STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
ENERGY FACILITY SITING BOARD

IN RE: Application of
Invenergy Thermal Development LLC's
Proposal for Clear River Energy Center

Docket No. SB 2015-06

PRE-FILED DIRECT TESTIMONY

OF

ROBERT M. FAGAN

CONSERVATION LAW FOUNDATION
55 Dorrance Street, Suite 202
Providence, RI 02903
(401) 351-1102

SUMMARY

Mr. Fagan was a witness in PUC Docket 4609 that examined, inter alia, whether there is a need for the Invenergy power plant. He is a mechanical engineer and energy economics analyst with over 25 years of experience in those fields.

At the PUC, Mr. Fagan testified that there is no short-, medium-, or long-term reliability need for the Invenergy plant. In its Advisory Opinion, the PUC rejected Mr. Fagan's opinion. In this testimony, Mr. Fagan presents new facts and data that were not available at the time of the PUC hearing in July 2016 to support his opinion that there is no short-, medium-, or long-term reliability need for the Invenergy plant. Mr. Fagan also analyzes several of the specific conclusions made by the PUC in light of newly available data that did not exist in July 2016.

Mr. Fagan concludes that (1) There is no near-to-medium term reliability need for the proposed Invenergy plant; (2) existing and proposed energy efficiency and renewable energy more than supplant the energy output of the proposed Invenergy plant; and (3) there is no long-term reliability need for the Invenergy plant.

Mr. Fagan relies here on the results of the ISO's Forward Capacity Auction 11, conducted in February 2017; the ISO's 2017 CELT Report (Capacity, Energy, Loads, and Transmission); the ISO's 2017 PV Forecast; and the ISO's 2017 Energy Efficiency Forecast. None of these documents had been published and most of these data were available at the time of the PUC hearing in July 2016.

Direct Testimony of Robert Fagan

Introduction

Q. Please state your name and occupation.

A. My name is Robert M. Fagan and I am a Principal Associate at Synapse Energy Economics.

Q. Please describe Synapse Energy Economics.

A. Synapse Energy Economics is a research and consulting firm specializing in electricity industry regulation, planning and analysis. Synapse works for a variety of clients, with an emphasis on consumer advocates, regulatory commissions, and environmental advocates.

Q. Are you the same Robert M. Fagan who submitted direct testimony in the Rhode Island Public Utilities Commission (RI PUC) Advisory Opinion case?

A. Yes. I provide to the EFSB a true and accurate copy of my earlier testimony at the PUC, and I incorporate that earlier testimony by reference. The PUC's date stamp on the front cover reflects that this was filed June 14, 2016.

Q. Please summarize your qualifications.

A. I am a mechanical engineer and energy economics analyst, and I've analyzed energy industry issues for more than 25 years. My activities focus on many aspects of the electric power industry, in particular: production cost modeling of electric power systems, general economic and technical analysis of electric supply and delivery systems, wholesale and retail electricity provision, energy and capacity market structures, renewable resource alternatives, including wind and solar PV, and assessment and implementation of energy efficiency and

demand response alternatives. I hold an MA from Boston University in energy and environmental studies and a BS from Clarkson University in mechanical engineering. My resume is included as Attachment 1 hereto.

Q. Please summarize your specific experience and familiarity with electric power sector issues in Rhode Island.

A. My professional career began in Rhode Island, working for Narragansett Electric Company as a field engineer and eventually as supervisor of electrical operations and maintenance (early 1980s). I also worked as a senior energy specialist at Rhode Islanders Saving Energy (RISE), conducting commercial and industrial facility energy assessments (late 1980s/early 1990s) and supporting the implementation of burgeoning electric utility energy efficiency programs for commercial and industrial customers. After graduate school, my consulting work over the past 20+ years has focused on myriad electric power sector issues in regulatory jurisdictions throughout the US and Canada, and included detailed engagement on specific Rhode Island energy efficiency issues as part of Synapse's work on behalf of the Rhode Island Division of Public Utilities and Carriers (during the period 2007-2011).

Q. On whose behalf are you testifying in this case?

A. I am testifying on behalf of the Conservation Law Foundation ("CLF").

Q. What is the general purpose of your testimony.

A. The general purpose of my testimony is to re-affirm my principal findings in my PUC testimony. Those appear starting on page 3, line 19 and run through page 6, line 13 of the earlier document. Those three principal findings were: (1) There is no near-to-medium term

reliability need for the proposed Invenergy plant; (2) existing and proposed energy efficiency and renewable energy more than supplant the energy output of the proposed Invenergy plant; and (3) there is no long-term reliability need for the proposed Invenergy plant, either.

Q. What is the specific purpose of your testimony?

A. The specific purpose of my current EFSB testimony is to provide new information and new data that was not available in July 2016, at the time of the PUC hearing, which new data provide additional support for my conclusions at the PUC, namely that there is no reliability need for either of the two turbines associated with Invenergy's proposed power plant. [1]

In this testimony, I present evidence concerning:

1) ISO NE's eleventh Forward Capacity Market (FCM) auction, FCA 11, the most recent three-year-ahead auction for procurement of capacity supply obligations (CSO). It was held in February 2017 and is applicable for the Capacity Commitment Period (CCP) 11, which runs from June 1, 2020 through May 31, 2021;

2) ISO NE's latest ten-year forecast of load, the 2017 CELT (Capacity, Energy, Loads, Transmission) Report, which includes updated information on trajectories of load, energy efficiency and behind-the-meter solar photo voltaics (PV) in New England and Rhode Island; and

3) How this new information, not available in July 2016, validates and further supports the

[1] Rhode Island Energy Facility Siting Board Application, Clear River Energy Center, Burrillville, Rhode Island. Prepared by ESS Group, Inc. October 28, 2015.

conclusions I drew in evidence I presented to the RI PUC in the Advisory Opinion docket in July of 2016.

Q. What documents do you rely upon in your analysis, and for your findings and observations?

A. I rely primarily upon the following documents:

1. ISO NE Results of the 2017 FCA 11 Forward Capacity Market auction
2. ISO NE 2017 Capacity, Energy, Loads, and Transmission (CELT) forecast data and report (May 1, 2017)
3. ISO NE 2017 PV Final Forecast
4. ISO NE 2017 EE Final Forecast

I also reference in my testimony additional material I used to develop this evidence.

Summary Observations and Testimony Structure

Q. Please summarize your findings/observations.

A. I have three summary observations.

1) The second unit of Invenergy's proposed plant failed to clear in FCA 11; no capacity supply obligation (CSO) was won. On its face, this indicates that based on ISO NE's current expectations out to the 2020/2021 period, there is no need for the proposed second Invenergy unit for reliability assurance in New England. FCA 11 also cleared no new large gas-fired power plants[2]; cleared more than 640 MW of new demand-side resources; and no major "at risk"

[2] A 202 MW CSO was awarded in FCA11 for a "new" gas-fired combined cycle plant (Milford Power, in Massachusetts). The CSO is actually tied to a 53 MW increment of power (i.e., repowering) at an existing ~150 MW facility, as noted in Dynegy's SEC 10-K filing concerning the FCA 11 award: "…Milford-Massachusetts cleared an incremental 53 MW of new capacity in FCA-11 that qualified the entire plant for a seven year rate lock. Milford-Massachusetts will receive the FCA-11 clearing price of $5.30 per kW-month for 202 MW through Planning Year 2026-2027." See page 79. See also ISO NE Annual Markets Report, May 30, 2017, p. 153, referencing the repowering, available at: https://www.iso-ne.com/static-assets/documents/2017/05/annual_markets_report_2016.pdf.

power plants retired.[3] The load and behind-the-meter solar PV forecast input parameters which informed the net Installed Capacity Requirement (net-ICR) for FCA 11 reflected the CELT 2016 forecast. FCA 12, to be held in February 2018 for the capacity commitment period 2021/2022, will reflect the 2017 CELT forecast.

2) The 2017 CELT forecast projects for New England an increased level of peak load reduction from energy efficiency, and lower net peak load[4] through the presence of additional behind-the-meter solar PV resources, compared to the forecast of these parameters in the 2016 CELT, for all future years. For example, for the summer of 2020, the 2017 CELT forecasts a New England net peak load of 26,298 MW; for the same year, the 2016 CELT forecast a net peak load of 26,789 MW; this is a difference of 491 MW. The effect of this updated forecast will be to continue to put downward pressure on capacity prices in New England by putting downward pressure on the net installed capacity requirement[5] and continue to highlight the relative surplus of capacity that exists, primarily because of the existence of increasingly greater amounts of peak load reduction through energy efficiency and small solar PV installations.

[3] The smaller Yarmouth station units 1 and 2, and a portion of unit 3 of the 4-unit oil-fired power plant in Maine (813 MW total) submitted de-list bids and did not clear in FCA 11. Thus, 81% (659 MW of the 813 MW total) of the station's capability retains a capacity supply obligation for 2020/2021 (CCP 11). No other "at-risk" unit failed to clear.

[4] ISO NE reports gross peak load, and peak load reduction contributions from energy efficiency and behind-the-meter solar PV (BTM PV). Net peak load is equal to gross peak load minus contributions from EE and BTM PV. Its publicly posted forecast data report each of these values for 10 years forward, for New England (as a whole, excluding the far reaches of Northern Maine) and for individual states.

[5] The net installed capacity requirement for FCA 12 has not yet been estimated by ISO NE, but will be available later this year. It is informed in large part by the forecast of gross peak load less the amount of behind-the-meter solar PV resource capacity (from the 2017 CELT). Solar PV resource capacity in summer 2021 will be credited at roughly a 34% discount from its "nameplate" value to reflect the overall capacity contribution expected from the resource at peak load times, which occur later than local solar noon when the resource output would reach its maximum. See slide 60 of Attachment 6, ISO NE's Final 2017 PV Forecast (May 1, 2017).

3) The results of FCA 11 and the lowered net load trajectories in the 2017 CELT validate the main issues I raised and conclusions I drew in the PUC Advisory Opinion docket. They buttress my synopsis from July 2016 of a lack of reliability need for the proposed Invenergy Plant, either the first unit, or the second unit.

Q. How is your testimony structured?

A. I introduce and explain the new evidence, and place it in context with the evidence I submitted to the RI PUC in the advisory opinion phase of this proceeding.

Q. You reference "demand-side resources" above. What are demand-side resources?

A. Demand-side resources that clear in the forward capacity market auction are comprised primarily of energy efficiency resources, demand response resources, and some distributed generation resources. The bulk of the 640 MW of "new" demand-side resources that cleared in FCA 11 are provided by the major New England electric utility energy efficiency programs.

Q. Why is important for the present analysis that the RI EFSB take proper account of both the amount of demand-side resources that cleared in FCA 11, and ISO NE's most recent projections of how much of these demand-side resources will be added to the system in future years?

A. It is critically important because these resources directly reduce the remaining need for supply side resources, such as new fossil-fuel power plants. More specifically, it is important because the presence of these resources show that the Invenergy plant is not needed.

Q. What do you mean by "at-risk" power plants?

A. The "at-risk" power plants refer to 5,577 MW of older fossil-fuel units in New England

that ISO NE has identified as being "at risk" of retirement sometime between now and 2030.

Q. What is a "Capacity Commitment Period" (CCP)?

A. A CCP is a one-year period commencing June 1 of the defined period and lasting for one year, through May 31 (of the following year). It corresponds to the period of time in which a Capacity Supply Obligation (CSO) is in force.

Results of the ISO NE Forward Capacity Market (FCM) Auction – FCA 11

Q. What were the results of the 11th Forward Capacity Market auction?

A. The auction cleared 35,835 MW of capacity resources for 2020/2021, at a New England wide clearing price of $5.30/ kW-month. This is 1,760 MW greater than the net-ICR of 34,075 MW for 2020/2021;[6] thus the auction cleared a surplus of 1,760 MW above the reliability requirement for New England. This 1,760 MW surplus exists without the second unit of Invenergy's proposed plant (because that second unit did not clear in the auction). This price was applicable to all of the Northern New England (NNE), Southeast New England (SENE), and Rest-of-Pool capacity zones. There were no binding transmission constraints between these zones, which include all of the load for the ISO NE area, effectively indicating a common pool for capacity supply resources. This "common pool" was also the result in the FCA 10 auction completed in 2016; thus, for two years running, there has been no locational premium (relative to the rest of New England) afforded capacity resources in the SENE zone (in which Rhode

[6] See, for example, in Attachment 2 to this testimony, page 8 of Attachment C to the ISO NE FERC filing of FCA 11 results, the Testimony of Robert G. Ethier on behalf of ISO NE.

Island is). Table 1 below summarizes the results. Attachment 2 contains the FCA 11 auction results as filed by ISO NE to the Federal Energy Regulatory Commission (FERC) on February 28, 2017.

Q. You refer to various "capacity zones" -- "Northern New England," Southeast New England" and "Rest of Pool." What are these capacity zones, and why are they important for this case?

A. The zones represent regions in New England that could possibly be constrained from either importing needed capacity, or exporting surplus capacity. They are an artifact of the modeling process used by ISO NE to represent electrical capacity resources in New England. These capacity zones are connected by multiple transmission paths. The capacity zones are important for this case because to the extent that transmission is not constrained between these zones, capacity from one zone can substitute for capacity from another zone; or, greater competition among all New England capacity resources is possible when the zones are not constrained.

Q. You say that in FCA-10 and FCA-11 "there were no binding transmission constraints between these zones." What does that mean, and why is that important to this case?

A. It means that the transmission path from the northern New England zone was not fully utilized in the capacity auction, and resources from Northern New England could compete directly with resources with southern New England to meet the region's overall capacity needs. It is important to this case because it means that there would be no relative premium attached to the price for capacity located in Southeast New England, compared to capacity available

from other zones, such as Canadian hydro delivered to a Vermont or New Hampshire location. This is an important fact to understand because it helps to demonstrate just why Invenergy's proposed power plant is not needed for system reliability.

Q. Is it true that in FCA-10 and FCA-11 the clearing price for capacity in the SENE capacity zone was identical to the clearing price in Rest of Pool? How does this illustrate the absence of binding constraints between the zones?

A. Yes. By definition, this illustrates the absence of binding constraints; when the prices are the same for two zones, it shows the lack of any transmission constraint between the zones.

Table 1. FCA 11 Summary Results – Capacity Supply Obligations

Capacity Supply Obligation, MW	Northern New England	Rest-of-Pool	Southeast New England	Grand Total
Existing				
Demand	439	958	1,175	2,571
Generator	7,536	13,572	10,017	31,125
Import		83		83
Existing Total	**7,974**	**14,612**	**11,192**	**33,779**
New				
Demand	72	233	335	640
Generator	43	13	209	264
Import	255	898		1,153
New Total	**370**	**1,143**	**544**	**2,057**
Grand Total	**8,344**	**15,755**	**11,736**	**35,835**

Source: ISO NE, tabulation by Synapse.

Q. What does Table 1 show?

A. The first column indicates the category of capacity supply obligation, essentially the form of resource that will be available to provide capacity in the commitment period 2020/2021. The next three columns differentiate the location of the resources, either in

Northern New England (essentially, Maine, New Hampshire and Vermont), Southeast New England (Northeastern and Southeastern Massachusetts and Rhode Island), or everywhere else in New England (western and central Massachusetts, and Connecticut).[7] The "existing" resource section illustrates that 33,779 MW of capacity resources are already existing, and they are in the form of demand, generator, and import resources. The "new" resource section illustrates that 2,057 MW of new resources are obliged to be online in 2020/2021; these are resources that have not yet been built or secured, but that now have a financial obligation to do so.

Q. Please explain these results.

A. These results illustrate that new demand-side resources and new import resources[8] provided the bulk of capacity supply beyond existing assets. They also show the distribution of capacity resources across New England, between new and existing resources, and across demand, generator, and import categories.

Q. In what specific ways are the data in Table 1 relevant to this case?

A The data reveal 2,057 MW of new resources that do not include any new, large gas-fired generation plant such as Invenergy's proposed plant. The data show that required capacity obligations can be procured from resources other than proposed new gas-fired combined cycle

[7] The specific boundaries that define the zones are shown in numerous places in the ISO NE documentation. See, for example, Slide 7 https://www.iso-ne.com/static-assets/documents/2016/03/a2_fca11_zonal_boundary_determinations.pdf.

[8] New import resources use existing transmission connections into New England. The nature of the arrangements for supply from external zones is such that each year, most of the import capacity into New England, from New York, Quebec and New Brunswick, is cleared as a "new" resource in the FCM auctions.

plants.

Q. Were there any retirements of so-called "at-risk" resources?

A. In fact, in FCA 11 there was very minimal retirement of "at-risk" resources. Of the 5,577 MW of "at-risk" resources, all but about 154 MW cleared FCA 11 (Yarmouth 1 and 2, and a portion of Yarmouth 3, the older and smaller of the units in Maine, did not clear).[9] This fact is important because it indicates that as of the 2020/2021 period, it remains economic for the bulk of the "at-risk" resources to serve as capacity resources in New England.

Q. Is there an early indication of FCA 12 retirement risk for the "at-risk" resources?

A. Yes, there is an indication of very limited retirement of at-risk resources for the 2021/2022 period. For "at-risk" facilities other than the Connecticut Bridgeport Harbor 3 coal plant, ISO NE data at this time indicates no departure from the market prior to FCA 12 (to be held next February) for the 2021/2022 Capacity Commitment Period. There are a total of 519 MW of resources that submitted "retirement de-list" bids in advance of FCA 12, and presumably the Bridgeport Harbor 3 coal plant (383 MW) is among the total (see Attachment 3).[10] It does not appear that any of the "at-risk" units other than the Bridgeport Harbor coal units are among the remaining 136 MW of capacity seeking to de-list. Remaining at-risk units can be price sensitive during the auction, but they would remain in service if the price is

[9] Synapse review of Capacity Supply Obligations associated with FCA 11 results. Yarmouth 4 and the remaining portion of Yarmouth 3 cleared a total of 654 MW. https://www.iso-ne.com/static-assets/documents/2017/03/ccp_2020_21_fca_obligations.xlsx.

[10] ISO NE, Retirement and Permanent De-list Bids for FCA #12 (CCP 2021-22), March 2017. https://www.iso-ne.com/static-assets/documents/2017/03/exitd-list-bids-for-fca2021-22.pdf. The data are aggregated into statewide categories for confidentiality reasons. The Bridgeport Harbor 3 plant has already publicly announced its impending retirement.

sufficiently high to cover their costs, as was the case in FCA 11.

Q. Please explain further what you mean by "price sensitive" at the Forward Capacity Market auction, and what that implies for reliability need in New England, and the need for the Invenergy proposed plant.

A. The Forward Capacity Auction (FCA) has a built-in market feedback mechanism - lower prices mean surplus supply relative to the net Installed Capacity Requirement. If prices decrease such that "at-risk" plants might not be able to earn enough revenue to remain in the auction and clear, that indicates that either load has gone down, and/or additional resources have been made available at low-enough prices, and the "at risk" unit(s) is/are no longer required to meet reliability needs.

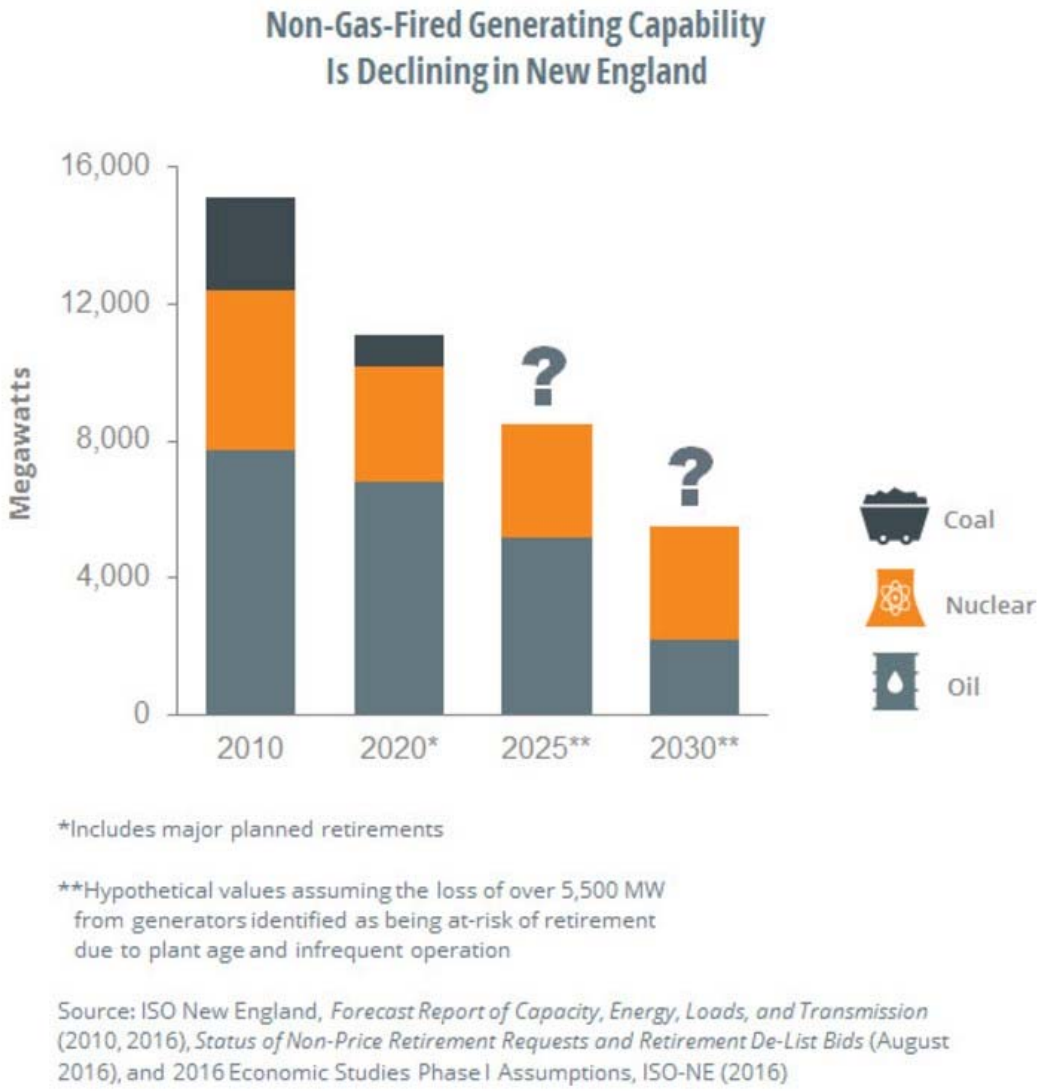
Q. What is the most current ISO NE information on the overall status of the "at risk" plants?

A. ISO NE indicates that "at-risk" units could retire over the next 13 years; they characterize them as "at risk of retirement in the coming years," as stated in their "Fast Stats" box on their webpage concerning the current resource mix:

- 4,200 MW of non-gas-fired generating capacity retired or retiring 2012–2020, with over 5,500 MW from coal- and oil-fired plants at risk of retirement in the coming years (https://www.iso-ne.com/about/key-stats/resource-mix)

ISO NE summarizes the "at-risk" retirement situation with a graphic depicting a possible retirement path, which I reproduce in Figure 1 below.

Figure 1: ISO NE Representations of "At-Risk" Plant Range of Retirement Date



Source: https://www.iso-ne.com/about/regional-electricity-outlook/grid-in-transition-opportunities-and-challenges/power-plant-retirements

This representation is different from ISO NE's representation in 2013 that the "at risk" units could be retired by 2020.[11] ISO NE also provides a more explicit representation in the Economic Studies they conducted during 2016, which is shown in Table 2 below.

[11] ISO NE, Strategic Transmission Analysis: Generation Retirements Study, Presentation at the Planning Advisory Committee meeting, December 13, 2012. https://www.iso-ne.com/static-assets/documents/committees/comm_wkgrps/prtcpnts_comm/pac/mtrls/2012/dec132012/retirements_redacted.pdf.

Table 2. ISO NE Representation of Range of Retirement Dates – "At Risk" Power Plants – For Economic Studies

Name	RSP Subarea	Fuel Type	FCA #10 Summer Capacity (MW)	In Service Date	Cumulative Capacity (MW)
Retired by 2025					
Schiller 4	NH	Coal	48	1952	48
Montville 5	CT	Oil	81	1954	129
Schiller 6	NH	Coal	48	1957	176
West Springfield 3	WMA	Dual	94	1957	271
Yarmouth 1	SME	Oil	50	1957	321
Middletown 2	CT	Oil	117	1958	438
Yarmouth 2	SME	Oil	51	1958	489
Merrimack 1	NH	Coal	108	1960	597
Middletown 3	CT	Oil	234	1964	831
Yarmouth 3	SME	Oil	115	1965	945
Bridgeport Harbor 3	SWCT	Coal	383	1968	1,329
Canal 1	SEMA	Oil	547	1968	1,876
Merrimack 2	NH	Coal	330	1968	2,206
Montville 6	CT	Oil	405	1971	2,611
Subtotal, Oldest Half			2,611		
Retired By 2030					
Middletown 4	CT	Oil	400	1973	3,011
Newington 1	NH	Oil	400	1974	3,411
Mystic 7	BOSTON	Dual	571	1975	3,982
New Haven Harbor 1	CT	Oil	448	1975	4,430
Canal 2	SEMA	Oil	545	1976	4,975
Yarmouth 4	SME	Oil	602	1978	5,577
Subtotal, Remaining Half			2,966		
Total					5,577

Source: ISO NE 2016 Economic Studies Phase I Assumptions, Power Supply Planning Committee presentation, June 10, 2016. Slide 35. https://iso-ne.com/static-assets/documents/2016/06/a9_2016_economic_study_assumptions.pdf.

Q. Please explain each of the columns listed in this table.

A. The first column lists the name of the "at-risk" unit, designated by plant name and number. The next column is the "RSP" or Regional System Plan subarea of New England that the unit is located in. The third column indicates whether the unit is fueled by oil, coal, gas, or a combination of fuels (i.e., "dual," which in these instances means oil and gas). The fourth

column is the capacity as measured by the unit's Capacity Supply Obligation for the summer portion of the 2019/2020 period, which corresponds to Capacity Commitment Period 10 (associated with FCA 10). The next column indicates when the plant went into service, and the last column is an accumulation of capacity associated with all units on the rows at and above the value.

Q. What is meant by the row indicating "subtotal, oldest half," associated with the first part of the tables with units listed under the subheading "Retired by 2025"?

A. For the purpose of ISO NE's economic studies, they assumed that the oldest facilities would retire before the newer facilities. The oldest half, roughly, of the "at-risk" units are listed in the top part of the table and in total sum to 2,611 MW.

Q. What is meant by the row indicating "subtotal, remaining half," associated with the last part of the tables with units listed under the subheading "Retired by 2030"?

A. For the purpose of ISO NE's economic studies, they assumed that the oldest facilities would retire before the newer facilities. The newest half, roughly, of the "at-risk" units are listed in the bottom part of the table and in total sum to 2,966 MW.

Q. What, specifically, do these data mean for this case?

A. The data provide an indication of the range of ages of the aggregate "at-risk" plant, and illustrate that ISO NE characterized the eventual retirement of these units according to their age. For this case, the table is further evidence that ISO NE is not anticipating the sudden retirement of 5,577 MW of capacity, and even the first portion of "at-risk" capacity that may retire could be available through 2025. The data also show, when considered in the context of

declining net peak load, surplus capacity, and intended additions of renewable or clean energy capacity, that the economic retirement of older fossil units in New England will not leave a reliability need for the proposed Invenergy plant.

Q. What does Table 2 show?

A. Table 2 shows that ISO NE assumes that 2,966 MW of the "at-risk" total, or 53% of the total, will still be online in 2025. The ISO assumes that 2,611 MW will be retired by 2025, but the ISO gives no indication of expectation of retirement of those units between 2022 and 2025.

Q. What are the other key aspects of the FCA 11 results that show that the proposed Invenergy plant is not needed?

A. The second unit at Invenergy's proposal Burrillville plant failed to clear in that auction. As noted, no large new gas-fired power plants cleared in the auction. The largest new resources secured were imports and energy efficiency. The surplus capacity procured reveals the existing headroom that currently exists for capacity need in New England. Without the first unit at the proposed Invenergy plant, New England would still have a surplus of capacity resources of 1,276 MW in 2020/2021, based on current ISO NE projections.[12] As will be seen in the following section, the 2017 CELT forecast exhibits even lower net peak loads for the 2020/2021 capacity commitment period, illustrating that this surplus of 1,276 MW – without the Invenergy plant first unit – will likely increase further, all else equal. As I show below, the 2020 summer net peak load forecast from the 2017 CELT is 490 MW lower (26,298 MW (2017

[12] And, major gas-fired resources cleared in earlier FCM auctions are either online, or under construction, as noted in the last section of this testimony.

CELT) vs. 26,788 MW (2016 CELT)) than the forecast from the 2016 CELT. In other words, in just one year, the downward reduction in projected net peak load from ISO NE is more than the capacity output of the first proposed Invenergy unit (485 MW).

ISO NE 2017 CELT Load Forecast

Q. What is the 2017 CELT Load Forecast?

A. It is ISO NE's latest forecast of load, energy efficiency (EE), and behind-the-meter solar PV (BTMPV). It contains load, EE, and BTM-PV trajectories in New England, along with additional information on capacity and transmission. It is included as Attachment 4 to this testimony.

Q. Why are the results of the 2017 CELT Forecast relevant to this case?

A. The 2017 CELT forecast is relevant because it shows the current projected level of peak load forecast for future years, which is a key input to the capacity needs requirement for any given future year. It also demonstrates that the trends shown in my testimony submitted to the RI PUC continue – that later vintages of CELT forecasts show lower net peak load than earlier vintages, for any given future year. This was a crucially important part of my earlier PUC testimony; it starts on page 12, line 8, and runs through page 27, line 16; it includes Figures 3 through 6 on pages 18 and 19, and Figures 7 and 8 on page 23. As I discuss in much more detail below, the PUC apparently did not credit this portion of my testimony last year; however, the 2017 CELT load forecast shows that my earlier testimony in the PUC was correct.

Q. What does the 2017 CELT load forecast show?

A. For all forward years, it shows lower net summer peak load, lower net annual energy needs, and increased levels of EE and BTMPV compared to last years' CELT forecast, and compared to the 2015 CELT forecast (on which need for Invenergy's proposed plant was first assessed). Table 3 below includes summary net peak load forecast metrics from the 2017 CELT, along with comparative data for the same metric from the 2016 and 2015 CELT forecasts. These data are the most relevant to informing the RI EFSB assessment of reliability need for the proposed plant, since capacity needs are directly tied to summer peak load.

Q. What do the data in Table 3 show?

A. The data first show that ISO NE's current net peak load forecast for the year 2019, the first year in which the proposed plant was to have provided capacity, is 901 MW lower than it was in the 2015 CELT, the forecast in effect at the time of Invenergy's initial application to the RI EFSB. Thus, over the span of just two forecast cycles, accounting for increased energy efficiency resource trajectories, and accounting for increases in behind-the-meter solar PV resource trajectories, has led to a reduction in reliability need that exceeds the Capacity Supply Obligation held by Invenergy for the first unit for the year 2019. The second unit, as indicated in the above section, did not even clear in FCA 11. The data also show that for the summer of 2020, the reduction in forecast net peak load between this years' CELT and the 2015 CELT is 1,102 MW, more than the projected output of both of Invenergy's units combined. The data also show that by the middle part of the next decade (2024), the net summer peak load will be more than 1,700 MW lower than was projected by ISO NE in 2015.

Q. What conclusion with regard to Invenergy's second proposed unit do you believe the

EFSB should draw from these data?

A. Not only is the second unit not needed as a result of the FCA 10 and FCA 11 auctions, where that unit did not clear, but the data clearly show that net peak demand for 2020 relative to what was forecast just last year is lower by even more than the capacity of Invenergy's second unit. Thus, while the applicant persists in saying that the second unit will eventually be needed to meet reliability needs, the data show that with each successive year, net demand for any given future year declines relative to the prior year's forecast. This validates the ISO NE net peak load over-forecast trends I provided evidence for in the RI PUC Advisory Opinion case.[13]

Q. What conclusion with regard to Invenergy's first generation unit do you believe the EFSB should draw from these data?

A. These ISO data show that even Invenergy's first unit is not needed for reliability. This is true because the forecast net peak load for summer 2019 is now 374 MW lower than last years' net peak load forecast, and more than 900 MW lower than what was forecast in 2015, which is what was used to develop FCA 10's capacity needs. ISO NE's over-forecast of net peak loads in 2015 for the summer of 2019 resulted in advance procurement of capacity (in FCA 10) that is now shown to be not needed. That is, we now have additional evidence that even Invenergy's first unit is not needed.

[13] Fagan testimony, RI PUC Advisory Opinion case, pages 22-23.

Table 3. ISO NE CELT Projections – Forecast Net Summer Peak Load, and Year-to-Year Differences, New England – 2017, 2016, 2015 CELT Forecasts

New England MW	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	10-Yr CAGR	
2017 CELT Forecast Net Summer Peak Load*			26,537	26,482	26,458	26,409	26,298	26,213	26,167	26,155	26,176	26,228	26,310	**-0.07%**	(2017-2026)
2016 CELT Forecast Net Summer Peak Load*		26,661	26,704	26,698	26,765	26,783	26,789	26,816	26,870	26,942	27,026	27,122		**0.16%**	(2016-2025)
2015 CELT Forecast Net Summer Peak Load*	26,404	26,565	26,835	26,977	27,178	27,310	27,400	27,487	27,599	27,733	27,876			**0.48%**	(2015-2024)
Change in Projection, CELT2017 vs. CELT2016				(216)	(307)	(374)	(491)	(603)	(703)	(787)	(850)	(894)			
Change in Projection, CELT2017 vs. CELT2015				(495)	(720)	(901)	(1,102)	(1,274)	(1,432)	(1,578)	(1,700)				

Source: ISO NE, 2017, 2016, 2015 CELT Reports. Tab 1.1 Summer Peak, reference load with reduction for BTM PV and PDR (passive demand response, or EE).
Notes: *Initial year of each CELT vintage forecast is weather-normalized for actual net peak load. The 2016 actual summer peak load was 25,596. The 2015 actual summer peak load was 24,437 MW. The 2014 actual summer peak load was 24,443 MW. CAGR = compound annual growth rate.

Q. What does the ISO NE net peak load forecast reveal for New England and Rhode Island?

A. The net peak load forecast patterns now show negative net peak load growth for New England, and for Rhode Island.[14] This is the first time the 10-year forecast for New England exhibits a negative trend. This follows from the recent trends in increased energy efficiency installations in New England, increasing behind-the-meter solar PV installations, and ISO NE forecasting trends that eventually pick up this decline.

Q. Is it important that that ISO NE's 10-year net peak load forecast is negative for the first time?

A. Yes.

Q. Why?

A. It is important because future net peak load needs, on which capacity requirements are mostly based, are now lower than current net peak load. This is a dramatic reversal from the history of load forecasting in New England. It shows how distributed resources can help to provide "breathing room" to allow older fossil units to retire as new renewable resources come online.

Q. How is this significant for this case? What conclusions should the RI EFSB draw from this new evidence concerning the need for Invenergy, and why?

[14] The 2017 CELT forecast data show a -0.23%/year (compound annual growth rate) net summer peak load forecast rate for Rhode Island for 2017-2026, or a drop in the forecast net summer peak load from 1,870 MW in 2017, to 1,828 MW in 2026. Data available at https://www.iso-ne.com/static-assets/documents/2017/05/forecast_data_2017.xlsx.

A. It is significant because it demonstrates that earlier load forecasts, on which the need for the proposed plant was premised, are now no longer accurate. Combined with new information on planned clean and renewable energy provision in New England, it shows that going forward the retirement of older units can occur without replacement with new natural gas combined cycle units. The RI EFSB should draw the conclusion that the over-forecasting of load by ISO NE in the 2015 CELT resulted (in FCA 10) in too high an advance procurement of capacity, and the reliability need for Invenergy is no longer demonstrated.

Q. What did the updated energy efficiency forecast used in the 2017 CELT show for New England?

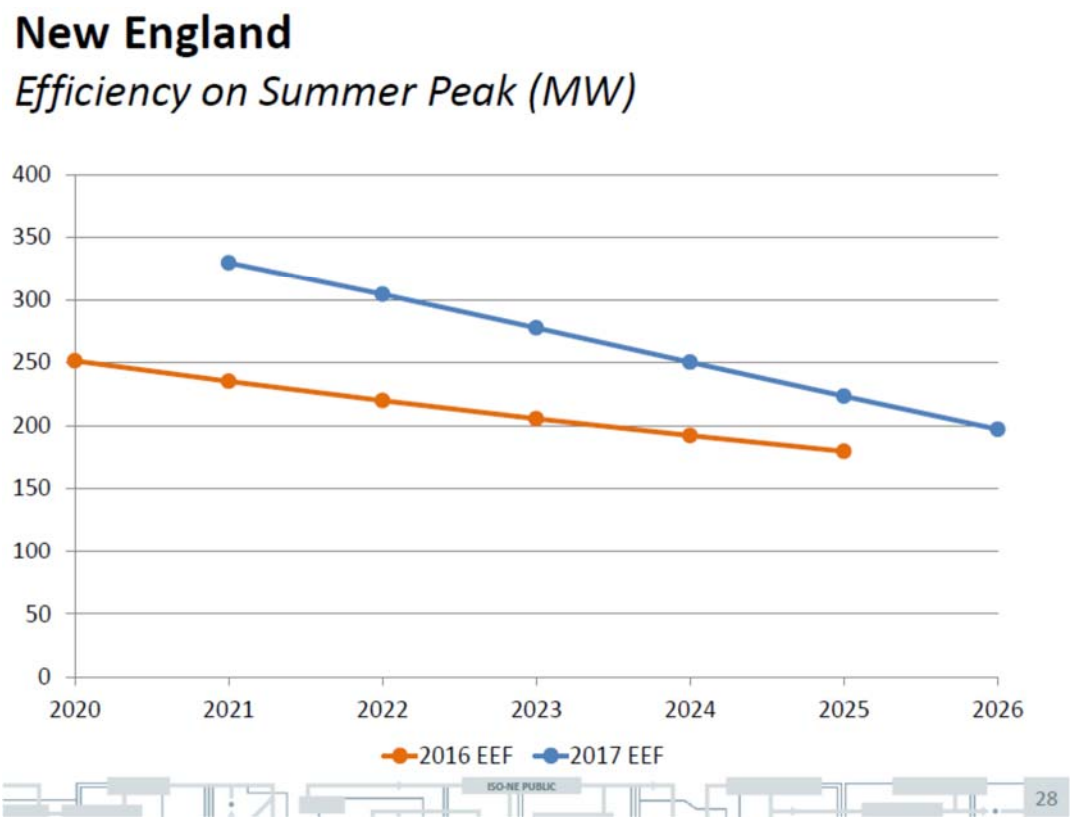
A. It indicated increased amounts of resource capability from EE in future years relative to last year's forecast. Figure 2 below is a summary of the incremental, annual peak-load-reducing effect of energy efficiency resources in New England, compared to last year's CELT. Each year, this incremental effect accumulates, contributing to the overall net peak load declines. The full presentation on the 2017 energy efficiency forecast is included as Attachment 5 to this testimony.

Q. Why is this important, and why is it relevant to this case?

A. The updated EE forecast is important because it quantifies this incremental resource availability that was not projected at the time of the applicant's analysis, but is now shown to be part of the capacity resources expected in future years. It is relevant to this case because it shows that a different resource is now planned for installation in New England that reduces the capacity needed from new fossil plants and eliminates any specific need for Invenergy's

proposed plant, either Turbine One or Turbine Two.

Figure 2. 2017 Energy Efficiency Forecast Snapshot – Incremental Summer Peak Load Decline from Energy Efficiency Resources – 2017 vs. 2016 Forecast



Source: ISO NE, 2017 Energy Efficiency Forecast, slide 28.

Q. What did the latest solar PV forecast for New England Indicate?

A. The 2017 solar PV forecast, included as Attachment 6, demonstrates a dramatic increase in projected installations of solar PV resources in New England over the next decade, compared to last year's forecast. As noted by ISO NE at the NEPOOL Participants Committee meeting on May 5, 2017:

> "As compared to the 2016 CELT forecast, the total 2017 nameplate PV forecast is approximately 40% higher in 2025, and estimated summer peak load reductions from the BTM PV portion of the forecast are approximately 24% higher in 2025"[15]

There will be more than 4,700 MW (AC) of solar PV on the system by 2026, and 4,584 MW by 2025. In 2016, ISO NE projected 3,273 MW by 2025; in one year's forecast cycle, the forecast adjustment for 2025 was more than 1,300 MW upward. This increase in solar PV resource installation trajectory will have a major effect on the need for other resources in New England – it reduces that need in proportion to the solar "capacity credit" designated for PV resources.[16]

Figure 3 below contains the data for projected solar PV resource installations from the current 2017 CELT, and Figure 4 contains the same data from the previous years' forecast, for comparison.

Figure 5 is a graphical comparison of solar PV projections over the past four years. As seen, for example, projected solar PV resource installations for 2020 will be more than 1,800 MW (AC) higher than was projected for that year in 2014; at a capacity credit of 33.5%, that translates to more than 600 MW of additional capacity not foreseen in 2014.

[15] Slide 92, from ISO NE's presentation at the NEPOOL Participants Committee meeting, May 5, 2017. https://www.iso-ne.com/static-assets/documents/2017/05/may-2017-coo-report.pdf. Also included as Attachment 7 to this testimony.

[16] This capacity credit is roughly 34% in 2020, declining to roughly 30% by 2026. See slide 60, Attachment 6.

Figure 3. ISO NE Solar PV Final Forecast, 2017

Final 2017 PV Forecast

Nameplate Capacity, MW_{ac}

States	Annual Total MW (AC nameplate rating)											Totals
	Thru 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	
CT	281.5	132.8	132.8	132.8	58.9	44.7	43.5	42.2	40.9	39.6	38.4	**988.2**
MA	1324.8	273.9	260.2	164.4	160.0	155.6	151.1	146.7	71.1	68.9	66.7	**2,843.3**
ME	22.1	6.8	6.8	6.8	6.2	5.8	5.8	5.8	5.8	5.8	5.8	**83.7**
NH	54.3	18.1	12.0	7.4	7.2	7.0	6.8	6.6	6.4	6.2	6.0	**138.2**
RI	36.8	41.3	41.3	35.3	31.8	15.2	11.3	11.1	10.8	10.6	10.4	**255.9**
VT	198.4	25.0	25.0	25.0	22.5	21.3	21.3	21.3	21.3	21.3	21.3	**423.4**
Regional - Annual (MW)	**1918.0**	**497.9**	**478.2**	**371.8**	**286.6**	**249.6**	**239.8**	**233.6**	**156.3**	**152.4**	**148.5**	**4,732.7**
Regional - Cumulative (MW)	**1918.0**	**2415.9**	**2894.1**	**3265.9**	**3552.5**	**3802.1**	**4041.9**	**4275.5**	**4431.8**	**4584.2**	**4732.7**	**4,732.7**

Notes:
(1) Forecast values include FCM Resources, non-FCM Energy Only Resources, and behind-the-meter PV
(2) The forecast reflects discount factors to account for uncertainty in meeting state policy goals
(3) All values represent end-of-year installed capacities

Figure 4. ISO NE Solar PV Final Forecast, 2016

Final 2016 PV Forecast

Nameplate, MW_{ac}

Note: Values in **red boldface** have changed relative to the draft forecast

States	Annual Total MW (AC nameplate rating)										Totals
	Thru 2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	
CT	188.0	85.5	104.5	81.0	81.0	81.0	55.8	54.3	45.0	45.0	45.0	866.1
MA	947.1	**294.4**	122.7	**69.7**	**38.7**	**38.7**	**38.7**	**38.7**	**38.7**	**38.7**	**38.7**	**1,705.0**
ME	15.3	4.7	4.7	4.4	4.4	4.4	4.2	3.9	3.9	3.9	3.9	57.9
NH	26.4	13.3	7.6	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	79.3
RI	23.6	21.6	38.7	36.0	36.0	25.9	9.1	6.6	6.6	6.6	6.6	217.2
VT	124.6	30.2	**23.8**	22.5	22.5	22.5	21.3	20.0	20.0	20.0	20.0	347.3
Regional - Annual (MW)	**1325.0**	**449.6**	**301.9**	**217.7**	**186.7**	**176.5**	**133.2**	**127.5**	**118.2**	**118.2**	**118.2**	**3,272.8**
Regional - Cumulative (MW)	**1325.0**	**1774.7**	**2076.5**	**2294.2**	**2480.9**	**2657.4**	**2790.6**	**2918.1**	**3036.3**	**3154.6**	**3272.8**	**3,272.8**

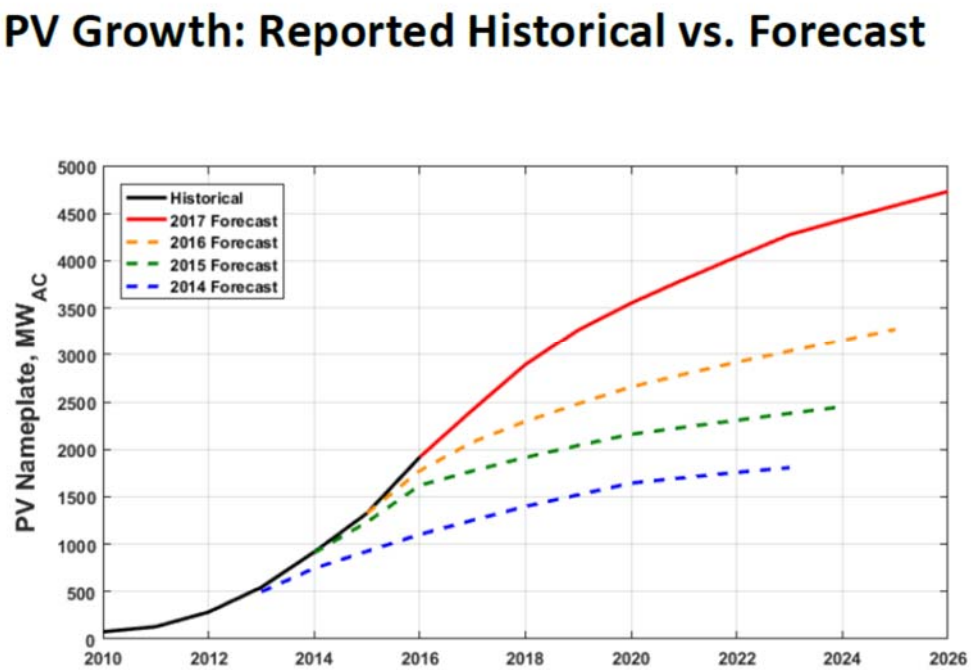
Notes:
(1) Forecast values include FCM Resources, non-FCM Energy Only Generators, and behind-the-meter PV resources
(2) The forecast reflects discount factors to account for uncertainty in meeting state policy goals
(3) All values represent end-of-year installed capacities

Source for Figures 2 and 3: ISO NE, Final 2017 Solar PV Forecast.

Q. Can you explain what the data represent in Figures 3 and 4?

A. Yes. The data represent the total amount of solar PV resources – both small scale, behind-the-meter (i.e., "rooftop") and utility-scale (i.e., larger scale, connected directly to the distribution or transmission system) resources projected to be on-line in each state in each year of the forecast through 2026 (for the latest 2017 forecast) and through 2025 (for the earlier, 2016 forecast). The data further show the installed solar PV capacity in AC terms, accounting for the losses that occur in the inverters used to change the DC solar electricity into AC power for consumption. For the 2016 forecast, the table also indicates that the final forecast was updated from an earlier draft forecast. The tables summarize annual installations and the cumulative amount of solar PV on the system.

Figure 5. ISO NE Graph Comparing 2017, 2016, 2015 and 2014 Solar PV Forecast



Source: ISO NE, Final 2017 PV Forecast, page 33. https://www.iso-ne.com/static-assets/documents/2017/05/2017_solar_forecast_details_final.pdf

Q. Please explain how the change in solar PV forecast between 2017 and earlier CELT forecasts affects the current assessment of reliability needs in Rhode Island and New England, and how it impacts the need for the proposed Invenergy plant.

A. Figure 5 above illustrates the dramatic increases in projected solar PV installations in New England for the near years, including the years in which the proposed plant is projected to come online, in the current forecast compared to earlier forecasts. A sizable portion of the solar PV seen in the above graph is from small, behind-the-meter solar PV resources, lowering the peak load requirements for the rest of the system. Reduced net peak load forecasts place downward pressure on the need for new capacity.

Q. What is the significance of the growth of PV for this case?

A. We now have more recent data (than we did in July 2016, when the RI PUC Advisory Opinion hearing was held) that show that the Invenergy plant is not needed in part because of the effect of increased amounts of available solar PV, relative to what was known last year.

Q. Are you saying that these updated data on increasing levels of projected solar PV were not available in July 2016?

A. Yes, that's right. It is very important for the EFSB to take account of the most recent, accurate ISO data. Those data show that there is no system reliability need for Invenergy's Turbine One or Turbine Two.

Q. What is the relationship between the data in Figures 3 and 4 and the chart that appears in Figure 5? Why are these data so important?

A. These data show that the ISO's forecast of solar PV megawatts on the system for the

same future year (say, 2020 or 2024) has gotten higher and higher as that future year approaches. It is reasonable to assume that the more recent forecast data is more accurate than earlier year data. I also note that the shifts in projected solar PV with each successive forecast since 2014 have been in the same direction – toward higher estimates of solar PV. This is powerful evidence that with each passing year, solar PV plays a larger role in contributing to what I see is the elimination of any need for either of the two Invenergy units.

The PUC Advisory Opinion and RI OER Testimony Points

Q. The PUC Advisory Opinion indicated that the proposed plant is needed because of potential "at-risk" plant retirements.[17] How does your new evidence affect this conclusion?

A. New evidence presented here – including the FCA 11 results, and the 2017 CELT report - illustrates the continuing material contributions being made towards reliability by the increasing amounts of energy efficiency installations and small solar PV, New England wide. As these resources reduce the net peak load forecast for New England relative to earlier year forecasts, thousands of MW of additional capacity is ultimately provided to allow for the economic retirement of the "at risk" plants without need to add the proposed Invenergy plant.

Q. Is there other information available since last summer concerning "at-risk" plant economic retirement effects?

A. Yes. Even more capacity comes from supply-side renewable resources and storage

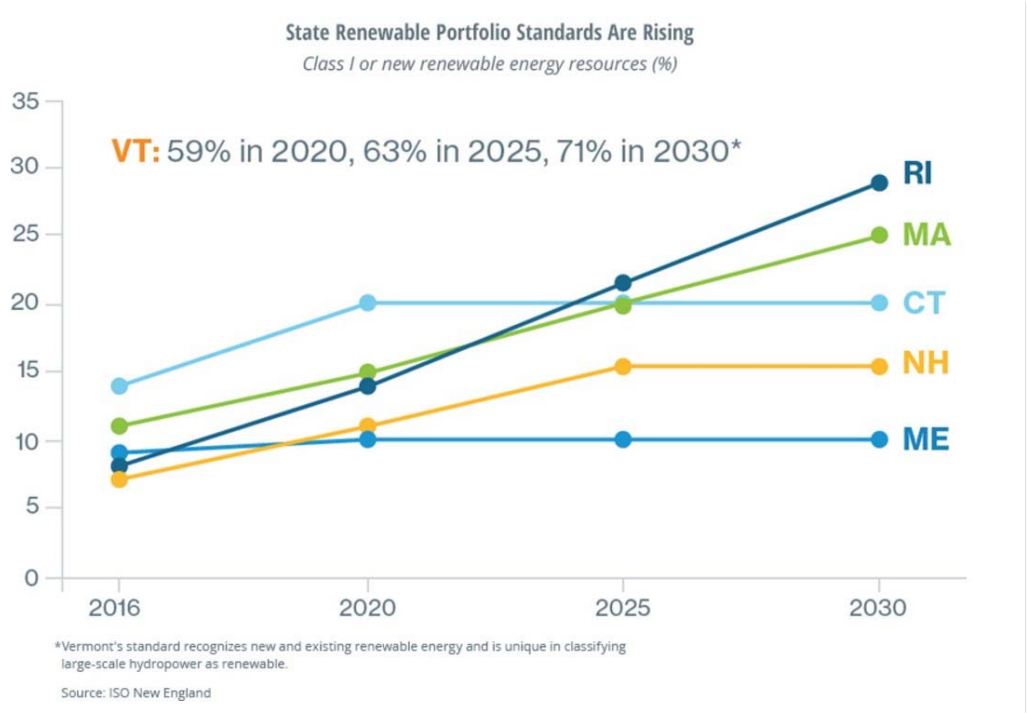
[17] Page 8, at-risk section.

options. Some of the same economic drivers that result in increases in small solar PV have led to lower utility-scale solar PV costs, and will lead to ongoing utility-scale solar PV additions.[18] Utility scale solar PV additions reduce the need for capacity from plants like the proposed Invenergy units. As I note later in this section, additional large-scale renewable or clean energy resources are also expected in New England over the near-to-medium term pursuant to Massachusetts legislation.[19] These resources will further mitigate any reliability effects that would otherwise be seen if or as the "at-risk" plants eventually retire.

Additional storage resources can also be expected; the Massachusetts "State of Charge" storage report released in September 2016 contains a policy recommendation for 600 MW of storage in MA by 2025; and pursuant to MA legislation, the Massachusetts Department of Energy Resources (DOER) has recommended that storage targets be set by electric companies.[20] Renewable Portfolio Standard (RPS) requirements in New England will also continue to lead to increased amounts of on-shore wind resources; Figure 6 below shows the increasing target levels for RPS in New England.

[18] See, e.g., the August 2016 Lawrence Berkeley National Laboratory publication on utility-scale solar cost, pricing and performance trends. https://emp.lbl.gov/sites/default/files/lbnl-1006037_report.pdf.
[19] An Act to Promote Energy Diversity, H.4568, https://malegislature.gov/Bills/189/H4568.pdf.
[20] See, e.g., Massachusetts energy storage study release http://www.mass.gov/eea/pr-2016/administration-releases-energy-storage-report.html, September 2016. Also, see December 2016 MA DOER indication that storage targets will be established for utilities in Massachusetts by July 1, 2017. http://www.mass.gov/eea/docs/doer/12-27-16-doer-letter-to-conferees-storage-target.pdf.

Figure 6. RPS in New England



Source: ISO NE webpage on resource mix, https://www.iso-ne.com/about/key-stats/resource-mix.

Q. What data does ISO NE provide about "at-risk" plants?

A. As noted above, ISO NE appears to expect "at-risk" retirement gradually, over the period through 2030. There is no imminent threat to reliability because of the existence of these older plants; ISO NE now says that the resources may be retired by 2030, and more than half of them could still be operating in 2025.

Q. Was all of this information available before the July 2016 RI PUC Advisory Opinion hearing?

A. Generally, no. Obviously, the 2017 CELT (issued May 1, 2017) including the solar PV and EE forecast information shown above, and the results of FCA 11 (February 2017) were not

available in July 2016, nor was any information concerning the new Massachusetts legislation from August 2016 (which is addressed in detail in the following section of this testimony). ISO NE's solar PV forecast was informed by various state policy initiatives, with one of the largest impacts being solar PV in Massachusetts, whose design was new after July 2016.[21] The graphic shown in Figure 1 previously in this testimony, concerning "at-risk" plant retirement, was developed and posted by ISO NE after August 2016, based on the ISO NE notations seen in that graphic. Earlier material from ISO NE had indicated a concern that the at-risk units could be retired by 2020 (see footnote 12); that is no longer the case. I do note that I had not seen the data in Table 2 prior to the filing of my testim ony in RI PUC case, and I had not seen it before my appearance in July 2016; but the data is indicated to have been posted on June 7, 2016, prior to a June 10, 2016 ISO NE Planning Advisory Committee meeting. My pre-filed testimony in that case was filed on June 14, 2016. RPS requirements are not new, but the Massachusetts legislation on Canadian hydro and offshore wind, which will affect clean energy trajectories in New England, is new.

Q. What does this new evidence, in total, imply for the concern about "at-risk" resource retirement and its effect on reliability in New England absent the Invenergy proposed plant?

A. Taken together, the existing surplus capacity, continued provision of energy efficiency and other demand-side resources, additional small solar PV and larger solar PV, contracted new

[21] The Massachusetts Department of Energy posted its final "Solar Massachusetts Renewable Target" (SMART) final design in January of 2017. http://www.mass.gov/eea/docs/doer/rps-aps/final-program-design-1-31-17.pdf.

clean energy resources and offshore wind, additional RPS-driven on-shore wind, and lastly, storage resources, all contribute to mitigating the effect on reliability if or as the "at-risk" plants retire.

Q. Why is this new evidence about at-risk plants relevant to this RI EFSB case?

A. The PUC Advisory Opinion relied in significant part on a hypothetical, possible, future possibility of these at-risk plants closing down. This appears in the PUC's Advisory Opinion in the section that runs from page 8 to page 11. But we now have the results from FCA-11 that show that the PUC's concern was misplaced, and new forecast evidence and clean and renewable supply evidence shows how the concern will be mitigated through alternative resources.

Q. But couldn't there still be retirements of at-risk plants in FCA 12, or future FCAs, that lead to a reliability need for the Invenergy plant?

A. We already know that FCA 12 retirement will be limited to economic decisions by plant owners, since no non-price retirement requests have been received.[22] Economic decisions mean that sufficient existing and new resources would exist to "allow" at-risk plants to retire with no reliability concern. Moreover, as I demonstrate below, renewable or clean energy capacity resources already in the "pipeline" and continuing trends of lower net peak loads from small solar PV and energy efficiency resource implementation provide ongoing capacity, making the retirement prospects associated with the "at-risk" plants less and less important to

[22] See attachment 3.

reliability with each passing year.

Q. The PUC Advisory Opinion indicated that the proposed plant is needed because of SENE as import constrained.[23] How does your new evidence affect this conclusion?

A. The new FCA 11 evidence shows no SENE zone constraint; thus the SENE zone has now not been constrained for the past two FCM auctions, FCA 10 and FCA 11. While it is still modeled as an import-constrained zone, the constraint has not been binding. With decreasing net load in the SENE zone, and with transmission investment made to bolster the SENE zone's capacity to import resources from outside, it is reasonable to expect it to not be constrained in future auctions. Mr. Parker noted "over the long run, as new resource investments are made and/or demand changes, these capacity prices should stabilize across the region."[24] Mr. Parker appears to have been correct in this regard: the prices have stabilized; new investment in energy efficiency, solar PV, and transmission have driven the SENE zone to be unconstrained. To the extent that SENE's being an import-constrained zone in the past supported the need for Invenergy, that is no longer the case.

Q. The PUC's Advisory Opinion indicated that the proposed Invenergy plant is needed in part because "there is no assurance that any of the new resources will be built"[25] and it noted that two resources in particular had yet to be built.[26] Is there additional assurance now that new gas-fired resources cleared in the FCA 10 auction other than the proposed plant, and

[23] RI PUC Advisory Opinion, page 11.
[24] Mr. Parker testimony at 11: 18-20.
[25] Page 14.
[26] Page 13, referencing the Canal 3 and Bridgeport Harbor 5 plants.

other large gas plants, will be built?

A. Yes. Of the remaining two large gas-fired resources that cleared FCA 10,[27] the Bridgeport Harbor 5 combined cycle facility is under construction,[28] and the Canal 3 combustion turbine facility has received its air quality permit from the Massachusetts Department of Environmental Protection (MA DEP).[29] A tentative decision by the Massachusetts Energy Facility Siting Board (MA EFSB) approving the Canal 3 plant was made on June 20, 2017.[30] Additional major natural gas-fired generation that cleared FCA 9 is also either under construction or has received permit approval: the 750 MW combined cycle facility in Towantic CT is under construction,[31] and the 195 MW West Medway combustion turbine has received approval from the MA EFSB.[32]

Q. The PUC Advisory Opinion noted that Mr. Parker, testifying on behalf of the RI OER, noted that "he was not aware of any energy efficiency of conservation resources that could adequately replace CREC's capacity."[33] Please describe the level of new demand-side resources that cleared in FCA 11.

[27] An exhibit in the PUC Advisory Opinion docket was a delineation of FCA 10 CSO (capacity supply obligation) accounting. It listed three large new gas-fired generators (totaling 1,302 MW): the proposed Invenergy plant (the first unit that cleared FCA 10), the 333 MW Canal 3 combustion turbine, and the 484 MW Bridgeport Harbor 5 combined cycle facility.
[28] Construction began in April 2017. See PSEG's monthly progress report, filed with the CT Siting Council. http://www.ct.gov/csc/lib/csc/pending_petitions/2_petitions_1201through1300/pe1218/progressreports/pe1218-monthly-progress-report-4-20170428.pdf.
[29] http://www.mass.gov/eea/docs/dep/air/approvals/final2016/nrgcanal-paqpa.pdf.
[30] See http://170.63.40.34/DPU/FileRoomAPI/api/Attachments/Get/?path=efsb15-06%2fNotice61317.pdf.
[31] http://www.cpvtowantic.com/index.html.
[32] MA EFSB Final Approval, November 2016. http://170.63.40.34/DPU/FileRoomAPI/api/Attachments/Get/?path=efsb15-01%2fEFSB1501FinalDecision111816.pdf.
[33] PUC Advisory Opinion, page 18, referencing Mr. Parker testimony (page 44).

A. FCA 11 cleared 640 MW of new demand side resources, in addition to all of the resources that have already been committed for capacity provision in New England. That level of cleared *new* capacity exceeds the output of one of the Invenergy units. Expected future *new* demand resource capacity is likely to result in demand-side resources in excess of the entire Invenergy plant, with just a few years' worth of incremental demand-side resources.

Q. Mr. Parker stated that you "over-estimated the role of distributed resources and renewables in the resource mix ISO-NE can rely upon to ensure system reliability, and under-estimated the role of conventional generating resources."[34] Please respond with new evidence supporting your assertion.

A. The newest CELT report, and the results of the FCA 11 show that 1) distributed resources are indeed increasing (increased demand-side resources clearing FCA 11, and increased amounts of small PV embedded in the CELT forecast), and 2) conventional generation is decreasing (no new large plants cleared).

I did not overestimate distributed resource and renewables role, and I did not underestimate the role of conventional generation. The two critical distributed resources reflected in the 2017 CELT forecast are energy efficiency and solar PV. In 2016, Rhode Island, Massachusetts, Connecticut and Vermont were ranked in the top tier of States for energy efficiency implementation, as ranked in the American Council for an Energy-Efficient Economy's (ACEEE's) annual State Efficiency Scorecard.[35] In 2017, ACEEE's approach focused on the largest

[34] Parker testimony at 46: 20-22.
[35] ACEEE, 2016 "The State Energy Efficiency Scorecard," http://aceee.org/state-policy/scorecard.

utilities in the country (which excluded Rhode Island), and three Massachusetts and Connecticut utilities were part of the top five, of 51 total utilities, continuing to demonstrate the region's success in EE resource installation.[36] New England is a national leader in utility energy efficiency program performance, as these rankings show, and the effect of such success is lower net peak loads. Simultaneously, small solar PV installations in New England have skyrocketed, as reflected in the ISO NE 2017 CELT data seen in this testimony, due to both state policies and the continuing cost declines for the resource. The impact of these distributed resources on reducing peak load is *compelling*, not "overestimated," as Mr. Parker incorrectly asserted.

Nor do I underplay the role of conventional generation. New England has more than 12,000 MW of existing gas-fired combined cycle resource, and multiple thousands of MW of hydro, pumped storage, and dispatchable Canadian imports that contributes to the region's ability to have a "flexible" resource base; part of the reason Invenergy's plant is not needed is because the existing resource base – which includes such conventional generation – is available to provide system dispatch flexibility.

Q. In stating his observations on forecasts for net peak load, Mr. Parker said "…but capacity needs are driven by the net peak load forecast (Figures 7 and 8)." Is this true, and what does ISO'NE's latest 2017 CELT forecast indicate about net peak load, upon which net Installed Capacity Requirements are based?

[36] ACEEE, "2017 Utility Energy Efficiency Scorecard", Grace Relf, Brendon Baatz, and Seth Nowak, June 2017, Report U1707, page 9. http://aceee.org/sites/default/files/publications/researchreports/u1707.pdf.

A. Mr. Parker is correct that net peak load drives capacity needs. The current forecast now shows declining net peak load; ISO NE's 2017 CELT forecast indicates that net peak load will decline over the 2017-2026 period. The forecast explicitly shows that my claim, which I made in mid-2016 based on the then-continuing trend of lower peak load forecasts with each successive ISO NE forecast vintage, is valid.[37] The 10-year net peak load forecast for New England (2017-2026) shows a negative 0.07% decline, and year-over year declines through 2023. The 10-year net peak load forecast for Rhode Island (2017-2026) shows a negative 0.23% decline, and year-over-year declines through 2023.

Q. Are there other recent, significant developments in New England that will affect the need for the proposed Invenergy plant?

A. Yes. Massachusetts passed its Energy Diversity Act in August 2016.[38] The Energy Diversity Act calls for two major solicitations for renewable energy, both of which are now underway: 1) direct contracting of capacity and energy from hydroelectric or other "clean energy" (non-fossil) energy resources, for delivery of 9.45 TWh (millions of MWh) by the end of 2022 ("83D" solicitation);[39] and 2) delivery of 1,600 MW of offshore wind by 2027.[40] The capacity contribution of these resources is likely to be in the ballpark of 2,000 MW.[41] I had

[37] Fagan pre-filed testimony, PUC Advisory Opinion docket, page 22.
[38] An Act to Promote Energy Diversity, H.4568, https://malegislature.gov/Bills/189/H4568.pdf.
[39] 83D final solicitation, March 31, 2017, at https://macleanenergy.files.wordpress.com/2017/03/83d-rfp-and-appendices-final.pdf.
[40] 83C draft solicitation, May 5, 2017 version, at https://macleanenergy.files.wordpress.com/2017/02/17-103-section-83-rfp-revised-5-5-17.pdf. The final solicitation is to be issued June 30, 2017.
[41] The clean energy (83D) solicitation calls for resources to be connected as a capacity resource. Depending on the flow pattern and average annual capacity factor, 9.45 TWh equates to roughly 1400 MW; and the offshore wind capacity contribution is likely to be in the range of 30-50%, or roughly 480-800 MW of capacity.

noted in my original PUC Advisory Opinion testimony that New England was considering the importation of significantly increased levels of Canadian hydropower.[42] The Massachusetts legislation is one key part of the means by which that capacity and energy will flow to New England.

Q. Why is this Massachusetts legislation important to this Rhode Island issue?

A. At the time of the RI PUC hearing in July 2016, Invenergy was supposed to be on line on June 1, 2019; now the on-line date has been pushed at least into 2020. At the time of the RI PUC hearing in July 2016, both the Canadian hydropower ("83D" solicitation) and the offshore wind ("83C" solicitation) prospects were still speculative; now they are statutory. These planned capacity resources, which begin to be available well before 2025, provide further evidence that the Invenergy plant is not needed for system reliability.

Q. Is this a change from your testimony in the RI PUC Advisory Opinion docket in July 2016?

A. My conclusion has not changed; however, in the intervening year, there is more evidence available that my conclusion then was correct. This specific evidence, for instance, about the roughly 2,000 MW of Canadian hydro and offshore wind planned capacity resource is now evidence not fully available in July 2016.

Q. Are these the only incremental capacity resources likely to be available during the decade of the 2020s, and available to provide capacity as "at risk" units economically retire?

[42] Fagan pre-filed testimony in the PUC Advisory Opinion docket, page 32.

A. No. Increased amounts of on-shore wind, large-scale utility solar, storage, and other resources available to meet state Renewable Portfolio Standard needs will provide energy, and are likely to provide capacity, to the grid. As noted above, utility-scale solar costs have been dropping, Massachusetts is targeting 600 MW of storage by 2025, and continuing increases in energy efficiency, other demand resources, and small solar PV will also continue to reduce the capacity needed from units like the proposed Invenergy plant.

Q. Does that complete your testimony?

A. Yes.

Attachments to Testimony

1. Robert M. Fagan Resume
2. FCA 11 Results – Filing to FERC
3. ISO NE Retirement and Permanent De-list Bids for FCA #12 (CCP 2021-22)
4. ISO NE 2017 CELT Tables
5. ISO NE 2017 EE Forecast
6. ISO NE 2017 PV Forecast
7. ISO NE Pages from presentation at May 5, 2017 NEPOOL Participants Committee Report