JULY 28, 2021

Peterborough to Kingston 2021 Integrated Regional Resource Plan (IRRP)

Engagement Webinar #2

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Agenda

1. IRRP Status Update
2. Demand Forecast – High Demand Growth Scenarios
3. Transmission System Needs
4. Options being considered
5. Community Engagement and Next Steps

Seeking Input

As you listen today, please consider the following questions to help guide your feedback after today's webinar:

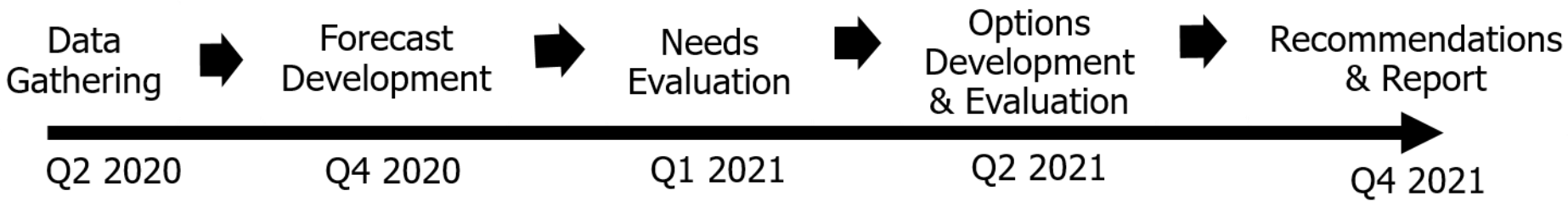
- What information needs to be considered when completing the options evaluation and making recommendations?
- How can the Peterborough to Kingston Technical Working Group continue to engage with communities through the remaining stages of the IRRP process, or to help prepare for the next planning cycle?

Please submit your written comments by email to engagement@ieso.ca by August 18

IRRP Status Update

IRRP Status Update - Timeline

- IRRP began in Q2 2020, and is on track for completion by Q4 2021
  - Electricity demand forecast, and needs have been determined and feasible options have been identified
  - The next steps are to complete options evaluation and subsequently draft the final recommendations and report



IRRP Status Update - Timeline

- Engagement launched on Scoping Assessment – March 27, 2020
- Draft Scoping Assessment posted for public comment - April 2, 2020
- Public webinar on this regional plan and draft Scoping Assessment – April 26, 2020
- Final Scoping Assessment posted – May 4, 2020
- Local outreach to help inform engagement process – Q4 2020
- Technical Working Group Meetings to develop demand forecast, assess needs, and determine options – Q2 2020 to Q2 2021
- Public Webinar #1 on this region's forecasting, needs, and engagement – March 25, 2021

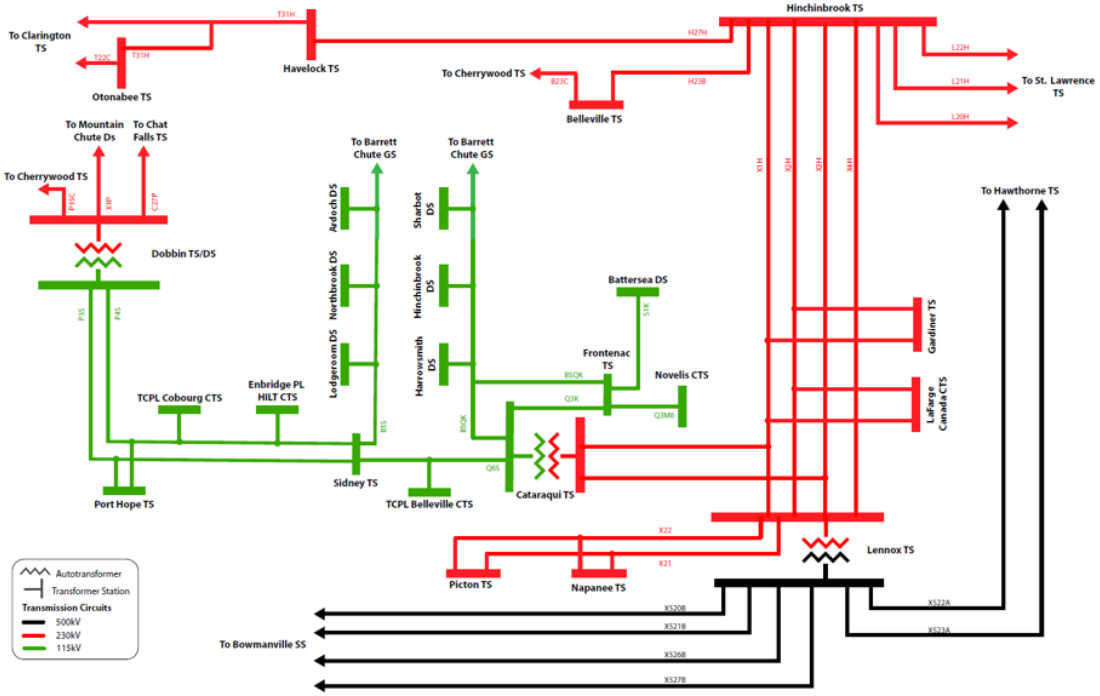
IRRP Status Update – Timeline con't

- Assessment of needs for the region is complete
- Options analysis underway
- Technical Working Group has developed additional load growth scenarios used to test robustness of solutions

Demand Forecast

Demand Forecast - Major stations and circuits

- Transformer Stations (TS) of note: Belleville, Cataraqui, Dobbin, Gardiner, Frontenac, & Sidney
- Supply circuits of note: P15C, X2H, X4H, B5QK, P3S, P4S, Q3K, and Q6S



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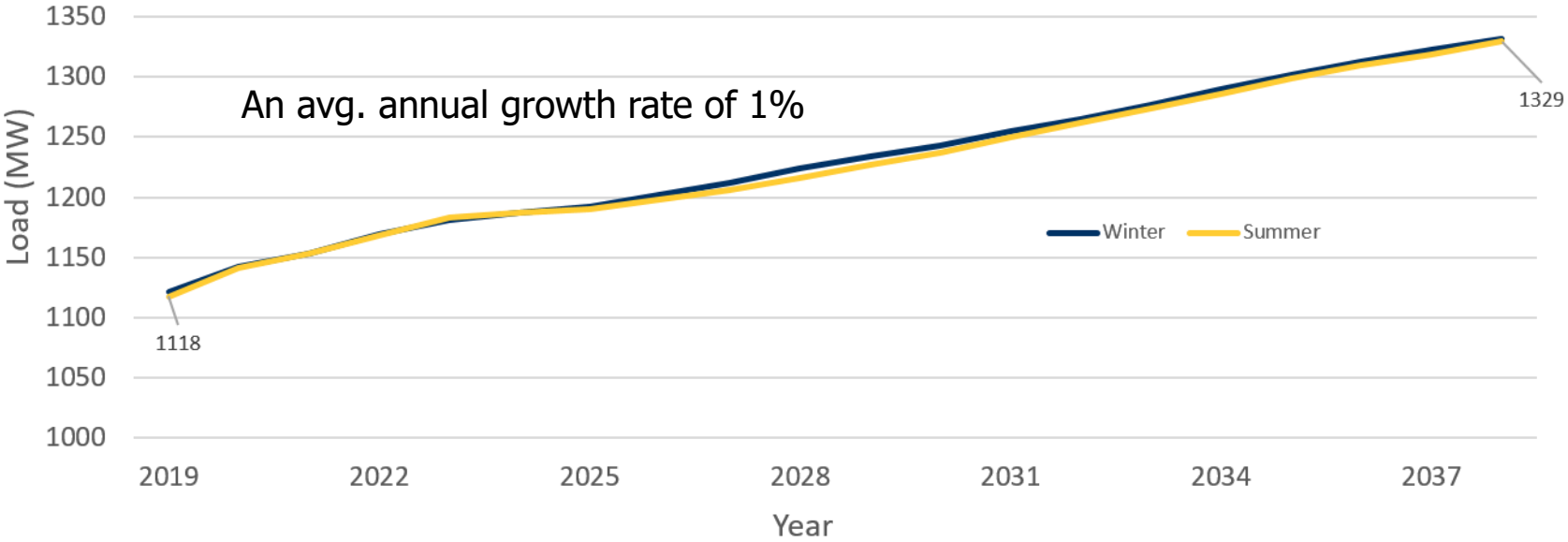
Demand Forecast - Reference Scenario

- As presented in the previous webinar, the **summer and winter** regional load forecast is:



- This is a coincident forecast, adjusted for extreme weather and with

Demand Forecast - Scenario Development

- Feedback received at last webinar indicated a need to examine a high demand scenario that better reflects potential mid- to long-term electrification uptake for the region

- The Technical Working Group, in consultation with key customers, developed a high demand scenario

    - While the scenario is most impacted by the incorporation of potential impacts of electrification in the Kingston area (identified through stakeholder feedback), the rest of the region was also reviewed by the applicable LDCs to capture any relevant long-terms growth plans or any currently foreseeable electrification impacts for their areas

Demand Forecast - Scenario Development 1

Who?

- Federal Institutions
- Municipalities
- Provincially funded Universities/colleges, Schools and Hospitals
- I-MUSH Sector

What?

- Electrification of heating
- Electrification of transportation
- Intensification of Development in central city core

Where?

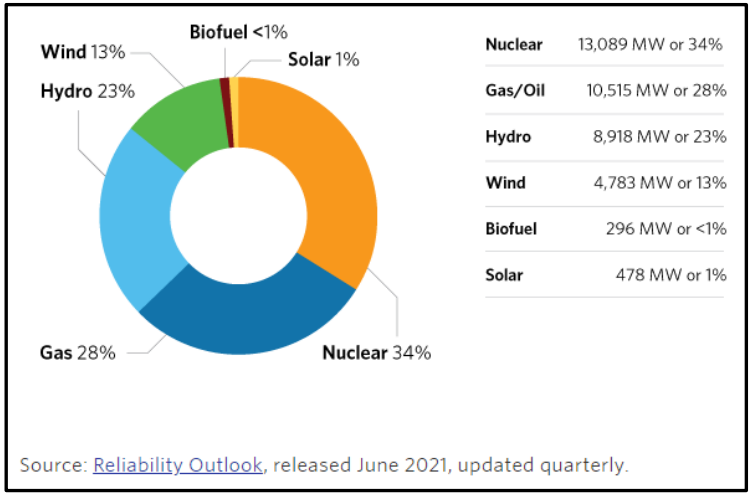
- Primarily focused on Kingston, ON

Demand Forecast - Scenario Development 2

Why?

- Significant GHG emissions from Heating and Transportation can be reduced by using Clean Energy from the Ontario Grid
- I-MUSH sector growth

How Clean is the Ontario Grid?

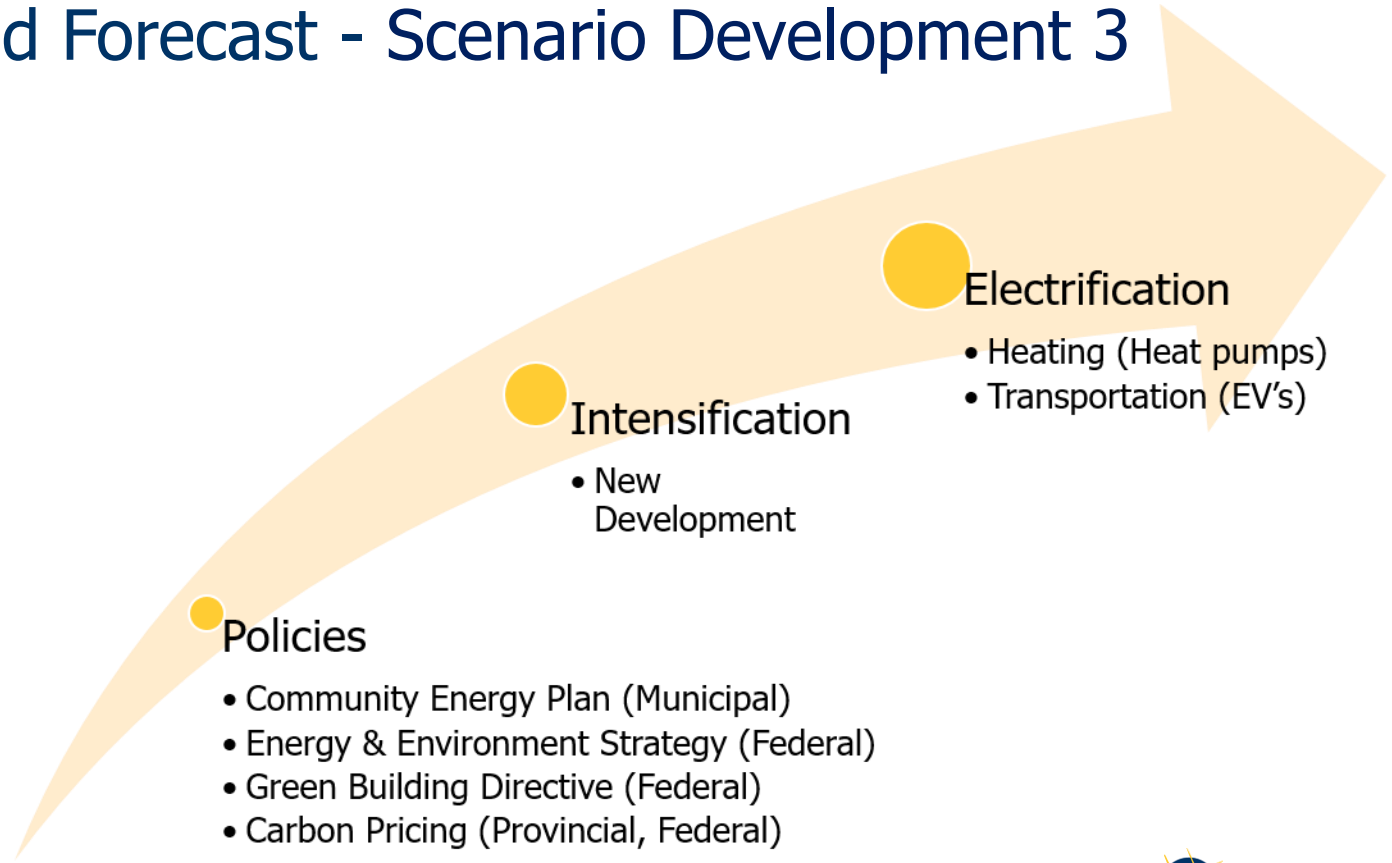


When?

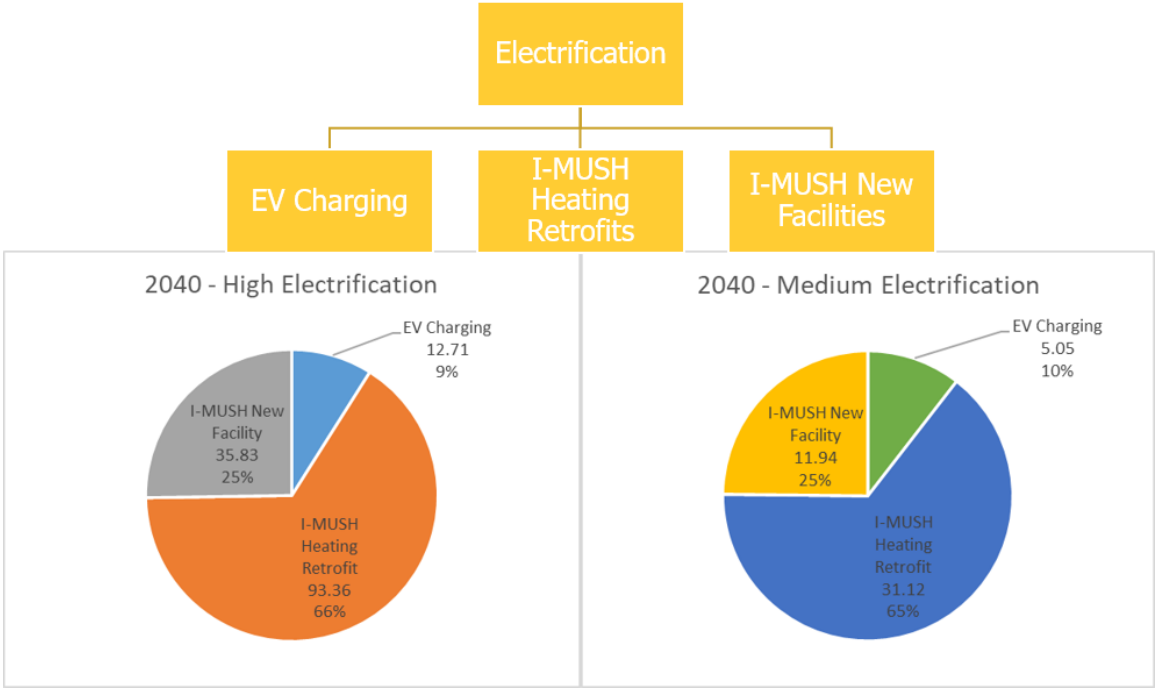
- Municipal: 2040 Net-Zero
- Provincial: 2040 Net-Zero
- Federal: 2050 Net-Zero GHG Emissions

Demand Forecast - Scenario Development 3

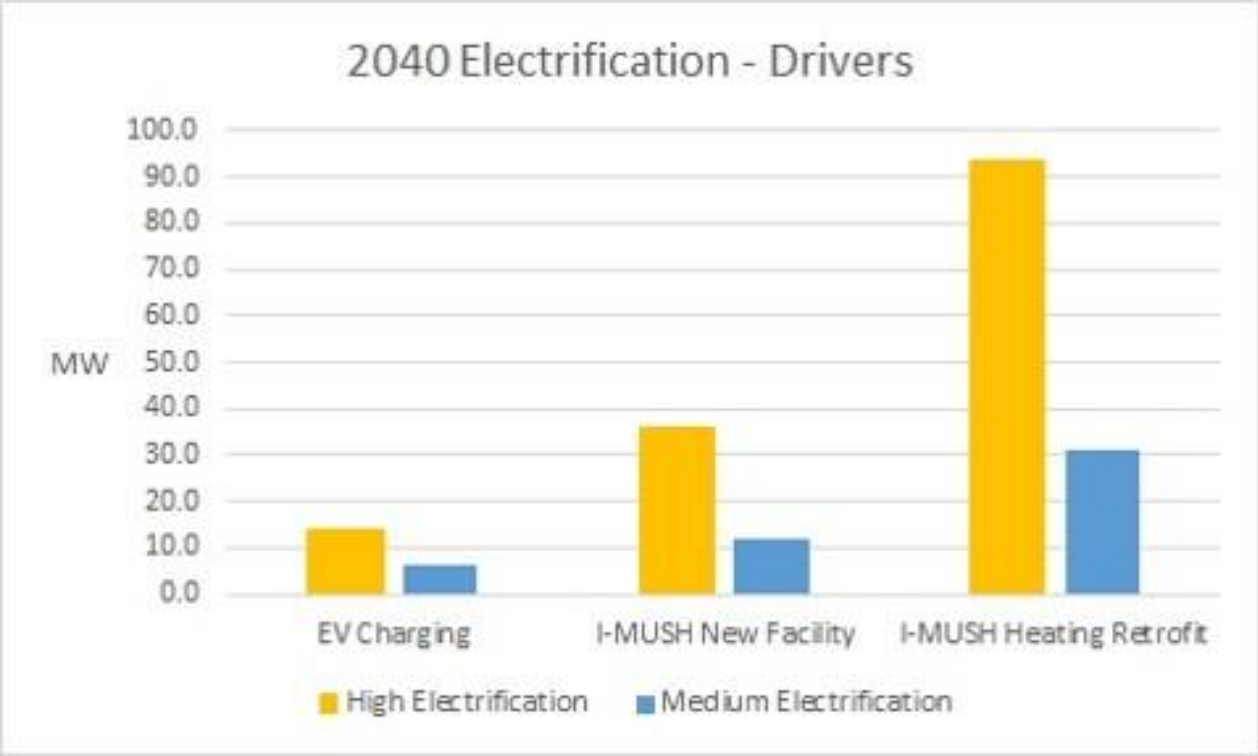
How?



Demand Forecast - Scenario Development - Kingston Area



Demand Forecast - Scenario Development: Kingston Area



Demand Forecast - Scenario Development: Kingston Area 2

Winter High Growth Assumptions

- Replace Natural Gas Heating appliance with equivalent Electric Resistive Heating

  Example: $\text{Electric Resistive Heating kW} = \text{rated output in BTUh x } \frac{29.307\text{kW}}{100{,}000\text{BTUh}}$

Winter Medium Growth Assumptions

- Replace Nat. Gas Heating w/ Dual Fuel system (Heat Pump & Nat. Gas Back-up)
- Typical Heat Pump Coefficient of Performance (COP) is 3

  Example: $\text{Electric Heat Pump kW} = \frac{\text{Electric Resistive Heating kW}}{\text{COP}}$

Demand Forecast - Scenario Development: Kingston Area 3

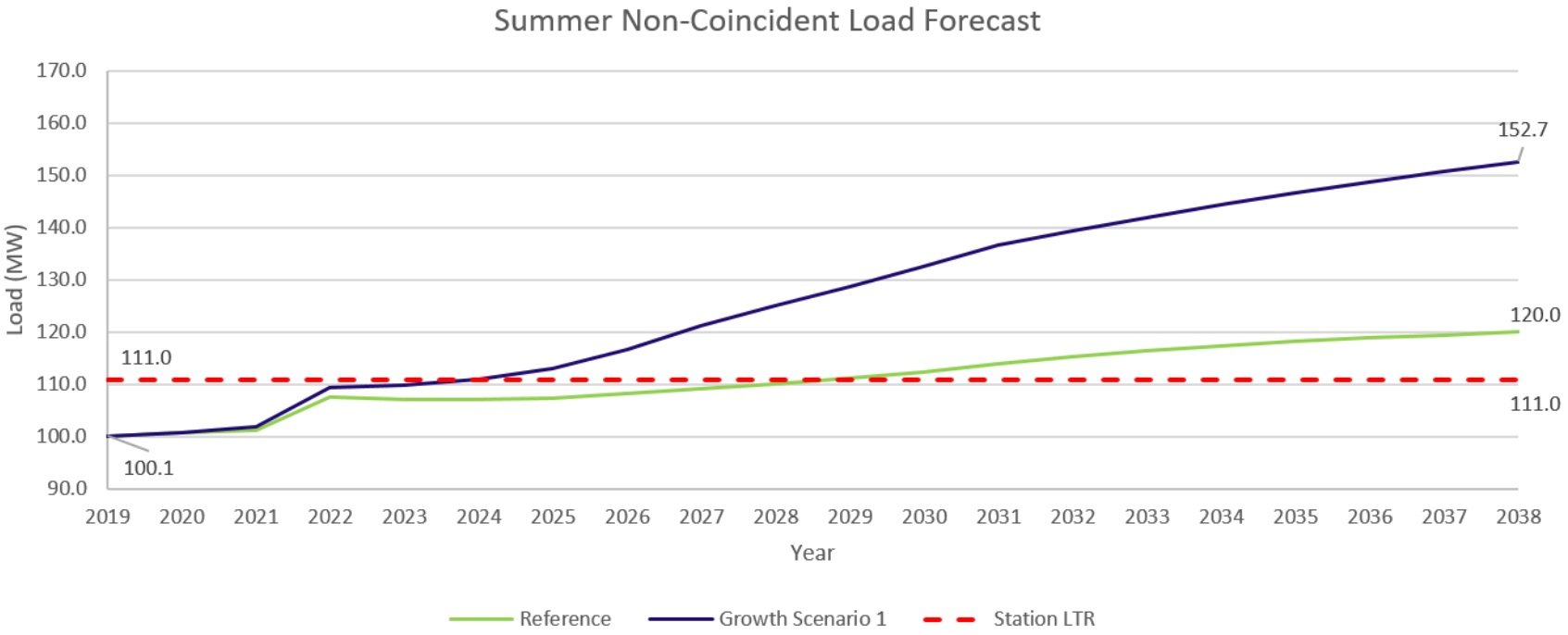
Summer High and Medium Growth Assumptions

- Heat Pumps have dual Heating and Cooling capability
- Winter Medium Growth Heating Demand is proxy for Summer Cooling Demand

Annual Peak Assumptions

- Kingston Region will remain Winter Peaking due to Electrification of Heating
- Heating is essential even when there are no occupants to prevent freeze/thaw
- Cooling is not essential when there are no occupants

Demand Forecast - Scenario Development - Frontenac TS



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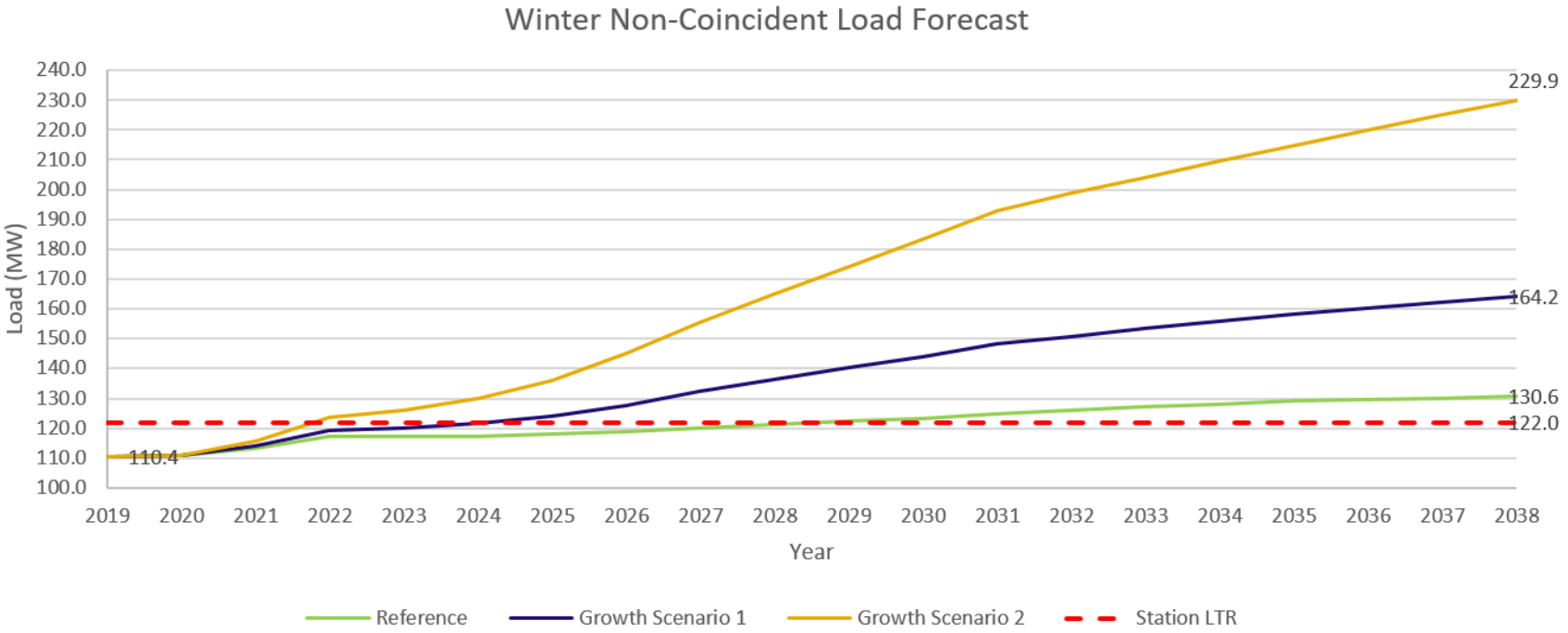
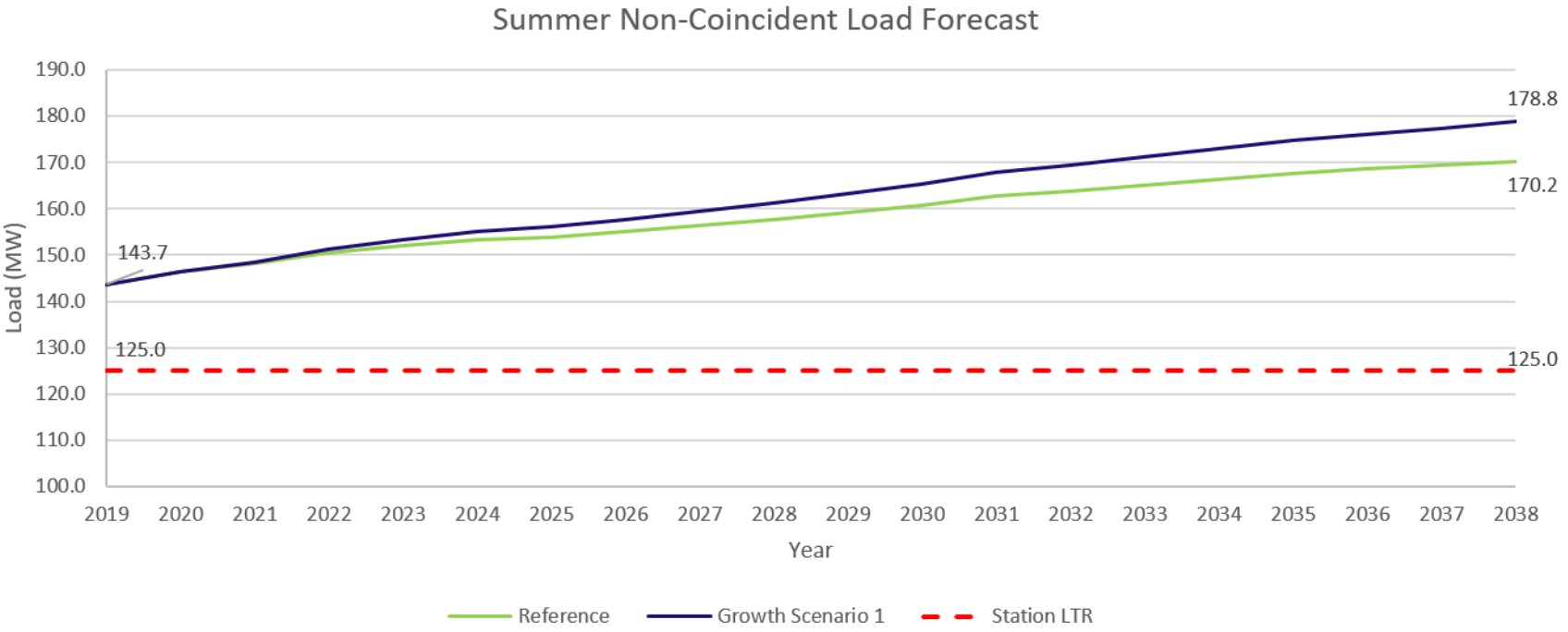
Demand Forecast - Scenario Development – Frontenac TS



Demand Forecast - Scenario Development – Gardiner DESN 1



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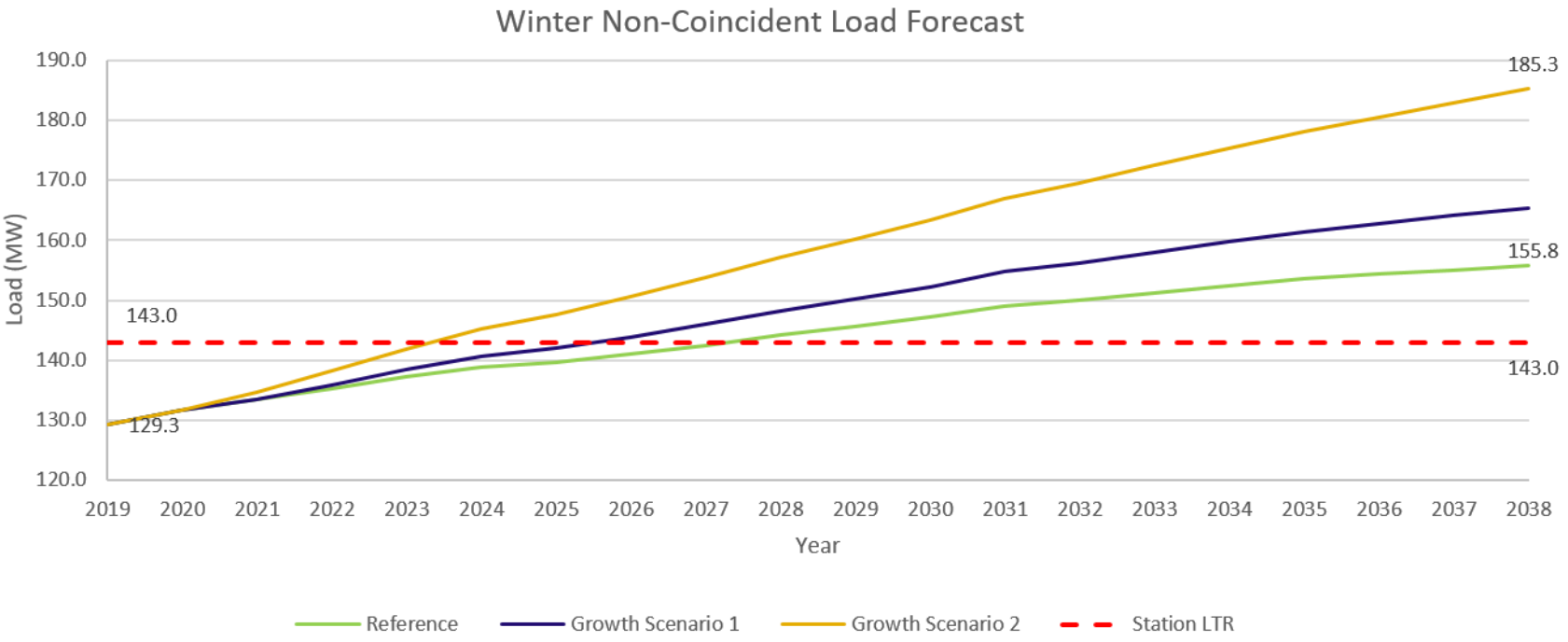
Demand Forecast - Scenario Development – Gardiner DESN 1



Demand Forecast - Electrification Scenario - Summary

- Due to impact of electrification in the Kingston area, the demand forecast increases at Frontenac and Gardiner stations
  - The impact on station needs is discussed later in the presentation

Forecast - Year	Frontenac TS Load (MW)	Gardiner TS DESN 1 Load (MW)
Summer Reference - 2038	120	170
Summer High Growth 1 - 2038	153	179
Winter Reference - 2038	130	155
Winter High Growth 1 - 2038	164	165
Winter High Growth 2 - 2038	230	185

Transmission System Needs

Categories of Regional Planning Needs

Capacity Needs

- Station capacity needs - refers to the ability to convert power from the transmission system down to distribution system voltages
- Local system supply capacity (or "load meeting capability") - refers to the ability of the electricity system to supply power to customers in the area, either by generating the power locally, or bringing it in through the transmission system

Load Restoration and Supply Security Needs

- Load restoration describes the electricity system's ability to restore power to those affected by a major transmission outage within reasonable timeframes
- Supply security describes the total amount of load interrupted following major transmission outages

End-of-Life Asset Replacement Needs

- Based on the best available asset condition information at the time
- Evaluated to decide if the facility should be replaced "like-for-like", "right-sized", or retired

Transmission System Needs - Summary

- Three types of needs have been identified for the region, station capacity needs, local system supply needs, and bulk system supply needs
- Bulk system supply needs are focused on the 230 kV system and the options/ recommendations will be done through a with Bulk System Planning study

	Needs	Location	Timeframe
1	Station Capacity	Belleville TS	Today
2	Station Capacity	Frontenac TS	Near/Mid term
3	Station Capacity	Gardiner TS DESN 1	Today
4	Local System Supply	115 kV area and B5QK circuit	Long term
5	Bulk System Supply	Dobbin to Sydney & Cataraqui Autos	Near term

Transmission System Needs - Station Capacity

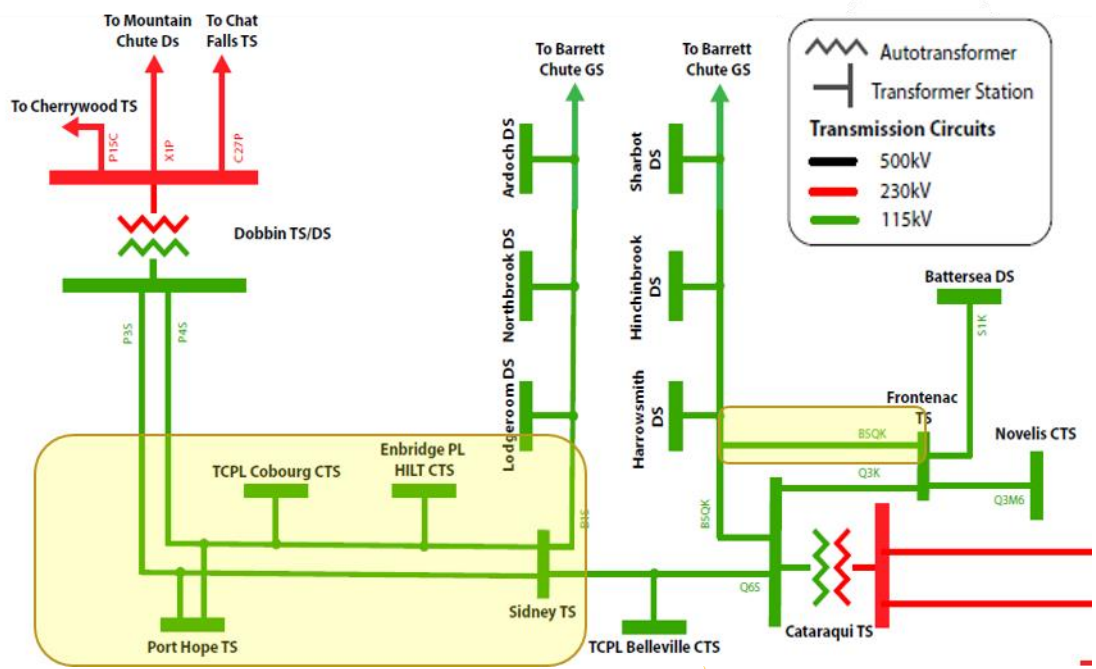
- The impact of high growth scenarios on station capacity needs is shown below
  - Frontenac TS need advances to year 2025 and 2022 for high growth scenario 1 and 2
  - Gardiner TS need remains the same – today

Demand Forecast	Belleville TS Need Date	Frontenac TS Need Date	Gardiner TS DESN 1 Need Date
Reference	Today	2029	Today
High Growth 1	-	2025	Today
High Growth 2	-	2022	Today

Transmission System Needs - Local system needs

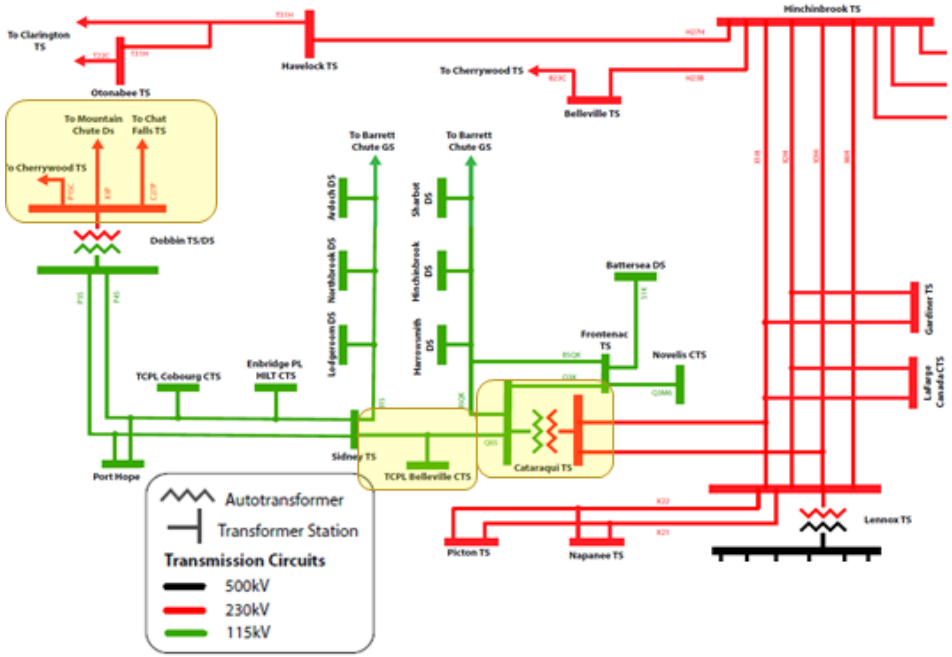
- There are also long-term local area needs in the 115 kV and B5QK circuits region

  - The 115 kV circuits can have voltage issues for the loss of P15C & C27P circuits, which will be resolved through a bulk study
  - B5QK circuit (~1km) can be overloaded, therefore, the load growth will be monitored. The outcome is related to Frontenac TS capacity



Transmission System Needs - Bulk system needs

- There are near-term Bulk system needs at Dobbin to Sydney & Cataraqui Autos
  - P15C and Q6S are critical supplies circuits to the Dobbin to Sydney Load; losing one will result in a thermal overload on the other
  - Losing one of the Cataraqui autotransformer will overload the remaining autotransformer



Options Considered

Potential Options

- Regional planning seeks to recommend the most cost-effective, technically feasible, and integrated solution
- Potential options being examined may include:
  - Non-wires alternatives (e.g. distributed energy resources, energy efficiency measures etc.)
  - Wires (e.g. step-down station, transmission line, etc.)
  - Centralized local generation (e.g. utility-scale storage, gas-fired peaking plant, etc.)

Evaluating Options

In addition to input from community engagement, 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?

Types of Wires Options

- The wires options considered for addressing the identified needs include combinations of the following elements:
  - Additional, refurbished and/or uprated load supply stations
  - New connection lines, as required, for any new or modified stations
  - Distribution load transfers between load supply stations

Types of Non-Wires Options

- An initial screening exercise, examining the duration, frequency, and magnitude of the need, need timing, and cost has been undertaken to determine if detailed evaluation of non-wires alternatives is warranted for each identified need
- Various technology types could contribute to meeting some of the identified needs as part of an integrated solution, and will form a part of the integrated options analysis for the capacity needs in Belleville and Kingston
- The scoping of non-wires alternatives is still on-going

Evaluating Non-Wires Options

- In addition to the typical considerations taken into account before selecting a preferred option (i.e., slide 35), development of non-wires options requires more information and analyses
- What information might stakeholders and solution providers require from the study team?
- Conversely, what information do stakeholders and solution providers believe the study team should incorporate?

Example of More Analysis Needed

Need Characterization

- Hourly and seasonal details on the load forecast to provide more granularity on estimated frequency, duration, and size of need events
- To help size and characterize the option

Economic Assumptions & Financial Models

- Planning-level estimates of cost factors (i.e., capital, O&M, operating life expectations) to compare against the preferred wires option
- Expected funding streams if the option provides multiple services/benefits

Options - Belleville TS

Options - Belleville TS

- At Belleville TS, there is an existing transformer station capacity need
- The wires options being considered are:
  1. The addition of a third transformer & station bus at Belleville TS, or
  2. A new station at Belleville TS
- Distribution load transfers are not an option; lack of adjacent stations
- To fully utilize the additional capacity of an uprated/expanded Belleville TS, a new supply line may be required beyond the planning horizon (i.e., 20+ years) based on the reference forecast

Options – Kingston Area (Gardiner and Frontenac TS)

Options - Frontenac & Gardiner TS

- Gardiner and Frontenac TS are both located within the City of Kingston and have adjacent service territories
- There is a transformer station capacity need at Gardiner TS (DESN 1) today, whereas, timing of the Frontenac TS capacity need depends on the demand forecast scenario

Options - Frontenac & Gardiner TS

- While there are identified capacity needs for Frontenac TS and Gardiner TS (DESN 1), there is remaining capacity at Gardiner TS (DESN 2) that can help meet the area's near-term capacity needs
- Due to the proximity of the stations, improvements to the availability of capacity at either station (or the addition of a new station within the City of Kingston), could be used to address both identified needs
  - This would be subject to cost and technical limitations of required distribution load transfers depending on where capacity is made available

Options - Frontenac & Gardiner TS

- In order to address this need, the wires options being considered are:
  1. Distribution load transfers - Permanent load transfers to a station with available capacity
  2. Increase capacity of the existing station(s) – through asset refurbishment and/or uprates
  3. A new station (new or existing site)
- A combination of options will be required in order to meet needs and provide sufficient flexibility to meet potential long-term growth

Options – Distribution Load Transfers

1. Transfer 10 MW from Frontenac TS to Gardiner DESN 1 or 2 TS

- Only resolves need for the reference load forecast
- Load transfers would be complex due to the configuration of the distribution system supplied from Frontenac TS
- If the high growth forecast materializes new capacity would be require in the Frontenac area which could result in the stranding the costs of the load transfers

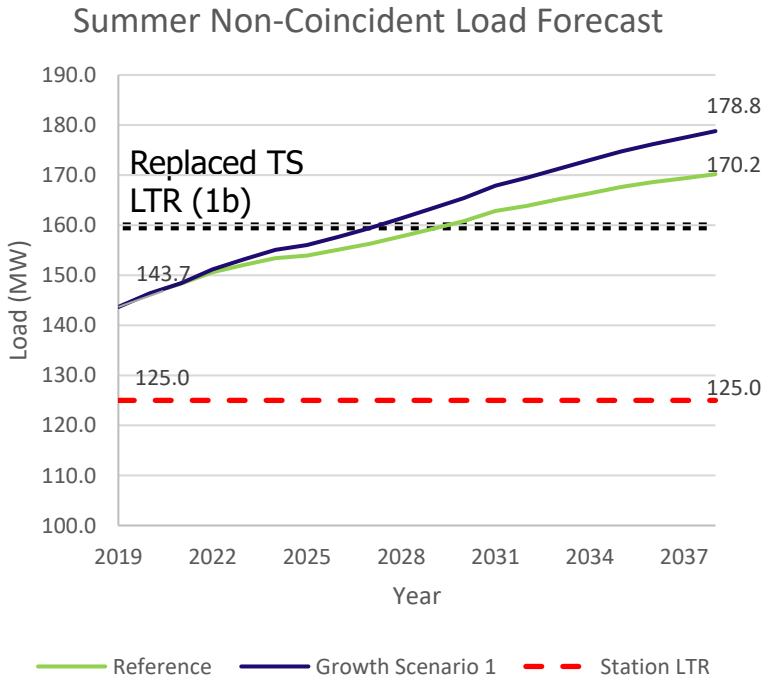
2. Permanent load transfer of 22 MW from Gardiner TS DESN 1 to 2

- Does not involve the same complexities as transferring load from Frontenac TS to Gardiner TS
- Required to be paired with another option (3) in order to fully meet the Gardiner TS DESN 1 capacity need

Options – Increase Capacity of Existing Station(s)

3. Advance the end of life replacement of Gardiner TS DESN 1 transformers

- Replacement of existing transformers with current standard units would result in a ~35 MW increase in the station's emergency rating (LTR)
- Combined with option 2, this could address the Gardiner TS DESN 1 capacity need for both the reference and the high growth scenario #1 and #2



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Options – New Stations

4. Build a new station – 115 kV connected

- A new station, connected to the 115 kV, which currently supply the Frontenac TS area
- A significant portion of the high growth scenario load is forecast for the Frontenac TS service territory
- Requires transmission upgrades and/or line extensions
- scenario 2 of load forecast would still require additional capacity

5. Build a new station – 230 kV connected

- A new station, connected to the 230 kV, which currently supply the Gardiner TS area
- The upstream 230 kV transmission system provides more capacity and can accommodate the scenario 2 of load forecast

Next Steps – Options Analysis & Evaluation

- Package options, including any identified feasible non-wires alternatives, to provide sets of integrated solutions which meet the overall needs
- Complete option evaluation
- Develop draft plan recommendations for stakeholder feedback

Engagement & Next Steps

Your Feedback is Important

As you prepare your feedback, consider the following questions to guide your feedback on the options analysis presented for the Peterborough to Kingston IRRP:

- What other information needs to be considered when completing the options evaluation and making recommendations?
- How can the Peterborough to Kingston Technical Working Group continue to engage with communities through the remaining stages of the IRRP process, or to help prepare for the next planning cycle?

Please submit your feedback/written comments by email to engagement@ieso.ca by August 18th

Next Steps

Item	Meeting Date /Submission Date	Description
Feedback/ written comments	August 18	• Feedback/written comments by email to engagement@ieso.ca by August 18
Response posted	September 1	• IESO will post the response
Public Webinar #4	September/October	• Draft recommendations
IRRP ends	Q4 2021	• Report published

Keeping in Touch

- **Subscribe** to receive updates on the Peterborough to Kingston regional electricity planning initiatives on the IESO website at Subscribe to Updates (ieso.ca)
- **Follow** the Peterborough to Kingston regional planning activities on the dedicated engagement webpage
- **Join** the East Regional Electricity Network on IESO Connects, a dedicated online engagement platform for ongoing dialogue on local developments, priorities and planning initiatives

Questions?

Do you have any questions for clarification on the material presented today?

Submit questions via the web portal on the webinar window, or by email to engagement@ieso.ca

Seeking Input on the Webinar

- Tell us about today
- Was the material clear? Did it cover what you expected?
- Was there enough opportunity to ask questions?
- Is there any way to improve these gatherings, e.g., speakers, presentations or technology?

Chat section is open for comments

Thank You

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