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June 14, 2016

Luly Massaro
Commission Clerk
RI Public Utilities Commission
89 Jefferson Bvld.
Warwick, RI 02888

*Re: CLF's Expert Testimony in Public Utilities Commission Docket 4609*

Dear Ms. Massaro:

Today, CLF is filing with the Public Utilities Commission in Docket 4609 the testimony of two expert witnesses: (1) Robert Fagan, testifying as to whether the proposed Invenergy plant is needed for system reliability, and (2) Christopher Stix, testifying as to whether the proposed Invenergy plant will achieve the ratepayer savings Invenergy has claimed.

The purpose of this letter is to provide some additional procedural detail regarding the testimony of Christopher Stix. This testimony contains confidential information protected by a nondisclosure agreement CLF has entered into with Invenergy.

CLF is producing hard copies and PDFs of Mr. Stix's testimony in two formats: redacted and unredacted. CLF is filing the requisite 10 hard copies with the PUC in **unredacted** form. However, CLF is serving everyone on the service list with a PDF of the **redacted** document. By this letter, CLF is requesting that you put only the **redacted** version of Mr. Stix's testimony onto the PUC website in order to protect information that CLF has agreed to keep strictly confidential.

CLF has cleared this procedure with counsel for Invenergy, who have indicated that they have no objection to it.

Thank you very much for your attention to this matter.

Best regards,

Max Greene

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
PUBLIC UTILITIES COMMISSION

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

Docket No. 4609

# PRE-FILED DIRECT TESTIMONY

# OF

# CHRISTOPHER T. STIX

[Redacted]

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CONSERVATION LAW FOUNDATION
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(401- 351-1102

**Q: Please state your name and occupation.**

**A:** My name is Christopher T. Stix. I am a volunteer financial analyst for the Conservation Law Foundation (CLF), providing financial and market analysis for CLF's energy initiatives, specifically in the area of power plant licensing and electric and gas transmission. Until December 2015, I was an Executive in Residence with the Babson College Fund in Wellesley, Massachusetts.

**Q: What is your office address?**

**A:** Conservation Law Foundation, 62 Summer Street, Boston, Massachusetts 02110.

Qualifications and Background

**Q: Please summarize your relevant educational background and work experience.**

**A:** In 1976, I received a Bachelor of Arts, *summa cum laude*, from the University of Wisconsin at Green Bay. In 1981, I received a Master in Business Administration (MBA) with High Honors from the Harvard Graduate School of Business Administration, where I was also a Baker Scholar. I have lectured in finance classes, as a guest lecturer, in the Babson College MBA program.

For almost the entirety of my professional career, I have been forecasting and modeling market and financial dynamics in the energy, real estate, and technology sectors. In 1979, I built models of low-head hydro dams being developed under the Public Utilities Regulatory Policy Act of 1978 (PURPA). PURPA was the first major set of amendments to the Federal Power Act of 1935; PURPA was one of the first pieces of federal legislation that encouraged the development of renewable energy.

In 1982, I developed a forecast of oil prices for one the world's largest oil companies. At that time, oil prices (in nominal, 1982 terms) were close to $30 a barrel, and well-respected economists forecast that oil prices would rise to between $40 and $100 a barrel in the near future. This followed a period of dramatic increase in oil prices from just under $4 a barrel in nominal terms in 1973 to approximately $30 a barrel following the 1973-74 and 1979 oil price shocks. Our analysis of the investment in conservation following two price shocks concluded that oil prices were likely to fall rather than continue to rise dramatically. The key insight from my work was that investment in conservation, through automobiles with higher gas mileage and energy conservation in industry and homes, takes place slowly over time. Many industry analysts had ignored the likely demand response to increasing prices. By 1986 oil prices had dropped to under $13 a barrel and they stayed in the teens through the 1990s. Other work for this client included building a supply curve for the natural gas liquids business, and modelling global flows of oil and petroleum products. In the late 1980s, while working for a major real estate developer of multi-family housing, I accurately forecast the coming oversupply of multi-family housing and helped this developer wind up a significant construction backlog before the housing crisis of the late 1980s.

In 1989, I founded RentGrow, a credit scoring business for the rental housing business, and I built that business up over a period of years. In 2010, RentGrow was acquired by Yardi, a leading international provider of software solutions for the real estate industry. From the mid-1990s to 2002, I was a sell-side securities analyst with Cowen & Co. (which subsequently became SG Cowen) and with Morgan Stanley, with a specialty in data networking. My work

was highly ranked by surveys published by Greenwich, the Wall Street Journal, and Institutional Investor magazine; and in 2001, I was ranked #1 as a Data Networking Analyst by Institutional Investor.

In addition to financial modelling work, I was successful in forecasting market dynamics and securities prices, based on the price performance improvements in networking equipment, the economic sensitivity of these products, product cycles, computing drivers of demand for networking equipment, and balance sheet changes in the companies that I covered. Based on my understanding of the market and financial dynamics, I was early in calling a turn in the market during 2000.

Nature of Testimony

**Q: Have you ever testified before the Rhode Island Public Utilities Commission or the Rhode Island Energy Facility Siting Board (EFSB) before?**

**A:** No, I have not. However, I provided testimony for CLF at the Massachusetts Energy Facility Siting Board with regard to a proposal by Exelon West Medway, LLC, and Exelon West Medway II, LLC, to build a 200-megawatt (MW) peaking power plant in Medway, Massachusetts. My written direct testimony was filed with the Massachusetts EFSB in November 2015; my appearance before the EFSB for cross-examination was in January 2016.

**Q: On whose behalf are you testifying in this proceeding?**

**A:** I am testifying on behalf of CLF.

**Q: What subject or subjects does your testimony address?**

**A:** My testimony addresses the proposal by Invenergy Thermal Development LLC for the so-called Clear River Energy Center, an 850 MW to 1000 MW fossil-fuel power plant to be constructed in Burrillville, Rhode Island. In my testimony, I refer to Invenergy Thermal Development LLC as "Invenergy." I refer to the Clear River Energy Center as the "Invenergy Proposal" or the "Invenergy Plant."

More specifically, the focus of my testimony is on certain claims made by Invenergy about the supposed benefits from the Invenergy Proposal for Rhode Island ratepayers.

In a press release dated August 4, 2015, Invenergy claimed that its Proposal would result in $280 million in savings to Rhode Island electricity ratepayers. I attach a copy of that press release at Tab A.

The claim in that press release was clarified in Invenergy's Response to CLF's Data Request 1.3, which Response Invenergy filed and served on January 28, 2016. I attach a copy of Invenergy's Response at Tab B. Specifically, Invenergy stated: "The $280 million is the approximate savings to Rhode Island ratepayers in cumulative energy and capacity costs resulting from the participation of Clear River in the energy and capacity markets from 2019 through 2022 (four calendar years). The capacity market savings are realized in Forward Capacity Auctions ('FCA') 10, 11, 12 and 13 (partial year given the FCA 13 delivery year is June 2022 through May 2023)." In the same Response, Invenergy says: "The $280 million represents the difference in total capacity and energy costs to Rhode Island-only load resulting from the Clear River capacity addition, as measured by comparing cost results from capacity and energy modeling cases (a) with Clear River starting in 2019; and (b) without Clear River."

**Q: Please summarize your testimony.**

**A:** My testimony can be summarized as follows: Invenergy's projections for savings for Rhode Island electricity ratepayers are vastly over-stated, and cannot possibly be accurate.

**Q: How is your testimony organized?**

**A:** I analyze separately Invenergy's claimed ratepayer savings from capacity and from energy.

On the capacity side, I examine possible or putative ratepayer savings year by year for the years beginning in June 2019 and June 2020. More precisely, I do my analysis by Forward Capacity Auction year, as I explain in more detail below, and I calculate a plausible range of likely ratepayer impacts for each year.

On the energy side, I analyze whether the claims for ratepayer savings made by Invenergy are at all plausible or realistic in light of facts that are now known.

Throughout my testimony, it is important to bear in mind that Invenergy's improbable claim is that this savings of $280 million will be realized specifically by Rhode Island electricity ratepayers, and specifically over a very short span of time, the first three years of the plant's operation.

Capacity

**Q: Let us start with the capacity market.**

**A:** In order to understand the capacity market, I first need to explain some background about the Independent System Operator-New England (ISO-NE).

**Q: What is ISO-NE?**

**A:** ISO-NE is the independent, non-profit corporation that runs the electricity grid for the six New England states. In my testimony, I refer to ISO-NE is simply "the ISO" for the sake of simplicity.

**Q: What are the crucial functions of the ISO relevant to your present testimony?**

**A:** First, the ISO runs the wholesale electricity energy market in New England. This includes the Day-Ahead energy market and the Real Time energy market. Together, these two energy markets determine the energy component of wholesale electricity prices in New England, which, in turn, determines the energy component of the commodity price that all electricity ratepayers in New England pay for electricity. I say "energy component" because there is also a capacity component to electricity prices. I say the "commodity price" because end-use ratepayers also pay a separate distribution charge on their bills.

Second, ISO also runs the Forward Capacity Market. This Forward Capacity Market (FCM) is designed to ensure that there will be sufficient electricity supply available in New England in the future. It is this Capacity Market that determines the capacity component of electricity prices that I just mentioned.

It is important to keep in mind that energy and capacity are two different commodities, and the ISO runs the New England markets for both of these commodities. Energy is the electrons that are running through our light bulbs and appliances today; capacity is the willingness of an electricity generator to be available to produce electricity at a specified future time. When end-use electricity ratepayers pay their monthly electricity bills to their local utility,

the commodity portion of that bill includes payment for both of these two commodities: energy and capacity.

**Q: What is the Forward Capacity Auction?**

**A:** The Forward Capacity Auction (FCA) is the way the ISO determines the price of that second commodity, capacity. The ISO holds the FCA once a year, every year. In each of these FCAs, the ISO buys capacity for a one-year time period a little over three years in the future. The purpose of these FCAs is basically to make sure that there will be enough electricity (that is, enough power generation capacity) here in New England to meet the expected load during that future one-year period. In each FCA, multiple electricity generators bid into the auction and compete for what the ISO calls a "Capacity Supply Obligation" (CSO). Those generators that "clear" in one of these FCAs then acquire a CSO for a one-year period a little over three years in the future. For a generator to "clear" in the auction means that that generator bid in successfully and acquired a CSO from the ISO.

The ISO's annual FCA is conducted in February of each year, for a Capacity Commitment Period (CCP) beginning June 1, a little over three years in the future. In February 2016, the ISO conducted its tenth annual FCA, called FCA-10. FCA-10 procured capacity for CCP-10, which will begin on June 1, 2019 and run through May 31, 2020. Similarly, the ISO conducted FCA-9 in February 2015 in order to buy capacity for CCP-9, which will begin June 1, 2018 and run through May 31, 2019.

FCA-10: My Calculations

**Q: What are the critical features of FCA-10, which was conducted on February 8, 2016, that are a necessary part of your analysis?**

**A:** There are four specific aspects of the ISO-conducted FCA-10 that are a necessary part of my analysis. These are: (1) that the FCA is a so-called "descending-clock auction," in which there were multiple rounds in FCA-10; (2) in FCA-9, the ISO, for the first time ever, used a sloped demand curve in the auction; (3) in FCA-10, for the first time ever, the ISO created a new capacity zone that includes all of Rhode Island (as well as part of Massachusetts), which the ISO calls "Southeastern New England," or "SENE"; and (4) in FCA-10, for the first time, Invenergy tried to obtain a CSO by bidding its proposed plant into the auction.

**Q: Let's discuss these four critical points in the order that you listed them. You said that the ISO-run FCA is a descending-clock auction, in which there were multiple rounds in FCA-10. First, what is a descending-clock auction?**

**A:** A descending-clock auction is different from a conventional auction at, say, an art house or estate sale. In a conventional auction, the price starts low and ascends through the auction, until there is only one bidder left who, in effect, wins whatever commodity is being sold. In contrast, in a descending-clock auction, the price of the commodity starts high and that price descends in each successive round of the auction.

In the case of the FCA, the ISO determines, before the FCA begins, how much capacity it needs and wants to procure in the upcoming FCA. This figure is called the "Installed Capacity Requirement" (ICR). The ICR is the largest amount of electricity that the ISO believes it could

possibly require for system reliability at the time of the year when electricity load is greatest. Here in New England, this peak load generally occurs during hot, muggy, afternoons during the summer, when many people turn on their air conditioners.

In FCA-10, the ICR was 34,151 MW. This means that, well before the ISO actually conducted FCA-10, the ISO had determined that during CCP-10 (that is, the period that runs from June 1, 2019 through May 31, 2020), electricity load in New England would go above 34,151 MW, on average less than once every 10 years, even on the hottest, muggiest days. It means that in FCA-10, the ISO was trying to procure 34,151 MW of capacity in the auction. And it means that that determination by the ISO had been approved by the Federal Energy Regulatory Commission (FERC).

In the FCA, the ISO begins the auction with a very high price, one that is so high that the ISO believes it will attract significantly more capacity than is required to meet the ICR. This stands to reason: if you offer a very generous price for a commodity, any commodity, you are likely to attract many offers from sellers.

**Q: And FCAs typically go through multiple rounds?**

**A:** Yes, that is correct. This is how the ISO describes the FCA process[1]:

> The descending-clock auction, run by an auctioneer, consists of multiple rounds. Before the beginning of each round, the auctioneer announces to all participants the start-of-round and end-of round prices. During the round, participants submit offers expressing their willingness to keep specific megawatt quantities in the auction at different price levels within the range of the start-of-round and end-of-round prices. During one of the

[1] "Overview of New England's Wholesale Electricity Markets and Market Oversight," found at http://iso-ne.com/pubs/spcl_rpts/2012/markets_overview_final_051512.pdf
At pages 10-11 (visited April 29, 2016).

rounds, the capacity willing to remain in the auction at some price level will equal or fall below the ICR.

It is also important to note that, at the end of each successive round in the auction, the ISO announces how much extra capacity bid in to the just-concluded round. If, but only if, there is sufficient extra capacity beyond the ICR, the auction proceeds to another round, during which round the offer price is lower than it had been in the previous round. This is why the FCA is referred to as a descending-clock auction: the price descends from round to round.

**Q: And you said that FCA-10 went through multiple rounds?**

**A:** Yes, FCA-10 went through four rounds.

In FCA-10, the starting price in Round 1 of the auction was $17.296 per kilowatt (kW)-month.

**Q: The next item you mentioned as being important for your analysis is the fact that, in FCA-10, the ISO, for the second time, used a sloped demand curve. First, what does this mean?**

**A:** In auctions prior to FCA-9, the ISO had always used a perfectly vertical demand curve, set at exactly the ICR amount. This perfectly vertical demand curve was widely criticized, because it tended to create very stark, almost binary, outcomes. If the ISO procured even a few megawatts less than the ICR, the auction clearing price spiked upward; this outcome was widely criticized by ratepayer advocates, because (of course) it was ratepayers who would ultimately bear the burden of paying those higher prices. Conversely, if the ISO procured even a few megawatts more than the ICR, the auction clearing price tanked; this outcome was criticized by generators,

which argued that when capacity prices go too low it jeopardizes the economic viability of generators whose continued presence in the market is vital for continued system reliability. And in both cases, it was recognized that there was an unnecessarily high likelihood of a volatile result. The institution of the sloped demand curve in FCA-9 was designed to ameliorate this problem, and it did.

**Q: Why is the presence of the sloped demand curve in FCA-10 important to your analysis?**

**A:** The presence of this sloped demand curve allowed me to calculate with considerable precision what the actual, real-world effect on the auction clearing price would have been in FCA-10 if Invenergy had not participated in the auction. The exact location on the ISO's sloped demand curve where the auction ultimately cleared is known. The clearing price is known; the total number of megawatts that cleared the auction is known; the CSO actually acquired by Invenergy is known.

As I demonstrate below, these factors enable us to determine the effect on the auction clearing price that Invenergy's presence had. And from that, we are able to calculate the effect that Invenergy's presence in the auction, that is in FCA-10, actually had for Rhode Island electricity ratepayers.

**Q: The third matter that you described as being important to your analysis is the creation of the new SENE zone. Please explain this.**

**A:** In the FCM, not all generators are created equal in the sense that not every generator is geographically located where it is equally able (as every other generator) to get electricity over the transmission system to every end-user. Because of these transmission constraints on the

electricity grid in New England, the ISO has created some geographical zones. Specifically, there are import-constrained zones that have what is called a Local Sourcing Requirement (LSR) in the auction. This means that it is difficult to get energy into that geographical area from generators located outside the zone. This Local Sourcing Requirement is exactly what it sounds like: the LSR is designed to ensure that electricity that is needed in the import-constrained zone can actually be generated geographically inside that same zone.

In FCA-8 (conducted in February 2014) and in FCA-9 (conducted in February 2015), all of Rhode Island was in a zone that the ISO then called "Southeastern Massachusetts/Rhode Island" (SEMA/RI). In FCA-9, the ISO had another import-constrained zone called "Northeastern Massachusetts/Boston" (NEMA/Boston). In FCA-9, those portions of New England not in SEMA/RI or in NEMA/Boston were in the "Rest of Pool."

In FCA-9, the auction closed with a clearing price in SEMA/RI for newly acquired resources of $17.728/ kW-month. This was much higher than the clearing price in the same auction for Rest of Pool, which was $9.551/kW-month. In FCA-9, the relatively much higher clearing price in the SEMA/RI zone, relative to Rest of Pool, was a matter of considerable consternation. This much-higher clearing price in SEMA/RI was especially alarming to ratepayer advocates and government officials, because that higher clearing price meant that ratepayers and constituents were going to be paying more for electricity.

For FCA-10, the ISO changed the configuration of the geographical zone in which Rhode Island is located. In fact, in FCA-10, the SEMA/RI zone ceased to exist. The prior SEMA/RI zone was combined with the prior NEMA/Boston zone to create the new SENE zone.

The creation or reconfiguration of these geographical zones, each with its own LSR, is not a result of political pressure or negotiation. Instead, they are the result of careful engineering. These zones are a reflection of real-world transmission constraints as they actually exist in New England.

The important point here is that in my analysis, I looked at the actual, real-world results of what occurred in FCA-10; this necessarily included the results in the newly created SENE zone which, as I indicated above, Rhode Island is located in.

**Q: The fourth matter that you described as crucial to your analysis is that, in FCA-10 for the first time, Invenergy participated in the auction.**

**A:** Yes, that is correct. My analysis started with the results of FCA-10, in which Invenergy participated.

FCA-10: Actual Results

**Q: What were the overall results of FCA-10, conducted by the ISO on February 8, 2016?**

**A.:** The ICR in FCA-10, set by the ISO and approved by the FERC, was 34,151 MW. In fact, using the sloped demand curve, the ISO cleared 35,567 MW in FCA-10. That is, the overall auction result in FCA-10 was that the ISO acquired 1,416 MW more than its ICR.

**Q: And what were the results of FCA-10 here in the SENE zone?**

**A:** Here in the SENE zone, the LSR was 10,028 MW. That means that the ISO had to acquire 10,028 MW of the larger ICR here, geographically within the SENE zone. In fact, the ISO acquired 11,349 MW in the SENE zone. That is, within the SENE zone, the ISO acquired 1,321 MW more than its LSR for the zone.

**Q: What was the CSO that Invenergy acquired in FCA-10?**

**A:** Invenergy acquired a CSO of 485 MW in FCA-10. This is very important, because it means that if Invenergy had not participated in the auction at all, and had acquired no CSO at all, both the entire New England region and the import-constrained SENE zone would have cleared an excess of capacity in FCA-10.

**Q. Are you are saying that, if Invenergy did not exist, and had not participated in FCA-10, the ISO would have still obtained more capacity in the zone that includes Rhode Island than the ISO needed?**

**A:** Yes, that is exactly what I am saying.

**Q: One of the specific issues that the Public Utilities Commission (PUC) is examining in this docket is whether or not the New England electricity grid does or does not need the proposed Invenergy plant. Do you have an opinion on that question?**

**A:** Yes, I do.

**Q: What is your opinion?**

**A:** As I explain above, neither the New England electricity grid, nor the ISO, needs Invenergy in order to keep the grid reliable.

Overall, in FCA-10, the ISO procured fully 1,416 MW more than its ICR. Even if you subtract all 485 MW of the CSO acquired by Invenergy, the ISO would have still over-procured 931 MW.

And, here in the SENE zone, the ISO procured 1,321 MW more than its LSR. Again, even if you subtract all 485 MW of the CSO acquired by Invenergy, the ISO would still have over-procured 836 MW in the zone.

The result of FCA-10 shows that the generation capacity that the Invenergy plant would bring to the electricity grid is not needed in Rhode Island, and is not needed in New England.

FCA-10: Invenergy's Possible Effect on Auction Clearing Price

**Q: Let us turn now to the effect that Invenergy's presence in FCA-10 may have had on the auction clearing price here in the SENE zone.**

**A:** In order to do that, we need to understand the different rounds of bidding that occurred in FCA-10.

**Q: How many bidding rounds were there in FCA-10?**

**A:** There were four rounds, but for purposes of the present analysis, it was the results of Rounds 3 and 4 that were most important.

**Q: Before we discuss the results of Rounds 3 and 4, please describe the results of FCA-10 here in the SENE zone.**

**A:** This is a very significant fact, crucial to understanding both the results of FCA-10, and my analysis. The results in every one of the four rounds in FCA-10 were that the LSR for the SENE zone was met and exceeded. For this reason, in every round, including the final Round 4, the auction clearing price here in the SENE zone defaulted to the clearing price in the Rest of Pool.

**Q: What was the final auction clearing price in FCA-10 in the Rest of Pool?**

**A:** The final auction clearing price in the Rest of Pool in FCA-10 was $7.03/kW-month. Note that, because the LSR for the SENE zone was procured – in fact, over-procured – the SENE zonal clearing price was also $7.03/ kW-month.

These are important facts to bear in mind as we discuss the auction results. First, the ISO over-procured the LSR here in the SENE zone. Second, as a result of that over-procurement, the zonal clearing price here in the SENE zone defaulted during every round of the auction to the clearing price in the Rest of Pool.

**Q: What was the situation at the end of Round 3 of FCA-10, conducted on February 8, 2016?**

**A:** At the end of Round 3, the clearing price in FCA-10 was $8.50/kW-month. At that price, generators had offered an excess of capacity of 1,732.6 MW.

This is important, because it means that, even without any of Invenergy's 997 MW[2] of offered capacity, the ISO had a surplus of capacity. (Remember that, even though Invenergy only cleared 485 MW in the auction, it was qualified to bid in 997 MW, and basic economics suggest that it very much wanted to obtain a CSO of up to 997 MW.) In fact, if you do the arithmetic, here is what you find. At the end of Round 3, in the recently completed FCA-10, the ISO had an excess of 1,732.6 MW of capacity. Invenergy could have offered in no more than

[2] The 997 MW figure for the amount of capacity the Invenergy was qualified to bid into the auction was found on the ISO website in a public document entitled "2019-2020 Forward Capacity Auction Obligations," posted on the website on April 13, 2016 at http://www.iso-ne.com/static-assets/documents/2016/02/fca_10_obligations.xlsx, and visited by me on May 5, 2016. This document is an Excel spreadsheet, and the listing for Invenergy (Capacity Resource Number 38504) appears on line 786; the 997 MW capacity qualification appears in Column T.

997 MW. Thus, even without any electricity from Invenergy – not a single electron – the ISO would have had excess capacity at the end of Round 3 of over 735 MW.

This also means that, regardless of the presence or absence of Invenergy, the auction clearing price in FCA-10 had to have been lower than $8.50/kW-month. If Invenergy had not been present, information that the ISO makes public does not allow us to know exactly where the auction would have cleared between $7.03/kW-month and $8.50/kW-month. However, information that the ISO makes public about the auction does allow us to know that that is the range of possible prices at which FCA-10 could have cleared: above $7.03/kW-month and below $8.50/ kW-month.

**Q: Do these figures that you are giving us here pertain only to the SENE zone in which Rhode Island is?**

**A:** No. It is important to understand that these figures are for both the SENE zone and for the Rest of Pool. As I said earlier, this is true because, in FCA-10, the clearing price in the SENE zone defaulted to the clearing price in Rest of Pool for every round of the auction.

**Q: What was the situation at the end of Round 4?**

**A:** The auction closed and cleared at the end of Round 4.

At the end of Round 4 – that is, at the end of FCA-10 – 35,567 MW had cleared in all of New England. The clearing price for those megawatts was $7.03/kW-month. Remember that the ICR was "only" 34,151 MW. That means that in FCA-10 the ISO procured 1,416 MW more than its ICR for all of New England.

Here in the SENE zone, at the end of Round 4 – that is, at the end of the auction – 11,349 MW had cleared. As noted above, the clearing price in the SENE zone was the very same $7.03/kW-month. Remember that the LSR in the SENE zone was "only" 10,028 MW. That means that, here in the SENE zone, the ISO procured 1,321 MW more than its LSR.

**Q: How much capacity did Invenergy clear in FCA-10?**

**A:** Invenergy was qualified by the ISO to bid 997 MW into FCA-10. [redacted]

However, significantly, Invenergy only cleared 485 MW.

**Q: Based on the foregoing information, were you able to determine what effect, if any, the presence of Invenergy had in FCA-10 for electricity ratepayers in Rhode Island, speaking now only of the capacity component of the commodity price?**

**A:** Yes, I was.

**Q: What effect, if any, did the presence of Invenergy have in FCA-10 for electricity ratepayers in Rhode Island?**

**A:** The effect that Invenergy had in FCA-10 for electricity ratepayers in Rhode Island, addressing now only the capacity component of the commodity price, must be expressed as a range. The range of possible effects that Invenergy could have had in FCA-10 is between close to zero and just $36 million.

**Q: How did you arrive at that range?**

**A:** In this case, because there was no price separation between SENE and the Rest of Pool in FCA-10, Rhode Island ratepayers will pay about 6.15%[3] of the overall cost of capacity in New England for CCP-10, which, as we said before, runs from June 1, 2019 through May 31, 2020.

First, I calculated what the Rhode Island share (that is, 6.15%) of the overall New England market capacity cost would be if the auction had cleared at $8.50/kW-month. Second, I calculated what the Rhode Island share (that is, 6.15%) of the overall New England market capacity cost would be at the $7.03/kW-month that the auction actually cleared at. Third, and finally, I subtracted that latter figure from the former figure. That subtraction yielded $36 million.

**Q: Is it your testimony that the presence of Invenergy in FCA-10 had the effect of lowering the capacity costs to be borne by Rhode Island ratepayers in CCP-10 by $36 million?**

**A:** No, emphatically not. I am saying that the maximum amount that the presence of Invenergy in FCA-10 could have saved Rhode Island ratepayers in capacity costs in CCP-10 was $36 million. However, that figure could also have been close to zero. My testimony is that, with information made public by the ISO, all we can tell for sure about the effect that Invenergy's presence in the auction had is that it could not possibly have been more than $36 million for CCP-10.

**Q: Please explain what you are saying in more detail.**

[3] The 6.15% is derived from the table provided by Invenergy on January 28, 2016, entitled "Rhode Island Capacity Cost Savings from Clear River," and appended to Invenergy's Response to CLF's Data Request 1-3, specifically from the first horizontal row, showing 2019, column 5 ("RI Peak Demand (MW) With Reserve Margin") and column 3 ("ISO-NE Cleared Capacity").

**A**: At the end of Round 3, we know that there was an excess of 1,732 MW being bid in to the auction. If you remove all 997 MW of Invenergy's largest possible offer, you are left with an excess of 735 MW. We do not know what the bidding behavior in Round 4 was by the entities that owned those 735 MW. Those owners could have bid those megawatts in to Round 4 at just over $7.03/kW-month—at, say, $7.04/kW-month. If that were the case, then the actual savings (on the capacity portion of the commodity charge) to be realized by Rhode Island ratepayers in CCP-10 due to the presence of Invenergy would work out to almost nothing at all.

On the other hand, if those 735 MW were actually bid into Round 4 at just under $8.50/kw-month – at, say, $8.48/KW-month – then the savings to be realized by Rhode Island ratepayers in CCP-10 due to the presence of Invenergy would be at or very close to my $36 million figure.

However, I emphasize again that we just do not know where within that broad range the actual, real-world figure for savings is. It could be close to zero, but it could not possibly be more than $36 million.

FCA-10: Invenergy's Gross Misstatements to the EFSB

**Q: What information has Invenergy given to the EFSB about the same subject, that is, the capacity market savings to Rhode Island ratepayers during just CCP-10?**

**A:** On January 12, 2016, Invenergy made a PowerPoint presentation to the EFSB. On Slide 24 of that presentation, attached to this testimony as Tab C, Invenergy provided a bar graph purporting to show capacity market savings to Rhode Island ratepayers during CCP-10, and also during CCP-11 and CCP-12. In this answer, I am describing just what Invenergy told the EFSB

about FCM savings, just in FCA-10, and just for Rhode Island ratepayers. In that respect, I am making an apples-to-apples comparison, because in my answers just above I was also talking about FCM savings, just in FCA-10, and just for Rhode Island ratepayers.

Invenergy claimed that savings just to Rhode Island electricity ratepayers, just during CCP-10, will be $118 to $120 million. More specifically, the Invenergy bar graph on Slide 24 of Invenergy's January 12 PowerPoint presentation shows that the fact of Invenergy's presence in FCA-10 will lower the clearing price by over $4.00/kW-month. This is consistent with moving down the actual sloped demand curve that the ISO actually used in FCA-10 by an amount that works out to Rhode Island ratepayers saving $118 to $120 million.[4]

**Q: This sounds very confusing. Can you explain this in a more simple way?**

**A:** Yes. There is another way to do an apples-to-apples comparison that may make this easier to understand. On January 12, 2016, Invenergy told the EFSB that its (Invenergy's) presence in FCA-10 would lower the auction clearing price by about over $4/kW-month. However, based on the actual, real-world results from FCA-10, we now know that Invenergy's presence in the auction could not possibly have been more than $1.47/kW-month (the difference between $8.50 and $7.03). And, as I explained above, in fact, Invenergy's presence in the auction could have been zero, or very close to zero. But it could not have been more than $1.47/kW-month.

**Q. So exactly how inaccurate was the information presented by Invenergy to the EFSB?**

[4] See also Invenergy's January 28, 2016 Response to CLF's Data Request 1.3.

**A:** The figure that Invenergy gave to the EFSB was a minimum of 272% of the accurate figure. Of course, that is only the minimum figure. This minimum figure would apply if, but only if, the auction had closed at just under $8.50/kW-month, without Invenergy. If the auction had actually cleared at just above $7.03/kW-month without Invenergy, the percentage of Invenergy's error, of course, would start approaching infinity.

**Q: That is a very substantial error. Do you have an understanding of what mistakes Invenergy made?**

**A:** Yes, I do.

The first difference between what Invenergy did to project capacity savings and what I did is very simple. Invenergy speculated, months before the auction occurred about possible, speculative, conjectural, theoretical future outcomes. In contrast, I looked, after the auction had occurred, at the actual, real-world results.

I can be more specific about this. In performing its analysis, Invenergy made two significant assumptions. Both of these assumptions had material effects on Invenergy's calculation of purported Rhode Island ratepayer benefits; and both of Invenergy's assumptions were wrong.

**Q: What was the first incorrect assumption that Invenergy made?**

**A:** Invenergy assumed, incorrectly, that the entire 997 MW that Invenergy was qualified to bid into the auction would clear. In understanding what effect Invenergy's presence had in the auction results, I had to move the clearing point on the ISO's sloped demand curve to the left (that is upward) to see the counter-factual hypothetical point where the auction might have

cleared without Invenergy's presence. Of course, we move a shorter distance up the curve because Invenergy only cleared 485 MW; we would have had to move significantly further up the curve if Invenergy had cleared all 997 MW. That would have made the presence of Invenergy more significant.

**Q: What was the second incorrect assumption that Invenergy made?**

**A:** Invenergy assumed, also incorrectly, that there would be no other potential generators bidding in to the auction in the general price range between $7.03/kW-month and $8.50/kW-month. In fact, we know for a fact that there were at least 735 MW of capacity other than Invenergy bidding in to the auction at that exact price range.

**Q: You say that both of these assumptions that Invenergy made were incorrect. But were these assumptions reasonable for Invenergy to have made?**

**A**: I divide my answer into three parts.

First, no, I do not believe that either of the wrong assumptions that Invenergy made was reasonable. It was especially unreasonable to assume that there would be no other bidders but Invenergy in the relevant price range.

Second, however, the main difference between Invenergy's calculations and my own is that Invenergy's calculations were an ex ante guess about possible future outcomes. I had the benefit of doing my analysis ex post, so I knew what actually happened.

Third, there is a way in which the magnitude of Invenergy's errors is not surprising at all. Invenergy is trying to sell a proposed new power plant to the EFSB. Basic economic principles suggest that Invenergy hopes to make a big profit on this plant; but, of course, in order to sell its

proposal to the EFSB and to the public, Invenergy has to emphasize possible benefits to ratepayers. In this context, of course, Invenergy would try to show the most favorable possible outcomes.

However, based on the actual results of FCA-10, we can now see how inaccurate Invenergy's calculations of supposed ratepayer benefits actually were.

**Q: I would like to direct your attention to the pre-filed direct testimony of one of Invenergy's expert witnesses, Ryan Hardy. This testimony was filed and served by Invenergy on April 22, 2016, well over two months after FCA-10 was completed. Mr. Hardy's company, PA Consulting Group, was responsible for calculating Invenergy's estimates for ratepayer savings that Invenergy had filed with the EFSB and that you now say were grossly inaccurate.**

**On page 9 of Ryan Hardy's April 22 pre-filed testimony, at lines 5 and 6, Mr. Hardy is asked: "How did the actual results of FCA 10 compare with your original forecast?"**

**Mr. Hardy's answer, on page 9, line 7, says: "PA's projections were very close to the actual results PA forecast."**

**You and Mr. Hardy seem to have a very substantial disagreement. You say that PA's forecast of the ratepayer impacts from FCA-10 were grossly inaccurate; Mr. Hardy says that PA's forecast was "very close to the actual result." How are we do decide which of you is correct?**

A: It is fairly easy to tell that Mr. Hardy is wrong.

You will note that Mr. Hardy's explanation and analysis of why his projections were so good consist of only three bullet points. These three bullet points all appear on page 9 of his testimony. In the first bullet point Mr. Hardy compares PA's advance estimate of the auction clearing price with the actual result. [Lines 8-9.] In the second bullet point, Mr. Hardy compares PA's advance estimate of the number of megawatts that would clear the auction with the actual result. [Lines 10-12.] In the third bullet, Mr. Hardy compares PA's advance prediction of the number of megawatts of new gas combined cycle generation that would clear the auction with the actual result. [Lines 13-15.] In every case, Mr. Hardy says that "PA's projections were very close to the actual results . . . ." [Line 7.]

In a very narrow, hyper-technical sense, Mr. Hardy is correct – on these three narrow points PA's projections were fairly accurate. However, none of the factors cited by Mr. Hardy had any material effect on the outcome of the auction. As a result, none of the factors cited by Mr. Hardy will have a material effect on the price paid for electricity by Rhode Island ratepayers.

In other words, Mr. Hardy may have accurately found small snippets or small sub-components of his earlier predictions that were not grossly wrong. But the fact remains that Mr. Hardy's main conclusion about the putative savings for Rhode Island ratepayers from FCA-10 was wildly wrong.

The irrefutable, bottom-line fact is that Mr. Hardy and PA wrongly predicted savings to Rhode Island ratepayers, just from capacity, and just from FCA-10, to be between $118 and $120 million dollars. The actual figure was somewhere between zero and $36 million. Mr. Hardy's projected figure was 272% of the actual figure, and maybe much, much more than that.

To put it another way, it is just not true to say that a predicted result of $118 million in ratepayer savings in one year "is very close to" ratepayer savings of between zero and $36 million.

I doubt very much if Rhode Island ratepayers consider $118 million in one-year savings to be "very close" to zero to $36 million. And I doubt that the PUC will view it that way, either.

**Q: Did Invenergy ever correct its gross error?**

A: I will answer that question in three parts.

First, Invenergy did not correct its gross error in a timely way. You'll remember that on page 4, I cited an August 4, 2015 press release in which Invenergy touted $280 million in supposed, putative ratepayer savings for Rhode Islanders, and I provide the actual press release at Tab A. That press release was issued in August 2015, over six months before FCA-10. However, at an EFSB hearing held in the auditorium of Burrillville High School, Invenergy repeated that same, inaccurate figure.

Significantly, the EFSB hearing at Burrillville High School was on March 31, 2016, more than 6 weeks after the auction, long after Invenergy knew that its figures were grossly inaccurate.

I note that approximately 700 people attended that hearing, and heard Invenergy's assertion about supposed savings for Rhode Island ratepayers, an assertion that Invenergy knew at the time was grossly inaccurate.

In fact, on March 31, in front of 700 people, Invenergy presented in two different ways this information that Invenergy knew, at the time, was false. First, the words "$280 million in Savings" appear in big, green letters on Slide 12 of Invenergy's presentation. I provide that slide

at Tab D. Second, the false information was emphasized by Invenergy's John Niland, who said, "Talking about ratepayer savings, the analysis we've done looks at what happens to the cost of power to the region when you put in a plant like this. . . . [T]hat's really what the $280 million number represents." [EFSB March 31, 2016 Hearing Transcript, page 16, lines 8-11; 15-17.]

So, the first part of my answer is that Invenergy did not correct its gross mistake in a timely way.

Second, eventually Invenergy backed off its wrong assertion of $118 to $120 million in capacity savings in just FCA-10. In Ryan Hardy's April 22 testimony, page 13, lines 20-21, Invenergy touts "Capacity cost savings to Rhode Island ratepayers . . . to be $170 million from 2019 to 2022, or $42 million annually on average." It is important to note here that in his testimony, Mr. Hardy gives no specific figure at all for projected capacity savings from just FCA-10. Instead, he sticks with a vague average over a period of several years.

Mr. Hardy does not acknowledge in his April 22 testimony that his figure had changed radically from his sworn testimony before the EFSB on January 12, 2016, when he stated under oath that "the savings from capacity costs alone is nearly 212 million" based on incorrect assumptions about FCA-10 that I have explained above. [January 12, 2016 Transcript, page 164, lines 6-14; and Slide 24.]

Third, and importantly, nothing changed between March 31, when Invenergy publicly presented figures that were grossly wrong, and April 22, when Invenergy presented very different figures. The relevant FCA had occurred on February 8. Invenergy acquired no new

information between March 31 and April 22. Thus, there was absolutely no reason for Invenergy to have presented inaccurate information to the EFSB and Burrillville residents on March 31.

FCA-11

**Q: Let us now move on to FCA-11. When is FCA-11 scheduled to occur, and does Invenergy discuss FCA-11 in its EFSB submissions?**

**A:** Yes, Invenergy does discuss FCA-11 in its materials. The ISO will conduct FCA-11 in February 2017. That auction will meet the ISO's anticipated ICR for CCP-11, which runs from June 1, 2020 through May 31, 2021. The ISO has announced that it is keeping the SENE zone from the just-completed FCA-10 intact and unchanged for FCA-11.

**Q: What analysis did you perform with regard to the possible effect on Rhode Island ratepayers of Invenergy's presence or absence in FCA-11?**

**A:** First, I considered and analyzed the likely effects of changes to the demand curve that the ISO has announced for FCA-11.

Next, I estimated the likely ICR value that the ISO will use in FCA-11.

Next, I analyzed and estimated the amount of capacity (in megawatts) that would likely clear in FCA-11.

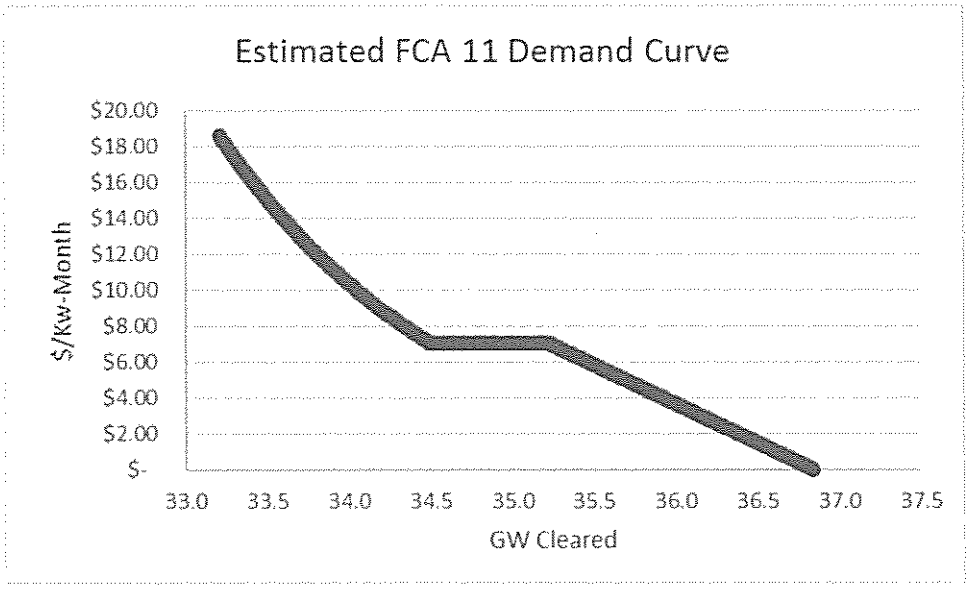
With all those figures in hand, I was able to calculate an estimated value for the potential capacity-market savings for Rhode Island ratepayers during CCP-11, on account of the presence or absence of Invenergy.

First Factor: Changes in the Demand Curve for FCA-11

**Q: You say that the first step in this process was analyzing the likely effects of changes to the demand curve that have been announced by the ISO for FCA-11. Please tell us what those changes are that you considered.**

**A:** The ISO has asked FERC to approve two significant changes in the demand curve it (the ISO) proposes to use in FCA-11.

First, in FCA-9, the ISO introduced for the first time a sloped demand curve; and that sloped demand curve was a downward-sloping straight line. In FCA-11 the ISO intends to introduce for the first time a convex curvature to a portion of that downward-sloping demand curve. This curve will also have a flat section at $7.03/kW-month and a sloped (but not convex) curve below that level. The curve that I am describing looks like this:



The second change in the demand curve to be used in FCA-11 is that the ISO will be offering a curve that overlays the new curve in capacity constrained zones such as SENE. Because the Invenergy Proposal is to be located geographically within the SENE zone, the new overlay curve will apply to the Invenergy Proposal.

This second change to occur in FCA-11 means that the ISO will be offering a curve for SENE that that reflects just the incremental impact on reliability of various levels of capacity within the zone. Because the proposed curve for SENE reflects the incremental impact on reliability within the zone, the price for any given level of capacity procured would be the additional, incremental compensation provided by the ISO to a generator for improving reliability within the zone. That incremental payment would be added to the system-wide clearing price in ISO's Rest of Pool.

However, because there is likely to be sufficient capacity in the SENE region in FCA-11, as I discuss more fully below, the likely <u>incremental</u> settlement price for capacity in that SENE overlay in FCA-11 is likely to be zero. In fact, if this separate, overlay curve that is proposed for use in FCA-11 had been used in FCA-10, the incremental settlement price in SENE in FCA-10 would have been zero also. This is because there was sufficient capacity available in SENE in FCA-10. Again, for FCA-10, even if Invenergy had not participated in the auction, and therefore only 10,864 MW had cleared in SENE, the price separation in SENE would still have been zero.

<u>Second Factor: Calculating ICR for FCA-11</u>

**Q: The second factor you described in your work on FCA-11 was calculating the ICR. Do you have an estimate of what the ICR will be for FCA-11?**

**A:** Yes. The ISO will not publish the ICR for FCA-11 until the autumn of 2016. However, the ISO has already published information from which it is possible to make a reasonable estimation of what the ICR will be for FCA-11.

The main ISO document from which we can estimate the ICR for FCA-11 is the most recent CELT Report, published by the ISO on May 2, 2016, and available as an Excel spreadsheet on the ISO website. CELT is an acronym that stands for "Capacity, Energy, Loads, and Transmission." Recall that New England is a summer-peaking system, so ICR is based upon the anticipated summer peak demand. In the 2016 CELT Report, anticipated gross load for the New England control area for CCP-11 actually declined from the anticipated gross load for CCP-11 as found in the previous, 2015 CELT Report. More specifically, the 2015 CELT Report anticipated summer peak gross load during CCP-11 to be 30,575 MW; in contrast the 2016 CELT Report anticipates summer peak gross load during CCP-11 to be 30,276 MW, a decline of 299 MW.

**Q: Do either of those figures for gross summer peak load during CCP-11, taken from the 2015 and 2016 CELT Reports, account for passive Demand Response (DR) or behind the meter solar PV not yet embedded in load – factors that mitigate peak load?**

**A:** No, neither of those figures account for either passive DR or behind the meter solar not yet embedded in load. In that regard, this is a fair apples-to-apples comparison.

**Q: What do the 2015 and 2016 CELT Reports say about anticipated summer peak load during CCP-11 after accounting for passive DR and behind the meter solar not yet embedded in load?**

**A:** The 2015 CELT Report forecast for CCP-11 summer peak load accounting for DR and solar was 27,400 MW, which is 3,175 MW lower than the gross figure in the 2015 CELT Report.

The 2016 CELT Report forecast for CCP-11summer peak accounting for DR and solar was 26,789 MW, which is 3,487 MW lower than the gross figure in the 2016 CELT Report. This 26,789 figure from the 2016 CELT Report is also 611 MW lower than the comparable figure from the previous year's (2015) CELT Report.

Just to sum up, the ISO is now (in the 2016 CELT Report) projecting that its requirements for CCP-11 may be about 611 MW lower than the ISO itself projected a year ago (in its 2015 CELT Report) its requirements for CCP-11 would be.

**Q: So, what is your estimate of the ICR in FCA-11?**

**A:** In order to be quite conservative, I estimated the ICR for FCA-11 to be only 300 MW lower than the ICR was in FCA-10. The ICR in FCA-10 was 34,151 MW. I estimated the ICR for FCA-11 to be 33,851 MW, which, as I said, is only 300 MW lower than the ICR in FCA-10.

**Q: Do you believe that that estimate is reasonable?**

**A:** Yes I do. In order to do a reality check, I looked back at the way ICRs have changed between auctions between FCA-6 and FCA-10. Those figures appear in this chart:

| Net Installed Capacity Requirement | | |
|---|---|---|
| FCA 6 | 2015/2016 | 33456 |
| FCA 7 | 2016/2017 | 32968 |
| FCA 8 | 2017/2018 | 33855 |
| FCA 9 | 2018/2019 | 34189 |
| FCA 10 | 2019/2020 | 34151 |

As you can see, this chart shows a fairly flat pattern year-over-year. More specifically, year-over-year ICR declined slightly twice during this period, and year-over-year ICR increased slightly twice during this period. This showed me that projecting a relatively small decrease in ICR between FCA-10 and FCA-11 was a reasonable conclusion.

**Q: How does your use of the ISO's 2016 CELT Report compare with what Invenergy used for its calculations?**

**A:** Invenergy's filing used the 2015 CELT Report; I used the more recent 2016 Report. This is found in the June 16, 2015 PA Letter, page 7.[5]

**Q: What is the difference between using the 2015 CELT Report (as Invenergy did) and using the 2016 CELT Report (as you did)?**

**A:** The difference is 611 MW. This is a significant difference. The movement on the sloped, but not convex, part of demand curve would amount to a reduction in clearing price of up to $2.65/kW-month.

I remind you that I only adjusted ICR by 300 MW (not 611 MW); thus, I am providing that $2.65/kW-month figure (representing the shift on the demand curve resulting from a

[5] This is public information that appears in the publicly filed, redacted version of the referenced letter.

difference of 611 MW) only in order to demonstrate that the difference between PA's using the 2015 CELT Report and my using the 2016 CELT Report is not trivial.

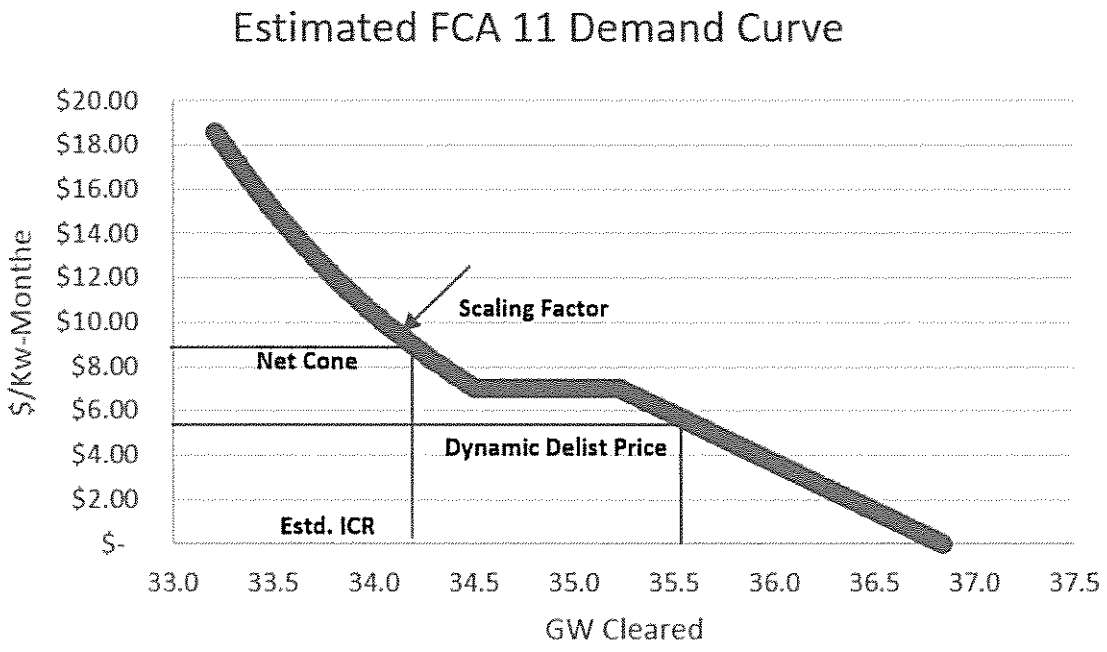
The ISO's Scaling Factor

**Q: Is there anything you want to add about the ICR?**

**A:** Yes, there is. The ICR (and where the ICR is set) also has a material effect on what the ISO calls the "Scaling Factor." The Scaling Factor – and, more specifically, the effect that the Scaling Factor has on the placement of the demand curve – must be included in this calculation.

**Q: What is this Scaling Factor, and why is it important?**

**A:** In FCA-11, for the first time, the ISO is including a so-called "Scaling Factor" in the determination of the demand curve. Basically, this Scaling Factor determines where the demand curve is placed onto the background of different prices to be paid for different levels of capacity. The scaling factor is a function of two components: CONE and ICR. Specifically, the Scaling Factor is determined by the point on the demand curve at which CONE intersects ICR, as shown on this graph:




**Q: You said that the Scaling Factor is, in part, a function of CONE. Please define CONE.**

**A:** CONE is an acronym that stands for Cost of New Entry. According to the ISO's Market Training Glossary, CONE is the price of capacity in dollars per kilowatt-month that is needed to attract new capacity. Basically, this is how much the ISO estimates in advance it would need to offer to new generators to be willing to build a new generation facility within the ISO footprint and then participate in a Forward Capacity Auction.

**Q: What is CONE for FCA-11?**

**A:** CONE in FCA-11, as announced by the ISO, is $11.64/kW-month.

**Q: Getting back to the Scaling Factor, how exactly does that work in the auction?**

**A:** In practice, if the ICR is higher, and all other inputs are equal, the entire sloped demand curve moves to the right, so that the clearing price in the auction would be higher for any given level of capacity that clears. Similarly, if the ICR is lower, and all other inputs are equal, the entire sloped demand curve moves to the left, and clearing prices in the auction would be lower for any given level of capacity that clears.

Third Factor: How Much Capacity Will Clear in FCA-11

**Q: The third factor you said you analyzed in performing your calculation of the effect that Invenergy may have in CCP-11 was your estimate of how much capacity will clear in FCA-11. Please describe what you did here.**

A: The calculation of how much capacity is expected to clear in FCA-11 is necessarily a multi-step process. In broad terms, there are three categories of capacity resources to examine. Those three categories are: (1) existing capacity resources from FCA-10 that will also bid in to FCA-11; (2) anticipated or likely new entry into FCA-11; and (3) anticipated or likely new retirements (or market exits) in FCA-11.

**Q: Let us take the first of those categories first. What value did you use for existing capacity resources in FCA-11?**

**A:** In FCA-10, 35,567 MW cleared the auction. (Remember, once again, that significantly more capacity cleared the auction in FCA-10 than the ICR.) So I used 35,567 MW for existing resources.

Q. **Let us take the second category. What do you anticipate the likely new capacity resources to be in FCA-11?**

**A:** Again, I wanted to be very conservative here. For my analysis I assumed new entry of only 600 MW from Clean Energy Connect, a project proposed by Iberdola Renewables, EDP Renewables North America, Brookfield, Eversource Transmission Ventures, Inc., and others. I note that this is a small portion of the 11,344 MW of FERC-regulated generating capacity currently in the ISO's Interconnection Queue (and excluding Cape Wind and fossil fuel generating capacity that has already received CSOs) and that this Clean Energy Connect is not even part of the Queue. But, as I say, I wanted to be conservative.

**Q: Let us now take the third category. What did you anticipate for likely new retirements or market exists for FCA-11?**

**A:** There are two types of retirements that need to be considered.

The first category is Non-Price Retirements (NPRs) and Permanent De-List Bids. The ISO's deadline is past for holders of current CSOs that want to file NPRs and Permanent De-List Bids for FCA-11. These resources have made their filings, and the ISO has published that information. The total combined NPRs and Permanent De-List bids for FCA-11 is 27 MW. This is substantially below the level of retirements in other, recent auctions. In fact, as much as 3,135 MW of capacity retired in recent auctions (the 3,135 MW figure is from FCA-8).

Needless to say, based on basic laws of supply and demand, this much smaller amount of capacity retiring in FCA-11 should serve to lower the capacity clearing price in FCA-11.

The second category is that capacity can also leave the market by submitting a Static De-List bid in advance of an up-coming auction. These Static De-List bids are entered into the auction and they can become effective if the auction clearing price during any round drops below

the Static De-List price. If and when this occurs, it has the effect of removing that capacity from that auction. These Static De-List bids are reviewed in advance by the ISO's Internal Market Monitor (IMM).

Over the last five FCAs, accepted Static De-List bids have averaged 336 MW of capacity per auction. The table below shows the accepted static de-list bids from each of the last five capacity auctions.

| Accepted Static Delist Bids by Auction (MW) | |
|---|---|
| FCA 6 | 473 |
| FCA 7 | 259 |
| FCA 8 | 444 |
| FCA 9 | 194 |
| FCA 10 | 311 |
| Average | 336.2 |

In order to derive a figure for anticipated market retirement for FCA-11, I added the 27 MW that we know have already filed for NPRs or Permanent De-Lists to the 336 MW of anticipated Static De-List bids, to get a total of 363 MW of overall anticipated retirements. Thus, my figure for projected resources exiting the market for FCA-11 is 363 MW.

**Q: So what is the final figure you derived when you started with the cleared capacity from FCA-10 (35,567 MW), added in anticipated new entry (600 MW), and deducted anticipated market exits (363 MW)?**

We come to 35,804 MW of capacity clearing in FCA-11. Just to be clear, this is my estimate of what the ISO may actually clear in FCA-11. This is not my estimate of the ICR for

FCA-11, which, as I said above, is 33,851 MW. And, to be further clear, this figure of 35,804 MW clearing in FCA-11 does include the 485 MW that Invenergy did clear in FCA-10 (because I am counting all the megawatts that cleared in FCA-10); but this 35,804 does not yet include the additional 485 MW that Invenergy hopes to clear in FCA-11.

**Q: This raises a question. Earlier, on page 16 of your testimony, you told us that Invenergy had been qualified by the ISO to bid 997 MW into FCA-10. But now you are using an aggregate figure of 970 MW for Invenergy's two turbines – 485 MW from one turbine that cleared in FCA-10, plus an additional 485 MW possible in FCA-11. Why the difference?**

**A:** Above, on page 16, I used the public figure of 997 MW, because that is the amount that Invenergy was permitted to bid into FCA-10, as reflected in the public ISO document I cited in footnote 2. Now I am using the lower figure (970 MW), based on the public, redacted version of Ryan Hardy's April 22, 2016 Testimony, page 13, lines 16-19.

FCA-11: Estimate of Possible Ratepayer Savings From Invenergy

**Q: You have described several components of your calculation of the possible ratepayer effect that the presence or absence of Invenergy may have in FCA-11; those factors include: (1) the features of the ISO's demand curve; (2) the calculation of likely ICR; (3) the effect of ICR on the Scaling Factor; (4) the estimate of how much capacity will actually clear in FCA-11. Using these inputs, were you able to derive an estimated clearing price in FCA-11?**

A: Yes.

In order to do that, one last step is needed. We need to locate where on the new three-part demand curve these 35,804 MW of capacity will actually clear. Using the data described above, I believe that FCA-11 is likely to clear at $5.50/kW-month. I note that this is the Dynamic De-List price for FCA 11, which likely serves as a de facto floor for the auction.

**Q: Why does the dynamic de-list price serve as a floor to bidding in the auction?**

**A:** The dynamic de-list price is likely a floor because bidders: (a) can remove their capacity from the ISO system for a one year period; (b) after seeing the results of the auction to that point. That is, in taking advantage of the dynamic de-list price, generators do not have to make the decision to exit the auction in advance, nor must they decide to leave the New England energy market permanently; instead, they can make that election during the auction, and for a one-year period only. Moreover, at the dynamic de-list price, generators are under no obligation to justify their decision to leave to auction to the ISO's Internal Market Monitor (IMM). Conversely, any effort by an existing generator (that is, a generator with a CSO from a prior auction) to exit the market at a figure above the dynamic de-list price ($5.50/kW-month) is severely constrained, must be announced well in advance, and is subject to review by the IMM.

In FCA 7, when bidding reached the Dynamic De-List threshold, some 1,301 MW removed themselves from the auction.

**Q: Based on these figures, what is your estimate of what the capacity-only savings or potential savings to Rhode Island ratepayers will be in CCP-11 due to the presence or absence of Invenergy?**

**A:** First, I will remove from the 35,804 MW clearing in FCA-11 the 485 MW from Invenergy that actually cleared in FCA-10. This has the effect of totally removing any and all of Invenergy's contribution to the clearing price in FCA-11. Without any contribution from Invenergy at all, 35,319 MW are projected to clear in FCA-11. I note that this is substantially more than my estimate of ICR in FCA-11, 33,851 MW.

The next step is to locate on the demand curve where these 35,319 MW would clear. I estimate that these 35,319 MW would clear at $6.64 per KW-month.

The next step is to locate where on the demand curve the auction would clear with all of Invenergy's now-projected contribution of 970 MW. I estimate that, in that event, the auction would clear at $5.50 per KW-month based on reaching the Dynamic De-List Range.

**Q: So, based on that, what is your estimate of the maximum potential impact on the clearing price of FCA-11 that could occur due to the presence or absence of Invenergy?**

**A:** There are two separate ways, both accurate, to express this value.

In term of dollars per kW-month, the maximum difference that could be attributed to the presence or absence of Invenergy in FCA-11 is $1.14 per kW-month.

In terms of possible, potential benefit to Rhode Island ratepayers, this works out to a maximum of $28 million from FCA-11.

**Q: Is it your testimony that Rhode Island ratepayers will derive $28 million in capacity market benefits during CCP-11 from the presence of Invenergy?**

**A:** No, I am not saying that at all. I am saying that, while Invenergy gives the EFSB the grossly inflated figure of $80 million for FCA-11, in fact the actual figure very probably could not

exceed $28 million. That $28 million in possible savings during CCP-11 is a likely ceiling; in fact, the actual figure could be much, much less.

More specifically, the actual, real-world effect of the presence or absence of Invenergy in FCA-11 could be zero under a number of different circumstances. The most obvious such circumstance is that additional new capacity – other than Invenergy – could bid in to FCA-11. In analyzing the possible outcomes of FCA-11, Invenergy is making the same mistake it made that led to its factually wrong result in FCA-10: it is making an assumption, unsupported by any evidence and highly improbable at best, that no additional generation resources will seek to enter the market other than Invenergy. Not content with its wrong prediction for FCA-10, Invenergy continues to make the same mistake in its calculations for FCA-11.

Comparison to Invenergy's Calculation for FCA-11

**Q: How does your estimate of possible savings for Rhode Island ratepayers in CCP-11 from the presence of Invenergy compare with the estimates provided by Invenergy in January 2016?**

A: I estimate the savings just to Rhode Island ratepayers, just from capacity payments, just in CCP-11, to be between zero and $28 million. Invenergy puts the figure at $80 million.

**Q: Could the impact of the Invenergy Proposal (and possible savings to ratepayers) in FCA-11 be more significant because the Invenergy Proposal would be built in the import-constrained SENE zone?**

**A:** Probably not.

Remember that in FCA-10, the SENE zone closed with an excess of capacity. For the same reasons, and for the reasons I discuss above, the SENE zone is likely to once again have no shortage of capacity in FCA-11. Thus, in FCA-11, the SENE Zone is likely to close with no price separation from Rest of Pool, just as it did in FCA-10.

**Q: Are you certain about this outcome in FCA-11?**

**A:** No, I am not certain. I am discussing future events, and no one can be 100% certain of the future. However, I believe that this outcome, or something very similar, is highly probable. I base that opinion on knowing what retirements of old, existing generation resources have occurred in recently concluded auctions; what the level of anticipated retirements in future auctions is; what the ISO has provided as the Allowable Dynamic De-List Range; and what new generation assets are presently in the ISO interconnection queue. I am also estimating the ICR.

**Q: When did Invenergy claim that capacity-market savings to Rhode Island ratepayers would be $80 million in CCP-11 as a result of Invenergy's presence?**

**A:** On that same Slide 24 of Invenergy's January 12 PowerPoint presentation to the EFSB, Invenergy projects a savings of approximately $3/kW-month in FCA-11. This translates to about $80 million in savings for just Rhode Island electricity ratepayers, and in just CCP-11, from June 1, 2020 to May 31, 2021.

**Q: So, just to be clear, Invenergy told the EFSB that electricity ratepayers would save about $80 million – and that is just Rhode Island ratepayers and just on capacity payments (not energy payments), and just during CCP-11; is that correct?**

**A:** Yes, that is what Invenergy told the EFSB on January 12, 2016, and on January 28, 2016, in its response to CLF Data Request 1.3.

**Q: And your estimate, in an apples-to-apples comparison, is that the correct figure for Rhode Island ratepayer savings during CCP-11 is between $28 million and zero?**

**A:** Yes. The figure that Invenergy gave to the EFSB in January is more than double what it should be.

**Q: What would happen if FERC does not approve the convex demand curve that the ISO has asked FERC to approve for use in FCA-11?**

**A:** Even with a sloped demand curve similar to the curve used in FCA-10 (with no added convex portion), the monetary impact of the Invenergy Project on the clearing price in FCA-11 is likely to be dramatically below the estimates made by Invenergy.

**Q: And you are not 100% certain that FERC will approve ISO's proposal for a convex curvature for part of the demand curve in FCA-11; is that correct?**

**A:** I believe that it is highly probable that FERC will approve the ISO's proposal for a convex demand curve. The proposal has broad support of the ISO, of NEPOOL, and of disparate sectors within NEPOOL, including generators and end users.

**Q: Did you also perform a calculation for likely outcome during a third FCA and a third CCP?**

**A:** No, I did not.

**Q: Why not?**

**A:** Because Invenergy projected very little benefit or savings for Rhode Island ratepayers during that third CCP; therefore, I did not believe it would be worthwhile to do a separate analysis.

The Bottom Line on Possible Capacity Savings to Rhode Island Ratepayers

**Q: So let's aggregate what Invenergy projects the capacity-only savings to Rhode Island ratepayers will be during the first two FCAs and the first two CCPs; and let's compare that figure to your own estimate of those two-year savings. Please make this a straight-on apples-to-apples comparison.**

**A:** Invenergy told the EFSB on January 12, 2016, that Rhode Island electricity ratepayers will save approximately $200 million, just on capacity, and just in the two Capacity Commitment Periods that run from June 1, 2019 through May 31, 2021.

I say that it is impossible, with the facts that are publicly known, to derive a precise figure. However, based on my analysis, it is my testimony that that amount could not possibly be over $63 million, and quite possibly it could be much lower, even close to zero. This is an apples-to-apples comparison with Invenergy's figure, because I am also talking about capacity only, for Rhode Island ratepayers only, during the same two-year period starting June 1, 2019.

Energy

**Q: Let's turn now to possible energy savings. What savings on the energy side does Invenergy project?**

**A:** In Invenergy's January 12, 2016 PowerPoint presentation, on slide 24, Invenergy projects energy savings for Rhode Island ratepayers of $46 million over three years, or about $15 million per year.

**Q: What is your view of those estimates?**

**A:** My view is that those estimates are highly improbable.

**Q: Why do you say that?**

**A:** I examined the regulatory filings of four proposed power plants in New England that participated in FCAs 7 through 10, and that acquired CSOs in those auctions. Specifically, I looked at: (1) Footprint in Salem, Massachusetts; (2) Towantic, in Oxford, Connecticut; (3) West Medway, in Massachusetts; and (4) the Invenergy proposal in Burrillville, Rhode Island.

I examined the claims made by the proponents of these plants to the respective regulators in Massachusetts, Connecticut, and Rhode Island, about the supposed downward pressure on ISO energy clearing prices that each separate project was supposedly going to have. I show my findings in the following table:

| Claimed Energy Price Reductions For Consumers 2020 Calendar Year | | |
|---|---|---|
| | $/MWH | Consultant |
| Towantic--Oxford | $ (4.45) | Concentric |
| Invenergy | $ (2.36) | PA |
| Footprint | $ (2.15) | Charles River |
| Medway | $ (0.24) | TAG |
| | | |
| Subtotal | $ (9.20) | |
| | | |
| Not Included: Canal 3 (484 MW); Bridgeport 6 (333 MW); Wallingford (90 MW) | | |
| If at Invenergy savings rate would lower prices by a further $2.19/MWH | | |

**Q: What do these figures in your chart mean?**

**A:** Simply stated, it is not possible for all of these separate claims to the respective regulatory agencies to be correct. If all of these claims of downward pressure on prices actually came true, the variable profit margin (spark spread minus variable operating costs and RGGI costs) for the average fossil fuel plant in New England (natural gas, coal, and oil) would drop by at least 92%, leaving variable margins close to zero. That is, the separate claims made by the proponents of these four power plants is that, taken together, they will depress energy clearing prices so far that there just won't be any meaningful margin left in the business. When taking into account the generators' cash fixed costs (taxes, employment costs, interest, etc.), they would be operating at a loss.

Of course, this is impossible.

If the margin for running a fossil fuel power plant in New England were to drop to zero, many generators would exit the market as a result. Of course, having so many generators exit the market would drive up energy clearing prices some, but it would drive up capacity prices enormously. Any small ratepayer savings on the energy side would be wiped out many, many times over on the capacity side.

In fact, this is exactly how the ISO-run markets were designed to operate. The purpose of the capacity market is to ensure that the New England region will have enough generation capacity in the future to meet demand in the future. If the profit margins for generators crashes to zero, generators will exit the market. If enough generators exit the market, the ISO would have trouble meeting its ICR in future auctions. (Or, to say the same thing another way: If enough generators exit the market, the integrity of the electricity grid would be threatened.) This

will cause capacity prices to rise, perhaps sharply. This is the very reason that the capacity market was created in the first place: to create a financial incentive to attract new entry when there is a shortage of generation capacity on the system.

In other words, the wildly optimistic energy savings projected by Invenergy and other companies proposing power plants just cannot all be true. The market could not sustain a price structure in which profit margins for generators all crashed to zero; and if anything approaching that did occur, the savings on the energy side would be immediately wiped out by price spikes on the capacity side. Moreover, and importantly, this would be the market working as it was designed to work. That is why the capacity market was created.

**Q: So are you saying that the $15 million annual ratepayer savings that Invenergy projects on the energy side is untrue?**

**A:** No, that is not at all what I am saying. But what I am saying is that Invenergy, exactly like the proponents of Towanic, Footprint, and Medway, are each, individually and separately, casting their own proposal in a very, very rosy – and ultimately unrealistic – light. I am not saying that Invenergy's story must be false. But I am saying that, in order for Invenergy's prognostication of energy-side savings from this plant to come true, the prognostications made by the proponents of these other three plants would necessarily have to not come true.

There is just so much money that can be squeezed out of the energy market before generators decide to leave that market en masse. This EFSB ought to take a hard, skeptical look at the deeply self-serving projections that Invenergy has offered. There is a parallel here to what I say above about Invenergy's inaccurate numbers on supposed capacity savings. Invenergy

hopes to make a huge profit on this proposed plant. But Invenergy cannot sell its plant to the EFSB and the public based on profits to Invenergy; Invenergy needs to sell its profit-making plant to the EFSB and the public based upon putative benefits to ratepayers. In this context, I am not at all surprised that Invenergy, and other proponents of new power plants, over-state those supposed ratepayer benefits so egregiously.

**Q: Has Invenergy publicly backed off its January 12, 2016 estimate of energy-market savings to Rhode Island ratepayers of $15 million per annum?**

**A:** Yes. In Ryan Hardy's testimony filed on April 22, Mr. Hardy estimates energy-market savings to Rhode Island ratepayers of "nearly $10 million annually." [Ryan Hardy April 22, 2016 Pre-Filed Testimony, page 13, line 10.]

**Q: Did either Mr. Hardy or Invenergy acknowledge, or point out to the EFSB, that this testimony was fully 33% lower than the figure it had presented on January 12, 2016?**

**A:** No.

**Q: Does this conclude your testimony?**

**A:** Yes, it does.

# Tab A

CLEAR RIVER
ENERGY CENTER

# Leading Clean Energy CEO, Governor Raimondo Join In Announcing State-of-the-Art Clean Power Project; Key Piece of Solution To Rhode Island Energy Challenges

*Clear River Energy Center will fill help meet the region's energy needs;*
*result in $280 million in electric rate savings;*
*create more than 300 full-time construction jobs;*
*and bring cleaner, healthier air to Rhode Island*

**PROVIDENCE, R.I., AUGUST 4, 2015** – Michael Polsky, president, founder, and CEO of leading clean energy developer and operator Invenergy, was joined by Rhode Island Governor Gina M. Raimondo and other state and local leaders on Tuesday to announce plans for the Clear River Energy Center, a "state-of-the-art" natural gas-fueled power generation facility in Burrillville. The project will play a major role in addressing energy reliability and affordability challenges due in part from aging coal and oil plant retirements, and is projected to result in $280 million in cumulative savings for Rhode Island consumers.

"The construction of this clean energy generation facility will create hundreds of jobs while delivering more affordable and reliable energy to our businesses and homes," said Governor Gina M. Raimondo. "We are tackling our regional energy challenges, committing to cleaner energy systems in the long-term, and putting Rhode Islanders back to work."

"Invenergy is excited about investing in Rhode Island and being part of the solution to energy challenges in the state and region," Polsky said. "Governor Raimondo has shown great leadership in working towards clean, affordable, reliable energy in the Ocean State, and the Clear River Energy Center will deliver just that."

Invenergy plans to invest more than $700 million in the new facility, which would generate an overall economic impact to Rhode Island's economy of $1.3 billion between 2016-2034. Facility construction would create more than 300 jobs for local workers, and once operational, it would employ 25 permanent skilled employees with total annual payroll of $3.5 million.

"The Clear River Energy Center will create hundreds of well-paying construction jobs, exactly the type of work our local tradesmen and women need," said Michael F. Sabitoni, President of the Rhode Island Building and Construction Trades Council. "Rhode Island's workforce is ready to help build this project and to bring new energy to the region."

The Clear River Energy Center will be the most efficient natural gas-fired energy facility in New England. Using the world's most advanced power generation technology, the project will address the region's energy needs by adding more than 900 megawatts (MW) of clean, domestic electricity to the regional grid.

**Project Details**

The Clear River Energy Center will provide critical electric rate savings and increased reliability for Rhode Island families and businesses; deliver jobs and economic benefits to workers and communities; and bring cleaner energy and healthier air to Rhode Island. Benefits will include:

**Electric rate savings and increased reliability:** Rhode Island customers already pay the fifth highest retail electric rates in the country, and with New England's regional electric grid facing the retirement of approximately 6,000 MW of aging power plants, keeping rates in check presents a major challenge. The Clear River Energy Center will add more than 900 MW of new, cleaner energy to the regional grid. By displacing older, inefficient plants, Clear River is projected to save ratepayers $280 million in cumulative savings between 2019 and 2022. Additionally, the project will allow ISO-NE to meet the current capacity shortage forecasted for the Rhode Island zone of the regional grid.

**Jobs and Economic Benefits:** The $700+ million project will be Rhode Island's largest energy project in decades. The Clear River Energy Center will create more than 300 local construction jobs, and, when operational, employ 25 full-time staff members. The project will contribute more than $3.5 million annually to the local economy in employee salaries. For Burrillville, the project will generate millions of dollars annually in new tax revenue, which can be used to support schools, libraries, police and fire services. Since the facility will have little-to-no impact on town services, the economic benefits should help reduce the property tax burden for homeowners for decades to come.

Clear River will also invest in well treatment and system upgrades, which should help the 1,200 water customers of the Pascoag Utility District by contracting on a long-term basis for industrial water supply. Plans for the Clear River Energy Center involve using water from two Pascoag Utility District wells that have been unusable since deemed contaminated in 2001. The Clear River Energy Center will pay for these wells to be reactivated and cleaned up over time.

**Cleaner energy and healthier air:** By enabling the transition away from older, less-efficient, and polluting coal and oil plants, Clear River will lower emissions of harmful pollutants in the region by the following amounts each year:

- Carbon Dioxide (CO2): by 913,000 tons
- Nitrogen Oxides (NOx): by 1,993 tons
- Sulphur Oxides (SOx): by 2,702 tons.

With fast start ability and the flexibility to vary energy production on demand, natural gas plants like the Clear River Energy center complement renewable energy technologies that vary output based on changes in wind speed and sunlight.

By reducing harmful carbon emissions and supporting the growth of renewable energy, the Clear River Energy Center will significantly contribute to Rhode Island meeting its Clean Power Plan goals.

Once approved by state and local regulators, construction on the Clear River Energy Center is scheduled to begin in the fourth quarter of 2016, with commercial operations expected by the summer of 2019.

The plant will be owned and operated by Invenergy, a leading clean energy company that has developed more than 9,000 MW of utility-scale wind, solar, and natural gas-fueled power generation and energy storage facilities in the United States, Canada, and Europe. This includes seven natural gas-fueled power generation projects in operation and construction, with a total capacity of more than 3,100 MW.

The Clear River Energy Center will propose connecting to the New England ISO. Currently, the project's permit applications are being prepared for submittal to the Rhode Island Department of Environmental Management, the state's Energy Facility Siting Board, and the Town of Burrillville.

Invenergy currently is reviewing potential offtake opportunities for the project.

**About Invenergy**

Invenergy and its affiliated companies develop, own and operate large-scale renewable generation and clean energy storage facilities in North America and Europe. Invenergy is North America's largest independent wind power generation company, with its home office is in Chicago and regional development offices in the United States, Canada, Europe, Japan, and Mexico. For more information, please visit www.invenergyllc.com.

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# Tab B

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

**INVENERGY'S RESPONSES TO CONSERVATION LAW FOUNDATION'S FIRST DATA REQUESTS**

1.3: This Data Request pertains to PowerPoint Slide 21 used by Invenergy at the January 12, 2016 Preliminary Hearing, specifically this sentence: "By displacing older, inefficient plants Clear River is projected to save ratepayers $280 million in cumulative savings between 2019 and 2022."

(a) Please confirm that the cumulate savings referred to pertain to: (1) the value of energy, not capacity or ancillary services; (ii) ratepayers in the Rhode Island load zone, not rest of pool; and (iii) the ISO-NE Capacity Commitment Periods 10, 11 and 12.

(b) Explain in detail how the $280 million figure was derived, and provide all work-papers used in the calculations.

(c) Identify all inputs into these calculations derived from outside sources, and identify the outside source(s).

(d) For all inputs that were not derived from outside sources (that is, assumptions made by Invenergy), identify the assumption and explain why Invenergy believes the assumption to be reasonable.

(e) identify the principal person(s) responsible for this calculation.

(f) Identify additional person(s) involved in this calculation and generally the role of each one.

RESPONSE:[1] (a) The $280 million is the approximate savings to Rhode Island ratepayers in cumulative energy and capacity costs resulting from the participation of Clear River in the energy and capacity markets from 2019 through 2022 (four calendar years). The capacity market savings are realized in Forward Capacity Auctions ("FCA") 10, 11, 12 and 13 (partial year given the FCA 13 delivery year is June 2022 through May 2023).

(b) Invenergy retained PA Consulting Group, Inc. ("PA") to complete the market analysis associated with Clear River. The ratepayer savings analysis is explained in the EFSB Application, in Section 5.0 (Project Benefits) and in Section 7.0 (Need)( Section 7.2.3 of the EFSB Application -- Analysis of Need – Rhode Island Ratepayer Cost Impact).

[1] Invenergy incorporates the objections to this Data Request, filed on January 15, 2016.

IN RE: Application of
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**INVENERGY'S RESPONSES TO CONSERVATION LAW FOUNDATION'S FIRST DATA REQUESTS**

The $280 million represents the difference in total capacity and energy costs to Rhode Island-only load resulting from the Clear River capacity addition, as measured by comparing cost results from capacity and energy modeling cases (a) with Clear River starting in 2019; and (b) without Clear River.

- Capacity costs to Rhode Island-only load are allocated by ISO-NE based on the capacity auction clearing price and Rhode Island's share of the system-wide peak demand. Rhode Island's share of the system-wide peak demand is calculated by multiplying Rhode Island's peak demand by (1 + Actual Reserve Margin). This accounts for the excess capacity that ISO-NE procures in the Forward Capacity Market ("FCM") in order to ensure peak demand is met even if outages occur. To calculate any capacity cost savings under ISO-NE's capacity cost allocation methodology, PA started by comparing the annual projected FCM Rest of Pool ("ROP") clearing prices from the "With Clear River" and "Without Clear River" scenarios for auctions starting with FCA 10 (the 2019/2020 delivery year). The difference in clearing prices between the two scenarios in each delivery year was then multiplied by Rhode Island's share of the system-wide peak demand to determine the savings to Rhode Island-only load as a result of Clear River.

- The energy cost to Rhode Island-only load for each case was calculated using projected Rhode Island-area energy prices from PA's fundamental production cost analysis (utilizing the AURORAxmp[2] software and PA's underlying market assumptions) for the two analyzed cases (i.e., "With Clear River" and "Without Clear River").

- Please see the accompanying worksheet calculations.

[2] The AURORAxmp Electric Market Model, developed by EPIS, Inc.

(c) PA employs a wide range of public and proprietary data to keep its various market models up to date, such that the universe of inputs cannot be easily divulged.

The inputs used by PA are described in the EFSB Application, Section 5.0 (Project Benefits) and in Section 7.0 (Need) (Section 7.2.3 -- Analysis of Need – Rhode Island Ratepayer Cost Impact) and in the documents prepared by PA Consulting and filed with the EFSB.

Key input drivers include the following:

- Peak Energy and Load: "2015-2024 Forecast Report of Capacity, Energy, Loads, and Transmission" ("2015 CELT Report") from ISO-NE;
- Auction Parameters: ISO-NE FCA 10 auction parameters (sourced from ISO-NE website);
- Natural Gas Prices: PA's base case forecast for delivered natural gas prices. Algonquin Citygate pricing is approximately $5.50/MMBtu in 2019, escalating to approximately $7.25/MMBtu by the 2022 timeframe (all figures in nominal dollars, assuming 2.2% per annum inflation rate); and
- RGGI $CO_2$ Prices: PA's base case forecast assumes RGGI pricing averaging approximately $6-7/short ton in the 2019-2021 period (all figures in nominal dollars, assuming 2.2% per annum inflation rate).

(d) All market assumptions were from PA's independent base case forecast for the ISO-NE market as of the date of the analysis, with the exception of Clear River's unit performance characteristics. The

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

Docket No.: SB – 2015-06

**INVENERGY'S RESPONSES TO CONSERVATION LAW FOUNDATION'S FIRST DATA REQUESTS**

primary variables include the unit's output or capacity, the variable Operation and Maintenance ("O&M ") costs, and unit's heat rate, which were provided to PA by Invenergy. The unit capacity and heat rate were based off of proposals received for the subject equipment and the variable (O&M) costs were based on Invenergy's experience with similar technology and by comparing these costs to our actual costs that we have seen at our other combined cycle facilities.

(e) This calculation was completed by PA, and primarily Ryan Hardy, Mark Repsher, and Mason Smith.

(f) PA has a team of power market experts in its Global Energy and Utilities practice that contributed to this analysis.

RESPONDENT: Ryan Hardy, Mark Repsher, and Mason Smith, of PA Consulting, John Niland of Invenergy

DATE: January 28, 2016

P1
'16/1/27

## Rhode Island Energy Cost Savings from Clear River

*nominal $*

| | | RI Energy Demand (GWh)[1] | | RI Energy Price Differential Resulting from Clear River ($/MWh) | | Energy Cost Savings to RI Ratepayer ($/month) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | *Calculated as Price "Without CREC" less Price "With CREC"* | | *Calculated as Price Differential (Price "Without CREC" less Price "With CREC") * Rhode Island Energy Demand* | | | |
| **Year** | **Month** | **On Peak** | **Off Peak** | **On Peak** | **Off Peak** | **On Peak** | **Off Peak** | **Total** | |
| 2019 | 1 | 376.12 | 321.03 | 0.00 | 0.00 | $ - | $ - | $ - | |
| 2019 | 2 | 328.87 | 281.34 | 0.00 | 0.00 | $ - | $ - | $ - | |
| 2019 | 3 | 333.22 | 286.64 | 0.00 | 0.00 | $ - | $ - | $ - | |
| 2019 | 4 | 318.79 | 248.48 | 0.00 | 0.00 | $ - | $ - | $ - | |
| 2019 | 5 | 307.42 | 274.49 | 0.00 | 0.00 | $ - | $ - | $ - | |
| 2019 | 6 | 382.92 | 293.28 | 1.81 | 0.75 | $ 692,926 | $ 218,957 | $ 911,883 | <-- Clear River online in June 2019. |
| 2019 | 7 | 463.10 | 344.48 | 2.35 | 0.83 | $ 1,087,173 | $ 286,097 | $ 1,373,270 | |
| 2019 | 8 | 383.47 | 345.97 | 2.02 | 0.80 | $ 774,803 | $ 275,878 | $ 1,050,681 | |
| 2019 | 9 | 361.75 | 275.98 | 1.70 | 0.73 | $ 613,756 | $ 201,958 | $ 815,714 | |
| 2019 | 10 | 340.46 | 278.06 | 1.71 | 0.73 | $ 583,345 | $ 202,210 | $ 785,555 | |
| 2019 | 11 | 332.97 | 289.47 | 1.95 | 0.84 | $ 650,385 | $ 243,884 | $ 894,269 | |
| 2019 | 12 | 387.35 | 305.33 | 2.35 | 1.09 | $ 909,631 | $ 334,201 | $ 1,243,831 | |
| 2020 | 1 | 372.06 | 317.55 | 4.16 | 3.11 | $ 1,548,616 | $ 989,137 | $ 2,537,753 | |
| 2020 | 2 | 325.31 | 278.30 | 3.55 | 2.72 | $ 1,158,891 | $ 757,797 | $ 1,916,688 | |
| 2020 | 3 | 329.62 | 283.54 | 2.42 | 1.77 | $ 798,131 | $ 500,567 | $ 1,298,698 | |
| 2020 | 4 | 315.34 | 245.79 | 2.21 | 1.51 | $ 695,676 | $ 370,383 | $ 1,066,059 | |
| 2020 | 5 | 304.10 | 273.53 | 2.25 | 1.49 | $ 685,665 | $ 404,318 | $ 1,089,983 | |
| 2020 | 6 | 378.78 | 290.11 | 2.35 | 1.56 | $ 889,303 | $ 452,314 | $ 1,341,617 | |
| 2020 | 7 | 458.09 | 340.76 | 3.05 | 1.73 | $ 1,395,280 | $ 591,009 | $ 1,986,289 | |
| 2020 | 8 | 379.32 | 342.22 | 2.62 | 1.67 | $ 994,384 | $ 569,899 | $ 1,564,283 | |
| 2020 | 9 | 357.84 | 273.00 | 2.20 | 1.53 | $ 787,695 | $ 417,198 | $ 1,204,894 | |
| 2020 | 10 | 336.78 | 275.05 | 2.22 | 1.52 | $ 748,666 | $ 417,718 | $ 1,166,384 | |
| 2020 | 11 | 329.37 | 286.34 | 2.53 | 1.76 | $ 834,705 | $ 503,806 | $ 1,338,511 | |
| 2020 | 12 | 383.17 | 302.03 | 3.05 | 2.29 | $ 1,167,422 | $ 690,381 | $ 1,857,802 | |
| 2021 | 1 | 368.85 | 314.82 | 5.12 | 3.88 | $ 1,887,228 | $ 907,553 | $ 2,794,781 | |
| 2021 | 2 | 322.51 | 275.90 | 4.38 | 2.52 | $ 1,412,287 | $ 695,294 | $ 2,107,581 | |
| 2021 | 3 | 326.78 | 281.09 | 2.98 | 1.63 | $ 972,645 | $ 459,281 | $ 1,431,926 | |
| 2021 | 4 | 312.63 | 243.67 | 2.73 | 1.39 | $ 847,788 | $ 339,834 | $ 1,187,623 | |
| 2021 | 5 | 301.48 | 269.19 | 2.77 | 1.38 | $ 835,588 | $ 370,970 | $ 1,206,559 | |
| 2021 | 6 | 375.51 | 287.61 | 2.89 | 1.44 | $ 1,083,753 | $ 415,007 | $ 1,498,760 | |
| 2021 | 7 | 454.15 | 337.82 | 3.74 | 1.61 | $ 1,700,364 | $ 542,263 | $ 2,242,627 | |
| 2021 | 8 | 376.05 | 339.28 | 3.22 | 1.54 | $ 1,211,810 | $ 522,894 | $ 1,734,704 | |
| 2021 | 9 | 354.75 | 270.65 | 2.71 | 1.41 | $ 959,928 | $ 382,788 | $ 1,342,717 | |
| 2021 | 10 | 333.88 | 272.68 | 2.73 | 1.41 | $ 912,365 | $ 383,265 | $ 1,295,630 | |
| 2021 | 11 | 326.53 | 283.87 | 3.12 | 1.63 | $ 1,017,217 | $ 462,253 | $ 1,479,470 | |
| 2021 | 12 | 379.86 | 299.43 | 3.75 | 2.12 | $ 1,422,683 | $ 633,438 | $ 2,056,122 | |
| 2022 | 1 | 366.27 | 312.61 | 5.19 | 2.65 | $ 1,899,969 | $ 829,022 | $ 2,728,991 | |
| 2022 | 2 | 320.25 | 273.97 | 4.44 | 2.32 | $ 1,421,622 | $ 635,130 | $ 2,056,952 | |
| 2022 | 3 | 324.49 | 279.13 | 3.02 | 1.50 | $ 979,212 | $ 419,539 | $ 1,398,751 | |
| 2022 | 4 | 310.44 | 241.97 | 2.75 | 1.28 | $ 853,512 | $ 310,428 | $ 1,163,941 | |
| 2022 | 5 | 299.37 | 267.30 | 2.81 | 1.27 | $ 841,229 | $ 338,870 | $ 1,180,100 | |
| 2022 | 6 | 372.88 | 285.60 | 2.93 | 1.33 | $ 1,091,069 | $ 379,097 | $ 1,470,166 | |
| 2022 | 7 | 450.97 | 335.46 | 3.80 | 1.48 | $ 1,711,844 | $ 495,341 | $ 2,207,185 | |
| 2022 | 8 | 373.47 | 336.90 | 3.27 | 1.42 | $ 1,219,991 | $ 477,648 | $ 1,697,640 | |
| 2022 | 9 | 352.27 | 268.75 | 2.74 | 1.30 | $ 966,409 | $ 349,665 | $ 1,316,075 | |
| 2022 | 10 | 331.54 | 270.77 | 2.77 | 1.29 | $ 918,525 | $ 350,101 | $ 1,268,626 | |
| 2022 | 11 | 324.25 | 281.88 | 3.16 | 1.50 | $ 1,024,085 | $ 422,254 | $ 1,446,339 | |
| 2022 | 12 | 377.20 | 297.33 | 3.80 | 1.95 | $ 1,432,289 | $ 578,627 | $ 2,010,916 | |

[1] Source: Rhode Island monthly energy demand sourced from ISO-NE's 2015 Capacity, Energy, Loads, and Transmission Report (CELT Report), and shown net of solar PV and demand response.

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## Rhode Island Capacity Cost Savings from Clear River

*nominal $*

| | Demand Figures (MW)[1] | | | | | |
|---|---|---|---|---|---|---|
| | RI Peak Demand | ISO-NE Cleared Capacity | ISO-NE Peak Load | RI Peak Demand (MW), With Reserve Margin Proportionate to ISO Reserve Margin | FCA Rest Of Pool (ROP) Capacity Compensation Differential ($/kW-mo) | Capacity Cost Savings to Ratepayer ($/year) |
| | | | | | *Calculated as ROP calendar year-adjusted capacity price "Without CREC" less the same price "With CREC"* | *Calculated as RI peak demand with reserve margin * ROP capacity price differential projected "With CREC" vs "Without CREC"* |
| Year | | | | | | |
| 2019 | 1,859 | 36,789 | 30,230 | 2,262 | $2.56 | $69,558,347 |
| 2020 | 1,856 | 36,877 | 30,575 | 2,239 | $3.59 | $96,403,279 |
| 2021 | 1,861 | 36,948 | 30,900 | 2,225 | $1.74 | $46,434,952 |
| 2022 | 1,863 | 37,038 | 31,230 | 2,209 | $0.22 | $5,914,198 |

[1] Source: Rhode Island and ISO-NE peak demand (MW) figures sourced from ISO-NE's 2015 Capacity, Energy, Loads, and Transmission Report (CELT Report)

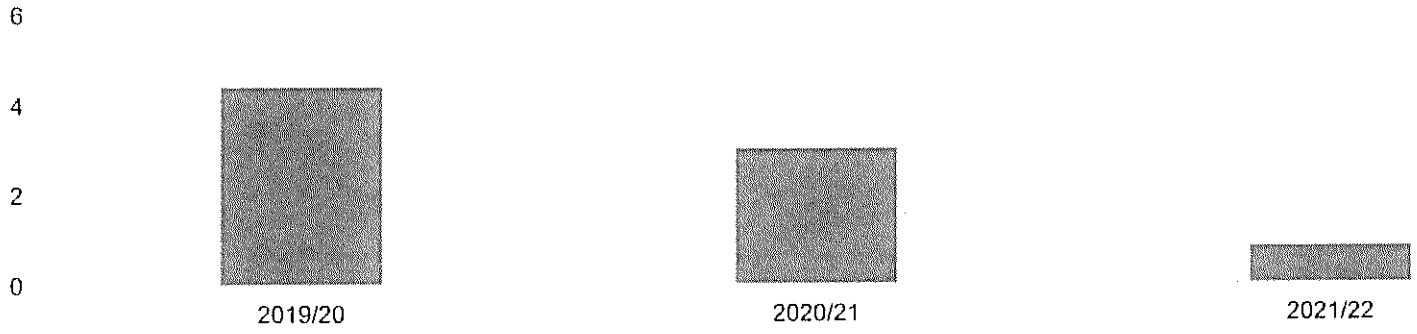
# Tab C

Invenergy

## CREC's economic impacts to Rhode Island ratepayers – $258 million in savings the first three years

- PA's methodology to analyze the rate impacts for Rhode Island customers compared two scenarios to determine the net impacts of Clear River on Rhode Island ratepayers
  - The first scenario projected total energy and capacity costs to Rhode Island without the addition of Clear River to the ISO-NE market; and
  - The second scenario projected total energy and capacity costs to Rhode Island with the addition of Clear River

### Projected FCM Capacity Price Savings w/ Clear River ($/kW-mo)[1]




- In the first three years of operation (2019-2021), market projections indicate that Clear River would save Rhode Island ratepayers $258 million in capacity and energy costs, or more than $86 million annually
  - The additional Clear River capacity is projected to result in capacity cost savings of nearly $212 million in this timeframe, with energy cost savings of approximately $46 million as Clear River displaces less efficient generation resources
  - Thereafter, Rhode Island ratepayers would continue to realize approximately $23 million in energy cost savings per year, with capacity cost impacts determined by the types of new development capacity that enter the ISO-NE market to maintain reliability after Clear River's market entry

[1] After the first three years PA does not project a material difference in capacity prices between the two cases.

# Tab D

Invenergy

# Electricity Savings & Water Benefits

- By displacing older, inefficient plants, this project is estimated to save consumers **$280 million** in total on electricity bills between 2019 and 2022

**$280 MILLION IN SAVINGS**

CLEAR RIVER ENERGY CENTER

WELL #3 / #3A

- The Clear River project will invest in treatment systems and upgrades to clean up and use water from a contaminated well in the Pascoag Utility District. **This will help to clean up the aquifer**.