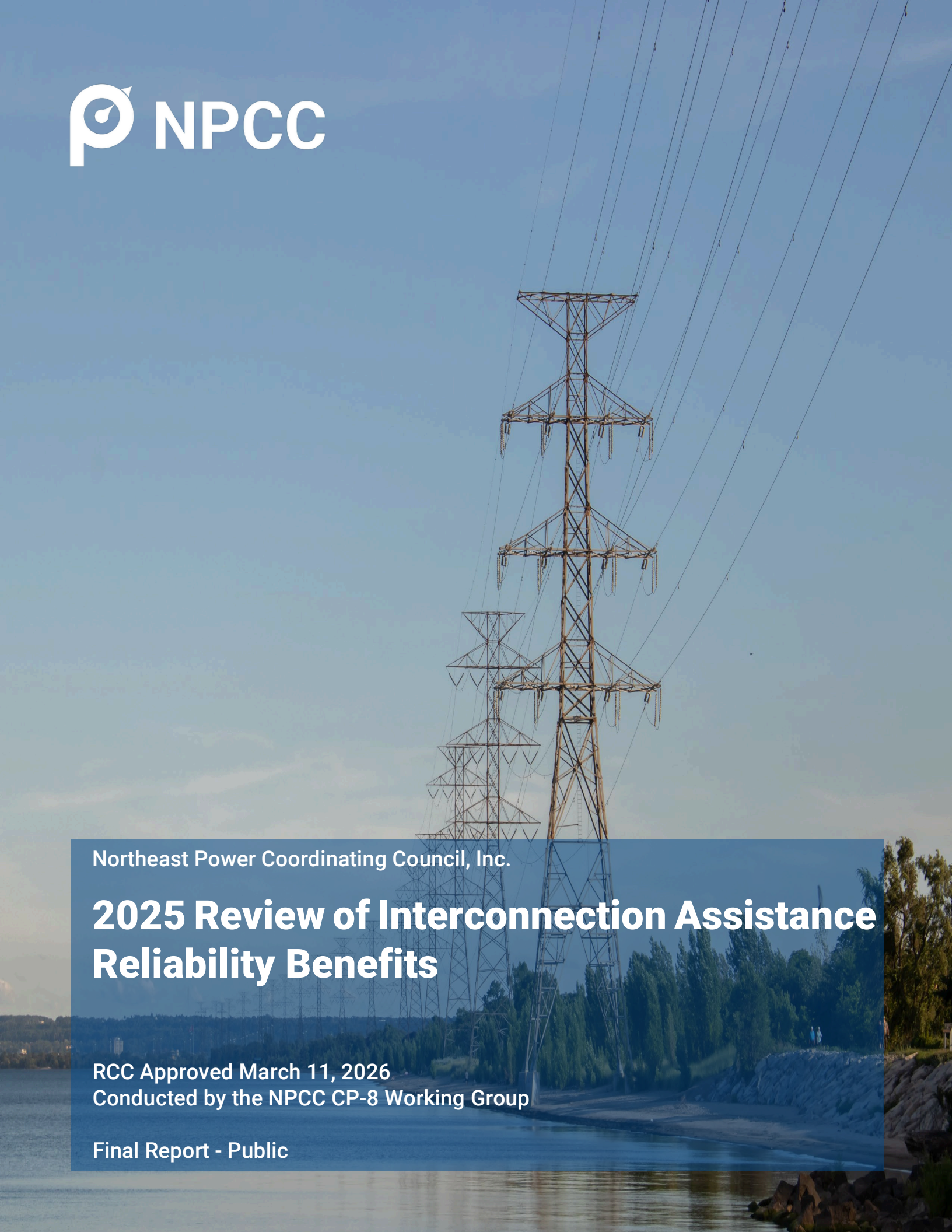

Northeast Power Coordinating Council, Inc.

2025 Review of Interconnection Assistance Reliability Benefits

RCC Approved March 11, 2026
Conducted by the NPCC CP-8 Working Group

Final Report - Public

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The CP-8 Working Group acknowledges the efforts of Alexis Gogola, Mikaela Lucas, Shannon Tucker, and Matt Etkins of GE Vernova, and Michael Lombardi of NPCC, and thanks them for their assistance in this analysis.

Executive Summary

NPCC's CP-8 Working Group, under the direction of the Task Force on Coordination of Planning was assigned to:

1. Estimate on a consistent basis the amount of interconnection assistance reliability benefits (i.e., "Annual Tie Benefits") available to the NPCC Areas for the 2026–2030 period;
2. Review each NPCC Area's current estimates of interconnection assistance reliability benefits used to meet the NPCC Area Resource Adequacy Criteria; and,
3. Verify that the current levels of interconnection benefits assumed in each Area's resource adequacy assessments are reasonable.

In meeting this objective, the CP-8 Working Group estimated the amount of interconnection assistance reliability benefits utilizing the General Electric (GE) Multi-Area Reliability Simulation (MARS) program for an "As Is" and hypothetically "At Criteria" NPCC Area system representation, applying a consistent methodology to all NPCC Areas. The assumptions used are consistent with the *2025 NPCC Long Range Adequacy Overview*.[1]

For the purposes of this review, the Annual Tie Benefits includes both the non-firm emergency assistance into an Area, and the net Area import from firm scheduled transactions between Areas. Recognizing that different NPCC Area definitions of tie benefits may exist, both components will be reported.

Table 1 shows the interconnection assistance reported in recent Area studies and the results from this review. While the data, assumptions and underlying methodology used in the recent NPCC Area studies may vary, the results of this review provide a consistent estimate of the range of the Annual Tie Benefits each Area will likely be able to rely on for planning purposes.

The estimated Annual Tie Benefits potential reported in **Table 1** excludes firm imports at the time of an Area's peak. There is a strong inverse relationship between the amount of an Area's firm imports and the amount of estimated Annual Tie Benefits, any shift in an Area's net firm import capability between 2026 and 2030 will produce a corresponding opposite change in its Tie Benefit value. As firm import capability increases, the calculated Tie Benefits decrease proportionally. As reported in **Table 1**, including the net firm imports from an Area leads to more consistent reporting and trending of the estimated Annual Tie Benefits.

After applying the same methodology, with the assumptions and model consistent with the *NPCC 2025 Long Range Adequacy Overview*,[1] the CP-8 Working Group concluded that the interconnection assistance reliability benefits assumed by the NPCC Areas in their recent

[1] See: Reliability Services | NPCC

resource adequacy assessments appear to be reasonable and do not overstate the interconnection benefits.

Table 1: Comparison of Assumed and Estimated Annual Interconnection Assistance (MW)

Comparison of Assumed and Estimated Annual Interconnection Assistance (MW)						
NPCC Area (Year of Latest Comprehensive review)[1]	**Assistance Reported in Latest NPCC Area Review of Resource Adequacy**	**Range of Estimated Annual Tie Benefits CP-8 Study Results for 2026 At Criteria/As Is**	**Range of Estimated Annual Tie Benefits CP-8 Study Results for 2030 At Criteria/As Is**	**Net Firm Imports Assumed at Time of Area Peak**[2] **(2026/2030)**	**Range of Estimated Annual Total Tie Benefit Potential for 2026**[3] **At Criteria/As Is**	**Range of Estimated Annual Total Tie Benefit Potential for 2030**[4] **At Criteria/As Is**
Québec (2023)	1,100-1,700[5]	3,369/3,538	2,740/2,914	-245/600	3,124/3,293	3,340/3,514
Maritimes (2025)	300	1,341/1,847	1,492/1,611	-122/0	1,219/1,725	1,492/1,611
New England (2023)	2,115-2,385[6]	3,090/3,123	2,713/3,023	276/-165	3,366/3,399	2,548/2,858
New York (2024)	3,500[7]	2,925/3,056	2,710/3,061	3,171/3,435	6,096/6,227	6,145/6,496
Ontario (2024)	302[8]	3,349/3,415	3,720/3,739	300/1,230	3,649/3,715	4,950/4,969

[2] Net Firm Imports consist of Areas' Firm Purchases/Sales and consistent with assumptions in the 2025 NPCC *Long Range Adequacy Overview.*

[3] The 2026 Annual Total Tie Benefit Potential is equal to the sum of the Range of Estimated Annual Tie Benefits for 2026 (column 3) plus the Net Firm Area Imports Assumed at Time of Area Peak (column 5).

[4] The 2030 Annual Total Tie Benefit Potential is equal to the sum of the Range of Estimated Annual Tie Benefits for 2030 (column 4) plus the Net Firm Imports Assumed at Time of Area Peak (column 5).

[5] The import capability of HVDC Sandy Pond – Nicolet interconnection has been excluded due to its unavailability during the peak period.

[6] These tie benefits values assumed by ISO New England for its resource adequacy studies are the non-firm emergency assistance from its directly interconnected external areas. The remaining transfer capabilities of the external ties can be used for capacity import purposes.
See: a03_pspc_tie_benefit_assumptions_presentation.pdf. Additionally, these values represent the updated assistance as reported in the 2025 ISO-NE Interim Review of Resource Adequacy.

[7] Implemented a statewide limit of 3,500 MW.
See: MARS-Emergency-Assistance-Modeling-Final-Draft.pdf (nysrc.org)

[8] These tie benefits values assumed by IESO for its resource adequacy studies are the non-firm emergency assistance from its directly interconnected external areas. The remaining transfer capabilities of the external ties can be used for capacity import purposes. Additionally, these values represent the updated assistance as reported in the 2025 Ontario Interim Review of Resource Adequacy.

Introduction

The objective of the CP-8 Working Group's Review of Interconnection Assistance Reliability Benefits is to estimate, on a consistent basis, the amount of interconnection assistance available to NPCC Areas for today's system (2026) and the near term (2030), review each NPCC Area's current estimates of interconnection benefits and verify that the current levels of interconnection assistance assumed in each Area's resource adequacy assessments are reasonable and do not result in overstating any Area's reliability.

The *NPCC Regional Reliability Directory No. 1 - Design and Operation of the Bulk Power System*, **R4** - Resource Adequacy[9] states:

> Each Planning Coordinator or Resource Planner shall probabilistically evaluate resource adequacy of its Planning Coordinator Area portion of the bulk power system to demonstrate that the loss of load expectation (LOLE) of disconnecting firm load due to resource deficiencies is, on average, no more than 0.1 days per year.

This is commonly referred to as the "NPCC Resource Adequacy Criteria." Additionally, **R4.1** provides the following guidance for meeting this criterion:

> Make do allowances for demand uncertainty, scheduled outages and deratings, forced outages and deratings, assistance over interconnections with neighboring Planning Coordinator Areas, transmission transfer capabilities, and capacity and/or load relief from available operating procedures.

In meeting its objective, the CP-8 Working Group used General Electric's (GE) Multi-Area Reliability Simulation (MARS) program to examine interconnection assistance for each of the NPCC Areas. GE Vernova was retained by NPCC to conduct simulations. The CP-8 Working Group:

1. Used the current NPCC CP-8 Working Group's GE MARS database to develop a model suitable for the 2026 and 2030 time periods;
2. Considered the impacts of Sub-Area transmission constraints in external Areas; and,
3. Developed a detailed near-term GE MARS reliability representation for regions bordering NPCC using publicly available information.

This evaluation utilized a common multi-area reliability program and a consistent methodology to evaluate each NPCC Area's interconnection assistance, based on the assumptions used for the *2025 NPCC Long Range Adequacy Overview*.[1]

[9] See: Directory No. 1

Area loads were correlated based on a composite load shape developed from the historical hourly loads for 2013, 2014, and 2021. The CP-8 Working Group considered the 2021 load shape to be representative of a reasonable expected coincidence of area load for the summer period assessments. Likewise, the 2013–2014 load shape has been used for the winter period assessments.

Because this study examines an entire year rather than a single season, the CP-8 Working Group elected to create a composite load shape using historical hourly load data from 2013, 2014, and 2021. The January–March portion of the composite reflects the corresponding 2014 hourly loads, April–September is drawn from the 2021 data for those months, and October–December is based on the 2013 hourly loads.

Area load forecast uncertainties and emergency operating procedures were modeled on a consistent basis. These operating procedures include actions such as manual voltage reduction and implementation of interruptible loads; resulting load relief from these procedures are specific to each Area.

While the amount of interconnection assistance that an Area receives from neighboring Areas will vary from hour to hour throughout the year, depending on the needs and availability of support, this study sought to determine an annual equivalent value of interconnection assistance that is available to each Area from its neighboring Areas.

Area Interconnection Assistance

Each NPCC Area is responsible for demonstrating that sufficient resources are available to meet its load and operating reserve in accordance with the NPCC Criteria, taking into consideration the potential benefit arising from reserve sharing through interconnections with neighboring Areas. Each NPCC Area is required to comply with the requirements outlined in the "*NPCC Regional Reliability Directory No. 1 – Design and Operation of the Bulk Power System*" and report their findings in their respective Area's "Interim/Comprehensive Review of Resource Adequacy." NPCC Areas currently measure Loss of Load Expectation (LOLE) when evaluating the resource adequacy of their systems. **Table 2** provides a list of factors that affect interconnection assistance and how each Area has modeled them in their resource adequacy assessments.

The Annual Tie Benefit potential determined in this review is the amount of "perfect capacity"[10] which allows an Area to maintain the same level of reliability[11] as it had when interconnected. It is expressed as a single annual MW value, available all year. This single MW value for an Area is referred to as its Annual Tie Benefit potential and includes both the non-firm emergency assistance into an Area and the net Area import from firm scheduled transactions between Areas.

[10] Perfect capacity is a hypothetical resource included in the model and considered as capacity with no planned or forced outages, perfectly available for the entire year.
[11] Expressed in terms of Loss of Load Expectation ("LOLE") in days/year.

Table 2: NPCC Area Reviews of Resource Adequacy Modeling

NPCC Area Reviews of Resource Adequacy Modeling[1]					
Factor	**Québec**	**Maritimes**	**New England**	**New York**	**Ontario**
1. Capacity support from interconnection modeled	Yes	Yes	Yes	Yes	Yes
2. Reliability index calculated in Area resource adequacy studies[12]	LOLE	LOLE	LOLE	LOLE	LOLE
3. Number of adjacent Areas/internal sub-areas modeled	4/6	2/4	3/13	4/11	4/10
4. External Interconnections explicitly modeled	No	No	Yes	Yes	No[13]
5. Load forecast uncertainty represented	Yes	Yes	Yes	Yes	Yes
6. Basis for reserve sharing assumed for interconnected systems	N/A	N/A	Equal Sharing	Equal Sharing[14]	N/A
7. Internal area transmission modeled for resource adequacy assessments	Yes	Yes	Yes	Yes	Yes
8. Interconnection outages modeled	No	No	Yes	Yes[15]	No
9. Year of recently approved NPCC Comprehensive Area Review of Resource Adequacy	2023	2025	2023	2024	2024

[12] Loss of Load Expectation equal to 0.1 days/year.
[13] In Ontario, imports and exports are modeled as load modifiers.
[14] All NPCC Control Areas indicate that they will share reserves equally among all members before sharing with PJM.
[15] Outages modeled on cables into New York City and Long Island.

Table 3 shows the interconnected Areas that are considered when each Area performs its reliability studies. The following table is read from left to right (e.g., the Québec Area considers interconnections with the Maritimes, New England, New York, and Ontario Areas).

Table 3: Interconnections Considered by NPCC Areas

Area Doing Study	Interconnections Considered in Area Studies						
	Québec	**Maritimes**	**New England**	**New York**	**Ontario**	**MISO**	**PJM**
Québec	-	X	X	X	X	-	-
Maritimes	X	-	X	-	-	-	-
New England	X	X	-	X	-	-	-
New York	X	-	X	-	X	-	X
Ontario[16]	X	-	-	X	-	X	-

[16] Ontario also models interconnections with Manitoba.

Multi-Area Reliability Analysis

Multi Area Reliability Model

GE MARS Program

General Electric's (GE) Multi-Area Reliability Simulation (MARS) Program[17] is a sequential Monte-Carlo simulator. It is capable of calculating on an Area and Sub-Area basis, the standard indices of daily Loss of Load Expectation (LOLE in days/year), hourly LOLE (hours/year), and a Loss of Energy Expectation (LOEE in MWh/year). In this study, the model was used to determine daily LOLE for each of the NPCC Areas and Sub-Areas based on all hours in the day.

In MARS, chronological system events are developed by combining randomly generated operating histories of the generating resources with inter-Area and intra-Area transfer limits and chronological hourly loads. The capacity margin is determined for each isolated Area at the time of its daily peak load. If an isolated Area has a negative capacity margin, the model seeks to initiate transfers from Areas with a positive capacity margin. Available reserves are allocated among all deficient Areas in proportion to their shortfalls. If a shortfall still exists after allocating the reserves that are available to flow across constrained interfaces, the model implements emergency operating procedures to avoid a loss of load to the extent possible. This process is repeated for each load forecast uncertainty level.

Methodology

The Tie Benefits Methodology used in this Review is a multi-step process that seeks to determine the amount of "perfect capacity" (capacity with no planned or forced outages) which, when added to an Area that has been isolated from the remainder of NPCC, allows the Area to maintain the same level of reliability, in terms of daily LOLE (Loss Of Load Expectation in days/year), as it had when interconnected.

While the amount of interconnection assistance that an Area receives from neighboring Areas will vary from hour to hour throughout the year, depending on its load, unit outages, etc., this study sought to determine an annual value of interconnection assistance which, if perfectly available for the entire year (in place of the actual interconnections with surrounding Areas) would enable the Area to maintain the same level of reliability, as measured in terms of daily LOLE as if the actual interconnections were present. This single MW value for an Area will be referred to as its Annual Tie Benefit potential. In this review,

[17] See: https://www.geenergyconsulting.com/practice-area/software-products/mars

the Annual Tie Benefit potential includes both the non-firm emergency assistance into an Area and the net Area import from firm scheduled transactions between Areas.

The specific steps are summarized below:

- **Step 1** – Isolate the "As Is"[18] Areas after scheduling firm contracts, remove any internal transmission constraints, and calculate the daily LOLE. Although this step is not required for the actual determination of the Annual Tie Benefit potential, it does provide an indication of the reliability of each of the "As-Is" Areas which can be helpful in understanding the study results.

- **Step 2** – Interconnect the Areas and restore internal transmission constraints in all Areas, except for the Area of interest.[19] Starting with the "As Is" capacity in each Area, adjust the capacity in the Area of interest (by adding or removing "perfect" capacity), based on the reserve margins relative to the sub-Area loads and subject to any locational requirements, until the Area is at approximately 0.1 days/year.

- **Step 3** – Using the adjusted capacity for each Area from **Step 2**, isolate the Areas after scheduling firm contracts and removing internal transmission constraints. Add "perfect" capacity to each Area for the entire year until the Area LOLE returns to the LOLE calculated in **Step 2** (approximately 0.1 days/year). The amount of perfect capacity added is the maximum amount of tie benefit available for each Area, excluding any firm contracts, assuming "As-Is" capacity for the neighboring Areas.

The reserve margin calculation used in **Step 2** to determine the capacity adjustments to each sub-Area within an Area is a simple calculation that involves just the installed capacity and annual peak load of the sub-Areas. It does not consider purchases and sales, demand response, or any other adjustments that an Area may include in its own reserve margin calculations. The purpose of the reserve margin calculation as used here is to allocate capacity adjustment in an Area between its sub-Areas. If we want to remove capacity from an Area (the usual situation), a target maximum reserve margin is determined that will result in the desired capacity adjustment to the Area. Perfect capacity is then removed from any sub-Areas that exceed the target maximum; sub-Areas below the target are left unchanged.

While adjusting the sub-Area capacities based on reserve margins is a good approach in estimating the total capacity adjustment that an Area can accommodate through its interconnections with neighboring Areas, the presence of internal transmission constraints

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[18] The "As-Is" assumption refers to the modeling of systems with resources that are expected to be in-place for the years 2026 and 2030, as described in the 2025 NPCC *Long Range Adequacy Overview*.

[19] The amount of assistance that an Area is able to deliver to their neighboring Areas may be overstated if the existing known internal constraints of the Areas providing assistance are not captured. In the GE MARS model, the Ontario and New York Areas use "dynamic limits" for interfaces. Ontario uses dynamic limits to model planned interface outages, while New York uses dynamic limits when specific units are on outage. For New York, see the 2024 NYISO Reliability Needs Assessment pg. 44.

within an Area can limit the amount of capacity adjustment possible in the constrained sub-Areas, and consequently in the Area as a whole. For this reason, the methodology employed in this study ignores the internal transmission constraints in an Area when adjusting the sub-Area capacities to determine the amount of assistance (non-coincident) that the other Areas can provide (**Step 2**). This approach thus provides an estimate of the amount of assistance (non-coincident) that is available to an Area, regardless of whether or not an Area can make use of all of it due to internal constraints.

In **Step 2**, while the internal constraints were ignored in the Area of interest, the internal constraints in all of the other Areas were respected in case there was bottled generation that would limit the amount of assistance that an Area could provide. Failure to model the internal constraints in the Areas providing assistance could overstate the amount of assistance that they are actually able to deliver to their borders.

In **Step 3**, the Areas start with the adjusted capacities determined in **Step 2** and are isolated from one another after scheduling the firm contracts and removing the internal constraints. Perfect capacity is then added to each Area until it returns to the target LOLE from **Step 2**, approximately 0.1 days/year. This then determines for each Area the single annual MW amount that is equivalent, on an annual basis, to the reliability benefits provided by the interconnections. This amount, when added to the net firm imports at time of Area peak, is the "As-Is" Annual Tie Benefit potential.

The above methodology was used for both 2026 and 2030 and provided an estimate of the "As Is" Annual Tie Benefit assuming the "As Is" loads in each of the Areas providing assistance. Since it is optimistic for an Area to plan its system assuming that the neighboring systems are much more reliable than is required by the NPCC criteria, the methodology was refined by adding the following steps:

- **Step 4** - Bring each Area of the interconnected "As-Is" system (including outside regions), with internal transmission constraints, to approximately 0.1 days/year LOLE by adjusting the capacity in each Areas based on the reserve margins in the sub-Areas, subject to any locational requirements.

- **Step 5** - Starting with the adjusted capacities from **Step 4**, remove the internal transmission constraints in the Area of interest and adjust its sub-Area capacity, based on reserve margins and subject to any locational requirements, until it returns to the LOLE in **Step 4**. This step is the same as **Step 2** except for the capacity in the Areas providing assistance.

- **Step 6** – Using the adjusted capacity for each Area from **Step 5**, isolate the Areas after scheduling firm contracts and removing the internal transmission constraints. Add "perfect" (100% available) capacity to each Area for the entire year until the Area LOLE returns to the LOLE calculated in **Step 5** (approximately 0.1 days/year). The amount of perfect capacity added is the maximum amount of tie benefit available for each

Area, excluding any firm contracts, assuming "At-Criteria" capacity for the neighboring Areas. This amount, when added to the net firm imports at time of Area peak, is the "At-Criteria" Annual Tie Benefit potential.

These additional steps were applied for the years 2026 and 2030 to provide an estimate of the amount of "At Criteria" Annual Tie Benefit available if each Area just met criterion.

The amount of perfect capacity added in **Steps 3** and **6** represents what is reported as the Areas' Tie Benefits throughout this report. These values do not include the firm imports at the time of an Area's peak added to them; it represents the Tie Benefits excluding firm imports. There is a strong inverse relationship between the amount of firm imports and the amount of perfect capacity needed in **Steps 3** and **6**. If there is a significant change to an Area's firm import value between the two study years, the result will cause the Tie Benefit value to change in the opposite direction (i.e., increase in firm imports will decrease proportionally to the reported Tie Benefit value).

Results

The Annual Tie Benefits are shown in **Table 4(a)** for the year 2026 and **Table 4(b)** for the year 2030. These results indicate the range of the Tie Benefit potential, regardless of whether an Area can make use of it due to its internal constraints. For reference, also shown in **Table 4(a)** and **Table 4(b)** is the Area's total import capability at time of their peak load.

For Areas where the "At Criteria" Annual Tie Benefits are nearly equal to the "As Is" Annual Tie Benefits, the Annual Tie Benefits are more limited by the area's ability to import the assistance than it is by the ability of the other Areas to assist.

The larger difference between the "As Is" and "At Criteria" Annual Tie Benefit indicates the extent to which those Areas, with more than adequate import capabilities, could rely extensively on assistance from their neighbors.

Table 4(a): Annual Interconnection Assistance Estimated for 2026 (MW)

Area	Modeled Total Tie Transfer Capability at Time of Area Peak	Net Firm Imports Assumed at Time of Area Peak[2]	Without Internal Constraints	
			"At Criteria" Annual Tie Benefits"	"As Is" Annual Tie Benefits
Québec	3,840	-245	3,369	3,538
Maritimes	1,750	-122	1,341	1,847
New England	4,000	276	3,090	3,123
New York	10,445	3,171	2,925	3,056
Ontario	5,910	300	3,349	3,415

Table 4(b): Annual Interconnection Assistance Estimated for 2030 (MW)

Area	Modeled Total Tie Transfer Capability at Time of Area Peak	Net Firm Imports Assumed at Time of Area Peak[2]	Without Internal Constraints	
			"At Criteria" Annual Tie Benefits"	"As Is" Annual Tie Benefits
Québec	3,840	600	2,740	2,914
Maritimes	1,750	0	1,492	1,611
New England	4,000	-165	2,713	3,023
New York	10,445	3,435	2,710	3,061
Ontario	5,910	1,230	3,720	3,739

Comparison of Area Interconnection Assistance

Table 5 shows the interconnection assistance assumed in recent Area studies and the results from this Review. Although the data and assumptions used in recent Area studies may be different from those used in these studies and the underlying methodology varies for each NPCC Area, the results of this study estimate the range of the Annual Tie Benefits each Area will likely be able to rely on for planning purposes.

Additional information follows for the five NPCC Areas that assume interconnection assistance in their resource adequacy assessments.

Table 5: Comparison of Assumed and Estimated Annual Interconnection Assistance

Comparison of Assumed and Estimated Annual Interconnection Assistance (MW)				
NPCC Area (Year of Latest Comprehensive Review)[20]	**Assistance Reported in Latest NPCC Comprehensive Review of Resource Adequacy**	**Net Firm Imports Assumed at time of Area Peak (2026/2030)**	**Range of Estimated Annual Tie Benefits CP-8 Study Results for 2026 At Criteria/As Is**	**Range of Estimated Annual Tie Benefits CP-8 Study Results for 2030 At Criteria/As Is**
Québec (2023)	1,100-1,700[21]	-245/600	3,369/3,538	2,740/2,914
Maritimes (2025)	300	-122/0	1,341/1,847	1,492/1,611
New England (2023)	2,115 – 2,385[22]	276/-165	3,090/3,123	2,713/3,023
New York (2024)	3,500[7]	3,171/3,435	2,925/3,056	2,710/3,061
Ontario (2024)	302[23]	300/1,230	3,349/3,415	3,720/3,739

[20] Previous Area Reviews of Resource Adequacy can be found at: Reliability Services | NPCC

[21] The import capability of HVDC Sandy Pond – Nicolet interconnection has been excluded due to its unavailability during the peak period.

[22] These tie benefits values assumed by ISO New England for its resource adequacy studies are the non-firm emergency assistance from its directly interconnected external areas. The remaining transfer capabilities of the external ties can be used for capacity import purposes.
See: a03_pspc_tie_benefit_assumptions_presentation.pdf. Additionally, these values represent the updated assistance as reported in the 2025 ISO-NE Interim Review of Resource Adequacy.

[23] These tie benefits values assumed by IESO for its resource adequacy studies are the non-firm emergency assistance from its directly interconnected external areas. The remaining transfer capabilities of the external ties can be used for capacity import purposes. Additionally, these values represent the updated assistance as reported in the 2025 Ontario Interim Review of Resource Adequacy.

New England

In setting its Installed Capacity Requirement (ICR) for its Forward Capacity Market, ISO New England includes the tie benefits (emergency assistance) from its directly interconnected neighboring bulk power systems of Québec, Maritimes, and New York. The tie benefits are derived based on the results of studies conducted annually. All the interconnected Areas in these tie benefit studies are assumed to be at the 0.1 days/year resource adequacy criterion simultaneously. The tie benefits assumed in the 2023 *Comprehensive Review* ICR calculations are 1,894 MW for 2024, 1,830 MW for 2025, 2,100 MW for 2026 and 2,115 for 2027.[1] However, the tie benefits assumed in the 2025 *Interim Review* ICR calculations have been updated to 2,385 MW for 2026, 2,115 for 2027, and 2,115 for 2028.[24]

The New England Clean Energy Connect (NECEC) project is a 1,200 MW high-voltage direct current (HVDC) transmission line designed to deliver clean hydroelectric power from Hydro-Québec to New England via Lewiston, Maine. NECEC is an interregional transmission enhancement aimed at supporting state decarbonization policies. The project includes an executed energy-only contract for 1,090 MW, reflecting the average hourly delivery of contracted annual energy. Since NECEC is being interconnected with Network Import Interconnection Service (NIIS), and not with Capacity Network Import Interconnection Service (CNIIS), the increased transfer capability between Québec and ISO-NE is not modeled in this analysis.

New York

The New York State Reliability Council (NYSRC) approved the 2026–2027 *Installed Reserve Margin* ("IRM") at 24.5% on December 5, 2025.[25] The New York ISO then determined the Locational Minimum Installed Capacity Requirements ("LCRs") for the Localities of New York City (Load Zone J), Long Island (Load Zone K), and the G-J Locality (Load Zones G, H, I, and J) for the 2026–2027 Capability Year beginning May 1, 2026.[26] Based on the approved NYSRC IRM base case for the 2026–2027 Capability Year, the NYISO's calculations result in effective New York City LCR of 86.4%, a Long Island LCR of 110.3%, and a G-J Locality LCR of 82.5%.

The New York State Reliability Council determined that limiting total emergency assistance to a maximum of 3,500 MW based on an analysis of total actual excess ten-minute operating reserves above required operating reserves in the four neighboring external areas, along with other factors is appropriate.[27] The methodology and assumptions used in the NYSRC study to determine emergency assistance limits differ from what is assumed in this NPCC

[24] See: https://www.iso-ne.com/static-assets/documents/2016/12/summary_of_historical_icr_values.xlsx
[25] See: 2026-IRM-Study-Technical-Report.pdf
[26] See: Local Minimum Installed Capacity Requirements for the 2026-2027 Capacity Year
[27] See: 2026-IRM-Study-Technical-Report-Appendices.pdf

Review of Interconnection Assistance Reliability Benefits. One notable difference is that the 2026-2027 IRM study set the emergency assistance limit from Québec to zero megawatts during the winter season.

Ontario

The Ontario Independent Electricity System Operator (IESO) has reported that it expects to meet the NPCC resource adequacy criterion in its NPCC 2025 *Ontario Area Interim Review of Resource Adequacy*.[1] The amounts of non-firm imports assumed are updated every year using the most recent four years of data. In its 2024 Ontario Area Comprehensive Review of Resource Adequacy, IESO assumed 250 MW of non-firm imports in the summer and 240 MW of non-firm imports in the winter. In the 2025 Interim Review, IESO updated these values to 302 MW of non-firm imports in the summer and 59 MW in the winter.

Under the median demand growth scenario, the NPCC criterion is satisfied for 2026, 2027 and 2028, and 2029 with existing and planned resources.

Maritimes

In the NPCC 2025 *Maritimes Area Comprehensive Review of Resource Adequacy*, covering the period of January 2026 through December 2030,[1] 300 MW of interconnection tie benefits from New England are assumed. These tie benefits are based on a 2011 decision by the New Brunswick Market Advisory Committee to recognize the lowest historical Firm Transmission Capacity posted from summer peaking New England to winter peaking New Brunswick since the commissioning of the second, 345 kV tie between these two systems in December 2007.

Québec

Results of the NPCC 2025 *Québec Interim Review of Resource Adequacy*[1] show that the loss of load expectation (LOLE) for the Québec area is below the NPCC reliability criterion of not more than 0.1 day per year under the base case scenario for all years of the review (from winter of 2025-2026 through winter 2027-2028).

No changes have been made to the internal transfer limits since the last NPCC comprehensive review. A 600 MW of firm import capacity from Ontario has been added to the resources. A new agreement between Hydro-Québec and the IESO was signed in 2024. For this purpose, the governments of Québec and Ontario have already signed a Memorandum of Understanding (MOU). This agreement allows Hydro-Québec to import 600 MW of firm capacity during the winter periods from 2025 to 2031 except for the winter 2027 and to export 600 MW of firm capacity to Ontario during summer peak period.

In addition to the Châteauguay HVDC back-to-back interconnection to New York, radial generation can be connected to the New York system through Line 7040. The Variable Frequency Transformer (VFT) at Langlois substation connects into the Cedar Rapids Transmission system, down to New York State at Dennison. The Outaouais HVDC back-to-back converters and accompanying transmission to the Ottawa, Ontario area are now in service. Other ties between Québec and Ontario consist of radial generation and load to be switched on either system.

The Hertel-New York Interconnection project is close to completion, with a commissioning date set for May 2026. This project is to increase transfer capability between Québec and New York by 1,250 MW. It involves the construction of a ±400-kV DC underground transmission line about 60 km (37 miles) long from Hertel 735/315-kV substation just south of Montréal to the Canada – U.S.A. border. The project will connect to the Champlain Hudson Power Express project (CHPE) in New York State. From the international border crossing, the DC transmission line will be extended 339 miles to a substation in Astoria, NY, where the power will be converted from DC to AC. The project in Québec also includes the construction of an AC to DC converter at Hertel substation. The project is considered as 1,250 MW and 0 MW, in the summer and winter months, respectively, based on the assumptions used for the *2025 NPCC Long Range Adequacy Overview*.[1]

As described in the New England section, since NECEC is being interconnected with Network Import Interconnection Service (NIIS), and not with Capacity Network Import Interconnection Service (CNIIS), the increased transfer capability between Québec and ISO-NE is not modeled in this analysis. All other ties with the Québec Area remain unchanged.

Conclusions

The CP-8 Working Group concluded that:

- The estimates of interconnection benefits used to meet the NPCC Resource Reliability Criterion were reviewed on a consistent basis;
- The interconnection assistance values reported by NPCC Areas in their recent resource adequacy methodologies and assistance values derived in this Review were consistently compared for all NPCC Areas, using the same multi-Area reliability model; and,
- NPCC Area assessments appear to be reasonable and do not overstate interconnection benefits
- Based on current and previous interconnection benefit analysis, external assistance from neighboring regions is declining, which reduces the tie benefit available to New York. Future New York Area Reviews are expected to reflect lower levels of interconnections assistance.

Appendix I: Comparison of Previous Reviews

There have been numerous changes to the NPCC system since earlier Reviews of Interconnection Assistance Reliability Benefits[28] were performed. In the 2021 analysis and the previous assessments, the load shape used for the summer months was the 2002 summer load shape.[1] The CP-8 Working Group considered the 2021 load shape to be representative of a reasonable expected coincidence of Area loads for the summer months, consistent with the annual NPCC Long Range Adequacy Overview and NPCC Summer Reliability assessments. This change in load shape affects when each Area's loss of load occurs and changes how Areas can support each other.

Table 6 through **Table 10** show the results of previously conducted NPCC Reviews of Interconnection Assistance Reliability Benefits.

Table 6: December 2023 Review of Annual Interconnection Assistance (MW)

NPCC Area (Year of Latest Comprehensive Review)[1]	Assistance Reported in Latest NPCC Area Comprehensive Review of Resource Adequacy	Net Firm Imports assumed at time of Area Peak (2024/2028)	Range of Estimated Annual Tie Benefits CP-8 Study Results for 2024 At Criteria/As Is	Range of Estimated Annual Tie Benefits CP-8 Study Results for 2028 At Criteria/As Is
Québec (2023)	1,100-1,700[29]	49/1,392	3,222/3,295	2,228/2,244
Maritimes (2022)	300	-72/0	1,395/1,778	1,286/1,721
New England (2023)	1,830 – 2,115[30]	1,297/84	2,242/2,271	3,460/3,519
New York (2021)	3,500[31]	1,932/3,518	4,173/4,178	2,717/2,719
Ontario (2021)	70 – 1,400	0/600	3,905/3,945	3,508/3,589

[28] See: 2023 NPCC Review of Interconnection Assistance Reliability Benefits

[29] The import capability of HVDC Sandy Pond – Nicolet interconnection has been excluded due to its unavailability during the peak period.

[30] These tie benefits values assumed by ISO New England for its resource adequacy studies are the non-firm emergency assistance from its directly interconnected external areas. The remaining transfer capabilities of the external ties can be used for capacity import purposes.
See: https://www.iso-ne.com/static-assets/documents/2021/09/a7_fca16_icr_and_related_values_and_tie_benefits_rev1.pdf

[31] Implemented a statewide limit of 3,500 MW.

Table 7: December 2021 Review of Annual Interconnection Assistance (MW)

NPCC Area (Year of Latest Comprehensive Review)[1]	Assistance Reported in Latest NPCC Area Comprehensive Review of Resource Adequacy	Net Firm Imports assumed at time of Area Peak (2022/2026)	Range of Estimated Annual Tie Benefits CP-8 Study Results for 2022 At Criteria–As Is	Range of Estimated Annual Tie Benefits CP-8 Study Results for 2026 At Criteria–As Is
Québec (2020)	1,600[32]	213/602	2,721/2,752	2,631/2,646
Maritimes (2019)	300	-66/0	1,376/1,574	1,325/1,506
New England (2020)	1,735 – 2,000[33]	1,292/0	2,282/2,298	3,533/3,590
New York (2021)	3,500[34]	1,892/2,138	4,141/4,172	3,592/3,601
Ontario (2021)	70 – 1,400	0/0	3,625/3,697	3,223/3,325

Table 8: December 2019 Review of Annual Interconnection Assistance (MW) [35]

NPCC Area (Year of Latest Comprehensive Reviews)[1]	Assistance Reported in Recent NPCC Review of Resource Adequacy	Net Firm Imports assumed at time of Area Peak (2020/2024)	Range of Estimated Annual Tie Benefit CP-8 Study Results for 2020 At Criteria/As Is	Range of Estimated Annual Tie Benefit CP-8 Study Results for 2024 At Criteria/As Is
Québec (2017)	1,600[36]	924/577	2,129/2,633	2,648/2,702
Maritimes (2019)	300	-110/0	1,016/1,623	1,016/1,504
New England (2017)	1,950 – 2,020[37]	1,522/81	2,070/2,221	3,577/3,804
New York (2018)	3,500[38]	1,783/1,939	4,665/4,808	3,737/3,878
Ontario (2018)	501 - 2,707	0/0	3,535/3,702	3,663/3,789

[32] The import capability of HVDC Sandy Pond – Nicolet interconnection has been excluded due to its unavailability during the peak period.
[33] These tie benefits values assumed by ISO New England for its resource adequacy studies are the non-firm emergency assistance from its directly interconnected external areas. The remaining transfer capabilities of the external ties can be used for capacity import purposes.
[34] In 2018, New York implemented a statewide limit of 3,500 MW.
[35] See: Jan 14 - Tie Benefits Report with Revised Results
[36] The import capability of HVDC Sandy Pond – Nicolet interconnection has been excluded due to its unavailability during the peak period.
[37] These tie benefits values assumed by ISO New England for its resource adequacy studies are the non-firm emergency assistance from its directly interconnected external areas. The remaining transfer capabilities of the external ties can be used for capacity import purposes.
[38] In 2018, New York implemented a statewide limit of 3,500 MW.

Table 9: June 2015 Review of Annual Interconnection Assistance (MW)

NPCC Area (2015 Review)	Assistance Reported in 2015 NPCC Area Review of Resource Adequacy	Net Firm Imports assumed at time of Area Peak (2016/2020)	Estimated Annual Tie Benefit Potential for 2016 At Criteria/As Is	Estimated Annual Tie Benefit Potential for 2020 At Criteria/As Is
Québec	1,600	766/931	3,402/3,491	3,592/3,789
Maritimes	300	-200/0	423/702	523/1,012
New England	1,847 – 1,970	1,516/-5	3,454/3,485	3,214/3,487
New York	4,135	1,727/2,225	8,571/9,774	8,311/9,632
Ontario	300 – 1,350	0	3,852/4,094	4,414/4,703

The *NPCC 2014 Québec Balancing Authority Area Comprehensive Review of Resource Adequacy*[39] reported 1,100 MW of winter capacity purchases from New York; the NPCC 2015 Québec Balancing Authority Area Interim Review of Resource Adequacy assumed a higher firm capacity import due to a new capacity sharing agreement between Québec and Ontario (500 MW for winter 2015-2016 and 2016-2017) for the base case scenario.

The NPCC 2015 Maritimes Area Interim Review of Resource Adequacy reported 300 MW of interconnection benefits from New England.

The tie benefits values assumed by ISO New England for its resource adequacy studies are the non-firm emergency assistance from its directly interconnected external areas. The remaining transfer capabilities of the external ties can be used for capacity import purposes.

The New York 2015 Comprehensive Review of Resource Adequacy reported 2,170 MW of summer external capacity – 1,080 MW from PJM and 1,090 from Hydro-Québec. In addition, up to 1,965 MW of locational capacity benefits are available through Unforced Capacity Deliverability Rights (UDRs).

For the high demand growth scenario for 2018, 2019, and 2020 forecast years, the 2015 Ontario Comprehensive Review of Resource Adequacy reported up to 1,350 MW of tie benefits; however, if planned outages were rescheduled, only 300 MW of tie benefits are required for 2019.

[39] Previous Area Reviews of Resource Adequacy can be found at: Resource Adequacy (npcc.org)

Table 10: June 2011 Review of Annual Interconnection Assistance (MW) [40]

NPCC Area (Year of Latest Review)	Assistance Reported in Recent NPCC Area Review of Resource Adequacy	Net Firm Imports assumed at Time of Area Peak (2011/2015)	Estimated Annual Tie Benefit Potential for 2011 At Criteria/As Is	Estimated Annual Tie Benefit Potential for 2015 At Criteria/As Is
Québec (2008)	**0**	**504/847**	**3,409/4,004**	**2,892/3,747**
Maritimes (2010)	**0**	**-200/0**	**1,076/1,353**	**1,252/1,536**
New England (2008)	**1,800**	**1,111/284**	**3,246/4,251**	**2,709/4,244**
New York (2009)	**1,861**	**1,888/1,888**	**4,393/8,538**	**5,088/7,788**
Ontario (2009)	**0**	**0/0**	**2,660/4,800**	**3,690/4,990**

New York's 2009 Comprehensive Area Review of Resource Adequacy was based on the New York Control Area Capacity Requirements for the Period May 2009 through April 2010.

[40] The Ontario – Hydro Québec HVDC interconnection with the capacity transfer up to 1,250 MW came into service in 2009.

Appendix II: Observations

Figure 1 shows the Québec Area Annual Interconnection Assistance for the years 2011-2030 including those reported in the latest Québec Area Comprehensive Review of Resource Adequacy (shown in **Table 6** through **Table 10**). A 'box and whisker' approach illustrates the range of each year's 'As Is' and 'At Criteria' interconnection assistance - an estimated mean average value is shown by an 'x' for each reported year. An 'x' in orange represents the first year of the study period and an 'x' in blue represents the last year of the study period's estimated average interconnection assistance. The dotted blue line in **Figure 1** represents a mean square fit of the yearly estimated mean averages to illustrate the trend.

The green line in **Figure 1** shows the corresponding amount of Annual Interconnection Assistance assumed by the Québec Area. Starting with the NPCC 2015 Québec Area Interim Review of Resource Adequacy, an increase in firm capacity import was assumed due to a new capacity sharing agreement between Québec and Ontario. Considering net firm capacity imports between study years will result in more consistent reporting and trending of the estimated Annual Tie Benefits over time. This applies to all Area's Annual Interconnection Assistance Trends, reported in **Figure 1** through **Figure 5.**

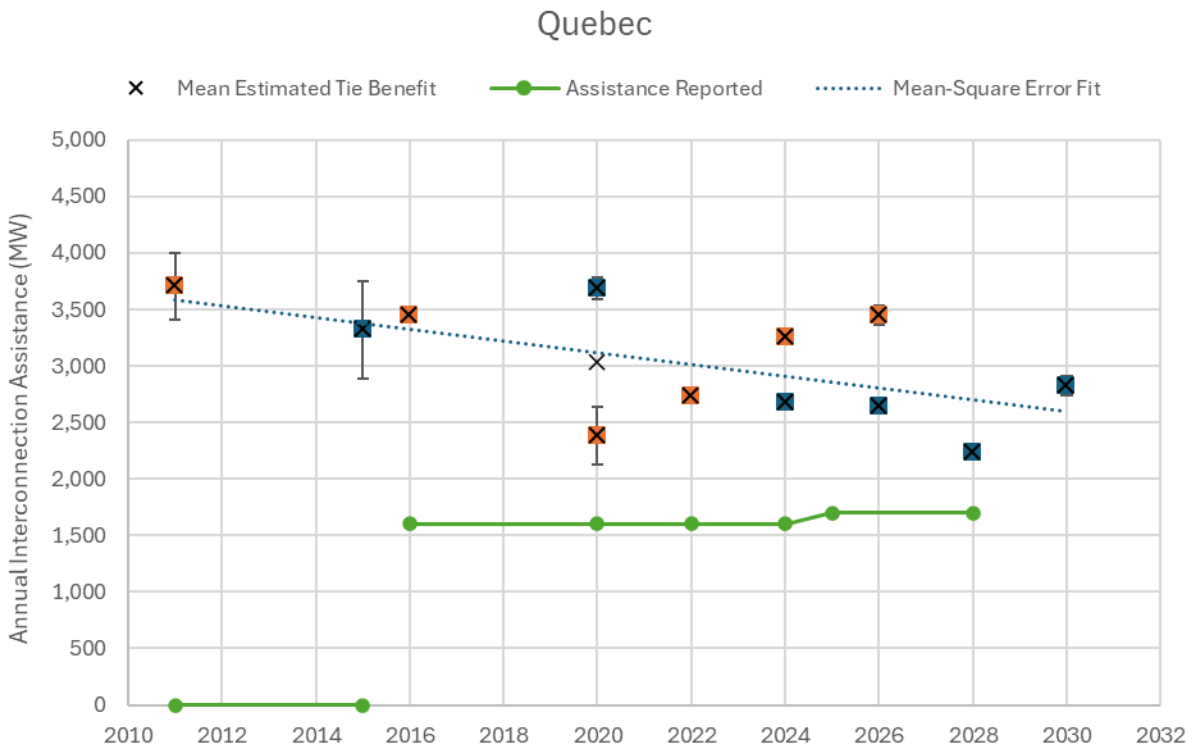

Figure 1: Québec Annual Interconnection Assistance Trends

Figure 2 shows the Maritimes Area Annual Interconnection Assistance for the years 2011-2030 reported in the latest Maritimes Area Comprehensive Review of Resource Adequacy (as shown in **Table 6** through **Table 10**). A 'box and whisker' approach illustrates the range of each year's 'As Is' and 'At Criteria' interconnection assistance - an estimated mean average value is shown by an 'x' for each reported year. An 'x' in orange represents the first year of the study period and 'x' in blue represents the last year of the study period estimated average interconnection assistance. The dotted blue line in **Figure 2** represents a mean square fit of the yearly estimated mean averages to illustrate the trend.

The green line in **Figure 2** shows the corresponding amount of Annual Interconnection Assistance assumed by the Maritimes Area.

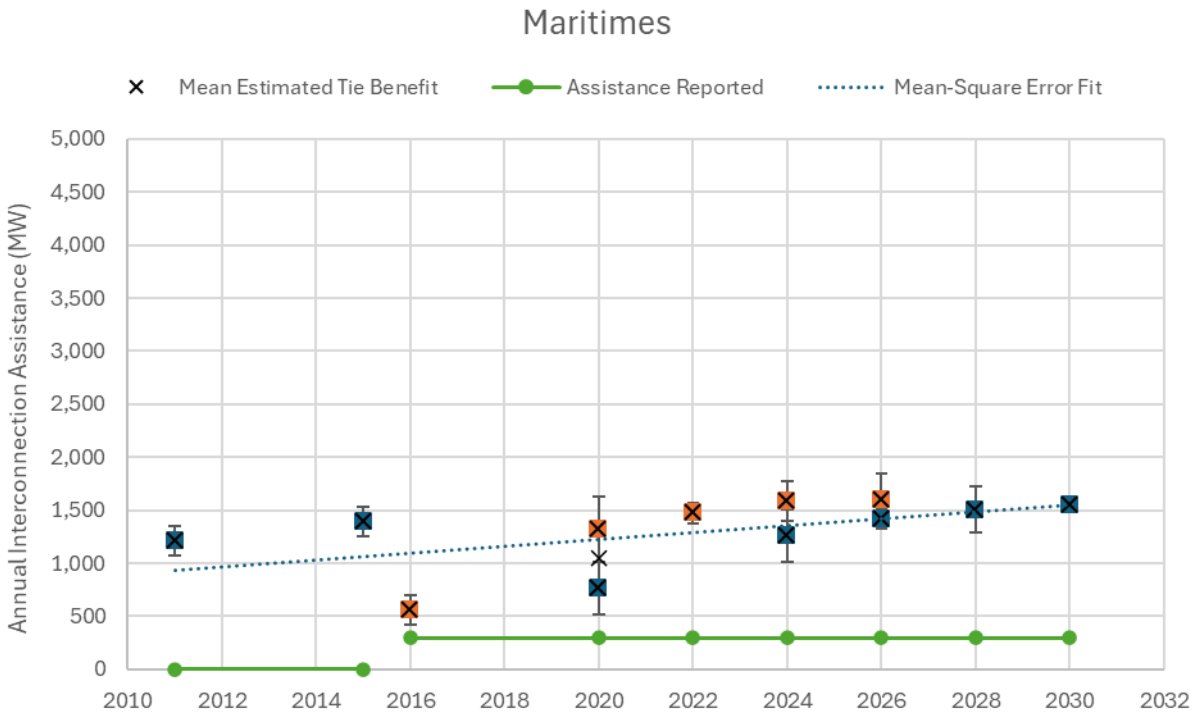

Figure 2: Maritimes Annual Interconnection Assistance Trends

Figure 3 shows the New England Area Annual Interconnection Assistance for the years 2011-2030 reported in the latest New England Area Comprehensive Review of Resource Adequacy (as shown in **Table 6** through **Table 10**). A 'box and whisker' approach illustrates the range of each year's 'As Is' and 'At Criteria' interconnection assistance - an estimated mean average value is shown by an 'x' for each reported year. An 'x' in orange represents the first year of the study period and 'x' in blue represents the last year of the study period estimated average interconnection assistance. The dotted blue line in **Figure 3** represents a mean square fit of the yearly estimated mean averages to illustrate the trend.

The green line in **Figure 3** shows the corresponding amount of Annual Interconnection Assistance assumed by the New England Area. The values assumed by ISO New England for its resource adequacy studies are the non-firm emergency assistance from its directly interconnected external areas. The remaining transfer capabilities of the external ties can be used for capacity import purposes. Assistance Reported values reflect the Tie Benefit study results conducted for the Forward Capacity Market for Forward Capacity Auction (FCA) and the Third Annual Reconfiguration Auction (ARA3). In 2023 when the study was conducted, New England assumed 2,115 MW for FCA 18 (CCP 2027-2028); in 2025, New England assumed up to 2,385 MW for third ARA for CCP 2026-2027.

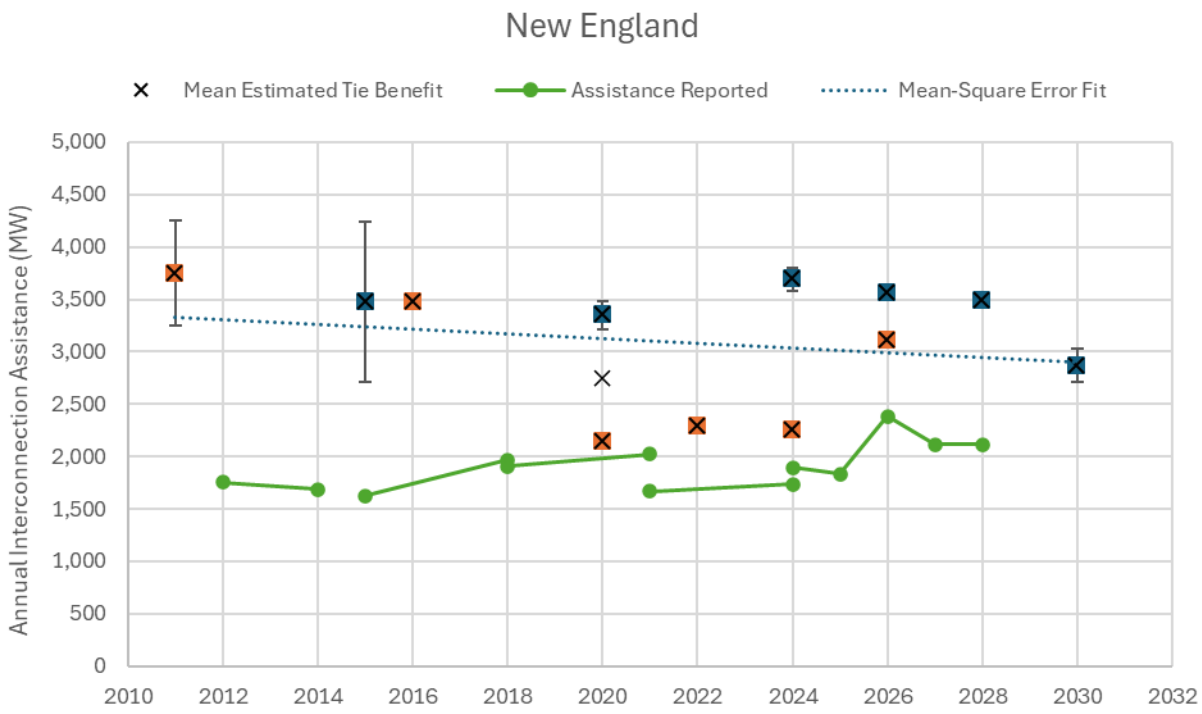

Figure 3: New England's Annual Interconnection Assistance Trends

Figure 4 shows the New York Area Annual Interconnection Assistance for the years 2011-2030 reported in the latest New York Area Comprehensive Review of Resource Adequacy (as shown in **Table 6** through **Table 10**). A 'box and whisker' approach illustrates the range of each year's 'As Is' and 'At Criteria' interconnection assistance - an estimated mean average value is shown by an 'x' for each reported year. An 'x' in orange represents the first year of the study period and 'x' in blue represents the last year of the study period estimated average interconnection assistance. The dotted blue line in **Figure 4** represents a mean square fit of the yearly estimated mean averages to illustrate the trend.

The green line in **Figure 4** shows the corresponding amount of Annual Interconnection Assistance assumed by the New York Area. In the 2009 NPCC review, New York assumed 1,861 MW; in the 2015 NPCC review, New York assumed 4,135 MW. The New York statewide

limit of 3,500 MW was adopted in 2018 and was assumed in 2020. Additionally, a new Emergency Assistance (EA) model was assumed in the 2024-2025 *IRM LCR Study*, applying a different EA limit for the different Load Forecast Uncertainty (LFU) bins. Currently, the maximum emergency assistance at the various LFU bins is as follows: 1,470 MW for LFU Bin 1; 2,600 MW for LFU bin 2; and 3,500 MW for LFU bins 3 through 7. While the 3,500 MW of emergency assistance accounted for in bins 3 through 7 is above the estimated tie benefit reported in this study, the highest load multipliers are in bins 1 and 2, which are both well below the estimated tie benefit. Future New York Area Reviews are indeed expected to assume lower levels of interconnection assistance, based on recent NPCC tie-benefit findings. The latest NPCC CP-8 analysis shows declining emergency support available from neighboring regions, which directly reduces the tie benefits New York can rely on.

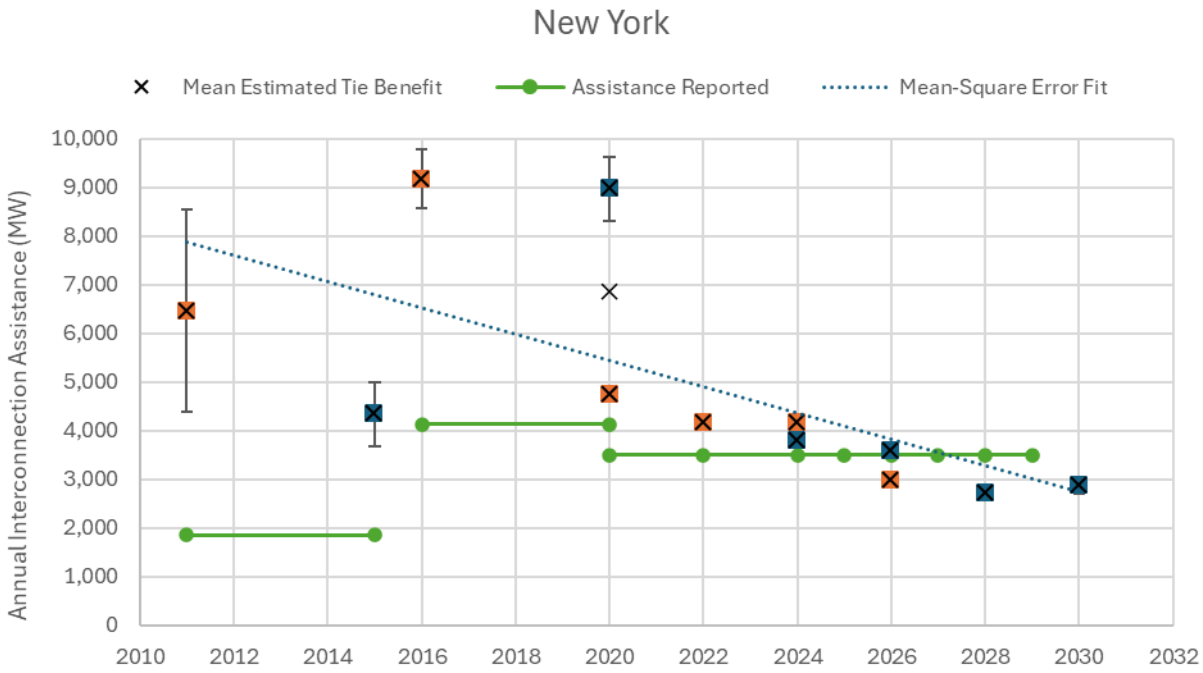

Figure 4: New York's Annual Interconnection Assistance Trends

Figure 5 shows the Ontario Area Annual Interconnection Assistance for the years 2011-2030 reported in the then latest Ontario Area Comprehensive Review of Resource Adequacy (as shown in **Table 6** through **Table 10**). A 'box and whisker' approach illustrates the range of each year's 'As Is' and 'At Criteria' interconnection assistance – an estimated mean average value is shown by an 'x' for each reported year. An 'x' in orange represents the first year of the study period and 'x' in blue represents the last year of the study period estimated average interconnection assistance. The dotted blue line in **Figure 5** represents a mean square fit of the yearly estimated mean averages to illustrate the trend.

The green line in **Figure 5** shows the corresponding amount of Annual Interconnection Assistance assumed by the Ontario Area. In 2015, Ontario assumed up to 1,350 MW; in 2018,

Ontario assumed up to 2,708 MW; in 2021, Ontario assumed up to 1,400 MW; in 2024, Ontario assumed up to 250 MW; in 2025, Ontario assumed up to 302 MW.

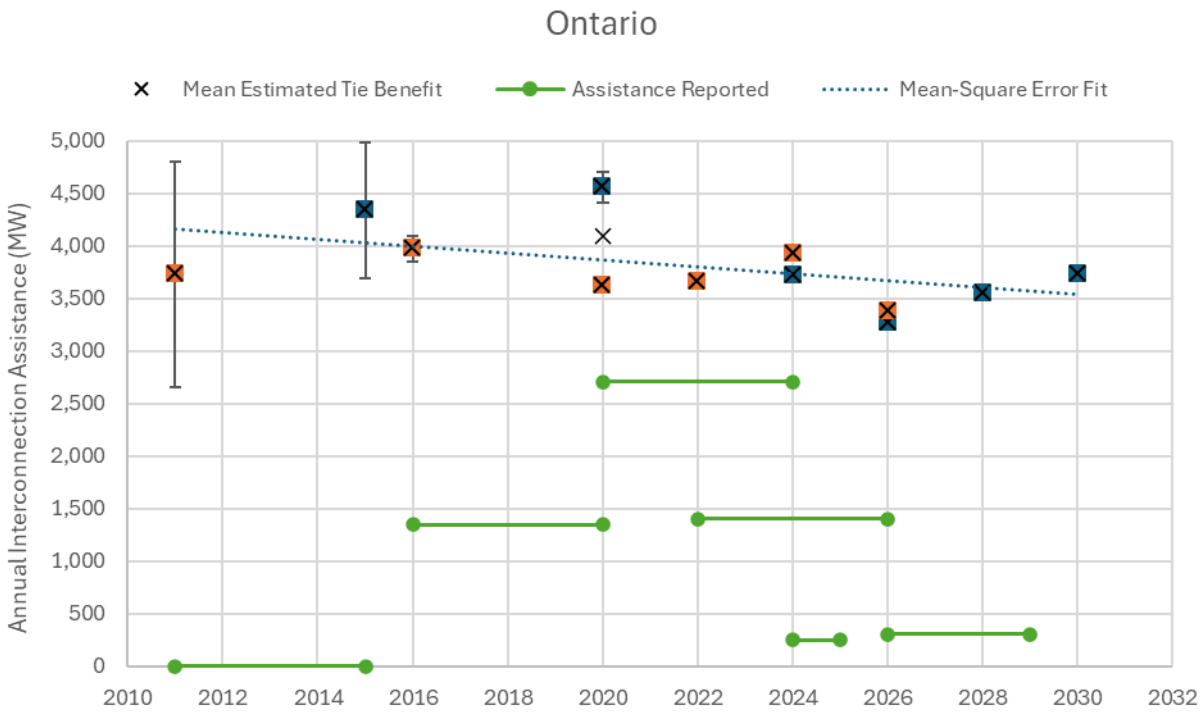

Figure 5: Ontario's Annual Interconnection Assistance Trends

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