering potential Meaford PS



Expansion of the 500 kV transmission system between Cherrywood TS and Bowmanville to enable expansion of generation, including SMRs and potential Marmora PS, in eastern Ontario

Sufficiency of the bulk transmission system between the Hamilton and Windsor areas given future economic development

Sufficiency of the bulk transmission system to the GTA given future growth in electrical demand, and decrease in reliance on local natural gas-fired generation

Draft Timeline

Activity	Timeline	Deliverable
Draft Study scope	February-March 2024	Scope Document
Define modules and associated generation and demand assumptions	March-May 2024	System Basecase and Sensitivity assumptions
Near-, Mid-, and Long-Term Needs identification. Link needs to specific study objectives and assumptions	June-October 2024	Needs Statement
Detailed options evaluation. Define "no regrets" near term actions, particularly actions to preserve longer term options (eg, corridor preservation and acquisition). Seek coordination with active regional planning studies to ensure bulk needs are studied in appropriate venue.	September 2024 -April 2025	Description of tx options, and impact on system capacity
Report back to Government on study progress. This may include any early results of the options analysis, if available.	December 2024	Report on plan status and progress
Prepare final report and recommendations for next steps	May-June 2025	Final Report - Public

Key Outcomes

December 2024

- Summary of progress on the South & Central bulk plan, along with other planning activities that are advancing the transmission work required to support Powering Ontario's Growth.
- Product may be leveraged to advance select recommendations, if early options evaluation work has sufficiently progressed related to more urgent needs.

Summer 2025

- Identify actions to be taken to initiate development work, as required, to address transmission needs, particularly to enable connection or phase out of resources identified in the Scope.
- Identify transmission corridors, new or existing, whose development or preservation should be prioritized to ensure short, medium, and long term options remain viable.
- Highlight needs that are still unmet (where applicable), and what additional steps may be required to identify solutions or meet needs.

Northern Ontario System Bulk Study

Recent Planning in Northern Ontario

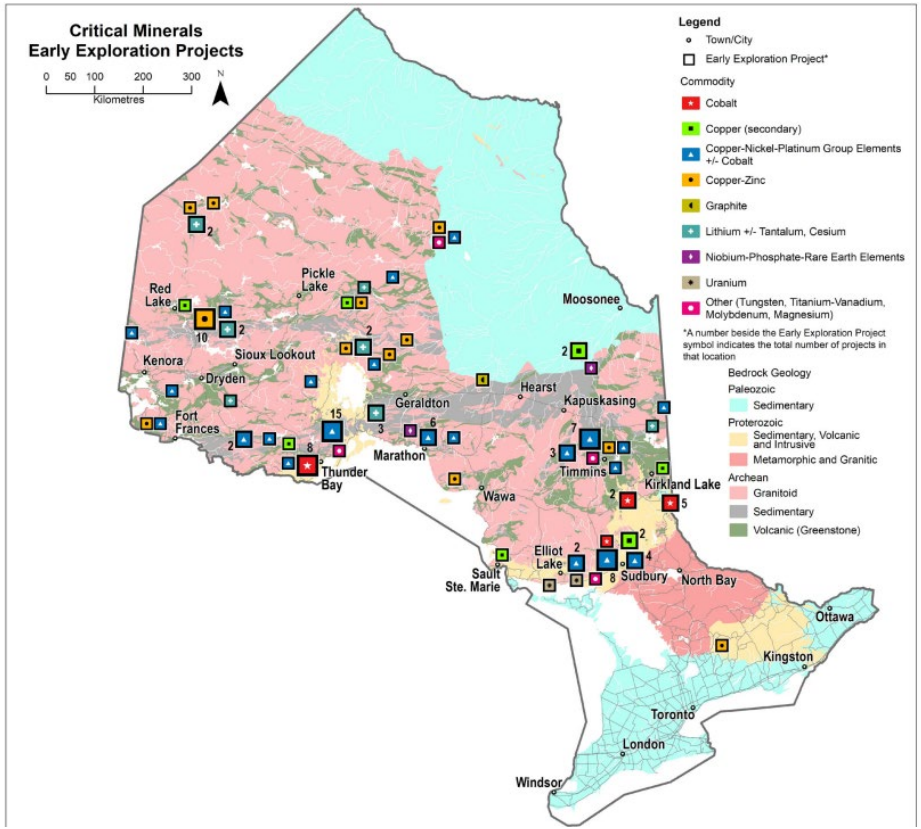
Facility Recommendations	Zone	I/S Date (est.)
Watay 115 kV Remotes Transmission System	Northwest	2022
New 230 kV circuit to Pickle Lake & 115 kV Remotes Transmission System	Northwest	2022
Ansonville to Kirkland Lake Transmission Line Refurbishment (A8K/A9K)	Northeast	2023
Kapuskasing Area Transmission Reinforcement	Northeast	2023
Sudbury Area Transmission Reinforcement (X25S Circuit Unbundling)	Northeast	Q2/3 2024
Sault#3 Transmission Line Refurbishment	Northeast	2026
Waasigan Transmission Lines (Lakehead to Dryden via Mackenzie)	Northwest	2025/2026
New 500 kV single circuit from Mississagi TS to Hanmer TS (Northeast Bulk Plan)	Northeast	2029
New 230kV double circuit from Mississagi TS to Third Line TS (Northeast Bulk Plan)	Northeast	2029
New 230 kV circuit from Porcupine to Wawa (Northeast Bulk Plan)	Northeast	2030

Additional Regional Planning Recommendations can be found at [Regional Planning (ieso.ca)]

Drivers for Growth

Forecasts continue to show increasing demand growth in Northern Ontario as a result of:

- The development of significant potential mineral deposit supplies in northern Ontario to support electric vehicle manufacturing
- Electrification of metal production sub-sector and adoption of industrial process electrification in existing mines
- Electrification in the residential and commercial sector and overall population growth

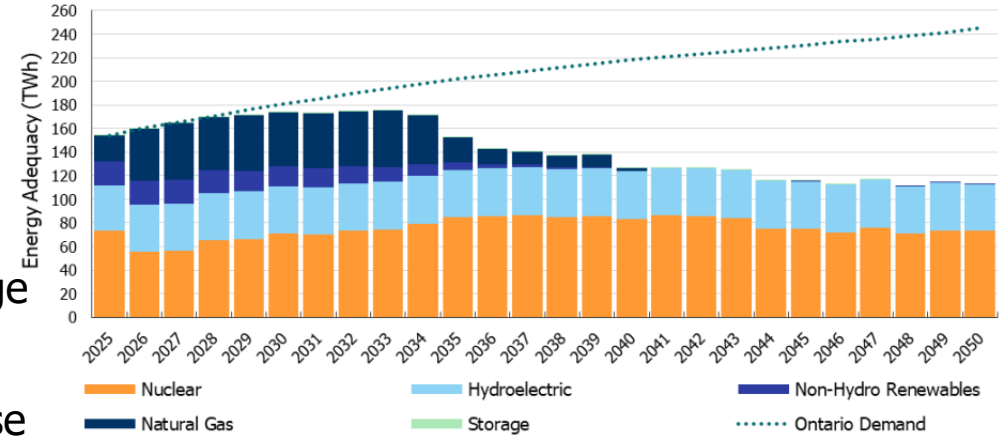


Drivers for Growth (2)

In addition to demand growth in Northern Ontario, the province as a whole is also undergoing demand growth underpinned by electrification and decarbonization, as well as the phase-out of natural gas generation.

The 2024 APO calls for:

- ~14-24 GW of capacity by 2050, depending on the season and the procurement of large nuclear
- ~60-120TWh of energy by 2050, depending on the procurement of large nuclear
- The size of this need requires a diverse portfolio of non-emitting resources across the province including Northern Ontario



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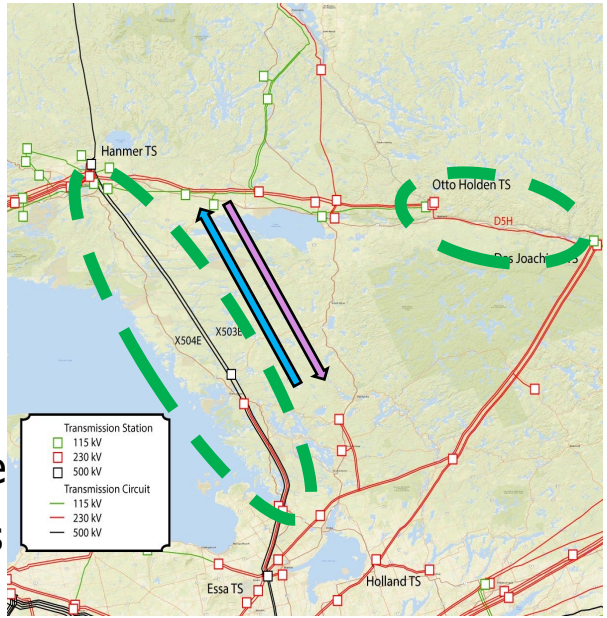
Purpose of Northern Ontario Bulk Study

The Northern and Southern electricity system in Ontario is interconnected by three transmission circuits that make up the North-South Interface.

This North-South Interface transmits excess energy from Northern Ontario to the South during system peak hours and vice versa.

This bulk transmission study will focus on the ability to continue to support economic growth and enable non-emitting resources in Northern Ontario by ensuring the North-South interface has adequate capacity to reliably supply Northern Ontario.



Scope of Study

Study will focus on bulk system limitations, i.e., if non-wires alternatives or transmission reinforcement is needed to reliably supply demand North on the FN/FS interface.

- Regional issues are assessed via regional planning
- Connection-specific details or new or modified facilities are addressed via the Connection assessment process

Summer/Winter peak scenarios, based on the latest assumptions used in the Annual Planning Outlook.

May result in additional phases of assessments upstream or downstream of Sudbury/Barrie depending on more specific large load or generation developments that materialize.

Key Outcomes

December 2024

- To ensure continued reliable electricity supply in Northern Ontario as it pertains to the North South Interface two sets of recommendations will be made:
  - Firm near-term recommendations for planned development
  - Conditional recommendations for potential further economic development

2025-2026

- Additional assessments to take place North and/or South of Sudbury x Barrie as necessary to continue to support the Critical Mineral Strategy, economic development activities and the ability to site generation in Northern Ontario.

Next Steps

Coordination between Bulk Studies

The scope of both the South & Central and Northern Ontario System Bulk studies contain several points of overlap which require coordination. Most Notably:

1. Overlap in the study in and around Essa TS.
   - Northern Study primarily focused on FN/FS interface north of Essa, South & Central study on all remaining Essa connections including the 500 kV corridor between Claireville and Essa
   - Iteration required during the solutions stage to ensure optimization and feasibility
2. Assumptions related to interface flows due to new demand or new generation sources and North South transfer capability.
   - Northern Study is responsible for identifying limiting FN/FS interface conditions and potential system upgrades
   - Verify resulting FN/FS assumptions in the South & Central study are within the range of, or less onerous than, tested conditions for Northern Ontario study

Coordination Between Bulk Studies and IRRPs

Bulk Plans are responsible for identifying preferred upgrades to address all bulk related needs

- However, regional needs can trigger requirements for bulk system upgrades
- This is expected to be the case for the ongoing Toronto and York Integrated Regional Resource Plans (IRRPs), where decreased reliance on local gas generation facilities may trigger major new supply requirements

- The South and Central Bulk Study will be responsible for identifying and evaluating bulk system upgrades required to address regional needs emerging from potential gas phase-out

- The Toronto and York IRRPs will be primarily responsible for carrying out engagement with local communities related to these needs and potential solutions, and identifying local need dates.

Next Steps

- Feedback due to engagement@ieso.ca by **July 10, 2024**
- IESO to post and respond to feedback by **August 2, 2024**

Potential topics for upcoming Bulk Studies quarterly updates:

- Discussing Needs, Options and Recommendations
- More detailed, targeted engagement sessions to be carried out as required for each individual study

Seeking Input

Reminder, questions for consideration for the active Bulk Studies include:

- What feedback do you have regarding the scope of work proposed?
- What other potential growth assumptions or resource scenarios should be considered as we quantify needs?
- What additional information should be taken into account as we develop options?

Questions?

Questions of clarification on the material presented today?

or

Submit questions by email to engagement@ieso.ca

Thank You

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