

**STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
ENERGY FACILITY SITING BOARD**

**IN RE: INVENERGY THERMAL DEVELOPMENT LLC's
APPLICATION TO CONSTRUCT THE
CLEAR RIVER ENERGY CENTER IN
BURRILLVILLE, RHODE ISLAND**

DOCKET No. SB-2015-06

**PRE-FILED SUPPLEMENTAL
TESTIMONY OF RYAN HARDY**

(November 20, 2017)

EXECUTIVE SUMMARY

This Supplemental Testimony updates the analysis previously provided to the Board in Ryan Hardy's Pre-Filed Direct and Pre-Filed Rebuttal Testimonies to include an update regarding ISO-NE's determination that the Clear River Energy Center ("CREC") Unit 2 is not qualified to participate in the upcoming Forward Capacity Auction 12, due to delays in the permitting process and deferrals in ordering of major equipment that have resulted from those permitting delays. Mr. Hardy's updated analysis confirms that there is still a need for both CREC Unit 1 and Unit 2 and, with updated adjustments to the analysis previously provided in Mr. Hardy's previous testimonies, the changes to the projected impacts on ratepayer savings, emissions reductions and economic analysis are insignificant as compared to the analysis in his Pre-Filed Direct Testimony.

LIST OF EXHIBITS

- RH SUPPLEMENTAL - 1** John Niland Letter to the Rhode Island Energy Facility Siting Board, dated November 1, 2017, enclosing PA Consulting Group's Memorandum, dated October 26, 2017
- RH SUPPLEMENTAL – 2** Providence Journal Article, entitled “Power grid operator says reliance on natural gas will last decades,” dated November 18, 2017
- RH SUPPLEMENTAL – 3** Presentation Slides of Gordon Van Welie, the President and CEO of the ISO-NE, dated November 17, 2017

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**INVENERGY THERMAL DEVELOPMENT LLC'S PRE-FILED SUPPLEMENTAL
TESTIMONY OF RYAN HARDY, PA CONSULTING GROUP, INC.**

1 **Q. PLEASE STATE YOUR NAME, BUSINESS TITLE AND BUSINESS ADDRESS.**

2 **A.** Ryan Hardy, Member of PA Consulting Group, Inc.'s ("PA") Management Group, located
3 at 10 Canal Park, Cambridge, Massachusetts.

4 **Q. ON WHOSE BEHALF ARE YOU TESTIFYING?**

5 **A.** My testimony is on behalf of the applicant, Invenergy Thermal Development LLC
6 ("Invenergy"), in support of its application for a license from the Rhode Island Energy Facility
7 Siting Board ("EFSB" or "Board") to construct the Clear River Energy Center project in
8 Burrillville, Rhode Island ("CREC" or "Facility" or "Project").

9 **Q. WHAT IS THE PURPOSE OF YOUR SUPPLEMENTAL TESTIMONY?**

10 **A.** The purpose of this Supplemental Testimony is to update the analysis provided to the Board
11 in my Pre-Filed Direct and Pre-Filed Rebuttal Testimonies to include an update regarding ISO-
12 NE's determination that CREC Unit 2 is not qualified to participate in the upcoming FCA 12, due
13 to delays in the permitting process and deferrals in ordering of major equipment that have resulted
14 from those permitting delays. *See Exhibit RH Supplemental - 1*, John Niland's Letter to the
15 EFSB, filed with the Board on November 1, 2017.

16 **Q. PLEASE EXPLAIN.**

17 **A.** The analysis that underpinned my previous testimonies assumed that CREC Unit 2 would
18 be able to participate in FCA 12. The determination that CREC Unit 2 will not be able to participate

1 potentially impacts the timing of when CREC Unit 2 could enter the market. While this adjustment
2 in timing will not change my testimony regarding the need for the full CREC Project, my analysis
3 on projected ratepayer savings, emissions reductions, and economic output will require some
4 adjustments. Moreover, as I describe further below, these changes do not materially impact the
5 findings of my previous analysis.

6 **Q. HAVE YOU UPDATED YOUR ANALYSIS FOR THIS NEW INFORMATION?**

7 **A.** Yes. I updated my analysis to assume that CREC Unit 2 participates in FCA 13 versus FCA
8 12. I made no other assumption changes to the analysis presented in my previous testimonies.
9 This update does not impact CREC Unit 1, as CREC Unit 1 has previously obtained a Capacity
10 Supply Obligation in FCA 10. In my updated analysis, CREC Unit 2 is expected to clear FCA 13
11 with an online date of June 1, 2022, which reflects a 1 year delay from my previous analysis.

12 **Q. DO THESE ADJUSTMENTS CHANGE YOUR OPINION THAT THE CREC**
13 **PROJECT IS NEEDED?**

14 **A.** The postponement in participation of CREC Unit 2 from FCA 12 to FCA 13 does not
15 impact my previous testimony that CREC is needed. And, the postponement of CREC Unit 2's
16 participation to FCA 13 also has no bearing on any of the four findings by the Rhode Island PUC
17 that concluded that the entire CREC Project is needed.

18
19 Also, in a recent presentation by Gordon Van Welie, the President and CEO of the ISO-
20 NE, Mr. Van Welie explained that ISO-NE expects electricity demand in the region to start going
21 up, especially as more people transition to electric vehicles and heat pumps for home heating. *See*
22 **Exhibit RH Supplemental-2**, Providence Journal Article, dated November 18, 2017. Mr. Van
23 Welie further explained that proposed wind farms, solar arrays and battery storage alone would
24 not be able to meet this new and growing demand for electricity (“not going to happen”) and that
25 “for the most part the energy for this increased demand for electricity will need to come from

1 natural gas.” Mr. Van Welie also cautioned that Invenenergy’s inability to sell half of its output in
2 recent auctions cannot be viewed as meaning the project is not needed. *See Exhibit RH*
3 **Supplemental-3**, Mr. Van Welie’s Presentation Slides, at 8 (noting that “additional retirements
4 are looming”). These recent statements confirm the PUC’s Advisory Opinion on the need for the
5 CREC Project, notwithstanding that the ISO-NE has taken this recent action in the QDN and the
6 results of recent FCA events.

7 **Q. PLEASE EXPLAIN WHY THE ISO-NE’S DETERMINATION DOES NOT**
8 **IMPACT THE PUC’S OPINION REGARDING THE NEED FOR BOTH UNITS.**

9 **A.** As confirmed by the Rhode Island PUC in its Advisory Opinion, there are several forms
10 of need within ISO-NE and Rhode Island. The Rhode Island PUC’s four major findings that
11 indicate a reliability need for the full CREC facility were that:

- 12 (1) CREC Unit 1 cleared an FCA;
- 13 (2) That there is a significant amount of capacity at-risk for retirement;
- 14 (3) Rhode Island is within an import constrained zone; and
- 15 (4) That capacity above the net Installed Capacity Requirement (“NICR”) is needed.

16 Moreover, there are several other forms of need for CREC that are not impacted by the
17 potential one-year postponement. These include CREC being a dual fuel facility that will use
18 natural gas as its primary fuel and fuel oil as a backup, and CREC’s ability to help integrate
19 renewable generation. The dual fuel capability of CREC improves the winter reliability of the ISO-
20 NE system, which ISO-NE has indicated is a major system challenge. Similarly, as a flexible and
21 efficient generator, CREC will help support the integration of renewable generation on the ISO-
22 NE grid by providing an effective resource to balance the variable nature of wind and solar. The
23 ISO-NE’s decision does not change any of these important considerations in the Board’s analysis
24 of the need for the CREC Project.

1 **Q. HOW DOES ISO-NE'S DETERMINATION IMPACT YOUR ESTIMATE OF THE**
2 **RATEPAYER SAVINGS LIKELY TO RESULT FROM CREC'S OPERATION?**

3 **A.** The postponement in participation of CREC Unit 2 from FCA 12 to FCA 13 has a minor
4 impact on ratepayer savings, compared with the analysis in my Pre-Filed Direct Testimony.

5 In the analysis presented in my Pre-Filed Direct Testimony, CREC was projected to save
6 Rhode Island ratepayers between \$122 million and \$429 million between 2019 and 2024,
7 depending on future retirements in New England. This range represents the difference in total
8 capacity and energy costs to Rhode Island-only load resulting from the CREC capacity addition,
9 as measured by comparing cost results from capacity and energy modeling cases (a) with CREC
10 coming online in two stages: June 2020 (485 MW) and June 2021 (an additional 485 MW); and
11 (b) without CREC. The capacity and energy cost differences between these two cases represented
12 the savings to the ratepayers attributable to CREC's operation. Capacity cost savings to Rhode
13 Island ratepayers were calculated to be \$72 million to \$379 million from 2019-2024, or \$12 million
14 to \$63 million annually, on average. Energy cost savings to Rhode Island ratepayers were
15 calculated to be \$50 million for 2020-2024, or approximately \$10 million annually.

16 Using this same methodology and set of assumptions, but with the second stage of CREC
17 coming online in June 2022 (versus 2021), the savings to Rhode Island ratepayers are projected to
18 be between \$119 million and \$365 million between 2019 and 2024, depending on future
19 retirements. This is less than a 3% difference on the low end of the range and a 15% difference on
20 the high end of the range. Capacity cost savings to Rhode Island ratepayers are projected to be \$71
21 million to \$317 million from 2019-2024, or \$12 million to \$53 million annually on average. Energy
22 cost savings to Rhode Island ratepayers are projected to be \$48 million for 2020-2024, or
23 approximately \$10 million annually.

1 **Q. HOW DOES ISO-NE’S DETERMINATION IMPACT YOUR ESTIMATION OF**
2 **THE EMISSIONS REDUCTIONS LIKELY TO RESULT FROM CREC’S**
3 **OPERATION?**

4 **A.** The assumed postponement in participation of CREC Unit 2 from FCA 12 to FCA 13 has
5 minor impact on emissions reductions compared with the analysis in my Pre-Filed Direct
6 Testimony.

7 In the analysis presented in my Pre-Filed Direct Testimony, CREC was projected to lead
8 to significant CO₂, NO_x and SO₂ emissions reductions in the region, and specifically annual
9 average reductions of 0.95% for CO₂, 0.99% for NO_x and 2.88% for SO₂ in the New England and
10 New York region in the 2020-2025 timeframe. This is due to CREC being the most efficient and
11 cleanest natural gas combined cycle generator in New England upon commercial operation,
12 displacing generation from dirtier sources of energy. These emission reductions will help Rhode
13 Island meet its emission targets under both the Resilient Rhode Island Act and the Regional
14 Greenhouse Gas Initiative (“RGGI”).

15 Using this same methodology and assumptions, but with the second stage of CREC coming
16 online in June 2022 (versus 2021), CREC’s inclusion in the New England generation fleet is
17 projected to lead to annual average reductions in emissions of 0.89% for CO₂, 0.89% for NO_x and
18 2.58% for SO₂ in the 2020-2025 timeframe.

19 **Q. HOW DOES ISO-NE’S DETERMINATION IMPACT YOUR ESTIMATION OF**
20 **THE ECONOMIC IMPACTS LIKELY TO RESULT FROM CREC’S**
21 **OPERATION?**

22 **A.** The assumed postponement in participation of CREC Unit 2 from FCA 12 to FCA 13 has
23 a very minor impact on economic benefits compared with the analysis in my Pre-Filed Direct
24 Testimony. In the analysis presented in my Pre-Filed Direct Testimony, the construction and
25 ongoing operation of CREC was projected to create hundreds of jobs and drive well over \$1 billion

1 in economic development in Rhode Island from 2018-2036. In particular, CREC was projected to
2 result in the following benefits:

3 • From 2018-2021, which includes the construction period, the first 1.5 years of operation
4 of CREC Unit 1, and the first partial year of operation of CREC Unit 2, CREC will
5 support the creation of 683 full-time jobs per year, on average. The construction and
6 operation of CREC alone – i.e., not including the electricity cost savings to the customer
7 – will create an average of more than 605 full-time jobs per year from 2018-2021 and
8 129 full-time jobs per year from 2022 to 2036 in Rhode Island.

9 • From 2018-2021, CREC will support the creation of nearly \$310 million in earnings to
10 Rhode Island workers, or more than \$75 million per year, on average. Earnings to Rhode
11 Island employees as a result of CREC will total more than \$520 million from 2018-2036.

12 • From 2018-2021, the total economic impact on Rhode Island is projected to be more than
13 \$530 million, or approximately \$133 million per year. The overall impact of CREC on
14 the Rhode Island economy will total more than \$1 billion from 2018-2036, or an average
15 of over \$60 million annually.

16 Using this same methodology and set of assumptions, but with the second stage of CREC
17 coming online in June 2022 (versus 2021), CREC is still projected to create hundreds of jobs and
18 drive well over \$1 billion in economic development in Rhode Island from 2018-2036. In the
19 updated analysis, CREC is projected to result in the following benefits (in many cases very similar
20 to the previous analysis):

21 • The job creation, both short and long term, is virtually unchanged from the previous
22 analysis. From 2018-2021, which includes the construction period and the first 1.5 years
23 of operation of CREC Unit 1, CREC will support the creation of 680 full-time jobs per

1 year, on average. The construction and operation of CREC alone – i.e., not including the
2 electricity cost savings to the customer – will create an average of more than 605 full-
3 time jobs per year from 2018-2021 and 129 full-time jobs per year from 2022 to 2036 in
4 Rhode Island.

- 5 • The projected earnings for Rhode Island workers is virtually unchanged from the
6 previous analysis. From 2018-2021, CREC will support the creation of nearly \$310
7 million in earnings to Rhode Island workers, or more than \$75 million per year, on
8 average. Earnings to Rhode Island employees as a result of CREC will total more than
9 \$520 million from 2018-2036.
- 10 • The total economic output for Rhode Island as a result of Clear River is virtually
11 unchanged from the previous analysis. From 2018-2021, the total economic impact on
12 Rhode Island is projected to be more than \$530 million, or approximately \$133 million
13 per year. The overall impact of CREC on the Rhode Island economy will total more than
14 \$1 billion from 2018-2036, or an average of over \$60 million annually.

15 **Q. DOES YOUR ANALYSIS CHANGE IF CREC UNIT 1 DOES NOT COME ONLINE**
16 **UNTIL JUNE 2021?**

17
18 **A.** Similar to the impacts of delaying CREC Unit 2 by one year, a one (1) year delay in CREC
19 Unit 1 will not significantly change my conclusions or underlying analysis. At a high level, if
20 CREC Unit 1 does not come online until June 2021, the range of ratepayer savings would be
21 reduced by approximately \$6 million, and this would result in a revised ratepayer savings of \$113
22 to \$359 million. Additionally, the one year delay of CREC Unit 1 would mean that emissions
23 reductions would also be delayed by one year, but I would expect the same emissions reductions
24 from June 2021 onward once CREC Unit 1 is operational.

25 **Q. DOES THIS CONCLUDE YOUR SUPPLEMENTAL TESTIMONY?**

1 A. Yes.

RH SUPPLEMENTAL – 1

Invenergy

November 1, 2017

Via Federal Express

RI Energy Facility Siting Board
89 Jefferson Boulevard
Warwick, RI 02888

Re: *Invenergy Thermal Development LLC's Application to Construct and Operate the Clear River Energy Center in Burrillville, Rhode Island*
Docket No. SB-2015-16

Dear Members of the Rhode Island Energy Facility Siting Board:

Invenergy Thermal Development LLC and the Clear River Energy Center Project ("Invenergy") has been informed by ISO New England ("ISO-NE") that Clear River Unit 2 is **not qualified** to participate in the upcoming FCA 12. ISO-NE's rationale for this decision was due to delays in the permitting process and deferrals in the ordering of major equipment that have resulted from those delays.

Invenergy does not agree with ISO-NE's assessment of the Clear River Energy Center Project's ("Project's" or "CREC's") current schedule and attempted to dissuade their determination, prior to it being issued. In particular, Invenergy noted that CREC Unit 2 had qualified previously to participate in FCA 10 and 11, the permitting process is ongoing and major equipment order dates have changed, however they are still consistent with the schedule associated with FCA 12. Although Invenergy considered appealing this decision to the Federal Energy Regulatory Commission ("the FERC"), Invenergy could not dispute that there have been permitting delays, and as such, the likelihood that the FERC would overturn ISO-NE's FCA qualification decision was determined to be remote. Invenergy elected to evaluate this change and advise the EFSB accordingly, which is the purpose of this letter.

Invenergy's inability to participate in FCA 12 does not have an impact on CREC's ability to participate in future FCA's (e.g. FCA 13 or beyond). Invenergy's future participation was confirmed by ISO-NE. This determination does not change Invenergy's position as to the need for CREC; however, it does change certain testimony and data CREC has provided to the EFSB. Once Invenergy received the final notice from ISO-NE that the Project would not be able to participate in FCA 12, Invenergy requested PA Consulting Group ("PA") to update the analysis previously provided to the EFSB, the Statewide Division of Planning and the Office of Energy Resources. Invenergy wanted to have this updated information available to be submitted along with this notice. Invenergy has updated its estimates as to Rhode Island ratepayer savings, emissions reductions and economic impacts to the State of Rhode Island. The changes to these analyses are outlined in the attached report prepared by PA, concluding the following:

- CREC is needed in the ISO-NE market; the postponement of CREC Unit 2's participation in FCA 12 has no bearing on any of the four findings made by the Rhode Island Public Utilities Commission. These four major findings, that indicate a reliability need for the full CREC facility, were:
 - CREC Unit 1 cleared an FCA;
 - There is a significant amount of capacity at-risk for retirement;
 - Rhode Island is within an import constrained zone; and
 - That capacity above the net Installed Capacity Requirement ("NICR ") is needed.
- CREC will provide Rhode Island ratepayers with material energy and capacity price savings.
- CREC will lead to significant CO₂, NO_x and SO₂ emissions reductions, including compliance with state and regional goals; and
- CREC will have several positive economic impacts on the Rhode Island economy.
- The postponement in participation of CREC Unit 2 from FCA 12 to FCA 13 has minor reduction on ratepayer savings compared with the values provided in Ryan Hardy's Pre-Filed Direct Testimony.

Invenergy has made every effort to provide this update in a timely manner and have confirmed with the ISO-NE that the public release of the FCA qualification decision is acceptable to the ISO-NE.

Very truly yours,



John Niland
Director Business Development

Enclosures

cc: Alan M. Shoer, Esq. (*e-mail only*)



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October 26, 2017

Update to CREC Market Analysis

Introduction

With the announcement that Invenergy's Clear River Energy Center ("CREC") Unit 2 will not be able to participate in the Forward Capacity Auction ("FCA") for the 2021-2022 capability year, also referred to as FCA 12, due to permitting delays, we have updated our analysis assuming a one-year postponement in CREC Unit 2's online date. This assumed change shifts CREC Unit 2's participation from FCA 12 to FCA 13 with a new online date of June 1, 2022. There were no other assumption changes made to the analysis presented in Ryan Hardy's Pre-Filed Direct Testimony submitted to the Energy Facilities Siting Board ("EFSB") on June 30, 2017. This memo outlines the impact of the postponement in participation of CREC Unit 2 from FCA 12 to FCA 13.

Overall, the impact of assuming a one-year delay in CREC Unit 2's participation in the FCA is relatively minor. It is important to note that while Ryan Hardy's Pre-Filed Direct Testimony only considered the impact and related benefits of the 980 MW CREC facility over a 5-year period, there is the expectation that benefits, particularly environmental, will continue for several years thereafter as will the permanent jobs that are created. Therefore, a 12-month delay for 485 MW of the facility does not significantly alter the analysis and related findings.

This updated analysis confirms the conclusions presented in Ryan Hardy's Pre-Filed Direct Testimony.

- CREC is needed in the ISO-NE market;
- CREC will provide Rhode Island ratepayers with material energy and capacity price savings;
- CREC will lead to significant CO₂, NO_x and SO₂ emissions reductions, including compliance with state and regional goals; and
- CREC will have several positive economic impacts on the Rhode Island economy.

The updated analysis is presented below in four sections: (i) impact on need, (ii) impact on ratepayer savings, (iii) impact on emissions reductions, and (iv) impact on economic benefits.

Impact on need

The postponement in participation of CREC Unit 2 from FCA 12 to FCA 13 ***does not impact previous conclusions on the assessment of need***. CREC Unit 1 has previously obtained a Capacity Supply Obligation, and within the updated analysis CREC Unit 2 is expected to clear FCA 13.

As confirmed by the Rhode Island PUC in its Advisory Opinion, there are several forms of need within ISO-NE and Rhode Island. The Rhode Island PUC's four major findings that indicate a reliability need for the full CREC facility were that:

- (1) CREC Unit 1 cleared an FCA,
- (2) That there is a significant amount of capacity at-risk for retirement,



- (3) Rhode Island is within an import constrained zone; and
- (4) That capacity above the net Installed Capacity Requirement ("NICR ") is needed.

The postponement of CREC Unit 2's participation to FCA 13 has no bearing on any of these four findings by the Rhode Island PUC. Moreover there are several other forms of need for CREC that are not impacted by the potential one-year postponement. These include CREC being a dual fuel facility that will use natural gas as its primary fuel and fuel oil as a backup, and CREC's ability to help integrate renewable generation. The dual fuel capability of CREC improves the winter reliability of the ISO-NE system, which ISO-NE has indicated is a major system challenge. Similarly, as a flexible and efficient generator, CREC will help support the integration of renewable generation on the ISO-NE grid by providing an effective resource to balance the variable nature of wind and solar.

Impact on ratepayer savings

The assumed postponement in participation of CREC Unit 2 from FCA 12 to FCA 13 has **minor impact on ratepayer savings compared with the analysis in Ryan Hardy's Pre-Filed Direct Testimony.**

CREC will provide capacity and energy at the least possible cost to the customer. All capacity that clears the FCA is part of the overall 'package' of capacity that provides the greatest economic benefit to the ratepayers, and the CREC facility will only be dispatched when it can generate electricity more cost effectively than other thermal generation options.

In the analysis presented in Ryan Hardy's Pre-Filed Direct Testimony, CREC was projected to save Rhode Island ratepayers between \$122 million and \$429 million between 2019 and 2024, depending on future retirements in New England. This range represents the difference in total capacity and energy costs to Rhode Island-only load resulting from the CREC capacity addition, as measured by comparing cost results from capacity and energy modeling cases (a) with CREC coming online in two stages: June 2020 (485 MW) and June 2021 (an additional 485 MW); and (b) without CREC. The capacity and energy cost differences between these two cases represented the savings to the ratepayers. Capacity cost savings to Rhode Island ratepayers were calculated to be \$72 million to \$379 million from 2019-2024, or \$12 million to \$63 million annually on average. Energy cost savings to Rhode Island ratepayers were calculated to be \$50 million for 2020-2024, or approximately \$10 million annually.

Using this same methodology and assumptions, but with the second stage of CREC coming online in June 2022 (versus 2021), the savings to Rhode Island ratepayers are projected to be between \$119 million and \$365 million between 2019 and 2024, depending on future retirements. This is less than a 3% difference on the low end of the range and a 15% difference on the high end of the range. Capacity cost savings to Rhode Island ratepayers are projected to be \$71 million to \$317 million from 2019-2024, or \$12 million to \$53 million annually on average. Energy cost savings to Rhode Island ratepayers are projected to be \$48 million for 2020-2024, or approximately \$10 million annually.

Impact on emissions reductions

The assumed postponement in participation of CREC Unit 2 from FCA 12 to FCA 13 has **minor impact on emissions reductions compared with the analysis in Ryan Hardy's Pre-Filed Direct Testimony.**

In the analysis presented in Ryan Hardy's Pre-Filed Direct Testimony, CREC was projected to lead to significant CO₂, NO_x and SO₂ emissions reductions in the region, and specifically annual average reductions of 0.95% for CO₂, 0.99% for NO_x and 2.88% for SO₂ in the New England and New York region in the 2020-2025 timeframe. This is due to CREC being the most efficient and cleanest natural gas combined cycle generator in New England upon commercial operation, displacing generation from dirtier sources of energy. These emission reductions will help Rhode Island meet its emission targets under both the Resilient Rhode Island Act and the Regional Greenhouse Gas Initiative ("RGGI").



Using this same methodology and assumptions, but with the second stage of CREC coming online in June 2022 (versus 2021), CREC's inclusion in the New England generation fleet is projected to lead to annual average reductions in CO₂, NO_x and SO₂ emissions of 0.89% for CO₂, 0.89% for NO_x and 2.58% for SO₂ in the 2020-2025 timeframe.

Impact on economic benefits

The assumed postponement in participation of CREC Unit 2 from FCA 12 to FCA 13 has **minor impact on economic benefits compared with the analysis in Ryan Hardy's Pre-Filed Direct Testimony.**

In the analysis presented in Ryan Hardy's Pre-Filed Direct Testimony, the construction and ongoing operation of CREC was projected to create hundreds of jobs and drive well over \$1 billion in economic development in Rhode Island from 2018-2036. In particular, CREC was projected to result in the following benefits:

Rhode Island jobs. From 2018-2021, which includes the construction period, the first 1.5 years of operation of CREC Unit 1, and the first partial year of operation of CREC Unit 2, CREC will support the creation of 683 full-time jobs per year, on average. The construction and operation of CREC alone – i.e., not including the electricity cost savings to the customer – will create an average of more than 605 full-time jobs per year from 2018-2021 and 129 full-time jobs per year from 2022 to 2036 in Rhode Island.

Rhode Island earnings. From 2018-2021, CREC will support the creation of nearly \$310 million in earnings to Rhode Island workers, or more than \$75 million per year, on average. Earnings to Rhode Island employees as a result of CREC will total more than \$520 million from 2018-2036.

Rhode Island economic output. From 2018-2021, the total economic impact on Rhode Island is projected to be more than \$530 million, or approximately \$133 million per year. The overall impact of CREC on the Rhode Island economy will total more than \$1 billion from 2018-2036, or an average of over \$60 million annually.

Using this same methodology and assumptions, but with the second stage of CREC coming online in June 2022 (versus 2021), CREC is still projected to create hundreds of jobs and drive well over \$1 billion in economic development in Rhode Island from 2018-2036. In the updated analysis, CREC is projected to result in the following benefits (in many cases very similar to the previous analysis):

Rhode Island jobs. The job creation, both short and long term, is virtually unchanged from the previous analysis. From 2018-2021, which includes the construction period and the first 1.5 years of operation of CREC Unit 1, CREC will support the creation of 680 full-time jobs per year, on average. The construction and operation of CREC alone – i.e., not including the electricity cost savings to the customer – will create an average of more than 605 full-time jobs per year from 2018-2021 and 129 full-time jobs per year from 2022 to 2036 in Rhode Island.

Rhode Island earnings. The projected earnings for Rhode Island workers is virtually unchanged from the previous analysis. From 2018-2021, CREC will support the creation of nearly \$310 million in earnings to Rhode Island workers, or more than \$75 million per year, on average. Earnings to Rhode Island employees as a result of CREC will total more than \$520 million from 2018-2036.

Rhode Island economic output. The total economic output for Rhode Island as a result of Clear River is virtually unchanged from the previous analysis. From 2018-2021, the total economic impact on Rhode Island is projected to be more than \$530 million, or approximately \$133 million per year. The overall impact of CREC on the Rhode Island economy will total more than \$1 billion from 2018-2036, or an average of over \$60 million annually.



Conclusion

The update of our market analysis described in this memo—which assumes CREC Unit 2's participation in FCA 12 is postponed to FCA 13—confirms that the foundational conclusions on Page 46 of Ryan Hardy's Pre-Filed Direct Testimony remain unchanged.

- ***CREC is needed to meet the energy needs of both Rhode Island and the broader New England region.***
- ***CREC will provide material ratepayer savings, is cost-justified, and can be expected to produce energy at the lowest reasonable cost to the consumer.***
- ***CREC will allow the state to meet its emission objectives under the Resilient Rhode Island Act and RGGI.***
- ***CREC will enhance the socioeconomic fabric of Rhode Island by creating hundreds of new jobs through both the construction and operation of the facility.***

For any questions, please contact:

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RH SUPPLEMENTAL – 2

ENERGY

Power grid operator says reliance on natural gas will last decades

Head of agency that operates regional power grid speaks at forum sponsored by groups that back fossil-fuel power generation

By Alex Kuffner Journal Staff Writer

CRANSTON — New England will continue to rely on natural gas for power generation decades into the future even as it transitions to renewable sources, the head of the nonprofit agency that operates the regional power grid said on Friday.

Speaking at an invitation-only energy forum, Gordon van Welie, president and CEO of Independent System Operator New England, said the region will not be able to wean itself off natural gas — which already fuels half of its power generation — any time soon.

“The gas problem is going to live with us for a long time,” van Welie said.

The forum was jointly organized by two organizations: the New England Coalition for Affordable Energy, which is sponsored by the American Petroleum Institute; and Rhode Islanders for Affordable Energy, a coalition formed by construction unions, chambers of commerce and some of the largest power consumers in the state in support of a fossil fuel-burning power plant proposed in Burrillville.

Other speakers included a representative of natural gas pipeline company Enbridge and Invenergy, the Chicago company behind the Burrillville project known as the Clear River Energy Center. Carol Grant, commissioner of the Rhode Island Office of Energy Resources, also spoke on one panel.

Even though energy usage in New England has declined slightly in recent years, ISO-NE expects demand to start growing again as more people switch to electric vehicles and use electric-powered heat pumps, van Welie said.

When asked if wind farms, solar arrays and new battery systems would be able to meet the additional needs, van Welie said they wouldn't because they're intermittent sources of power.

“That's not going to happen,” he said. “For the most part, it will come from natural gas.”

He did not mention the 1,000-megawatt Clear River project, which would primarily burn natural gas. The \$1-billion project is nearing the end of the state permitting process, with a decision expected early next year.

The proposal has suffered delays and setbacks, including Invenergy's failure to sell half of its power output at forward capacity auctions held by ISO-NE. Opponents to the project have pointed to the results as evidence that the power grid doesn't need the plant.

In response to questions after his talk, van Welie said that such a conclusion can't be drawn from the auction results.

"I think they're conflating things together that shouldn't be conflated together," he said.

Each auction is a snapshot in time, he said, securing resources for only a single 12-month period three years before it's needed.

"The system we've set up will always ensure there's enough capacity to meet the needs three years in the future and as that demand forecast changes, we'll adjust it," he said. "You can't take one point in time and link it to a decision that was made in a completely different point in time."

Things can change fast in the power grid, especially if an old plant is retired.

"It's much harder to predict what resources will be out there beyond the three-year time frame because it's going to depend on how the forward capacity market fares in any year," van Welie said. "If you ask me what's going to be there four years out, I'm not going to be able to answer that question."

ISO-NE recently disqualified the Clear River project's second unit from the upcoming auction in February that will tie up capacity for the 2021-2022 supply year. According to Invenergy, the decision was based on permitting delays that have plagued the project.

When asked about the decision, van Welie declined comment.

"These are proprietary and market-sensitive decisions and so what we don't get into, in terms of public discourse, is talking about the reasons why we disqualify certain resources and qualify other resources," he said. "We're not allowed to do it."

Dan Ewan, a vice president with Invenergy, reiterated his company's argument that New England will face a shortfall in reliable sources of power.

"It still remains an economic and sound investment for our company," he said of the Clear River project. "And we're committed to it."

During her remarks, Grant, the Rhode Island energy commissioner, said she would not comment on the Burrillville project.

Opponents to the project objected to van Welie's appearance at the forum, arguing that as an impartial operator of the power grid, ISO-NE shouldn't be represented at an event sponsored by groups that back fossil-fuel power generation.

A half-dozen protesters demonstrated outside the offices of heating and cooling company Taco, which hosted the morning event.

"The oil industry is rolling in dough and they can afford to put on fancy breakfasts and present their spin on our energy future to people who should be neutral like the CEO of ISO New England," said Justin Boyan, vice president of Climate Action R.I., an affiliate of 350.org. "We're representing science and the environment and the future of the planet. And we don't have a seat at this table."

RH SUPPLEMENTAL – 3

NOVEMBER 17, 2017 | CRANSTON, RI



Transformation of the New England Electric Grid and Impacts on Energy Affordability and Reliability

The Energy Council of Rhode Island

Energy Reliability and Affordability in New England Forum

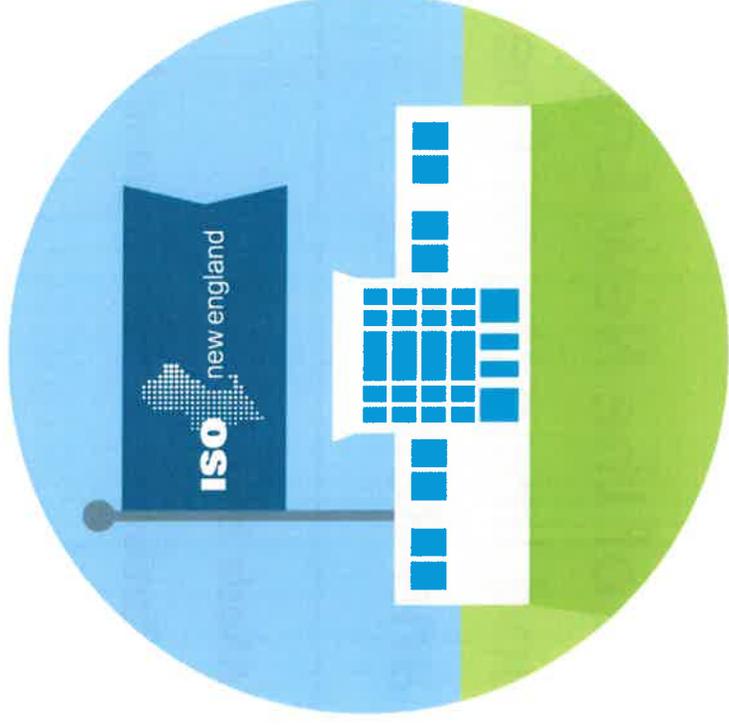
Gordon van Welie

PRESIDENT & CEO



ISO New England (ISO) Has Two Decades of Experience Overseeing the Region's Restructured Electric Power System

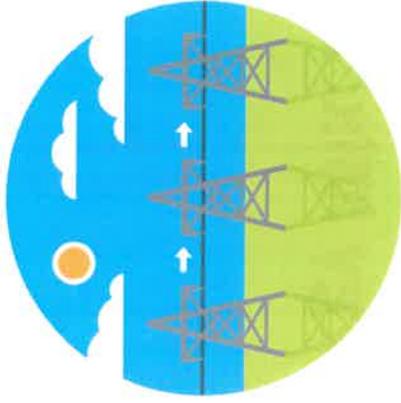
- **Regulated** by the Federal Energy Regulatory Commission
- **Reliability Coordinator** for New England under the North American Electric Reliability Corporation
- **Independent** of companies in the marketplace and **neutral** on technology



ISO New England Performs Three Critical Roles to Ensure Reliable Electricity at Competitive Prices

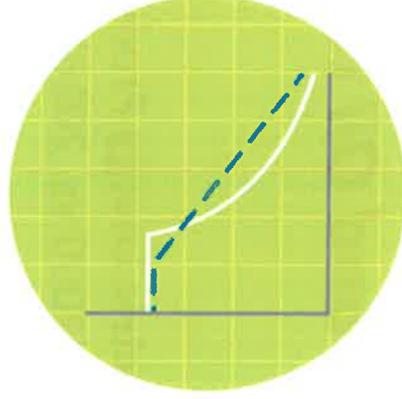
Grid

Coordinate and direct the flow of electricity over the region's high-voltage transmission system



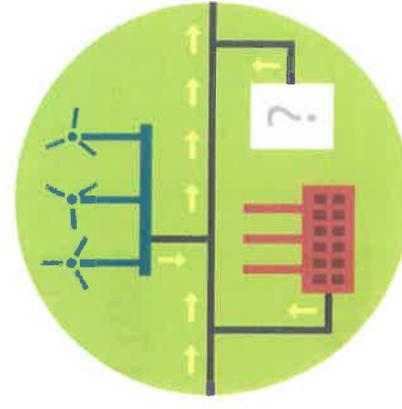
Market

Design, run, and oversee the markets where wholesale electricity is bought and sold



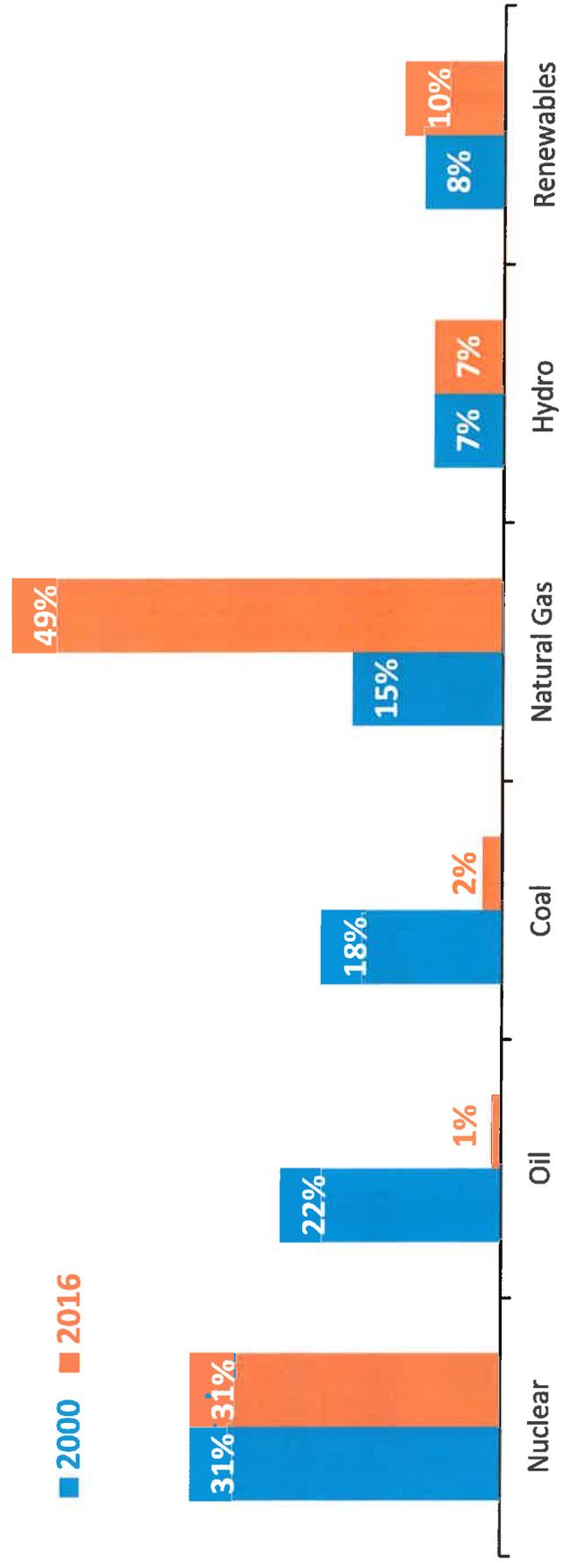
Power System

Study, analyze, and plan to make sure New England's electricity needs will be met over the next 10 years



New England Has Seen Dramatic Changes in the Energy Mix: From Coal and Oil to Natural Gas

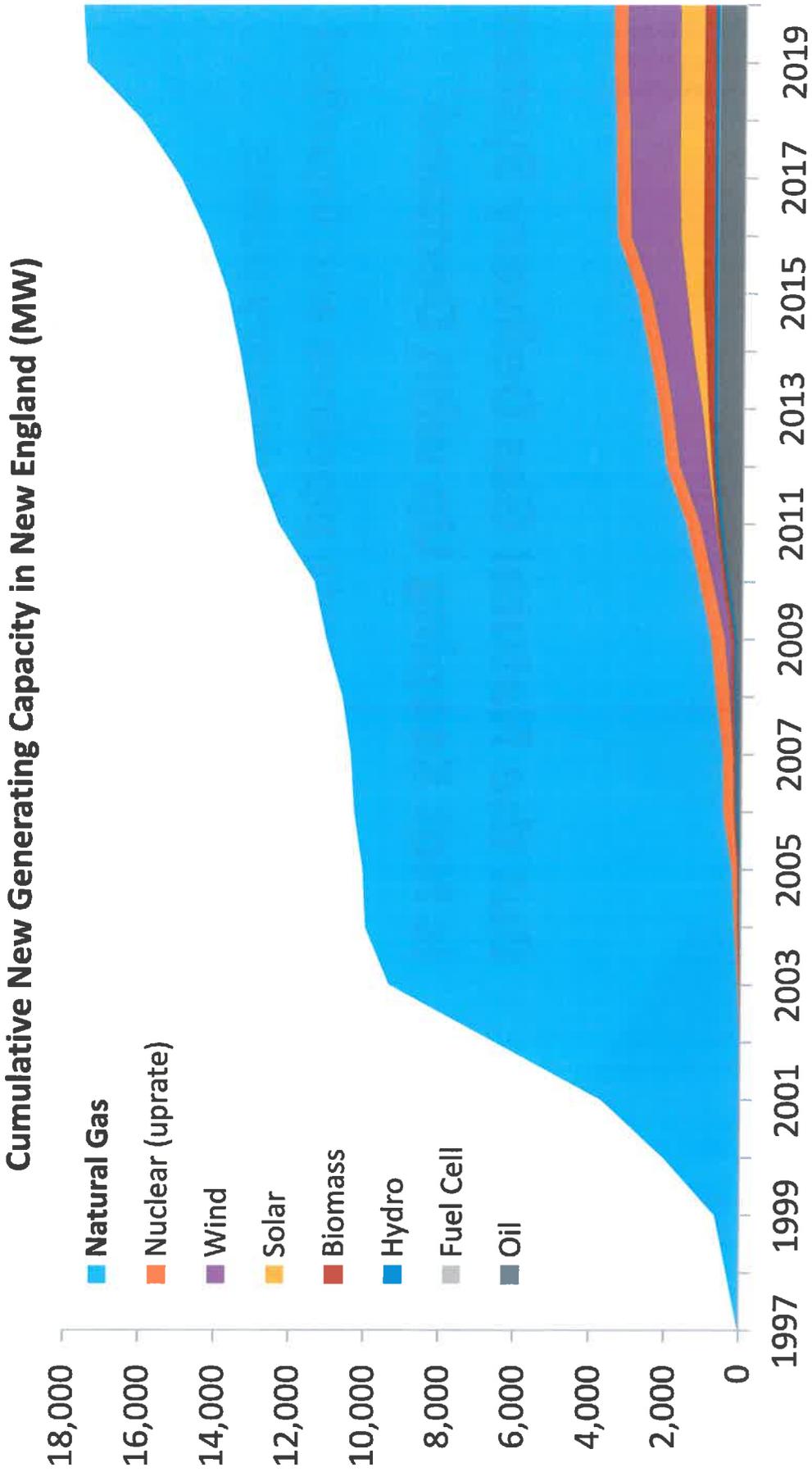
Percent of Total Electric Energy Production by Fuel Type (2000 vs. 2016)



Source: ISO New England [Net Energy and Peak Load by Source](#)

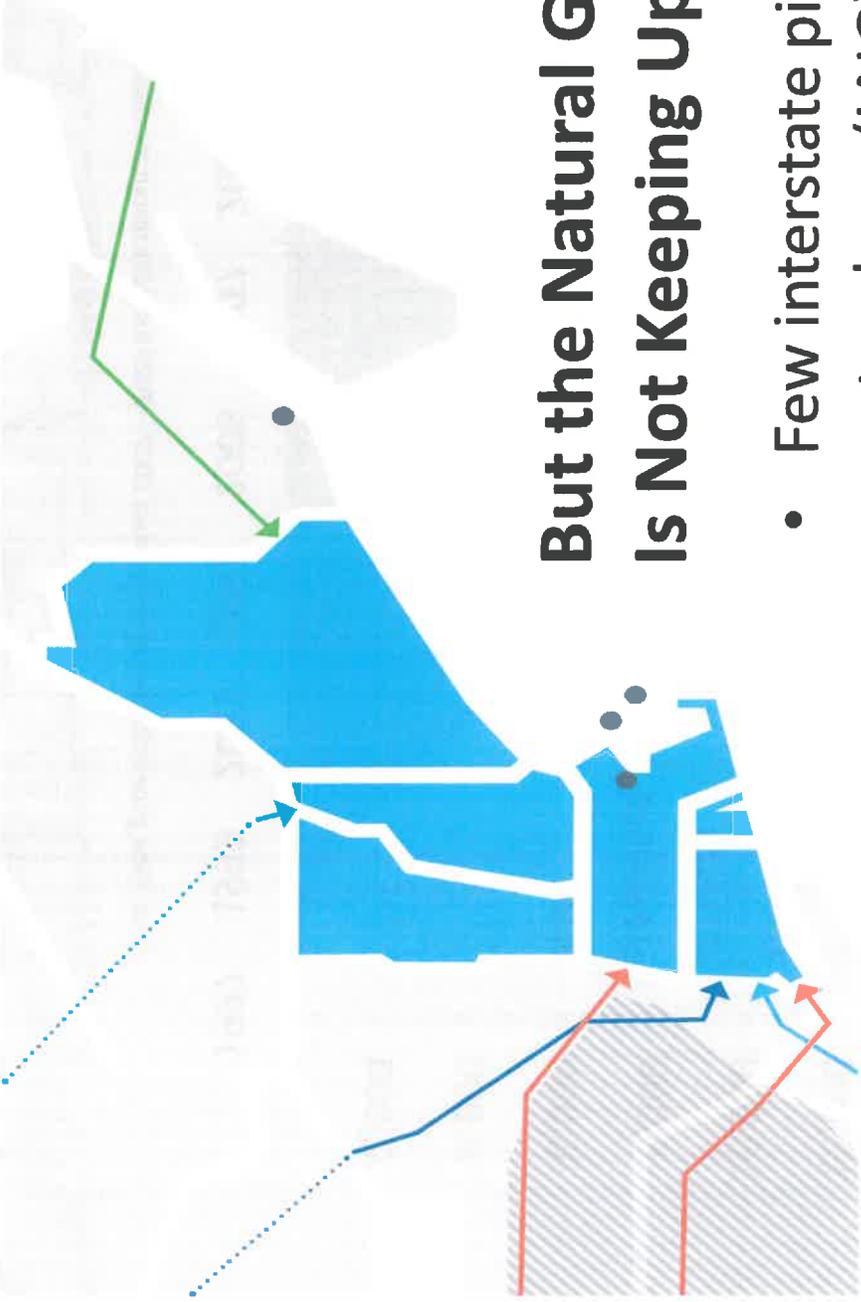
Renewables include landfill gas, biomass, other biomass gas, wind, solar, municipal solid waste, and miscellaneous fuels

Natural Gas Has Been the Dominant Fuel Source for New Generating Capacity in New England



Note: New generating capacity for years 2017 – 2020 includes resources clearing in recent Forward Capacity Auctions.





— Pipelines

● LNG facilities

Marcellus shale

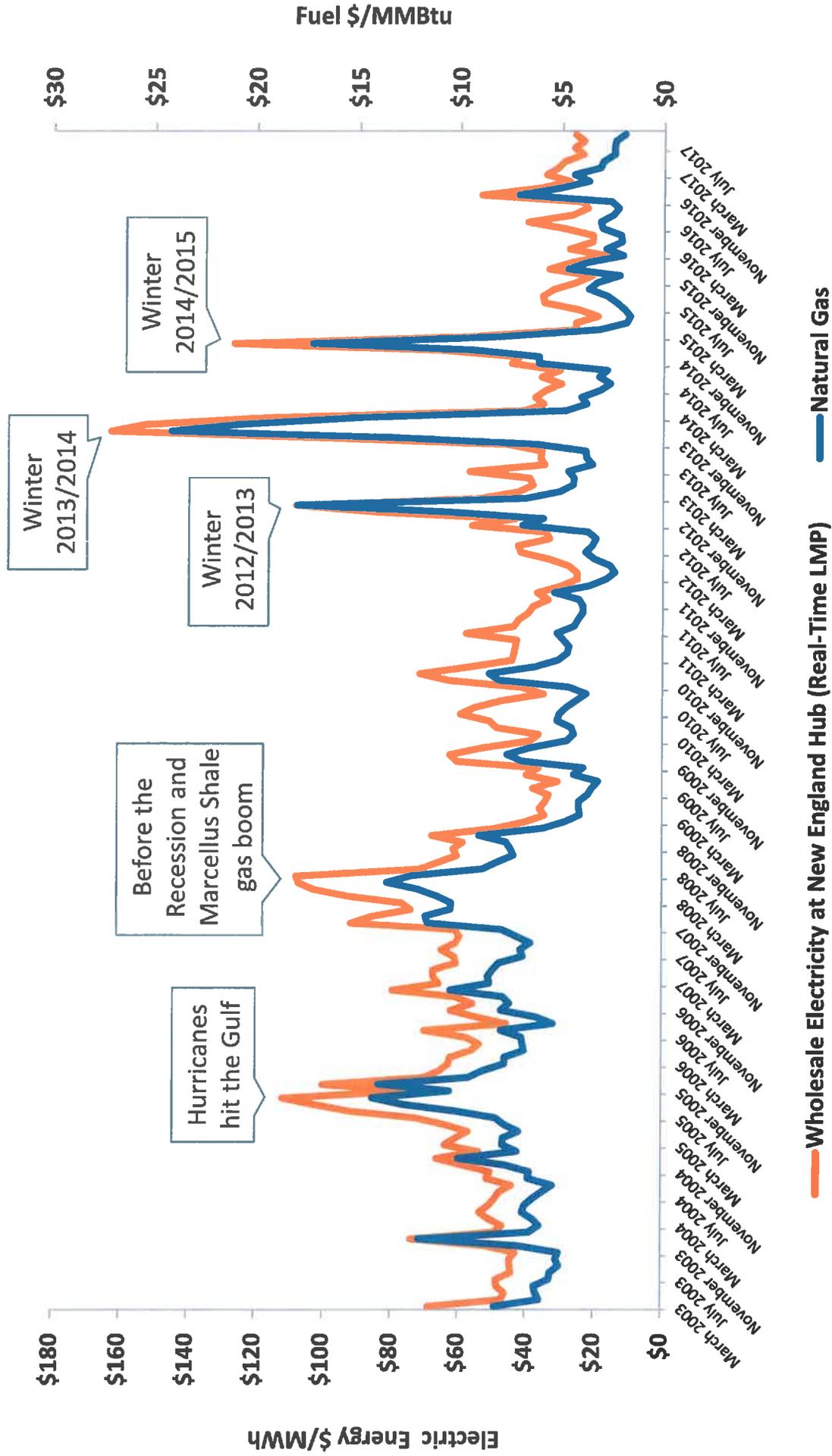
Source: ISC New England

But the Natural Gas Delivery System Is Not Keeping Up with Demand

- Few interstate pipelines and liquefied natural gas (LNG) delivery points
- Regional pipelines are:
 - Built to serve heating demand, not power generation
 - Running at or near maximum capacity during winter

Natural Gas and Wholesale Electricity Prices Are Linked

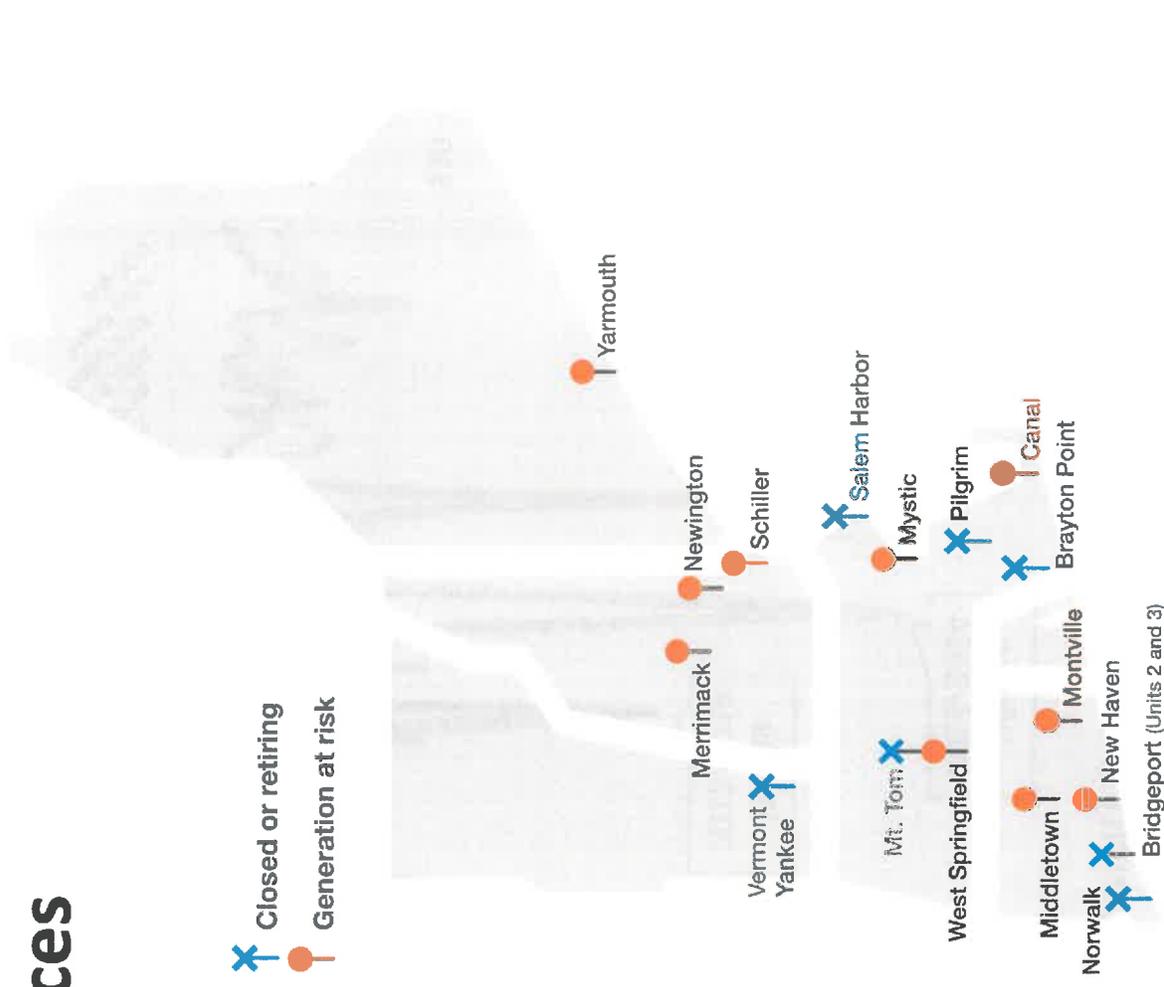
Monthly average natural gas and wholesale electricity prices at the New England hub



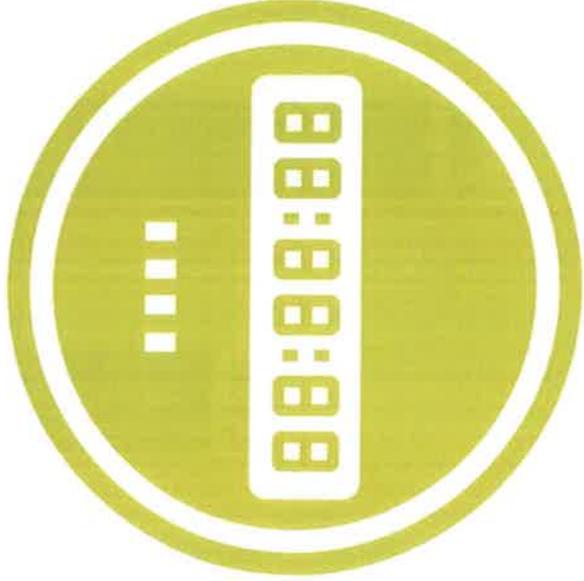
The Region Has Lost—and Is at Risk of Losing— Substantial Non-Gas Resources

Major Generator Retirements:

- **Salem Harbor Station (749 MW)**
 - 4 units (coal & oil)
- **Norwalk Harbor Station (342 MW)**
 - 3 units (oil)
- **Mount Tom Station (143 MW)**
 - 1 unit (coal)
- **Vermont Yankee Station (604 MW)**
 - 1 unit (nuclear)
- **Brayton Point Station (1,535 MW)**
 - 4 units (coal & oil)
- **Pilgrim Nuclear Power Station (677 MW)**
 - 1 unit (nuclear)
- **Bridgeport Harbor Station (564 MW)**
 - 2 units (coal & oil)
- *Additional retirements are looming*



The Forward Capacity Market Is Attracting New Resources Amid Retirements



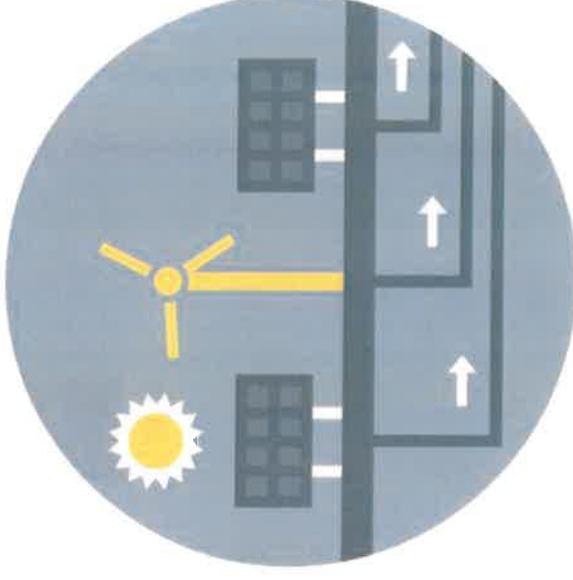
Demand Resources

energy-efficiency and active demand response resources



Natural Gas Resources

efficient and fast-starting gas resources, many with dual-fuel capability

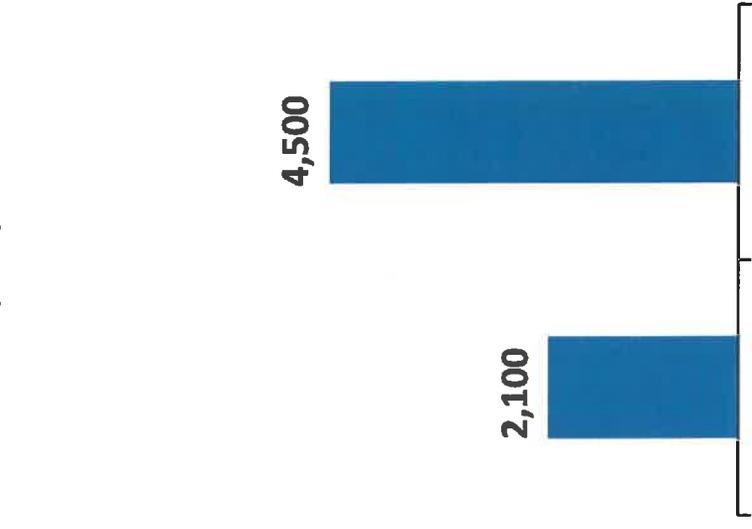


Renewable Resources

onshore and offshore wind, solar photovoltaics, and fuel cells

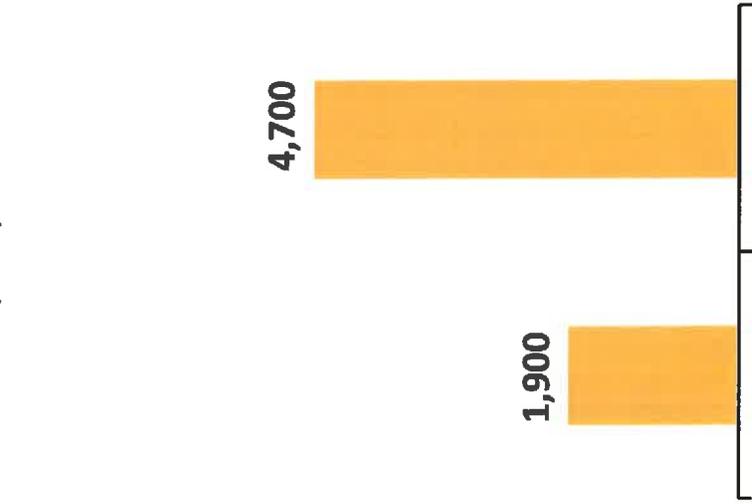
Energy-Efficiency and Renewable Resources Are Trending Up in New England

Energy Efficiency (MW)



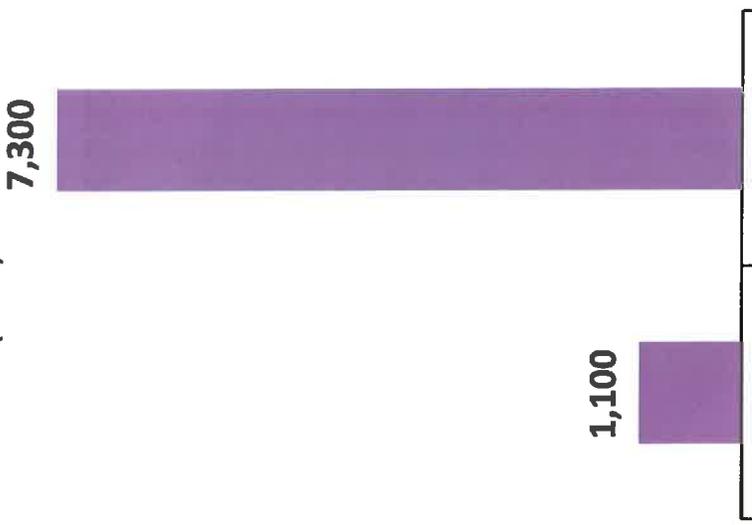
Final 2017 CELT Report, EE through 2016 includes EE resources participating in the Forward Capacity Market (FCM). EE in 2026 includes an ISO-NE forecast of incremental EE beyond the FCM.

Solar (MW)



Final 2017 ISO-NE PV Forecast, AC nameplate capacity from PV resources participating in the region's wholesale electricity markets, as well as those connected "behind the meter."

Wind (MW)



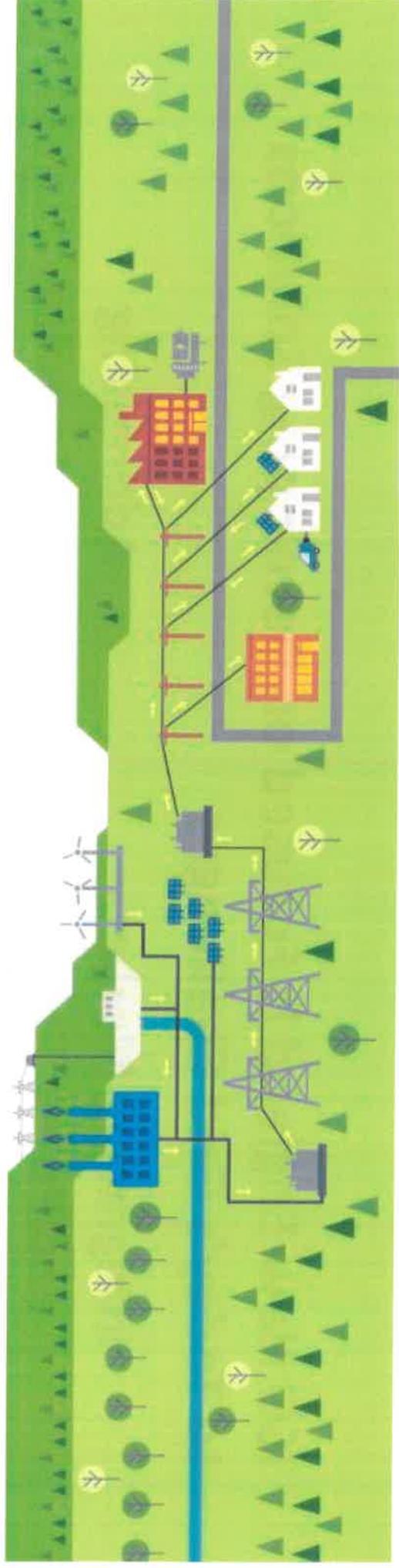
Nameplate capacity of existing wind resources and proposals in the ISO-NE Generator Interconnection Queue; some wind proposals include battery storage.



A “Hybrid Grid” Is Emerging

The region is changing how it generates, delivers, and uses electricity

- Large grid-connected power resources + thousands of small “behind-the-meter” resources
- Significant amounts of variable generation and some battery storage
- Changes in how much grid energy people use and when they use it
- Two-way grid communications



ISO New England Is Focused on Developing Solutions to Today's Grid Challenges

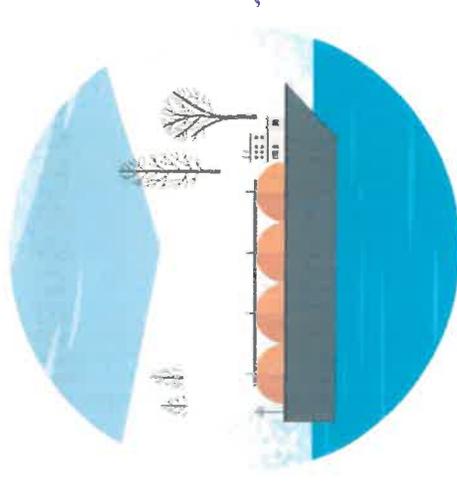
Integrating Markets and Public Policy

Accommodating the states' clean energy goals while maintaining competitively based capacity pricing for other resources



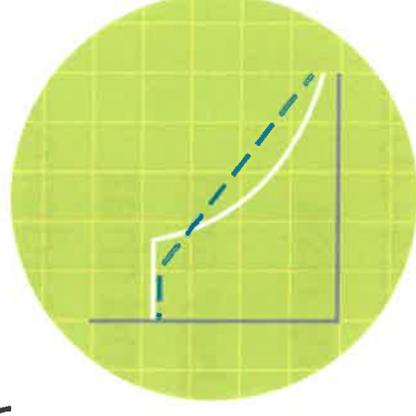
Addressing Fuel Security

Ensuring the region's generators have adequate fuel to produce electricity, particularly in the wintertime



ISO New England Has Proposed a Near-Term Solution to Integrate Markets and Public Policy

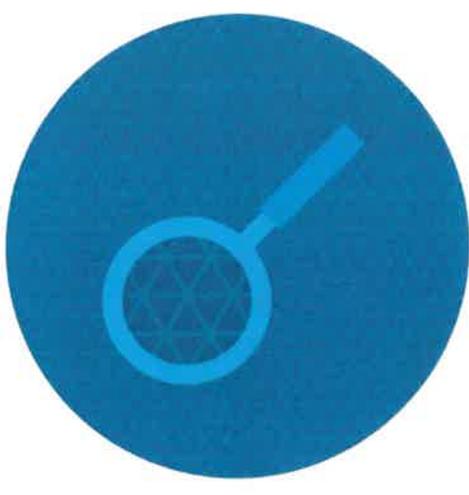
Competitive Auctions with Sponsored Policy Resources or “CASPR”



- The ISO’s capacity market design approach:
 - **Accommodates** sponsored policy resources into the Forward Capacity Market over time, and
 - **Preserves** competitively based capacity pricing for other resources
- Likely to help the New England states achieve their renewable energy and greenhouse gas reduction goals as older, higher-emitting (traditional) units are likely to retire sooner
- The ISO sought feedback from stakeholders through the NEPOOL stakeholder process
 - The ISO plans to file tariff revisions in December 2017/January 2018, in time for FCA #13, which will be run in February 2019

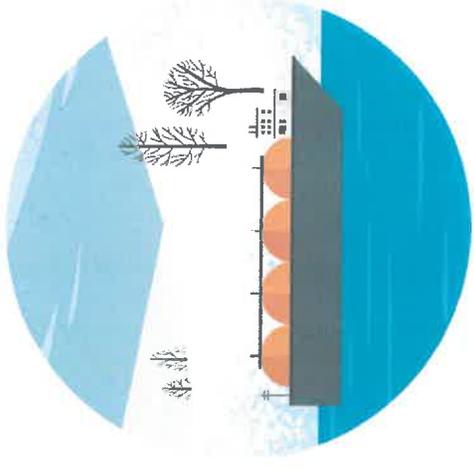
Note: Additional materials can be found on the ISO’s [Wholesale Markets and State Public Policy Initiative website](#)

ISO New England Is Conducting a Study of Fuel Security Challenges



- Fuel security refers to the ability of power plants to have or obtain the fuel required to generate electricity, especially during the **winter peak season**
- The study is examining more than 20 cases of generating resource and fuel-mix combinations during the 2024-2025 winter, and will quantify each case's **fuel security risk**
- Fuel security risk will be measured by the **number** and **duration** of energy shortfalls that could occur and that would require implementation of emergency procedures to maintain reliability

ISO New England Will Work With Stakeholders to Address Region's Fuel Security Risks



- The study is **not** focused on the effects of expanded access to natural gas and will not identify needs for new or expanded pipeline capacity or natural gas infrastructure
- The preliminary results will be presented to regional stakeholders for full discussion and input
- The ISO will work with stakeholders to determine whether further **operational** or **market design measures** will be needed to address the fuel security risk

U.S. Department of Energy Proposes Grid Resiliency Pricing Rule

- On **September 28**, the U.S. Department of Energy (DOE) issued a Notice of Proposed Rulemaking (NPR) directing FERC to take final action on a “grid resiliency” pricing rule
- The proposal directs FERC to impose rules on Commission-approved ISOs and RTOs “to ensure that the reliability and resiliency attributes of generation with **on-site fuel supplies** are fully valued”
- The ISO has delayed finalization of its fuel security analysis pending **resolution** of the U.S. DOE NPR



ISO New England Opposes Adoption of DOE NOPR

- On **October 23**, ISO New England submitted comments to FERC objecting to the DOE NOPR on the basis that it will significantly **undermine** the efficient and effective wholesale electricity markets that, with FERC’s guidance, the New England region has built over the last two decades
- The NOPR shifts away from the **numerous benefits** markets have achieved, including improvements in electric reliability, lower emissions, and reductions in wholesale electricity costs
- The NOPR does not address New England’s **biggest challenge**, which is fuel security and availability of natural gas for power generation in the winter



Identification of Solutions to Future “Resilience” Needs Will Require Deliberative Stakeholder Process

- “Resilience” is an **amorphous concept** that is difficult to describe precisely or quantify—likely means something different to different regions
- NOPR-directed timeframe for adoption of market rules is inadequate for **time-tested regional stakeholder process**
- Should additional reliability measures be needed, the region should be permitted to design **market-based solutions** through the stakeholder process that are targeted to meet New England’s specific needs



Questions

