# NPCC 2018 New England Interim Review of Resource Adequacy



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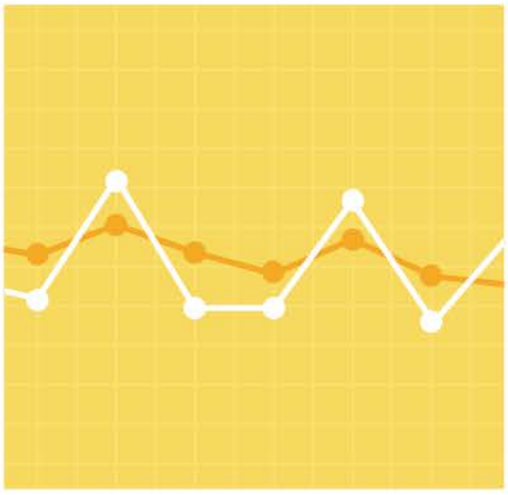
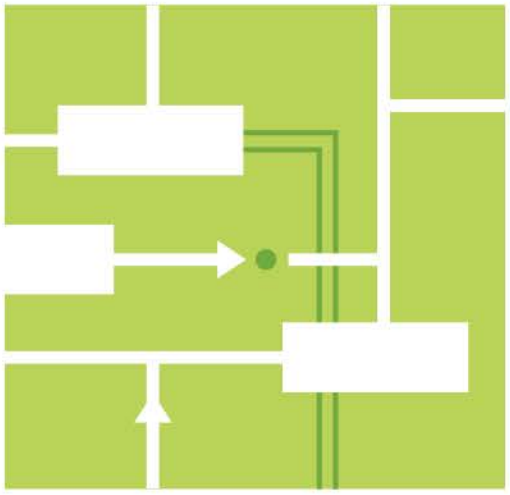


# Section 1
# Executive Summary

This report is ISO New England's (ISO) 2018 annual assessment (Interim Review) of its 2017 Comprehensive Review of Resource Adequacy, and covers the time period of 2019 through 2022. 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, Design and Operation of Bulk Power System*.

To ensure the 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 Forward Capacity Market (FCM). Forward Capacity Auctions have been conducted to purchase needed resources for the Capacity Commitment Periods (CCP) 2019/2020[1] to 2021/2022. The resources procured by ISO New England through the FCM assume a capacity supply obligation (CSO), and must be available to offer energy and reserve to the New England energy markets. Resources that do not have a CSO can participate in the energy markets to serve New England load and provide reserve on a voluntary basis. For this Interim Review, resource adequacy is assessed under two sets of resource assumptions: 1) using resources' seasonal claimed capabilities; 2) using capacity supply obligations of resources purchased in the Forward Capacity Market.

Table 1-1 and Table 1-2 summarize the Loss of Load Expectation (LOLE) for the study period using two demand forecasts and two sets of capacity resource assumptions.

**Table 1-1**
**New England LOLE using Reference Demand Forecast**

| Year | 2017 Comprehensive Review (Days/Year) | 2018 Interim Review (Days/Year) | |
|---|---|---|---|
| | Based on Resources' Seasonal Claimed Capabilities | Based on Resources' Seasonal Claimed Capabilities | Based on Resources' Capacity Supply Obligations |
| **2019** | 0.028 | 0.019 | 0.032 |
| **2020** | 0.030 | 0.017 | 0.024 |
| **2021** | 0.058 | 0.015 | 0.053 |
| **2022** | 0.061 | 0.040 | N/A (auction to be conducted) |

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

**Table 1-2**
**New England LOLE using High Demand Forecast**

| Year | 2017 Comprehensive Review (Days/Year) | 2018 Interim Review (Days/Year) | |
|---|---|---|---|
| | Based on Resources' Seasonal Claimed Capabilities | Based on Resources' Seasonal Claimed Capabilities | Based on Resources' Capacity Supply Obligations |
| **2019** | 0.038 | 0.027 | 0.043 |
| **2020** | 0.043 | 0.029 | 0.037 |
| **2021** | 0.080 | 0.028 | 0.080 |
| **2022** | 0.086 | 0.069 | N/A (auction to be conducted) |

Results of this Interim Review show that New England has adequate existing and planned resources to meet the NPCC Resource Adequacy Design Criteria under both the reference and high load forecasts for the study period 2019 through 2022. Forward Capacity Market auctions have procured an adequate amount of resources for the years for which the Forward Capacity Auction (FCA) has been conducted.

# Section 2
# Introduction

This is the first update of New England's 2017 Comprehensive Review of Resource Adequacy, which was approved by NPCC in December 2017. The load and resource assumptions of this Interim Review are based on the "2018-2027 Forecast Report of Capacity, Energy, Loads, and Transmission" (2018 CELT Report)[2]. Resource performance and transmission interface transfer capability assumptions are consistent with the values used by ISO New England in its calculation of the region's Installed Capacity Requirements, which were approved by the New England Power Pool and filed with the Federal Energy Regulatory Commission. ISO New England continues to use the General Electric Multi-Area Reliability Simulation (MARS) model to simulate New England system resource adequacy.

[2] https://www.iso-ne.com/static-assets/documents/2018/04/2018_celt_report.xls

# Section 3
# Assumptions Changes

## 3.1 Resources

Table 3-1 compares resource assumptions between the two reviews. As shown, the total resources assumed for the 2018 review is higher than the amount assumed for each of the common years of the reviews. For 2019 and 2020, the higher amount of approximately 800 MW is the result of higher demand resources and generation uprates. For 2021, the higher amount of approximately 1,800 MW is the result of higher demand resources, generation uprates, and additional capacity imports after accounting for resource retirements. For 2022, the higher amount of approximately 750 MW is due to higher demand resources, and generation uprates after accounting for resource retirements.

On March 23, 2018, Exelon submitted to the ISO Retirement De-List Bids for Mystic Station, expressing its intention to retire the generators when the existing capacity supply obligations expire on May 31, 2022. Mystic Station consists of four units, designated as Units 7, 8, 9, and "Mystic Jet", and have an aggregate nominal summer capacity rating of 2,274 MW. In this review, the Mystic Station units are assumed available because there is no certainty that the Retirement De-List Bid will clear the FCA.

This review also conducts an assessment using only the resources with capacity supply obligations. The amount of capacity supply obligations are based on the values as of October 2018.[3]

**Table 3-1**
**New England Resource Assumptions Comparison (Summer Ratings in MW)**

| Year | Based on Resources' Summer Claimed Capabilities | | | | Capacity Supply Obligations assumed in 2018 Review |
|---|---|---|---|---|---|
| | 2017 Review | 2018 Review | Difference | Major Reasons for Changes | |
| 2019 | 35,129 | 35,927 | 798 | • more demand resources (~600)<br>• resource uprates (~200) | 35,330 |
| 2020 | 35,287 | 36,121 | 834 | • more demand resources (~520)<br>• resource uprates (~300) | 35,787 |
| 2021 | 34,540 | 36,363 | 1,823 | • more demand resources (~750)<br>• resource uprates (~400)<br>• new capacity imports procured for 2021 in FCA (~1,150)<br>• retirements starting in 2021 (~400) | 35,567 |
| 2022 | 34,840 | 35,574 | 734 | • more demand resources (~750)<br>• resource uprates (~400)<br>• retirements starting in 2021 (~400) | N/A (auction to be conducted) |

[3] https://www.iso-ne.com/static-assets/documents/2018/10/october-2018-coo-report.pdf

## 3.2 Load

This Interim Review uses the 2018 load forecast, which updates the data for the region's historical annual use of electric energy and peak loads by adding another year of historical data to the model, incorporating the most recent economic and demographic forecasts, and making adjustments for resettlement that include meter corrections. The forecast also reflects the impacts of behind-the-meter photovoltaics (PV) load reductions. Demand response programs, which include both active and passive demand resources, are modeled and reported on the resource side. Table 3-2 compares the reference summer peak demand forecasts between the 2017 and the 2018 reviews. This year's forecast is lower by approximately 400 MW to 600 MW. Table 3-3 compares the high demand forecasts, which shows a similar trend.

**Table 3-2**
**New England Reference Summer Peak Demand Forecast Comparison**

| Year | 2017 Comprehensive Review (MW) | | | 2018 Interim Review (MW) | | | Delta of Net Peak |
|---|---|---|---|---|---|---|---|
| | Gross Peak Forecast | BTM PV Peak Reduction [4] | Net of BTM PV Peak | Gross Peak Forecast | BTM PV Peak Reduction | Net of BTM PV Peak | |
| 2019 | 29,750 | 783 | 28,967 | 29,298 | 721 | 28,577 | -390 |
| 2020 | 30,036 | 848 | 29,188 | 29,504 | 790 | 28,714 | -474 |
| 2021 | 30,322 | 891 | 29,431 | 29,744 | 851 | 28,893 | -538 |
| 2022 | 30,620 | 929 | 29,691 | 29,994 | 901 | 29,093 | -598 |

**Table 3-3**
**New England High Summer Peak Demand Forecast Comparison**

| Year | 2017 Comprehensive Review (MW) | | | 2018 Interim Review (MW) | | | Delta of Net Peak |
|---|---|---|---|---|---|---|---|
| | Gross Peak Forecast | BTM PV Peak Reduction | Net of BTM PV Peak | Gross Peak Forecast | BTM PV Peak Reduction | Net of BTM PV Peak | |
| 2019 | 30,083 | 783 | 29,300 | 29,579 | 721 | 28,858 | -442 |
| 2020 | 30,431 | 848 | 29,583 | 29,906 | 790 | 29,116 | -467 |
| 2021 | 30,773 | 891 | 29,882 | 30,253 | 851 | 29,402 | -480 |
| 2022 | 31,115 | 929 | 30,186 | 30,602 | 901 | 29,701 | -485 |

## 3.3 Interface Limits

The same sub-area configuration (bubble transportation model) is used to represent the transmission system in these two reviews. The transfer capabilities for the Boston Import interface and Southeast New England (SENE) Import interface have been updated for 2019 and 2020 to account for the delay in the Wakefield Woburn 345 kV Project. This project, which is part of the Greater Boston upgrades, consists of installing a new 345 kV underground cable between Wakefield and Woburn, approximately 8.5 miles long, and a 160 MVAR shunt reactor in addition to termination facilities at both Wakefield and Woburn. The project was approved by the Massachusetts Electric Facilities Siting Board in February 2018. However, this decision has been

[4] These values are the estimated peak load reduction impacts from the BTM PV. Hourly profiles were used in the simulation model.

appealed by two towns to the MA Supreme Judicial Court. The appeals process, coupled with lengthy local permitting approval processes, has delayed the expected in-service date for the 345 kV underground cable from May 2019 to May 2021.

## 3.4 Unit Availability

Table 3-5 compares the weighted average EFORd assumptions used in the 2017 Comprehensive Review and this Interim Review. Overall, the system weighted average EFORd for generating capacity assumed in this review has slightly improved as compared to the 2017 review assumptions. The change is the result of the update of the rolling 5-year average of generator-submitted Generation Availability Data System (GADS) data.

**Table 3-4**
**New England Change In EFORd Assumptions – Weighted Averages**

| Unit Type | 2017 Comprehensive Review EFORd (%) | 2018 Interim Review EFORd (%)[5] |
|---|---|---|
| Fossil | 19.3 | 20.4 |
| Combined Cycle | 3.9 | 4.0 |
| Diesel | 9.3 | 8.3 |
| Combustion Turbine | 10.4 | 10.7 |
| Nuclear | 1.9 | 0.9 |
| Hydro | 3.5 | 2.5 |
| Others | 10.0 | 10.9 |
| System | 7.3 | **7.2** |

## 3.5 Fuel Security

The ISO and New England stakeholders have been grappling with a growing threat to the reliable operation of the New England system. This threat is posed by the region's increasing reliance on natural gas-fired generation combined with minimal growth in regional gas pipeline capacity. The problem is most critical during the winter months, when the region's pipelines are delivering firm gas to the LDCs. In January 2018, ISO New England published an operational analysis of fuel-security challenges to the continued reliability of New England's power system and opened a dialogue with stakeholders on the issue. The study illustrates the number and duration of energy shortfalls that could occur during the winter period that would require implementation of emergency procedures to maintain reliability. The purpose of the fuel-security analysis is to examine how anticipated generating resource and fuel-mix combinations could affect reliable operation of the regional bulk power system during an entire winter period (December 1 through February 28). Quantifying the level of risk over a wide range of possible combinations provides information the region can use to consider approaches to ensuring power system reliability. The ISO has commenced efforts to develop solutions to be accomplished in the near-term, mid-term, and longer-term development horizons.

[5] https://www.iso-ne.com/static-assets/documents/2018/08/a3_pspc_prpsd_icr_values_08302018.pdf

In the near-term, ISO New England is revising its Operating Procedure No. 21, Energy Inventory Accounting and Actions During an Energy Emergency (OP-21), by the addition of an energy emergency forecasting and reporting protocol to improve situational awareness. This reporting protocol will establish energy alert thresholds similar to those used in NERC Standards, encouraging proactive measures to avoid certain forecasted conditions. The revision to OP-21 is expected to be completed before 2019. In addition, the ISO is formalizing a framework for specific opportunity costs to be incorporated into energy market supply offer, which would promote the availability of additional energy during tight winter fuel scarcity events. The first phase of this project, targeted for implementation in the 4th quarter of 2018, focuses on addressing the energy opportunity costs of resources, such as oil-fired and dual-fuel generators, with fuel supply limitations over a relatively short (e.g., 7-day) period. The second phase will evaluate a more comprehensive approach to opportunity-cost modeling.

In the mid-term, ISO New England has developed a Tariff-based approach, applicable for the Capacity Commitment Periods 2022-2023 through 2024-2025, for reliability reviews and retention of resources wanting to delist to help maintain regional energy security. Assessment criteria that may require retaining a resource in the Forward Capacity Market to address regional fuel-security risks with a corresponding timing and integration of fuel-security reliability reviews of resource delist requests, Forward Capacity Auction pricing treatment, and allocation of associated costs for retained fuel-security resources, have been developed and filed with the Federal Energy Regulatory Commission. To promote energy availability during 2023-2024 through 2024-2025, ISO New England is evaluating an interim compensation treatment for these CCPs associated with reliability reviews for fuel security. The stakeholder process to develop this interim compensation treatment is scheduled to span from the fourth quarter 2018 through the first quarter 2019.

In the long-term, under a Federal Energy Regulatory Commission (FERC) Order, the ISO is to develop and file with the commission improvements to its market design to better address regional fuel security for CCPs beyond 2024-2025 by July 1, 2019. Currently, ISO New England has initiated the process and is discussing the problem statement and proposed conceptual approaches with the stakeholders.

## 3.6 Environmental Regulations and Initiatives

State, regional, and federal environmental requirements impose differing compliance costs on generators, with different prime movers and fuel sources, and are not expected to pose reliability concerns during the study period, but are a factor in retirement decisions. The federal Clean Air Act imposes a range of compliance obligations, including emission limits for nitrogen oxides, sulfur dioxide and air toxics from coal-, oil-, and gas-fired generators, with more stringent requirements on generators greater than 25 MW. In New England, most generators already comply with all applicable Clean Air Act requirements, or in the case for certain oil-fired generators subject to the Mercury and Air Toxics Standards (MATS), or operate below an 8% annual capacity factor and are subject to more limited compliance requirements.

Implementation of certain new state regulations is likely to impose operational limits on new and existing generators[6]. The impact of these state requirements are an uncertain risk on unit

[6] Connecticut RCSA 22a-174-22e, 22a-174-22f; Massachusetts 310 CMR 7.19 Reasonably Available Control Technology (RACT) for Nitrogen Oxides (NOx) sources; Massachusetts 310 CMR 7.74 $CO_2$ Generator Emissions Cap.

retirements and pose operational constraints when compared with earlier assessments. The Regional Greenhouse Gas Initiative (RGGI) and state specific carbon dioxide ($CO_2$) emissions cap are increasing compliance costs for affected generators, but the reliability impacts for such greenhouse gas reduction measures remains uncertain during the study period.[7] Since the last assessment, the combined impact of changing federal air, water, endangered species, and carbon standards are more uncertain. Reconsideration or withdrawal of certain federal environmental measures could affect the economic performance of existing and new nuclear, renewable, and fossil-fired generators if states pursue additional measures to address diluted federal regulatory requirements.[8] Either scenario risks imposing additional operational constraints and capital costs for pollution control retrofits.

Implementation of certain Clean Water Act requirements on existing and new cooling water structures for thermal generation is proceeding on a case-by-case basis, but retirements have reduced the number of facilities subject to these waste water discharge requirements. Clean Water Act and Endangered Species Act requirements are affecting the relicensing of some existing hydro-electric units and new renewable resources during the study periods. The ISO is monitoring regulatory developments and permit renewals to assess the impacts of operational restrictions (maintenance of minimum flows) on the ability of hydro-electric generators to offer regulation and reserve services or curtailment of wind resources during migratory travel of protected bird species.

## 3.7 Integration of Variable Energy Resources

There are no material changes since the 2017 Comprehensive Review.

## 3.8 Others

The interconnection benefits from neighboring Areas are considered in both assessments. Since the 2017 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 3-5 summarizes the tie benefit assumptions for the 2017 and 2018 reviews.

[7] Regional Greenhouse Gas Initiative; Massachusetts Global Warming Solutions Act Generator Emissions Cap, 310 CMR 7.74 (as amended July 2018).

[8] Many existing federal environmental measures, such as the Mercury and Air Toxics Standards (MATS). include compliance exemptions for low capacity factor units such as legacy oil units. Reconsideration of existing federal measures may inadvertently jeopardize such compliance exemptions and causes other existing federal environmental requirements may 'snap-back' into place increasing the retirement risk for existing resources.

**Table 3-5**
**New England Assumed Tie Benefits from Neighboring Areas (MW)**

| Year | 2017 Comprehensive Review | 2018 Interim Review |
|---|---|---|
| **2019** | 1,990 | 1,945[9] |
| **2020** | 1,950 | 1,950[7] |
| **2021** | 2,020 | 2,020[7] |
| **2022** | 2,020 | 2,000[10] |

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

[9] https://www.iso-ne.com/static-assets/documents/2018/08/a41_pspc_prpsd_tie_benefits_08302018.pdf

[10] https://www.iso-ne.com/static-assets/documents/2018/07/a41_pspc_propsd_tiebenfits_fca13_07262018.pdf

# Section 4
# Results

Tables 4-1 and 4-2 summarize the New England system LOLE results for the scenarios investigated within this Interim Review and those from the 2017 Comprehensive Review. They show that New England has adequate existing and planned resources to meet the NPCC Resource Adequacy Design Criteria under all scenarios for the study period 2019 through 2022.

**Table 4-1**
**New England LOLE using Reference Demand Forecast**

| Year | 2017 Comprehensive Review (Days/Year) | 2018 Interim Review (Days/Year) | |
|---|---|---|---|
| | Based on Resources' Seasonal Claimed Capabilities | Based on Resources' Seasonal Claimed Capabilities | Based on Resources' Capacity Supply Obligations |
| **2019** | 0.028 | 0.019 | 0.032 |
| **2020** | 0.030 | 0.017 | 0.024 |
| **2021** | 0.058 | 0.015 | 0.053 |
| **2022** | 0.061 | 0.040 | N/A (auction to be conducted) |

**Table 4-2**
**New England LOLE using High Demand Forecast**

| Year | 2017 Comprehensive Review (Days/Year) | 2018 Interim Review (Days/Year) | |
|---|---|---|---|
| | Based on Resources' Seasonal Claimed Capabilities | Based on Resources' Seasonal Claimed Capabilities | Based on Resources' Capacity Supply Obligations |
| **2019** | 0.038 | 0.027 | 0.043 |
| **2020** | 0.043 | 0.029 | 0.037 |
| **2021** | 0.080 | 0.028 | 0.080 |
| **2022** | 0.086 | 0.069 | N/A (auction to be conducted) |

# Section 5
# Conclusions

Results of this Interim Review show that the New England region has adequate existing and planned resources to meet the NPCC Resource Adequacy Design Criteria under both the reference demand forecast and high load forecast for the study period 2019 through 2022. ISO New England has procured an adequate amount of resources to meet system reliability through the Forward Capacity Market.

To address fuel security concerns, ISO New England has conducted analysis to identify possible issues to better prepare ISO staff and New England market participants to address these concerns; implemented market rule changes to promote generation availability; and modified its operating procedures to improve operations and market participants' situational awareness. ISO New England also has developed a Tariff-based approach, applicable in the Capacity Commitment Periods 2022-2023 through 2024-2025, for reliability reviews and retention of resources wanting to delist, in order to help maintain regional energy security. Currently, ISO New England is going through a stakeholder process to improve its market design to better address regional fuel security for CCPs beyond 2024-2025 in response to a FERC Order. The required market design improvements will need to be filed with the FERC by July 1, 2019.