



NPCC 2015 Summer Reliability Assessment Summary Report

Adequate Summer Electricity Supplies Projected

Summer 2015 Reliability Assessment Overview

The comprehensive reliability assessment conducted by the Northeast Power Coordinating Council, Inc. (NPCC) projects that the region will have an adequate supply of electricity this summer.

A wide range of assumptions were analyzed, including extreme weather conditions derived through over 40 years of experience, unexpected plant outages, transmission constraints between and within regions, implementation of operating procedures and estimated impact of demand response programs.

The assessments indicate that the NPCC geographic area (consisting of the six New England states, the State of New York, Ontario, Québec and the Canadian Maritime Provinces of New Brunswick and Nova Scotia) will have an adequate supply of electricity this summer, even during periods of extreme weather.

Extreme weather conditions are considered to be wide-spread and prolonged heat waves with high humidity and near record temperatures.

The assessment considered severe system conditions that included the impact of: 1) extended unit maintenance; 2) reductions in demand-response programs; 3) reductions in the ability to import power from neighboring Regions; 4) transmission constraints; and, 5) extreme weather characterized by wide-spread and prolonged heat waves with high humidity and near-record temperatures.

Established operating procedures are available, as required, to maintain reliability for the unlikely simultaneous occurrence of severe system and extreme weather conditions to keep electricity supplies and demand in balance.

Summary of Key Findings

Approximately 4,600 MW of new capacity¹ has been installed since last summer which includes projects expected to be in service over the course of this summer period. No delays to the in-service dates of new generating capacity are anticipated. Considering the retirements, the resultant net change in NPCC generation (from 2014 summer through 2015 summer) is approximately 3,400 MW.

For New York City and throughout New York State, an adequate supply of electricity is forecast this summer. From the summer of 2014 through this summer, major additions include the 532 MW repowering of the Danskammer plant, the return to service of Astoria generation (180 MW) and the return to service of several small generators (107 MW) totaling 819 MW. The mothballing of the Ravenswood Gas Turbine 3-3 (43 MW)

¹ Based on summer nameplate ratings.



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and other capacity reductions total 102 MW. Considering all changes, the resultant net change for New York generation (from summer 2014 through this summer) is +717 MW.

New England expects to have a sufficient supply of electricity this summer. From the summer of 2014 through this summer, 120 MW of new generating capacity (wind and wood-fueled) has been added to the New England system. Retirements include the Vermont Yankee Nuclear generator (615 MW). Considering all changes and 76 MW of capacity derates, the resultant net change for New England generation (from summer 2014 through this summer) is -571 MW.

Ontario is projected to have a sufficient supply of electricity this summer. From the summer of 2014 through this summer, capacity additions total 2,105 MW, consisting of wind generation (1,050 MW), solar (180 MW), hydro units (353 MW), biomass projects (193 MW), the Green Electron gas-fired power plant (298 MW) and nuclear capacity adjustments (31 MW). Retirements and other adjustments reduce this total by 323 MW. Considering all changes, the resultant net change for Ontario generation (from summer 2014 through this summer) is +1,782 MW.

Québec and the Canadian Maritime Provinces have more than an adequate supply of electricity forecast for the summer period. Both of these areas are winter peaking. Normal hydro conditions are expected for this summer.

Since the summer of 2014 and through this summer, Hydro-Québec Production has added 808 MW of hydro capacity including the La Romaine-2 generator (640 MW), and 482 MW of wind generation. Considering all changes, the resultant net change for Quebec generation (from summer 2014 through this summer) is +1,290 MW.

Since the summer of 2014 and through this summer, the Maritimes will have added 214 MW of wind generation and 4 MW of biomass generation. Considering a small amount of retirements (-14 MW), the net change to Maritimes generation (from summer 2014 through this summer) is +204 MW.

Projected NPCC Load

The non-coincident (sum of the individual NPCC area) forecast peak demand for NPCC during the summer of 2015 is 108,106 MW (May – September period).

More importantly, the NPCC 2015 summer coincident peak demand forecast of 107,440 MW is expected to occur during July. This forecast is slightly higher (99 MW) than last year's forecast NPCC coincident peak demand of 107,341 MW. Several factors influence the load growth projection, including the economic outlook as well as the on-going effects of conservation measures, efficiency improvements, and demand response programs.



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Nevertheless, ambient weather conditions remain the most important variable in forecasting peak demand during the summer months. Historically, the peak loads and temperatures between New England and New York have a high correlation due to the relative locations of their respective load centers. Depending upon the extent and duration of a summer weather system, there is some potential for the Ontario summer peak demand to be coincident with New England and New York.

New York

The forecast New York area peak load for summer 2015 by the New York Independent System Operator (NYISO) is 33,567 MW, which is 99 MW lower than the summer 2014 forecast of 33,666 MW, attributed to a decrease in upstate industrial load.

New England

The Independent System Operator of New England's (ISO-NE's) forecast New England area summer 2015 peak demand is 26,710 MW, assuming historically-based expected summer peak weather conditions. The 2015 forecast of peak demand is 52 MW higher than the corresponding 2014 forecast of 26,658 MW; the forecast takes into account the demand reductions associated with energy efficiency, load management and distributed generation.

Ontario

The forecast Ontario area 2015 summer peak demand forecast by the Ontario Independent Electricity System Operator (the IESO) for 'weather normal' conditions is 22,991 MW, and includes the reductions due to conservation measures, growth in embedded solar and wind generation, and pricing factors. The forecast is 34 MW lower than last summer's forecast 'weather normal' peak demand of 23,025 MW.

Québec

The forecast Quebec area 2015 summer peak load is 21,090 MW for the week beginning August 15, 2015. The Québec 2015 forecast is 23 MW lower than the summer 2014 forecast of 21,113 MW (week of June 15, 2014). It should be noted, however, that Hydro-Québec's system is winter peaking. Since some heating load remains on the system in early May and picks up again in late September, the summer peak for Québec may occur around those times.

Maritime Provinces

The Maritime area 2015 summer peak load of 3,748 MW is forecast for the Maritime Provinces for the week of April 26, 2015. The Maritime Provinces are winter-peaking; forecast peaks for the shoulder months are normally higher than the summer period. The 2015 forecast peak is 10 MW higher than last year's corresponding forecast summer peak of 3,738 MW (for the week of April 27, 2014).



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Transmission and Resource Adequacy Summary

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During the NPCC forecast coincident peak load week (beginning July 5th), the overall spare operable capacity (capacity over and above reserve requirements) for NPCC is estimated to be 14,154 MW. A portion of this spare operable capacity is in the Québec and Maritime Provinces. The transfer capability between the Québec and the Maritimes Provinces to the remainder of NPCC will not permit the usage of all this forecast spare operable capacity. As a result, the spare operable capacity is reduced to 10,548 MW.

The week beginning June 28th represents the week with the lowest forecast operable capacity margin (spare operable capacity less transfer capability limitations); 9,007 MW is estimated to be available. This is not the same week of the forecasted NPCC coincident peak demand.

The sizeable forecast NPCC operable capacity margins will help to counteract any adverse reliability impacts that project delays could have on overall NPCC reliability this summer.

New York

The New York Independent System Operator (NYISO) forecasts installed capacity of 38,700 MW for the peak week demand forecast of 33,567 MW. Accounting for purchases, sales, required operating reserve, planned and unplanned outages results in an operable spare capacity margin of 1,985 MW for the peak week.

Supply-Side Resources

From the summer of 2014 through this summer, major additions include the 532 MW repowering of the Danskammer plant, the return to service of Astoria generation (180 MW) and the return to service of several small generators (107 MW) totaling 819 MW. The mothballing of the Ravenswood Gas Turbine 3-3 (43 MW) and other capacity reductions total 102 MW. Considering all changes, the resultant net change for New York generation is +717 MW.

New York currently has 1,466 MW of installed nameplate wind capacity, of which 223 MW is assumed available during the summer peak demand period.

Demand Response Resources

The New York ISO has three demand response programs to support system reliability:

- ✓ The Emergency Demand Response Program (EDRP) provides demand resources an opportunity to earn the greater of \$500/MWh or the prevailing locational-based marginal price (“LBMP”) for energy consumption curtailments provided when the NYISO calls on the resource.



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- ✓ The Installed Capacity (ICAP) Special Case Resource program allows demand resources that meet certification requirements to offer Unforced Capacity (“UCAP”) to Load Serving Entities (“LSEs”).
- ✓ The Targeted Demand Response Program (“TDRP”), introduced in July 2007, is a NYISO reliability program that deploys existing EDRP and SCR resources on a voluntary basis, at the request of a Transmission Owner, in targeted subzones to solve local reliability problems. The TDRP program is currently available in the New York City zone.

For this summer, the NYISO projects to have approximately 1,124 MW of SCR and 86 MW of EDRP resources available, representing a total of 1,210 MW of available demand response resources.

Transmission

New York does not anticipate any reliability issues for this summer.

In March 2015, a new substation, Eastover Road, went into service tapping the 230 kV Rotterdam-Bear Swamp line between New York and New England. The station is located in New York near Albany, electrically connects to the local 115 kV system, and consequently changes the New York – New England interface definition to Eastover Road-Bear Swamp.

New England

Based on the 2015 load forecast (50% chance of being exceeded) and projected available capacity for the summer 2015 period, weekly operable capacity margins ranging from 316 MW to about 5,000 MW are projected. These margins do not include the short-term capacity and energy purchases from neighboring systems that are anticipated to be available.

Supply-Side Resources

From the summer of 2014 through this summer, new generation projects include a new wind and a new wood/refuse project with nameplate ratings totaling 120 MW.

ISO New England’s total wind capacity for this summer is 784 MW, with 92 MW of that amount counted toward installed capacity.

Demand Response Resources

For this summer, ISO New England has 638 MW of active demand resources expected to be available on peak. The active demand resources consist of real-time demand response of 446 MW and real-time emergency generation of 192 MW, which can be activated with the implementation of New England operating procedures.



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In addition to active demand resources, there are 1,685 MW of passive demand resources (i.e., energy efficiency & conservation), which are treated as demand reducers and accounted for in the load forecast of 26,710 MW. These include installed measures (e.g., products, equipment, systems, services, practices and/or strategies) on end-use customer facilities that result in additional and verifiable reductions in the total amount of electrical energy used during on-peak hours.

Without the effects of passive demand resources, the summer 2015 forecast would equate to 28,395 MW.

Transmission

The New England transmission system is anticipated to be sufficient for this summer. New transmission facilities anticipated in New England are associated with the 345 kV Maine Power Reliability Project (MPRP) and the Interstate Reliability Project.

Some of the more significant improvements include two new 345 kV transmission lines, one 345/115 kV transformer, two 40 MVar shunt reactors and the retirement of many Special Protection Systems; all part of the MPRP. The first three are identified as the 345 kV line from Albion Road to Coopers Mill, the 345 kV line from Coopers Mill to Larrabee and the Coopers Mill 345/115 kV step down transformer. These elements are located in an area that joins the Northern and Central Loop regions of the MPRP project and will significantly reinforce power transfers into and out of the area.

The Interstate Reliability Project, a portion of the New England East-West Solution, is another major transmission project that plays a role in introducing further transmission improvements to the New England transmission system. Commissioning of the 345 kV line from Card to Lake Road will increase Connecticut import and export transfer capabilities and significantly improve local generation limitations during line out conditions.

Ontario

The Independent Electricity System Operator (IESO) of Ontario is anticipating spare operable capacity margin of 2,212 MW during the peak week (week beginning July 5, 2015).

Supply-Side Resources

From 2014 summer through this summer, generation additions total 2,105 MW, consisting of wind generation (1,050 MW), solar (180 MW), hydro units (353 MW), biomass projects (193 MW), the Green Electron gas-fired power plant (298 MW) and nuclear capacity adjustments (31 MW). Retirements and other adjustments reduce this total by 323 MW. With the exception of the Green Electron Power Plant, all new



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resources are expected to be installed and become commercial before the NPCC forecasted peak week.

Demand Response Resources

Ontario's demand response is comprised of the following programs: peaksaver, dispatchable loads, Capacity Based Demand Response (CBDR) time-of-use (TOU) tariffs and the Industrial Conservation Initiative (ICI). Dispatchable loads and CBDR resources can be dispatched in the same way that generators are, whereas TOU, ICI, conservation impacts and embedded generation output are factored into the demand forecast as load modifiers.

The capacity of the demand response program consists of 678 MW of dispatchable load, 519 MW of CBDR resources and 128 MW of Peaksaver resources. Although the total demand response capacity is 1,325 MW, the effective capacity is 859 MW due to program restrictions and market participant actions. During peak periods of the year, market participants take independent action to reduce their consumption for economic reasons, reducing the available capacity for demand measures.

Transmission

For this summer, Ontario's transmission system is expected to be adequate.

Québec

The Province of Québec is winter peaking. Adequate resources are forecast to be available to serve summer peak demand and meet operating reserve requirements this summer. Québec is projecting weekly operable capacity margins in the range of about 6,000 MW to about 9,200 MW for this summer.

Supply-Side Resources

For this summer, nameplate wind capacity of the Québec area has reached 2,881 MW, a 482 MW increase since last summer. La Romaine-2 Hydro Generating Station (640 MW) was successfully commissioned at the end of 2014. The Québec is winter peaking, generation projects' commissioning is typically scheduled during autumn in preparation for the following winter peak period.

For this assessment, Québec assumed that its entire wind generation capacity of 2,881 MW is 100% derated.

Demand Response Resources

The demand response programs in Québec are available only during the winter period; they are neither required nor available for the summer.



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Transmission

In Québec, most transmission line, transformer and generating unit maintenance is done during the summer period. Internal transmission outage plans are assessed to meet internal demand, firm sales, expected additional sales and additional uncertainty margins. They should not impact inter-area transfer capabilities with neighboring systems. Known maintenance/derates vary between 10,650 to 12,493 MW. During this summer, some maintenance outages are scheduled on the interconnections. Maintenance is coordinated with neighboring areas so as to provide maximum capability to summer peaking areas.

Maritimes

The Maritime Provinces are also winter peaking. Adequate resources are forecast to be available to serve summer peak demand and meet operating reserve requirements. The Maritimes forecast spare operable capacity margins ranging from about 1,200 MW to about 2,200 MW over this summer.

Supply-Side Resources

Since the summer 2014 and through this summer, the Maritimes will have added 214 MW of wind generation and 4 MW of biomass capacity. Considering a small amount of retirements (-14 MW), the net change to Maritimes capacity is +204 MW.

The Maritimes currently have approximately 1,087 MW of nameplate installed wind generation. After applying derates, the wind capacity for the summer period is assumed to be 191 MW.

Demand Response Resources

Interruptible and dispatchable loads are forecast on a weekly basis and range between 309 MW and 336 MW, and are available for use if or when corrective action is required.

Transmission

The Maritimes transmission system is projected to be adequate to supply the demand requirements for this summer. The Onslow substation transmission upgrade has increased the internal (Nova Scotia) transmission corridor transfer limit.

Annual maintenance is scheduled for the Eel River HVDC terminal during one week in May and one week in June (one circuit at a time) which will lower the transfer capability between New Brunswick and Québec. This maintenance is scheduled to be completed prior to the forecasted NPCC summer peak.



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Estimated Need for Operating Procedures

A wide range of assumptions were analyzed, including extreme weather conditions derived through over 40 years of experience, unexpected plant outages, transmission constraints between and within regions, implementation of operating procedures and estimated impact of demand response programs.

In the probabilistic assessment, chronological system histories were developed by combining randomly generated operating histories of the generating units with the inter-area transfer limits and the hourly chronological loads. Consequently, the system was modeled in great detail with accurate recognition of random events, such as equipment failures, peak load forecast uncertainty, as well as the deterministic rules and policies that govern system operation.

Figure 1 shows the expected use of the indicated operating procedures under the Base Case assumptions and the expected load level. The expected load level is based upon the probability-weighted average of the seven load levels simulated.

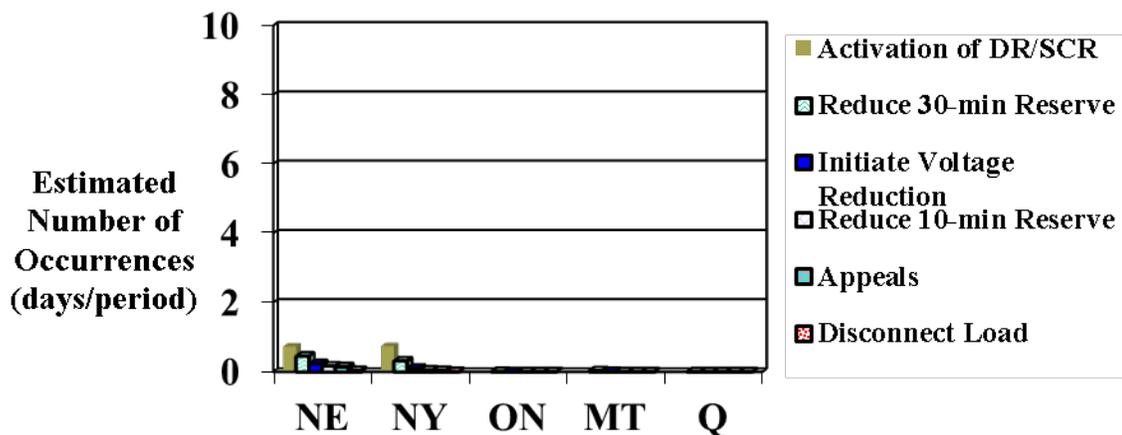


Figure 1
Range of the Expected Use of Indicated Operating Procedures for Summer 2015
(May – September)
(Expected Load Forecast)

Following activation of demand response resources, there is no significant likelihood of implementing operating procedures designed to mitigate resource shortages (reducing 30-minute reserve, voltage reduction, and reducing 10-minute reserve) during the 2015 summer period under expected conditions.

The overall NPCC forecast for electricity demand has increased slightly when compared to last summer’s forecast; reflecting slow load growth associated with the economic



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outlook, ongoing conservation measures, improvements in efficiency and contributions from demand response programs.

Additional resources and improved transmission capacity resulting from transmission projects available this summer are additional factors that act to minimize the expected need for the use of these operating procedures this summer.

Established operating procedures are available, as required, to maintain reliability for the unlikely simultaneous combination of severe system conditions – such as unplanned outage of generating resources, reductions in anticipated demand response, and reductions in the ability to import power from neighboring Regions – coincident with higher than expected electricity demands from a wide-spread, prolonged heat wave with high humidity.

Operational Readiness

The Resource and Transmission Reliability Adequacy Assessments are key elements in determining NPCC's ability to meet the forecast demands of the summer period. To be prepared to deal with the constantly changing operating conditions on the power system, as well as contingencies, NPCC routinely conducts daily and week-ahead planning calls between system operators and neighboring regions to coordinate short-term system operations.

NPCC continues to refine and expand its situational awareness capability to include wide-area visual displays of NPCC and its adjacent Regional Entities to further enable NPCC system operators and neighboring regions to communicate current operating conditions and facilitate the procurement of assistance under emergency conditions.

Geomagnetic Storms

Past experiences have shown the serious effect that geomagnetic disturbances can have on the NPCC bulk power system. These effects can include transformer failures, and unintentional tripping of transmission lines (outages) due to geomagnetically induced currents (GICs).

Since 1989, NPCC has operating procedures ² in-place to mitigate the effects of GICs resulting from geomagnetic storms. NPCC system operators receive, on a continual twenty-four hour by seven day basis, the status of solar activity and geomagnetic storm alerts.

² See: <https://www.npcc.org/Standards/Procedures/c-15.pdf>



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After reviewing the available data, the system operator evaluates the situation and enacts appropriate measures designed to protect system elements such as transformers, transmission lines, generators, and other critical facilities.

The period near the 13th to the 30th of each month during this summer will be more susceptible to several periods of minor GIC activity.³ By the end of this summer, this “zone” may shift to the earlier part of the month (from about the 8th to the 25th of each month). During the 1st to the 13th of each month, there will be a slight, but notably increased risk of stronger GIC events from active sunspot groups producing solar flares and attendant higher-velocity coronal mass ejections.

Since the events associated with solar activity cannot be reliably predicted more than 72 hours in advance, it is important for operators to keep an eye on current forecasts at all times of the month.

Natural Gas Supply

While natural gas has become the predominant fuel source in New England, ISO New England continues to monitor impacting factors to the natural gas fuel deliverability throughout the summer reliability assessment periods. Regarding this summer capacity, ISO New England expects some natural gas pipeline maintenance to occur in late September, but does not forecast any deliverability issues that would affect reliability.

ISO New England and the interstate natural gas pipeline operators continue to improve the forecast of their combined systems, discuss specific system conditions, and take actions, under their existing authorities, to avoid reliability problems. Sharing information allows ISO New England to better anticipate and address potential reliability problems in the event that there is insufficient fuel for all gas-fired generators to meet their schedules. Along with near-term weather data, load forecasts and planned outage conditions, this information is also used to develop short-term and long-term operating plans.

ISO New England has several procedures that can also be invoked to mitigate regional fuel supply emergencies impacting the power generation sector.

NPCC

NPCC is one of eight Regional Entities located throughout the United States, Canada and portions of Mexico. The NPCC geographic region includes the State of New York and the six New England states as well as the Canadian provinces of Ontario, Québec and the Maritime provinces of New Brunswick⁴ and Nova Scotia. Overall, NPCC covers an area

³ 2015 Solar Terrestrial Dispatch’s Forecast of Geomagnetically Induced Current

⁴ Includes the connected part of northern and eastern Maine.



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of nearly 1.2 million square miles, populated by more than 56 million people. In total, from a net energy for load perspective, NPCC is approximately 45% U.S. and 55% Canadian. With regard to Canada, approximately 70% of Canadian net energy for load is within the NPCC Region.

NPCC coordinates international electric power grid reliability for Northeastern North America. NPCC annually performs comprehensive seasonal assessments of electricity supply and demand reliability for eastern Canada, New England and the City and State of New York. These assessments require months of detailed preparation and are performed with the participation of regional electricity power grid operators and planners.

Additional information regarding NPCC is available at: www.npcc.org.