New England 2014 Comprehensive Review of Resource Adequacy

ISO New England Inc.

RCC Approved

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Section 1 Executive Summary

ISO New England Inc. (ISO-NE) is the not-for-profit corporation responsible for the reliable and economical operation of New England's electric power system. It also administers the region's wholesale electricity markets and manages the comprehensive planning of the regional power system. As part of its planning functions, ISO-NE is the Planning Coordinator for the New England Area of the Northeast Power Coordinating Council (NPCC). One of ISO-NE's responsibilities as a Planning Coordinator is to conduct studies and provide results to demonstrate that the New England Area bulk power system will meet the NPCC Resource Adequacy – Design Criteria as defined in NPCC Regional Reliability Reference Directory #1 – *Criteria for Design and Operation of Bulk Power Systems*[1].

This 2014 New England Comprehensive Review of Resource Adequacy, covering 2015 through 2019, was prepared by ISO-NE to satisfy NPCC compliance requirements on resource adequacy. This comprehensive review follows the guidelines as specified in Appendix D of NPCC Directory #1 entitled *Guidelines for Area Review of Resource Adequacy*. This review supersedes the New England 2011 Comprehensive Review of Resource Adequacy[2], which was approved by the Reliability Coordinating Committee (RCC) on November 29, 2011.

1.1 Major Findings

The findings of this review are based on the results of a resource adequacy assessment of the New England bulk power system using the General Electric Multi Area Reliability Simulation Program (GE MARS) and results of other studies conducted for the ISO New England 2014 Regional System Plan (RSP 14)[3].

The major findings of this comprehensive review are as follows:

- The anticipated resources are expected to be adequate to meet the NPCC Resource Adequacy Design criterion of disconnecting firm load customers no more than 0.1 days/year for each year of the study period under the expected load forecast conditions.

- Past Forward Capacity Market (FCM) auctions in New England have procured an adequate amount of resources to meet the expected demand through 2017/18. Proposed enhancements to the FCM will create stronger incentives to retain existing resources and attract new resources, and to improve their performance when called on during periods of system stress. These enhancements include modification of the zonal structure, employment of a sloped demand curve, and a "pay-for-performance" mechanism.

- The summer peak demands of the 2014 load forecast are lower than the 2011 forecast. The changes are mainly attributed to the updated economic forecast, which reflects the economic trends of the New England region. ISO-NE forecasts the 10-year growth rate to be 1.3% per year for the summer peak demand, 0.6% per year for the winter peak demand, and 1.0% per year for the annual use of electric energy as compared to the 2011 forecast growth rates of 1.4% per year for the summer peak demand, 0.5% for the winter peak demand, and 1.1% per year for the annual use of electric energy.

[1] https://www.npcc.org/Standards/Directories/Directory%201%20-%20Design%20and%20Operation%20of%20the%20Bulk%20Power%20System%20%20Clean%20April%2020%202012%20GJD.pdf

[2] A copy of this review can be found at: https://www.npcc.org/Library/Resource%20Adequacy/NE_2011_Comprehensive_Review_of_Resource_Adequacy%20-%20RCC%20Approval%20-%2020111129.pdf

[3] http://www.iso-ne.com/trans/rsp/index.html.

- Several strategic planning issues associated with fuel certainty and resource performance stem from the region's high dependence on natural gas-fired generation and other constrained-energy resources. ISO-NE has taken a number of actions to address fuel-certainty issues in the short and longer terms. These problems have been quantified, and market and operational solutions are being implemented. For the 2014/2015 winter, ISO-NE will be implementing a FERC-approved winter reliability program[4] to mitigate the fuel constraints. By the end of 2014, ISO-NE plans on implementing rule changes that allow generators to better reflect the real-time price of fuel in their supply offers.[5] Longer-term, an FCM pay-for-performance mechanism should create stronger financial incentives for capacity supplies to produce electricity and supply reserves when needed the most. This planned market improvement is designed to encourage generator owners to invest in dual-fuel capability or new fast-start assets, enter into firmer fuel arrangements, and have more reliable operating and maintenance practices, which all should in turn reduce the need for stop-gap measures like a winter reliability program.

- ISO-NE has been assessing the potential impact of existing and proposed US Environmental Protection Agency (EPA) and state regulations on the operation of existing fossil steam units and other types of generation in the region. Many generators in the region already have installed the needed controls to comply with existing state environmental rules. Uncertainty remains over the extent to which the final regulations will require generator owners to make capital investments in environmental remediation measures and potentially increase plant operating costs. These factors could require long-term generator outages for implementing required remediation measures. They also could trigger unit retirements as an alternative to accepting higher capital and operating costs. Alternatively, generators may comply with some of the environmental requirements by reducing capacity or energy production. ISO-NE will continue to assess the generators at risk for retirement and generators that already have environmental remediation measures in place or may require relatively minor upgrades. The actual compliance timelines will depend on the timing and substance of the final regulations and site-specific circumstances of the electric generating facilities, such as their economic performance.

- The New England states have targets for the proportion of electric energy that load-serving entities (LSEs) must serve using renewable resources, such as wind, solar, and energy efficiency. Because the states are revising these targets to reflect different amounts and types of resources that qualify for Renewable Portfolio Standards (RPSs), ISO-NE cannot project the precise amount of regional renewable energy goals. The region's RPSs can be met by developing the renewable resources already in the ISO-NE queue; importing renewable resources from adjacent balancing authority areas; building new renewable resources in New England not yet in the queue; and using "behind-the-meter" projects and eligible renewable fuels, such as biomass, at existing generators. If the development of renewable resources falls short of providing sufficient Renewable Energy Certificates

[4] ISO New England Inc., *Docket No. ER14-___-000, Winter 2014-15 Reliability Program* (Parts 1 and 2), FERC filing (July 11, 2014), http://www.iso-ne.com/static-assets/documents/regulatory/ferc/filings/2014/jul/er14_2407_000_win_rel_pro_7_11_2014.pdf and http://www.iso-ne.com/regulatory/ferc/filings/2014/jul/er14-2407-001_winter_rel_7-11-2014.pdf. Also see above footnote for FERC's September 10, 2014, order.

[5] The Energy Market Offer Flexibility Rule will allow power supply offers to vary by hour in the Day-Ahead Energy Market, changes in Real-Time Energy Market bids until 30 minutes before the hour in which the offer applies, and negative offers in both markets as low as −$150/MWh. For additional information on these market improvements, see the ISO's "Interdependencies of Market and Operational Changes to Address Resource Performance and Gas Dependency" (2013), http://www.iso-ne.com/committees/comm_wkgrps/strategic_planning_discussion/materials/interdependency_of_iso_proposals_to_key_spi_risks.pdf. Also, *ISO New England Inc. and New England Power Pool, Energy Market Offer Flexibility Changes*, FERC filing (July 1, 2013), http://www.iso-ne.com/static-assets/documents/regulatory/ferc/filings/2013/jul/er13_1877_000_mkt_offer_flex_7_1_2013.pdf.

(RECs) to meet the RPSs, load-serving entities can make state-established alternative compliance payments (ACPs).[6] ACPs also can serve as a price cap on the cost of the RECs.

- Transmission upgrade projects placed in service have reduced congestion and decreased dependence on generating units located in load pockets. Several transmission projects to come on-line during the study period will further enhance the system or sub-area reliability. The major transmission projects under development include the Maine Power Reliability Program (MPRP) that is expected in-service in 2015, and New England East-West Solution (NEEWS) that is to be completed in 2016 and 2018. These infrastructure projects will improve system reliability in the areas of Maine, New Hampshire, Springfield in Massachusetts, and Rhode Island.

1.2 Summary of Major Assumptions and Results

Table 1 shows the major assumptions used in this review, and Table 2 summarizes the LOLE results. The detailed assumptions and results are documented in the later sections of this review.

Table 1 Major Assumptions

Assumptions	Description
Reliability Criterion	NPCC Criterion: no more than once in 10 years of firm load disconnection (LOLE of 0.1 days/year)
Load Model	2014 CELT reference and high load forecasts[7] with forecast uncertainty
Reliability Model	GE MARS
Expected Existing Resources	Generating Resources: based on Seasonal Claimed Capability Active Demand Resources: based on Capacity Supply Obligation Passive Demand Resources: based on Qualified Capacity through 2017-18 and the energy efficiency forecast thereafter Imports: based on Capacity Supply Obligation
Expected Resource Additions	Resources under construction and/or assume a Capacity Supply Obligation
Expected Capacity Retirements	Resources with retirement request approved and/or disconnected from the system
Resource Availability (EFORd and Scheduled Maintenance Requirements)	Generating resources based on their 5 year historical average (Jan 2009 through Dec 2013); Demand resources based on historical actual and audit performance from 2010 to 2013
Tie Benefits Assumptions from Neighboring Systems	Based on results of tie benefits studies conducted for ISO-NE's Forward Capacity Markets: 1,624 MW (2015); 1,870 MW (2016 and 2017); 1,970 MW (2018 and 2019)
Emergency Operating Procedures (Load Relief from Voltage Reduction)	Assumed 1.5% of load relief from Voltage Reduction during OP 4 Actions 6 and 8
Internal Transmission Constraints	Subarea representation[8] and the interface limits are shown in Appendix 7.8.

[6] *Renewable Energy Certificates* are tradable, nontangible commodities, each representing the eligible renewable generation attributes of 1 MWh of actual generation from a grid-connected renewable resource.

[7] http://www.iso-ne.com/static-assets/documents/trans/celt/report/2014/2014_celt_report_rev.pdf

[8] The subarea representation is consistent with New England's RSP 14.

Table 2 LOLE Results

Year	Expected Resources (MW)	Reference Load Forecast		High Load Forecast	
		50/50 Peak[9] (MW)	LOLE (days/year)	50/50 Peak (MW)	LOLE (days/year)
2015	35,020	28,615	0.025	29,180	0.044
2016	35,834	29,130	0.016	29,830	0.036
2017	34,612	29,610	0.060	30,420	0.109
2018	34,851	30,005	0.068	30,915	0.130
2019	35,075	30,335	0.074	31,330	0.150

The anticipated available resources are expected to be adequate to meet the NPCC resource adequacy criterion under the reference load forecast. Additional cumulative resources of 100 MW by 2017, 380 MW by 2018, and 660 MW by 2019 are needed if the high economic growth load forecast materializes for the years 2017 to 2019.

[9] The 50/50 peak is the peak load that has 50% chance of being exceeded.

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Section 3 Introduction

The Reliability Assessment Program established by NPCC requires its member Planning Coordinators to conduct their resource adequacy assessment on an annual basis. The purpose of this report is to document the results and findings of the ISO-NE comprehensive resource adequacy studies, covering 2015 to 2019, for NPCC review. The assessment is conducted in accordance with the guidelines as specified in Appendix D of NPCC Regional Reliability Reference Directory #1, entitled *Guidelines for Area Review of Resource Adequacy*. This assessment supersedes the New England 2011 Comprehensive Review of Resource Adequacy[10], which was approved by the NPCC Reliability Coordinating Committee on November 29, 2011.

3.1 Previous Comprehensive Review of New England's Resource Adequacy

The RCC approved the previous New England Comprehensive Review of Resource Adequacy in November 2011. The findings of that review showed that New England conformed with the NPCC Resource Adequacy Design Criterion over the study period under the expected load and resource conditions.

3.2 Comparison of Current and Previous Reviews

3.2.1 Load Forecast

ISO-NE annually updates its load forecast for the next ten years to reflect the impacts from the region's recent historical annual use of electric energy and peak loads, and an update of economic and demographic forecasts. The load forecast accounts for reductions based on the historical growth of non-FCM energy-efficiency savings and the expected effects of federal EE standards for appliances and commercial equipment. The passive demand resources (i.e. energy efficiency and conservation), which include installed measures on end-use facilities that result in additional and verifiable reductions in electrical energy use during on-peak hours, and the active demand resources, which consists of real-time Demand Response and real-time Emergency Generation and can be activated by the ISO-NE operation, are not included in the load forecast. These demand side resources participate in the Forward Capacity Market, and are represented as supply-side resources in the study.

The region has witnessed significant growth in the development of solar photovoltaic (PV) resources over the past few years and continued growth of PV is anticipated. These PV resources are predominantly behind-the-meter generation (BTMG); ISO-NE is not directly involved in the interconnection of most of these resources and has therefore not traditionally been aware of when and where they are installed. ISO-NE has formed a stakeholder working group to increase its understanding of development trends of PV and other distributed generation resources, and to develop a forecast of PV over the next 10 years. This assessment does not reflect the projected impacts of the load reduction from the PV resources.

This study assesses the New England system adequacy using both the reference load forecast and the high load forecast. The reference and high load forecasts were developed based on a "most likely" long-run economic and demographic forecast and a high growth long-run economic and demographic forecast, respectively, from Moody's Economy.com.

Since the last review, ISO-NE has revised its load forecast downward slightly. The 2014 forecast expects the 10-year growth rate to be 1.3% per year for the summer peak demand, 0.6% per year for the winter peak demand, and 1.0% per year for the annual use of electric energy as compared with 2011 forecast values of 1.4%, 0.5% and1.1%, respectively.

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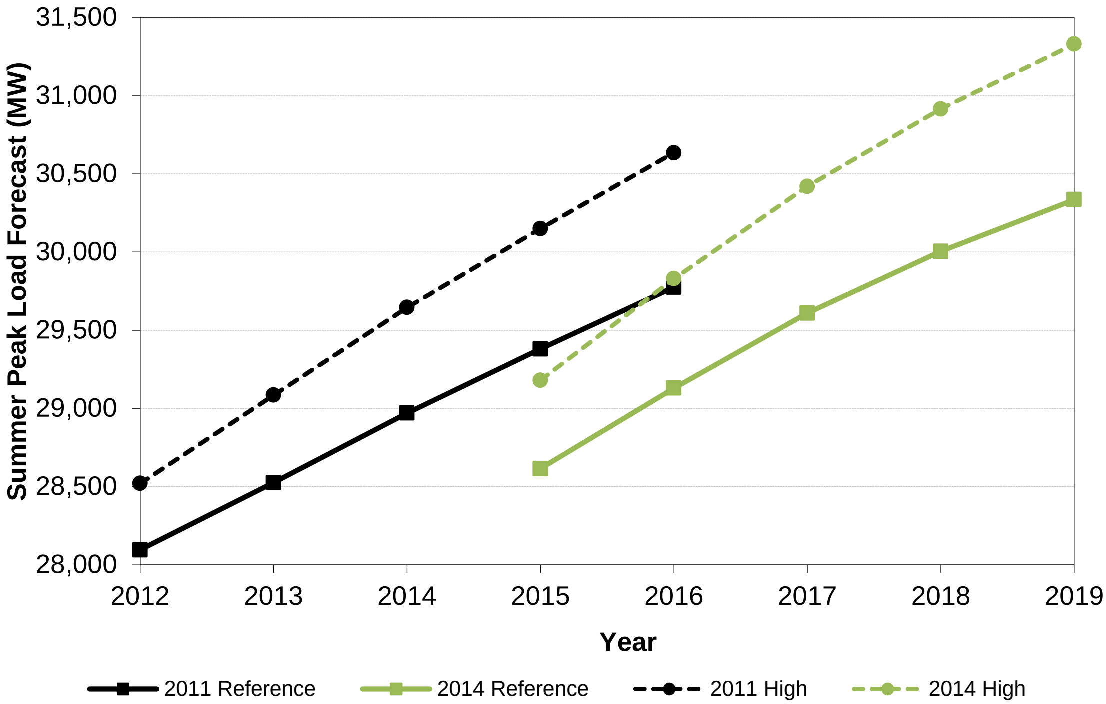
[10] A copy of this review can be found at: https://www.npcc.org/Library/Resource%20Adequacy/NE_2008_Comprehensive_Review_of_Resource_Adequacy%20-%20Approved%20by%20RCC%20on%20Nov192008.pdf

Table 3 tabulates the annual (summer) peak load forecasts used in the 2011 and 2014 reviews. Figure 1 shows these values in graphical form. The annual (summer) peaks are presented for both the reference load forecast and high load forecast scenarios. The peak loads shown in Table 3 have a 50% chance of being exceeded (50/50 peaks) due to weather uncertainty, and are expected to occur at a weighted New England-wide, average temperature of 90.2 ºF. While Table 3 shows the annual 50/50 peaks of the forecast, the inherent uncertainty of the forecast from weather variations is modeled within the LOLE calculation. The 50/50 peaks are tabulated in Table 3 for ease of reference and to facilitate comparisons.

Table 3 Comparison of Annual Peak Load Forecasts

Year	Annual Peak (MW)			
	Reference Load Forecast		High Load Forecast	
	2011 Review	2014 Review	2011 Review	2014 Review
2015	29,380	28,615	30,150	29,180
2016	29,775	29,130	30,635	29,830
2017	N/A	29,610	N/A	30,420
2018	N/A	30,005	N/A	30,915
2019	N/A	30,335	N/A	31,330

Figure 1 Comparison of Summer Peak Load Forecasts



3.2.2 Resources

The resources that can be used to meet the region's installed capacity requirements include generating resources, measureable and verifiable demand side resources (including both passive demand resources and active demand resources), and capacity imports. This study uses these resources to assess the region's resource adequacy while reflecting the expected year-to-year variations from planned resource additions, and expected retirements and deactivations.

Since the last review, a number of generation resources have retired or ceased operations. Salem Harbor Units 1 and 2, which were coal-fired units with a total capacity of 158 MW, were retired in December 2011. Salem Harbor Units 3 and 4, which are coal- and oil-fired units with a combined capacity of 587 MW, were retired in June 2014. Three oil-fired resources representing 342 MW from Norwalk Harbor Station have ceased operations. A few more retirements are expected to take place in the near future. In August 2013, the Vermont Yankee nuclear plant (619 MW) announced that it would be shutting down by the end of 2014. In late 2013, ISO-NE was notified of the planned retirement of the 1,535 MW Brayton Point Station, on June 1, 2017.

Approximately 1,300 MW of resource additions are assumed during the study period to offset some of the generation loss in the region. These expected additions include the resources that have been procured under the Forward Capacity Market and assumed a supply obligation, or resources that are under construction and have a high likelihood of coming on-line by the planned in-service dates.

The generating resources and their ratings used for the assessment are based on the ISO New England 2014-23 Forecast Report of Capacity, Energy, Loads and Transmission (CELT).[11] The total amount of generating resources in this review are higher than what was assumed in the previous review. The 2011 review included

[11] http://www.iso-ne.com/static-assets/documents/trans/celt/report/2014/2014_celt_report_rev.pdf

only the resources that had previously participated in the Forward Capacity Market, and their ratings were capped at their Capacity Supply Obligation level at the previous auction.

Passive and active demand resources participate in the Forward Capacity Market, and are represented as supply-side resources in the study. The Qualified Capacity of passive demand resources under the FCM are used for the years 2015 to 2017, and a forecast amount is used for 2018 and 2019. For the active demand resources, the study assumes the actual amount procured under FCM for 2015 to 2017. As there are no auction results for 2018 and 2019, the values are assumed to remain at the 2017 level through 2019. As compared to the 2011 review, the demand resources procured for 2015 and 2016 have decreased because some demand resources have chosen to withdraw from market participation. The demand resources for 2017 and beyond are expected to increase as the energy efficiency program is forecast to continue to grow in the region.

External capacity import resources assumed for this assessment are based on FCM Capacity Supply Obligations, which amount to 1,642 MW in 2015 and decrease to 1,267 MW in 2017. The import level beyond 2017 are held constant at the 2017 value. In 2011 review, 242 MW and 20 MW of capacity import were assumed for 2015 and 2016. During the assessment period, there is a firm capacity sale to New York (Long Island) of 100 MW anticipated to be delivered via the Cross-Sound Cable.

Table 4 and Figure 2 compare the MW values of resources assumed for the 2011 and 2014 reviews.

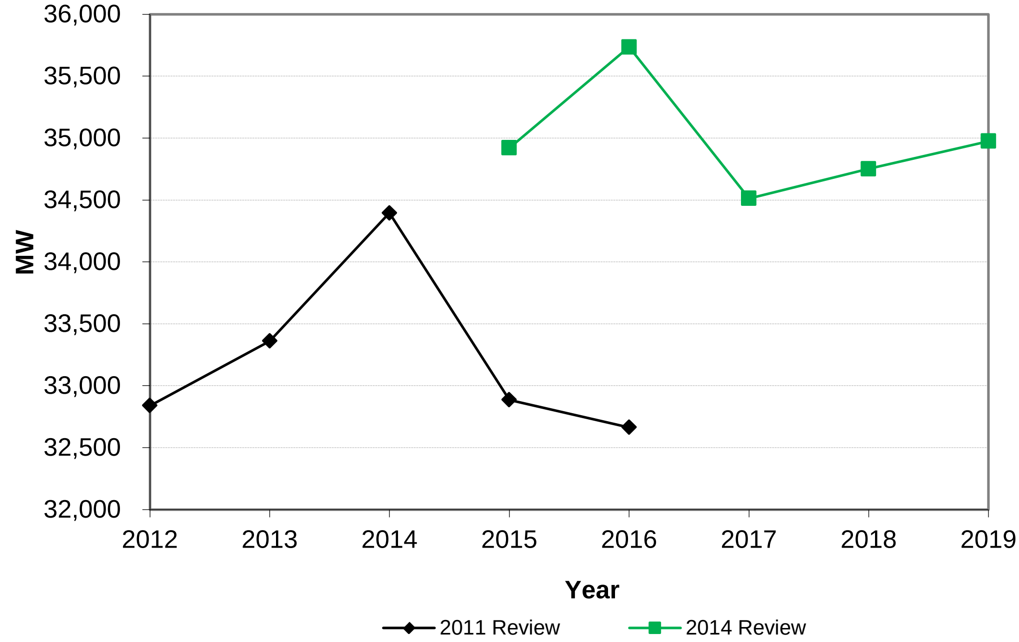
The NPCC Resource Adequacy Design Criterion allows the use of load and capacity relief from the implementation of emergency operating procedures to meet system capacity needs. Specifically, the tie benefits assumed available from the interconnections and load relief from implementing voltage reductions are used in meeting the 0.1 days/year LOLE but are not reflected as resources in Table 4 and Figure 2. The tie benefits assumptions are detailed in Appendix 7.4. The load relief from implementing a 5% voltage reduction was assumed to be a 1.5% reduction from the peak loads in both the 2011 and 2014 reviews.

Table 4 Comparison of 2011 vs. 2014 Resources Assumptions (MW)[12]

Year	Resource Category	2011 Review	2014 Review
2015	Generating Resources	29,245	30,626
	Demand Resources	3,399	2,852
	Net Purchase and Sale	242	1,542
	Total	**32,886**	**35,020**
2016	Generating Resources	29,245	31,545
	Demand Resources	3,399	2,782
	Net Purchase and Sale	20	1,507
	Total	**32,664**	**35,834**
2017	Generating Resources	N/A	30,362
	Demand Resources	N/A	3,083
	Net Purchase and Sale	N/A	1,167
	Total	**N/A**	**34,612**
2018	Generating Resources	N/A	30,362
	Demand Resources	N/A	3,322
	Net Purchase and Sale	N/A	1,167
	Total	**N/A**	**34,851**
2019	Generating Resources	N/A	30,362
	Demand Resources	N/A	3,546
	Net Purchase and Sale	N/A	1,167
	Total	**N/A**	**35,075**

[12] Demand resource values include an 8% transmission and distribution loss gross-up.

Figure 2 Comparison of 2011 vs. 2014 Resource Assumptions



Section 4 Resource Adequacy Criterion

4.1 Statement of New England Resource Adequacy Criterion

The New England Resource Adequacy Criterion[13] complies with the NPCC Resource Adequacy Design Criterion and reads:

"Resources will be planned and installed in such a manner that, after due allowance for the factors enumerated below, the probability of disconnecting noninterruptible customers due to resource deficiency, on the average, will be no more than once in ten years. Compliance with this criteria shall be evaluated probabilistically, such that the loss of load expectation [LOLE] of disconnecting noninterruptible customers due to resource deficiencies shall be, on average, no more than 0.1 day per year.

a. The possibility that load forecasts may be exceeded as a result of weather variations.

b. Immature and mature equivalent forced outage rates appropriate for generating units of various sizes and types, recognizing partial and full outages.

c. Due allowance for scheduled outages and deratings.

d. Seasonal adjustment of resource capability.

e. Proper maintenance requirements.

f. Available operating procedures.

g. The reliability benefits of interconnections with systems that are not Governance Participants.

h. Such other factors as may from time-to-time be appropriate."

4.2 Application of New England Resource Adequacy Criterion

The New England Resource Adequacy Criterion is used to determine the amount of installed resources needed to reliably satisfy system demand. In calculating the amount of resources needed, New England also takes into account the tie benefits that are assumed available from neighboring systems. The impacts from the Québec, New York and New Brunswick interconnection assistance have been modeled within this reliability review.

To properly capture the intended operation of the system, the emergency operating procedures that are implemented during periods of capacity deficiencies are also modeled in the form of the amount of load relief that is assumed obtainable. It is assumed that the system operators will always maintain at least some minimum level of operating reserve to ensure control over transmission loadings and maintain a minimum reliability level.

Table 5 documents the actions of ISO New England Operating Procedure No 4 (OP 4) – *Action During A Capacity Deficiency*[14]. In actual practice, these actions may be implemented in a different order to reflect the situation and the magnitude of the expected deficiency experienced at the time. Actions 1, 2, 5, 6 and 8 were modeled in this review. OP 4 Actions 3, 4, 7, 9, 10 and11 were not modeled as load relief in this reliability assessment and are therefore listed as contingency resources. The amount of capacity assistance obtainable

[13] http://www.iso-ne.com/static-assets/documents/rules_proceds/isone_plan/pp03/pp3_final.pdf.

[14] http://www.iso-ne.com/rules_proceds/operating/isone/op4/op4_rto_final.pdf.

through OP 4 Action 5 is modeled as tie reliability benefits and the assumed benefits are shown in Appendix 7.4.

Table 5 Estimate of Additional Generation and Load Relief from System Wide Implementation of Actions in ISO New England Operating Procedure NO. 4 - Action During a Capacity Deficiency Based on a 26,658 MW System Load [15]

Action #	Description	MW
1	Implement Power Caution and advise Resources with a Capacity Supply Obligation to prepare to provide all associated capacity. Notify "Settlement Only" generators with capacity supply obligations to monitor the status of reserve pricing to meet those obligations. Begin to allow the depletion of 30-minute reserve.	0 0 About 600 MW
2	Dispatch Real-Time Demand Resources in the amount and location required.	325[16]
3	Voluntary Load Curtailment of Market Participants' Facilities	40[17]
4	Implement Power Watch	0
5	Schedule Market Participant-submitted EETs Arrange to purchase Control Area-to-Control Area emergency	Variable (could be between 0 and 1,000 MW)
6	Implementation of 5% VR Requiring More Than 10 Minutes Dispatch Real-Time Emergency Generation Resources in the amount and location required. Alert NYISO that sharing of reserves within NPCC may be required	133[18] 150[17]
7	Request Generating Resources not subject to a Capacity Supply Obligation to voluntarily provide energy for reliability purposes.	Variable (could be between 0 and 1,500 MW)
8	Implementation of 5% VR Requiring 10 Minutes or Less	267[19]
9	Transmission Customer Generation Not Contractually Available to Market Participants During a Capacity Deficiency Voluntary Load Curtailment by Large Industrial and Commercial Customers	5 200[18]
10	Radio and TV Appeals for Voluntary Load Curtailment Implement Power Warning	200[18]
11	Request State Governors to Reinforce Power Warning Appeals	100[18]
Grand Total		2020 - 4520

4.3 Statement of Required Resources

The ISO-NE installed capacity requirements (required resources) are based on the amount of installed capacity needed to meet the NPCC LOLE reliability criterion of no more than one day in ten years disconnection of non-interruptible customers.

4.4 Comparison of New England and NPCC Resource Reliability Criterion

New England's Resource Adequacy Criterion as defined in Section 4.1 complies with the Resource Adequacy Criterion established by the NPCC.

15 http://www.iso-ne.com/static-assets/documents/rules_proceds/operating/isone/op4/op4a_rto_final.pdf. Estimated MW values are shown in this table for illustration purposes. The amount of load relief obtainable and the sequence of implementing these actions may vary depending on actual system conditions.

16 The MW values are reviewed on a quarterly basis; actual available MW amounts can be viewed using the demand response dispatch software.

17 The actual load relief obtained is highly dependent on circumstances surrounding the appeals, including timing and the amount of advanced notice that can be given.

18 The MW values are based on a 26,658 MW system load and the most recent voltage reduction test % achieved.

4.5 Resource Adequacy Studies Conducted Since the 2011 Comprehensive Review

Each year, ISO New England prepares a Regional System Plan on the planning efforts to identify the region's electricity needs and the plans for meeting these needs in order to maintain reliable and economic operation of New England's bulk power system over a ten-year horizon. The RSP and the ongoing system planning process comply with all applicable sections of the ISO-NE's *Transmission, Markets, and Services Tariff* (ISO tariff), approved by FERC. The plan and planning process also satisfy the relevant standards, criteria, and other requirements established by the North American Electric Reliability Corporation (NERC), the Northeast Power Coordinating Council (NPCC), participating transmission owners (PTOs), and ISO-NE. The study proposals, scopes of work, assumptions, study results, findings and recommendations presented in the RSP have been reviewed and discussed through the regional stakeholder process. The RSP provides information on electric power system needs; system improvements; and the results of newly completed load, resource, and transmission studies for reliably meeting demand throughout the region to the next decade. It discusses ongoing and new analyses based on the current and planned system and describes new and planned infrastructure for all areas of New England. The RSP also addresses many of the challenges the region is facing and how ISO-NE and its stakeholders are addressing key strategic issues. Notably, it addresses the major factors influencing resource development, the requirements for fuel certainty, and the development of the electric power system infrastructure for the 10-year planning period, such as existing and pending state and federal environmental and energy policies. As part of its compliance with Attachment K of the ISO-NE's *Open Access Transmission Tariff* (OATT), the RSP specifically provides information on the timing of system needs and the quantity, general locations, and characteristics of the generation and demand resources that could resolve these needs and defer or eliminate the need for transmission projects. Since the 2011 Comprehensive Review, ISO-NE has published three regional system plans.

Section 5 Resource Adequacy Assessment

5.1 Based On Reference Load Forecast

Table 6 summarizes the LOLE results under the reference load forecast using the resource assumptions detailed in Section 3.2. As shown, New England will meet the NPCC Resource Adequacy Design Criterion of disconnecting firm load customers no more than 0.1 days/year during the study period.

Table 6 LOLE Results Based on Reference Load Forecast

Year	Resources Assumed (MW)	Reference Peak Load Forecast (MW)	LOLE (days/year)
2015	35,020	28,615	0.025
2016	35,834	29,130	0.016
2017	34,612	29,610	0.060
2018	34,851	30,005	0.068
2019	35,075	30,335	0.074

5.2 Based On High Load Forecast

ISO-NE also has analyzed the system resource adequacy under a higher than expected load forecast, which would be primarily driven by higher economic growth. Table 7 shows the LOLE results based on the high load forecast, while using the same resource assumptions as for the reference load forecasts.

Table 7 LOLE Results Based on High Load Forecast

Year	Resources Assumed (MW)	High Load Peak Forecast (MW)	LOLE (days/year)
2015	35,020	29,180	0.044
2016	35,834	29,830	0.036
2017	34,612	30,420	0.109
2018	34,851	30,915	0.130
2019	35,075	31,330	0.150

The results of the high load forecast show that New England would meet the NPCC Resource Adequacy Design Criterion through 2016. Additional cumulative resources of 100 MW by 2017, 380 MW by 2018, and 660 MW by 2019 are needed for 2017 to 2019. There are over 8,000 MW of new generation projects in the queue that can potentially be used to meet these additional resource needs should the high load forecast materialize. Among these new generation projects, about 1,800 MW has target in-service date in 2017, ~3,500 MW in 2018, and ~1,000MW in 2019.

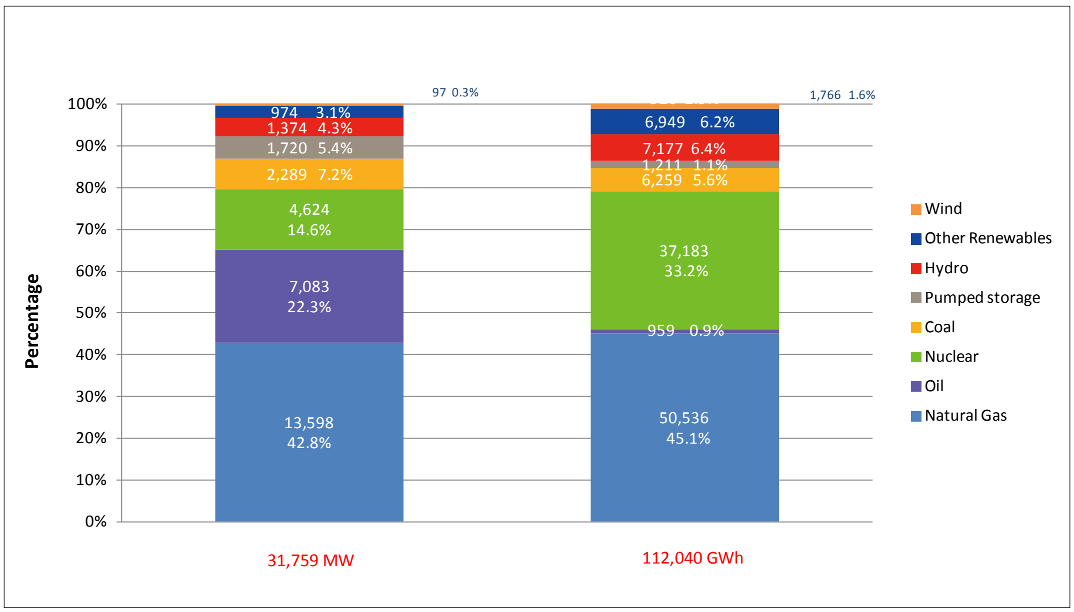
5.3 Mechanisms to Mitigate Potential Reliability Impacts of Uncertainty

Under the FCM, the Installed Capacity Requirement is forecasted and purchased three years ahead of the commitment period, based on ISO New England's assumed system conditions three years into the future. The FCM design recognizes that system conditions can change and uncertainties exist in load forecasts, resource ratings and availability, as well as transmission topology. The FCM construct provides measures to mitigate the reliability impacts that might be caused by these potential uncertainties through a series of annual "reconfiguration auctions" conducted prior to each commitment period. These annual reconfiguration auctions are held in each subsequent year after the FCA for each commitment period. For each such subsequent reconfiguration auction, ISO-NE recalculates the Installed Capacity Requirement using the updated forecast of loads and resources. If the recalculated capacity needs are higher than the latest amount of resources purchased for the designated period, ISO New England will purchase additional resources to meet the revised needs in the reconfiguration auctions.

Section 6 Planned Resource Capacity Mix

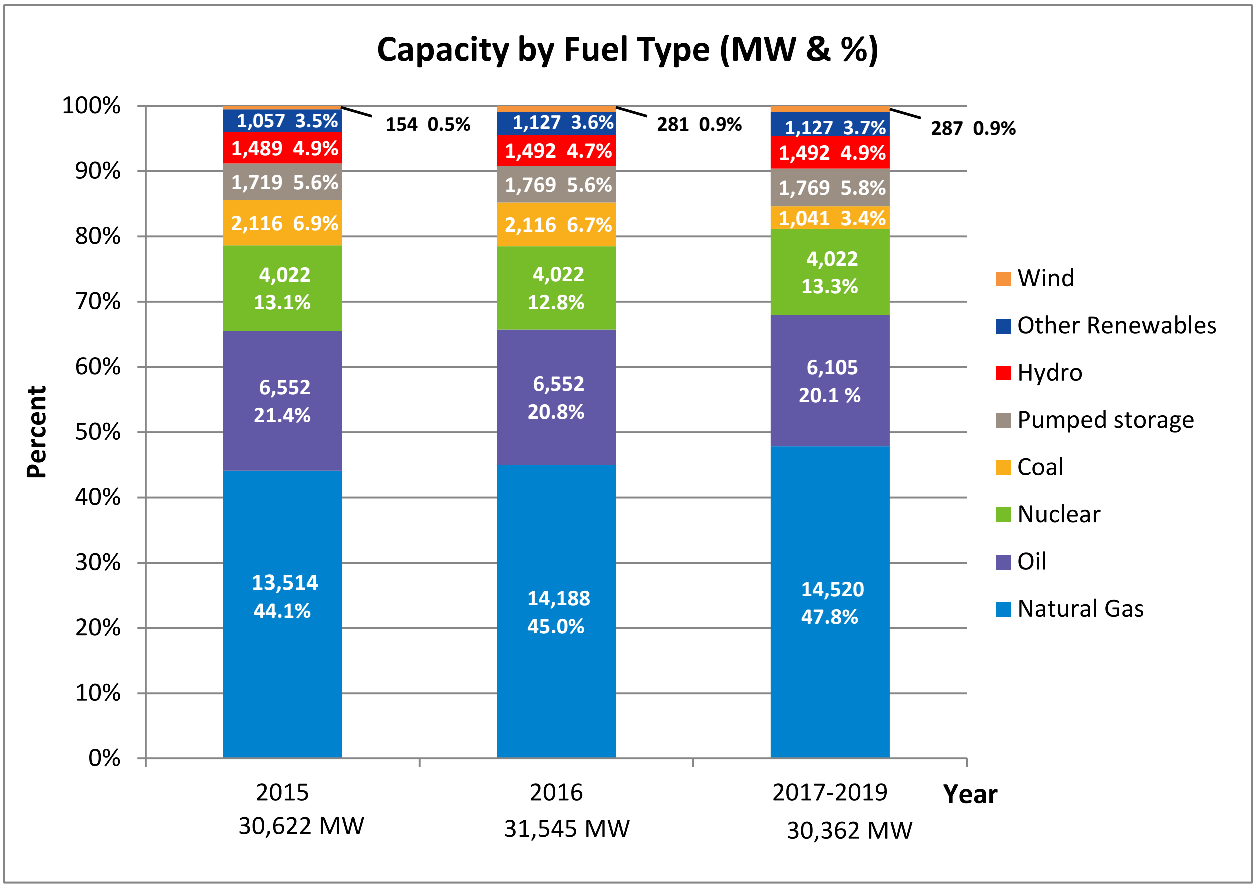
Figure 3 shows New England's summer seasonal claimed capability and electric energy production by fuel type for 2013. Figure 4 depicts the regional generation capacity mix expected during the study period by primary fuel type[19]. This is expressed in terms of summer capacity ratings (MW and associated percentages). Natural-gas-fired generation represents the largest fleet, at 44.1-47.8% of total generation capacity. Oil-fired generation is the second largest component at approximately 20-21%. Nuclear generation accounts for 4,022 MW, or approximately 13%. Coal-fired generation accounts for approximately 6.9% at 2,116 MW in 2015, and decreases to 3.4% at 1,041 MW in 2017 due to the expected retirements. Conventional hydro (~1,490 MW) comprises approximately 5%. Pumped-storage (~1,770 MW) makes up over 5.6% of the total installed generation capacity. Other renewable resources, including landfill gas (LFG), other biomass gas, refuse (municipal solid waste), wood and wood-waste solids, wind, and tire-derived fuels, represent about 4% of the total installed generating capacity.

Figure 3 New England's summer seasonal claimed capability and electric energy production by fuel type for 2013 (MW and %)



19 Demand resources and capacity import resources are not reflected in the mix.

Figure 4 Expected Future New England's summer generation capacity mix by primary fuel type (MW and %)



6.1 Discussion of Reliability Impacts from Fuel Supply and Transportation

New England has fuel diversity, certainty, and flexibility concerns. The capacity and electric energy production in the past years as shown in Figure 3 indicate that the region is highly dependent on natural gas-fired generation. As shown in Figure 4, the future fuel mix of the region will exhibits continued dependence on natural-gas-fired generation and the addition of wind resources. The upcoming retirements of the Vermont Yankee nuclear plant and the coal- and oil-fired generators in the region, and potential additional retirements of coal- and oil-fired generation facing environmental compliance obligations, will likely be replaced by the units in the ISO-NE Generator Interconnection Queue, which primarily are natural-gas-fired generation and wind resources. Most natural-gas-fired generators in New England have not made long-term financial commitments that would support the natural gas delivery infrastructure and storage facilities and, in turn, the reliability of the natural gas supply. The lack of alignment between the natural gas and wholesale electricity market days and the structural mismatch between the "24 x 7" demands of the electric power system and the less-liquid, overnight and weekend market for gas supply creates additional uncertainty regarding the commitment and dispatch of gas units during overnight and weekend hours. Other concerns have occurred when the interstate natural gas pipelines were being maintained or otherwise constrained, and when LNG inventories or injections into the interstate pipelines were low. LNG deliveries are subject to a worldwide market demand, increased costs stemming from shipping and processing, and weather-related interruptions.

The region has started efforts to quantify the extent of the regional fuel-diversity risk and assess the ability of the regional gas supply and delivery system to serve the gas demands of New England's power supply. ISO-NE has been actively collaborating with stakeholders on developing comprehensive, near- and long-term solutions to address the risks associated with fuel uncertainty, including market redesign, electric power and gas sector coordination, policy developments, and other actions. A FERC-approved winter reliability program will be implemented during the winter of 2014–2015 to mitigate the fuel constraint risk. The major components of the program include annual audits of dual-fuel resources; additional compensation to offset testing costs associated with restoring or commissioning dual-fuel capability; additional winter period demand response; and additional compensation for unused oil inventory at the end of the winter period. Proposed enhancements to the markets include the addition of flexibility in Energy Market offers; modification of the zonal structure used in the capacity market; employment of sloped demand curve and a "pay-for-performance" mechanism in the FCM that will create stronger financial incentives for capacity suppliers to perform when called on during periods of system stress.

6.2 Discussion of Potential Reliability Impacts Due to Environmental Regulations

Environmental compliance obligations for generators due to existing and pending state, regional, and federal environmental requirements are likely to impose operational limits on new and existing generators but pose only a limited retirement risk and lower reliability impacts compared to earlier assessments. The lowered retirement risk is due in large part to the flexibility that the EPA has provided in its cooling water rule and the Mercury & Air Toxics Standards (MATS), recognizing the reliability value that low capacity factor fossil steam generators provide in maintaining system fuel diversity.

Modification of cooling water use may be necessary for up to 10.1 GW of generating capacity in New England utilizing once through cooling, with a subset of units with larger withdrawal capacities potentially needing to convert to closed-cycle cooling systems. In the short-term, approximately 440 MW of capacity may need to convert to closed-cycle cooling system during the study period. ISO New England is monitoring these resources. No reliability concerns are expected at this time.

Approximately 7.9 GW of existing coal- or oil-fired capacity in New England is subject to MATS. Most affected generators in New England are equipped with required air toxics control devices due to earlier compliance with state air toxics regulations in New England. No retirements have been announced or are expected in New England due to MATS during the study period. A compliance extension request until April 2016 for 95.4 MW of coal-fired capacity to retrofit mercury pollution control devices is pending in the region and is expected to be acted upon by state regulators early in 2015. Recent revisions to air quality standards limiting ambient concentrations of ozone and its precursors, fine particulate matter, and sulfur dioxide, are expected to require additional emissions reductions from fossil-fired generators but these revisions are not expected to affect the reliability of the New England bulk power system.

6.3 Discussion of Potential Reliability Impacts From Integration of Renewable and Intermittent Resources

Intermittent renewable resources (mainly wind resources) along with natural gas-fired generation resources make up the most of the ISO-NE Generator Interconnection Queue. To investigate the impacts of integrating large amounts of intermittent resources to the electric power system, ISO-NE has been conducting a number of studies, gathering operational data and observations, and participating in other renewable/wind integration studies. The New England Wind Integration Study (NEWIS) found that the large-scale integration of wind resources is feasible, but resources planner will need to continue addressing a number of issues, including the development of an accurate means of forecasting wind generation output, and the increasing need for flexible resources to provide operating reserves as well as other ancillary services, such as regulation and ramping. The Strategic Transmission Analysis has been conducted to examine the transmission system improvements necessary to integrate approximately 1,100 MW of wind resources in Maine that could be accommodated without constructing major new transmission lines. In January 2014, ISO-NE began incorporating wind forecasting into the ISO-NE processes, scheduling, and dispatch services. While the level of wind resources is not expected to trigger additional requirements during the study period, ISO-NE is working toward increasing system flexibility and has increased its operating reserve to address resource performance issues.

New England has witnessed significant growth in the development of solar photovoltaic resources over the past few years, and continued growth of PV is anticipated. Regional PV installations are predominantly small (i.e., less than 10 MW) and state-jurisdictionally interconnected to the distribution system. State policies largely influence the spatial distribution of PV, such that states with policies more supportive of PV (e.g., Massachusetts) are experiencing the most growth of the resource. From resource adequacy perspective, these PV resources will reduce the net electric demand in the region. This assessment does not reflect the projected impacts of the load reduction from the PV resources.

Existing amounts of PV have not caused noticeable effects on system operation, but impacts are anticipated. There are approximately 72 MW of peak load equivalent behind the meter photovoltaic distributed generating resources embedded in the 2014 ISO New England load forecast. This amount is expected to grow to approximately 90 MW by the summer of 2019. To examine and prepare for the potential effects of large-scale PV development in the region, ISO-NE has engaged in several initiatives. In September 2013, ISO-NE established the Distributed Generation Forecast Working Group (DGFWG), to assist its development of a DG forecast that can be used in the long-term planning studies. ISO-NE is working with the New England states, distribution utilities, and IEEE and other international experts to ensure that the future interconnection standards for PV (and other inverter-interfaced DG resources) better coordinate with broader system reliability requirements.[20] ISO-NE will participate in the revision of the IEEE standard with the aim of improving the coordination of distribution system needs and transmission system performance requirements. ISO-NE also will continue to actively track the growth of PV in the region and evaluate its potential impacts on the efficient administration of wholesale electricity markets and the reliable operation and planning of the region's electric power system. Because many other regions of North America also are witnessing the large-scale adoption of PV, ISO-NE is engaging with other ISO/RTOs to share relevant methods and experience.

[20] IEEE 1547 and interconnection requirements for low/high- voltage ride through, low/high-frequency ride through, ramp rates, and others.

Section 7 APPENDIX

7.1 Description of Resource Reliability Model

GE MARS uses a sequential Monte Carlo simulation to compute the reliability of a system comprised of a number of interconnected areas containing generation and load. This Monte Carlo process simulates the year repeatedly (multiple replications) to evaluate the impacts of a wide range of possible random combinations of generator outages. The transmission system is modeled in terms of transfer limits (constraints) on the interfaces between interconnected areas. Chronological system histories are developed by combining randomly generated operating histories of the generating units and inter-area transfer limits with the hourly chronological loads. For each hour of the year, the program computes the isolated area margins based on the available capacity and demand in each area. GE MARS then uses a transportation algorithm to determine the extent to which areas with negative margin can be assisted by areas having positive (excess) margin, subject to the available transfer constraints between the areas. The program collects the statistics for computing the reliability indices, and proceeds to the next hour. After simulating all of the hours in the year, the program computes the annual indices and tests for convergence. If the simulation has not converged to an acceptable level, it proceeds to another replication of the study year; otherwise, it moves on to the next study year.

7.2 Load Model

7.2.1 Hourly Loads

GE MARS employs an 8,760-hour chronological subarea load model. The load model currently used relies on actual historical loads from the year 2002. This model is then scaled up to the summer peak for the future years being analyzed.

7.2.2 Load Forecast Uncertainty

The load forecast uncertainty was modeled on a seasonal basis, which accounts for the uncertainty due to weather variations.

7.2.3 Demand of Entities that are Not Members of NEPOOL

All the demands of entities within NEPOOL are modeled. The Maine Public Service (MPS) company demand is not modeled in this review because it is currently not a part of the ISO-NE Planning Coordinator area.

7.2.4 Demand Side Management Programs

The demand side programs included in this assessment are Demand Response resources that participate in New England's Forward Capacity Market. The active demand resources, including Real-Time Demand Response Resources and Real-Time Emergency Generation Resources, provide real-time peak load relief at the request of ISO New England during, or in anticipation of, expected operable capacity shortage conditions, where ISO-NE plans on implementing Operating Procedure No. 4, *Actions During a Capacity Deficiency*. The passive demand resources, which are non-dispatchable, include On-peak Demand Resources and Seasonal-Peak Demand Resources.

- An On-peak Demand Resource is a non-dispatchable measure that is not weather sensitive and its reduction in load will be measured during the hours ending 14:00 through 17:00, Monday through Friday on non-holidays during the months of June, July and August, and the hours ending 18:00 through 19:00, Monday through Friday on non-holidays during the months of December and January.

- A Seasonal Peak Demand Resource is a non-dispatchable, weather-sensitive measure and its reduction in load will be measured during hours in which the actual, real-time hourly load for

Monday through Friday on non-holidays, during the months of June, July, August, December, and January, as determined by ISO-NE, is equal to or greater than 90% of the most recent 50/50 system peak load forecast, as determined by ISO-NE, for the applicable summer or winter season.

- A Real-Time Demand Response Resource is a type of Demand Resource that is comprised of installed measures (e.g., products, equipment, systems, services, practices and/or strategies) on end-use customer facilities that: (i) curtail electrical usage in response to a Dispatch Instruction; and (ii) continue curtailing electrical usage until receiving Dispatch Instructions to restore electrical usage. Such measures include Load Management and Distributed Generation. The period of curtailment shall be consistent with Real-Time Demand Response Event Hours.

- A Real-Time Emergency Generation Resource is Distributed Generation whose Federal, State and/or local air quality permits limit operation in response to requests from ISO-NE to the times when ISO-NE implements voltage reductions of five percent of normal operating voltage that require more than 10 minutes to implement. A Real-Time Emergency Generation Resource must be capable of: (i) curtailing its end-use electric consumption from the New England grid within 30 minutes of receiving a Dispatch Instruction; and (ii) continuing that curtailment until receiving a Dispatch Instruction to restore consumption. The amount of Emergency Generators used to meet the ICR is currently limited to 600 MW, as stipulated in the market rules.

7.3 Resource Unit Representation

7.3.1 Unit Ratings

7.3.1.1 Definition

The ratings of resources were based upon their Seasonal Claimed Capabilities and Qualified Capacity values that are determined in accordance with the FCM market rules.

7.3.1.2 Procedure for Verifying Ratings

Seasonal Claimed Capability of Generating Units

ISO-NE has the authority to initiate audits of all generating units to verify their Seasonal Claimed Capability. Audits are initiated by ISO-NE, ordering the generator output to be increased from its current operating level (if that level is below SCC) to its SCC. The unit is then required to hold the output at its SCC for a predefined time period. The required duration for a claimed capability audit is at least two hours and no more than eight hours, depending on the Capability Period and type of unit. In order to pass a claimed capability audit, a unit must demonstrate it can achieve average output greater than or equal to its Claimed Capability. Full details of the audit process can be found in the ISO New England Operating Procedure No. 23 – Generator Resource Auditing located at:. http://www.iso-ne.com/static-assets/documents/rules_proceds/operating/isone/op23/op23_rto_final.pdf.

Qualified Capacity Value under FCM

The determination of the Qualified Capacity value of a resource for participation in the FCA is outlined in Section III. 13 – Forward Capacity Market of Market Rule 1 located at: http://www.iso-ne.com/regulatory/tariff/sect_3/index.html.

The summer Qualified Capacity of a Generating Resource is calculated as the median of the most recent five summer Seasonal Claimed Capability (SCC) ratings with only positive, non-zero ratings included in the calculation.

The seasonal Qualified Capacity for Intermittent Power Resources, is calculated as the median of the net output during the Seasonal Intermittent Reliability Hours, of the most recent five summer periods.

The summer Qualified Capacity of a Demand Resource is rated using the summer seasonal Demand Reduction Value calculation which is dependent upon the Demand Resource type.

7.3.2 Unit Unavailability Factors

7.3.2.1 Unavailability Factors Represented

Forced outage rates, planned outages, and maintenance outages are represented for each resource in the reliability assessment.

7.3.2.2 Sources of Unavailability Factors

A 5-year, historical average of unit-specific forced outage assumptions is determined for each Generating Resource, using its individual unit data of monthly EFORd[21] values from NERC's Generating Availability Data System (GADS). NERC GADS data submitted by generators to ISO-NE for the months of January 2009 through December 2013 is used to create an EFORd value for each unit that submits such data. NERC Class Average data is used as a substitute for units that do not submit GADS data.

Passive demand resources, which include On-peak and Seasonal Peak demand resources, are considered 100% available in the models. These resources are mainly from energy efficiency programs which are considered to be always "*in service*" and as such are 100% available. Performance of active Demand Resources, which consist of Real-Time Demand Response and Real-Time Emergency Generation Resources, are measured by actual response during historical events, including audits and OP 4 events.

A weekly representation of a generator's planned outages is calculated for each unit, based on a 5-year historical average.

7.3.2.3 Maturity Consideration

NERC Class Average data is used as a substitute for immature units and new additions.

7.3.2.4 Tabulation of Unavailability Factors

Table 8 and 9 show the average unavailability factors used in this reliability assessment by unit type.

Table 8 Generating Resource EFORd and Maintenance Weeks by Category[22]

Unit Type	Assumed Weighted EFORd (%)	Assumed Weighted Maintenance Weeks
Fossil	14.9	5
Combined Cycle	3.6	6
Diesel	6.5	1
Combustion Turbine	9.5	2
Nuclear	3.1	4
Hydro	4.6	7
Others	14.2	2
System	6.7	5

[21] The calculation methodology of EFORd can be found in Appendix F of the NERC GADS Data Reporting Instructions at http://www.nerc.com/pa/RAPA/gads/Pages/Data%20Reporting%20Instructions.aspx.

[22] http://www.iso-ne.com/static-assets/documents/2014/09/a6_fca9_icr_values.pdf

Table 9 Demand Resources EFORd Assumptions by Category[22]

Type	Assumed Weighted EFORd(%)	Assumed Maintenance Weeks
On-Peak Demand Resources	0	0
Seasonal Peak Demand Resources	0	0
Real-Time Demand Response	12	0
Real-Time Emergency Generator	12	0

7.3.3 Imports and Exports Representation

Table 10 summarizes the capacity imports and exports with neighboring systems assumed for this assessment.

Table 10 Capacity Import and Export Assumptions (MW)

	2015	2016	2017	2018	2019
Total Import	1,642	1,607	1,267	1,267	1,267
Export to New York (via Cross Sound Cable)	100	100	100	100	100

7.3.4 Retirements & Deactivations

Retirements assumed in this review are detailed in Section 3.2.2.

7.4 Representation of Interconnected Systems

New England's directly interconnected neighboring bulk power systems of Quebec, Maritimes, and New York provide tie benefits (emergency assistance) and capacity imports in this comprehensive review.

The tie benefits are derived based on results of studies conducted with the GE MARS program. In these tie benefit studies, all the interconnected Areas are assumed to be at the 0.1 days/year resource adequacy criterion simultaneously. The Area's load, resources (including load and/or capacity relief assumed available from implementing emergency operating procedures) and transmission interface transfer limits are based on data that each Area has provided to NPCC for its studies. ISO-NE updates its tie benefit studies whenever it deems necessary. The tie benefit assumptions used in this review for 2015 to 2018 are based on the results of the latest tie benefits studies. Since no tie benefits study has been conducted for 2019, the 2018 values are assumed for 2019 in this assessment. Table 11 summarizes the tie benefit assumptions for this review. The tie benefits assumed in this assessment are within the range of tie benefits available to New England as estimated in the NPCC tie benefits study.

The capacity imports, summarized in Table 10 above, are based on FCM Capacity Supply Obligations and the transmission import capability of the external interconnections after accounting for tie benefits. In other words, the amount of capacity imports that clear in the FCM auctions cannot exceed the transmission import capability of the external interconnections after accounting for emergency assistance assumed available over the external interconnections.

Table 11 Assumed Tie Benefits From Neighboring System (MW)

Neighboring System	2015[23]	2016[24]	2017[25]	2018[26]	2019
Québec	1,046	1,164	1,151	1,101	1,101
New Brunswick	328	392	492	523	523
New York	248	314	227	346	346
Total	1,624	1,870	1,870	1,970	1,970

7.5 Modeling of Limited Energy Sources

New England's pumped storage and hydro-electric units were considered available to meet daily and monthly peak loads except when they are on planned maintenance or forced outages.

7.6 Modeling of Demand Side Management (DSM)

A description of the DSM programs was presented in Section 7.2.4.

7.7 Modeling of Resources

Modeling of resources was described in the above sections.

7.8 Other Assumptions

Consistent with the ISO-NE's Regional System Plan, the New England system was modeled as 13 interconnected sub-areas, with predefined transmission interface limits between them. The transmission interface transfer capabilities between these sub-areas have been determined based on established ISO-NE and NPCC reliability criteria. These criteria are described, respectively, in the ISO-NE Planning Procedure No. 3, *Reliability Standards for the New England Power Pool*, and NPCC Regional Reliability Reference Directory #1, *Design and Operation of Bulk Power System.* These criteria require that the interconnected bulk power supply system be designed for a level of reliability such that the loss of a major portion of the system, or unintentional separation of any portion of the system, will not result from reasonably foreseeable contingencies. Therefore, the system must be designed to meet representative contingencies as defined in those criteria. Contingencies are simulated to assess the potential for widespread cascading outages due to overloads, instability, or voltage collapse. New England's bulk power supply system must remain stable during and following the most severe of the contingencies specified in the criteria, with due regard to re-closing facilities and before making any manual system adjustments. Voltages, line loadings, and equipment loadings must be within normal limits for pre-disturbance conditions, and within applicable emergency limits following the contingencies specified in the criteria. Disturbances in New England must not adversely affect other NPCC Control Areas and vice versa. Conversely, the loss of small portions of the system may be tolerated, provided the reliability of the overall interconnected system is not jeopardized.

The transmission interfaces used in the reliability analysis represent potential limiting areas of New England's transmission system, which may become constrained under a variety of system conditions, generation patterns, or transmission topology. The most limiting transmission facility and critical contingency which limits the interface transfer, may change depending on unit dispatch, load level, load

[23] http://www.iso-ne.com/static-assets/documents/2014/08/2015_ara3_tie_benefits_pspc_08282014.pdf

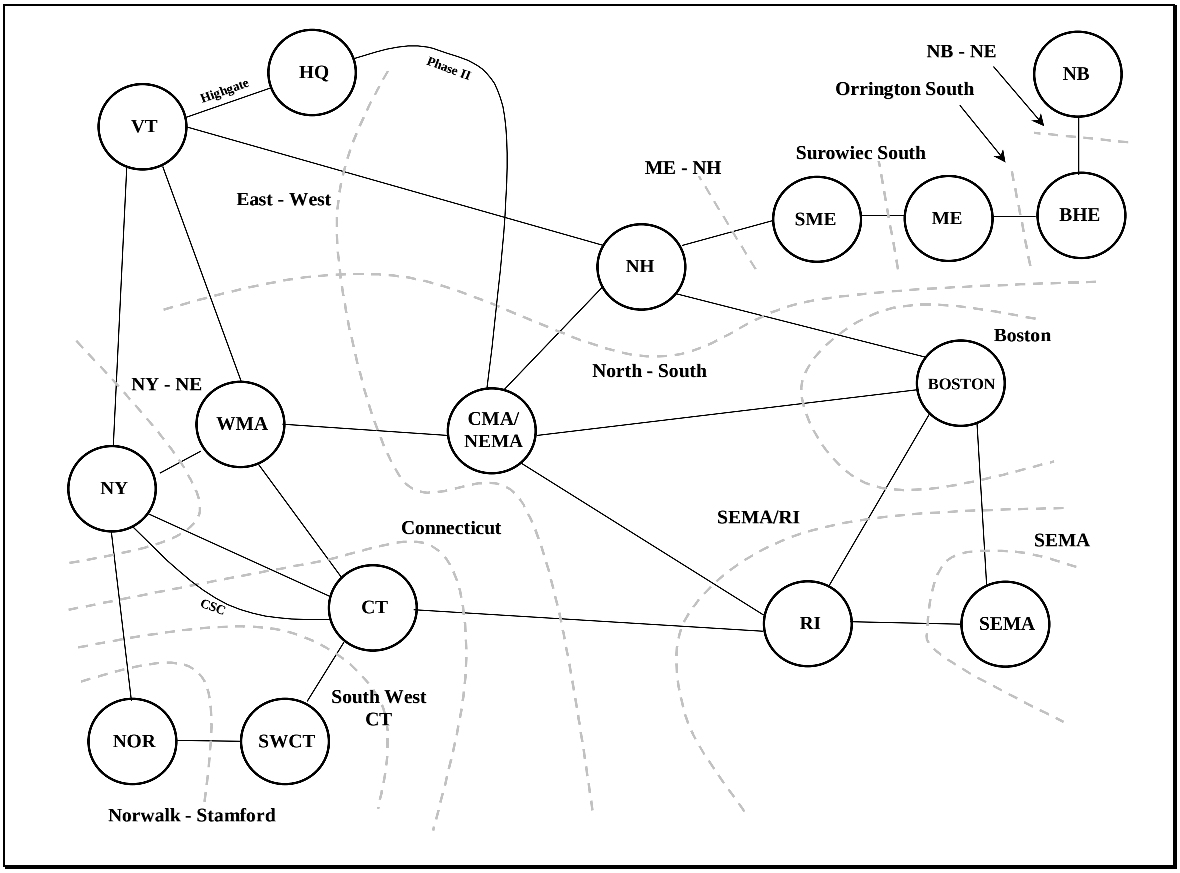
[24] http://www.iso-ne.com/static-assets/documents/committees/comm_wkgrps/relblty_comm/pwrsuppln_comm/mtrls/2012/jun142012/2016_fca_tie_benefits_study.pdf

[25] See A5 FCA 8 HQICC & ICR/LSR/MCL Values http://www.iso-ne.com/committees/reliability/reliability-committee

[26] http://www.iso-ne.com/static-assets/documents/2014/09/a6_fca9_tie_benefits_study.pdf

distribution, and transmission configuration. For modeling purposes, these interface limits are shown as static. Interfaces composed of one or more transmission facilities have been defined to gauge the amount of power which can be transferred between or through various areas before a transmission limitation is reached. Figure 55 shows the New England sub-area representation.

Figure 5 New England Sub-Area Representation



Sub-areas

BHE	-	Northeastern Maine
ME	-	Western & Central Maine / Saco Valley, New Hampshire
SME	-	Southeastern Maine
NH	-	Northern, Eastern, & Central New Hampshire / Eastern Vermont & Southwestern Maine
VT	-	Vermont / Southwestern New Hampshire
BOSTON	-	Greater Boston, including North Shore
CMA/NEMA	-	Central Massachusetts / Northeastern Massachusetts
WMA	-	Western Massachusetts
SEMA	-	Southeastern Massachusetts / Newport, Rhode Island
RI	-	Rhode Island / bordering Massachusetts
CT	-	Northern and Eastern Connecticut
SWCT	-	Southwestern Connecticut
NOR	-	Norwalk / Stamford, Connecticut

NB, HQ and NY represent the New Brunswick, Québec and New York balancing authority respectively.

Interface Limits (MW)[27]

Interface or Interface Group	Interface Limit (MW)
New Brunswick to NE	700
Orrington South	1,325
Surowiec South	1,500
Maine – NH	1,900
North to South	2,700
Boston Import	4,850
SEMA / RI Export	3,000
	3,400 (Year 2018)
SEMA / RI Import	786(Year 2018)
East to West	2,800
	3,500 (Year 2018)
West to East	1,000
	2,200 (Year 2018)
Connecticut Import	3,050
	2,800 (Year 2016)
	2,950 (Year 2018)
Southwestern CT Import	3,200
Norwalk / Stamford Import	1,650
New York / New England Import	1,400 (summer) 1,875 (winter)
HQII Import	1,400
Highgate Import	200
Cross Sound Cable Import	0

[27] http://www.iso-ne.com/static-assets/documents/2014/08/rsp2014_transfer_capability_assumptions_update.pdf