STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

ENERGY FACILITY SITING BOARD

In Re: Invenergy Thermal Development LLC	)	
Application to Construct and	)	
Operate the Clear River Energy	)	Docket SB-2015-06
Center, Burrillville, Rhode Island	)	

SURREBUTTAL TESTIMONY OF GLENN C. WALKER

Summary:

This surrebuttal testimony of Mr. Walker rebuts misrepresentations of facts by Ryan Hardy and Marc Vatter and provides additional support for the opinion that the proposed Clear River Energy Center ("CREC") is not needed or justified by long-term State of Rhode Island and/or regional energy forecasts, and that there are more than ample cost-effective efficiency and conservation opportunities, and other more environmentally and socially justified renewable alternatives to the proposed facility.

List of Exhibits

INTRODUCTION

Q. Please state your name, business address, and employer.

A. My name is Glenn C. Walker and my business address is 7 Greenleaf Woods Drive, Unit 102, Portsmouth, NH. I am employed by George E. Sansoucy, P.E., LLC.

Q. On whose behalf are you testifying?

A. My testimony is on behalf of the Town of Burrillville, Rhode Island in opposition to the application for a license from the Rhode Island Energy Facility Siting Board ("RI EFSB" or the "Board") to construct the Clear River Energy Center ("CREC") in Burrillville, RI.

Q. Have you previously filed testimony in this matter which includes your resume and nature of your testimony?

A. Yes. I provided testimony to the RI EFSB on March 2, 2017 primarily regarding the lack of need for the CREC being proposed by Invenergy Thermal Development LLC ("Invenergy"). I also provided supplemental prefiled testimony to the RI EFSB on August 7, 2017.

Q. What is the purpose of your testimony in this proceeding?

A. To rebut claims made by witnesses Ryan Hardy[1] on behalf of Invenergy and Marc H. Vatter, Ph.D.[2] on behalf of the Rhode Island Building and Construction Trades Council ("RIBCTC") with respect to the need for CREC, cost justification, and ratepayer savings.

[1] RI EFSB Docket No. SB-2015-06 Pre-Filed Rebuttal Testimony of Ryan Hardy, PA Consulting Group, Inc.
[2] RI EFSB Docket No. SB-2015-06 Rebuttal testimony of Marc H. Vatter.

This rebuttal addresses misrepresentations of my previous testimony by these witnesses, corrects misleading statements in their testimony, and provides additional support for my original conclusions.

Q. Can you summarize your prior testimony?

A. On October 29, 2015, Invenergy filed an application with the RI EFSB to construct two 500± megawatt ("MW") combined cycle dual-fuel electric generating units with a total capacity of 1,000± MW to be located in Burrillville, Rhode Island.

My testimony addresses why I am of the strong opinion that the proposed facility is not justified by long term state and/or regional energy need forecasts and that there are more than ample cost-effective efficiency and conservation opportunities, and other more environmentally and socially justified renewable alternatives to the proposed facility. In regard to need, I will address issues raised by Mr. Hardy and I will rebut his opinion that the Advisory Opinion from the Rhode Island Public Utilities Commission ("RI PUC") is still relevant given the passage of time and the significant changes that have taken place in the ISO-NE service territory.

In addition to the issues that involve the Advisory Opinion, I will address the market reality facing the CREC units and the criticism of my prior testimony by the previously mentioned witnesses.

Q. Can you summarize why your feel the Advisory Opinion is not relevant?

A. Yes. The Advisory Opinion issued from the RI PUC on September 12, 2016 is one-year old. It did not have the benefit of (1) the ISO-NE Forward Capacity Auction ("FCA") 11 results,[3] (2) the recent increased development of renewables and demand response in the ISO-NE region, or (3) the most recent ISO-NE Report of Capacity, Energy, Loads, and Transmission ("CELT") estimates of energy efficiency, conservation, and renewable energy development over the next 10 years, as well as other significant changes in the ISO-NE market. Also, the Advisory Opinion did not have the benefit of capacity prices falling approximately 25% between FCAs 10 and 11, Invenergy's inability to obtain a Capacity Supply Obligation ("CSO") in FCA 11 for CREC Unit 2, and [redacted].

In addition, due to events and trends in the market, that were unavailable when the RI PUC prepared its Advisory Opinion, the conclusions are unreliable. This is illustrated below for each of the major findings.

1. *"…I am of the opinion that CREC is needed in order to meet the electric generation reliability needs of Southeastern New England and Rhode Island consumers…"*[4]
    - Since the Advisory Opinion, the number of load zones in New England has decreased to two[5] which makes reliance on the capacity constraints of the SEMA/RI load zone inappropriate to support a conclusion of need.

[3] The ISO-NE eleventh Forward Capacity Auction for the Capacity Commitment Period of June 1, 2020 to May 31, 2021 (FCA 11) was held on February 6, 2017.
[4] RI PUC Docket No. 4609 Advisory Opinion, p. 2.
[5] The two zones are ROP (Rest of Pool) and SENE (Southeastern New England). SENE replaced NEMA and SEMA/RI.

2. *"…and generate savings to wholesale energy prices in New England, the effects of which should benefit Rhode Island consumers."*[6]

   - As stated below, Invenergy is costing ratepayers approximately [redacted] relative to alternative capacity. In addition, the high level of energy efficiency, demand-reduction, and renewables that are anticipated to be built in the ISO-NE territory over the next 10 years is likely to have a greater impact on ratepayer savings than CREC.

3. *"…particularly given that Unit 1 has a mechanism to contract for firm supply of natural gas, which is rare in the gas fired generation industry."*[7]

   - The benefits of a firm gas supply are unknown at this point since Invenergy has not provided any financial details of this agreement. While it is generally thought that a firm gas supply is beneficial, it would only be for the first CREC unit and may have been more beneficial to Invenergy to persuade Spectra (the provider of the firm contract) to allow it a site in Burrillville at its compressor station than to ratepayers.

4. *"As the facility will be operated as a merchant plant by Invenergy, all of the costs and risks relative to the plant will be borne by the Applicant, and not by the ratepayers."*[8]

[6] RI PUC Docket No. 4609 Advisory Opinion, p. 2.
[7] RI PUC Docket No. 4609 Advisory Opinion, p. 2.
[8] RI PUC Docket No. 4609 Advisory Opinion, pp. 2, 3.

- Consumers are already paying more for the Invenergy capacity than the value of capacity in FCA 11 and/or the cost of its replacement capacity as identified below. These were facts unknown at the time the RI PUC issued its Advisory Opinion, but after the fact, make Invenergy's capacity look expensive in the marketplace.

5. *"I am convinced that energy efficiency and renewable energy supply cannot, at this time, reliably meet the need for which CREC will be built."*[9]

- This finding is misplaced by the results of FCA 11. As the ISO-NE makes it clear in a press release:

  *"The 11th Forward Capacity Market (FCM) auction (FCA #11) closed at a preliminary, system-wide clearing price of $5.30 per kilowatt-month (kW-month), compared to $7.03/kW-month in the previous auction for New England resources. No major generators retired in FCA #11 and no large new generators cleared in the auction, but 640 megawatts (MW) of new energy efficiency and demand-reduction measures—**the equivalent of a large power plant**—cleared and will be available in 2020-2021."* [10] ***[emphasis added]***

Q. Can you provide simple quantitative examples of why you believe there is no need for the CREC?

A Yes. The simplest way to illustrate the lack of need is the fact that, (1) Invenergy has failed to secure a CSO for its second unit and (2) [redacted]

[9] RI PUC Docket No. 4609 Advisory Opinion, p. 3.
[10] ISO-NE press release, February 9, 2017.

[redacted]. The result is that Invenergy's original award is costing ratepayers [redacted].[11]

Q. [redacted]**?**

A. [redacted].

Q. Do you have any reason to believe that Mr. Hardy's prediction that CREC will clear in FCA 12 is any more accurate?

A. No. After reviewing Mr. Hardy's assumptions to his most recent "quantitative analysis" as well as relying upon my knowledge of the Forward Capacity Market ("FCM"), I do not believe that the second unit at CREC will clear in FCA 12 or for several more FCAs. I base this opinion on both a "quantitative analysis" of the ISO-NE market and discussions with entities that manage generating facilities throughout New England, who are not optimistic about the near-term FCA results.

[11] [redacted]

[12] RI PUC Docket No. 4609 Pre Filed Testimony of Ryan Hardy, p. 9 lines 19-20.

Q. Do you have any specific criticism of Mr. Hardy's quantitative analysis?

A. Yes. In determining the supply and demand for future generating resources in the ISO-NE service territory, Mr. Hardy fails to account for the additions of base load renewable resources that Massachusetts is currently procuring and which I will more fully discuss below. In short, Mr. Hardy *"does not assume new transmission is built from Canada to satisfy ISO-NE load."*[13] This assumption artificially lowers the future supply of electricity in his amounts and creates a false need for CREC.

In addition to omitting new base load renewables and wind resources being proposed by Massachusetts, Mr. Hardy also lowered his forecast reserve margin by using an unrealistically low estimate of behind-the-meter (solar) photovoltaic (BTMPV). For example, the ISO-NE forecast 1,014 MW of BTMPV installed by 2025.[14] Mr. Hardy adjusted this figure based on PA Consulting Group's internal view to a figure of 912 MW, or 10% less BTMPV than the ISO-NE used in its 2017 CELT report. Mr. Hardy states in a data request response that, *"The BTMPV assumptions are based on ISO-NE's projections from the 2017 CELT Report, which are adjusted based on PA's internal view of BTMPV growth in ISO-NE. This is the same methodology use in PA's previous analysis of CREC."*[15]

[13] RI EFSB Docket NO. SB-2015-06 Invenergy Thermal Development LLC's Responses to The Town of Burrillville's 32nd Set of Data Requests, August 9, 2017 Responses 32-4(a) and 32-4(b).
[14] ISO-NE 2017 CELT Report, Section 1.1 Summer Peak Capabilities and Load Forecast.
[15] RI EFSB Docket NO. SB-2015-06 Invenergy Thermal Development LLC's Responses to The Town of Burrillville's 32nd Set of Data Requests, August 9, 2017 Response 32-2(a).

These continual "adjustments" to known events or trends in the ISO-NE market are examples of Mr. Hardy being biased against renewables and in favor of fossil units such as CREC. A graph comparing the ISO-NE BTMPV load forecast to Mr. Hardy's forecast is found in Exhibit GCW-1.

Q. Do you believe that these manipulations are part of the reason Mr. Hardy failed to predict the results of FCA 11?

A. Yes. Clearly, if one ignores or understates significant trends in the market by using erroneous inputs, the results of any model will be incorrect. This is akin to garbage in garbage out. In particular, one of the factors in the FCA 11 results was as the ISO-NE stated in its press release, *"…640 megawatts (MW) of new energy efficiency and demand-reduction measures—**the equivalent of a large power plant**—cleared and will be available in 2020-2021."*[16] ***[emphasis added]***

If Mr. Hardy's model inputs fail to account for the addition of new renewable resources, energy efficiency, and demand-reduction measures, then the model will almost certainly be wrong and predict a need for CREC when none is present in the market.

Q. Did Mr. Hardy disagree with your characterization of the 2017 Connecticut Siting Council opinion finding a lack of need?

[16] ISO-NE press release, February 9, 2017.

A. Yes. Mr. Hardy raised the issue, which is mischaracterized in his rebuttal testimony. First, he cites only a portion of the actual conclusion reached by the Siting Council. Mr. Hardy's testimony states:

> *"However, the Siting Council acknowledged that the 'need, for a facility is a function of time' and that Killingly Energy Center may be needed in the future."*[17]

His citation is out of context and misleading. The Siting Council actually stated:

> *"The public benefit, or need, for a facility is* ***a function of time, a relationship directly contingent upon a date when additional capacity will be needed****. The Council finds and determines that the proposed facility* ***is not necessary for the reliability of the electric power supply*** *of the state or for a competitive market for electricity* ***at this time. If there is a future need for additional capacity, the market will respond."***[18] ***[emphasis added]***

Clearly, the Siting Council is rejecting the proposed unit until such time as there may be a market-based need supported by a CSO. The decision recognizes that the "market" will determine the need for a new natural gas-fired combined cycle unit, if and when such a need arises. In other words, the Siting Council notes that if the market does not give a proposed unit a CSO, it is not needed for reliability of the electric power supply. This lack of market-based need resulted in the Siting Council denying the application because it did not want to approve a plant that would result in unnecessary surplus capacity in the State of Connecticut or the New England system. This is exactly why these types of projects go before a siting council, such as the RI EFSB.

[17] Pre-Filed Rebuttal Testimony of Ryan Hardy, p. 2, lines 12-14.
[18] Connecticut Siting Council Docket No. 470, Opinion, May 11, 2017, p. 11.

Q. Do you agree with Mr. Hardy's characterization of the Siting Council opinion that just because a unit has a CSO, it is *"part of the package of capacity necessary to meet New England and Rhode Island reliability needs."*[19]

A. No. His selective use of dicta from the Siting Council's opinion lends no support for the total CREC and is misplaced [redacted] Therefore, his statement is false in two ways. First, the total CREC was never part of a "package" selected by the ISO-NE, and second, there is a requirement for certain amounts of capacity or megawatts in a particular zone, in this case Southeastern New England ("SENE") but there is absolutely no requirement at all that the unit be Invenergy's CREC Unit 1, [redacted].

Q. [redacted]**?**

A. [redacted].

Q. [redacted]**?**

[19] Pre-Filed Rebuttal Testimony of Ryan Hardy, p. 3, lines 22-23.

A. [redacted].

Q. [redacted]**?**

A. [redacted].

Q. Do you and Mr. Hardy still disagree on unit retirements in the ISO-NE?

A. Yes. We still disagree on at risk retirements and whether current or future FCA results will be sufficient to keep these older units operating, which were typically built before the 1970s. In my prior testimony, I summarized approximately 5,500 MW of older at risk units that cleared in FCA 11. This is consistent with the 5,500 MW of at risk units identified in the 2017 Regional Energy Outlook cited by Mr. Hardy. However, we still disagree on the time period when these unit will retire.

As Mr. Hardy states:

> *"Mr. Walker and I have similar views on the very low end of my range of retirements. The assumption on the low end of my range is that no additional retirements of existing units occur beyond those that have already been announced with firm retirement dates. This is an extremely conservative view and does not assume the retirement of any of the 5,500 MW capacity at-risk for retirement that ISO-NE identifies in the 2017 Regional Energy Outlook, nor the 1,280 MW of static*

delist bids submitted in FCA 11 that did not exit the market, nor the possibility for 1,044 MW of Public Service of New Hampshire 6 ("PSNH") units to retire if Eversource Energy is ultimately unable to sell them."[20]

As illustrated in the statement above, Mr. Hardy and I agree on the low end of the range which includes approximately 5,500 MW of capacity that the ISO-NE identified in 2017 as at risk. These at risk units, in fact, did not retire in FCA 11 and few, if any of these, are anticipated to retire in FCA 12. Therefore, it appears there is still disagreement on the timing of when the at risk 5,500 MW of capacity may retire.

However, Mr. Hardy implies in his testimony that I never expected these units to retire, which is not true. I stated in my prior testimony:

"Q. Have you reviewed those at risk units that chose to stay in the market after FCA 11?

A. Yes. I have compared the units the ISO-NE identified as at risk in the 2017 Regional Electricity Outlook, page 28, all of which, except for the Yarmouth units, received CSOs in FCA 11. It is my opinion that at the current capacity prices, few, if any, of these units are likely to exit the market over the next several FCAs (see Exhibit GCW-4).

Q. Have you reviewed the retirement delist bids that have been filed in advance of FCA 12 which will be held in February 2018?

[20] Pre-Filed Rebuttal Testimony of Ryan Hardy, p. 9, lines 14-21.

A. Yes. There are 519 MW that have submitted retirement delist bids. It is my opinion that this total likely includes the 380 MW Bridgeport Harbor coal-fired unit that previously announced closure. Therefore, of the approximately 5,500 MW of capacity identified as at risk, only about 380 MW is likely to exit the market in FCA 12 if prices are in the $5.00-$6.00/kW-month range. The market surplus will easily absorb this."[21]

Q. So, you never testified or implied that these units will never retire?

A. No. Unlike the impression Mr. Hardy and Mr. Vatter are trying to give from my testimony, each time I have addressed the retirements I have explained clearly that retirements were not likely to occur over the next several FCAs or if prices remain in the range of $5.00 to $6.00/kW-month. The rationale for this is due to what is typically measured as the marginal or going-forward cost of the last unit necessary to meet demand for capacity or the "marginal unit." This going-forward marginal cost is similar to the ISO-NE's Dynamic Delist Bid Threshold[22] or "soft floor" of capacity prices. In FCA 11 the "soft floor" was $5.50/kW-month and was consistent with the bidding behavior of suppliers of capacity as FCA 11 cleared slightly under the "soft floor."

Q. Has the ISO-NE proposed to lower the Dynamic Delist Bid Threshold or "soft floor"?

A. Yes. Based upon the formula established by the ISO-NE and approved by the Federal Energy Regulatory Commission ("FERC"), the ISO-NE and its Independent Market

[21] Supplemental Prefiled Testimony of Glenn C. Walker, p. 17 line 22, p. 18, lines 1-12.
[22] The option to remove capacity from the capacity market at prices below the Dynamic Delist Bid Threshold during a single capacity commitment period.

Monitor have proposed to change the Dynamic Delist Bid Threshold for FCAs 13-15 to only $4.30/kW-month. This reduction means to me that the ISO-NE expects bidding behavior of existing resources to move lower as opposed to upwards, which is necessary to attract new units based on its review of historic and expected bidding behavior. Therefore, if one considers the Dynamic Delist Bid Threshold to reflect a "soft floor" for existing resources, there is a high probability this price will be at or around $4.30/kW-month given the anticipated level of existing supply in FCAs 13-15. See Exhibit GCW-2 for a discussion of the Dynamic Delist Bid Threshold. For CREC, this reduction in the Dynamic Delist Bid Threshold means that if it could not clear the market at a capacity price of $5.30/kW-month in FCA 11, it certainly cannot clear the market at a lower price in the range of $4.30/kW-month.

Q. Do you think it is possible that if CREC is licensed it could actually displace nuclear units instead of coal or oil units?

A. Yes. There are essentially no coal units still operating in the Rhode Island zone, and almost no residual fuel units. However, if CREC is constructed, it could lead to the shutdown of one of the two remaining nuclear units in New England. As Mr. Hardy identified, Dominion Energy is currently analyzing its strategy options at the Millstone Power Station ("Millstone") located in Connecticut. Those options include potential closure due to low prices.[23] Therefore, the addition of CREC could have the unintended consequence of not closing the older fossil units that are currently identified as at risk, but instead a large base load carbon-free generator such as Millstone or the Seabrook Station in New Hampshire.

[23] Pre-Filed Rebuttal Testimony of Ryan Hardy, p. 10, lines 16-21.

Q. How is it possible that a nuclear unit would potentially close instead of an older fossil unit like those identified by the ISO-NE?

A. As both Mr. Hardy and I agree, the decision to close a plant is not based on a *"single year of cleared capacity prices"*[24] but instead, as Mr. Hardy stated and I agree, *"[f]uture expectations of costs, as well as future revenue projections, can shift from-year-to year driven by market factors (e.g. changes to fuel cost expectations) as well as factors inside-the-fence at a given facility (e.g. changes to maintenance costs driven by an unexpected outage)."*[25]

In the case of older fossil units, the low utilization of these units and the limited contribution of the energy sales or energy margin makes them more dependent on capacity revenue. In general, these units have had their invested capital paid back to them for years and now only require the recovery of going-forward O&M costs and/or low levels of invested capital. These units have been and are considered to be economically resilient in the ISO-NE markets. This is evidenced by their continued operation through FCAs 1-6 where the payment rates were very low - ranging from $2.52 to $4.25/kW-month. Therefore, the current price levels of $5.00 to $6.00/kW-month are substantially more attractive to these old units, even accounting for pay-for-performance[26] issues.

[24] Pre-Filed Rebuttal Testimony of Ryan Hardy, p. 9, line 27.
[25] Pre-Filed Rebuttal Testimony of Ryan Hardy, p. 14, lines 22-25.
[26] The FCM performance payment is determined by resource performance during shortage conditions and may be positive or negative (on top of base payment).

In contrast, nuclear units are less dependent on capacity payments and more dependent on the sale of electric energy due to the size of the unit and the significant amount of fixed O&M expenses and ongoing capital expenditures. The low gas and electric energy prices that the ISO-NE is currently experiencing (and expected to experience) result in significantly less energy margin contributions for nuclear units which may impact the economic decision to continue operating them. These decisions to retire are evidenced by the closure of the Vermont Yankee and Pilgrim nuclear plants in New England, along with numerous other nuclear units throughout the country.

Mr. Hardy raised the possibility of losing Millstone. I think that is unlikely, especially given Connecticut's recent bill to provide it a near-term contract, recognizing its importance to the region's electric market. A compromise bill[27] was passed by the Connecticut Senate on September 15, 2017 that authorizes the Connecticut Department of Energy & Environmental Protection ("DEEP") to solicit and enter into a 3 to10-year contract for nuclear power. In addition, the age and size of the Millstone units (2,088 MW) provide the additional economies of scale relative to units such as Pilgrim (677 MW) or Vermont Yankee (620 MW).

This type of contract is not unique to Connecticut. The states of New York and Illinois have enacted such legislation and Ohio has pending legislation. Therefore, even in the current low-cost energy environment, the environmental and social benefits of carbon-free

[27] Connecticut Senate Bill No. 1501 "An Act Concerning Zero Carbon Procurement" (as amended by Senate "A").

Millstone make it unlikely that this plant will retire in the near-term, especially given the action by the Connecticut legislature to ensure its continued operation.

Q. In your testimony do you have a "view of low capacity prices in perpetuity"?[28]

A. No. I would expect, as is always the case in the power markets, that prices will go through a boom and bust cycle with long periods of low capacity prices followed by a significant rise in prices to attract new capacity, then another long period of low prices. In my opinion, we are in the low price period that will eventually lead to an increase in prices sometime in the future. However, if we look at historic FCA results (FCAs 1-11), it is likely to take several FCAs for prices to rise to a point that will justify the addition of new units such as CREC. The results of FCA 11 were below the price necessary to attract new units. Instead, the market is able to satisfy demand with small improvements to existing units ("capacity creep"), the addition of renewables, energy efficiency, and other demand resources.

Q. Is there a requirement that renewables compete financially with fossil units?

A. No. There are additional environmental and social benefits of renewables that typically result in those units being compensated at a higher price than carbon emitting units in the marketplace. This is evidenced by the fact that all of the New England states have enacted Renewable Portfolio Standards ("RPS") to promote renewable resources and that there have been a number of Connecticut and Massachusetts requests for proposals ("RFPs") that have sought to procure electric resources that meet a particular environmental standard. Therefore, to suggest that the economics of a natural gas-fired combined cycle unit is

[28] Pre-Filed Rebuttal Testimony of Ryan Hardy, p. 10, line 14.

somehow relative to the economics of a renewable resource that provides additional environmental and social benefits is inconsistent with the energy policy in New England.

Q. Do you agree with Mr. Hardy's characterization that he takes into account the results of the recent renewable RFPs?

A. No. At best, Mr. Hardy only addressed the prior solicitation for renewable resources typically referred to as the three-state Clean Energy RFP,[29] not those mandated by Massachusetts legislation and passed by the Baker Administration in 2016, which I address in detail in my prior testimony.

Q. Do you agree with Mr. Hardy's characterization that the outcome of the RFPs is questionable and that Massachusetts will not burden its ratepayers with excess costs above what is necessary to meet its RPS?

A. No. As with many of the citations used by Mr. Hardy, he chooses to omit portions of the citation that lend key meaning to the phrase he is citing. For example, Mr. Hardy quotes the following from the Massachusetts RFP:

> *"that the DPU shall consider both the potential costs and benefits of such contracts and shall approve a contract only upon a finding that it is a cost effective mechanism for procuring low cost clean energy on a long-term basis." Similar language is found in the Massachusetts off-shore wind RFP, which states on page 13 that "proposals must be cost effective for ratepayers."*[30]

[29] The soliciting parties include the Commonwealth of Massachusetts and the states of Connecticut and Rhode Island.
[30] Pre-Filed Rebuttal Testimony of Ryan Hardy, p. 10, line 14. p. 18, lines 4-8.

Mr. Hardy uses the citation above to imply that somehow these solicitations are optional or unlikely to procure significant amounts of long-term base load resources. However, in my prior testimony I cited the 2016 Massachusetts legislation. It is my opinion that the Massachusetts law mandates the procurement of these resources, as indicated by the following sections of House Bill 4568:

> *"The distribution companies may conduct 1 or more competitive solicitations through a staggered procurement schedule developed by the distribution companies and the department of energy resources; provided, that the schedule* ***shall ensure that the distribution companies enter into cost-effective long-term contracts for clean energy generation equal to approximately 9,450,000 megawatt-hours by December 31, 2022****. Proposals received pursuant to a solicitation under this section shall be subject to review by the department of energy resources. If the department of energy resources, in consultation with the distribution companies and the independent evaluator, determines that reasonable proposals were not received pursuant to a solicitation, the department may terminate the solicitation, and* ***may require additional solicitations to fulfill the requirements of this section****."*[31] *[****emphasis added****]*

> *"Section 83C. (a) In order to facilitate the financing of offshore wind energy generation resources in the commonwealth, not later than June 30, 2017, every distribution company shall jointly and competitively solicit proposals for offshore*

[31] Massachusetts House Bill 456, p. 26, lines 509-519.

wind energy generation; and, provided, that reasonable proposals have been received, shall enter into cost-effective long-term contracts. Long-term contracts executed pursuant to this section shall be subject to the approval of the department of public utilities and shall be apportioned among the distribution companies."[32]

"Section 83D. (a) In order to facilitate the financing of clean energy generation resources, not later than April 1, 2017, every distribution company shall jointly and competitively solicit proposals for clean energy generation and, provided that reasonable proposals have been received, shall enter into cost-effective long-term contracts for clean energy generation for an annual amount of electricity equal to approximately 9,450,000 megawatts-hours. Long-term contracts executed pursuant to this section shall be subject to the approval of the department of public utilities and shall be apportioned among the distribution companies under this section."[33]

In regard to the Clean Energy RFP, the 9,450,000 MWh base load renewables solicitation attracted multiple bidders.[34] This solicitation is mandated to procure 9,450,000 MWh of long-term base load renewables and the Offshore Wind Energy RFP has a similar mandate.

Q. Do you anticipate that wind and solar will operate at 90% capacity factors in New England?

[32] Massachusetts House Bill 456, p. 18, lines 336-341.
[33] Massachusetts House Bill 456, p. 25, lines 496-502.
[34] Supplemental Prefiled Testimony of Glenn C. Walker, p. 15, lines 1-23 and p. 16, lines 1-5.

A. No, of course not. Mr. Vatter mischaracterizes my illustration of the Massachusetts procurements under Section 83D that seek 9,450,000 MWh, which is targeted at base load resources (not intermittent resources) which at a 90% capacity factor results in approximately a 1,200 MW procurement.

Q. Do you believe the trend analysis for future capacity as set forth by Mr. Vatter is accurate?

A. No. Mr. Vatter illustrates a trend of capacity prices[35] which has no relationship to reality and is based on a flawed trend analysis of past FCA results. Mr. Vatter clearly is unfamiliar with the workings of the ISO-NE FCM and the sloping demand curve used by the ISO-NE.

The simplest example of why Mr. Vatter's trend analysis is incorrect is to cite the proposed Dynamic Delist Bid Threshold by the ISO-NE at $4.30/kW-month [redacted]. In order for Mr. Vatter's "upward trend" to be correct, the market would have to be tight on capacity, which is not anticipated to be the case for the next several FCAs.

Q. Do you believe there are other resources that are currently being developed in the ISO-NE that meet the "back stop" needs of renewables better than the CREC units?

A. Yes. These types of units are typically peaking turbines like the units being built in Medway, Massachusetts and the Canal 3 unit in Sandwich, Massachusetts. These resources

[35] Rebuttal testimony of Marc H. Vatter, lines 195-204.

are not expected to be base load (like CREC) but are being built as peaking or intermediate units to "back stop" renewables.

Q. Do you agree with Mr. Hardy's statement that *"CREC will likely operate at higher efficiency than Canal 3, indicating that the ISO-NE would typically dispatch CREC over this less efficient resource to meet fast start, ramping, and flexibility needs."*?[36]

A. This statement is partially correct. CREC will be dispatched ahead of the Canal 3 unit, typically as a base load resource. However, Mr. Hardy's testimony implies that the ISO-NE will be doing so based on the flexibility of the units or in real-time. This is not true. The CREC units will likely be base load and will not be available to "back stop" renewable resources in real-time.

Q. Do you believe that the CREC fast starts, ramping, and flexibility are going to be used to "back-up intermittent renewable generation?"

A. No. I believe this argument to be somewhat of a red herring. There is no doubt that the GE 7FH technology that Invenergy is proposing meets these characteristics. However, it is not "*an important tool for integrating intermittent solar and wind*."[37] The reality is that technology such as the GE 7FH in the New England market will operate in a base load fashion due to its efficiency and is likely do so at or near its full capacity. Therefore, while the base load power is available to the grid, the unit cannot "back stop" renewables as claimed in Mr. Vatter's testimony.

[36] Pre-Filed Rebuttal Testimony of Ryan Hardy, p. 15, lines 18-20.
[37] Rebuttal testimony of Marc H. Vatter, lines 165-166.

The ability for any natural gas-fired combined cycle unit to "back stop" renewables is a function of more than just fast start characteristics and the ability to have a sufficient fuel source for operation, which in most markets requires procuring natural gas on the day prior to operating or operating on oil until sufficient natural gas can be procured in the spot market.[38] Therefore, the CREC units, as proposed, have several operating issues that make them highly unlikely to "back stop" renewables in the real-time market. These include:

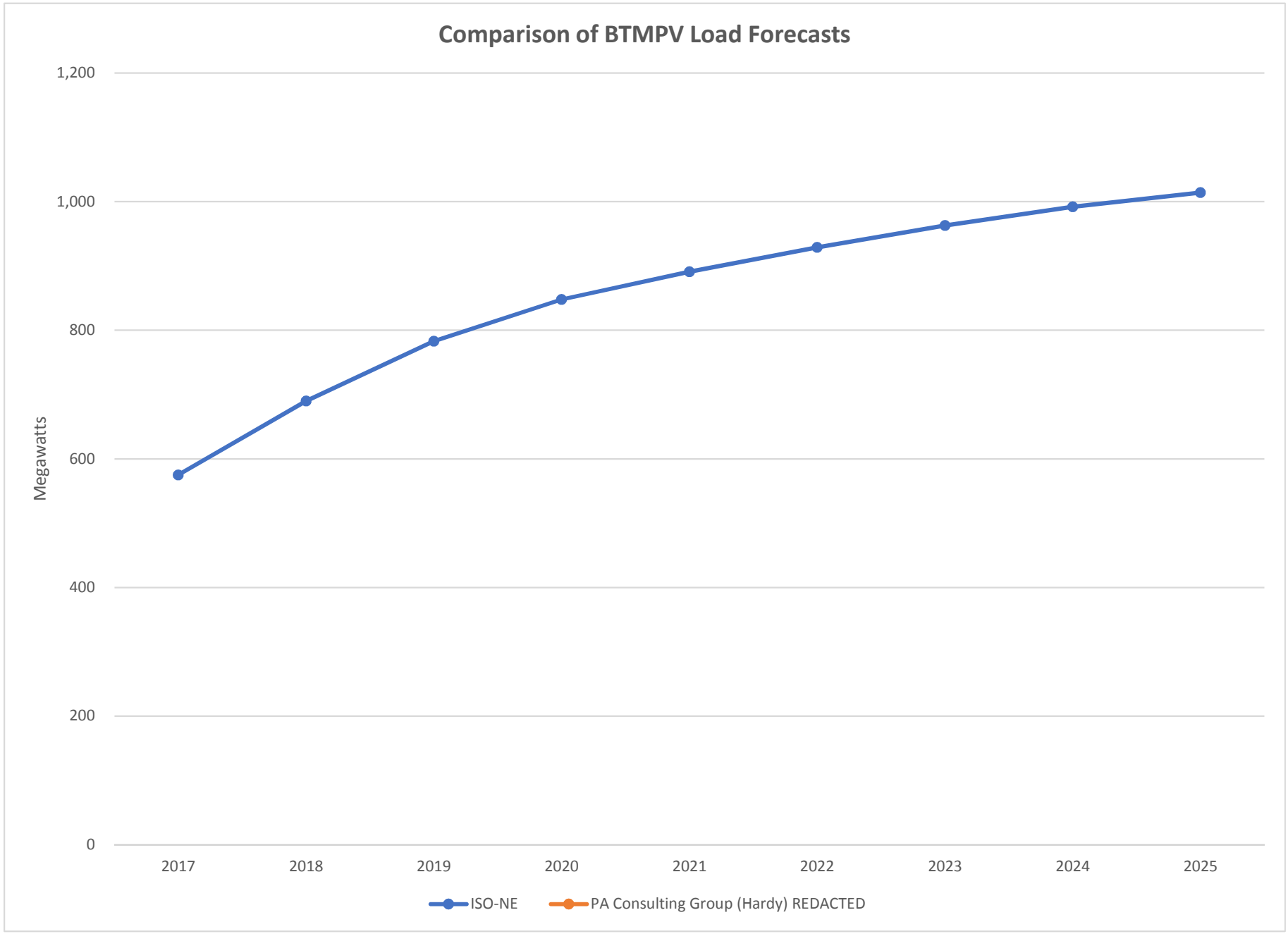
- The base load operation proposed by Invenergy is supported by Mr. Hardy's analysis which assumes a capacity factor of 75%, indicating that the unit will likely be displacing other resources in the market for its operation.
- Invenergy has indicated that it will procure a natural gas contract for some portion of CREC which, unless sold on a day-ahead basis, will almost certainly result in base load operation.
- Invenergy's limited water supply will result in it operating for only short periods on ultralow sulfur distillate fuel oil due to the significant amount of water necessary for NOx control when firing oil. This will also impact its ability to "back stop" renewables when natural gas is unavailable or potentially too costly relative to other options in the market.

Therefore, while CREC's technical characteristics theoretically provide it the flexibility to complement renewables, the economic reality is that it will be operated as a base load unit that displaces other resources in the system for most of the hours of the year.

[38] A market in which natural gas is bought and sold for immediate or very near-term delivery, usually for a period of 30 days or less. The transaction does not imply a continuing arrangement between the buyer and the seller. A spot market is more likely to develop at a location with numerous pipeline interconnections, thus allowing for a large number of buyers and sellers. The Henry Hub in southern Louisiana is the best known spot market for natural gas.

Q. Does that conclude your surrebuttal testimony?

A. Yes.



Sources:
(1) ISO-NE 2017 CELT Report, Section 1.1.
(2) Invenergy Responses to CLF's Ninth Set of Data Requests, 7/11/17.

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Dynamic Delist Bid Threshold for FCA 13-15

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Agenda for Today

- Review comments and resulting changes from summer meeting
- Review Assumptions
- Outline Tariff Changes

Review of Dynamic Delist Bid Threshold (DDBT)

WMPP ID: 119

Proposed Effective Date: March 2018 (for FCA 13)

- ISO Tariff requires triennial review of the Dynamic De-list Bid Threshold
- ISO is proposing to change the Dynamic Delist Bid Threshold (DDBT) for FCA 13-15 and set it to $4.30/kW-m
- Today: Discuss assumptions and Tariff language.

Tariff requirement and economic logic are the drivers of the change

- DDBT for FCA 10-12 is set at $5.50/kW-m
- In addition to the Tariff requirement to revisit DDBT triennially, ISO and IMM have concluded that the DDBT in FCA11 does not properly reflect the likely cost of the marginal resource for FCA13.
  - This presentation explains why this is important for setting DDBT.
- ISO relies on the same FERC approved economic framework used to establish DDBT for FCA9-12 for setting the DDBT for FCA13-15
- Data and parameters are updated to arrive the new DDBT value.

Assumptions, Comments, and Changes

Component	Reason for Change	8/9/2017 Value	Updated Value	Impact on DDBT
MW-Weighted Price (inframarginal offers)	Application of FCA 12 Demand Curve	$4.12/kW-month	$4.15/kW-m	Increase
Capacity Scarcity Conditions (H)	ICR reduced from 34,075 MWs to 33,725 MWs	5 hours	4.15 hours	Decrease
Performance Score (A)	Consistency in MW-weighted price analysis	.69	.56	Increase
Residual Component	Foregoing changes to H, A, and MW-weighted price	$3.99/kW-month	$3.95/kW-m	Decrease

Assumptions, Comments, and Changes

Formula Component	Description	Data Source	Value
MW-Weighted Price	Weighted price of inframarginal resources	Inframarginal offers from FCA 11	$4.15/kW-m
Capacity Scarcity Conditions (H)	Expected annual Capacity Scarcity Condition hours	Expected H, provided by ISO-NE memo	4.15 hr/yr
Performance Score (A)	Expected Performance during CSC	Reserve Constraint Penalty Factor (RCPF) analysis	.56
Residual Component	All components which are not cover elsewhere in the formula	Implied	$3.95/kW-m
Performance Payment Rate (PPR)	Payment or charge based on deviations	Tariff	$2,000/MWh (FCA11) $3,500/MWh (FCA13)
Balancing Ratio (Br)	System performance relative to CSO position	Consistent with expectations used in Net CONE study	0.85

Overview

- Review formula and data selection process
- MW-Weighted Price Calculation
- Hours (H) Assumption
- Performance (A) Assumption
- Residual Component
- Dynamic De-List Bid Calculation

Inputs to calculate both Residual Component and DDBT

$$b_{FCA} \geq \underbrace{PPR \times Br \times H}_{\text{Expected PFP financial obligation charges}} + \max\underbrace{\{0, RC - PPR \times A \times H\}}_{\text{Part of the NGFC not covered by PFP performance credit}}$$

Observations: MW-Weighted Price

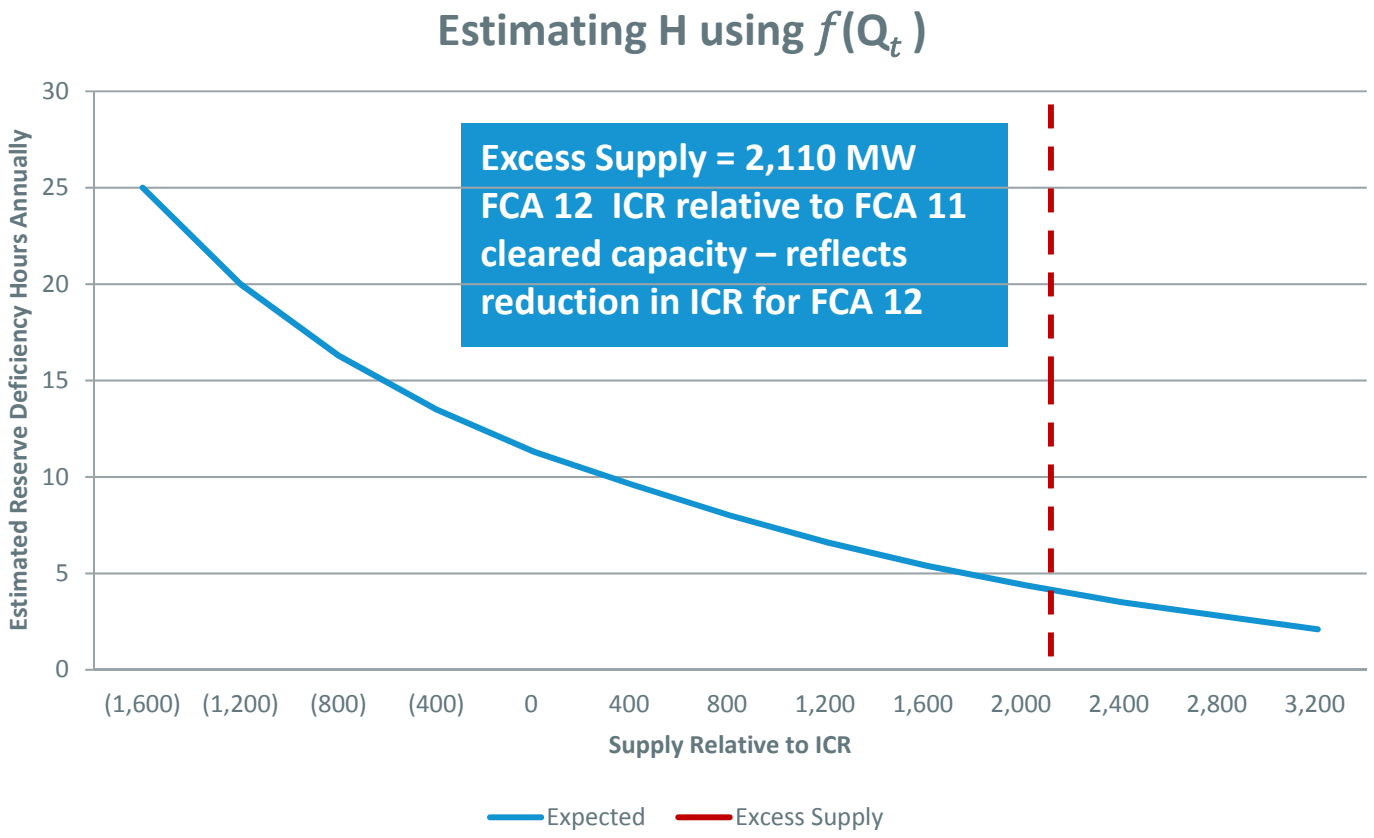
- This value is used to derive the Residual Component by replacing variables in the optimal bid formula with known or knowable values using available data
- MW-weighted price is comprised of offers observed and implied in FCA 11
  - Offers from inframarginal existing generating resources within dynamic round (resources that obtained a CSO), and
  - All other inframarginal offers assumed to be priced at $3.999/kW-m ($0.001/kW-m below the end of round price of the closing round in FCA11)
    - Specific resources were not selected, only a quantity was used
  - Quantity limited to the size of the largest supplier 2,968 MW
    - Limiting the quantity mutes the impact of lowest priced offers on DDBT and the ability of large suppliers to individually influence the DDBT
  - MW-Weighted price resulting from foregoing is $4.15/kW-month

Analysis: Hours Assumption

- Calculated the excess supply (2,110 MW) as the difference between the FCA11 cleared capacity (35,835 MW) and the Net ICR for FCA 12 (33,725 MW).
- The excess is plotted against the $f(Q_t)$ as represented by ISO-NE Operating Reserve Deficiency Information (December 19, 2016)
  - https://www.iso-ne.com/static-assets/documents/2016/12/iso_memo_operating_reserve_deficiency_dec_19_2016.pdf

Forecast: Hours Assumption

- $H_{12} = f(Q_{12})$ = 4.15 hours - Given Q_{11} = 35,835 MW



Analysis: Performance Assumption

- Compared resource performance during recent (2014-2016 calendar years) RCPF activations to CSO
- Used MW-weighted average of inframarginal resources
  - Based on committee feedback, we used actual MWs and performance for intra-round offers
  - Used a MW-weighted average of all other resources from the $3.999/kW-month subset

Calculated: Residual Component

- Represents the implied GFC, Risk Premium, and Opportunity Cost not included elsewhere in the formula
- If we can know all other assumptions, the RC can be set to a variable for which we can solve
- Competitive bid formula used to infer the RC:

$$\mathrm{P} = \mathrm{PPR} \times \mathrm{Br} \times \mathrm{H} + \max(0, RC - \mathrm{PPR} \times \mathrm{A} \times \mathrm{H})$$

  - Where:
    - P = $4.15/kW-m (or $49,800/MW-yr) MW-weighted offers
    - PPR = $2,000/MWh for FCA11
    - Br = 0.85
    - H = 4.15 hr/yr
    - A = 0.56
    - RC = Variable

Implied: Residual Component

$$49{,}800 = 2{,}000 \times .85 \times 4.15 + \max(0, RC - 2{,}000 \times .56 \times 4.15)$$

$$49{,}800 = 7{,}055 + \max(0, RC - 4{,}648)$$

RC = $47,393/MW-yr

Or simply:

RC = $3.95/kW-m

Dynamic De-List Bid Threshold calculation

Formula:

$$\mathrm{DDBT}_{13-15} = \mathrm{PPR}_{13} \times \mathrm{Br} \times \mathrm{H}_{12} + \max(0, RC - \mathrm{PPR}_{13} \times \mathrm{A} \times \mathrm{H}_{12})$$

Inputs:

- PPR = $3,500/MWh for FCA13
- Br = 0.85
- H = 4.15 hr/yr
- A = 0.56
- RC – $3.95/kW-m (or: $47,393/MW-yr)

$$\mathrm{DDBT}_{13-15} = 3{,}500 \times 0.85 \times 4.15 + \max(0, 47{,}393 - 3{,}500 \times 0.56 \times 4.15)$$

↔ $\mathrm{DDBT}_{13\text{-}15}$= $51,606/MW-yr or: **$\mathrm{DDBT}_{13\text{-}15}$= $4.30/kW-m**

Summary of Proposed Tariff Changes

Tariff Section	Tariff Change
III.13.1.2.3.1.A Dynamic De-List Bid Threshold	The Dynamic De-List Bid Threshold for a Forward Capacity Auction is ~~$5.50~~ **$4.30**/kW-month. The Dynamic De-List Bid Threshold shall be recalculated no less often than once every three years. When the Dynamic De-List Bid Threshold is recalculated, the Internal Market Monitor will review the results of the recalculation with stakeholders.

Stakeholder Schedule

Stakeholder Committee and Date	Scheduled Project Milestone
Markets Committee **August 9, 2017**	Initial presentation of ISO proposal – Documents
Markets Committee **September 13, 2017**	Review ISO proposal and comments from August 9th meeting.
Markets Committee **October 3-4, 2017**	Vote
Participants Committee **October 3, 2017**	Vote

Questions

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Acronyms and Abbreviations in this Presentation

- CSO: Capacity Supply Obligation
- DDBT: Dynamic Delist Bid Threshold
- FCA: Forward Capacity Auction
- FCM: Forward Capacity Market
- Net CONE: Net Cost Of New Entry
- PPR: Performance Payment Rate
- ROP: Rest-of-Pool Capacity Zone
- RCPF: Reserve Constraint Penalty Factor