July 12, 2019

BY ELECTRONIC FILING

The Honorable Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

RE: **ISO New England Inc., Informational Filing on Fuel Security Reliability Review for the Thirteenth Forward Capacity Auction; Docket No. ER19-___-000**

Dear Secretary Bose:

Pursuant to the December 3, 2018 order of the Federal Energy Regulatory Commission (the "Commission") in Docket Nos. ER18-2364-000 and EL18-182-000,[1] ISO New England Inc. (the "ISO")[2] hereby submits this informational filing to assess the study triggers, study assumptions and study scenarios utilized by the ISO in performing its fuel security reliability review for the thirteenth Forward Capacity Auction ("FCA 13") in comparison to the actual conditions experienced during the 2018-2019 winter months. As the Commission explained in the December 2018 Order, "this filing will be for informational purposes and will not be noticed for comment or subject to Commission order."[3]

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[1] *Order Accepting Compliance Filing and Requiring Informational Filings*, 165 FERC ¶ 61,202 (2018) ("December 2018 Order").

[2] Capitalized terms used but not defined in this filing are intended to have the meaning given to such terms in the ISO New England Inc. Transmission, Markets and Services Tariff (the "Tariff"), the Second Restated New England Power Pool Agreement, and the Participants Agreement. Market Rule 1 is Section III of the Tariff.

[3] December 2018 Order at P 39 n 72.

I. DESCRIPTION OF THE FILING PARTY; COMMUNICATIONS

The ISO is the private, non-profit entity that serves as the regional transmission organization ("RTO") for New England. The ISO operates the New England bulk power system and administers New England's organized wholesale electricity market pursuant to the Tariff and the Transmission Operating Agreement with the New England Participating Transmission Owners. In its capacity as an RTO, the ISO has the responsibility to protect the short-term reliability of the New England Control Area and to operate the system according to reliability standards established by the Northeast Power Coordinating Council ("NPCC") and the North American Electric Reliability Council ("NERC").

All correspondence and communications in this proceeding should be addressed to the undersigned for the ISO as follows:

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II. INTRODUCTION

The December 2018 Order accepted the ISO's compliance filing of Tariff provisions that address the evaluation the ISO will perform for three Forward Capacity Auctions—FCAs 13, 14 and 15—to assess whether a resource that has submitted a Forward Capacity Market bid to retire from the wholesale markets must be retained by the ISO to address the region's fuel security needs.[4] The rules in question are to be in

[4] *ISO New England Inc.*, Compliance Filing to Establish a Fuel Security Reliability Standard, Short-Term Cost-of-Service Mechanism, and Related Cost Allocation for Out-of-Market Compensation, Docket Nos. EL18-182-000 and ER18-2364-000 (filed August 31, 2018) ("Fuel Security Reliability Standard Filing"). Mr. Brandien's testimony included with the Fuel Security Reliability Standard Filing is referred to herein as the "Brandien Testimony." The Tariff provisions for the fuel security reliability review are contained in a new Section III.13.2.5.2.5A to the Forward Capacity Market rules, and the trigger conditions are defined in a new Appendix L to Market Rule 1. In addition, the set of scenarios and assumptions that will be used in the fuel security study are detailed in Appendix I of the ISO's Planning Procedure No. 10 (referred to

(continued...)

place on a temporary basis until the ISO can fully assess and implement Tariff changes to address fuel security needs through market mechanisms. The rules require the ISO to perform a fuel security study for any resource that submits a retirement bid, using a fuel security model that assesses the impact of the retirement on the ISO's ability to reliably operate the bulk power system under stressed winter conditions. If, under the modeled scenarios, either of two Tariff-defined trigger conditions occur, the ISO is required to retain the resource for fuel security.

In accepting the ISO's proposed fuel security reliability review rules, the Commission noted that the process is newly developed, is based on a number of assumptions, and may need to be modified as the ISO develops additional experience.[5] It therefore directed the ISO to submit an annual informational filing as follows:

> We recognize that the Fuel Security Study process, performed over the planning horizon, is a newly developed process, is based upon a number of assumptions, and is not addressed by the NERC Reliability Standards. As ISO-NE gains additional information and experience, we expect that the study assumptions, methods, scenarios, and triggers may need to be further refined and updated. We also note that, as discussed below, the Fuel Security Study process may be necessary to evaluate the impact of retiring resources on regional fuel security beyond FCA 15. In light of this potential future need for the proposed process, we direct ISO-NE to submit an annual informational filing regarding the applicability of its study triggers, study assumptions, and study scenarios compared to actual experiences, starting with the winter of 2018/19. Specifically, following the winter, we direct ISO-NE to submit an informational filing comparing the study assumptions and triggers from the modeling analysis to actual conditions experienced in the winter of 2018/19. The informational filing should also include a description of lessons learned, and explain if changes to study assumptions and triggers are necessary for future studies.[6]

The Commission noted in a footnote that "this filing will be for informational purposes and will not be noticed for comment or subject to Commission order."[7]

(...continued)
herein as "Appendix I"). The version of Appendix I used in the FCA 13 fuel security reliability review is included herewith in Attachment A. As discussed in this filing, the ISO has updated Appendix I for use in the FCA 14 fuel security reliability review, which was performed earlier this year. A redlined version of the updated Appendix I is included herewith in Attachment B.

[5] December 2018 Order at P 39.

[6] December 2018 Order at P 39.

[7] December 2018 Order at P 39 n 72.

III. OVERVIEW OF THE FCA 13 FUEL SECURITY RELIABILITY REVIEW INFORMATIONAL FILING

The fuel security reliability review is designed to examine the system response to the retirement of an existing resource during extended cold weather conditions when the region's fuel delivery mechanisms are under significant stress. For this reason, the fuel security reliability review is performed using several data inputs from the winter of 2014-2015, during which New England experienced a series of extended cold spells throughout the winter that would stress the capability of the natural gas pipeline system and the availability of stored fuels. The model is therefore very sensitive to changes in weather conditions, as the large majority of inputs are directly impacted by winter weather patterns, including temperatures, precipitation, sun profiles, and wind profiles. Because winter weather conditions change significantly from year-to-year, drawing conclusions about the methodology employed for the fuel security reliability review from any single year of winter weather conditions is not prudent, unless there is clear evidence of a significant underlying concern with the methodology that is highlighted by a particular winter weather pattern during the winter under review.

The 2018-2019 winter was relatively mild, and very mild in comparison to the severe winter of 2014-2015 used in the base modeling assumptions for the fuel security reliability review. As is explained in more detail below, although there were brief periods of more severe cold winter weather, during the winter of 2018-2019 New England did not experience a sustained period of well-below-normal temperatures. As a result, no fuel constraints were experienced that raised significant reliability concerns. It is therefore not prudent to draw significant conclusions about the fuel security reliability review methodology from the 2018-2019 winter.

The ISO has, however, made several updates to the fuel security reliability review methodology that is being utilized for FCA 14. Over the course of four meetings of the NEPOOL Reliability Committee and a meeting of the NEPOOL Participants Committee during the spring of 2019, stakeholders provided input on the methodology for the fuel security reliability review as memorialized in Appendix I to the ISO's Planning Procedore No. 10. Stakeholders raised a number of useful points about the manner in which certain static inputs in the review process were calculated, including points about how new offshore wind projects are accounted for in the review, the manner in which gas demand and oil inventories are modeled, and the manner in which the capacity from various generation sources is calculated for the analysis. In response to this input, and in light of the ISO's experience in performing the FCA 13 fuel security reliability review, the ISO implemented refinements to the method for establishing certain static inputs in the review, which have been used in the FCA 14 fuel security reliability review and will be used going forward. Broadly speaking, these refinements increase the amount of natural gas and fuel oil that is modeled in the analysis, and further increase the capacity values of certain renewable resources. Collectively, these revisions tend to move the analysis in a less conservative direction. These updates have been reflected in revisions to Appendix I, which are contained in the redlined version of Appendix I included in Attachment B to this filing.[8]

In the remainder of this informational filing the ISO presents data on the inputs and triggers used for the FCA 13 fuel security reliability review, and compares that to data from the winter of 2018-2019 winter. As noted above, few conclusions are drawn from this comparison regarding the fuel security reliability review methodology. The informational filing also explains substantive modifications to the fuel security reliability review methodology for FCA 14 that are based on stakeholder input and experience received in performing the review for FCA 13.

To provide context, the filing begins with an overview of the review process and a discussion of the actual conditions experienced during the 2018-2019 winter.

IV. DEVELOPMENT OF STUDY ASSUMPTIONS AND STUDY SCENARIOS FOR THE FUEL SECURITY RELIABILITY REVIEW

The fuel security reliability review is a 90-day winter energy analysis that is designed to examine an entire winter season (December, January and February) using pre-defined scenarios that assess the system response to the retirement of an Existing Generating Capacity Resource.[9] The methodology and assumptions are largely detailed in Appendix I to the ISO's Planning Procedure No. 10.[10] The pre-defined scenario cases consist of three Liquified Natural Gas ("LNG") supply cases, each comprising six different scenarios, for a total of 18 scenario cases.[11] The LNG supply cases represent different maximum levels of daily LNG injections, and each scenario within an LNG supply case accounts for varying levels of electricity imports and dual-fuel resource fuel inventories.[12]

The review utilizes a number of static input assumptions defined in Appendix I. These include: peak load, winter energy profile, Local Distribution Company ("LDC")

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[8] NEPOOL, which pursuant to the Participants Agreement provides the sole Participant Processes for advisory voting on ISO matters, reviewed the revisions to Appendix I and provided advisory votes on the revisions through the NEPOOL Reliability Committee and the NEPOOL Participants Committee. At its April 24, 2019 meeting, the NEPOOL Reliability Committee did not support the Appendix I revisions, with a vote of 63.61% in favor. However, at its May 3, 2019 meeting, the NEPOOL Participants Committee voted to support the Appendix I revisions, with 69.47% in favor.

[9] Fuel Security Reliability Standard Filing, transmittal letter at p. 7.

[10] *See* Attachment A hereto.

[11] Fuel Security Reliability Standard Filing, transmittal letter at p. 7.

[12] Fuel Security Reliability Standard Filing, transmittal letter at p. 8 and Brandien Testimony at p. 8.

gas demand, pipeline capacity, satellite LNG facility vaporization, oil-only inventory levels, resource seasonal claim capability, installed PV forecast and sun profiles, wind resource nameplate values and wind profiles (onshore and offshore), demand response resource capacity values, equivalent forced outage rate on demand ("EFORd"), estimated hourly MW relief for each action of the ISO's Operating Procedure No. 4 (actions taken during a capacity deficiency event),[13] exports, pumped storage levels, and conventional hydro-electric generation capacity.

Many values assigned to the static input assumptions are established using data from the 2014-2015 winter. The ISO used the 2014-2015 winter because, while that winter did not include the coldest days recorded in the past ten years, it had the most sustained consecutive cold days as measured by heating-degree days. This provided a wider perspective on the cumulative use of oil and LNG inventories over the 90-day winter period, and the need to replenish those inventories as cold weather persists.

Several static input assumptions are also established using data from the target Capacity Commitment Period. For example, while the hourly electricity demand profile is based on the 2014-2015 winter, this demand is adjusted to reflect the 90/10 peak load forecast for the winter period of the target Capacity Commitment Period. Therefore, the fuel security reliability review for the winter associated with FCA 13 used the projected winter peak load of 20,342 MW for the 2022-2023 Capacity Commitment Period.[14]

Finally, some static inputs are based on current data, and are to be adjusted annually to reflect updated data.

V. ACTUAL CONDITIONS EXPERIENCED IN 2018-2019 WINTER

Overall, the 2018-2019 New England winter was less severe than other recent winters. Although there were brief periods of extremely cold winter weather, New England did not experience a sustained period of well-below-normal temperatures. As a result, no fuel constraints were experienced that raised significant reliability concerns.

The 2018-2019 average winter temperature in New England was 29.7°F, which was 0.9 °F above normal consistent with the National Oceanic and Atmospheric Administration's seasonal outlook of near-to-slightly above normal temperatures. Ten consecutive days of below-normal temperatures occurred in early December (December 4-13), which was the longest below-normal temperature stretch of the winter, followed by a nearly month-long stretch in which temperatures averaged above normal. While a ten-

[13] ISO New England Operating Procedure No. 4, Action During A Capacity Deficiency ("OP-4"), *available at* https://www.iso-ne.com/static-assets/documents/rules_proceds/operating/isone/op4/op4_rto_final.pdf.

[14] The 90/10 peak load value is adjusted to net out the impacts of projected Energy Efficiency. The load values are taken from the most recent Capacity, Energy, Loads and Transmission Report ("CELT Report") published by the ISO.

day below-normal temperature spell later in the winter season might have placed constraints on the region's fuel delivery system, the temperatures during this 10-day December period were still relatively mild and did not cause the region to rely significantly on stored fuels. Two brief cold snaps occurred from January 20 to 22 and from January 31 to February 2.

New England experienced above-average precipitation for the 2018-2019 winter. While below-normal amounts of snow fell in Boston and Hartford, total precipitation was above normal in Hartford by 4.4 inches.

The 50/50 and 90/10 winter peak demand forecast was 20,357 MW and 21,056 MW, respectively. Actual winter peak demand was 20,719 MW on January 21, 2019.

Despite the above average temperatures, natural gas demand was higher than in previous years, and the total seasonal LNG injections were slightly above average as well.[15] As discussed below, this increased demand may have been the result of two factors. During the winter months, two LNG carrier ships docked at the Excelerate offshore buoy, injecting approximately 5.2 Bcf of natural gas into the Algonquin pipeline, which accounted for the higher than average LNG injections for the winter.[16] This may have prompted some LDCs to rely more heavily on pipeline gas rather than utilize gas stored in satellite LNG facilities. Furthermore, increased pipeline capacity from two incremental expansion projects[17] permitted LDCs to utilize additional gas from pipelines rather than utilize gas held in their satellite LNG tanks.

Fuel inventories and potential emissions restrictions for oil, coal and natural gas-fired resources were monitored throughout the winter via weekly surveys. Oil-fired resources entered the winter in December 2018 with tanks filled to approximately 50%, which was about 20% lower than tank levels at the start of the prior winter. With the mild winter weather, oil resources were rarely in merit and ran infrequently. They ended the winter with tanks approximately 55% full.

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[15] LNG injections are from the Canaport LNG terminal in New Brunswick, the Excelerate buoy connected to the underwater Algonquin Hubline, and the Distrigas facility in Everett, MA. The LNG injections for the 2018-2019 winter were slightly above the average over the prior six winters but less than the base model winter of 2014-2015.

[16] The ISO does not have sufficient reason to believe that LNG injections from the Excelerate buoy will continue in future winters. Excelerate explained to New England stakeholders at a March 2019 meeting that its vessels are normally committed under long-term contracts year-round in other markets. Excelerate further explained that the availability of a vessel for the New England market for the 2018-2019 market was the result of a short-term contract suspension with a long-term counterparty and was not a response to the needs of the New England market.

[17] Three relatively small expansion projects—Atlantic Bridge, Portland Xpress and Westbrook Xpress—are scheduled to increase pipeline capacity by .16 Bcf/day to 3.92 Bcf/day within the next several years. Phase 1 of the Portland Xpress project and a portion of the Atlantic Bridge project have been completed and were in service for the 2018-2019 winter.

The generation fleet generally performed well throughout the winter. The lowest observed capacity margin during the winter was an 800 MW (approximate) surplus on February 2. The ISO did not make any supplemental out-of-market commitments for fuel security for the entire winter.

For the winter of 2018-2019, the ISO implemented enhancements to its offer requirements to more easily allow generators to include fuel-related opportunity costs in their energy market supply offers. The ISO also implemented the weekly 21-day energy assessment forecast that provided participants with a rolling forecast of system conditions and forecasted energy surpluses, which afforded participants an opportunity to take action to procure fuel in advance of a forecasted energy deficiency. Due to the mild winter conditions, however, there was minimal need to utilize the opportunity cost mechanism. Furthermore, the weekly 21-day energy assessment forecast did not produce any forecasted energy deficiencies; the minimum forecasted energy surplus for the winter was 3,500 MW on February 4, 2019, which was reflected on the January 15th 21-day energy assessment forecast.

VI. COMPARISON OF STATIC INPUTS USED IN FCA 13 FUEL SECURITY RELIABILITY REVIEW TO ACTUAL 2018-2019 WINTER CONDITIONS

This section VI explains the static input assumptions used for the FCA 13 fuel security reliability review and for comparison provides data for each assumption from the 2018-2019 winter. As noted above, for the large majority of assumptions no conclusions are drawn from the comparison; winter 2018-2019 was a mild winter by comparison to the more severe winter that the fuel security reliability review attempts to model, and furthermore it is difficult to draw conclusions from experience in a single winter. Where the ISO is making a substantive change to the methodology for calculating a static input assumption for future fuel security reliability reviews (unrelated to its experience from the 2018-2019 winter), those changes are explained in this section VI as well.

1. Peak Load and Winter Energy Profile

Appendix I requires that the fuel security reliability review use the 90/10 winter peak load (after taking into account the effect of energy efficiency) for the relevant Capacity Commitment Period, as specified in the most recently available draft Capacity, Energy, Loads, and Transmission ("CELT") Report that is available at the time the review is performed.[18] This value, along with the hourly system demand from the 2014-2015 winter, is used to create an hourly winter load shape comprising the ratio of the CELT peak load for the relevant Capacity Commitment Period to the 2014-2015 winter peak load.[19]

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[18] Attachment A, section 3.A.i.

[19] Attachment A, section 3.A.ii.

For the FCA 13 fuel security reliability review, the ISO utilized a 90/10 winter peak load value of 20,342 MW for the 2022/23 Capacity Commitment Period, which was the value presented to the Planning Advisory Committee in March of 2018.[20] The actual peak load for the 2018/19 winter was 20,719 MW, which occurred on Monday, January 21, 2019.[21]

The table below compares the winter demand profiles in MWh using the demand profile of winter 2014-2015 (i.e., the profile used in the FCA 13 fuel security reliability review) and the demand profile of winter 2018-2019, both scaled for the projected winter of study 90/10 load of 20,342 MW. Due to the more stressed conditions during the 2014-2015 winter, the electrical demand based on the demand profile from the winter of 2014-2015 is approximately 2,700,000 MWh higher than the electrical demand based on the 2018-2019 winter profile.

	Using 2014-2015 profile	**Using 2018-2019 profile**
Adjusted Electric Demand for 2022-2023	33,313,686 MWh	30,661,095 MWh

2. Fuel Supply Inputs

a. LDC Gas Demand –

Under Appendix I, LDC peak gas demand for the FCA 13 analysis was modeled at 5.262 Bcf/day. This quantity was calculated using forecasted gas demand data from each New England state utility's Integrated Resource Plan on file as of 2016.[22]

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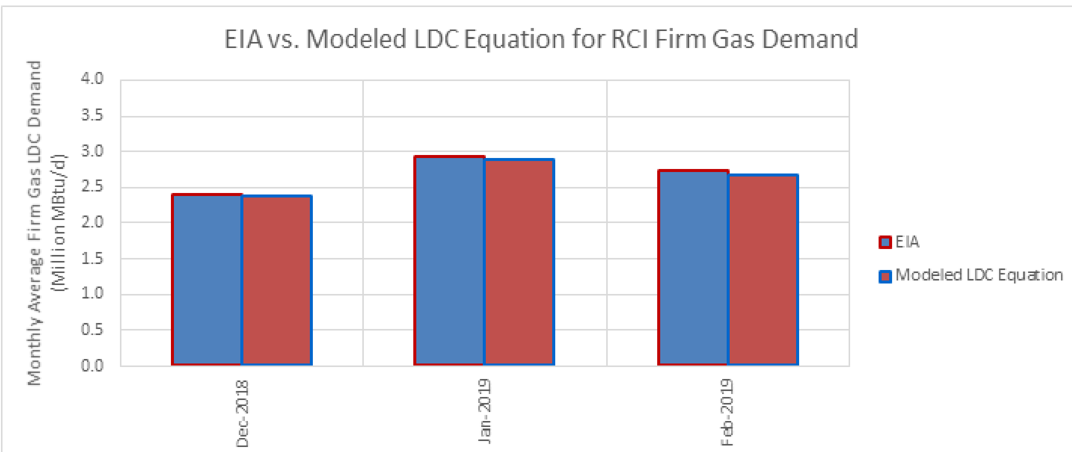
[20] Projected 90/10 winter peak load for the 2022-2023 winter from the 2018 CELT Load Forecast, *available at* https://www.iso-ne.com/static-assets/documents/2018/09/forecast_data_2018.xlsx**.**

[21] While this peak load value appears high relative to the projected 90/10 winter peak load value for the 2022/23 Capacity Commitment Period, peak loads are declining and expected to continue to decline for the foreseeable future. For comparison, the projected peak loads for the next five winters decline each year as follows: 19/20—21,173 MWh; 20/21—20,920 MWh; 21/22—20,715 MWh; 22/23—20,533 MWh; 23/24—20,384 MWh. *See* 2019 CELT Report, Winter Load Forecasts, *available at* https://www.iso-ne.com/static-assets/documents/2019/04/forecast_data_2019.xlsx.

[22] Attachment A, section 3.A.iii.

As noted above, despite the relatively mild winter, overall gas demand was higher than average during the 2018-2019 winter, which may be due in part to an increase in LDC gas demand and increased pipeline capacity. The increased gas supply from the two tankers that provided LNG from the Excelerate offshore buoy may have prompted some LDCs to rely more heavily on pipeline gas rather than utilize gas stored in satellite LNG facilities. Furthermore, increased pipeline capacity from two incremental expansion projects[23] permitted LDCs to utilize additional gas from pipelines rather than utilize gas being held in their satellite LNG tanks. Nevertheless, as displayed below, the gas demand observed in the 2018-2019 winter from United States Energy Information Administration ("EIA")[24] data is consistent with the LDC gas demand modeled for the FCA 13 fuel security reliability review using the methodology set forth in Appendix I. This comparison reinforces the established methodology for modeling LDC gas demand.



For the FCA 14 fuel security reliability review, Appendix I has been updated so that LDC peak gas demand will be modeled at 5.181 Bcf/day. This value is calculated once again using forecasted gas demand data from each New England state utility's most recently filed Integrated Resource Plan. In addition, gas demand growth for future year model runs will not exceed the increase in gas supply capacity necessary to serve the new demand.[25]

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[23] Three relatively small expansion projects—Atlantic Bridge, Portland Xpress and Westbrook Xpress—are scheduled to increase pipeline capacity by .16 Bcf/day to 3.92 Bcf/day within the next several years. Phase 1 of the Portland Xpress project and a portion of the Atlantic Bridge project have been completed and were in service for the 2018-2019 winter.

[24] The data from EIA was compiled from natural gas consumption data for the six New England states for the months of December 2018, January 2019, and February 2019, *available at* https://www.eia.gov/dnav/ng/ng_cons_sum_dcu_nus_m.htm.

[25] *See* revisions in Attachment B, section 3.A.iii. Further, the gas demand included in the model for *future* years (i.e., for the FCA 15 analysis) is to be capped at the value utilized in the prior

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b. Natural Gas Pipeline Capacity –

Natural gas pipeline capacity is determined for the target Capacity Commitment Period based on vendor-supplied information that is updated annually.[26] For the FCA 13 fuel security reliability review, the ISO modeled 3.86 Bcf/day of natural gas pipeline capacity, which was established based on then-current index of customer data on firm pipeline capacity contracts and forecasted capacity expansions for each of the four New England pipelines (Algonquin Gas Transmission, Iroquois Gas Transmission, Portland Natural Gas Transmission, and Tennessee Gas Pipeline).

Updated vendor-supplied information indicates that, based on updated information on firm pipeline capacity contracts and the forecasted increased capacity from pipeline expansion projects, the natural gas pipeline capacity available to New England is 3.59 Bcf/day.[27] The following explains how this value was determined:

- Data from the first quarter of 2019 on firm pipeline contracts indicates a total capacity into New England on existing pipelines of 3.75 Bcf/day.

- Three relatively small expansion projects—Atlantic Bridge, Portland Xpress and Westbrook Xpress—to be in service before the FCA 14 Capacity Commitment Period, will increase pipeline capacity by .16 Bcf/day to 3.92 Bcf/day.

- There are .33 Bcf/day in firm contracts to Long Island, New York from the Algonquin Gas Transmission into Iroquois pipeline at the Brookfield, Connecticut interconnection. The ISO observed these flows to Long Island throughout the 2018-2019 winter.[28] Upon further evaluation, the ISO has determined that .33 Bcf/day of capacity must be netted from the capacity to New England to account for the firm contracts that have been in place since the 2008 Brookfield interconnection was brought into service.

The updated data on firm pipeline capacity contracts and the forecasted increased capacity from pipeline expansion projects reflect current information on pipeline capacity as of the winter of 2018-2019, and will therefore be used going forward for future fuel security reliability reviews (and were used for the FCA 14 review completed in June of this year). Accounting for the .33 Bcf/day firm contracts to Long Island arguably

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year's fuel security reliability review. This treatment is based on the premise that any growth in future forecasted LDC demand will be offset by an equivalent amount of increased supply.

[26] Attachment A, section 3.0 "Natural Gas Assessment" and section 3.A.iv.

[27] This value was used for the FCA 14 fuel security reliability review performed earlier this year.

[28] The ISO also reevaluated flows from 2015-2019 as well, and observed the same flows to Long Island through New England.

indicates that the pipeline capacity value used for the FCA 13 fuel security reliability review was overstated; however the amount of the overstatement was relatively small.

c. Satellite LNG Facility Vaporization –

The ISO does not have access to data that shows the amount of natural gas supplied in New England from the vaporization of LNG held by LDCs in smaller satellite storage facilities throughout New England. For the FCA 13 fuel security reliability review, the ISO used vendor-supplied data to model the satellite LNG injections starting when the heating degree day was greater than 53 degrees, which equates to an average daily temperature of 12 degrees Fahrenheit or lower, with a maximum sendout of 1.456 Bcf/day.[29] The maximum sendout value is the aggregate of the New England LDC satellite LNG facilities vaporization capabilities.[30]

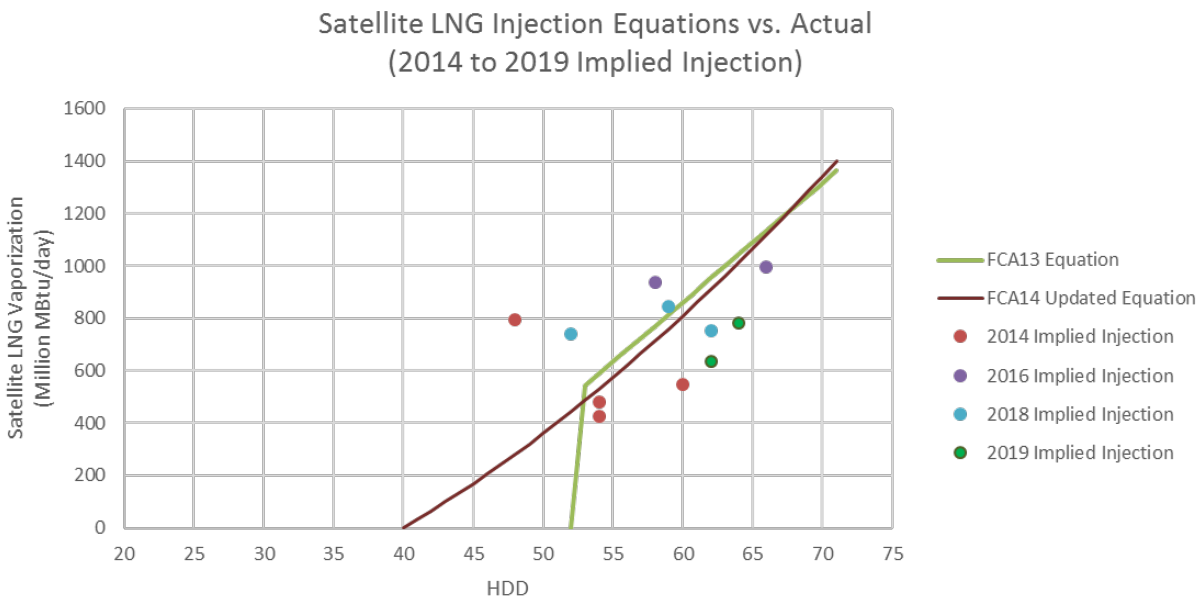
Because the ISO does not have direct data on satellite LNG facility vaporization, it is difficult to extrapolate any useful information from natural gas usage during the winter of 2018-2019 for purposes of assessing the accuracy of the FCA 13 modeling, or to assess whether changes should be made for FCA 14. Nevertheless, the ISO has refined its modeling to develop a more accurate picture of satellite LNG facility vaporization for use in the FCA 14 fuel security reliability review.[31] The ISO charted the forecasted gas demand for the 2017-2018 winter, and compared that to the actual non-power gas demand for the 2017-2018 winter (demand data collected from publicly available bulletin boards). This comparison produced a "gap" between the forecasted total gas demand and the actual non-power gas demand that grew as the heating degree days ("HDD") increased (i.e., as temperatures dropped) in the winter. This "gap," or the difference between the two, provided a chart of the "implied" satellite LNG vaporization at each HDD. In contrast to the FCA 13 model, this data showed that satellite LNG vaporization begins when the HDD is approximately 40 (25 degrees Fahrenheit), and increases as temperatures drop. This same data—i.e., the implied satellite LNG vaporization—was then developed for the winters of 2014, 2016 and 2019, and plotted on a curve, which produces the following equation for determining satellite LNG vaporization for the FCA 14 analysis. The red line on the curve represents the satellite LNG facility vaporization rates, in MMBtus per day, at each HDD point as used in the FCA 14 fuel security reliability review.

$$\text{Satellite LNG Vaporization} = 0.4355*(HDD)^2 - 3.113*(HDD) - 572.3$$

[29] *See* Attachment A, section 3.0 "Natural Gas Assessment" and section 3.A.v.

[30] This value is the aggregate vaporization capacity sendout of all satellite LNG facilities in New England, per the requirements of Appendix I, section 3.A.v.

[31] These changes are reflected in the updated Appendix I. *See* Attachment B, section 3.0 "Natural Gas Assessment."



d. Oil Unit Inventory and Replenishment Levels –

Under Appendix I, oil unit inventory levels for oil-only resources and dual-fuel resources that operate primarily on oil during the winter are set using the most recent December fuel survey results submitted to the ISO by participants with oil-fired generators.[32] Tank inventories are then replenished using a proxy rate of 202 barrels per hour (approximately one tanker truck per hour) when the reorder level is reached. The figure below shows the maximum fuel tank levels and the available fuel levels as reflected in the December fuel survey results provided for the last four years. For the FCA 13 fuel security reliability review, inventory levels were set at 69.6 percent of the maximum inventory levels, as reflected in the December 2017 fuel survey results.

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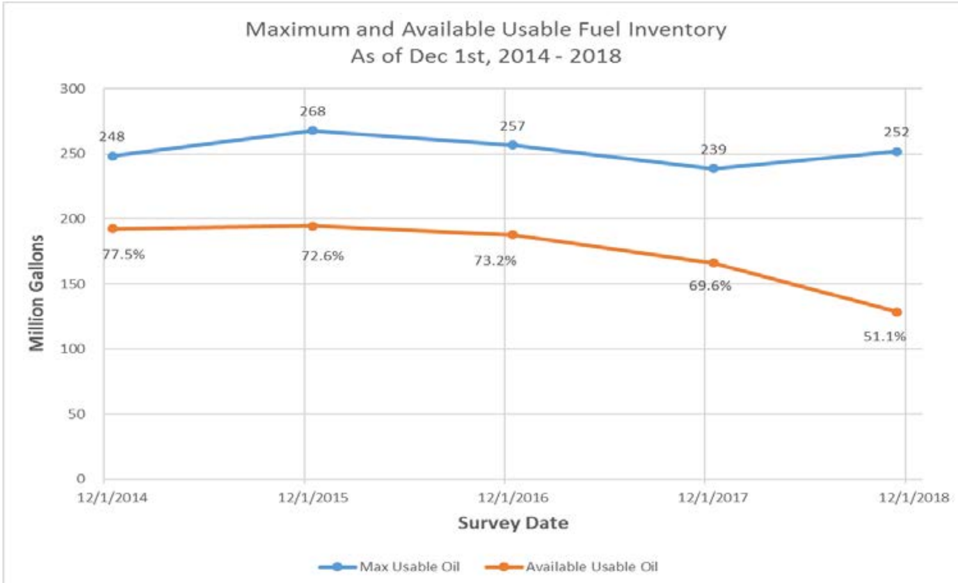
[32] *See* Attachment A, section 3.A.vi and ISO New England Operating Procedure No. 21, Energy Inventory Accounting and Actions During an Energy Emergency, Appendix A, *available at* https://www.iso-ne.com/static-assets/documents/rules_proceds/operating/isone/op21/op21a_rto_final.pdf.



December 2018 fuel survey results indicate a decrease in inventory levels to 51.1 percent of the maximum. Given the warm winter, these units were utilized infrequently during the 2018-2019 winter, and with replenishments they ended the winter with tank inventories at 55 percent of the maximum inventory levels.

To apply the existing provisions in Appendix I on oil unit inventory levels would require setting the inventory levels at 51 percent of maximum for the FCA 14 fuel security reliability review. Several stakeholders have noted, however, that this inventory level does not take account of possible increases in oil inventories due to participation in the ISO's recently-filed Inventoried Energy Program.[33] If accepted by the Commission that program will provide incremental compensation to resources—including oil-fired resources—that maintain inventoried energy during cold periods when winter energy security is most stressed. To reflect the potential participation in this program by oil-fired units, the ISO is updating Appendix I[34] to model oil inventories for the FCA 14 fuel security reliability review at 69.6 percent of the maximum, which is the oil inventory level recorded for December 2017—the last year of the ISO's winter reliability program that compensated resources for maintaining fuel during the winter months.[35] While the terms of the two programs are not the same, the higher oil levels reflected in the December 2017 inventory data are a more reasonable estimation of inventory levels for FCA 14 given the additional compensation that both programs provide, as compared with

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[33] *ISO New England Inc.*, Inventoried Energy Program, Docket No. ER19-1428-000 (filed March 25, 2019).

[34] *See* Attachment B, PP-10 Appendix I, section 3.A.vi.

[35] Market Rule 1, Attachment K, Winter Reliability Solutions for 2015-2016, 2016-2017 and 2017-2018.

the oil inventory data from last year where no additional compensation program was in place.

Replenishment will continue to be modeled at 202 barrels per hour (approximately one tanker truck per hour). The mild 2018-2019 winter did not require the oil-fired resources to replenish beyond what delivery arrangements were already scheduled because these resources operated very infrequently. Therefore, operating experience from the winter of 2018-2019 does not indicate the need for a change to the existing replenishment methodology used in the fuel security reliability review.

3. Resources Available For Dispatch

a. Resource Seasonal Claimed Capability Values –

Resource capability values are established using the winter Seasonal Claimed Capability ("SCC") values from the most recently published CELT Report for all Existing Generating Capacity Resources qualified for the instant FCA and energy-only resources active in the ISO markets. For non-commercial Existing Generating Capacity Resources that are not in the CELT Report, the fuel security reliability review is to use the resource's winter Qualified Capacity value.[36]

The following table shows the winter SCC values of resources by generation type for FCAs 13 and 14, as well as columns for the differences between the two values and the reason for the change. This data is from the May 2017 (for FCA 13) and May 2018 (for FCA 14) CELT Reports, supplemented where necessary with winter Qualified Capacity values per the requirements of Appendix I.

Generation	FCA 13 Total (MW)	Updates (MW)	Retirements (MW)	FCA 14 Total (MW)	Details on changes
Nuclear	3,393	(50)	-	3,343	SCC Adjustments
Pump Storage	1,762	23	-	1,785	Added Rocky River

[36] Attachment A, section 3.A.vii. For the FCA 14 fuel security reliability review, the ISO has also updated Appendix I to reflect that energy-only generators (i.e., those without a Capacity Supply Obligation in the capacity market) that are not in the CELT Report will be modeled using the resource's winter Seasonal Claimed Capability value.

Hydro	1,483	103	-	1,586	SCC Adjustments
Natural Gas Only	7,779	-	-	7,779	-
Combined Cycle Dual-Fuel	9,160	236	(62)	9,334	Burrillville Energy Center removed, Killingly Energy Center added, Pawtucket Power retired
Coal	498	37	-	535	SCC Adjustments
LNG Only (Mystic 8&9)	1,700	-	-	1,700	-
Oil Units	7,103	-	-	7,103	-
Bio/Refuse	958	31	-	989	SCC Adjustments

For winter 2018-2019, resources generally performed in a manner that is consistent with their winter claimed capability values, and therefore the ISO does not have reason to modify the approach taken in establishing resource capability values for performing the FCA 14 fuel security reliability review.

b. Photovoltaic Forecast and Sun Profile –

Under the Appendix I requirements, the photovoltaic forecast for the target Capacity Commitment Period is established using the PV Forecast-Nameplate values for the year of analysis, as calculated from the draft CELT Report that is presented to stakeholders in the spring of the year when the reliability review is being performed, adjusted to account for capacity factors generated from the 2014-2015 sun profile.[37]

For FCA 13 the ISO modeled 4,388.8 MW of photovoltaic resources, which was the nameplate value of the forecasted PV resources for the 2022-2023 winter included in

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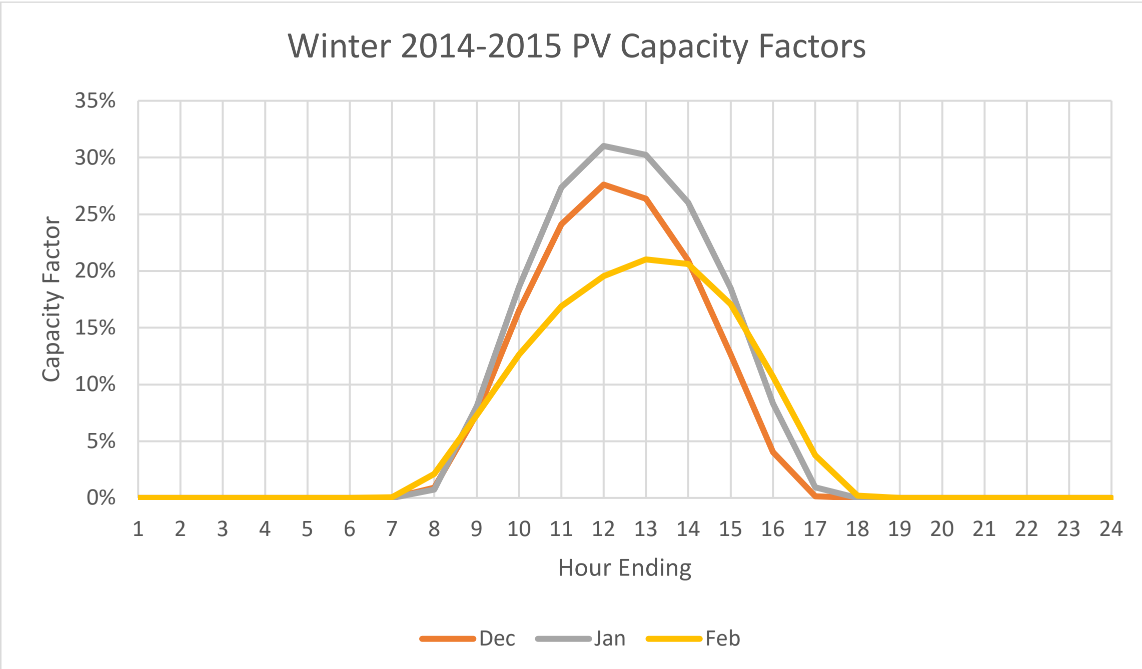
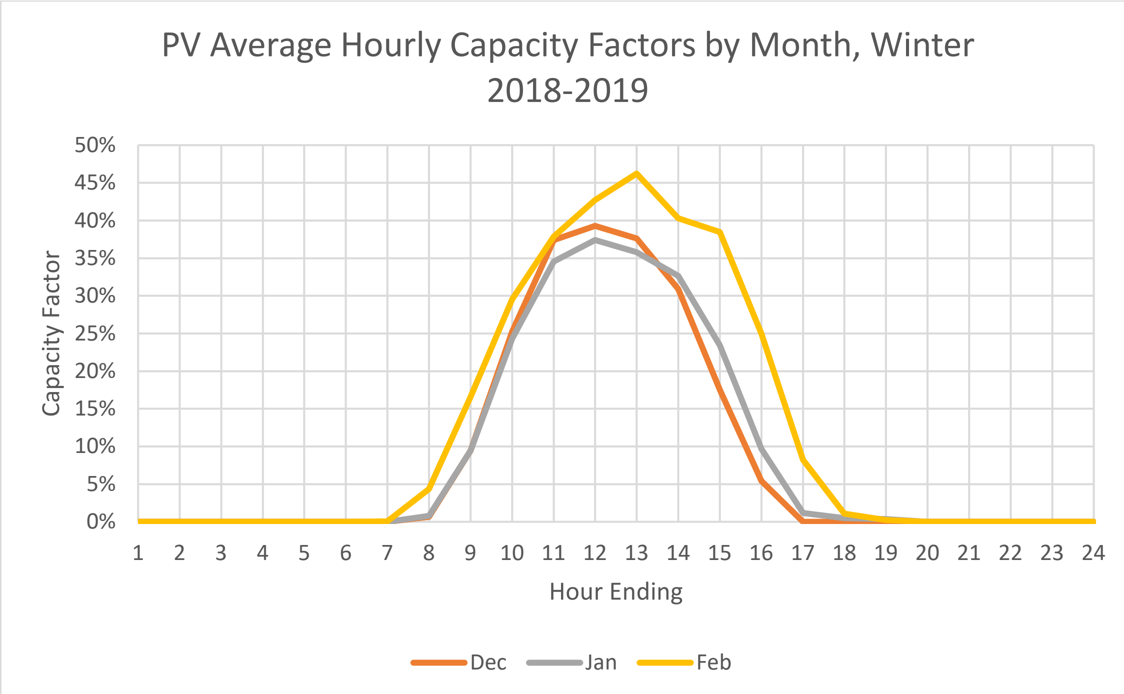
[37] *See* Attachment A, sections 3.A.viii and 3.A.x.

the draft 2018 CELT Report finalized in May of 2018.[38] For comparison, for the winter of 2018-2019 the nameplate capacity of PV resources was 2865.8 MW.

The 2014-2015 sun profile values are graphed directly below, and then are compared to the sun profile observed for the 2018-2019 winter in the graph that follows.



[38] *See* Attachment A, section 3.A.viii. For the FCA 14 fuel security reliability review, the ISO has updated PP-10, Appendix I to more clearly reflect how photovoltaic resources are modeled for the target winter. These clarifications explain that in service PV resources that are not reflected in the draft CELT Report, as well as non-commercial PV resources that will be in service for the target winter but are also not in the draft CELT Report, will be modeled using their nameplate values. *See* Attachment B, section 3.A.viii.



The PV resources performed at a higher capacity factor in 2018-2019 than under the modeled scenario for the FCA 13 fuel security review due to differences in the sun profiles between the two winters modeled. These differences simply reflect variations in sun profiles between the two winters and are not indicative of winter weather conditions that warrant changes to the manner in which PV resources are modeled for purposes of performing the FCA 14 fuel security reliability.

c. Onshore and offshore wind capacity values and wind profiles –

The capacity values for onshore and offshore wind resources are established using the nameplate values of the wind resources for the modeled Capacity Commitment Period from the most recently available CELT Report, with the capacity factors determined using the 2014-2015 onshore and offshore wind profiles.[39]

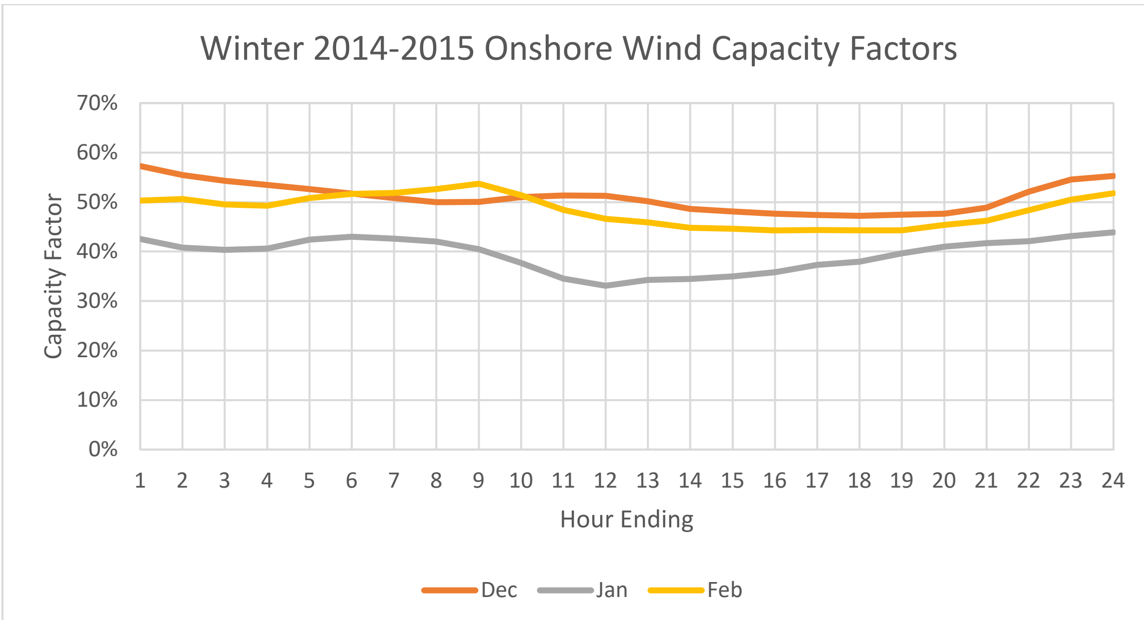
For the 2022-2023 Capacity Commitment Period, the aggregate nameplate value was 1,317 MW for onshore wind and 29.25 MW for offshore wind, as reflected in the summer 2017 CELT report.[40] For comparison, for the winter of 2018-2019 the

[39] *See* Attachment A, sections 3.A.ix, 3.A.xi and 3.A.xii. As with the capacity values for PV resources, the ISO is updating the language in Appendix I to reflect that wind resources that will be available for the target winter will be accounted for in the modeling at the nameplate value. *See* Attachment B, section 3.A.ix.

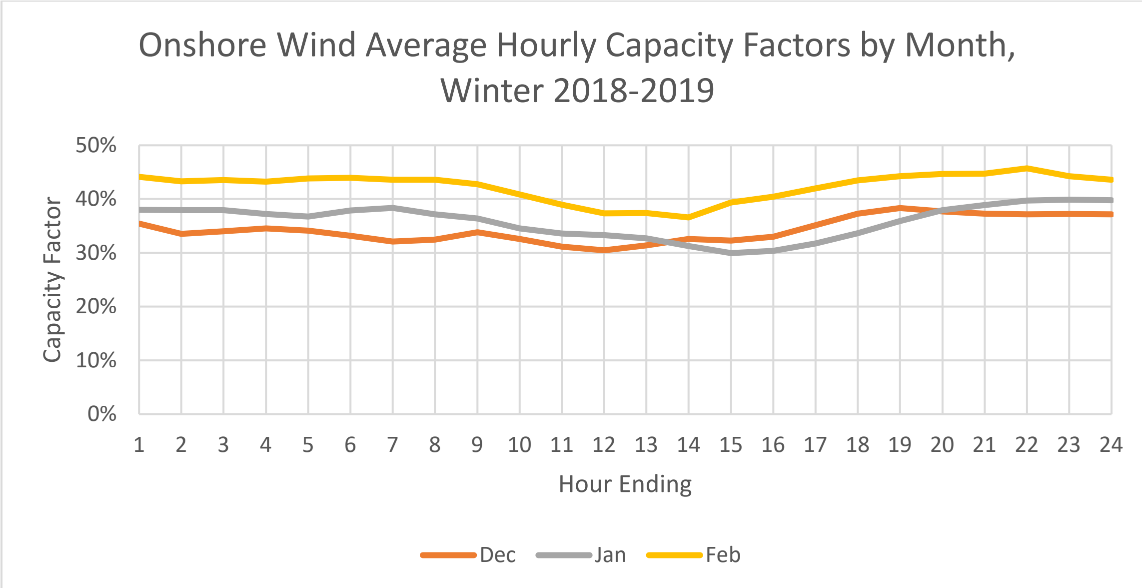
[40] Additional onshore and offshore wind capacity based on contractual commitments and clearing in FCA 13 are addressed in section VI.4.b below.

nameplate capacity of onshore and offshore wind resources was 1,323 MW and 29.25 MW respectively.[41]

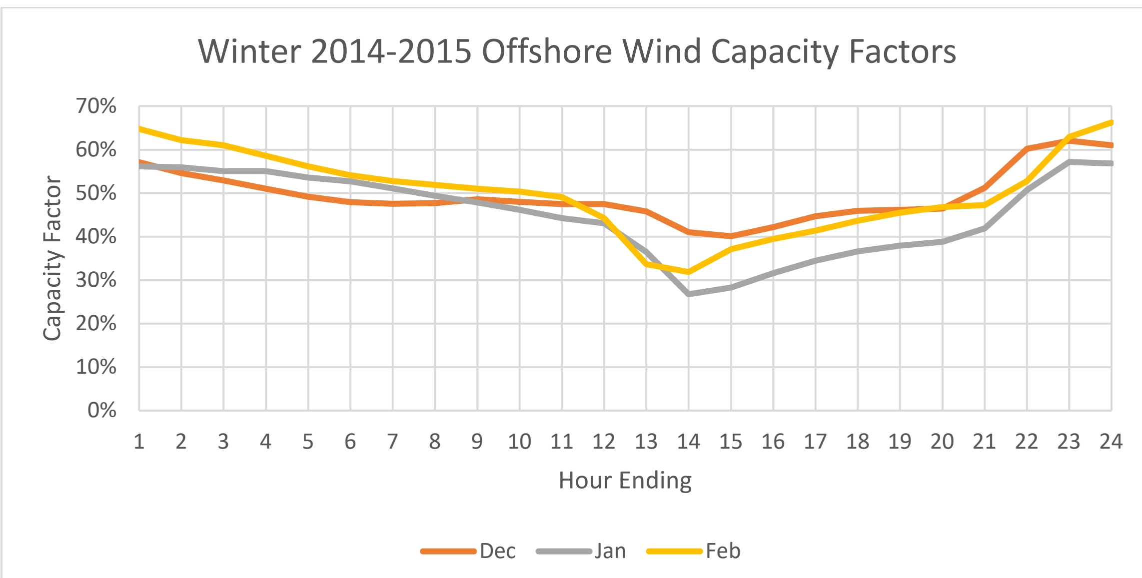
The onshore and offshore hourly wind profiles for the 2014-2015 winter as used in the FCA 13 fuel security reliability review are graphed below. For comparison, immediately below each wind profile used for the FCA 13 fuel security reliability review, a second graph contains the winter monthly capacity factors using the 2018-2019 winter wind and capacity factor data.

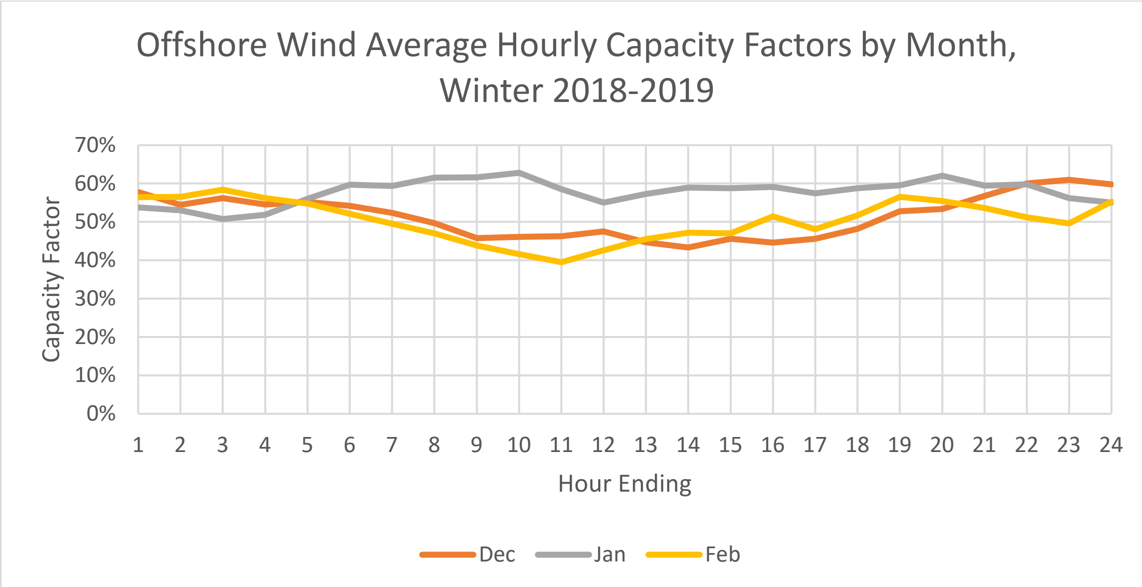


[41] *See* the 2019 CELT Report, Generator List data, *available at* https://www.iso-ne.com/static-assets/documents/2019/04/forecast_data_2019.xlsx.



The onshore wind resource fleet performed, on average, at a lower capacity factor during the winter of 2018-19 than did the fleet modeled for the FCA 13 fuel security reliability review using the winter 2014-2015 onshore wind profile. This is a result of differences in the wind profiles resulting from variations in weather conditions between the two winters, and does not warrant changes to the manner in which wind resources are modeled for purposes of performing the FCA 14 fuel security reliability review.





The offshore wind profile from winter 2014-2015, which was used in the FCA 13 fuel security reliability review shows a pronounced dip in wind speeds during the middle of the day for each of the three winter months. The two sets of profiles are driven by different weather conditions but are largely consistent and support the manner in which offshore wind is being modeled in the fuel security reliability reviews.

d. Demand Response Resources –

Demand Response Resources are modeled in the reliability review based on their current winter Seasonal Claimed Capability capacity values.[42] For FCA 13, 200 MW of active Demand Response Resources were modeled in the fuel security reliability review, because this represented the capability of the active Demand Response Resources that were available to System Operators in the prior (i.e., 2017-2018) winter for activation in the event of a capacity deficiency.

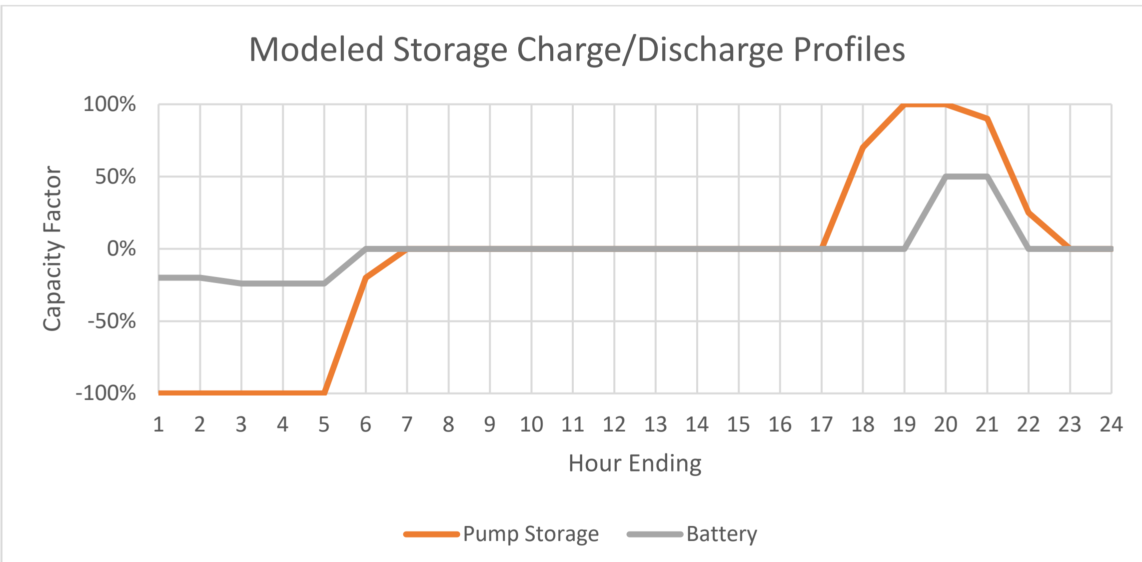
The winter of 2018-2019 was the first winter in which Demand Response Resources participated in the region's Energy Markets as price-responsive demand, and therefore were activated as part of the energy supply stack based on price, rather than being used solely as a reliability resource to respond to a capacity deficiency. The Seasonal Claimed Capability of Demand Response Resources varied from month-to-month during the 2018-2019 winter (starting the winter at 262 MW and ending at 318 MW). Demand Response Resource performance resulted in an average aggregate peak

[42] *See* Attachment A, section 3.A.xiii.

hour reduction of 295 MW for the winter of 2018-2019; these resources performed in accordance with ISO dispatch instructions when called upon.

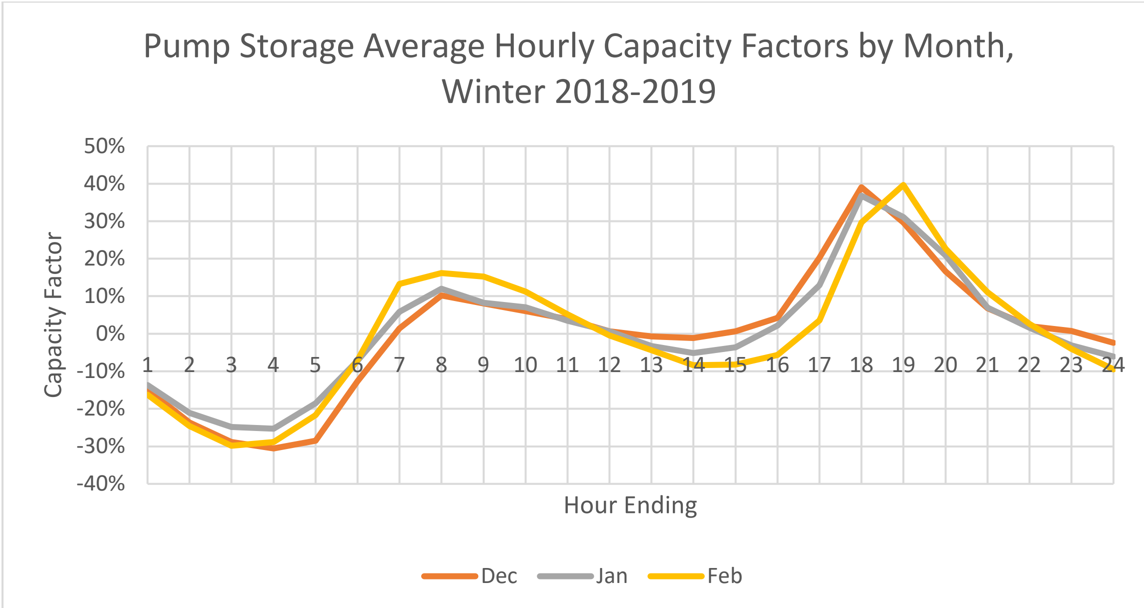
e. Pumped Storage –

Pumped storage and other storage facilities are modeled using a daily pumped storage profile to reflect the characteristic operation of the resource by storing energy during low load periods and generating energy during the higher load periods.[43] The figure below represents the storage resource charge/discharge profile utilized for the FCA 13 fuel security reliability review, which was generated using data from the observed behavior of pumped storage facilities during the 2016-2017 and 2017-2018 winters.



The figure below represents the charge and dispatch data for pumped storage resources during the winter of 2018-2019. As the graph displays, storage resource operation during the winter of 2018-2019 was consistent with the historical charge/dispatch profile used for the FCA 13 fuel security reliability review, with charging (or in this case, pumping) taking place in off-peak hours and dispatch taking place in higher load hours.

[43] Attachment A, section 3.A.xvii.



For the FCA 14 fuel security reliability review, the ISO is updating Appendix I to explicitly reflect that the modeling accounts for both pumped storage operation and the operation of other electric storage devices.[44]

f. Conventional Hydro-Electric Generation –

For the FCA 13 fuel security reliability review, conventional hydro resources were modeled at an hourly output based on the weighted average of the hydro capacity factors from the last five years, which were applied to the winter Seasonal Claimed Capability values for hydro-electric resources from the latest CELT Report.[45] For the FCA 13 fuel security reliability review, the weighted average hydro capacity factor was 34.3%, and the winter Seasonal Claimed Capability value for conventional hydro resources was 1,483 MW, which produced an hourly dispatch value of 509 MW.

In response to stakeholder input, the ISO is updating Appendix I for the FCA 14 fuel security reliability review to align the modeling of conventional hydro resources with the modeling of other intermittent resources whose output varies by weather and other uncontrollable conditions.[46] Therefore, for the FCA 14 review the ISO will use an hourly

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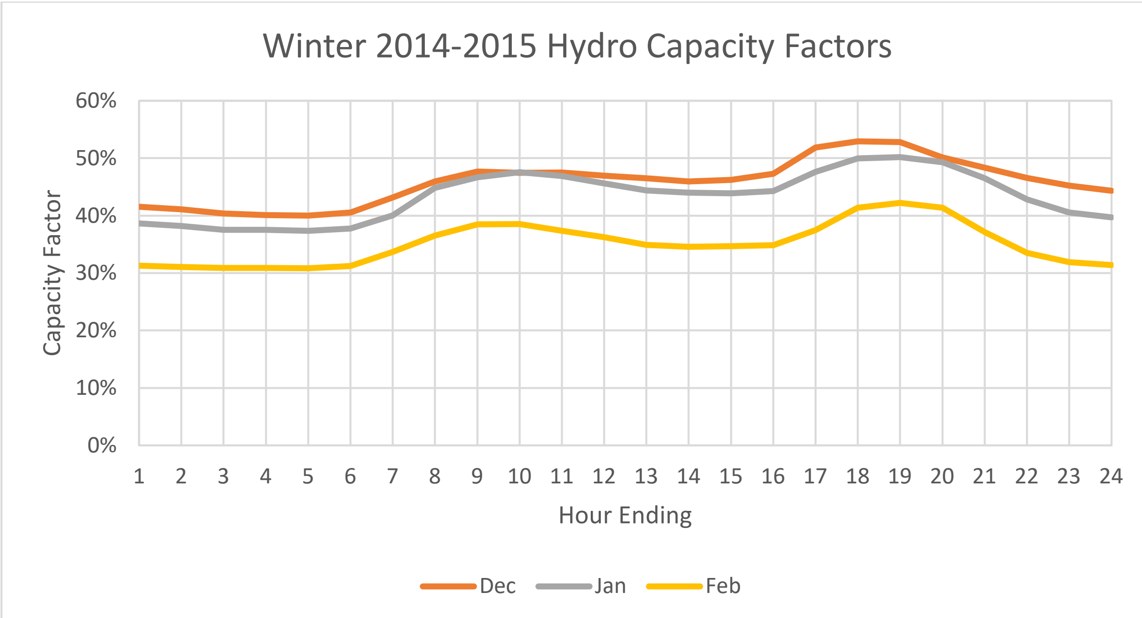
[44] *See* Attachment B, section 3.A.xvii.

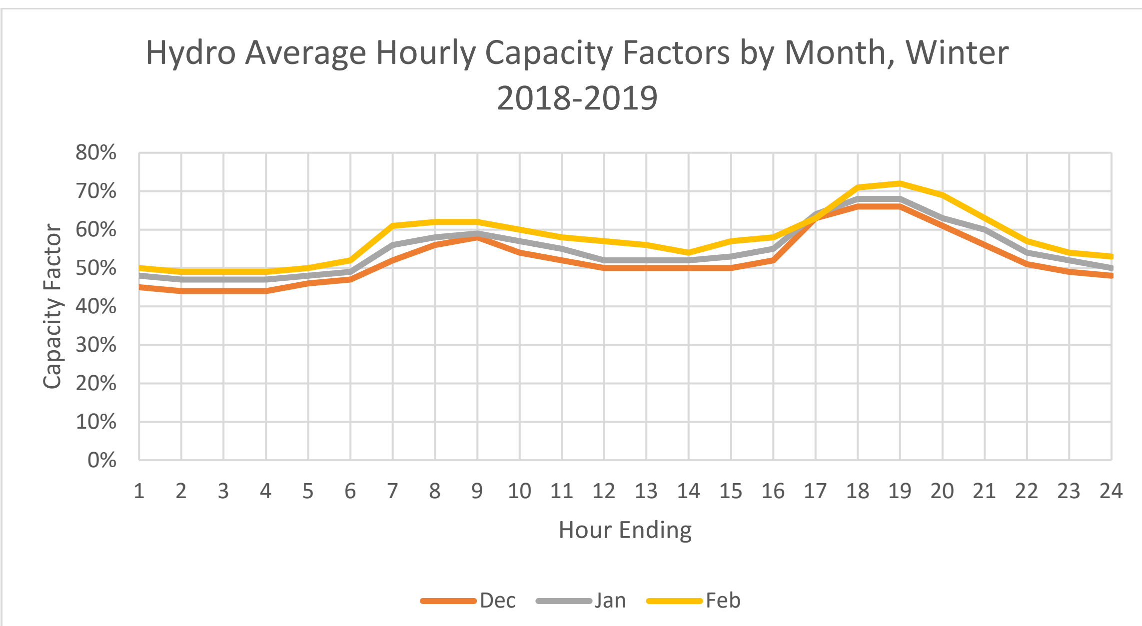
[45] Attachment A, section 3.A.xviii.

[46] *See* Attachment B, section 3.A.xviii. This methodology allows the model to account for the increased precipitation experienced during more severe winters, and in general is consistent with the manner in which other intermittent resources are being modeled in the reliability review. This approach therefore better reflects the operation of such resources during a winter that is experiencing stressed conditions.

profile based on conditions from the base winter of 2014-2015. The graph below represents this profile.



For comparison, the graph below shows average hourly capacity factors for hydro resources by month for the winter of 2018-2019.



For the winter of 2018-2019, conventional hydro resources performed at higher capacity factor profiles than those of the winter of 2014-2015. The higher performance value, relative to the winter of 2014-2015, reflects higher water runoff due to higher levels of precipitation during the winter of 2018-2019, much of which was in the form of rain rather than snow due to the warmer winter weather.

4. Other Factors Relevant for Static Inputs

a. Equivalent Forced Outage Rate Demand (EFORd) –

EFORd values are established using the Generating Availability Data System ("GADS") data provided by resource operators. Consistent with the manner in which EFORd values are calculated for other reliability-related purposes (e.g., the calculation of the Installed Capacity Requirement), for the FCA 13 fuel security reliability review the average of the GADS data from the past five years (2013 through 2017) was used in establishing EFORd values.[47] For comparison purposes (as well as for use in the FCA 14 fuel security reliability review), the GADS data was updated for the 2018 year (2014 through 2018) showing an approximate 14% decrease in EFORd values for the various technology groups. This is not surprising given the less severe winter weather, which put less strain on generation resources, decreased forced outages and helped to improve performance. This reduction in EFORd values will be reflected in the EFORd values used for the FCA 14 fuel security reliability review as follows (for FCA 14, EFORd values will be calculated using GADS data from the years 2014 through 2018):

Resource Type	**FCA 14 EFORd Capacity Reduction (MW)***	**FCA 13 EFORd Capacity Reduction (MW)**	**Difference**
Dual-Fuel	1,085	1,150	-65
Oil	730	740	-10
Natural Gas	234	320	-87
LNG	17	72	-55
Coal	76	38	38
Nuclear	40	136	-96
Pump Storage	29	106	-78
Other Renewables	82	80	2
Total	**2,292**	**2,642**	**-350**

[47] Attachment A, section 3.A.xiv.

b. Contractual Commitments Under State Procurements –

Under Section 3.C of Appendix I, the fuel security reliability review is to account for capacity from new resources that have a "binding and enforceable contract under a state procurement to be in-service by the December 1 of the associated Capacity Commitment Period," even if those resources have not been fully committed to provide capacity through the FCM for that commitment period.[48] For the FCA 13 fuel security reliability review, no new resources were included as new supply because none of the new resources met the state procurement criteria.

Since the FCA 13 fuel security reliability review was performed, several new offshore wind resources have submitted bids to participate in state procurement programs, and some of these are to be in service in time for the 2023-2024 winter (which takes place during the FCA 14 Capacity Commitment Period). Following a series of discussions with stakeholders, the ISO has updated the language in section 3.C of Appendix I to ensure that all such resources that have a binding and enforceable contract under a state procurement to be in place for the winter of 2023-2024 will be accounted for in the FCA 14 fuel security reliability review.[49] The modifications loosen the restrictions on which entities may provide the ISO with the necessary documentation to demonstrate that the contract has been finalized and approved by the appropriate state authorities. The modifications also permit the ISO to account for an offshore wind resource under a state procurement even if it will not be in service until January 1, 2024. This allows the ISO to account for a large offshore wind resource with an in service date of December 31, 2023. In making this change, the ISO reasoned that January and February tend to be the more severe winter months; if a new offshore wind resource will be in service for those months—thereby helping to relieve constraints on the fuel delivery system in New England—it is appropriate to account for it in the fuel security analysis.

With the adjustments made for the FCA 14 fuel security reliability review, a total of 1000 MW of state procurement-based capacity with an in service date for the 2023-2024 winter will be accounted for in the ISO's fuel security reliability review for FCA 14.

c. Estimated Relief From Actions During Capacity Deficiencies

In the event energy and reserves cannot be met with available capacity, the reliability review assumes that the actions from Operating Procedure No. 4, Actions During a Capacity Deficiency, are deployed to relieve system stress.[50] The following

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[48] Attachment A, section 3.C.

[49] *See* Attachment B, section 3.C.

[50] Attachment A, section 3.A.xv. OP-4 is available at *available at* https://www.iso-ne.com/static-assets/documents/rules_proceds/operating/isone/op4/op4_rto_final.pdf.

table summarizes the estimated hourly MW relief assumed for the FCA 13 fuel security reliability review from the implementation of the OP-4 actions.[51]

Progression of Emergency Actions	**Action Description**	**Estimated Hourly MW Relief**
OP-4 Action 1	Begin to allow depletion of 30-minute reserves	700*
OP-4 Actions 2-5	Voluntary load curtailment of Market Participants' facilities (0 MW assumed for load relief during winter months) Schedule Emergency Energy Transactions (500 MW assumed for scheduled transactions)	500
OP-4 Actions 6-11	Voltage Reductions Public appeals	500
10-Minute Reserve Depletion	Dispatch reserve resources for energy	1,400*
Load Shedding	ISO orders local control centers operated by transmission owners to reduce a specific percentage of system load Transmission Owners manually open distribution system breakers to disconnect blocks of customers	As needed

[51] In the fuel security reliability reviews, the ISO measures the operational impacts of the retirement of the Existing Generating Capacity Resource using the same operational metrics applied in the OFSA and Mystic Retirement Studies – that is, full utilization of OP-4 actions, depletion of 10 minute operating reserves, and load shedding under OP-7. In the fuel security review, as the system stress intensifies in each of the scenarios assessing the loss of the generation resource being studied, the study model progresses through the series of actions specified in OP-4, in sequence. The fuel security reliability review calculates the load affected as the ISO progresses through the non-emergency and emergency actions under OP-4. *See* Fuel Security Reliability Standard Filing, Brandien Testimony at pp. 18-19.

For the winter of 2018-2019, the region did not experience any capacity deficiency events that warranted reliance on actions under OP-4. This is not surprising given the relatively mild winter weather and temperature conditions in much of the region. Consistent with similar observations above, because of the mild 2018-2019 winter, the ISO is not modifying its OP-4 assumptions for the FCA 14 fuel security reliability review based on its experience during the most recent winter.

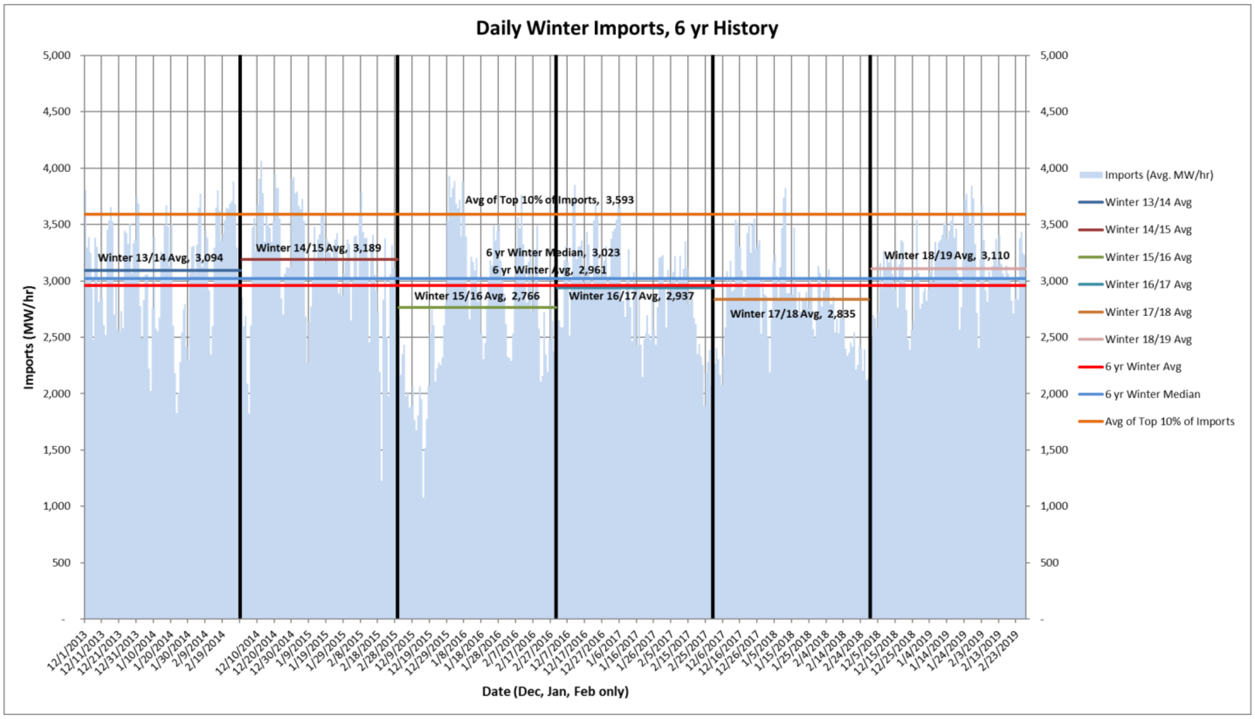
VII. COMPARISON OF VARIABLE INPUTS USED IN FCA 13 FUEL SECURITY RELIABILITY REVIEW TO ACTUAL 2018-2019 WINTER CONDITIONS

To perform the fuel security reliability review, the ISO performs a total of 18 scenario analyses by varying three sets of inputs, reflecting different levels of energy imports from neighboring control areas, LNG injections into the gas pipeline transmission system from the region's three LNG facilities, and dual-fuel resource oil tank inventory levels. In this section VII The ISO reviews each of these variable inputs and compares them with observed performance during the winter of 2018-2019.

1. Energy Imports

Under Appendix I, the total net flow into New England from the interfaces with New York, New Brunswick and Hydro-Quebec is to be modeled at 2,800 MW, 3,000 MW and 3,500 MW, with each level of imports creating a separate scenario to be tested.[52] As the following graph indicates, total net flow into New England for the 2018-2019 winter was consistent with net flows into New England in prior winters. The average flows of 3,110 MW/hour for the 2018-2019 winter were the second highest observed over the last six winters. However, they were well below the highest assumed imports of 3,500 MW utilized in the fuel security review scenario analyses. Furthermore, net flows above 3,500 MW that occurred during the 2018-2019 winter did not correlate with days where the region was experiencing colder winter weather, but rather are a reflection of price differences between New England and neighboring control areas. In other words, higher import days are more indicative of days on which energy prices in New England were higher than in the neighboring control areas from which the power was imported. Accordingly, the 2018-2019 winter import data does not support a change to the import values to be used for the FCA 14 fuel security reliability review.

[52] Attachment A, section 3.B.i.



2. LNG Injections

Total LNG injections into the pipeline transmission system by the region's three LNG facilities—Canaport, Distrigas and Excelerate—are modeled at three injection levels under Appendix I: 0.8 Bcf/day, 1.0 Bcf/day and 1.2 Bcf/day.[53] Separate scenarios are run for each injection level.

The graph below shows LNG injections over the last six winters. Despite the fact that the 2018-2019 winter did not contain any significant duration of cold weather, LNG injections during the three winter months were above average, and on three days during the winter the region experienced higher levels of LNG injections than have been experienced in any of the five preceding winters. These higher than normal levels of LNG injections can be attributed to the presence of two tankers at the Excelerate buoy during the winter of 2018-2019, which scheduled an approximate total of 5.23 Bcf of natural gas into the pipelines during the winter. One of the tankers began injections on January 2nd and was utilized in full by February 9th, and the second arrived on January 28th and departed on February 20th. As a result of the Excelerate deliveries, LNG injections into the pipeline system were approximately 33% higher during the 2018-2019 winter than in the prior winter.

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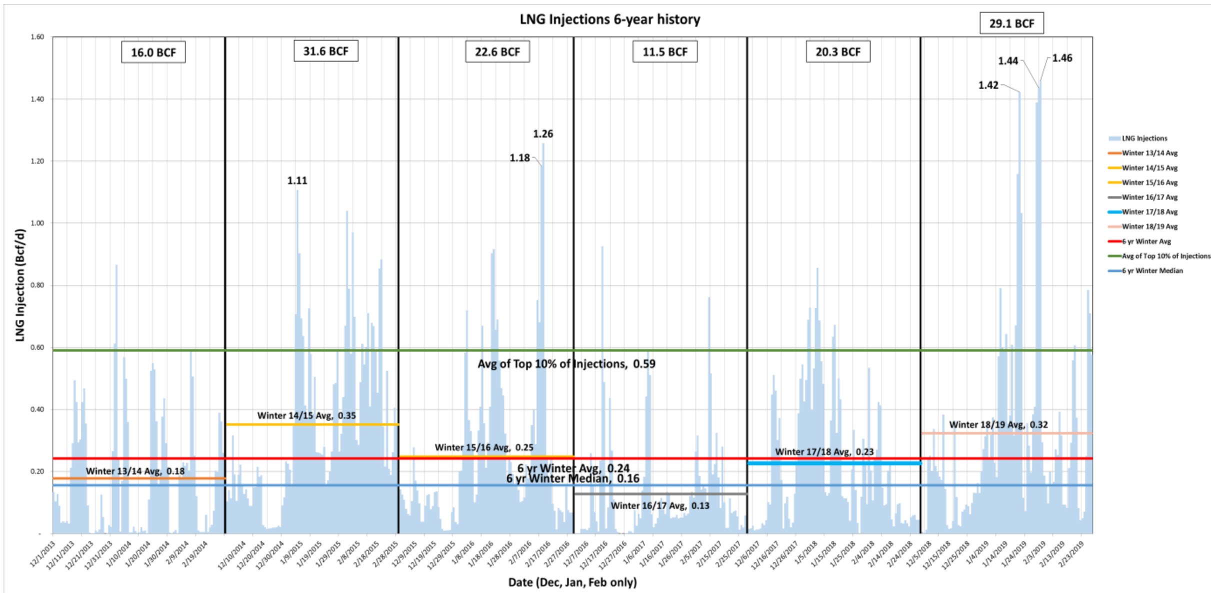
[53] Attachment A, section 3.B.ii.



The ISO evaluated the increase in peak LNG injections for the 2018-2019 winter and is not increasing the level of LNG injections to be modeled for the FCA 14 fuel security reliability review to reflect the increased LNG supply levels from winter 2018-2019. The average daily LNG injections for the 2018-2019 season were .32 Bcf/day, which is significantly less than the most "conservative" case of 0.8 Bcf/day modeled for the FCA 13 fuel security reliability review and below the LNG injections from the winter of 2014-2015. In addition, as noted above, the ISO does not have sufficient reason to believe that LNG injections from the Excelerate buoy will continue in future winters. Excelerate explained to New England stakeholders at a March 2019 meeting that its vessels are normally committed under long-term contracts year-round in other markets, and that the availability of a vessel for the New England market for the 2018-2019 market was the result of a short-term contract suspension with a long-term counterparty, not a response to the needs of the New England market. For these reasons, the ISO is not increasing the level of LNG injections modeled in the fuel security reliability review for FCA 14.

3. Combined Cycle Dual Fuel Resource Tank Inventory

Under Appendix I, dual fuel resource tank inventories for combined cycle resources that operate primarily on natural gas during the winter are modeled with two replenishment levels—125 percent of the resource's tank level as of December 1, and 200 percent of the resource's tank level as of December 1.[54] Separate scenarios are run for each tank level.

[54] Attachment A, section 3.B.iii.

For the FCA 13 fuel security analysis, the two replenishment levels equated to approximately 38.7 million gallons and 61.8 million gallons of replenishment fuel for the two scenarios. For the 2018-2019 winter, approximately 13 million gallons of replenishment were observed for the dual fuel fleet, which equates to 5.28 percent of the maximum inventory. Given the relatively mild winter, it is not surprising that dual fuel resources did not require significant amounts of replenishment. The low replenishment levels observed for the 2018-2019 winter therefore do not warrant a revision to the replenishment values utilized in the variable inputs for the fuel security reliability review.

VIII. TRIGGER CONDITIONS

Under the fuel security reliability review rules, a resource's Retirement De-List Bid will be rejected if, under the modeled scenarios, either the retirement of the resource results in the depletion of 10-minute reserves below 700 MW in any hour in the absence of a contingency in more than one of the LNG supply scenarios, or the retirement of the resource results in load shedding in any hour pursuant to the ISO's Operating Procedure No. 7.[55]

The mild 2018-2019 winter conditions did not present the ISO with an opportunity to test the adequacy of these trigger conditions. Nevertheless, it is useful to revisit the rationale provided for the less conservative 10-minute operating reserve trigger condition, and to consider whether conditions during the 2018-2019 winter are consistent with that rationale.

The 10-minute operating reserve trigger calls for the depletion of 10-minute operating reserves down to 700 MW. Were the ISO to deplete 10-minute operating resources, this would constitute a violation of the applicable NERC Balancing Standard requirement related to the maintenance of Contingency Reserves.[56] The ISO has been clear that it will not violate NERC reliability criteria—i.e., system operators would shed load if required to protect the interconnection for the next contingency. Nevertheless, in response to pressure from stakeholders who argued that using depletion of any amount of 10-minute reserves as the trigger was too conservative, the ISO agreed to permit reserve depletion down to 700 MW for purposes of performing the fuel security reliability review.[57] To justify this treatment, the ISO noted that the fuel security reliability review is occurring three years in advance of the capacity delivery period, and so it is possible that changes will take place—for example new market-based incentives—that would improve fuel procurement practices.[58]

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[55] Market Rule 1, Appendix L.

[56] Fuel Security Reliability Standard Filing, Brandien Testimony at p. 21.

[57] Fuel Security Reliability Standard Filing, Brandien Testimony at pp. 22-23.

[58] Fuel Security Reliability Standard Filing, Brandien Testimony at p. 22.

Two market-related mechanisms were implemented in 2018 to assist with increasing resource preparedness for severe winter weather. These include the ISO Operating Procedure No. 21 three week look-ahead and enhancing the capability of Market Participants to reflect opportunity costs in resource Supply Offers in the Energy Markets. The experience from the 2018-2019 winter did not provide the ISO with sufficient information to assess whether implementation of these market-related mechanisms provide a basis for modifying the fuel security reliability review triggers. Due to the mild winter conditions there was minimal need to utilize the opportunity cost mechanisms. As the Internal Market Monitor noted in its 2019 Winter Quarterly Markets Report, "periods of very cold weather did not sustain long enough to put sufficient strain on the natural gas supply,"[59] and as a result the opportunity cost adder never increased above zero or had an impact on the generation supply curve for the winter. Furthermore, as noted above, the weekly 21-day energy assessment forecast did not produce any forecasted energy deficiencies.

IX. CONCLUSION

The ISO requests that the Commission accept this informational filing regarding the FCA 13 fuel security reliability review.

Respectfully submitted,

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[59] ISO New England Internal Market Monitor 2019 Winter Quarterly Markets Report, at p. 6, *available at* https://www.iso-ne.com/static-assets/documents/2019/05/2019-winter-quarterly-markets-report.pdf.

ATTACHMENT A

ISO NEW ENGLAND PLANNING PROCEDURE NO. 10, APPENDIX I

VERSION APPLICABLE FOR THE FCA 13 FUEL SECURITY RELIABILITY REVIEW

19.0 Appendix I – Fuel-Security Reliability Review for Forward Capacity Market (FCM)

1.0 Purpose

This appendix will establish the process and criteria for evaluating the reliability impacts of FCM (a) Retirement De-List Bids, (b) substitution auction demand bids, (c) bilateral transactions, and (d) all reconfiguration auction demand bids on system fuel security as required by Section III.13.2.5.2.5A of the Tariff. The process for this fuel-security reliability review is set out in this Appendix I to PP10.

1.1 Term and Sunset of this Appendix I

This appendix shall remain in use for the period described in Section III.13.2.5.2.5A.a of the Tariff.

2.0 Timeline and Applicability

The timeline for and applicability for fuel security reliability reviews is set out at Section III.13.2.5.2.5A.b of the Tariff.

2.1 Input Review with Stakeholders

Each year in February or March, prior to the commencement of the fuel-security reliability review for a FCA, the ISO will discuss the inputs described in Section 3 below with the Reliability Committee.

2.2 ISO Notification of Fuel-Security Reliability Review Results to the Participant

The results of the fuel-security reliability review will be quantified in an ISO issued determination notification that is issued pursuant to Section III.13.2.5.2.5A.f of the Tariff.

2.3 ISO Notification and Review of Determination with Stakeholders

The ISO determinations described in Section III.13.2.5.2.5A.f will be reviewed with stakeholders, at the Reliability Committee, in the same general timeframe that resources retained for transmission security are reviewed, as outlined in PP-10, Section 7.6.

2.3.1 50/50 Load Informational Analysis Presentation

An informational fuel-security reliability review with a 50/50 peak load forecast from the most recent CELT will also be performed in all scenarios analyzed for units retained utilizing the 90/10 peak load forecast, and included in with the materials described in this Section 2.3. This analysis is not used for unit retention determinations.

3.0 Fuel-Security Reliability Review

The fuel-security review consists of an hour-by-hour chronological simulation of the New England electric supply systems for a winter period from the beginning of December through the end of February. One of the key assumptions driving the results of the review is the amount of natural gas available for electric generation.

Natural Gas Assessment

The fuel-security reliability review models natural-gas consumption on a daily basis. The primary, independent variable is average daily temperature converted to heating degree days (HDD). Given a daily temperature, the total gas demand for Residential, Commercial and Industrial (RCI) customers is established based on updated gas demand reports and the sources for serving this gas demand are based the following:

- Gas from Pipelines – The first source utilized for natural gas comes from the pipeline supply encompassing Algonquin, Tennessee, Iroquois, and Portland Natural Gas Transmission System (PNGTS) from the west and Sable Island and Deep Panuke from the east (both assumed to be inactive in the near future).
- Satellite Liquefied Natural Gas (LNG) – On cold days with 53 HDD or more, the model assumes that injections from gas Local Distribution Company (LDC) satellite LNG storage facilities will be activated in order to support the LDC behind-the-meter operations by increasing pressures and limiting draws from pipelines in accordance with their contractual agreements and supply plans.
- Pipeline Connected LNG – Any remaining needs of the LDCs are supplied by large pipeline-connected LNG facilities such as Canaport, Distrigas and the Excelerate buoy. Depending on the assumed daily “cap” on LNG vaporization (the cap is a proxy for LNG inventory management) all of the assumed sources are prorated by the same percentage (Factor = daily cap / total vaporization capability).

Once the gas LDC demand is served, the remaining amount of natural gas for electric generation – and its supply source – can be determined. If the gas LDC demand was ‘low,’ then pipeline gas may be available for electric generators. After the pipeline gas is fully utilized, the next source of gas for electric generation would be from unused pipeline connected LNG facilities. The maximum daily amount of gas available from both classes of supply to the electric sector is then passed to the Electric Sector Dispatch Model.

Electric Sector Dispatch Model

The maximum daily amount of natural gas available to the electric power sector is allocated to each hour using a heuristic algorithm to shape the available gas. The algorithm provides more gas during the higher load hours and less gas to lower load hours with the goal of ensuring that all of the available gas would be consumed each day before turning to other liquid fuel resources. Separate accounting is done for gas supply available from pipelines and gas supply available from pipeline connected LNG facilities.

The amount of gas available from both sources in each hour is converted to available electric MWh in each hour assuming an average conversion efficiency of 7,400 Btu/kWh. This amount of MWhs from available gas is used by the dispatch algorithm where pipeline gas is used first and then resources using gas from vaporized LNG facilities are dispatched subsequently.

Electric Sector Load

The New England electric loads used in the model are based on the loads and temperatures experienced during the winter of 2014/15. All winter hourly loads are then scaled using the ratio of the forecast 90/10 peak demand (net of Energy Efficiency) for the applicable future Capacity Commitment Period year to the observed peak in the historical benchmark year (2014/15).

Reserves

Thirty-Minute Operating Reserves and Ten-Minute Operating Reserves are being served by the distillate oil-only resources with the highest heat rates, which are the best suited to providing reserves.

Resource Availability

The fuel-security model does not assume any scheduled outages. Random unavailability due to forced outages and derates is treated by “derating” the capacity of a resource by an Equivalent Forced Outage Rate on Demand (EFORd) utilizing the ISO’s Generating Availability Data System (GADS) data as described below.

Dispatch Order

Energy to serve the load comes from dispatching the resources in an economic order reflecting winter conditions. Wind and Photovoltaics (PV) are dispatched first using profiles adjusted to reflect expected amounts of those resources as described in the Static Inputs below. Other renewables such as wood, biomass and municipal solid waste are then assumed to be dispatched next, followed by nuclear resources and then coal generators; the Seasonal Claimed

Capability of these resource technologies is based from the most recent CELT report as described in the Static Inputs below. Pumped storage is dispatched next using a daily pumped storage profile used to reflect the characteristic operation of this resource by storing energy during low load periods and generating energy during the higher load periods as described below in the Static Inputs.

Next, conventional hydro-electric generation is dispatched as a constant MW amount in all hours based on average hydro conditions as described in the Static Inputs below. This is followed by the dispatch of imports as a constant MW resource in accordance with assumptions set forth in Section A below.

Next, the aggregate natural gas only resources are dispatched on pipeline gas in each hour, subject to the hourly availability of pipeline gas MWhs. If there is remaining pipeline gas, it is used by the gas-fired, dual-fueled, combined-cycle resources to serve remaining energy demands until the gas MWhs are exhausted.

Next in the dispatch order are the natural-gas only resources that would be dispatched on pipeline-connected-LNG gas, subject to the hourly availability of pipeline-connected-LNG gas MWhs. If there is remaining pipeline-connected-LNG gas, it is used by the gas-fired, dual-fueled, combined-cycle resources to serve remaining energy demands until the pipeline-connected-LNG gas MWhs are exhausted.

If more load still needs to be served, the dual-fueled combined cycle resources that have not been previously dispatched on pipeline or pipeline-connected-LNG are dispatched on distillate oil, subject to fuel in a specific generator's associated oil tank as determined in Section A below.

Next in the dispatch order are the distillate only generators not held for reserve and residual oil generators, subject to fuel in a specific generator's oil tank determined in Section A below.

Last, the dispatch of demand response resources will be applied to the unmet energy.

Any remaining energy not served is then converted to MWhs of Operating Procedure – 4 Actions, Ten-Minute Reserve Depletion and Operating Procedure – 7 Load Shed.

The following inputs will be used when performing the fuel-security reliability reviews.

A. STATIC INPUTS

A fuel-security reliability review will utilize the following static inputs:

i. **Peak Load:** This is calculated using the most recently available CELT Net 90/10 winter peak load (including the effects of energy efficiency) as presented to the Participants Advisory Committee (PAC) in the March timeframe, prior to the annual issuance of the CELT report on May 1.

ii. **Winter Energy Profile:** The hourly system demand from the 2014/2015 winter will be used to create an hourly load shape by using the ratio of the CELT peak load for the relevant Capacity Commitment Period to the 2014/2015 winter peak load. The hourly temperature from the 2014/2015 winter will be used as the modeled hourly temperature.

iii. **LDC Gas Demand:** Set for modeled Capacity Commitment Period with future year total forecasted LDC gas demand held constant from last known Integrated Resource Plan based on vendor-supplied information annually.

iv. **Pipeline Capacity:** Set for modeled Capacity Commitment Period based on vendor-supplied information annually.

v. **Satellite LNG facility vaporization:** Set for modeled year based on vendor-supplied information annually.

vi. **Oil-Only inventory levels:** Set to levels determined using the most recent December fuel surveys submitted to the ISO. Tank inventories then will be assumed to be replenished with one proxy tanker truck per hour when the reorder level is reached. The reorder level is provided using the most recent fuel survey.

vii. **Resource Seasonal Claim Capability:** The winter Seasonal Claimed Capability (MW) from the most recently published CELT report for all Existing Generating Capacity Resources qualified for the instant FCA and energy-only generators active in ISO New England markets. For non-commercial Existing Generating Capacity Resources that are not in the CELT report, the fuel-security reliability review will use the resource's winter Qualified Capacity.

viii. **PV Forecast:** The PV Forecast-Nameplate, year of analysis, and the sum of Markets Total Cumulative and Behind-the-Meter Total Cumulative values from the most recently available CELT report.

ix. **Wind Resource Nameplate:** Based on the most recently available CELT report and Existing Generating Capacity Resources with a Primary Fuel Type = WND, where the sum of the Nameplate (MW) values will be used.

x. **Sun Profile:** The ISO will use the observed hourly profile from the winter of 2014/2015, adjusted to reflect the expected performance of the fleet assumed in service in the study year, and updated annually.

xi. **Onshore Wind Profile:** The ISO will use the observed hourly profile from the winter of 2014/2015, adjusted to reflect the expected performance of the fleet assumed in service in the study year, and updated annually.

xii. **Offshore Wind Profile:** The ISO will use an hourly profile reflecting the expected performance of the fleet assumed in service in the study year as though it had been in operation in the winter of 2014/2015, and updated annually.

xiii. **Demand Response Resources:** The winter Seasonal Claimed Capability (MW) reduction value from active Demand Response Resources.

xiv. **EFORd:** The ISO calculated Equivalent Forced Outage Rate on Demand (EFORd) utilizing the ISO's Generating Availability Data System (GADS) data. EFORd will be applied to Seasonal Claimed Capability, vii above, in the same manner it is applied for ICR and related values calculations.

xv. **OP-4 Action MW:** Estimated hourly MW relief for each action of OP-4.

xvi. **Export De-List Bids and Administrative Export Bids:** Resource capacity associated with Export De-List Bids and Administrative Export Bids qualified for the instant FCA will not be included as capacity available to ISO to meet internal New England load, and these bids will not be modeled.

xvii. **Pumped Storage:** Set to levels using a daily pumped storage profile used to reflect the characteristic operation of this resource by storing energy during low load periods and generating energy during the higher load periods.

xviii. **Conventional Hydro-Electric Generation:** This resource is dispatched at an hourly output based on the weighted average hydro Capacity Factor calculated using the latest 5-year NERC EFORd Capacity Factor Class Averages for HYDRO 1-29 and HYDRO 30 Plus.

B. VARIABLE INPUTS:

The fuel-security reliability review will consider the following variable inputs:

i. **Imports:** Imports for this review will be defined as the total net flow across the NY-NE, NB-NE and HQ-NE interfaces. The values are set at 2,800 MW, 3,000 MW, and 3,500 MW and will be utilized in separate scenarios.

ii. **LNG Injections:** LNG injections for this review will be defined as the total LNG injected into the pipeline transmission system by the region's three available LNG facilities, Canaport, Distrigas and Buoy. The values are set at 0.8 Bcf, 1.0 Bcf and 1.2 Bcf and will be utilized in separate scenarios.

iii. **Dual-Fuel resource tank inventory:** Dual-Fuel resource tank inventory for this review will be defined as a multiplier for the onsite fuel-storage tank of the individual resource. The values are set at 1.25 and 2 and will be utilized in separate scenarios. When the value is set to 1.25, the onsite available fuel for the individual resources will be set to

125% capacity of the individual resources' tanks at the start of the analysis. When the value is set to 2, the onsite available fuel for the individual resources will be set to 200% capacity of the individual resources' tanks at the start of the analysis.

The variable inputs in this section can be changed based upon historical trends, new infrastructure, fuel surveys and as the ISO deems necessary, and the information will be provided to the Reliability Committee in accordance with section 2 above.

C. SYSTEM MODEL STARTING POINT

The model will include all new resources that have a binding and enforceable contract under a state procurement to be in-service by the December 1 of the associated Capacity Commitment Period that, by the time the fuel-security reliability review is conducted, have submitted the certification described in Section 10 of PP10, pursuant to Section 4.1(f) of Attachment K to Part II of the Tariff. The model will take into consideration any obligation(s) to operate under these contracts, or lack thereof, regarding energy deliveries specific to winter stress conditions being reviewed for fuel security.

Table 1
Timetable for ISO Notification to Include Resources in the Fuel Security Reliability Review

Date	CCP13 2022-2023	CCP14 2023-2024	CCP15 2024-2025	Submission of Certification of Contractual Commitment from Resources Being Built in Accordance with Attachment K to the ISO*
Receipt of FERC order for FCA 13				Sep-15-18
Feb-19	FCA			Jan-15-19
Feb-20		FCA		Jan-15-19
Jun-20	ARA1			Apr-15-20
Feb-21			FCA	Jan-15-20
Jun-21		ARA1		Apr-15-21
Aug-21	ARA2			Jun-15-21
Mar-22	ARA3			Jan-15-22
Jun-22			ARA1	Apr-15-22
Aug-22		ARA2		Jun-15-22

Mar-23		ARA3		Jan-15-23
Aug-23			ARA2	Apr-15-23
Mar-24			ARA3	Jan-15-24

* If the notification to ISO indicates the contract for the resource is pending regulatory approval of the state's review, the ISO will require an update 5 business days prior to the auction or prior to the retirement de-list bid deadline that the pending contracts have been approved. If the notification timeline is not met, the resources will be removed from the model for the given auction for fuel-security reliability review.

D. ORDER OF REVIEW

Bids reviewed for fuel-security will be reviewed in the order prescribed by Section III.13.2.5.2.5A.d of the Tariff.

E. RESULTS OF THE FUEL-SECURITY RELIABILITY REVIEW

The fuel-security reliability review results will document the following metrics per scenario:

- OP-4 Action 1 MWh
- OP-4 Action 1 Hours
- OP-4 Actions 2-5 MWh
- OP-4 Actions 6-11 MWh
- 10 - Minute Reserve Depletion MWh
- 10 - Minute Reserve Depletion Hours
- 10 - Minute Reserve Depletion less than 700 MW in Hours
- OP-7 Action: Load Shedding MWh
- OP-7 Action: Load Shedding Hours
- OP-7 Action: Load Shedding Individual Days

Hourly curves profiling the MWh of OP-4 Actions and OP-7 Actions across the applicable analyzed winter period will also be documented.

4. Reliability Need for a Generator Based on Fuel-Security Reliability Review Results

The ISO New England fuel-security reliability review standard is set out at Appendix L of Section III of the Tariff. Results from the testing described in this Planning Procedure 10, Appendix I will be measured against the trigger set out in that Appendix L.

ATTACHMENT B

ISO NEW ENGLAND PLANNING PROCEDURE NO. 10, APPENDIX I

VERSION CONTAINING REDLINED CHANGES FOR USE IN THE FCA 14 AND SUBSEQUENT FUEL SECURITY RELIABILITY REVIEWS

19.0 Appendix I – Fuel-Security Reliability Review for Forward Capacity Market (FCM)

1.0 Purpose

This appendix will establish the process and criteria for evaluating the reliability impacts of FCM (a) Retirement De-List Bids, (b) substitution auction demand bids, (c) bilateral transactions, and (d) all reconfiguration auction demand bids on system fuel security as required by Section III.13.2.5.2.5A of the Tariff. The process for this fuel-security reliability review is set out in this Appendix I to PP10.

1.1 Term and Sunset of this Appendix I

This appendix shall remain in use for the period described in Section III.13.2.5.2.5A.a of the Tariff.

2.0 Timeline and Applicability

The timeline for and applicability for fuel security reliability reviews is set out at Section III.13.2.5.2.5A.b of the Tariff.

2.1 Input Review with Stakeholders

Each year in February or March, prior to the commencement of the fuel-security reliability review for a FCA, the ISO will consult with the Reliability Committee regarding ~~discuss~~ the inputs described in Section 3 below ~~with the Reliability Committee~~.

2.2 ISO Notification of Fuel-Security Reliability Review Results to the Participant

The results of the fuel-security reliability review will be quantified in an ISO issued determination notification that is issued pursuant to Section III.13.2.5.2.5A.f of the Tariff.

2.3 ISO Notification and Review of Determination with Stakeholders

The ISO determinations described in Section III.13.2.5.2.5A.f will be reviewed with stakeholders, at the Reliability Committee, in the same general timeframe that resources retained for transmission security are reviewed, as outlined in PP-10, Section 7.6.

2.3.1 ~~50/50 Load~~ Informational Analysis Presentation

An informational fuel-security reliability review with a 50/50 peak load forecast from the most recent CELT will also be performed in all scenarios analyzed for units retained utilizing the 90/10 peak load forecast, and included in with the materials described in this Section 2.3. This analysis is not used for unit retention determinations.

For the FCA 14 fuel-security reliability review cycle, an additional informational analysis will be performed to simulate the impact of approximately 500 MW of offshore wind that is being developed under a state procurement program with an in-service date for the winter under study, but which has not yet received all required state approvals.

3.0 Fuel-Security Reliability Review

The fuel-security review consists of an hour-by-hour chronological simulation of the New England electric supply systems for a winter period from the beginning of December through the end of February. One of the key assumptions driving the results of the review is the amount of natural gas available for electric generation.

Natural Gas Assessment

The fuel-security reliability review models natural-gas consumption on a daily basis. The primary, independent variable is average daily temperature converted to heating degree days (HDD). Given a daily temperature, the total gas demand for Residential, Commercial and Industrial (RCI) customers is established based on updated gas demand reports and the sources for serving this gas demand are based on the following:

- Gas from Pipelines – The first source utilized for natural gas comes from the pipeline supply encompassing Algonquin, Tennessee, Iroquois, and Portland Natural Gas Transmission System (PNGTS) ~~from the west and Sable Island and Deep Panuke from the east (both assumed to be inactive in the near future)~~.
- Satellite Liquefied Natural Gas (LNG) – On cold days (HDD) ~~with 53 HDD or more~~, the model assumes that injections from gas Local Distribution Company (LDC) satellite LNG storage facilities will be activated in order to support the LDC behind-the-meter operations by increasing pressures and limiting draws from pipelines in accordance with their contractual agreements and supply plans. An LNG injection curve shall be constructed from the implied satellite LNG injections calculated for the past five winters using forecast LDC gas demand for the modelled Capacity Commitment Period and actual non-power gas demand determined using publicly available bulletin board data.
- Pipeline Connected LNG – Any remaining needs of the LDCs are supplied by large pipeline-connected LNG facilities such as Canaport, Distrigas and the Excelerate buoy. ~~Depending on the assumed daily "cap" on LNG vaporization (the cap is a proxy for LNG inventory management) all of the assumed sources are prorated by the same percentage (Factor = daily cap / total vaporization capability).~~

Once the gas LDC demand (i.e., New England and New Brunswick gas demand) is served, the remaining amount of natural gas for electric generation – and its supply source – can be determined. If the gas LDC demand was 'low,' then pipeline gas may be available for electric generators. After the pipeline gas is fully utilized, the next source of gas for electric generation would be from unused pipeline connected LNG facilities subject to the daily "cap" on LNG vaporization as addressed in Section B below. The maximum daily amount of gas available from both classes of supply to the electric sector is then passed to the Electric Sector Dispatch Model.

Electric Sector Dispatch Model

The maximum daily amount of natural gas available to the electric power sector is allocated to each hour using a heuristic algorithm to shape the available gas. The algorithm provides more gas during the higher load hours and less gas to lower load hours with the goal of ensuring that all of the available gas would be consumed each day before turning to other liquid fuel resources. Separate accounting is done for gas supply available from pipelines and gas supply available from pipeline connected LNG facilities.

The amount of gas available from both sources in each hour is converted to available electric MWh in each hour assuming an average conversion efficiency of 7,400 Btu/kWh. This amount of MWhs from available gas is used by the dispatch algorithm where pipeline gas is used first and then resources using gas from vaporized LNG facilities are dispatched subsequently.

Electric Sector Load

The New England electric loads used in the model are based on the loads and temperatures experienced during the winter of 2014/15. All winter hourly loads are then scaled using the ratio of the forecast 90/10 peak demand (net of Energy Efficiency) for the applicable future Capacity Commitment Period year to the observed peak in the historical benchmark year (2014/15).

Reserves

Thirty-Minute Operating Reserves and Ten-Minute Operating Reserves are being served by the distillate oil-only resources with the highest heat rates, which are the best suited to providing reserves.

Resource Availability

The fuel-security model does not assume any scheduled outages. Random unavailability due to forced outages and derates is treated by "derating" the capacity of a resource by an Equivalent Forced Outage Rate on Demand (EFORd) utilizing the ISO's Generating Availability Data System (GADS) data as described below.

Dispatch Order

Energy to serve the load comes from dispatching the resources in an economic order reflecting winter conditions. Wind and Photovoltaics (PV) are dispatched first using profiles adjusted to reflect expected amounts of those resources as described in the Static Inputs below. Other renewables such as wood, biomass and municipal solid waste are then assumed to be dispatched next, followed by nuclear resources and then coal generators; the Seasonal Claimed Capability of these resource technologies is ~~based~~ derived from the most recent CELT report as described in the Static Inputs below. Pumped storage and other electric storage resources are~~is~~ dispatched next using ~~a~~ daily ~~pumped~~ storage profiles used to reflect the characteristic operation of each ~~this~~ resource type by storing energy during low load periods and generating energy during the higher load periods as described below in the Static Inputs.

Next, conventional hydro-electric generation is dispatched at an hourly profiled ~~s a constant~~ MW amount ~~in all hours based on average hydro conditions~~ as described in the Static Inputs below. This is followed by the dispatch of imports as a constant MW resource in accordance with assumptions set forth in Section A below.

Next, the aggregate natural gas only resources are dispatched on pipeline gas in each hour, subject to the hourly availability of pipeline gas MWhs. If there is remaining pipeline gas, it is used by the gas-fired, dual-fueled, combined-cycle resources to serve remaining energy demands until the gas MWhs are exhausted.

Next in the dispatch order are the natural-gas only resources that would be dispatched on pipeline-connected-LNG gas, subject to the hourly availability of pipeline-connected-LNG gas MWhs. If there is remaining pipeline-connected-LNG gas, it is used by the gas-fired, dual-fueled, combined-cycle resources to serve remaining energy demands until the pipeline-connected-LNG gas MWhs are exhausted.

If more load still needs to be served, the dual-fueled combined cycle resources that have not been previously dispatched on pipeline or pipeline-connected-LNG are dispatched on distillate oil, subject to fuel in a specific generator's associated oil tank as determined in Section A below.

Next in the dispatch order are the distillate only generators not held for reserve and residual oil generators, subject to fuel in a specific generator's oil tank determined in Section A below.

Last, the dispatch of demand response resources will be applied to the unmet energy.

Any remaining energy not served is then converted to MWhs of Operating Procedure – 4 Actions, Ten-Minute Reserve Depletion and Operating Procedure – 7 Load Shed.

The following inputs will be used when performing the fuel-security reliability reviews.

A. STATIC INPUTS

A fuel-security reliability review will utilize the following static inputs:

i. **Peak Load:** This is calculated using the ~~most recently available~~ draft CELT Net 90/10 winter peak load values (including the effects of energy efficiency) ~~as~~ presented to the

Participants Planning Advisory Committee (PAC) in the March timeframe during the spring of the year when the fuel security reliability review is performed, which is prior to the annual issuance of the final values in the CELT report released on May 1.

ii. **Winter Energy Profile:** The hourly system demand from the 2014/2015 winter will be used to create an hourly load shape by using the ratio of the CELT peak load for the relevant Capacity Commitment Period to the 2014/2015 winter peak load. The hourly temperature from the 2014/2015 winter will be used as the modeled hourly temperature.

iii. **LDC Gas Demand:** Set for modeled Capacity Commitment Period with future year total forecasted LDC gas demand held constant from last known Integrated Resource Plan based on vendor-supplied information annually. The LDC winter peak demand for the modeled Capacity Commitment Period will be set annually based on vendor supplied information with growth for the modeled period adjusted to not exceed the addition of any new gas supply capacity. The LDC winter peak demand shall be capped at the value utilized in the prior year's fuel security reliability review (i.e., for the prior Capacity Commitment Period). Both New England and New Brunswick LDC gas demand shall be accounted for in the modelling.

iv. **Pipeline Capacity:** Set for modeled Capacity Commitment Period based on vendor-supplied information annually.

v. **Satellite LNG facility vaporization:** Set for modeled year based on vendor-supplied information annually.

vi. **Oil-Only inventory levels:** Tank inventory levels for oil-only resources and dual-fuel resources that operate primarily on oil during the winter shall be sSet to levels determined using the 2017/2018 winter most recent December fuel surveys submitted to the ISO in December. Tank inventories then will be assumed to be replenished with 202 barrels per one proxy tanker truck per hour when the reorder level is reached. The reorder level is provided using the results of the 2017/2018 winter most recent fuel survey.

vii. **Resource Seasonal Claim Capability:** The winter Seasonal Claimed Capability (MW) from the most recently published CELT report for all Existing Generating Capacity Resources qualified for the instant FCA and energy-only generators active in ISO New England markets. For non-commercial Existing Generating Capacity Resources that are not in the CELT report and energy-only generators that are in service but are not in the CELT report, the fuel-security reliability review will use the resource's winter Qualified Capacity and the winter SCC value (as of the fifth business day in May), respectively.

viii. **PV Forecast:** For photovoltaic resources accounted for in the PV forecast, the fuel-security reliability review will use ~~The PV Forecast-Nameplate, year of analysis, and the sum of Markets Total Cumulative and Behind-the-Meter Total Cumulative~~ draft CELT values ~~from the most recently available CELT report~~as presented to the PAC during the spring of the year when the fuel security reliability review is performed, which is prior to the annual issuance of the final values in the CELT report released on May 1. For in-service photovoltaic resources not accounted for in the draft forecast values, the fuel-security reliability review will use the nameplate values. For non-commercial photovoltaic Existing Generating Capacity Resources that are not in the CELT report, the fuel-security reliability review will use the nameplate equivalent of the resource's Capacity Supply Obligation received in the most recent Forward Capacity Auction.

ix. **Wind Resource Nameplate:** For wind resources accounted for in the most recently available CELT report and in-service wind resources not accounted for in the most recently available CELT report, the fuel-security reliability review will use the nameplate values~~Based on the most recently available CELT report and Existing Generating Capacity Resources with a Primary Fuel Type = WND, where the sum of the Nameplate (MW) values will be used~~. For non-commercial wind Existing Generating Capacity Resources that are not in the CELT report, the fuel-security reliability review will use the nameplate equivalent of the resource's Capacity Supply Obligation received in the most recent Forward Capacity Auction.

x. **Sun Profile:** The ISO will use the observed hourly profile from the winter of 2014/2015, adjusted to reflect the expected performance of the fleet assumed in service in the study year, and updated annually.

xi. **Onshore Wind Profile:** The ISO will use the observed hourly profile from the winter of 2014/2015, adjusted to reflect the expected performance of the fleet assumed in service in the study year, and updated annually.

xii. **Offshore Wind Profile:** The ISO will use an hourly profile reflecting the expected performance of the fleet assumed in service in the study year as though it had been in operation in the winter of 2014/2015, and updated annually.

xiii. **Demand Response Resources:** The winter Seasonal Claimed Capability (MW) reduction value from active Demand Response Resources.

xiv. **EFORd:** The ISO calculated Equivalent Forced Outage Rate on Demand (EFORd) utilizing the ISO's Generating Availability Data System (GADS) data. EFORd will be applied to Seasonal Claimed Capability, vii above, in the same manner it is applied for ICR and related values calculations.

xv. **OP-4 Action MW:** Estimated hourly MW relief for each action of OP-4.

xvi. **Export De-List Bids and Administrative Export Bids:** Resource capacity associated with Export De-List Bids and Administrative Export Bids qualified for the instant FCA will not be included as capacity available to ISO to meet internal New England load, and these bids will not be modeled.

xvii. **~~Pumped~~ Pumped Storage and Other Electric Storage Devices:** Set to levels using a daily ~~pumped~~ storage profile ~~used to~~that reflects the characteristic operation of ~~this~~ the resource by storing energy during low load periods and generating energy during the higher load periods.

xviii. **Conventional Hydro-Electric Generation:** This resource is dispatched at an hourly output based on the ~~weighted average hydro Capacity Factor calculated using the latest 5-year NERC EFORd Capacity Factor Class Averages for HYDRO 1-29 and HYDRO 30 Plus~~observed hourly profile from the winter of 2014/2015, adjusted to reflect the expected performance of the fleet assumed in service in the study year, and updated annually.

B. VARIABLE INPUTS:

The fuel-security reliability review will consider the following variable inputs:

i. **Imports:** Imports for this review will be defined as the total net flow across the NY-NE, NB-NE and HQ-NE interfaces. The values are set at 2,800 MW, 3,000 MW, and 3,500 MW and will be utilized in separate scenarios.

ii. **LNG Injections:** LNG injections for this review will be defined as the total LNG injected into the pipeline transmission system by the region's three available LNG facilities, Canaport, Distrigas and Buoy. The values are set at 0.8 Bcf, 1.0 Bcf and 1.2 Bcf and will be utilized in separate scenarios.

iii. **Dual-Fuel resource tank inventory:** For d~~D~~ual-f~~F~~uel resources that operate primarily on natural gas during the winter, tank inventory for this review will be defined as a multiplier for the onsite fuel-storage tank of the individual resource. The values are set at 1.25 and 2 and will be utilized in separate scenarios. When the value is set to 1.25, the onsite available fuel for the individual resources will be set to 125% capacity of the individual resources' tanks at the start of the analysis. When the value is set to 2, the onsite available fuel for the individual resources will be set to 200% capacity of the individual resources' tanks at the start of the analysis.

The variable inputs in this section can be changed based upon historical trends, new infrastructure, fuel surveys and as the ISO deems necessary, and the information will be provided to the Reliability Committee in accordance with section 2 above.

C. SYSTEM MODEL STARTING POINT

With the exception noted below, tThe model will include all new resources that have a binding and enforceable contract under a state procurement to be in-service by the January 1 December 1 of the associated Capacity Commitment Period that, by the time the fuel-security reliability review is conducted, have (i) submitted the certification described in Section 10 8.1.2 of PP10, pursuant to Section 4.1(f) of Attachment K to Part II of the Tariff, or (ii) demonstrated the contractual requirements through submittal of an order or other similar authorization from the appropriate state regulatory agency, along with a copy of the contract, by five business days prior to the Existing Capacity Retirement Deadline. - The model will take into consideration any obligation(s) to operate under these contracts, or lack thereof, regarding energy deliveries specific to winter stress conditions being reviewed for fuel security. With respect to (ii) above, the demonstration can be made by the state regulatory agency authorizing the contract, by a transmission company or electric distribution companies that is a counterparty to the contract, or by a third-party organization representing the interests of the New England states regarding energy-related issues (e.g., NESCOE). For FCA 14, offshore wind resources shall have until April 23, 2019 to demonstrate the contractual requirements stated above. If demonstration of the contractual requirements is received after April 23, 2019, the ISO will make reasonable efforts to account for the resource in the model (e.g., scenario analysis), to the extent that doing so will not interfere with the ability of the ISO to complete the analysis and issue its determination by 90 days after the Existing Capacity Retirement Deadline.

Table 1
Timetable for ISO Notification to Include Resources in the Fuel Security Reliability Review

Date	CCP13 2022-2023	CCP14 2023-2024	CCP15 2024-2025	Submission of Certification of Contractual Commitment from Resources Being Built in Accordance with Attachment K to the ISO*
Receipt of FERC order for FCA 13				Sep-15-18
Feb-19	FCA			Jan-15-19
Feb-20		FCA		JanApr-2315-19
Jun-20	ARA1			Apr-15-20

Feb-21			FCA	Jan-15-20
Jun-21		ARA1		Apr-15-21
Aug-21	ARA2			Jun-15-21
Mar-22	ARA3			Jan-15-22
Jun-22			ARA1	Apr-15-22
Aug-22		ARA2		Jun-15-22
Mar-23		ARA3		Jan-15-23
Aug-23			ARA2	Apr-15-23
Mar-24			ARA3	Jan-15-24

* If the notification to ISO indicates the contract for the resource is pending regulatory approval of the state's review, the ISO will require an update 5 business days prior to the auction or prior to the retirement de-list bid deadline that the pending contracts have been approved. If the notification timeline is not met, the resources will be removed from the model for the given auction for fuel-security reliability review.

D. ORDER OF REVIEW

Bids reviewed for fuel-security will be reviewed in the order prescribed by Section III.13.2.5.2.5A.d of the Tariff.

E. RESULTS OF THE FUEL-SECURITY RELIABILITY REVIEW

The fuel-security reliability review results will document the following metrics per scenario:

- OP-4 Action 1 MWh
- OP-4 Action 1 Hours
- OP-4 Actions 2-5 MWh
- OP-4 Actions 6-11 MWh
- 10 - Minute Reserve Depletion MWh
- 10 - Minute Reserve Depletion Hours
- 10 - Minute Reserve Depletion less than 700 MW in Hours
- OP-7 Action: Load Shedding MWh
- OP-7 Action: Load Shedding Hours

- OP-7 Action: Load Shedding Individual Days

Hourly curves profiling the MWh of OP-4 Actions and OP-7 Actions across the applicable analyzed winter period will also be documented.

4. Reliability Need for a Generator Based on Fuel-Security Reliability Review Results

The ISO New England fuel-security reliability review standard is set out at Appendix L of Section III of the Tariff. Results from the testing described in this Planning Procedure 10, Appendix I will be measured against the trigger set out in that Appendix L.