
APRIL 14, 2022

Gatineau Corridor End-of-Life Study Public Webinar #1

Webinar Purpose

- To provide an overview of the Gatineau Corridor End-of-Life Study and how it fits into the overall context of electricity planning across Eastern Ontario
- To present the IESO's proposed recommendations to address the Gatineau Corridor reaching end-of-life, and existing and forecast supply requirements to the areas of Peterborough to Quinte West and Ottawa
- To seek input on growth and development and other key considerations for plan development
- Outline next steps in electricity planning in the area

Agenda

1. Introduction and Overview of Planning Activities
2. Gatineau Corridor Bulk Plan
 - i. Background
 - ii. Scope, Methodology, and Identified Needs
 - iii. Options Evaluation
 - iv. Proposed Recommendations
3. Interdependencies with Other System Needs
4. Next Steps

About the IESO



Reliably operate Ontario's power system 24/7



Purposefully engage to enable informed decisions



Plan for Ontario's future energy needs



Support innovation



Enable competition and create efficient electricity markets



Show cybersecurity leadership



Deliver province-wide energy efficiency



Serve as Ontario's Smart Metering Entity

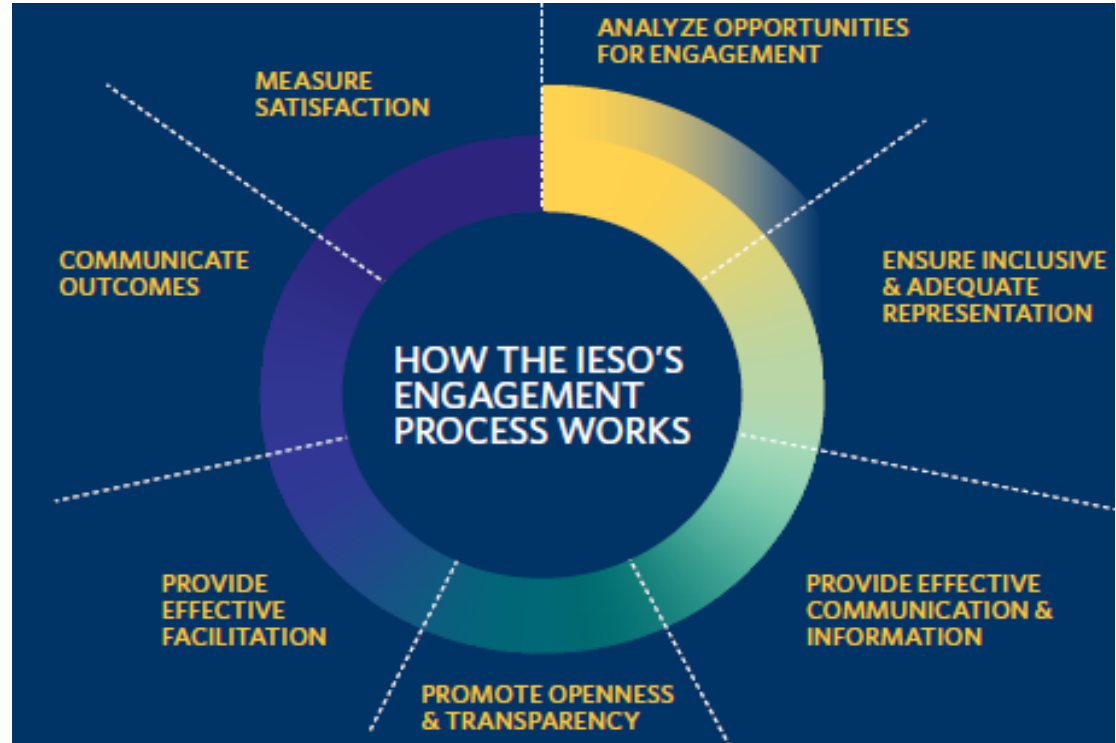
Key Electricity Trends in Ontario Today

- Demand for electricity is on the rise
- Existing and new resources will be required to avoid shortfalls
- Technological evolution can support the energy goals of municipalities, Indigenous communities
- Local energy solutions are being tested
- Interest in decarbonization continues to grow, particularly among municipalities



Engagement in Electricity Planning

- Broaden opportunities for more inclusive engagement
- Increase communication channels to raise awareness
- Inform decision-making process for regional and bulk planning initiatives



Who Should Participate?

- Municipalities
- Indigenous Communities
- Chambers of Commerce/Boards of Trade
- Large energy users
- Community groups and associations
- Academia and research organizations
- Energy service providers
- Environmental and sustainability organizations
- General public



Overview of Electricity Planning

Different Levels of Electricity Planning in Ontario



Gatineau Bulk Study

**Ottawa IRRP
Peterborough to Kingston IRRP**

Drivers for the Gatineau Corridor End-of-Life Study

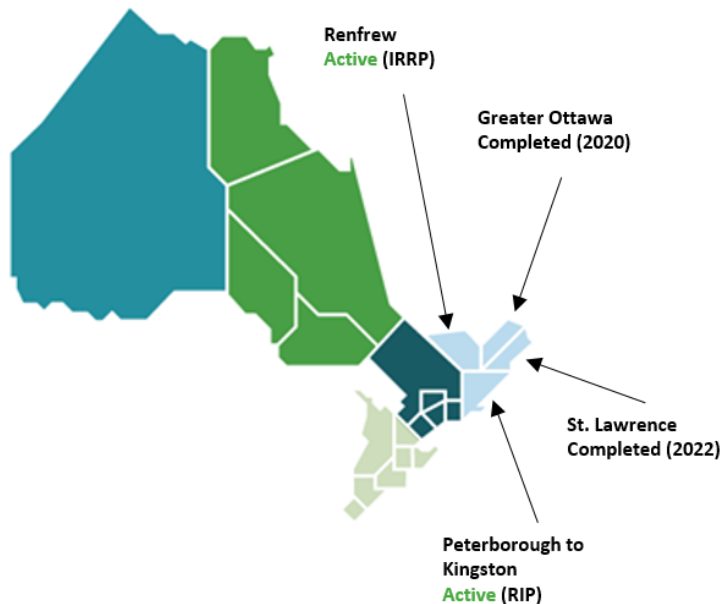
An integrated bulk system planning process was recently put in place to formalize the process to enhance transparency and opportunities for stakeholder and community input.

Prior to the formalized process being established, bulk planning was underway in eastern Ontario.

The Gatineau Corridor bulk study had been initiated to address the following issues:

- Approximately 800 km 230 kV transmission line reaching end-of-life in 5-10 years
- Existing and forecast reliability needs in the Peterborough to Quinte West and Ottawa areas

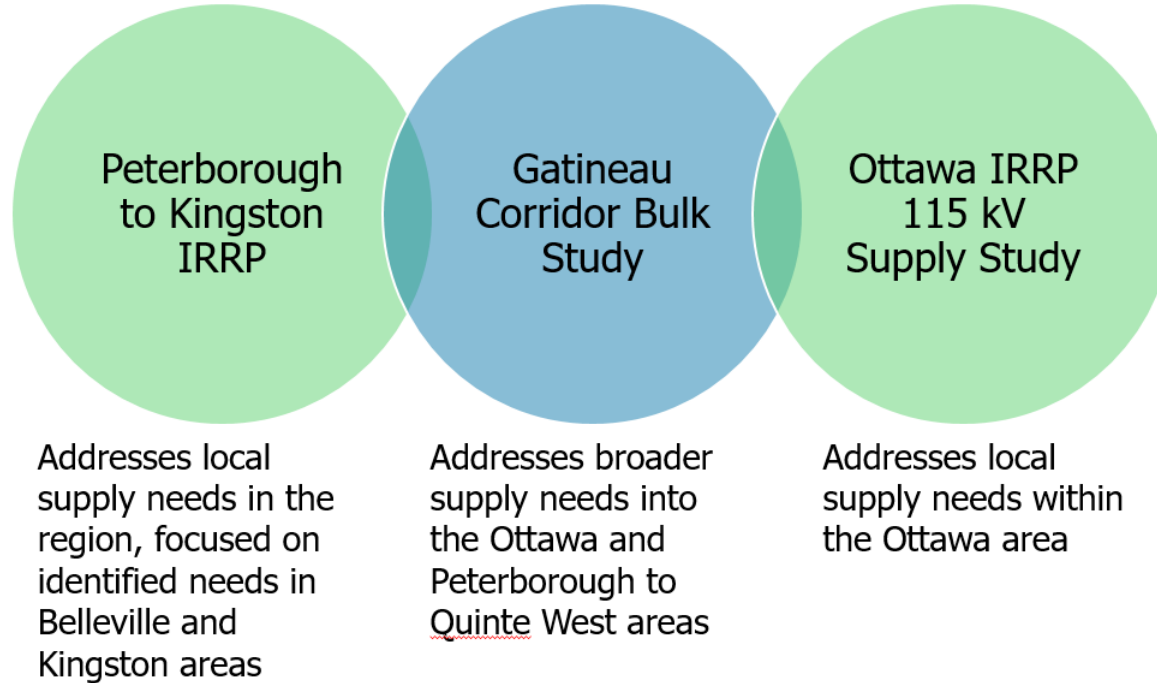
Regional Planning Activities Across Eastern Ontario



- Four regional planning areas (Renfrew, Greater Ottawa, St. Lawrence, and Peterborough to Kingston)
- IRRP completed for Ottawa Area in February 2020; study of Ottawa 115 kV supply underway
- IRRP completed for Peterborough to Kingston in November 2021
- RIP completed for St. Lawrence Region in March 2022
- IRRP is actively underway for Renfrew Region

For more information, please visit the IESO [website](#)

Overlapping Bulk and Regional Electricity Needs



Recap: Recent Engagement Activities for Eastern Plans

- December 2020/January 2021 – outreach/meetings with local communities and stakeholders to discuss Peterborough to Kingston IRRP
- January 2021 – public webinar as part of Network regional planning to provide an update on the Gatineau Corridor bulk study identified needs and options
- March, July, September 2021 – public webinars to provide updates and seek input on the Peterborough to Kingston IRRP
- May 2021 – outreach/meetings with local community and stakeholders to discuss load growth drivers in the Ottawa area
- September/October 2021 –public webinar and outreach/meeting with local communities and stakeholders to discuss Peterborough to Kingston IRRP

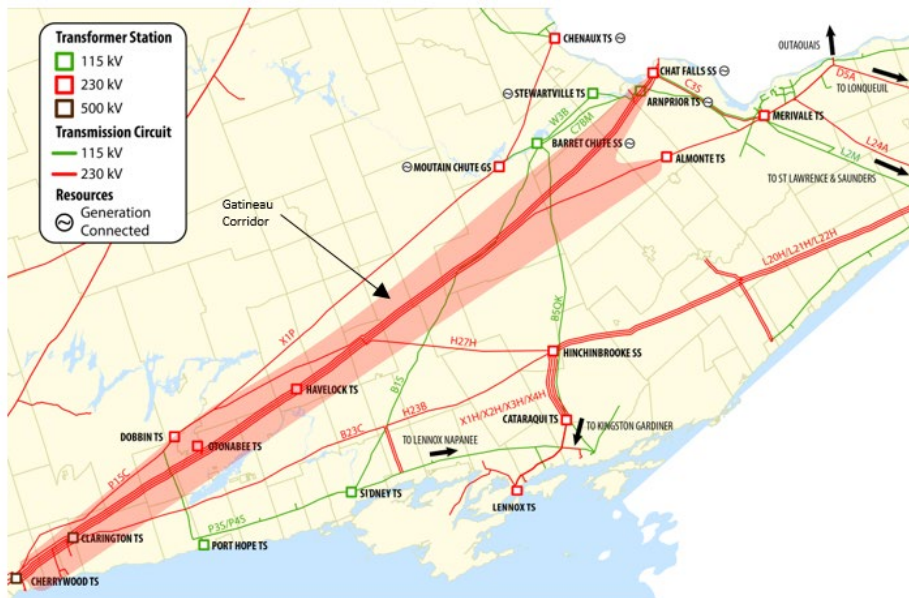
What we've heard so far...

- Electricity planning needs to consider and develop plans to accommodate both the long-term transition strategy for the Ottawa electricity sector laid out in the City of Ottawa's Energy Evolution plan, as well as more near term developments such as the electrification of the city's bus fleet
- Growing demand for power in Kingston resulting from de-carbonization targets (most recently Canadian Forces Base Kingston and Novelis)



Background

Electricity System in Eastern Ontario



- The Eastern Ontario transmission system consists of 500 kV and 230 kV circuits that generally transfers power east-west, and an underlying 115 kV system that supplies local customers.
- Generation comes from various sources including nuclear, gas, and hydroelectric with a small portion of cogeneration, wind, solar, and biofuel.

The Gatineau Corridor

- The Gatineau is a 300 km long transmission corridor that stretches between the Greater Toronto Area (GTA) East and Ottawa, and passes through Peterborough
- The corridor consists of five (5) 230 kV transmission lines that were originally constructed in the late 1920's and early 1930's primarily to transfer power from the hydro electric facilities in eastern Ontario and Quebec to the rest of Ontario
- The five transmission lines have a combined length of 1300 line-km, of which 800 line-kms have been identified by the facility owner as nearing end-of-life

Primary Functions of the Gatineau Corridor

The Gatineau Corridor's primary functions include:

- Transmission supply to the Peterborough to Quinte West area
- Transmission supply to the Ottawa area during critical outage conditions¹
- Facilitates generation imports from Quebec

¹ Loss of multiple 500 kV transmission circuits into Ottawa

Planning for Transmission Asset End-of-Life

- Consideration of end-of-life (EOL) transmission asset replacement needs is an integral part of transmission planning
- When an asset reaches EOL, a decision must be made to either replace it (like-for-like or right-size) or, in some cases, decommission it to meet safety, reliability, environmental, and customer requirements
- Many transmission assets remain in use and deliver value for 40 years or more, and over such a long period of time the functional requirements of the system could change
- Coordination of transmission asset replacement needs with other reliability and security needs forecast over the long term is critical to maximizing the benefits and value of investments

End-of-Life Definition

- EOL represents the state of having a high likelihood of failure, or loss of an asset's ability to provide the intended functionality, wherein the failure or loss of functionality would cause unacceptable consequences
- EOL is determined by the asset owner's risk-based assessments, taking into account such factors as reliability, loss of load, environmental considerations, and safety.

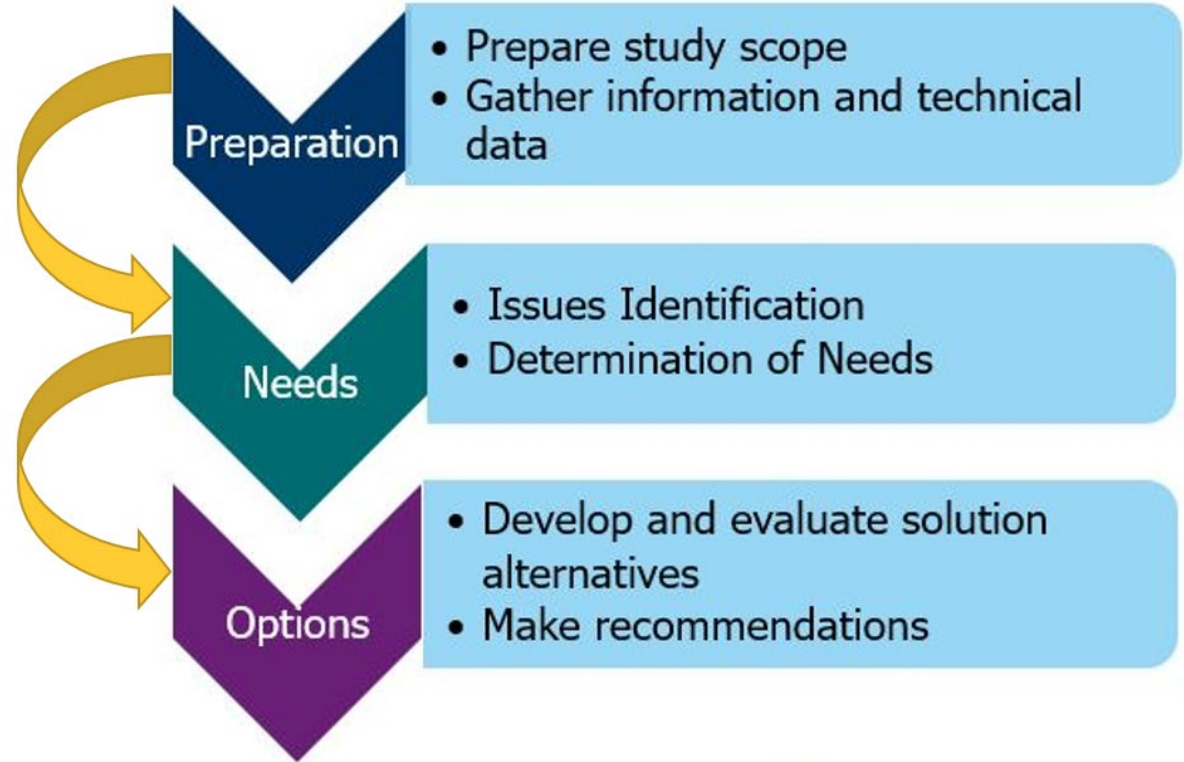


Scope, Methodology and Identified Transmission Issues

Bulk System Plan Development

Components of the Plan Development:

- Data Gathering
- Issues Identification
- Determination of Needs
- Option Development and Evaluation
- Outreach and engagement with communities, stakeholders and public



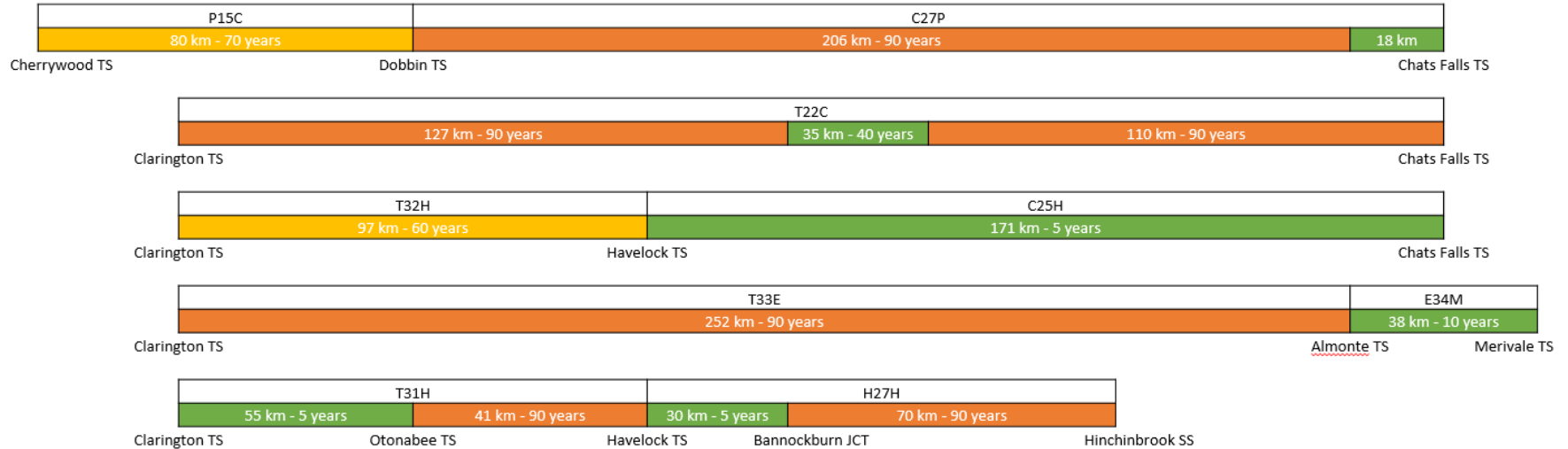
Gatineau Corridor Study Scope

- Determine the scope of the Gatineau Corridor transmission EOL refurbishment/decommissioning
- Identify and develop a plan to address forecast transmission reliability issues for the areas of:
 - i. Peterborough to Quinte West
 - ii. Ottawa

Gatineau Corridor End-of-Life Information

- At over 90 years since they were originally constructed, most transmission lines in the corridor are nearing EOL, and in some instances have already been partially refurbished
- The facility owner, Hydro One has identified that the transmission lines C27P, T22C and T33E are nearing EOL based on asset condition assessments and require replacement before 2028
- A decision to either refurbish the EOL facilities “like-for-like” or decommission and replace them with new cost effective facilities that provide additional value must be made now, as alternatives such as new transmission lines typically take 7 years to design, approve and construct.

Gatineau Corridor Asset Demographics

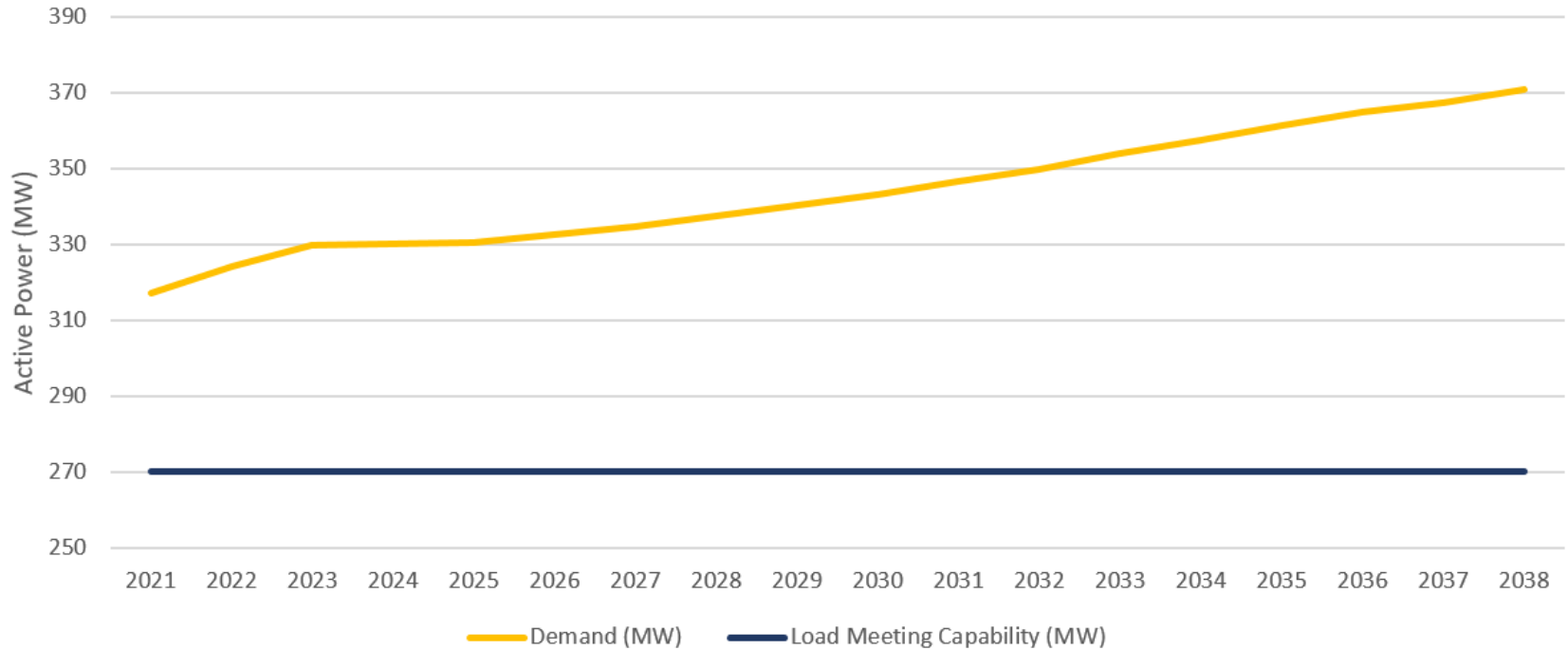


- GREEN** Recently refurbished, the plan assumes continued service
- YELLOW** Intermediate age
- ORANGE** Sections that are ~90 years old total 806 km

Electricity Demand Forecast

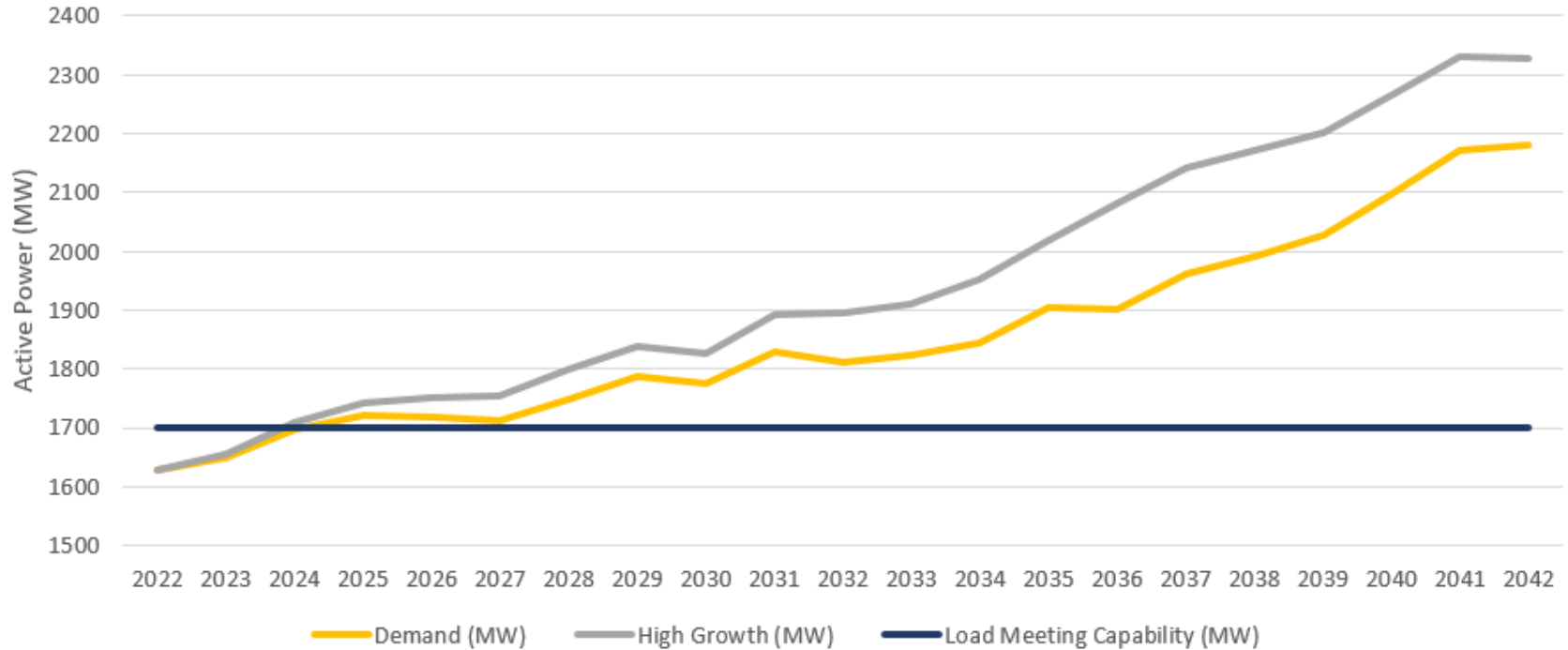
- An electricity demand forecast was developed to examine the magnitude of projected demand growth and the capability of existing transmission infrastructure to supply this growth
- The demand forecast includes the effects of conservation programs consistent with the latest Annual Planning Outlook

Peterborough to Quinte West Demand Forecast



ⁱ Demand forecast adjusted for extreme weather conditions

Ottawa Demand Forecast



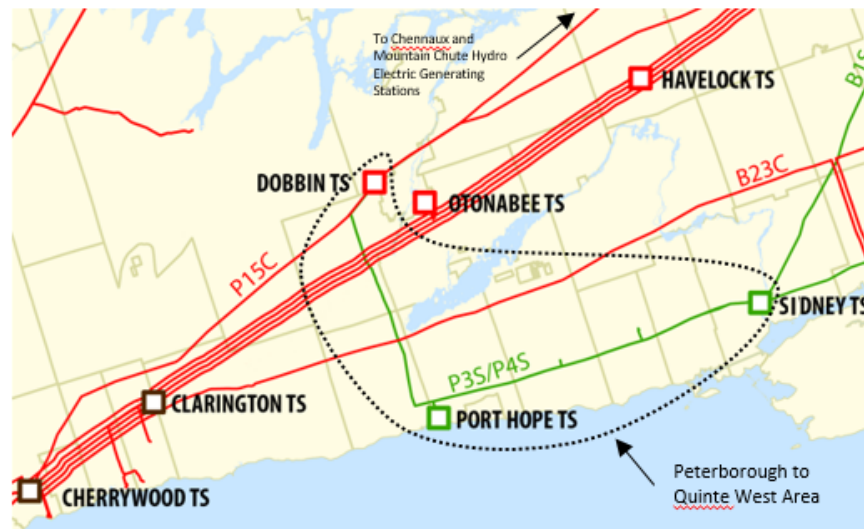
ⁱ Demand forecast adjusted for normal weather conditions

Determining Reliability Issues: Security Analysis Methodology

- Supply capacity issues, or security issues, describe the electricity system's inability to provide continuous supply to an area at peak demand over the long-term based on an electricity demand forecast.
- To determine when/if a supply capacity issue emerges, the load meeting capability of the transmission supply to an area is determined by evaluating the maximum demand that can be supplied when accounting for limitations of the transmission elements (e.g., a transmission line, group of lines, or autotransformer) when subjected to contingencies and criteria prescribed by planning standards.

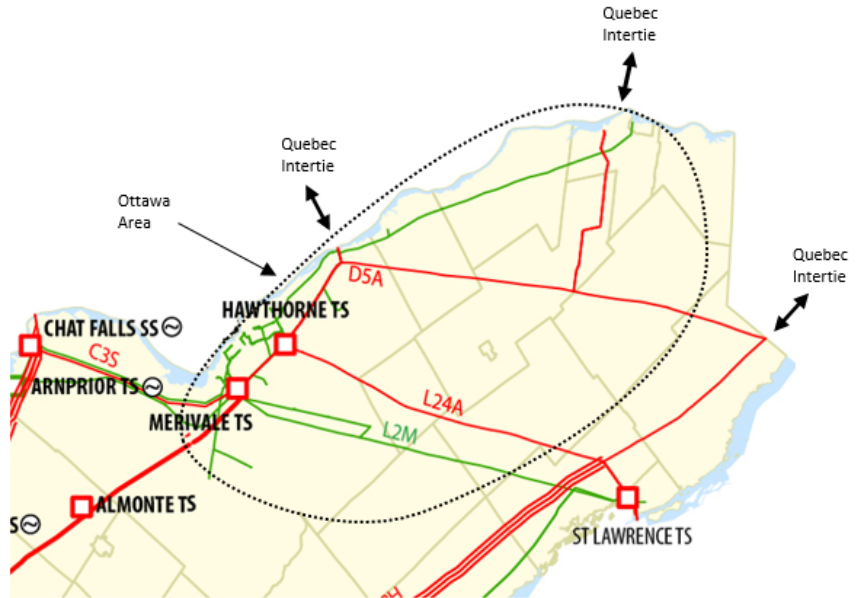
Peterborough to Quinte West Reliability Issues

- The area is primarily supplied by one 115 kV circuits from Cataraqui TS, and two 230 kV circuits in the Gatineau Corridor
- This area is also supported by two hydro-electric generation facilities, Mountain Chute GS and Chenaux GS, both of which are located in the Renfrew Region
- The Peterborough to Quinte West load meeting capability of 270 MW is not sufficient to address the forecast demand today during periods with low water conditions at Mountain Chute and Chenaux generating stations



Ottawa Reliability Issues

- The Ottawa area is primarily supplied by two (2) 500 kV circuits from Lennox TS (located in Lennox and Addington County)
- During outage conditions on the 500 kV system, the Gatineau Corridor circuits combined with other circuits from Chats Falls, Barrett Chute, Stewartville, and St. Lawrence areas are relied upon to supply to Ottawa
- Ottawa's load meeting capability is forecast to be exceeded in 2025¹



¹ The upstream constraint limiting supply to the Ottawa area also limits supply to Peterborough to Quinte West

Planning for Emerging Needs

- Based on the forecast reliability issues and transmission asset EOL needs in the area, solutions were developed to:
 - Address transmission asset EOL needs in the Gatineau Corridor
 - Reinforce supply to the Peterborough to Quinte West and Ottawa areas



Options Evaluation

Evaluating Options

Potential solutions are evaluated based on the following key considerations:

Technical Feasibility

- Can the option actually be executed? i.e., proximity to customers, routing and spacing considerations, operations

Ability to Address Needs

- Are the number, magnitude, and diversity of needs adequately addressed?

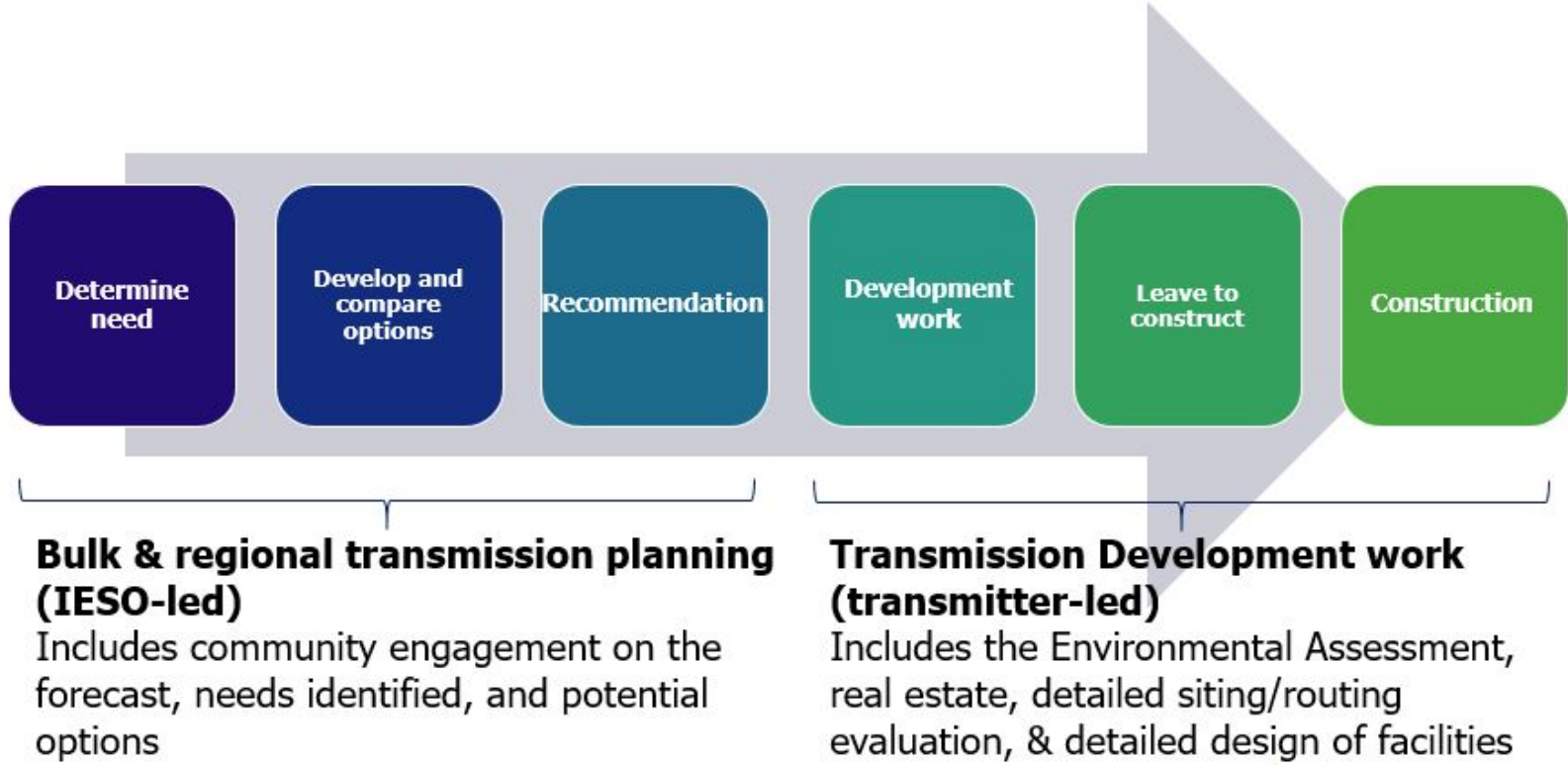
Integration & Cost-Effectiveness

- What is the lowest cost solution considering the possibility that one option may be able to address multiple needs simultaneously?
- Would a combination of option types be most effective?

Lead Time

- New transmission infrastructure or resource procurement/development could take 4-10 years – how does this compare to the timing of needs?

Typical Transmission Development Process



Gatineau Corridor End-of-Life Opportunities

- The Gatineau Corridor was examined to identify cost-effective opportunities for right-sizing and/or decommissioning
- There are limited opportunities to upgrade the current carrying capacity of the transmission lines due to structural limitations of the existing towers

Gatineau Corridor End-of-Life Opportunities cont.

- Transmission lines were screened for possible decommissioning (in combination with other system reinforcements) that considered factors such as the availability of cost effective alternatives and the current refurbishment status
- Decommissioning of P15C, C27P, T32H, C25H, T31H, and H27H were screened out due to the lack of cost effective alternatives
- Transmission lines T22C and T33E were screened in and assessed as part of the options evaluation

Transmission Options Considerations

- The assessment of transmission options focused around the necessary reinforcements to Peterborough to Quinte West and Ottawa areas with and without the refurbishment of the end-of-life transmission circuits T22C and T33E
- The most limiting constraint for both Peterborough to Quinte West and Ottawa areas is an overloaded 230 kV circuit that runs from Pickering to Peterborough, as such a transmission reinforcement into Peterborough can help address the existing and near-term forecast reliability needs for both areas

Peterborough to Quinte West Reinforcement

- The transmission reinforcement for the Peterborough to Quinte West area requires a transmission line into Dobbin TS (Peterborough), this reinforcement is required with or without refurbishment of T22C/T33E
- There are different possible routing/termination points in eastern GTA that result in comparable cost, scope, and capability. These different options should be explored during the latter parts of the transmission development process by the transmitter:
 - Rebuilding an existing single circuit 230 kV line from Cherrywood TS (Pickering) to Dobbin TS (Peterborough)
 - Build a new double circuit 230 kV transmission line from Cherrywood TS to Dobbin TS
 - Build a new double circuit 230 kV transmission line from Clarington TS (in Oshawa) to Dobbin TS

Ottawa Reinforcement

- The transmission reinforcement for the Peterborough to Quinte West area described in the previous slide can accommodate the forecast demand in Ottawa up to year 2037 when combined with the refurbishment of T22C and T33E
- Other transmission reinforcements considered as part of the study which would be required if T22C and T33E were decommissioned include:
 - Build a new double circuit 230 kV transmission line from St. Lawrence TS (Cornwall) to Merivale TS (Ottawa)
 - Build a new single circuit 500 kV transmission line from St. Lawrence TS (Cornwall) to Hawthorne TS (Ottawa)

Transmission Wires Options Considered (cont.)

	T22C & T33E	Peterborough to <u>Quinte West</u> Improvements	Peterborough to <u>Quinte West</u> LMC	Ottawa Improvements	Ottawa LMC	Capital Cost
1	Refurb	Two 230 kV circuits from Dobbin TS to Clarington TS/ <u>Cherrywood</u> TS	440 MW	N/A	1950 MW	\$525-600M
2	Retire	Two 230 kV circuits from Dobbin TS to Clarington TS/ <u>Cherrywood</u> TS	440 MW	Two 230 kV circuits from St Lawrence TS to Merivale TS	2050 MW	\$675-750M
3	Retire	Two 230 kV circuits from Dobbin TS to Clarington TS/ <u>Cherrywood</u> TS	440 MW	One 500kV circuit from St Lawrence TS to Hawthorne TS	2150 MW	\$800-875M

Energy Efficiency and Non-wires Alternatives

- The magnitude and timing of identified reliability needs are too large and appear to soon to be addressed via energy efficiency alone.
- However, energy efficiency was found to be an effective complimentary measure to transmission reinforcement to defer needs in the Ottawa area into the long-term.
- In terms of resource options, battery storage was evaluated to address the capacity need in the areas of Peterborough to Quinte West and Ottawa. However, the battery storage solution is not cost effective relative to the transmission solution.



Gatineau Corridor End-of-Life Bulk Plan

Recommendations

- The IESO recommends the following integrated solution package:
 - Refurbish all 800 km of 230 kV circuits on the Gatineau corridor
 - Build a new double circuit 230 kV transmission line from either Clarington TS or Cherrywood TS (in Oshawa or Pickering) to Dobbin TS (in Peterborough)
 - Pursue cost-effective energy efficiency in the Ottawa area through province-wide and Local Initiative Programs, while monitoring demand growth and resource acquisition activities in the Ottawa zone

Rationale for Recommendations

The recommended solution package supports the following:

- Timely replacement of EOL transmission equipment for the safe and reliable operation of the power system
- Sufficient supply for Peterborough to Quinte West for the next 20 years
- Sufficient supply for Ottawa for up to the next 20 years if targeted energy savings are successfully pursued
- Minimized costs and land-use impacts

Rationale for Recommendations (cont.)

- This solution package is the lowest cost option, while also preserving the option to support future growth (i.e. constructing the Cornwall to Ottawa reinforcement at a later date to supply high load growth scenarios such as electrification)
- This solution package maintains the capacity provided by the existing circuits being refurbished to Ottawa to help support future growth. This approach also mitigates the need to address localized issues that would result from retiring the circuits (e.g. maintaining imports capability from Chat Falls (Quebec), and avoiding the need to re-terminate existing stations supplied by the circuits).



Interdependencies with Other System Needs

Interdependencies Between Bulk and Local Needs

Ottawa 115 kV System Supply

- An outcome of the 2020 Ottawa Area IRRP was to conduct a detailed assessment of the Ottawa 115 kV supply
- This study was carried out in tandem with the Gatineau study in order to assess if appropriately located local resource and energy efficiency options could directly contribute to meeting both sets of needs
- Pursuing additional system cost effective energy efficiency as part of the recommendations of the Gatineau plan can also defer the long-term local supply needs within the Ottawa area when paired with required near-term station improvements

Interdependencies Between Bulk and Local Needs (2)

Merivale TS in Ottawa

- The 2021 Greater Ottawa Regional Infrastructure Plan identified a number of transmission equipment at Merivale TS nearing EOL, including the 230 kV breakers, a portion of the 115 kV breakers (oil circuit breakers), and auto-transformer T22
- The EOL planning of Merivale TS was carried out by the transmitter in coordination with the Gatineau study in order to develop an optimized plan addresses the EOL needs, near-term capacity needs, and provide provisions for future expansion to help address needs arising over the long-term

Interdependencies Between Bulk and Local Needs (3)

Peterborough to Quinte West 115 kV System Supply

- The 2021 Peterborough to Kingston IRRP identified low voltage concerns on the 115 kV system in Peterborough to Quinte West arising in the long-term
- The Peterborough reinforcement examined in the Gatineau Corridor study also addresses this low voltage concern

Interdependencies with Provincial Adequacy Needs

- There is a growing provincial need for capacity, as such, local generation could contribute to meeting that need. This was considered in the bulk study cost analysis.
- With the recommended transmission reinforcement in place, a minimum requirement for the Ottawa zone would not emerge until the late 2030s. Timing would depend on how the load forecast materializes and the effectiveness of pursuing additional energy efficiency savings.



Engagement and Next Steps

Seeking Input

As you listen today, consider any additional factors that should be considered:

- What additional information should be considered in the study assumptions to determine electricity needs?
- What feedback is there on the recommended scope of refurbishment for the EOL facilities and integrated solution package?
- What information should be considered in finalizing the recommendations?

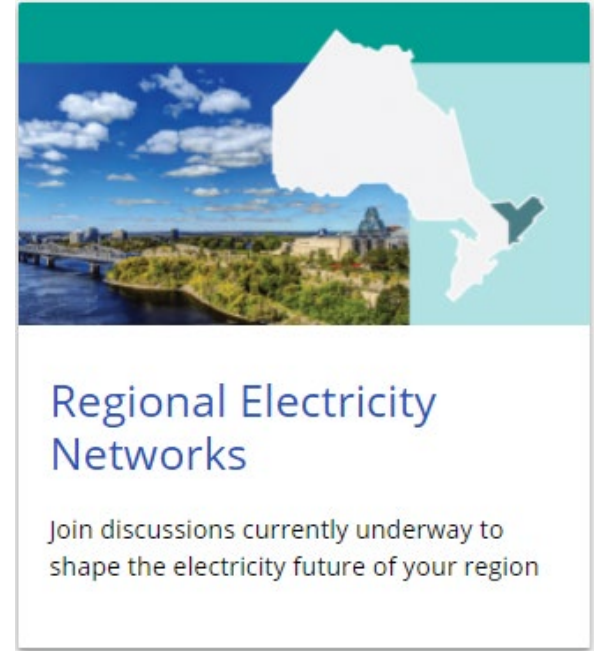
Please submit your written comments by email to engagement@ieso.ca by May 5

Next Steps

- Written feedback on draft recommendations– May 5
- Ongoing outreach throughout the development of the recommendations and integrated solution package
- Early Q3 webinar to provide outline feedback received, outcomes of targeted discussions, describe updates to recommendations that emerge as a result of input, and discuss considerations for medium-to long-term planning
- The final Gatineau EOL plan is targeted to be posted in Q3 2022

Stay Connected

- **Visit** the **dedicated engagement webpage**
- **Join** the **East Regional Electricity Network** to participate in a broader regional dialogue



Thank You

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