



memo

To: NESCOE
From: ISO New England
Date: July 18, 2018
Subject: Responses to Operationally-oriented Questions on Fuel Security

The New England states have asked questions regarding operational actions during the winter and how those actions may affect the region's fuel security challenges. The ISO's responses to these questions are detailed below. In addition to these questions, the states have asked the ISO to provide its fuel security problem definition at this time.

As the ISO has reported, the discussions on the long-term market design have been temporarily deferred until after the "Chapter 2" discussions and the required FERC filing on August 31, 2018. The region's fuel security problem has been broadly discussed and presented through ISO analysis and numerous other studies. Put simply, from an ISO operational perspective, the problem is defined as the ability to serve load during the winter period when the interstate pipeline infrastructure is constrained. While the Operational Fuel Security Analysis (OFSA) was intended to illustrate the trend lines under various scenarios and measure such risks in terms of operational metrics, the ISO is not planning on the OFSA model being the basis upon which its market-based solution is built. The ISO believes that the question related to problem definition is primarily with regard to a market-based solution that is contemplated in "Chapter 3." The ISO kicked off an early view of how such an approach might be considered through three frameworks in a stakeholder meeting in June. The ISO plans to build upon that discussion with increasing levels of specificity, starting in late August. The ISO acknowledges the framing of the problem includes principles, product definition, its attendant obligations, and how it interacts with existing market structures.

The ISO looks forward to continuing these important discussions with the states and NEPOOL stakeholders.

[STATE QUESTION 1] What specific out-of-market / non-economic actions did System Operations take during the cold snap?

[ISO RESPONSE] As unit outages, reductions, or external transaction curtailments were either reported or forecasted, supplemental commitments were made to meet load and operating reserve requirements for peak hours. The majority of out-of-market actions occurred during the end of the cold snap, when oil units were depleted significantly and the ISO had to posture units. The ISO reports on commitments and costs through various periodic reports, such as the monthly COO report. System Operations exercises caution and limits such commitments to those needed to maintain reliability.

The following table describes the scope and duration of out-of-market actions taken during the cold spell.

Date	MWh Average	Average Duration (Hours)	Reason for Commitment
12/27/2017	277.7	4.82	Several generators tripped and potential interchange curtailments were reported
12/28/2017	572.4	9.00	Potential interchange curtailments reported
12/29/2017	400.0	8.59	Four generators tripped or were reduced due to non-gas-related issues
12/30/2017	592.6	9.03	Units committed in prior day for operating reserve
12/31/2017	109.9	3.00	Two unit trips, wind generation under forecast, load over forecast
1/1/2018	0.0	0.00	
1/2/2018	0.0	0.00	
1/3/2018	0.0	0.00	
1/4/2018	244.9	24.00	Severe weather, Pilgrim tripped, M/LCC 2 declared
1/5/2018	0.0	0.00	
1/6/2018	881.7	16.28	M/LCC 2 still in effect, Oil inventories depleted significantly
1/7/2018	1379.4	10.99	M/LCC 2 still in effect, Oil inventories depleted significantly

[STATE QUESTION 2] How many hours were affected by such actions?

[ISO RESPONSE] The scope and duration of out-of-market actions taken during the cold spell are captured as part of the ISO’s response to the first question.

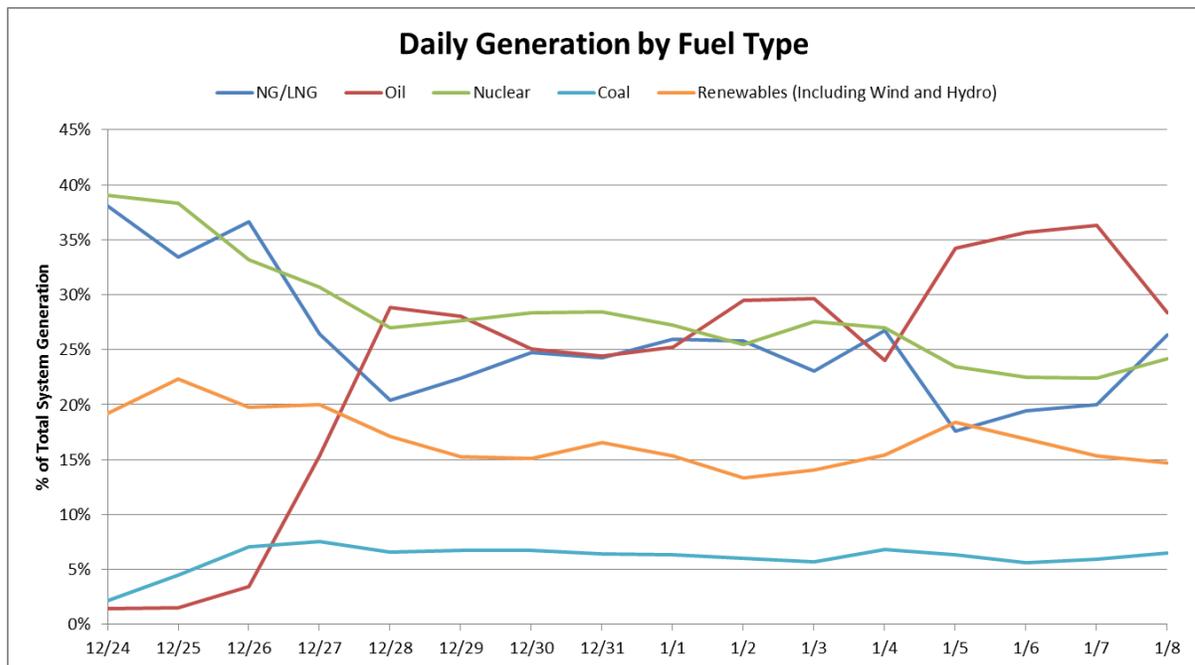
[STATE QUESTION 3] Please describe the standards by which ISO-NE System Operations decide to intervene, with particular focus on those actions that tend to affect prices or would likely limit PFP shortage events?

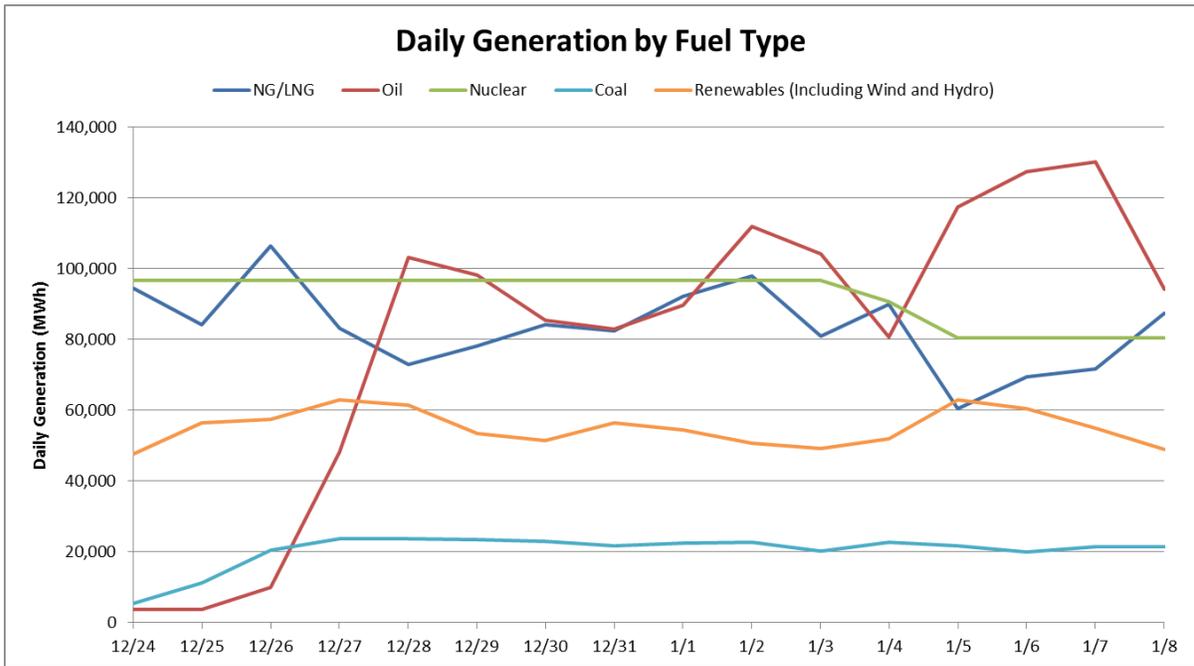
[ISO RESPONSE] The ISO has an obligation to operate in accordance with NERC and NPCC standards; these standards, among others, require the ISO to maintain adequate energy to serve load and operating reserves. ISO System Operations’ actions are to comply with such standards. More specifically, the standards that are relevant are as follows:

- NERC and NPCC require Balancing Authorities to carry 10-minute operating reserves at least equal to the largest source loss. NPCC requires Balancing Authorities to carrying 30-minute reserves equal to half the next largest source loss on top of the 10-minute reserve requirement. NERC does not have a 30-minute reserve requirement.

- NERC and NPCC require Balancing Authorities to activate their 10-minute reserves following a source loss and recover their Area Control Error (ACE) within 15 minutes following the resource loss 100% of the time.
- NERC and NPCC require Balancing Authorities to restore their 10-minute reserves as soon as possible but not to exceed 90 minutes following the ACE recovery period for a total of 105 minutes.
- NPCC requests the ISO to take action if we forecast or are experiencing a shortage of 30-minute reserves for greater than 4 hours. The actions taken would include making arrangements for energy purchases from neighboring areas.

During this past winter, in order to ensure compliance with the above standards, ISO System Operations intervened by either committing supplemental units as other generator outages and reductions were reported or posturing oil units when aggregate oil inventory levels dropped to very low levels and the weather forecasts called for continued cold weather for several more days. The charts below illustrate the fuel used during the period, including Daily Generation by Fuel Type (percent of total) and Daily Generation by Fuel Type (MWh). The ISO was working to ensure that the system made it to the end of the event without developing into an energy emergency – in which case, options to serve load would be limited.





[STATE QUESTION 4] The graphics from the recent cold snap below illustrate potential market impacts associated with system operator actions to reinforce fuel security. Are energy and reserve prices reflecting the regional fuel security value of operators' posturing resources and/or fuel-focused commitments?

Figure 4-4: Day-Ahead and Real-Time Energy and Reserve Prices

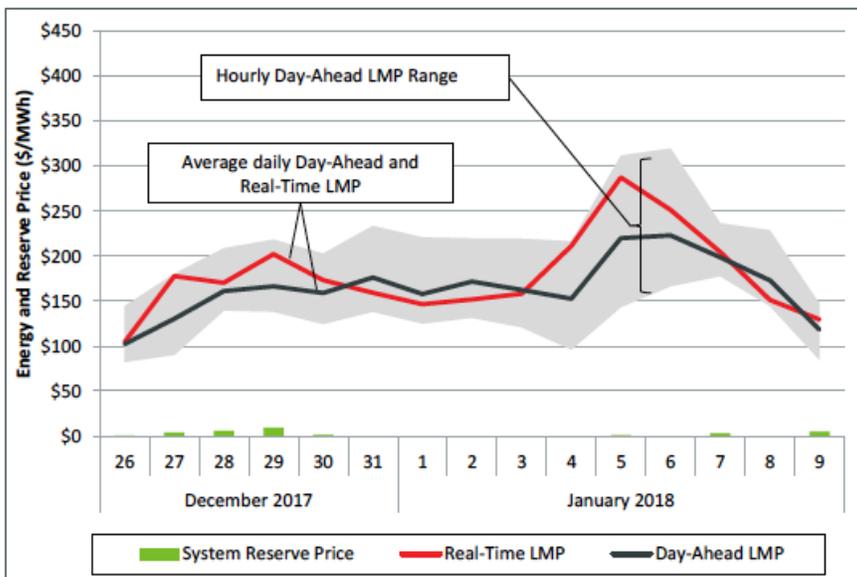
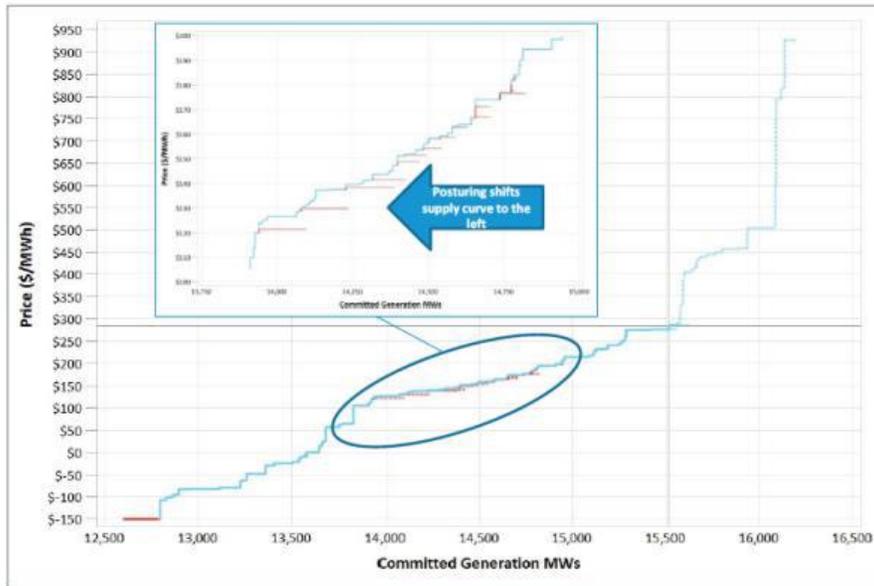


Figure 4-10: Supply Curve at SPM on January 5, 2018



[ISO RESPONSE] The ISO’s fuel security concerns--either on a day-of through week-ahead timeframe or for the duration of a single or multiple cold snap period(s)--revolve around the total MWh of energy available to meet load and reserve requirements. The current energy markets price this on a real-time basis and day-ahead basis, but do not look forward and account for the costs of depleting scarce winter fuel supplies beyond the next day timeframe (via the Day-Ahead Market). That is, the current energy market design (day-ahead and real-time) does not optimize scarce fuel use to ensure sufficient fuel is available throughout the winter and does not reflect the opportunity costs that generators incur if their limited fuels are depleted before they can be replenished.

Using the most recent winter as an example, the ISO does not believe that the energy and reserve prices were reflective of the fuel security risks faced by the region. The Winter Reliability Program incented sufficient levels of oil, and arguably influenced the forward prices and expectations in the market. The ISO commitments to maintain energy and reserves also affected price formation, and the lack of opportunity costs being factored into the energy market muted price signals.

The ISO expects that this will be a topic of discussion as we evaluate market-based solutions to address (a) fuel security risks and (b) reserve market enhancements recommended by the External Market Monitor.

[STATE QUESTION 5] Please explain how previous years’ winter weather and energy security metrics – with Winter Program incentives and without Pay for Performance incentives – are indicative of upcoming winters’ energy security needs?

[ISO RESPONSE] The ISO is required to operate the system to comply with NERC and NPCC standards. The ISO has not established specific metrics for winter operations, beyond the obligation to serve load and maintain operating reserves. It has been well established that New England is reliant on stored fuels when the natural gas interstate pipelines become constrained. As experienced during the recent December-January cold weather, these stored fuels can be depleted quickly. Depending on fuel inventories at the start of the season and the time needed to replenish stored fuels, an extended cold spell or a series of cold spells may result in the implementation of emergency procedures.

Previous winters, including the winter of 2014-2015, which had a series of cold spells, provide a reasonable energy profile against which to evaluate starting levels of stored fuels, replenishment capabilities, and contributions from other resources. The Winter Reliability Program was narrowly tailored to fuel oil and, therefore, it established a baseline of fuel oil that was available as a starting point for the past few winter periods. This December, the ISO will have its first data point with regards to the Pay-for-Performance incentives – specifically if the transition incentives will result in similar, or different levels of oil inventories, and other measures that resources might take.

For the 2018/19 winter, the ISO is planning on updating its OP-21 procedure to provide additional information to the market through 21-day energy forecasts. The ISO is also planning on making improvements to the opportunity costs provision of the energy market – partly to alleviate the need for the ISO to posture units. Beyond these immediate considerations, the ISO will be working with stakeholders to implement a market-based solution to improve regional energy security during the winter period. The specific objectives and metrics for success for the market-based solution will be discussed as part of this process.

To: ISO-NE
From: NESCOE
Date: July 9, 2018
Subject: Operationally-oriented Questions on Fuel Security and Problem Statement

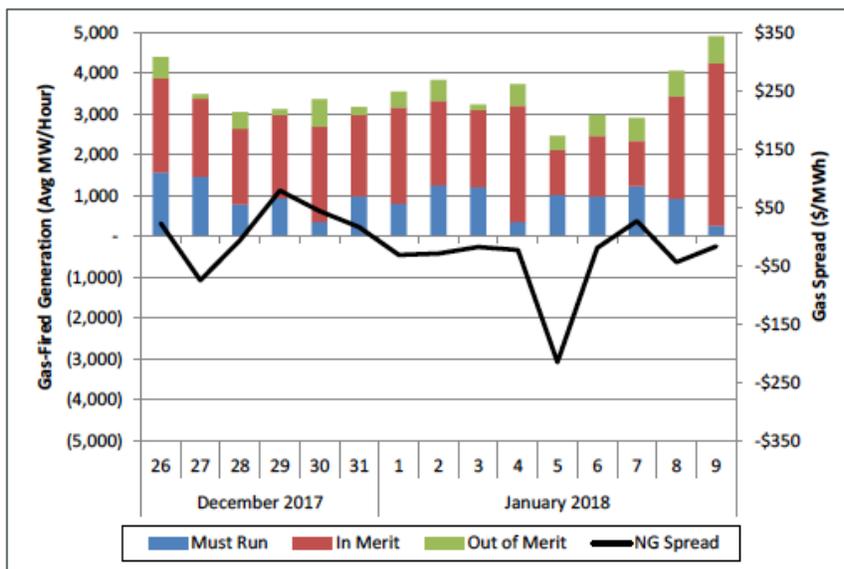
State officials' discussions with NEPOOL Sectors at the June 2018 NEPOOL Participants Committee meeting highlighted questions related to ISO-NE's fuel security concerns and the need to better understand ISO-NE's operational concerns prior to exploring potential market solutions. NESCOE would appreciate ISO-NE providing information in response to related questions below.

Similarly, state officials' discussions with NEPOOL Sectors underscored the continuing need for ISO-NE to issue, based on its operational and market experience and analysis, the specific long-term fuel security problem that ISO-NE believes New England needs to solve.

NESCOE understands that ISO-NE intends to defer stakeholder meetings on the long-term ("Chapter 3") project in order to meet the August 31, 2018 timeframe FERC directed in its Mystic 8/9 Waiver Order (Docket Nos. ER18-1509 and EL18-182). ISO-NE noted in its July 3, 2018 communication to states and stakeholders that it remains open to receiving stakeholder feedback on Chapter 3 until ISO-NE resumes those stakeholder meetings. We agree that while the near-term stakeholder meetings need to focus on the August 31, 2018 compliance filing, the region is best served by everyone continuing to think about the potential range of long-term solutions that may satisfy power system needs, state jurisdictional and otherwise. To enable states to make productive use of time between now and the resumption of discussions about potential long-term solutions that may satisfy ISO-NE's concerns about winter power system reliability, NESCOE requests that ISO-NE release its problem definition at this time or alternatively, explain why that is not possible.

We believe that a period of time to consider ISO-NE's long-term problem statement and the operationally-oriented information requested below will help states, stakeholders and ISO-NE continue our collaborative approach to solution development and we appreciate ISO-NE's assistance to this end.

Figure 4-9: Real-Time Gas-Fired Generation by Commitment/Dispatch Type



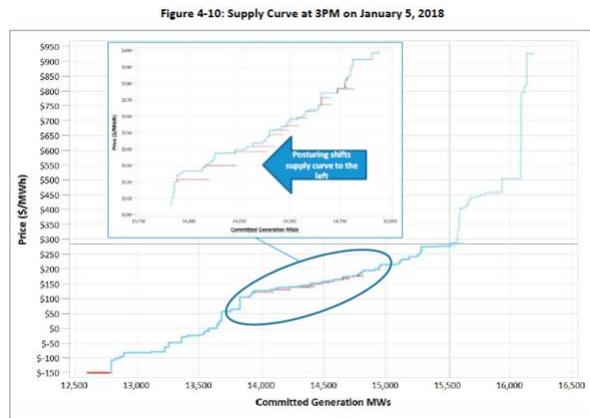
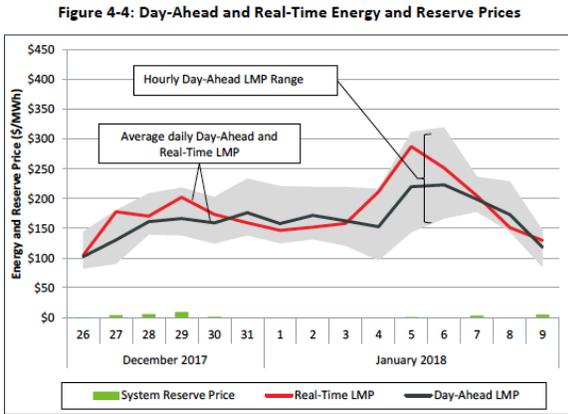
Source: ISO-NE 2018 Winter Quarterly Markets Report

The states heard various market participants’ perception that when fuel security issues arise, ISO-NE system operations intervene and inadvertently distort energy and reserve market prices. Please refer to the graph above for an illustration.

If this perception is supported by facts, market participants are concerned that 1) energy market price formation is understated and 2) the shortage event concept underlying the Pay-for-Performance (PfP) market design will trigger far less frequently than expected at the time of program adoption, if at all. To that end, states, and we believe based on discussions many stakeholders, would benefit from better understanding the types of actions taken by ISO-NE system operations during fuel insecure periods, especially the recent cold snap last winter. (To be clear, questions about ISO-NE system operators’ management of the power system during tight power conditions are entirely about understanding the problem; they are not and should not be interpreted as judgment.)

1. What specific out-of-market / non-economic actions did System Operations take during the cold snap?
2. How many hours were affected by such actions?
3. Please describe the standards by which ISO-NE system operations decide to intervene, with particular focus on those actions that tend to affect prices or would likely limit PfP shortage events?
4. The graphics from the recent cold snap below illustrate potential market impacts associated with system operator actions to reinforce fuel security. Are energy and reserve

prices reflecting the regional fuel security value of operators' posturing resources and/or fuel-focused commitments?



Source: ISO-NE 2018 Winter Quarterly Markets Report

Any market-based solution to the region's fuel security challenges requires ISO-NE to estimate the amount of fuel security (or "energy secure infrastructure", a term ISO-NE coined at the June 2018 fuel security meeting and agreed to define) to be procured by the market. To the extent ISO-NE uses *historical* weather, loads, and electricity market results in New England to inform potential regional fuel security procurement quantity estimates going forward, states and stakeholders would benefit from better understanding how ISO-NE will use that information. Specifically, the question is how ISO-NE will compare information from different time periods with different wholesale market incentives (e.g., before the winter program, during the winter programs, after Pfp implementation) and the likelihood of past conditions being reasonably accurate predictors of future conditions.

5. Please explain how previous years' winter weather and energy security metrics – with Winter Program incentives and without Pay for Performance incentives – are indicative of upcoming winters' energy security needs?