REDACTED

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

PUBLIC UTILITIES COMMISSION

IN RE:	**INVENERGY THERMAL DEVELOPMENT LLC**	**)**	
	APPLICATION TO CONSTRUCT AND	**)**	**Dkt. 4609**
	OPERATE THE CLEAR RIVER ENERGY	**)**	
	CENTER, BURRILLVILLE, RHODE ISLAND	**)**	

PRE FILED TESTIMONY OF

RYAN HARDY

1.1 INTRODUCTION

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

A. My name is Ryan Hardy, and my business address is 10 Canal Park, Cambridge, Massachusetts.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING?

A. My testimony is on behalf of the applicant, Invenergy Thermal Development LLC ("Invenergy"), in support of their application for a license from the Rhode Island ("R.I.") Energy Facilities Siting Board ("EFSB" or the "Board") to construct the Clear River Energy Center project in Burrillville, Rhode Island ("Clear River Energy Center" or "Clean River").

Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE.

A. I am employed by PA Consulting Group, Inc. ("PA"), and I am a Member of PA's Management Group. A detailed description of my educational background and professional experience is included as **Exhibit RH-1**.

Q. WHAT IS PA CONSULTING GROUP?

A. PA is a global consulting, technology and innovation firm. We are an independent firm employing approximately 2,500 people from offices across the Americas, Europe, the Nordics, the Gulf and Asia Pacific. We work across eight industries including energy and utilities, consumer and manufacturing, defense and security, financial services, government, healthcare, life sciences, transport, travel and logistics.

Q. CAN YOU PLEASE DESCRIBE PA CONSULTING GROUP'S EXPERIENCE WITH POWER MARKETS?

A. PA's energy economics advisors are experts across the entire energy value chain, from fuels through to power. Our energy economics advisors have refined our approach to analyzing North American power markets over the last 15 years.

Over this time period, we have developed a robust, well-developed, and industry-tested fundamental power market modeling process, including our proprietary stochastic dispatch optimization, capacity compensation, environmental, renewable, and valuation models along with the use of production cost, transmission, and natural gas models that are operated by PA's subject matter experts and populated with PA proprietary data.

In the last five years alone, we have supported the development, buy-side, sell-side, and financing processes for over 225 GW of power generation in North America and nearly 20 GW in New England specifically.

Q. PLEASE DESCRIBE YOUR EXPERIENCE PROVIDING TESTIMONY TO REGULATORY COMMISSIONS, BOARDS, AGENCIES OR AS AN EXPERT WITNESS.

A. I have conducted several appraisals of power plants (approximately 5 GW) under the Uniform Standards of Professional Appraisal Practice ("USPAP") appraisal standards in a

litigation context. I have also submitted testimony to Federal Energy Regulatory Commission ("FERC") related to the financial parameters supporting the PJM ISO's capacity auction construct. More information related to my professional experience is included as **Exhibit RH-1**.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. On October 29, 2015, Invenergy filed its application with the R.I. EFSB to construct a 850-1,000 megawatt ("MW") combined cycle dual fueled generation facility ("Facility") called the Clear River Energy Center project, and to be located in Burrillville, R.I., as described in more detail in the application. In accordance with the Preliminary Order of the EFSB, the Board requested an advisory opinion from the Rhode Island Public Utilities Commission ("PUC") as to (1) the need for the proposed Facility; (2) whether it is cost-justified to the consumer consistent with the object of ensuring that the construction and operation of the Facility will be accomplished in compliance with all the requirements of the laws, rules and regulations; and (3) whether cost effective efficiency and conservation opportunities provide an appropriate alternative to the proposed Facility.

My testimony will be with regard to (1) the need for Clear River Energy Center and (2) the cost-justification of the facility, which the PUC will be focusing on in its Advisory Opinion.

Q. PLEASE IDENTIFY THE SPECIFIC SECTIONS OF THE APPLICATION FOR WHICH YOU ARE SPONSORING TESTIMONY IN THIS PROCEEDING.

A. My analysis supports the following sections of the application:

- Section 7.0 titled "Assessment of Need," pages 115-121; Supplement to the Application: Three reports; and
- Section 10.0 titled "Study of Alternatives," pages 124-129.

Q. **PLEASE PROVIDE AN OVERVIEW OF YOUR TESTIMONY.**

A. My testimony addresses five topics:

- The need for the Clear River Energy Center.
- PA's modeling methodology with regard to the Clear River Energy Center analysis performed.
- The ratepayer impacts of the Clear River Energy Center.
- The emissions impacts of the Clear River Energy Center.
- The broader economic impacts of the Clear River Energy Center.

Q. PLEASE PROVIDE A SUMMARY OF YOUR ASSESSMENT OF THE NEED FOR CLEAR RIVER.

A. My analysis indicates that Clear River Energy Center is needed to cost-effectively maintain reliability in ISO-NE and to support the introduction of more renewable energy projects into the ISO-NE region. I base this conclusion on both the results of ISO-NE's most recent capacity auction, other information from ISO-NE, and my modeling of subsequent auctions.

Q. WHAT IS YOUR UNDERSTANDING OF THE STANDARD USED BY THE PUC TO REVIEW THE NEED FOR THE CLEAR RIVER PROJECT?

A. My understanding is that the PUC will apply a liberalized standard to determine the need for the project, given that wholesale generation of electricity is a competitive industry where the risk of success for such projects and the risks associated with the cost of construction are placed not on ratepayers, but on private investors. I believe the PUC explained this view in its Advisory Opinion in the Indeck-North Smithfield project (Docket No. 3094). In the Indeck Advisory Opinion, the PUC pointed out that, in its most recent three advisory opinions (Indeck, Tiverton Power, Hope Energy) the PUC concluded that as a result of the Utility Restructuring Act of 1996 ("URA") the URA has "effectively repealed by implication the much older need assessment

provision of the" Energy Facilities Siting Act, thereby relaxing the standard of review required by the PUC. In the Indeck Advisory Opinion, the PUC concluded that "as a result of the new era of competition, the need for generating plants is determined by the free market, and therefore, the PUC's determination of "need" is limited to whether the proposed electric supply is necessary to meet demand."[1] As I will explain further below, the Clear River Energy Center is necessary to meet demand in the ISO-NE market.

Q. PLEASE PROVIDE A SUMMARY OF YOUR ASSESSMENT OF CLEAR RIVER ENERGY CENTER'S IMPACT ON RATEPAYERS.

A. From 2019-2022, and based upon the most recent information to account for the results of the Forward Capacity Auction ("FCA") 10 auction, the presence of Clear River Energy Center is projected to save Rhode Island ratepayers approximately $210 million.

Q. PLEASE PROVIDE A SUMMARY OF YOUR ASSESSMENT OF CLEAR RIVER'S IMPACT ON EMISSIONS.

A. My analysis indicates that the addition of Clear River Energy Center will lead to an annual average reduction of 1,037,000 short tons for CO_2, 2,399 short tons for NOx and 2,984 short tons for SO_2 in the New England and New York region over the 2019-2022 timeframe. This equates to annual emission reductions of 1.01% for CO_2, 3.12% for NOx and 3.35% for SO_2. With regard to reductions in greenhouse gases, these reductions will support the goals of the state and regional efforts to mitigate climate change, including the Regional Greenhouse Gas Initiative ("RGGI") and the more recent Resilient Rhode Island Act. These goals also support the U.S. Environmental Protection Agency's ("EPA") Clean Power Plan ("CPP") efforts, and by supporting the increased development of renewable energy resources these goals also support the

[1] *In RE: Indeck-North Smithfield L.L.C.* Need Assessment To Construct A Gas Fired Power Generation Facility, Docket No. 3094 (9/6/2000) at pp 6-8.

State's Energy Policy ("Energy 2035"). I understand these issues will be taken up by the Office of Energy Resources and Statewide Planning, in the context of their specific requests for Advisory Opinions to the EFSB.

Q. PLEASE PROVIDE A SUMMARY OF YOUR BROADER ASSESSMENT OF CLEAR RIVER'S ECONOMIC IMPACTS.

A. The addition of Clear River Energy Center will have several positive impacts to the Rhode Island economy.

Rhode Island jobs. From 2017-2021, which includes the most intense two years of construction and the first years of operation, Clear River will support the creation of just under 800 full-time jobs per year. The construction and operation of Clear River alone – i.e., not including the electricity cost savings to the customer – will create an average of more than 660 full-time jobs per year from 2017-2019 and 145 full-time jobs per year from 2020 to 2034 in Rhode Island.

Rhode Island earnings. From 2017-2021, Clear River will support the creation of approximately $360 million in earnings to Rhode Island workers, or more than $70 million per year. Earnings to Rhode Island employees as a result of Clear River Energy Center will total more than $550 million from 2016-2034.[2]

Rhode Island economic output. From 2017-2021, the total economic impact on Rhode Island is projected to be $700 million, or approximately $140 million per year. The overall impact of Clear River Energy Center on the Rhode Island economy will total more than $1.2 billion from 2016-2034, or an average of $65 million annually.

1.2 ASSESSMENT OF THE NEED FOR CLEAR RIVER ENERGY CENTER

[2] The analysis assumes 30 months of construction and a June 2019 commercial online date. As a result, there is one month of construction assumed in 2016 – the small 2016 benefits are excluded from most economic impact considerations, but are included in the analysis period totals (2016-2034).

Q. CAN YOU PLEASE PROVIDE AN OVERVIEW OF THE ISO-NE MARKET?

A. ISO-NE is an independent, non-profit Regional Transmission Organization ("RTO") serving Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont. Among other items, ISO-NE is tasked with system planning, operating the power system, and administering the region's FERC approved wholesale energy, ancillary and capacity markets for members operating within these states.

Members of ISO-NE, such as Rhode Island load-serving entities, rely upon the ISO-NE Forward Capacity Market ("FCM") capacity procurement mechanism developed by ISO-NE stakeholders and approved by FERC, in which ISO-NE seeks to procure sufficient capacity, on a both a system-wide and localized basis, three-years in advance of a Delivery Year[3] ("DY") in order to meet projected peak demand *plus* minimum target reserve margins.

I have prepared a more detailed overview of ISO-NE in the Clear River Energy Center Application in Section 7.1 titled "Standards for Determining Need for the Proposed Facility," pages 115-116.

Q. CAN YOU PLEASE PROVIDE AN OVERVIEW OF THE ISO-NE CAPACITY MARKET?

A. ISO-NE's FCM capacity procurement mechanism is utilized by ISO-NE market participants as a means to ensure that the ISO-NE power system has sufficient resources to reliably meet the future demand for electricity. Under the FCM, FCAs are utilized as a market-based approach to determine both system-wide and localized needs for both existing and new generation capacity through a competitive auction process designed to select the portfolio of existing and new resources needed for system-wide and local reliability with the greatest social

[3] Within ISO-NE, a Delivery Year runs from June 1 through May 31 of the following year.

surplus.[4] In other words, resources that clear an FCA maximize social surplus in order to meet both system-wide and local reliability needs and are by definition needed by ISO-NE.

I have prepared a more detailed overview of ISO-NE's FCM in the Clear River Energy Center Application in Section 7.1.2 titled "7.1.2 ISO-NE FCM Overview and Objectives," pages 115-116.

Q. DID YOU CONDUCT A FORECAST OF THE RESULTS OF FCA 10 PRIOR TO THE AUCTION FOR CLEAR RIVER ENERGY CENTER?

A. Yes.

Q. WHAT WERE THE RESULTS OF YOUR ANALYSIS?

A. Utilizing PA's proprietary FCM Simulation Model, PA forecasted the need for [redacted] MW of incremental capacity in FCA 10 with a system-wide clearing price of [redacted] Of that total, PA projected that approximately [redacted] MW would be combined cycle generation in the form of Clear River Energy Center.

I have prepared a more detailed overview of this analysis in Clear River Energy Center's Application in Section 7 titled "PA's FCM Simulation Methodology and Results," pages 117-118, and in the Memorandum on Capacity Prices included as **Exhibit RH-2**.

Q. WHAT WERE THE ACTUAL RESULTS OF FCA 10?

A. On February 8, 2016, FCA 10 concluded with 1,459 MW of new generation clearing the auction with a system-wide clearing price of $7.03/kW-mo. The new cleared capacity generation was primarily comprised of three facilities:

- 485 MW of Invenergy's Clear River Energy Center;

[4] Social surplus, sometimes called social welfare, is the sum of consumer and supplier surplus, which is maximized when demand equals supply.

- PSEG's 484 MW Bridgeport Harbor 6 combined cycle generation facility proposed to be located in Bridgeport, Connecticut; and
- NRG's 333 MW Canal 3 peaking facility proposed to be located in Sandwich, Massachusetts.

Q. HOW DID THE ACTUAL RESULTS OF FCA 10 COMPARE WITH YOUR ORIGINAL FORECAST?

A. PA's projections were very close to the actual results PA forecasted:

- A clearing price in the auction of [redacted]. The actual clearing price was $7.03/kW-mo. This is less than a [redacted]% difference;
- That approximately [redacted] MW of total generation would clear FCA 10. This compares with the approximately 35,567 MW of total generation that actually cleared the auction. This is less than a [redacted]% difference; and
- That approximately [redacted] MW of new combined cycle generation would clear FCA 10. This compares with 969 MW of new combined cycle generation that actually cleared FCA 10. This is an approximately [redacted]% difference.

Q. HAVE YOU UPDATED YOUR ANALYSIS FOR FCA 11?

A. Yes.

Q. WHAT ARE YOUR FORECASTED RESULTS FOR FCA 11?

A. PA forecasts that an additional [redacted] MW of combined cycle capacity—the incremental capacity at Clear River Energy Center— will clear FCA 11 at a price of [redacted]. My approach is summarized in the Memorandum on Capacity Prices included as **Exhibit RH-2**. The analytical methodology is identical to the one I utilized to project FCA 10 clearing prices.

Q. IS IT YOUR ASSESSMENT THAT CLEAR RIVER ENERGY CENTER IS NEEDED FOR RELIABILITY IN THE ISO-NE MARKET?

A. Yes. Capacity that clears an FCA is by definition needed. Approximately half of Clear River Energy Center's capacity cleared FCA 10, which indicates that this capacity is needed to maintain reliability in ISO-NE. Additionally, based on my analysis for FCA 11, the full capacity of Clear River Energy Center will be needed starting in the 2020/21 delivery year and beyond.

Q. IS IT YOUR ASSESSMENT THAT THE CLEAR RIVER ENERGY CENTER WOULD HELP SUPPORT THE FURTHER DEVELOPMENT OF RENEWABLE ENERGY RESOURCES IN THE ISO-NE REGION, INCLUDING RHODE ISLAND?

A. Yes. Flexible and efficient generation, such as Clear River Energy Center, broadly helps ensure reliability is maintained in a least-cost and efficient manner. However, flexible generation is also critically important in markets with the expansion of variable and intermittent renewable energy, such as wind and solar. For example, wind generation's intermittent and at times unpredictable nature (e.g., wind ramp-down events where wind stops blowing suddenly) requires flexible generation that can ramp up quickly to respond to changes in wind generation in order to maintain reliability. The same is true for other variable non-dispatchable generation such as solar. ISO-NE has recognized this system need. In the ISO's 2016 State of the Grid report, ISO-NE states that "growing levels of variable generation will require a fleet of flexible resources to successfully integrate." As a new highly flexible resource, Clear River Energy Center will help ISO-NE be able to more reliably integrate renewable resources across the New England footprint, including in Rhode Island.

1.3 MODELING APPROACH

Q. CAN YOU PLEASE DESCRIBE PA'S ENERGY MARKET MODELING METHODLOGY?

A. PA has a robust, well-developed, and industry-tested fundamental modeling process, including its proprietary stochastic dispatch optimization, capacity compensation, environmental, renewable, and valuation models along with the use of production cost, transmission, and natural gas models that are operated by PA's subject matter experts and populated with PA proprietary data.

PA utilizes AURORA^{xmp5} for its production cost modeling in order to dispatch generation units to minimize total system cost, and PA analyzes both fixed and future capital costs required to meet electric demand and ensure system reliability. The latter analysis results in a projection of incremental compensation required to maintain reliability, which existing generation should be measured against. PA's proprietary environmental optimization model integrates the natural gas-power-coal sectors, as well as the coal generator capital expenditure versus coal selection and resulting emission price, paradigms. PA also utilizes its proprietary stochastic model to assess specific generator operations and economics relative to the electric system and under power purchase agreements, as necessary, as well as to assess financial hedges and fuel transportation rights.

I have prepared a more detailed overview in the Memorandum on Clear River included as **Exhibit RH-3** in the section titled "Modeling methodology overview," Pages 1-2.

Q. WHAT ARE THE KEY ASSUMPTIONS THAT PA USED IN ITS MODELING?

A. PA views power markets within the context of six key value drivers (i.e., major assumptions) that are directly integrated into PA's fundamental market modeling process. These

[5] EPIS, Inc.

key drivers include market structure, fuels (e.g., natural gas, coal, and fuel oil), environmental regulations, supply and demand, cost of new entry, and transmission. PA's specific assumptions are available in the Memorandum on Clear River included as **Exhibit RH-3**.

Q. WHAT GEOGRAPHIC AREA DID PA CONSIDER IN ITS UNDERLYING ANALYSIS AND MODELING?

A. PA modeled the entire Eastern Interconnect, focusing in on the ISO-NE and New York ISO ("NYISO") regions.

Q. WHY DID PA SELECT TO REPORT THIS GEOGRAPHIC REGION INSTEAD OF RHODE ISLAND ONLY?

A. Rhode Island is part of the broader ISO-NE market, which is an integrated electric system that centrally dispatches electricity across the New England region (i.e., across ISO-NE). Due to this integrated nature, it would be inappropriate to report the impacts of Clear River Energy Center on just Rhode Island specifically. PA also considered NYISO due to New York being party to the RGGI, and the high degree of interconnectivity (approximately 2 GW of transfer capability) between ISO-NE and NYISO.

Q. DOES REPORTING THESE GEOGRAPHIES AMOUNT TO CHERRY PICKING?

A. Absolutely not. This is the most appropriate way to represent the electricity system and impacts on greenhouse gas emissions. The ISO-NE and NYISO footprints have a high degree of interconnectivity and seams agreements that help to facilitate the participation of a resource in either market's wholesale energy and capacity markets. For example, on December 16, 2015, ISO-NE and NYISO went live on a new interregional market system to streamline energy exchanges between the two ISOs by utilizing Coordinated Transaction Scheduling ("CTS")

which enables the more efficient use of interregional transmission lines and, therefore, better access to the lowest-cost source of power between the two regions. In other words, it is incorrect to look at the operation of ISO-NE as an "island" from an electricity market perspective, and one needs to consider surrounding impacts (including emissions impacts).

1.4 Ratepayer impact

Q. WILL CLEAR RIVER ENERGY CENTER LOWER WHOLESALE POWER COSTS TO RHODE ISLAND RATEPAYERS?

A. Yes, absolutely. From 2019-2022, the presence of Clear River Energy Center is projected to save Rhode Island ratepayers approximately $210 million.

Q. HOW WERE THE $210 MILLION IN SAVINGS TO THE RHODE ISLAND RATEPAYER CALCULATED? HOW DID THE SAVINGS BREAK DOWN BETWEEN CAPACITY AND ENERGY COST SAVINGS?

A. Cost savings to the ratepayer will accrue primarily through wholesale capacity and energy markets. The $210 million represents the difference in total capacity and energy costs to Rhode Island-only load resulting from the Clear River Energy Center capacity addition, as measured by comparing cost results from capacity and energy modeling cases (a) with Clear River Energy Center coming online in two stages: 2019 (485 MW) and 2020 (an additional 485 MW); and (b) without Clear River Energy Center.

With Clear River Energy Center:

- Capacity cost savings to Rhode Island ratepayers were calculated to be $170 million from 2019-2022, or $42 million annually on average.
- Energy cost savings to Rhode Island ratepayers were calculated to be $41 million for 2019-2022, or nearly $10 million annually.

Q. WHY WILL CLEAR RIVER ENERGY CENTER RESULT IN CAPACITY MARKET SAVINGS TO THE RHODE ISLAND RATEPAYER?

A. As stated, ISO-NE's FCM capacity procurement mechanism is utilized by ISO-NE market participants as a means to ensure that the ISO-NE power system has sufficient resources to reliably meet the future demand for electricity. Resources that clear an FCA are the resources that maximize social surplus in order to meet both system-wide and local reliability needs. Stated simply, as supply gets tighter (i.e., reserve margins decline), capacity prices will increase, all else being equal. When new generation capacity enters the market it increases the reserve margin, which, all else equal, results in lower capacity prices, thereby saving ratepayers money. Additional information regarding these FCM dynamics is included in **Exhibit RH-2**.

Q. WHY WILL CLEAR RIVER ENERGY CENTER RESULT IN ENERGY MARKET SAVINGS TO THE RHODE ISLAND RATEPAYER?

A. Clear River Energy Center will be a very efficient combined cycle facility. It will generate low-cost energy that will displace higher cost generation, including output from coal-, oil-, and less efficient natural gas-fired facilities (a list that would include almost all existing natural gas-fired generation in New England). Stated simply, Clear River Energy Center will reduce system energy costs and save ratepayers money, and we know from my analysis that the energy cost savings to Rhode Island ratepayers will be significant.

Q. HOW WERE THE SAVINGS IN RHODE ISLAND CAPACITY MARKET COSTS CALCULATED?

A. 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. PA calculated Rhode Island's share of the system-wide peak demand by multiplying Rhode Island's annual

peak demand, in megawatts, by 1 + the actual realized reserve margin, to account for the excess capacity that ISO-NE procures in the 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 Energy Center" and "Without Clear River Energy Center" 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 Energy Center.

Q. HOW WERE THE SAVINGS IN RHODE ISLAND ENERGY MARKET COSTS CALCULATED?

A. 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 AURORA^{xmp} software and PA's underlying market assumptions) for the "With Clear River Energy Center" and "Without Clear River Energy Center" modeling cases.

Q. DID THE ANALYSIS CONDUCTED BY PA CONSIDER ALL RELEVANT COMPLIANCE COSTS ASSOCIATED WITH EMISSIONS PROGRAMS INCLUDING RGGI, CLIMATE CHANGE (RESILIENT RHODE ISLAND ACT) AND OTHER EMISSIONS PROGRAMS?

A. Yes, PA's analysis included all compliance costs associated with existing emissions programs, for both Clear River and all other generating facilities located within the geographic footprint analyzed by PA. For example, PA's analysis includes compliance costs for the RGGI

program, and compliance costs associated with the EPA's Cross State Air Pollution Rule ("CSAPR") for SO_2 and NOx emissions.[6] Given that there are no explicit compliance programs related to the Resilient Rhode Island Act that have been proposed and/or promulgated, PA has not included any specific compliance costs associated with this law.

1.5 Environmental Impacts

Q. DID YOU CALCULATE THE EMISSIONS IMPACTS OF CLEAR RIVER ENERGY CENTER?

A. Yes.

Q. WHAT METHODOLOGY DID YOU USE?

A. I used the same methodology previously described to calculate energy prices.

Q. BASED ON THIS APPROACH, DO YOU FORECAST A DECLINE IN EMISSIONS FOR THE NEW ENGLAND AND NEW YORK FOOTPRINT?

A. Yes. Annual average emissions reductions from 2019-2022, due to the addition of Clear River Energy Center, are projected to be on average 1,037,000 short tons for CO_2, 2,399 short tons for NOx and 2,984 short tons for SO_2. This equates to annual emission reductions of 1.01% for CO_2, 3.12% for NOx and 3.35% for SO_2 for this region.

Q. EXCLUDING NEW YORK, DO YOU FORECAST A DECLINE IN EMISSIONS FOR JUST THE ISO-NE REGION?

A. Yes. Annual emissions reductions from 2019-2022, due to the addition of Clear River Energy Center, are projected to be 135,000 short tons for CO_2, 1,441 short tons for NOx and 2,208 short tons for SO_2. This equates to annual emission reductions of 0.25% for CO_2, 4.84% for NOx and 5.40% for SO_2.

[6] Note that the CSAPR program does not directly impact the ISO-NE footprint (or generators located therein) due to the fact that the rule's coverage area does not extend north of New York.

Q. DO YOU FORECAST A DECLINE IN EMISSIONS FOR THE ENTIRETY OF THE REGIONAL GREENHOUSE GAS INITIATIVE FOOTPRINT?

A. Yes. Annual emissions reductions from 2019-2022, due to the addition of Clear River Energy Center, are projected to be 1,014,000 short tons for CO_2, 2,359 short tons for NOx and 2,936 short tons for SO_2. This equates to annual emission reductions of 0.84% for CO_2, 2.64% for NOx and 2.83% for SO_2.

Q. HOW DOES THE ADDITION OF A HIGHLY EFFICIENT NATURAL GAS COMBINED CYCLE FACILITY LOWER ENVIRONMENTAL EMISSIONS?

A. The net system-wide decrease is largely driven by highly efficient natural gas-fired combined cycle generators, such as Clear River Energy Center, requiring less fuel per unit of energy generated than less efficient competing generators. This results in both emissions and economic advantages relative to existing generators. As such, Clear River Energy Center will displace less efficient (and less environmentally-friendly) resources that are currently dispatched on the power system.

Q. WHAT IS RGGI?

A. RGGI is the first market-based regulatory program in the United States explicitly directed at reducing greenhouse gas emissions from the power sector. It is a cooperative cap-and-trade program among Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island and Vermont. RGGI recognizes that greenhouse gas emissions are a global issue, and not a localized emissions issue.

Q. IS RHODE ISLAND PARTY TO RGGI?

A. Yes. Rhode Island was a leader by participating in the initial negotiations that informed the original memorandum of understanding that formed RGGI in 2005, and officially signed on

to RGGI with the General Assembly's passage and Governor's signature of The Implementation of the Regional Greenhouse Gas Initiative Act of 2007.

Q. DOES THE IMPLEMENTATION OF RHODE ISLAND'S REGIONAL GREENHOUSE GAS INITIATIVE ACT REQUIRE RHODE ISLAND'S PARTICIPATION IN RGGI?

A. Yes.

Q. WHAT IS THE LEGISLATIVE INTENT OF THE IMPLEMENTATION OF THE REGIONAL GREENHOUSE GAS INITIATIVE ACT?

A. According to the Legislative Findings under § 23-82-2 of the Act, "Rhode Island's implementation of the Regional Greenhouse Gas Initiative, (hereinafter referred to as "RGGI"), should be managed to maximize the state's contribution to lowering carbon emissions while minimizing impacts on electric system reliability and costs to Rhode Island power consumers over the long term." Additionally, the legislative findings include that "it is the intent of the General Assembly in enacting this chapter that the state of Rhode Island shall fulfill the mutual understandings and commitments of the regional greenhouse gas initiative so that the state may fully participate in that initiative and all sales or auctions and other proceedings as may be established under that initiative."

Q. DOES THE ADDITION OF CLEAR RIVER ENERGY CENTER HELP RHODE ISLAND LOWER REGIONAL CARBON EMISSIONS WHILE MINIMIZING IMPACTS ON ELECTRIC SYSTEM RELIABILITY?

A. Yes. As I demonstrated above, the addition of Clear River Energy Center is necessary for system reliability, and will also help lower regional carbon emissions.

Q. WILL THE ADDITION OF CLEAR RIVER ENERGY CENTER NEGATIVELY IMPACT THE ABILITY OF RHODE ISLAND OR NEW ENGLAND TO MEET BINDING CO2 EMISSION REDUCTION TARGETS?

A. No. As a participant in the RGGI, all thermal generators greater than 25 MW located within Rhode Island are subject to RGGI program CO_2 emissions caps. As such, the addition of Clear River Energy Center will not impact the overall emissions reduction goals of RGGI given its emissions are also accounted for under the RGGI cap. Moreover, given the likelihood that the addition of Clear River Energy Center will actually lead to an overall decrease in regional CO_2 emissions given the high efficiency of the unit (see previous section), it may lead to an overall less costly compliance trajectory for the region under the RGGI program. In other words, the addition of Clear River Energy Center could help save Rhode Island ratepayers costs associated with the state's participation in the RGGI program.

In addition, as a new unit, Clear River Energy Center may not be subject to the EPA's recently finalized CPP, which addresses CO_2 emissions from existing thermal resources. However, the final version of the CPP does allow states to address leakage of CO_2 emissions under the rule through inclusion of new sources via a concept called new source complements. If a state chooses to include new resources in a State Implementation Plan ("SIP") for the CPP, the state emissions budget is credited with additional allowances to cover incremental future demand growth that would be presumably served by new sources. The EPA's calculations to derive the emissions associated with incremental demand growth served by new sources assume a CO_2 emissions rate from these sources of 1,030 lbs/MWh. This is notably much higher than the expected emissions rate of Clear River which would be around 760 lbs/MWh. The result is that

even if Clear River is included in the yet-to-be-developed SIP for Rhode Island, it potentially produces fewer emissions than would be added to the state budget from its inclusion in the rules. It is my opinion that the likely pathway for CPP compliance in the New England states, including Rhode Island, is a regional approach through the continuation of the RGGI program which currently includes new resources under its emissions caps. It is likely that this program will continue to include new resources as a compliance approach, and the inclusion of a low-CO_2-emitting and highly efficient resource such as Clear River would actually help the region to meet CO_2 caps under the CPP and drive down compliance costs for ratepayers in New England, including those in Rhode Island.[7]

Q. DOES THE CONSTRUCTION AND OPERATION OF CLEAR RIVER ENERGY CENTER RUN COUNTER TO OBJECTIVES LAID OUT IN THE RESILIENT RHODE ISLAND ACT?

A. Absolutely not. The Resilient Rhode Island Act was enacted to help reduce overall *global* emissions regarding the *global* issue of climate change. In particular, as described by Conservation Law Foundation's witness J. Timmons Roberts' pre-filed testimony before the EFSB on Page 10 Line 18, the carbon-emission-reduction goals in the Resilient Rhode Island Act are based on an overarching goal to see the "reduction of *worldwide* carbon emissions by 80% below 1990 levels by 2050 [emphasis added]." This is the target set by the Resilient Rhode Island Act at R.I. Gen. Laws § 42-6-2.2.

Moreover, the Resilient Rhode Island Act states that among the goals of the Rhode Island Executive Climate Change Coordinating Council is to "work with other New England states to explore areas of mutual interest to achieve common goals" (R.I. Gen. Laws § 42-6-2.2(a)(8)).

[7] Current regulations contemplate a final version or draft of the SIP to be submitted no later than September 2016.

The common goal here is regional CO_2 reduction, in support of the overarching goal of *worldwide* carbon emissions reductions, and Clear River Energy Center advances that objective as noted in my prior responses with regard to the RGGI program.

While the Rhode Island Executive Climate Change Coordinating Council has not issued its strategic planning document, a planning document issued by the Massachusetts Secretary of the Executive Office of Energy and Environmental Affairs in compliance with a similar law, the Massachusetts Global Warming Solutions Act, concluded that new natural gas generation can comport with targeted reductions to "act as a bridge to a clean energy future" (Climate Change Plan at 39). Professor Roberts identifies the Massachusetts Global Warming Solutions Act as a similar law to the Resilient Rhode Island Act, and, within the context of this law, the Massachusetts EFSB determined that a natural gas-fired combined cycle development project similar to Clear River Energy Center (the Footprint Power Salem Harbor Station) is consistent with the Massachusetts Global Warming Solutions Act. The Massachusetts EFSB concluded that "*New England* fossil fuel units displaced by Footprint in the foreseeable future would yield GHG [(greenhouse gas)] and criteria pollutant emission reductions on a net basis under any plausible modeling scenario [emphasis added]."[8] This recognition by the Massachusetts EFSB of the regional nature of carbon emissions efforts as compatible with the Commonwealth's Global Warming Solutions Act to help meet global greenhouse emission goals further supports my opinion that the Clear River Energy Center's regional benefits in carbon reductions, by displacing more polluting generation resources, is in complete support of the goals and targets set by the Resilient Rhode Island Act.

[8] *In RE: Footprint Power Salem Harbor Development LP For Approval to Construct a Bulk Generating Facility in the City of Salem, Massachusetts*, EFSB 12-2 (Final Decision 10/10/2013) at pp 27-32 (emphasis added).

Moreover, with the most recent natural gas generation project approved (in 2013) by the Connecticut Siting Board (the Towantic project), the Connecticut EFSB did not even consider the project for compliance with the Conn. Global Warming Act, which Professor Roberts also identifies as a similar law to the Resilient Rhode Island Act.

In any event, Professor Roberts explained (at page 21) that "he performed no analysis on the overall effect on carbon emissions for that seven state area . . ." I did that regional analysis, as I describe above, and this regional approach is consistent with the regional goals that are set forth in RGGI and the Resilient Rhode Island Act, and are compatible with the regional nature of the electric generation market managed by the ISO-NE.

Even if one was to take the view that the legislative intent of the Resilient Rhode Island Act is to directly reduce CO_2 emissions within the state, a significant component of CO_2 emissions triggered by Rhode Island ratepayers would be missed by stopping an analysis at the State's border given Rhode Island's electricity load is served by power imported from other portions of ISO-NE (much of which is carbon emitting fossil power). Within a CO_2 accounting context, such a point of view would result in emissions "leakage" – in other words, not properly accounting for the impacts of emissions "outside" of a specified region even though emissions in that area "outside" of the specified region are impacted by activities "inside" the specified region. This is not a unique issue. For example, within California's state CO_2 cap-and-trade program (AB 32), electricity that is imported into the state is "taxed" based on the CO_2 intensity of the imported generation – given the high degree to which the state relies on power imports to meet in-state electricity needs.

Finally, if one were to take such a "Rhode Island-only" point of view to its logical (and extremely hypothetical) conclusion, analyzing Rhode Island as an electrical and emissions island

thereby necessitates a worldview that Rhode Island, in the future, will generate all of its energy needs within the state. While I have not performed an analysis to better understand such a hypothetical scenario, in this worldview, Rhode Island's CO_2 emissions and ratepayer costs would almost certainly go up given the need for more baseload and quick-start generation to be constructed in the state (even if a portion of those in-state needs were eventually met with renewable generation given the need to balance the intermittency of this generation).

1.6 Economic Impact

Q. DID YOU ANALYZE THE ECONOMIC IMPACT OF CLEAR RIVER ENERGY CENTER?

A. Yes, PA was retained to evaluate the economic development impacts resulting from the construction and ongoing operation of the Clear River Energy Center.

Q. IN COMPLETING THIS ECONOMIC ANALYSIS, DID YOU COLLABORATE WITH ANY RHODE ISLAND EXPERTS ON THE TOPIC? IF SO, WHO?

A. Yes, PA collaborated with Professor Edinaldo Tebaldi. Dr. Tebaldi is an associate professor of economics at Bryant University. He also serves as the Rhode Island forecast manager for the New England Economic Partnership ("NEEP"). He is an applied econometrician with research interests in economic growth, development and labor market outcomes. Dr. Tebaldi has published several articles in refereed journals and co-authored a number of economic impact assessment studies and reports analyzing economic conditions across New England States.

Q. PLEASE DESCRIBE THE METHODOLOGY EMPLOYED TO ESTIMATE THE ECONOMIC IMPACTS?

A. To estimate the magnitude of the resulting economic impacts, the study uses input-output ("I-O") analysis. I-O analysis accounts for inter-industry relationships within a city, state or expanded area, and employs the resulting economic activity multipliers to estimate how the local economy will be affected by a given investment (in this case, the construction and ongoing operation of the Clear River Energy Center facility).

Multiplier analysis is based on the notion of feedback through I-O linkages among firms and households who interact in regional markets. Firms buy and sell goods and services to other firms and pay wages to households. In turn, households buy goods from firms within the economic region. Thus, the economic impact of Clear River Energy Center spreads to other local businesses through direct purchases from them as well as from purchases of locally produced goods and services that are made using the income derived by the employment that has been created. Further impacts occur because of feedback effects – where other local firms require more labor and inputs to meet rising demand for their output, which has been stimulated by Clear River Energy Center's construction and operation.

The economic impact of Clear River Energy Center's construction and operation can be categorized as follows:

- Direct Effects – Jobs, income, output and fiscal benefits that are created directly by the construction and ongoing operations of Clear River Energy Center. The jobs (and other benefits) that are created may be short-term, as in the case of construction jobs, or long-term, such as the operations and maintenance positions that exist throughout the life of the generation facility.
- Indirect Effects – Jobs, income, output and fiscal benefits that are created throughout the supply chain and that are spawned by the direct investment to build and operate the

facility. Indirect jobs include the jobs created to provide the materials, goods, and services required by the construction and operation of Clear River Energy Center, as well as the jobs created to provide the goods and services paid for with the wages from the direct jobs.

- Induced Effects – Jobs, earnings, output and fiscal benefits created by household spending of income earned either directly from Clear River Energy Center or indirectly from businesses that are impacted by Clear River Energy Center.

Q. WAS THE ANALYSIS COMPLETED USING ANY MODELS OR SOFTWARE DESIGNED FOR THIS TYPE OF ECONOMIC ANALYSIS?

A. Yes, the job creation, earnings and overall economic impact of Clear River Energy Center on Rhode Island were analyzed using project cost specifics and two I-O models: IMPLAN[9] and the National Renewable Energy Lab's Jobs and Economic Development Impact model ("JEDI").

IMPLAN is an economic analysis tool that takes data from multiple government sources and employs an estimation method based on industry accounts or I-O Matrix that allows, using multipliers, to make estimations of how changes in income and spending impact the local economy. IMPLAN estimates are generated by interacting the direct economic impact of Clear River Energy Center with the Regional Input-Output Modeling System (RIMS II) multipliers for Rhode Island. The United States Bureau of Economic Analysis ("BEA") provides these multipliers.

The JEDI model estimates the economic impact of constructing and operating power generation plants at the state level. The JEDI model also uses an I-O methodology and relies on economic

[9] IMPLAN Group LLC, IMPLAN System (data and software),16905 Northcross Dr., Suite 120, Huntersville, NC 28078 www.IMPLAN.com.

multipliers derived from IMPLAN. The JEDI model allows estimating of the economic impact of power generation investment in a state including local labor, services, materials, other components, fuel and other inputs. The model also allows adjusting the portion of project investment that occurs locally.

Q. WILL THE PROJECT HAVE A POSITIVE ECONOMIC IMPACT ON THE STATE OF RHODE ISLAND? WHAT IS THE SOURCE OF THESE ECONOMIC IMPACTS?

A. Yes. As is typical of generation facilities like Clear River Energy Center, the project will create a significant number of jobs and income for Rhode Island workers and will have a very positive impact on the Rhode Island economy. These economic development impacts will result from the following three areas:

1. Construction of the facility – Equipment, materials and labor employed during construction as well as state sales tax, permitting fees and other activities.
2. Ongoing operation of the facility – Fixed and variable costs associated with the materials and labor needed to operate the facility as well as annual property taxes.
3. Power market cost savings to Rhode Island ratepayers – The addition of new efficient generation capacity in Rhode Island will result in lower capacity and power prices, thereby driving significant savings to Rhode Island ratepayers. In addition to direct cost savings, PA has evaluated the induced economic effects on the Rhode Island economy associated with these electricity customer cost savings.

Q. WHAT WAS THE SOURCE OF THE LABOR AND COST INPUTS?

A. Cost and labor inputs related to the construction and ongoing operation of the facility were provided by Invenergy. Wholesale power markets savings – the reinjection of ratepayer

savings into the economy resulting in induced impacts to the Rhode Island economy – were calculated using PA's projected energy and capacity market prices.

Q. WHAT ARE THE ESTIMATED ECONOMIC IMPACTS OF THE CONSTRUCTION AND OPERATION OF THE CLEAR RIVER ENERGY CENTER ON THE STATE OF RHODE ISLAND?

A. The construction and ongoing operation of Clear River Energy Center will create hundreds of jobs and drive well over $1 billion in economic development in Rhode Island. The direct economic impacts themselves will be significant, realized in the form of jobs, income, output and benefits created directly by the construction and ongoing operations of Clear River Energy Center. In addition, Clear River Energy Center will generate significant economic activity in Rhode Island through I-O linkages among firms and households who are affected by its construction and operations.

The construction of Clear River Energy Center is expected to generate 388 jobs in 2017 and 492 jobs in 2018. Ongoing facility operations will create an additional 25 onsite (direct) jobs and approximately $2 million in earnings annually from 2020 through 2034. Note that these figures do not include the jobs and earnings associated with the contractors and service professionals that will be involved in the regular operation and maintenance of the facility.

The total impact of Clear River Energy Center on the Rhode Island economy, including all direct, indirect and induced economic activity, will be considerably larger. In summary, the job creation, earnings and overall economic impact of the project on the state of Rhode Island are projected as follows:

- Rhode Island jobs – From 2017-2021, which includes the most intense two years of construction and the first years of operation, Clear River Energy Center will support the

creation of just under 800 full-time jobs per year. The construction and operation of Clear River Energy Center alone – i.e., not including the electricity cost savings to the customer – will create an average of more than 660 full-time jobs per year from 2017-2019 and 145 full-time jobs per year from 2020 to 2034 in Rhode Island.

- Rhode Island earnings – From 2017-2021, Clear River Energy Center will support the creation of approximately $360 million in earnings to Rhode Island workers, or more than $70 million per year. Earnings to Rhode Island employees as a result of Clear River Energy Center will total more than $550 million from 2016-2034.[10]
- Rhode Island economic output – From 2017-2021, the total economic impact on Rhode Island is projected to be $700 million, or approximately $140 million per year. The overall impact of Clear River Energy Center on the Rhode Island economy will total more than $1.2 billion from 2016-2034, or an average of $65 million annually.

It is important to note that the most significant economic impacts will be realized in the early years of the project: the construction of Clear River Energy Center will bring significant investment and construction activity to Rhode Island from 2016 to 2019.

Q. HAVE THE DESIGN SPECIFICATIONS AND CONSTRUCTION SCHEDULE ASSUMED CHANGED SINCE THE ECONOMIC ANALYSIS WAS COMPLETED?

A. Yes. The facility as currently planned is substantially very similar to the facility envisioned at the time of the economic analysis, but there have been changes to the planned capacity and the construction schedule, and subsequently to the total projected savings to Rhode Island ratepayers that warrant noting.

[10] The analysis assumes 30 months of construction and a June 2019 commercial online date. As a result, there is one month of construction assumed in 2016 – the small 2016 benefits are excluded from most economic impact considerations, but are included in the analysis period totals (2016-2034).

- Planned capacity – The economic impact analysis was completed assuming a 1,000 MW combined cycle facility, while the facility is now expected to be approximately 970 MW.
- Construction schedule – The economic impact analysis was completed assuming that the plant would be constructed in a single 30-month timeframe and commence commercial operation in June 2019. However, the plant is now expected to be built in two stages – 485 MW, in a 1x1x1 configuration, is projected to come online in June 2019, and an additional 485 MW will come online in June 2020, when the plant is expanded to a 2x2x2 configuration.
- Savings to ratepayer – The current economic impact analysis assumes that Clear River Energy Center results in $284 million in savings to the Rhode Island ratepayer from 2019-2022, which represents approximately $280 million in induced economic impacts for the state. Under the latest plant configuration, 2019-2022 savings are projected to be only $210 million.

Q. HOW WOULD YOU EXPECT THE RESULTS TO BE IMPACTED, IF AT ALL?

A. We have not updated the economic impact analysis to account for these assumption adjustments. The impact of these changes on the projected economic impact of the facility would be determined by the collective impact of the three changes on the cost and level of employment required to construct and operate the facility. Equipment and materials costs would be expected to be slightly lower as a result of the reduced capacity, as would induce economic effects as a result of the lower ratepayer cost savings projections, but the cost of construction would be expected to increase somewhat with the plant being built and brought online in phases. Collective economic impacts would likely decline slightly, but we would still expect the impact

of Clear River Energy Center on total economic output in Rhode Island to be well over $1.0 billion from 2016-2034.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.

EXHIBIT
RH-1

Ryan Hardy

Member of PA's Management Group

Ryan has over 15 years of experience in energy market advisory services to support strategic planning, generation asset financings, power company restructurings and reorganizations, and power and fuel contract litigation and negotiation support. Ryan has managed the valuation process for numerous asset transactions, including thermal (natural gas, coal), renewable (wind, solar, landfill gas, and biomass) capacity and utility scale battery storage. He has been a strategic advisor to both private equity and utility clients on acquisition strategies, and he is an expert on power market structures including capacity market constructs and their impact on asset values.

Primary expertise

- Power market advisory services
- Asset valuation
- Financial restructuring and due diligence
- Litigation support

Related experience

- Battery storage valuation
- Landfill gas valuation
- Formalized capacity market analysis

Qualifications

- MBA with concentration in finance
- Member of American Society of Appraisers
- Certified Appraiser, Machinery and Technical Specialty

Primary expertise

Power Market Advisory Services – Ryan possesses extensive experience in wholesale energy markets as it relates to market price forecasting, portfolio valuation, due diligence, and contract analysis

Asset Valuation – Ryan has amassed extensive valuation experience with thermal and renewable asset types including coal, natural gas, hydro, geothermal, wind, solar, biomass, landfill gas, and battery storage

Financial Restructuring and Due Diligence – Ryan has led fundamental analysis and forecasting efforts for two of the largest restructuring efforts in the energy industry including valuation, budgeting, and power and fuel contract renegotiations

Litigation Support – Ryan has supported power and fuel contract dispute resolution through providing analysis and strategic guidance to regulatory bodies supporting stakeholders with capacity market development

Key client achievements

Served as project manager and trusted advisor to $3 B hedge fund providing quarterly power market updates and serving as the analytic arm to this active participant in power market investments. Provided numerous case studies examining complex scenarios around transmission development, demand growth, renewable investment, and environmental legislation.

Retained by a major Southeast utility to provide market insights and articulate the investment climate of power markets outside of its native service territory as part of a corporate initiative to explore strategic asset acquisition opportunities. Analyzed seven power markets including an analysis of major market players, typical contract structures, market operations, and environmental regulations. In addition, PA evaluated the potential acquisition of a major wind developer and our presentation provided supporting materials for the company's board of directors to approve the acquisition of a 100 MW biomass power generating facility.

Served as the strategic advisor to a major Independent Power Producer seeking to develop over $2 B in new power generation projects in New Jersey, Maryland, New York, and California, among others. I have worked closely with members of management to provide analysis and strategic support for both equity and debt-raising efforts, and I have presented market and asset analysis to potential investors, investment banks, and rating agencies resulting in the successful development of natural gas-fired combined cycle projects.

Retained to provide negotiation support for long-term power contracts, asset analytics and strategic support for

power plant acquisitions and financings. Key strategic support included detailed analysis of potential contract counterparties and in-depth analysis of cogeneration power facilities including optimization analysis around the provision of power (energy and capacity), steam, and ancillary services.

Retained as a strategic advisor by the management group of this IPP to help develop its growth strategy. In particular, I developed a process to evaluate diversification options to the IPP's current power generating portfolio, as a means to reduce overall portfolio risk. As part of this process, I conducted an independent review of the IPP's current power generating portfolio, performed an in-depth analysis of all U.S. power markets, identified areas for strategic growth, and ultimately highlighted specific generation technologies, markets, and specific assets that would complement the client's current portfolio, and presented multiple executive-level presentations for the client to formulate its growth platform.

Served as project manager for PA's engagement with a start-up firm to provide independent market analysis and insight in support of the client's development of utility scale battery storage technology. PA provided a detailed description of U.S. power markets and analyzed the potential for the technology to earn energy, capacity, and ancillary services margins as both a standalone project and in conjunction with wind generation. PA utilized a proprietary storage dispatch model to evaluate the technology and forecast returns and net present value under various market scenarios. PA worked with the client to develop a presentation for use in discussions with potential partners such as utilities and wind developers.

Additional experience

From 2009-2010, Mr. Hardy assisted with the development of a coalition to develop a green bank at the federal level to fund renewables, transmission and distribution. The Coalition was formed in order to advocate and support an entity funded by the government that would provide financing opportunities for clean energy technologies. Ryan's work with the Coalition involved driving initiatives such as analysis and presentations used in discussions with members of Congress and other stakeholders, hosting and speaking at stakeholder conferences and meeting with Congressmen about the Green Bank and its goals. Through its work, the Coalition facilitated the inclusion of the Clean Energy Deployment Administration (CEDA)/Green Bank in the Waxman Markey bill that passed in the House of Representatives, which encompasses many of the goals of the Coalition.

In 2008, Ryan supported a private equity firm in performing a valuation on a portfolio of landfill gas generating assets in the state of New York. PA's valuation of the portfolio was conducted in support of a potential acquisition and included analysis related to energy, capacity, and renewable energy credit (REC) markets. PA also conducted an analysis of the contracts in the landfill gas portfolio, which included landfill gas procurement, REC contracts, and forward capacity contracts. In addition to providing a forecast of plant cash flows, PA submitted a market expert report to the client outlining the Northeast power markets and the portfolio's ability to sell into both the New York and New England markets. The explanation of risk factors and projected cash flows for the portfolio allowed the client to determine a suitable price under which they would complete the transaction.

In 2007, Ryan managed the auction process for the sale of the client's 50 MW peaking facility in ERCOT. Drafted information memorandum and acted as lead arranger in the two-stage auction resulting in the successful sale of the power plant.

Over several years, Ryan led the fundamental valuation effort for Calpine's U.S. generating portfolio consisting of natural gas combined cycles, combustion turbines, cogen facilities, and geothermal plants. Conducted claims analysis for power and steam contracts for various facilities, and contributed to the company's plan for reorganization.

Performed litigation analysis involving the alleged violation of EPA regulations. Project work included interpreting results of the IPP's independent production cost modeling and recreating forecasts using PA's applications. Results of this analysis were incorporated into expert testimony. Due diligence was performed on all company documentation and depositions regarding the violations. Additional analysis was done to prepare rebuttal of opposing side's testimony.

EXHIBIT
RH-2

(REDACTED)

EXHIBIT
RH-3

(REDACTED)