Ten Year PEI Transmission Outlook - 2025

This report is a follow-up to the 10 Year PEI Transmission Outlook (2021) and 2020 Integrated System Plan and is intended to provide an update on MECL's upcoming transmission system loading and proposed projects to Transmission Customers.

Island Load Situation – 2025 to 2034

The increasing penetration of electric heat is leading to higher Island loads and energy usage. Most new electric heat is supplied by mini-split heat pumps, supplemented by electric resistance heating, which are used in both retrofit and new installations. Over 90% of new homes are installing electric heat exclusively.

The impact of electric vehicles will likely not be discernable until the 2030 timeframe, and large-scale integration will continue after that time. The Island load forecast over the next decade is shown below:

Year	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
50/50 Island Forecast (MW)[1]	383	397	408	419	429	439	449	458	468	478

2020 Integrated System Plan Methodology, Criteria and Development

The following methodology was used to develop the study cases:

- Load forecast from Transmission Customers was received;
- Base cases were developed for each year between 2021 to 2026, and 2030;
- High-level system studies were performed on each base case to determine if results differed from previous system studies;
- Wind and solar generation were considered over the range from zero to full output; and
- Strive to meet NERC Standard TPL-001-4 (Transmission System Planning Performance Requirements).

Generation is not planned per se, since generation is not dispatched under base load conditions; however, generation to be used in back up or emergency situations was considered. The Island system is typically pushed hardest under peak load, no wind conditions. Solar generation is assumed to be zero at times of system peak, which occurs in winter months before sunrise or after sundown.

Current System Issues

The following system issues were identified during high load periods using the aforementioned methodology. All have been seen previously in study work:

[1] Transmission forecast does not include demand response per North American Electric Reliability Corporation ("NERC") modeling working group recommendations.

- Amount of firm load-serving capability from Sherbrooke substation;
- West Royalty 138/69 kV transformer overloads under single contingency;
- Western PEI low voltages;
- Eastern PEI system stability; and
- 300 MW import limit from NB Power.

Firm Load

When a constraint exists on the system which requires curtailment, non-firm load is shed first, followed by firm load (including load associated with network service). There is no differentiation between lengths of firm reservations when it comes to curtailment; short-term firm is treated the same as long-term firm.

Firm transmission service can only be procured if there is sufficient system capacity under a single outage scenario (i.e., N-1 contingency). Long-term firm service can be awarded if capacity is available for the next 10 years based on the most recent load forecast (similar to process used in New Brunswick). Long-term firm service is a Transmission Customer's long-term commitment to the transmission system and, as such, as system usage increases the system is upgraded to deliver its long-term commitments.

Short-term firm is available for shorter periods, or seasonally, but is not considered a long-term commitment to the system (based on its contract length). The system is not upgraded to meet requests for short-term firm service. If overall system usage (i.e., network or long-term firm) increases and there is less short-term firm available, then less short-term firm is awarded.

Network service is a long-term commitment and, as such, system planning and upgrades are completed as needed to be able to supply the Network load.

Firm Load Availability in Western PEI

Short term firm service availability in Western PEI (areas currently supplied via the 138/69 kV transformers in Sherbrooke) is limited. Using system resources that are currently in place:

1. There is no long-term firm available in Western PEI due to 138/69 kV transformer thermal limitations at Sherbrooke.
2. The amount of short-term firm available during the winter period is limited by system transformer capacity, as follows:

Winter Heating Season	System Peak Load (MW)	Available Short-Term Firm Service[2] - Existing and Planned[3] Facilities (MW)
2025-26	397	0
2026-27	408	0[4]
2027-28	419	0
2028-29	429	17[5]
2029-30	439	17
2033-34	478	15

During shoulder season months, there may be additional short-term firm service available[6].

3. The ongoing and proposed system upgrade projects as detailed below, in particular the Woodstock 138/69 kV transformer and transmission line Y-119, increase the amount of short-term firm service available in Western PEI.
4. Additional system infrastructure is required to support Eastern PEI voltages. This will include transmission line Y-119, a 138 kV connection from the Scotchfort area to Lorne Valley, and a synchronous condenser located in Charlottetown.

List of Ongoing Projects

The following projects have been approved by the Island Regulatory and Appeals Commission ("IRAC") and are ongoing.

- Tignish substation (expected completion 2026);
- Woodstock switching station (expected completion 2026);
- Sherbrooke bus tie breaker and X1 replacement (expected completion 2027); and
- T-4 rebuild at 138 kV (new Y-106) and Lorne Valley expansion (expected completion 2027).

List of Proposed Projects

The transmission system projects proposed in this document generally align with those presented in the 2020 Integrated System Plan ('ISP'), although the timing on some has changed to reflect load growth

[2] Indicative figures. Allows 10% overload on autotransformers at winter peaking conditions. Assumes Summerside import is at 98% power factor; firm limit will be lower if 98% power factor cannot be maintained.
[3] Refer to "List of Proposed Projects" section for details on planned projects
[4] Even after Woodstock is in service, T-1 open point is between Hunter River and West Royalty to avoid a system collapse for loss of Y-111.
[5] T-1 open point moved to between Kensington and Rattenbury with addition of new transmission line from Bedeque to Scotchfort (Y-119)
[6] Lower off-season monthly peaks may allow the T-1 open point to be moved west, enabling additional load-serving capability through the remaining Sherbrooke transformer.

patterns. There are also additional condition related projects below that were not presented in the 2020 ISP. Additional projects are likely to be identified in the upcoming 2025 ISP.

- Line Y-119 build / Y-109 rebuild;
- Scotchfort switching station;
- Synchronous condenser in Charlottetown Plant;
- West Royalty X6 transformer replacement;
- Capacitor bank in Woodstock;
- T-1 reroute and rebuild;
- T-15 rebuild;
- Y-107 rebuild;
- Replacement of Bedeque reactors and related station modifications (MECL/PEIEC responsibility);
- Lines Y-101 and Y-103 rebuilds (PEIEC responsibility);
- Spare breaker procurement;
- Various distribution substations; and
- Capacitor bank(s) in Eastern PEI.

Discussion of Proposed Projects

Line Y-119 build / Y-109 rebuild (2025-2028)

In recent years, Y-109 was replaced by Y-119 between Borden-Carleton and West Royalty. This replacement is temporary, as Y-119 is required to connect Bedeque to Scotchfort when Island loads are greater than 350 MW. As these load levels are now reasonably expected, Y-109 is required to be rebuilt and the remaining section of Y-119, from West Royalty to Scotchfort, is now required. After this build is completed, Y-109 will connect Borden-Carleton to West Royalty, and Y-119 will connect Bedeque to Scotchfort.

Scotchfort switching station (2025-2027)

The Scotchfort switching station is required to connect Y-119 to the existing transmission system. When analyzing connection options, consideration was also given to connecting Y-119 to West Royalty. Ultimately, this option was dismissed for the following reasons:

- The addition of a third line to the West Royalty substation is challenging due to physical constraints and would require significant substation modifications;
- The addition of a third line to the West Royalty substation would increase the reliance on this substation. The establishment of a new substation in Scotchfort will provide geographic supply diversity for Central and Eastern PEI; and
- The addition of a third line to the West Royalty substation would not alleviate other system concerns, the most significant of which is the overloading of transmission line T-2 with the loss of line Y-102.

The new Scotchfort station will connect Y-119 (from Bedeque), Y-102 (from West Royalty), Y-106 (to Lorne Valley), and Y-110 (to Church Road). The station will include provisions for reactive power support equipment, which will be required to support Eastern PEI voltages, and a distribution yard to replace the existing Scotchfort distribution substation, which is at the end of its useful life.

Synchronous condenser in Charlottetown Plant (2025-2029)

Eastern PEI requires additional reactive power support to maintain voltage stability under a single outage scenario. A project to install on-island generation has been proposed to IRAC. This project includes the proposed addition of a combustion turbine in Charlottetown plant. This turbine will be equipped with a clutch between the turbine and the generator, enabling the generator to decouple from the turbine and operate as a synchronous condenser. The generator will be operated in synchronous condenser mode during periods of high system load, improving voltage stability.

Capacitor bank in Woodstock (2026-2027)

A capacitor bank is required in the Woodstock switching station to support Western PEI voltages under N-1 contingencies. The switching station was engineered with this addition in mind. The exact size and switching increments will be determined during the detailed engineering phase of the project.

West Royalty X6 transformer replacement (2027-2029)

The West Royalty 50 MVA autotransformer X6 requires replacement due to age and condition. The autotransformer will be replaced with a 75 MVA unit to address loading concerns that are also becoming evident.

Rebuild projects: T-1 (2029-2030), T-15 (2029-2030), Y-107 (2030)

Transmission lines T-1 (1983 vintage), T-15 (1986 vintage), and Y-107 (1971 vintage) are aging and require replacement. These lines will also be rerouted to more accessible locations, where practical, to improve access during maintenance or outages.

Replacement of Bedeque reactors and related station modifications (2026-2028)

Reactors 1 and 2 at Bedeque are showing signs of advancing age. Reactor 1 has had significant gassing issues in the past few years and has been out of service several times for emergency inspections. Reliability is an increasing concern. Reactor 1 was installed in 1977 when Cables 1 and 2 were originally installed and has reached the end of its useful life. Reactor 2 was installed in 1991 and is also having gassing issues. Loss of a reactor may lead to a forced outage on a cable, or limitations in returning cable(s) to service, depending on the season. Reactors 1 and 2 will be replaced by 2028, and the replacement units will likely have similar ratings to the original units.

Lines Y-101 and Y-103 rebuilds (2026-2028)

Lines Y-101 and Y-103 were constructed in 1977 and are showing signs of advancing age. Rebuilding of these lines is scheduled to begin in 2026 and may be undertaken in a staged approach over several years.

Spare breaker procurement (2028)

Due to extended lead times, a spare 69 kV and 138 kV breaker will be procured to ensure that a replacement is available should an in-service failure occur.

Various distribution substations

Distribution substations are regularly required due to both load growth and asset replacements. Each substation may have transmission impacts depending on the high voltage bus configuration. The impacts will be determined on a case-by-case basis.

Interconnection Replacement Work

The original subsea cables, Cable #1 and Cable #2, were installed in 1977 and are approaching their end of useful life. Replacement should be considered in the 2030 timeframe. Study work is ongoing to determine the design parameters for the cable replacement.

The replacement design will aim to facilitate a 550 MW import from NB and will likely include two 138 kV cables (identical to Cables #3 and #4) and a new 138 kV transmission line in NB from Murray Corner to Memramcook. Note that additional infrastructure will be required in NB and PEI to realize an import of 550 MW. Detailed study will be required to determine exactly which infrastructure is required and where it is needed.

Future System Studies

The next Integrated System Plan is expected in 2025. As such, the next 10 Year PEI Transmission Outlook will be completed in 2026 and will provide a detailed plan for 2025-2034.