



## NPCC 2013 New England Annual Interim Review of Resource Adequacy

ISO New England Inc.  
Approved by the RCC  
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## 1. Executive Summary

This report is ISO New England's 2013 annual assessment (Interim Review) of its 2011 Comprehensive Review of Resource Adequacy, and covers the time period of 2014 through 2016. This Interim Review is conducted to comply with the Reliability Assessment Program (RAP) as established by the Northeast Power Coordinating Council (NPCC). It follows the resource adequacy review guidelines as outlined in the *NPCC Regional Reliability Directory #1 Appendix D, Basic Criteria for Design and Operation of Bulk Power System*.

Results of this Interim Review show that New England has procured adequate resources through its Forward Capacity Market (FCM) to meet the NPCC Resource Adequacy Design Criteria under the reference forecast for the study period 2014 through 2016, and adequate resources are available to meet the high demand forecast should it materialize. Tables E1 and E2 summarize the Loss of Load Expectation (LOLE) for the study years for the two demand forecast scenarios simulated under two sets of capacity resource conditions.

**Table E1 LOLE under Reference Demand Forecast**

Year	2011 Comprehensive Review (Days/Year)	2013 Interim Review (Days/Year)	
		Based on Capacity Supply Obligations	Based on Existing, Planned and Import Capacity Seasonal Ratings
2014	0.005	0.058	0.005
2015	0.044	0.061	0.012
2016	0.067	0.096	0.016

**Table E2 LOLE under High Demand Forecast**

Year	2011 Comprehensive Review (Days/Year)	2013 Interim Review (Days/Year)	
		Based on Capacity Supply Obligations	Based on Existing, Planned and Import Capacity Seasonal Ratings
2014	0.014	0.095	0.011
2015	0.083	0.113	0.029
2016	0.140	0.186	0.038

To ensure resource adequacy for the region, ISO New England identifies the amount and locations of resources the system needs and meets these needs in the short term through the FCM. Forward Capacity Auctions have been successfully conducted to procure an adequate amount of resources to cover the resource needs of the New England system through the year 2016/17<sup>1</sup>.

<sup>1</sup> A capacity commitment period of 20xx/yy refers to a period from June 1, 20xx through May 31, 20yy.

The resources procured by ISO New England through FCM assume a capacity supply obligation (CSO), and must be available to offer energy and reserve to the New England energy markets. Other resources that do not have a capacity supply obligation can also participate in the energy markets to serve New England load and provide reserve. Every year, ISO New England updates its Installed Capacity Requirements (ICRs) for the FCM to reflect the latest load forecast, resource availability and other system condition changes, and procures additional resources through the market if more resources are needed to satisfy system reliability. For this Interim Review, resource adequacy is assessed under two sets of resource assumptions: 1) using capacity supply obligations of resources purchased in the Forward Capacity Market; and 2) using the seasonal ratings of the existing, planned and capacity import resources.

Results of this Interim Review show that the amount of resources that have been procured for the study period from 2014 to 2016 in the FCM is adequate to meet the reference load forecasts but inadequate to meet the high load growth scenario for 2015 and 2016. However, when accounting for the existing and planned resources' additional supply capabilities beyond their current obligations, the capacity will be more than adequate to cover the additional needs. ISO New England will procure additional resources in the reconfiguration auctions prior to these years should the high growth load materialize.

## 2. Introduction

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This is the second update of New England's 2011 Comprehensive Review of Resource Adequacy, which was approved by NPCC in November 2011. Since the approval of the 2011 Comprehensive Review, ISO New England has conducted additional comprehensive resource adequacy assessments as part of its Regional System Plan (RSP) process. The major assumptions of this Interim Review are consistent with those used for the most recent RSP, RSP13<sup>2</sup>. ISO New England continues to use the General Electric Multi-Area Reliability Simulation (MARS) model to simulate New England system resource adequacy.

## 3. Assumptions Changes

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### 3.1 Resource

Table 1 compares resource assumptions between the two reviews. In the 2011 Comprehensive Review, the resources with capacity supply obligations for 2014, (except for capacity imports that reflected only the grandfathered contracts) were assumed as resources for both 2015 and 2016. In this Interim Review, two sets of resource assumptions are used to simulate the system LOLE. As shown in Table 1, the first set of resource assumptions reflects the CSOs purchased under the FCM. The other set of resource assumptions reflects the seasonal capability ratings of the existing, planned, and import capacities. The seasonal capability ratings of these resources are reported in the *ISO New England 2013–2022 Forecast Report of Capacity, Energy, Loads, and Transmission* (2013 CELT Report)<sup>3</sup>.

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<sup>2</sup> [http://www.iso-ne.com/committees/comm\\_wkgrps/prtcpnts\\_comm/pac/mtrls/2013/sep122013/index.html](http://www.iso-ne.com/committees/comm_wkgrps/prtcpnts_comm/pac/mtrls/2013/sep122013/index.html)

<sup>3</sup> [http://www.iso-ne.com/trans/celt/report/2013/2013\\_celt\\_report.pdf](http://www.iso-ne.com/trans/celt/report/2013/2013_celt_report.pdf)

**Table 1 - Resource<sup>4</sup> Assumptions Comparison (Summer Ratings)**

Year	2011 Comprehensive Review (MW)	2013 Interim Review (MW)			
		Capacity Supply Obligations	Difference	Existing, Planned and Import Capacity Seasonal Ratings	Difference
2014	34,395	33,258	-1,137	36,106	1,711
2015	32,886	33,607	721	35,566	2,680
2016	32,664	33,211	547	35,579	2,915

### 3.2 Load

The RSP11 load forecast was used in the 2011 Comprehensive Review, while this Interim Review uses the RSP13 forecast. The 2013 forecast updates the data for the region’s historical annual use of electric energy and peak loads by adding additional years of data, the most recent economic and demographic forecasts, and resettlement adjustments that include meter corrections. The new forecast for summer peak demand for years 2014 through 2016 is lower than the RSP11 forecast for these years, with differences ranging from -680 MW in 2014 to -425 MW in 2016, as shown in Table 2. The economic recession that ended in 2009 significantly affected regional electric energy consumption and its corresponding impacts continue through a downward trend on annual electric energy use and seasonal peak loads. In Table 3, a similar trend can be seen in the high demand forecast.

**Table 2 - Reference Demand Forecast Comparison**

Year	2011 Comprehensive Review (MW) <sup>5</sup>	2013 Interim Review (MW) <sup>6</sup>	Difference (MW)
2014	28,970	28,290	-680
2015	29,380	28,825	-555
2016	29,775	29,350	-425

<sup>4</sup> Resources include generating units, demand-side resources and capacity imports.

<sup>5</sup> Demand values without reduction for passive demand resources of 1,148 MW (2014 – 2016).

<sup>6</sup> Demand values without reduction for passive demand resources of 1,361 MW (2014), 1535 MW (2015) and 1,520 MW (2016).

**Table 3 - High Demand Forecast Comparison**

<b>Year</b>	<b>2011 Comprehensive Review (MW)<sup>7</sup></b>	<b>2013 Interim Review (MW)<sup>8</sup></b>	<b>Difference (MW)</b>
<b>2014</b>	29,645	28,850	-795
<b>2015</b>	30,150	29,515	-635
<b>2016</b>	30,635	30,155	-480

### **3.3 Interface Limits**

The same sub-area configuration (bubble transportation model) is used in these two reviews. The transmission interface limits used in the 2011 Comprehensive Review were based on RSP11 assumptions, while RSP13 assumptions are used in this Interim Review. Table 4 shows the transmission transfer limits used for both reviews. The differences are mainly due to changes of in-service dates of proposed transmission upgrades.

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<sup>7</sup> Demand values without reduction for passive demand resources of 1,148 MW (2014 – 2016).

<sup>8</sup> Demand values without reduction for passive demand resources of 1,361 MW (2014), 1535 MW (2015) and 1,520 MW (2016).

**Table 4 - Major Transmission Interface Limits Assumed in the 2011 & 2013 Reviews (MW)**

<u>Interface</u>	<u>Limit assumed in 2011 Comprehensive Review (MW)</u>	<u>Limit assumed in 2013 Interim Review (MW)</u>
New Brunswick to New England <sup>9</sup>	700	700
Orrington South	1,200	1,200 1,325 (2015)
Surowiec South	1,150	1,150 1,500 (2015)
Maine – NH	1,600 1,575 (2015) 1,550 (2016)	1,600 1,900 (2015)
North to South	2,700	2,700
Boston Import	4,900 4,850 (2014)	4,900 4,850 (2014)
SEMA Export	No Limit	No Limit
SEMA / RI Export	3,000 3,300 (2016)	3,000 3,400 (2018)
East to West / West to East <sup>10</sup>	2,800 3,500 (2016)	2,800/1000 3,500/2200 (2018)
Connecticut Import (interface will be redefined starting in 2017 in the 2013 Review)	2,500 2,600 (2014) 3,400 (2016)	3,050 (2014) 2,800 (2017)
Southwestern CT Import	3,200	3,200
Norwalk / Stamford Import	1,650	1,650
New York/New England (Summer/Winter) <sup>11</sup>	1,400/1,875	1,400/1,875
HQII Import <sup>12</sup>	1,400	1,400
Highgate Import	200	200
Cross Sound Cable <sup>13</sup>	0	0

<sup>9</sup> The electrical limit of the New Brunswick - New England (NB-NE) tie is 1,000 MW. When adjusted for the ability to deliver capacity to the greater New England control area, the NB-NE transfer capability is 700 MW because of downstream constraints; in particular Orrington South.

<sup>10</sup> In the 2013 Review, the limitation from the west to the east direction of the East to West interface is modeled. The limit is currently at 1,000 MW, and will change to 2,200 MW in 2018.

<sup>11</sup> The New York/New England transmission interface limits are without the CSC and with the Northport-Norwalk Cable at 0 MW flow. Simultaneously importing into New England and Southwest Connecticut or Connecticut can lower the New York/New England transfer capability (very rough decrease = 200 MW). Simultaneously exporting to New York and importing to Southwest Connecticut or Connecticut can lower the New England - New York capability (very rough decrease = 700 MW).

<sup>12</sup> The Hydro Quebec Phase II interconnection is a DC tie with equipment rating of 2,000 MW. Due to the need to protect for the loss of this line at full import level in the PJM and NY control areas' systems, ISO New England has assumed its transfer capability for capacity and reliability calculation purposes to be 1,400 MW. This assumption is based on the results of loss-of-source analyses conducted by PJM and NYISO.

<sup>13</sup> The Cross Sound Cable (CSC) is a DC tie with an equipment rating of 345 MW. The import capability of the CSC is dependent on the level of local generation in New England. For reliability analyses, the local generation is assumed to be fully available and therefore, there is no room to import additional capacity into New England through the CSC.

### 3.4 Unit Availability

Table 5 compares the weighted average EFORd assumptions used in the 2011 Comprehensive Review and this Interim Review. Overall, the system weighted average EFORd for generating capacity assumed in this review has increased about 1% as compared to the 2011 review assumptions. The increase is mainly attributable to the high EFORd of some generating resources in 2012 operations.

**Table 5 - Change In EFORd Assumptions – Weighted Averages**

Unit Type	2011 Comprehensive Review EFORd (%)	2013 Interim Review EFORd <sup>14</sup> (%)
<b>Fossil</b>	6.9	9.9
<b>Combined Cycle</b>	4.1	3.9
<b>Diesel</b>	6.8	7.8
<b>Jet</b>	7.6	8.5
<b>Nuclear</b>	1.8	2.6
<b>Hydro</b>	3.5	5.1
<b>Others</b>	14.4	15.8
<b>System</b>	4.9	<b>5.9</b>

### 3.5 Fuel Supply Diversity

New England is increasingly dependent on natural gas as a primary fuel for generating electric energy and decreasing its dependence on oil. The high regional use of natural gas to generate electricity is the result of the addition of new, efficient natural-gas-fired units over the past decade; the recent low price of natural gas; and the displacement of older, less efficient oil- and coal-fired units in economic dispatch. Further dependency on natural gas-fired generation will likely occur, resulting from the loss of other types of generation subject to risks, such as nuclear and hydro units that may not be relicensed. Many units also do not have effective dual-fuel capability (in terms of the amount of time they need to switch to oil burning or the availability of secondary fuel inventory). Accompanying the increased use of natural gas are concerns regarding the adequacy of the region’s natural gas pipeline capacity and gas supply in the pipelines to reliably serve electric power generation; at any time of the year, natural and geopolitical events of all types could interrupt supplies of gas and other fuels, such as oil and coal.

To understand the pipeline capacity of the natural gas supply system to satisfy New England’s electric generation needs, ISO New England commissioned a planning study of regional natural gas issues that quantified the regional need for additional natural gas system supply or the use of non-gas-fired resources under a number of scenarios. The analysis considered several scenarios, including the replacement of older oil- and coal-fired generating units with natural gas-fired generators, and natural gas infrastructure outages affecting reliable electric power operation.<sup>15</sup> Results of this study indicate that gas shortages are expected during extreme winter conditions from now to 2020, if assumed conditions persist, and that New

<sup>14</sup> [http://www.iso-ne.com/committees/comm\\_wkgrps/relblty\\_comm/pwrsuppln\\_comm/mtrls/2012/sep62012/2013ara3\\_2014ara2\\_2015ara1\\_icr\\_values\\_pspc9-06revised.pdf](http://www.iso-ne.com/committees/comm_wkgrps/relblty_comm/pwrsuppln_comm/mtrls/2012/sep62012/2013ara3_2014ara2_2015ara1_icr_values_pspc9-06revised.pdf)

<sup>15</sup> ICF International, *Assessment of New England’s Natural Gas Pipeline Capacity to Satisfy Short- and Near-Term Electric Generation Needs*, final report (June 15, 2012), [http://www.iso-ne.com/committees/comm\\_wkgrps/prtcpts\\_comm/pac/reports/2012/gas\\_study\\_public.pdf](http://www.iso-ne.com/committees/comm_wkgrps/prtcpts_comm/pac/reports/2012/gas_study_public.pdf)

England will be fine through the 2016 summer under a maximum gas demand forecast. From an operations planning perspective, ISO New England does expect the potential for various amounts of single fuel, gas-only power plants to be temporarily unavailable during extreme winter weather conditions or during force majeure conditions on the regional gas grid. This risk is evaluated and accounted for in long- and short-term outage coordination efforts, and plans to mitigate these scenarios are balanced with Real-Time supplemental resource commitment and use of emergency procedures, as needed.

From the longer range planning perspective, ISO New England is addressing several strategic planning issues associated with natural gas dependency, resource performance, and natural gas supplies. These problems have been quantified, and solutions are being implemented to improve infrastructure and markets. The market improvements, expected to be implemented over the next few years, include the following:

- More fully integrating demand resources into the energy market, which will increase the circumstances under which demand resources will be called on to help meet the region's energy needs
- Further modifying the FCM shortage-event trigger and replacing the shortage-event penalty structure with a pay-for-performance model so that resources will have even stronger incentives to perform when system needs are greatest

Additionally, a follow-up natural gas study has begun for determining the potential risks of energy shortfalls for the region under a variety of scenarios. The ISO also is coordinating an interregional study of the natural gas system with the NYISO, PJM, the Midcontinent Independent System Operator (MISO), the Independent Electricity System Operator (of Ontario) (IESO), and the Tennessee Valley Authority (TVA).

### **3.6 Impacts of Environmental Emission Regulations**

Existing and pending state, regional, and federal environmental requirements addressing air pollution, greenhouse gas emissions, cooling water drawn from rivers and bays and wastewater discharges that flow back into these water bodies, as well as public treatment works, are under consideration by the Environmental Protection Agency (EPA) and local and state environmental regulators. These guidelines, once known, will affect New England generators. However, many generators in the region already have installed needed control technologies because of state environmental rules requiring earlier compliance, and new transmission upgrades have reduced the dependence on older, less efficient oil- and coal-fired units previously needed to address local reliability concerns. These changes and the greater reliance on natural gas for power generation have lessened air pollution emissions and thermal pollution into rivers and bays in the region. ISO New England will analyze their impact on the New England generation fleet once the guidelines are known in the next year or two.

In addition, ISO New England analyses for the Strategic Planning Initiative and other planning efforts will continue to update stakeholders regarding 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.

### **3.7 Others**

The interconnection benefits from neighboring Areas are considered in both assessments. Since the 2011



Comprehensive Review, ISO New England has conducted additional tie benefit studies to identify the amount of tie reliability assistance New England can rely on from its neighbors for resource adequacy studies. Table 6 summarizes the tie benefit assumptions for these two reviews.

**Table 6 – Assumed Tie Benefits from Neighboring Areas (MW)**

Year	2011 Comprehensive Review	2013 Interim Review
2014	1,689	1,602 <sup>16</sup>
2015	1,676	1,676 <sup>17</sup>
2016	1,676	1,870 <sup>18</sup>

Other assumptions for these two reviews are consistent with each other.

#### 4. RESULTS

Tables 7 and 8 summarize the New England system LOLE results for the scenarios investigated within this Interim Review and those from the 2011 Comprehensive Review. The differences in the results of the two reliability reviews can be attributed to the differences in assumptions used for each review as previously outlined.

The LOLE results indicate that New England’s Forward Capacity Market has procured adequate resources to meet the reference load forecast for the study period from 2014 to 2016. The existing and planned resources in the region are expected to be adequate to satisfy reliability requirements should the high load forecast materialize.

**Table 7 – LOLE Under Reference Demand Forecast**

Year	2011 Comprehensive Review (Days/Year)	2013 Interim Review (Days/Year)	
		Based on Resource Capacity Supply Obligations	Based on Existing, Planned and Import Capacity Seasonal Ratings
2014	0.005	0.058	0.005
2015	0.044	0.061	0.012
2016	0.067	0.096	0.016

<sup>16</sup> [http://www.iso-ne.com/committees/comm\\_wkgrps/relbly\\_comm/pwrsuppln\\_comm/mtrls/2013/sep162013/2014ara3\\_tie\\_benefits\\_pspc\\_09162013.pdf](http://www.iso-ne.com/committees/comm_wkgrps/relbly_comm/pwrsuppln_comm/mtrls/2013/sep162013/2014ara3_tie_benefits_pspc_09162013.pdf)

<sup>17</sup> [http://www.iso-ne.com/committees/comm\\_wkgrps/relbly\\_comm/pwrsuppln\\_comm/mtrls/2011/sep152011/index.html](http://www.iso-ne.com/committees/comm_wkgrps/relbly_comm/pwrsuppln_comm/mtrls/2011/sep152011/index.html)

<sup>18</sup> [http://www.iso-ne.com/committees/comm\\_wkgrps/relbly\\_comm/pwrsuppln\\_comm/mtrls/2012/jun142012/2016\\_fca\\_tie\\_benefits\\_study.pdf](http://www.iso-ne.com/committees/comm_wkgrps/relbly_comm/pwrsuppln_comm/mtrls/2012/jun142012/2016_fca_tie_benefits_study.pdf)

**Table 8 – LOLE Under High Demand Forecast**

Year	2011 Comprehensive Review (Days/Year)	2013 Interim Review (Days/Year)	
		Based on Resource Capacity Supply Obligations	Based on Existing, Planned and Import Capacity Seasonal Ratings
2014	0.014	0.095	0.011
2015	0.083	0.113	0.029
2016	0.140	0.186	0.038

## 5. Conclusions

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Results of this Interim Review show that New England had procured adequate resources through its Forward Capacity Market to meet the NPCC Resource Adequacy Design Criteria under the reference demand forecast, and there are adequate resources that could be procured to meet the high demand forecast for the study period 2014 through 2016.

ISO New England does not expect that the upcoming environmental regulations will impact resource adequacy during the period covered by this Interim Review.

ISO New England expects that the potential for various amounts of single fuel, gas-only power plants to be temporarily unavailable during extreme winter weather conditions or during force majeure conditions on the regional gas grid will be mitigated with long and short term resource outage coordination efforts and plans, and with real time supplemental resource commitment and use of operating procedures, as needed.