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September 12, 2016

Mr. Todd A. Bianco
Coordinator
Energy Facility Siting Board
89 Jefferson Blvd.
Warwick, RI 02888

VIA HAND DELIVERY

Re: Invenergy Thermal Development LLC/Clean River Energy Center Application, EFSB Docket No. SB-2015-06

Dear Mr. Bianco:

Enclosed for filing, in accordance with the Board's Preliminary Decision and Order, dated March 10, 2016, please find an original and ten copies of the Advisory Opinion of the Rhode Island Statewide Planning Program. This Advisory Opinion has also been e-served to all members on the Service List.

The Statewide Planning Program does not intend to offer any witness testimony in this matter. However, it will make the following witnesses available for examination by the Board or cross-examination by other parties:

1. Jared L. Rhodes, II, (Sponsor and witness)
2. Erik Godwin, (Witness for Economic Impact analysis)
3. Ellen G. Cool (Witness for Energy analysis)

I am including current curricula vitae for all three witnesses. Thank you for your attention to this matter.

Sincerely,

Jennifer S. Sternick

Encl.

Advisory Opinion

on the

Socio-economic Impact and State Guide Plan Consistency

of the proposed

Clear River Energy Center

Prepared for the:

ENERGY FACILITY SITING BOARD

Docket No. SB-2015-06

By the:

Statewide Planning Program

Rhode Island Department of Administration

One Capitol Hill

Providence, RI, 02908

August 3, 2016

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PART ONE: INTRODUCTION

A. ENERGY FACILITY SITING ACT AND STATEWIDE PLANNING PROGRAM RESPONSIBILITIES

The Energy Facility Siting Act (the "Act"), enacted in 1986 (Rhode Island General Laws § 42-98-1 *et seq.*), requires that the Rhode Island Energy Facility Siting Board (the "Board") make certain findings prior to granting a license. One of those findings is that, "[T]he proposed facility...will enhance the socio-economic fabric of the state" (§ 42-98-11(b)(3)). Section 42-98-9(e) of the Act also provides that the Statewide Planning Program (the "Program") at the Department of Administration will, "[C]onduct an investigation and render an advisory opinion as to the socio-economic impact of the proposed facility and its construction and consistency with the state guide plan."

In its Preliminary Decision and Order for "Invenergy Thermal Development LLC Application to Construct and Operate the Clear River Energy Center, Burrillville, Rhode Island," dated March 10, 2016, the Board provided additional instruction regarding this requirement specifically concerning Invenergy Thermal Development LLC's ("Invenergy" or "the Applicant") proposed Clear River Energy Center ("CREC" or "the Project" or the "Facility"). The Board directed the Program as follows:

> The Statewide Planning Program within the Division of Planning shall render an advisory opinion as to (i) the socio-economic impact of the proposed Facility, including its construction and operation; (ii) the Facility's consistency and compliance with the State Guide Plan; and (iii) in coordination with the Rhode Island Office of Energy Resources, a particular examination of the Facility's consistency and compliance with the State Energy Plan.[1]

B. PROJECT SUMMARY

According to Invenergy's application (EFSB Docket No. SB-2015-06), the CREC would be a combined-cycle electric generating facility, run on natural gas, located within the Town of Burrillville. The CREC is proposed to be built adjacent to the existing Spectra Energy Algonquin Compressor Station (SEACS) site, on Wallum Lake Road (State Route 100). A new access road to the CREC is proposed be constructed south of, and parallel to, the existing Algonquin Road.

The natural gas supply for the CREC would be provided by a pipeline from the adjacent SEACS. The power output of the CREC would be approximately 850-1,000 megawatts and the electrical

[1] Energy Facilities Siting Board, Preliminary Decision and Order section VII, Advisory Opinions

power generated would be transmitted through a new, 6-mile long 345-kV transmission line. The new transmission line would run west from the CREC switchyard along a short section of a new right-of-way and an existing National Grid right-of-way that currently carries two existing 345 kV transmission lines to the Sherman Road Substation, also located in Burrillville. The new transmission line would be carried on new towers, set within the National Grid right-of-way, from a point north-west of the Facility to the Sherman Road Switching Station. The towers would be substantially the same as those already existing in the National Grid right-of-way. The Sherman Road Switching Station would be expanded to add a breaker to accommodate the new transmission line connection. Additionally, a 10.8 mile transmission line from the Sherman Road Switching Station to ANP Blackstone, known as Line 3361, will be upgraded to a minimum rating set of 1400/1685/1685 MVA to accommodate the additional generation capacity.

The process water supply for the CREC is proposed to be provided by the Pascoag Utility District ("PUD") through a dedicated pipeline that would be installed from an existing PUD well to the Facility. The proposed well (Well #3A) is contaminated and the water is not potable. An activated carbon treatment system would be installed to produce water of sufficient quality for use in the Facility. Wastewater from the Facility is anticipated to be discharged to the Burrillville Wastewater Treatment Facility. The application states that the CREC would be equipped with state-of-the-art air emissions control and sound abatement systems designed to minimize and avoid impacts to the environment.

C. STATEWIDE PLANNING PROGRAM REVIEW PROCESS

1. Role of Statewide Planning Program Staff

Statewide Planning Program's staff had the primary responsibility for creating a draft of this report and advisory opinion for consideration by the State Planning Council. Socio-economic impacts of the Project and State Guide Plan consistency were addressed. Program staff reviewed the full set of application materials, formulated requests for additional information, and then reviewed the data request responses provided by the Applicant. Additionally, staff monitored pre-filed testimony and Applicant responses to other agencies' data requests as such information was made available through the EFSB's Service Contact list for this Project, and, in conjunction with other state offices, independently analyzed data provided by the Applicant.

2. Coordination with other Agencies

Role of other EFSB Designated Agencies

The Energy Facility Siting Act notes that, "The jurisdiction of each state agency should be defined, and the role of each agency in energy siting should be delineated, *to eliminate overlap and duplication* and to insure that expeditious decisions are made within a time frame to be

determined by law.[2]" Therefore, in determining which topics to address for this advisory opinion, the Program recognized that the EFSB has already requested[3] that many of these factors be evaluated by the state's leading experts within their respective fields. These included:

- Land use consistency with the comprehensive plan, local land use zoning, noise, property value, and soil erosion impacts by the Town of Burrillville;
- Traffic and road impacts by the Rhode Island Department of Transportation;
- Historic cultural and heritage impacts by the Rhode Island Historic Preservation and Heritage Commission;
- Impacts on groundwater, wetlands, fish and wildlife habitats, state conservation priorities and plans, public recreation on state conservation lands and nearby Parks and Management Areas, and the cumulative environmental impacts of the proposed Facility by the Rhode Island Department of Environmental Management;
- Impacts of the proposed facility on anticipated greenhouse gas emissions and state energy policies by the Office of Energy Resources, in collaboration with the Rhode Island Executive Climate Change Coordinating Council and the Department of Environmental Management;
- Energy supply/need, cost, and reliability impacts by the Rhode Island Public Utilities Commission;
- Public health impacts of electromagnetic fields by the Rhode Island Department of Health; and,
- Drinking water impacts by the Pascoag Utility District and the Rhode Island Department of Health.

Given the intent of the Energy Facility Siting Act not to duplicate efforts, and the extensive list of experts that were otherwise being consulted, the Program chose instead to examine factors that were not otherwise being considered by others.

Collaboration with other Agencies

In conducting its review and analysis, the Program collaborated with several State divisions and agencies including the Department of Administration's Office of Management and Budget ("OMB"), the Division of Public Utilities and Carriers ('DPUC), and the Department of Administration's Office of Energy Resources ("OER") for their assistance in certain subject matters as described below.

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[2] RIGL 42-98-1(c)

[3] EFSB Preliminary Decision and Order, and Modification of Preliminary Order SB-2015-06

- Office of Management and Budget: The Program requested technical assistance from OMB in reviewing the economic modelling and projections found in the Application and determining whether the results seemed reasonable in terms of the direct economic impacts from the construction and operation of the Project as well as the Project's indirect/induced economic impacts. Additionally, the Program requested an estimate of the State revenues that could result from the construction and operation of the Project. In response to the Program's request, OMB not only reviewed the modeling provided by the Applicant but also used an additional tool (RIMS II) to assess the multiplier effects of the Project. This analysis is described in more detail and its results are found in Part Two of this Advisory Opinion.
- Division of Public Utilities and Carriers: Order SB-2015-96 requires the Public Utilities Commission, with participation of the Division of Public Utilities and Carriers, OER, and the Division of Planning of the Department of Administration, to render a single advisory opinion on the need for the Project and whether the Project is cost-justified. In working toward this end, the Program participated in the review of pre-filed testimony offered by Seth Parker, Vice President and Principal of Levitan & Associates, Inc., advisory consultant to DPUC and OER. The Program subsequently submitted a letter relaying its support of the pre-filed testimony to the Public Utilities Commission, on July 14, 2016. (See Appendix A).
- Office of Energy Resources: The Program staff reviewed the Project's consistency with, *Energy 2035*: Rhode Island State Energy Plan, in close collaboration with staff of the OER, as required by Order SB-2015-96. Program staff and OER staff met several times to coordinate the process and discuss each office's findings. OER, as the experts on the topic of energy and the main authors and implementers of *Energy 2035*, led the analysis on determining whether the Project is consistent with the State's Energy Plan. The Program staff reviewed the draft consistency determination produced by OER and coordinated with it in finalizing the content. The final consistency determination found in Part Three of this Advisory Opinion reflects this close collaboration between OER and the Program.

3. Information Requests and Responses

In executing the review process, there were instances in which Program staff required clarification of issues discussed in the Application or identified issues that needed to be supplemented with additional information. As such, the Program made several informational requests to the Applicant. Specifically, the Program requested (1) clarifications on the input assumptions that were used in the Applicant's Economic Impact Analysis; (2) clarification on portions of the Application pertaining to employment figures, economic impacts, and cost savings to ratepayers; (3) information about how local tax revenue to the Town of Burrillville would be calculated; and (4) requested clarification regarding the Application's visual impact

analysis. Copies of the requests and responses where applicable and reproducible in this format, can be found in Appendix B.

In addition to the written data requests, Program staff participated in a conference call with the Applicant's consultants in order to help understand and clarify some of the economic benefits material provided in the Application. The Applicant provided information both during the conference call and with a follow-up email on May 31, 2016.

4. State Planning Council Review

The final draft advisory opinion, prepared by Program staff was submitted to the State Planning Council ("Council"), excluding EFSB members Parag Agrawal and Janet Coit, for initial review on July 22, 2016. In order to avoid the potential of *ex parte* communication, the draft opinion was not sent to these two members. In following a procedure used for other types of project reviews, Council members were given ten days to enter any objections to the draft advisory opinion. Having received none, the draft advisory opinion was thereby accepted by the State Planning Council on August 2, 2016 and subsequently forwarded to the EFSB thereby fulfilling the Program's responsibilities. Had any objection been received, the matter would have been docketed for discussion and action at the Council's next regularly scheduled meeting.

D. ORGANIZATION OF THE ADVISORY OPINION

In response to the Board's instruction, Part Two of this Advisory Opinion presents the results of the Program's socio-economic impact assessment of the construction and operation of the CREC; Part Three presents State Guide Plan consistency assessments, including the State Energy Plan; and, Part Four concludes the Advisory Opinion with a summary of findings and recommendations.

PART TWO: SOCIO-ECONOMIC IMPACT ASSESSMENT

The EFSB's Preliminary Decision and Order charges the Program with providing an advisory opinion as to the socio-economic impact of the Project's construction and operation on the state. As discussed in the Introduction, the Energy Facility Siting Act does not specify the topics to be included in a socio-economic impact assessment. The EFSB's order gives some direction by stating the analysis must include, "economic and reliability benefits, including employment and tax benefits to the Town of Burrillville and/or the State." Given these broad parameters, the Program determined other factors that would be appropriate in evaluating socio-economic impacts.

The Program reviewed the requests that the EFSB made to other State agencies and organizations. Adhering to the intent of § 42-98-1(c), the Program chose not to duplicate the efforts of other agencies. After careful consideration, the Statewide Planning Program concluded that its socio-economic impact assessment would include economic impacts from the construction and operation of the Facility on employment, state and local tax revenues, and impacts to the size and composition of the Town's population, vulnerable populations, local support services, and visual impacts. In addition, the Program assessed whether the indirect economic impacts resulting from multiplier effects of the Project would be positive or negative in nature. Also considered are the reliability benefits that could occur if the CREC were constructed and operated.

Many portions of this socio-economic analysis were conducted using quantitative and qualitative data supplied by the Applicant. With regards to economic data provided by the Applicant, the Program and OMB utilized Invenergy's construction and operations cost data, and performed an independent analysis to evaluate the direct and indirect economic effects as measured in jobs, earnings, and total economic output. As detailed below, in some other parts of its analysis the Program referred to independent sources to test the Applicant's assertions. Staff also reviewed pre-filed testimony from all parties and noted where there were differences of opinion on the accuracy of the data and/or projections reported in the Application.

A. ECONOMIC IMPACT ASSESSMENT

In order to evaluate Invenergy's Application regarding the projected economic benefits of the Project, the Statewide Planning Program enlisted the assistance of the Office of Management and Budget (OMB) in the Department of Administration which conducted additional research and economic modeling. In addition to OMB, the Program reviewed the pre-filed testimony of Seth Parker, Vice President and Principal of Levitan & Associates, Inc., who was retained by the Division of Public Utilities and Carriers (DPUC) and the Office of Energy Resources (OER) to provide testimony on i) the Project's need, ii) whether it is cost-justified, and iii) whether it is cost-effective.

1. **Energy Costs Impacts**

The Program finds that the Project will reduce regional wholesale capacity and energy prices and that the Project will lower electricity costs for Rhode Island consumers.

In testimony on behalf of DPUC and OER to the PUC, Mr. Parker offered several opinions on energy cost impacts that the Program accepts as a basis for the above finding. The Program notes that Mr. Parker did not conduct an independent estimate of reduced wholesale capacity and energy prices; rather, he analyzed the estimates prepared for Invenergy and identified the strengths and weaknesses in those calculations. In summary, Mr. Parker found Invenergy's wholesale capacity price reductions to be "exaggerated" but that there would still be positive benefits to Rhode Island customers. Therefore, while the amount of savings may be in dispute, the fact that some amount of savings is anticipated leads the Program to its finding.

In particular, the Program found the following statements compelling:

- In summary, I believe the actual wholesale capacity savings would be less than PA [Consulting Group] estimated, but would still provide a material savings for Rhode Island consumers. Importantly, while the PUC has been presented with a range of potential capacity savings stemming from CREC, it must be recognized that any savings ultimately realized as a result of constructing CREC will accrue to consumers without shifting investment risk onto them.[4]

- [In response to the question, 'Will Rhode Island consumers benefit from reduced wholesale 1 energy costs beyond 2022?] Yes. Unlike the capacity market that will rebalance after a few years, I would expect that CREC will displace higher cost and less efficient generation resources for many years due to its high efficiency relative to other power plants in the ISO-NE system.[5]

- When adjusted to reflect [Invenergy's] exaggerated wholesale capacity price savings…the percentage savings for Rhode Island consumers would be small but meaningful.[6]

2. **Local and Statewide Business Impacts: Jobs, Earnings, and Economic Output**

In conducting this assessment, the Program notes that the economic impacts analysis provided in Invenergy's Application is based on the CREC being constructed to its full proposed capacity in

[4] Pre-filed Testimony of Seth Parker. State of Rhode Island and Providence Plantations Public Utilities Commission in RE: Invenergy Thermal Development LLC Application to Construct and Operate the Clear River Energy Center, Burrillville Rhode Island. Page 36.
[5] Ibid. Page 38
[6] Ibid. Page 39

one stage. However, pre-filed testimony from Ryan Hardy of PA Consulting Group indicates that the plan for the CREC power plant has changed, with half its capacity coming online in June 2019 and the other half coming online in June 2020. Mr. Hardy testified that the economic impact analysis was not updated to reflect this new plan. His testimony indicates that the economic impact of the Project may decrease slightly. The analysis presented in this report uses data from Invenergy's Application to the Energy Facilities Siting Board presented in "Revised Sections 5.1 5.1.1 and 5.1.2 Project Benefits." The Application describes a one-stage project. Invenergy also provided data about Project benefits directly to the Statewide Planning Program in May 2016 which also reflects a one-stage project plan.[7] We also note that the following assessment does not take into consideration the potential savings resulting from lower energy costs as previously discussed.

The Program finds that the Project will have a positive impact on the state's businesses.

Both the construction and operations phases of the CREC involve a significant amount of out-of-state investment in Rhode Island, which economic theory and modeling indicates will lead to a positive effect on businesses through increased spending and employment. While altering some of the assumptions in these models varies the magnitudes of the estimated economic effects, the impacts on employment, earnings, and economic output from the CREC remain uniformly positive.

Direct and Indirect Impacts: Jobs, Earnings, and Output

The Application includes an analysis by PA Consulting Group, which uses input-output modeling to estimate the employment, earnings, and total economic output impact of the Project. Invenergy's consultant used two related economic models to estimate the economic benefits provided by the construction and continued operation of the CREC. The two modeling systems that were used were IMPLAN and the National Renewable Energy Lab's Jobs and Economic Development Impact model (JEDI). IMPLAN relies on RIMS II multipliers provided by the federal government's Bureau of Economic Analysis.

Each of these modeling programs use assumptions for multiple categories of spending, as well as estimated local share percentages and other variables. The outputs from the models estimate both Rhode Island and overall regional effects in three primary categories: employment impact (measured in FTEs per year), earnings impact (measured in millions of dollars per year), and economic output (measured in millions of dollars per year). The models estimate both the direct and indirect/induced impacts. Direct impacts are those directly related to the construction and operation of the Facility. Indirect impacts are those that occur throughout the supply chain as a result of the direct impacts. Induced impacts are caused by changes in household spending.

[7] CITE

In order to evaluate the employment, earnings, and economic output figures from Invenergy's Application, OMB used two methods to analyze the results of Invenergy's analysis. These analyses rely on cost data supplied by Invenergy.[8] Invenergy also provided an estimate of the share of each cost that would be attributable to Rhode Island. This is important because Project costs that are not met by Rhode Island-based firms cannot have multiplicative effects on the Rhode Island economy.

OMB used the RIMS II multipliers, available from the Bureau of Economic Analysis website, to produce estimates of the economic activity generated by this Project.[9] RIMS II is a backward-linkage model, which means it starts with looking at how a project changes the output of goods in a certain industry. It then looks backwards and considers how inputs into that industry have to change in order to generate those outputs. For example, if a shoe company is undertaking a project that will lead to $2 million in new shoe sales, there are inputs needed to generate that change in output. A shoe company might need to build more factory space, purchase more forklifts, or spend more money on electricity. In turn, the purchase of these inputs by the shoe company has a multiplicative effect throughout the economy. For example, in order to supply more forklifts, the forklift company might need to hire more workers or take other steps to increase its own output. The multipliers used in RIMS II are regional. RIMS II will adjust for the fact that, for example, very little forklift manufacturing occurs near the shoe company (leading to a lower multiplier). The RIMS II analysis, described in more detail below, shows positive economic benefits for Rhode Island from the CREC.

OMB also used the cost estimate inputs and other assumptions provided by Invenergy, as well as default values from the JEDI modelling program, to see if the JEDI model generates similar results. The JEDI Natural Gas Model is available to download from the National Renewable Energy Laboratory's website.[10] Adjustments to the assumed costs of the project, as well as the share of each cost category that is spent in-state versus out-of-state, alter the magnitude of the economic impact of the project. OMB altered many of the local share assumptions to test the sensitivity of the results to various input estimates. While a wide-range of economic impacts are estimated during this sensitivity analysis, the impact of the Project on employment, earnings, and economic output remains uniformly positive.

Similar Analyses from Other Energy Facility Projects

The Program staff noted that analyses of other recent energy facility projects across the country find similar positive economic impacts on state and regional economies. In a comparison of energy facility impacts in a wide-range of categories, the Nuclear Regulatory Commission's

[8] Adler Pollock & Sheehan P.C., May 4, 2016
[9] https://www.bea.gov/regional/rims/rimsii/
[10] http://www.nrel.gov/analysis/jedi/download.html

Generic Environmental Impact Statement (GEIS) cites a Utility Data Institute study, and notes that in general, natural gas power facilities have "moderate long-term economic [and] community benefits."

A socio-economic analysis of the Pilgrim Nuclear Power Station in Plymouth, Massachusetts, conducted by researchers at the University of Massachusetts, Amherst in 2015 finds significant positive economic impacts on the local community and regional area. While that generating station is much larger than the proposed Invenergy project, its substantial economic impact on the surrounding communities is informative. The Pilgrim analysis estimates total direct and secondary economic output impacts of Pilgrim Station's operation on the local economy to be $545 million in 2014.[11] The operational workforce totaled 586, and secondary employment effects totaled 589.[12] At no point in the analysis did the University of Massachusetts, Amherst, find any negative economic effects associated with the operation of the Pilgrim Power Plant within the impact categories the Program is evaluating in the review of the CREC.

The Connecticut Center for Economic Analysis at the University of Connecticut conducted a similar study on a proposed 805 MW natural-gas electric generating facility in Oxford, Connecticut. The economic impact analysis used REMI economic modelling software to estimate direct and indirect economic benefits resulting from the Oxford Power Plant. The analysis estimated multiple construction-phase and operations-phase impacts. Total construction-phase impact on Connecticut real GDP was estimated at $272 million between 2015 and 2018, with peak construction-phase employment of 2,351 jobs in 2017.[13] Operations-phase employment impacts is sustained at over 1,763 jobs, and the total impact on Connecticut real GDP between 2015 and 2040 was estimated to be $7.8 billion.[14] At no point in the analysis did the University of Connecticut find any negative economic effects associated with the construction and operation of the proposed Towantic facility within the impact categories the Program is evaluating in the review of the CREC siting.

Construction Phase: Direct and Indirect Impacts

Direct Impacts

Direct construction employment impacts for 2016 through 2019 are provided in Invenergy's supplemental filing submitted to the Board on November 9th, 2015. OMB's analysis of the JEDI model uses Invenergy's cost inputs, and compares the effect of varying the local share

[11] http://scholarworks.umass.edu/cgi/viewcontent.cgi?article=1080&context=larp_ms_projects page 50
[12] http://scholarworks.umass.edu/cgi/viewcontent.cgi?article=1080&context=larp_ms_projects page 55
[13] http://webshare.business.uconn.edu/ccea/studies/CPV-TowanticLLC-EconImpactAnalysis-2015.pdf pages 15 and 18
[14] http://webshare.business.uconn.edu/ccea/studies/CPV-TowanticLLC-EconImpactAnalysis-2015.pdf pages 18 and 19

percentages in three scenarios: a scenario that uses the information provided by Invenergy, an extremely conservative scenario, and the JEDI default scenario. OMB's conservative scenario generates a lower-bound estimate for total construction periods impacts at 464 FTEs. OMB used Invenergy's data to generate an upper-bound estimate of 1,194 FTEs. This range encompasses Invenergy's provided estimate of 1,035 FTEs. Based on this, the Program deems Invenergy's estimate to be reasonable, and consistent with a finding of positive economic impact for the state.

OMB's conservative JEDI scenario generates a lower-bound for direct earnings impact from 2016-2019 of $69.06 million, and an upper-bound estimate of $188.2 million. This range encompasses Invenergy's provided estimate of $185.6 million. Based on this, the Program deems Invenergy's estimate to be reasonable, and consistent with a finding of positive economic impact for the state.

While OMB's analyses generally align with Invenergy's modeling, one specific metric was inconsistent with our assumptions. Comparing the number of FTEs and the amount of direct earnings presented in Invenergy's Application generates an average earnings per FTE. For the construction phase this average is $179,323 per FTE. According to federal Bureau of Labor Statistics' (BLS) data by industry, the annual wage for construction workers in Rhode Island is $57,000.[15] The differential may be due to the highly specialized nature of construction involved with natural gas power plants. It is also unclear if these earnings include benefits or overhead. Regardless, using $57,000 as an input value still yields positive economic effects for the state.

Gross Impact: Direct, Indirect and Induced Impacts

In addition to the JEDI modeling, OMB used the RIMS II multipliers as a second model to test the robustness of Invenergy's data. Though magnitudes vary, OMB's model generates values that are generally consistent with Invenergy's Application. Applying the RIMS II multipliers to the cost and local share data provided by Invenergy generates a total economic output figure for the construction phase that is $96 million lower (26% less) than Invenergy's estimate. The RIMS II analysis generates an estimate of total earnings (which includes the direct salaries paid during construction and the indirect/induced earnings generated in the economy) that is $7 million lower (3% less) than Invenergy's figure. In contrast, OMB's estimates for total employment impacts for the construction phase are actually 50 jobs greater (3% more) than those supplied by Invenergy's Application.

OMB's conservative JEDI scenario generates a lower-bound estimate for total economic output for the construction phase of $154.58 million and an upper-bound estimate of $375.84 million. This range encompasses Invenergy's provided estimate of $371.1 million. Based on this, the

[15] BLS, http://www.bls.gov/data/, Table ENU440005051012

Program deems Invenergy's estimate to be reasonable, and consistent with a finding of positive economic impact for the state.

Operations Phase: Direct and Indirect Impacts

Direct Impacts

Invenergy's application claims that 25 FTEs would be needed to operate the CREC. Planning consulted the federal government's Bureau of Labor Statistics (BLS) employment statistics in the Rhode Island utility industry. Because there are so few firms in Rhode Island classified as "electric power generation," BLS does not always report on these numbers for reasons of confidentiality and data quality. The last year for which data is available for this category is 2009. Dividing total employees by number of firms generates an average of 12 employees per firm.[16] If the industry category is expanded to "utilities" the average increases to 27 employees per firm.[17] These findings indicate that Invenergy's estimate of 25 employees at the CREC plant is reasonable.

Comparing the number of FTEs and the amount of direct earnings presented in Invenergy's Application generates an average earnings per FTE of $68,000 per year for operations (increasing with inflation). According to BLS, the average annual wage for an employee in Rhode Island who works in the utilities sector is $95,000.[18] This BLS data indicates that Invenergy's direct earnings estimates for employees at the CREC are reasonable.

Direct operations phase employment impacts for 2019 through 2034 are provided in Invenergy's supplemental filing submitted to the Board on November 9th, 2015. OMB's analysis of the JEDI model uses Invenergy's cost inputs, and compares the effect of varying the local share percentages in three scenarios: a scenario that uses the information provided by Invenergy, an extremely conservative scenario, and the JEDI default scenario. OMB's conservative scenario generates a lower-bound estimate for annual operations period impacts at 13 FTEs. OMB used Invenergy's data to generate an upper-bound estimate of 25 FTEs. This range encompasses Invenergy's provided estimate of 25 FTEs. Based on this, the Program deems Invenergy's estimate to be reasonable, and consistent with a finding of positive economic impact for the state.

OMB's conservative JEDI scenario generates a lower-bound for annual direct earnings impact of $0.81 million, and an upper-bound estimate of $1.61 million. Invenergy's provided estimate of $1.7 million for the first fully operational year falls close to this range. Based on this, the

[16] BLS, http://www.bls.gov/data/, Table ENU4400010522111 (number of employees), Table ENU4400020522111 (number of establishments)
[17] BLS, http://www.bls.gov/data/, Table ENU4400010522 (number of employees), Table ENU4400020522 (number of establishments)
[18] BLS, http://www.bls.gov/data/, Table ENU4400050522

Program deems Invenergy's estimate to be reasonable, and consistent with a finding of positive economic impact for the state.

Gross Impact: Direct, Indirect and Induced Impacts

As described above, OMB used RIMS II multipliers to estimate the economic impact of the Project. OMB's analysis looked at employment, earnings, and economic output and compared those results to the figures presented in Invenergy's Application. For the operations phase, OMB's analysis generated figures across all three categories that are larger than the estimates in the Application. Employment is 140 FTEs (97%) more, earnings are $3 million (26%) more, and total economic output is $8 million (25%) more. This suggests that the magnitude of the employment, earnings, and economic output benefits described by Invenergy are reasonable, or even low, and consistent with a finding of positive economic impact for the state.

OMB's conservative JEDI scenario generates a lower-bound estimate for annual economic output of $15.26 million and an upper-bound estimate of $41.65 million. This range encompasses Invenergy's provided estimate of $34.8 million for the first fully operational year. Based on this, the Program deems Invenergy's estimate to be reasonable, and consistent with a finding of positive economic impact.

B. REVENUES

1. State Revenue

The Program finds that the construction and operation of the Project will result in positive revenue benefits to the State.

The Office of Management and Budget assisted the Program in determining estimated revenue impacts to the state resulting from the construction and operation of the Project. OMB's analysis included assessment of revenue from personal income taxes, other state taxes, such as business corporation tax, sales and use tax, etc., revenues collected by various State departments and agencies such as licenses, fees, and penalties, and other miscellaneous revenue.

The results of this assessment are shown in Table 1 below.

Table 1: Estimated Total General Revenues to the State of RI from Construction and Operation of the CREC, in millions

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Personal Income Tax	0.2	3.0	3.9	1.5	0.7	0.7	0.7	0.7	0.8	0.8
Other State Taxes	0.3	4.1	5.3	1.9	1.0	1.0	1.0	1.1	1.0	1.0
Departmental Revenue	0.0	0.9	1.1	0.5	0.2	0.2	0.2	0.2	0.2	0.3
Other Miscellaneous Revenue	0.1	1.0	1.3	0.4	0.2	0.2	0.3	0.2	0.3	0.2
TOTAL	0.6	9.0	11.6	4.3	2.1	2.1	2.2	2.2	2.3	2.3

	2026	2027	2028	2029	2030	2031	2032	2033	2034	**TOTAL**
Personal Income Tax	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	1.0	**20.9**
Other State Taxes	1.1	1.1	1.2	1.1	1.1	1.2	1.2	1.3	1.2	**28.2**
Departmental Revenue	0.2	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.3	**6.3**
Other Miscellaneous Revenue	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.3	0.3	**6.6**
TOTAL	2.4	2.4	2.5	2.5	2.6	2.6	2.7	2.8	2.8	**62**

The Program also finds that there are no anticipated costs to the State from the construction and operation of the CREC.

2. Municipal Revenue

The Program finds that construction and operation of the CREC will have a positive impact on the Town of Burrillville's municipal revenue.

As this Advisory Opinion is being written, the Town of Burrillville and Invenergy are still in the process of negotiating a tax treaty for the Project. While not finalized, Burrillville has reported that in principle, the tax treaty would result in a $2.9 million upfront payment and $92 million to $180 million in guaranteed payments over the next 20 years. (See Appendix C).

C. ENERGY RELIABILITY

The Program finds that the Project will enhance reliability resulting in positive benefits to the surrounding region.

According to the testimony of Seth Parker, ISO-NE's reliability criterion is described as the probability "...of disconnecting non-interruptible customers (a loss of load expectation or 'LOLE'), on average, no more than once every ten years."[19] This probability is calculated based on capacity of the regional system to meet demand. Mr. Parker notes that the capacity cleared by ISO-NE (including the CREC) "[is] needed for reliability by definition" and it "provide[s] a positive reliability value and cost savings for New England consumers." Mr. Parker further states, "More capacity resources would benefit consumers by lowering the probability of blackouts and other service interruptions." The socio-economic benefits of a more reliable energy system accrue to both individuals and businesses. A more reliable energy system will lessen interruptions to the region's power supply. At a minimum, electrical power disturbances can result in inconveniences to customers but power supply interruptions can also harm vulnerable populations, cause economic loss to businesses, disrupt quality of life, and lead to more serious consequences such as fatalities. In the long-term, a system that is not reliable may lead to increased cost of service and an inability to respond to emergencies.

D. SOCIAL IMPACT ASSESSMENT

1. Population Change

The Program finds that while precise estimates cannot be determined, the Project is not likely to result in any significant population changes within the Town of Burrillville.

Another aspect of socio-economic impact that was considered in regards to the construction and operation of the CREC was the impact it will have on the local population. As the CREC is a non-residential use, any population growth that would occur as a result of the construction and operation of the Facility would most likely be related to in-migration due to employment. The greatest number of jobs associated with the Project would be temporary jobs related to its construction. It is unlikely that a significant number of these temporary workers would establish permanent residency in Burrillville as a result of their temporary employment. The ongoing operations of the Facility will "create an additional 25 onsite (direct) permanent jobs."[20] It is not possible, however, to determine how many of these jobs could be filled by persons already living in Burrillville or, for non-residents filling positions, how many would chose to relocate to Burrillville. However, even if all permanent staff were to relocate to Burrillville, the resulting percentage of population growth would be negligible. If all 25 workers and their families moved to Burrillville, it would generate approximately 60 new residents (based on an average household

[19] Pre-filed Testimony of Seth Parker. State of Rhode Island and Providence Plantations Public Utilities Commission in RE: Invenergy Thermal Development LLC Application to Construct and Operate the Clear River Energy Center, Burrillville Rhode Island.

[20] *Pre-filed Testimony of Ryan Hardy.* State of Rhode Island and Providence Plantations Public Utilities Commission in RE: Invenergy Thermal Development LLC Application to Construct and Operate the Clear River Energy Center, Burrillville Rhode Island, 27.

size). With a population projected to be 15,713 in 2020,[21] the result would be a 0.004% increase in Burrillville's population.

To estimate potential population decline resulting from the Project, the Program sought to identify a comparable energy facility and to research the population impacts associated with its construction and operation, with the hope that any findings related to the impacts of the comparable facility may be transferable to the CREC analysis. The Ocean State Power facility, being located in Burrillville, was selected for comparison purposes.

The Ocean State Power facility began operation in 1990. Burrillville had experienced consistent population growth for decades, except for 1990 – 2000 when it experienced a decline of approximately 400 residents. However, the Program cannot assume this decline was due to the facility, since a decline in population could be a result of many possible factors. Additionally, Burrillville's population rose again between 2000 and 2010 (1.0%), a time period during which the impacts of facility operation would be expected to be similar to those experienced between 1990 and 2000. If the out-migration from Burrillville between 1990 and 2000 were caused by any negative impacts of the operation of the facility, it would be assumed that those negative impacts would have continued in the next decade; they did not.

The Program believes that the Project has the potential to result in some small in-migration to Burrillville due to the creation of 25 permanent jobs. It is also possible that the Facility could prompt some out-migration if current residents object to the Facility's operation. However, within the context of Burrillville's overall population, it is unlikely that the net result would be a either a significant increase or decrease.

2. Federally-Protected Populations

The Program finds that the construction and operation of the Facility will not unfairly impact Federally-protected populations.

In considering the potential impacts of the CREC on the socio-economic fabric of the state, the Program examined whether any Federally-protected group of people would bear a "disproportionate share of the negative environmental consequences resulting from industrial, governmental and commercial operations or policies."[22] Federal government statutes and regulations protect the following groups of people, which represent the groups considered in this analysis: minority populations,[23] persons of low-income,[24] children and the elderly,[25] households with limited English proficiency,[26] and individuals with a disability.[27]

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[21] Technical Paper 162: Rhode Island Population Projections 2010-2040. Rhode Island Statewide Planning Program, Division of Planning, Department of Administration, April 2013, 16.
[22] *Learn About Environmental Justice.* Environmental Protection Agency, March 29, 2016. Web. 11 May 2016.
[23] Title VI Statute, 42 U.S.C. § 2000d (1964). Web.

Table 2 below presents data relative to the presence of the identified select population groups within the U.S. Census Tract in which the CREC would be located (Tract 130.01), the Town of Burrillville and the State of Rhode Island.

Table 2: Presence of Select Population Groups in Proximity to the CREC

	Tract 130.01		Town of Burrillville		Rhode Island	
	#	*% of total*	#	*% of total*	#	*% of total*
Minority Population[28]	137	3.9%	596	3.7%	248,882	23.6%
Population under 200% Poverty Level[29]	507	13.7%	3,632	23.3%	310,086	30.6%
Population under 5-years of Age[30]	136	3.9%	781	4.9%	57,448	5.5%
School-aged Population (age 5 to 18)[31]	699	20.1%	3,148	19.7%	204,310	19.4%
Aging Individuals (age 65+)[32]	369	10.6%	1,990	12.5%	151,881	14.4%
Limited English Proficiency Households[33]	38	1.1%	144	0.9%	84,851	8.5%
Individuals with a Disability[34]	587	15.7%	2,247	14.3%	133,024	12.8%

For the purposes of this assessment, a significant concentration of any single population group is said to exist when the group makes up a greater percentage of the population in the defined area than in the host state as a whole. This methodology was chosen based on the approval that the

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[24] Exec. Order No. 12898, 3 C.F.R. 1-5 (1994). Web.
[25] Age Discrimination Act, 29 U.S.C. § 6101 (1975). Web.
[26] Exec. Order No. 13166, 3 C.F.R. 1-6 (2000). Web.
[27] Americans with Disabilities Act, 42 U.S.C. § 126-12101 (1990). Web.
[28] Data source: U.S. Census 2010
[29] Data source: U.S. Census 2014 American Community Survey 5-year estimates, Table S1701
[30] Data source: U.S. Census 2010
[31] Data source: U.S. Census 2010
[32] Data source: U.S. Census 2010
[33] Population is individuals aged 5 and older where the language spoken at home is other than English and have identified as speaking English "less than very well;" data source: U.S. Census 2014 American Community Survey 5-year estimates, Table DP02
[34] Universe is civilian, non-institutionalized population; data source: U.S. Census 2014 American Community Survey 5-year estimates, Table S18103

Program had received from the State's Federal Highway Administration Civil Rights Specialist to use it as the basis of developing the Transportation Equity and Environmental Justice Analysis contained in the State's Draft FY 17-25 Transportation Improvement Program. As shown in Table 3, Census Tract 130.1 as well as the Town of Burrillville as a whole, have slightly higher percentages of persons with a disability and of school-aged children than are found within the Rhode Island generally. In two categories, populations under 5-years of age and over 65-years of age, the concentration of persons within Tract 130.1 and the Town as a whole, are slightly lower than those in the state as a whole. Notably, however, there are three population groups that are considerably under-represented in Tract 130.1 and the Town of Burrillville, when compared to state concentrations. Minority populations, the population under 200% of the poverty level, and limited English proficiency households all exist in significantly lower percentages within Tract 130.1 and the Town of Burrillville than in the state as a whole.

Overall, the population group data for Census Tract 130.1 and the Town of Burrillville indicates that vulnerable population groups do not exist in significant concentrations in proximity to where the CREC will be constructed.

3. Housing

The Program finds that there would be no significant impact to the number of housing units that exist within the Town of Burrillville.

The CREC is to be constructed on a vacant parcel of land adjacent to the Spectra Energy Algonquin Compressor Station.[35] As such, the Program expects that no existing housing units will be lost as a result of the construction and/or operation of the CREC and that housing demands in the area will not be impacted. The northwest quadrant of the state, which includes Burrillville, is predicted to experience a decrease in population between now and 2025.[36]

Given that the Program expects no significant change in Burrillville's population as a result of the Project, it correspondingly does not expect any changes in housing supply or demand. However, even if a change to the population were to occur within the Town, it seems as though no new housing units would be necessary. As of 2010, the Town of Burrillville contained 320 non-seasonal, vacant housing units. Based on Burrillville's 2010 average household size of 2.64 persons, these vacant units could house approximately 845 people. [37]

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[35] *Rhode Island Energy Facility Siting Board Application: Clear River Energy Center, Burrillville, Rhode Island.* Invenergy Thermal Development, LLC, 28 October 2015, 9.
[36] *Projecting Future Housing Needs Report*, Housing Works RI, April, 2016, 24.
[37] Data source: U.S. Census 2010, Table DP-1

4. School and Library Services

The Program finds that there would be little to no impact on school and library services in the Town of Burrillville.

The need for additional school capacity is related to the number of school-aged children being served. The adequacy of the library system and community centers are directly related to the number of people and/or housing units being served. For these services, increase in demand or capacity would be directly related to population growth and/or new housing units. As little to no population growth is expected and no new housing units are anticipated, there would be little impact on these services.

5. Police, Fire, and Emergency Services

The Program finds that may be a slightly increased demand on routine EMT, fire, and police personnel for purposes of coordination of emergency plans and services in the Town of Burrillville.

Primarily, demand for police, fire, and emergency services is based on population growth and/or new housing units. In its assessment, the Program has found that neither situation is likely to occur. However, given that the CREC will store and use hazardous materials, there may be some additional demands on the local emergency management system. The Applicant has indicated that it will work with local emergency response personnel to "implement an emergency response procedure that is appropriate for the types of incidents that could potentially occur at the [F]acility,"[38] and to "ensure that proper Hazmat procedures are in place at the [F]acility and that all local, state, and federal safety regulations and guidance are adhered to at all times."[39] The Applicant has also indicated that it will coordinate with local EMT, police, and fire departments on the development of emergency response plans and procedures.[40] These coordination efforts do not appear to necessitate an increase in demand for these services but may require time from EMT, police, and fire personnel for coordinating with Invenergy.

6. Solid Waste Management

The Program finds that construction and operation of the CREC is likely to have minimal to no impact on any solid waste management services that the Town of Burrillville may provide.

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[38] *Invenergy Thermal Development LLC's Responses to the Town of Burrillville's 4th Set of Data Requests.* State of Rhode Island and Providence Plantations Energy Facility Siting Board in RE: Invenergy Thermal Development LLC Application to Construct and Operate the Clear River Energy Center, Burrillville Rhode Island, 7.
[39] *Id.* 26.
[40] *Id.* 38-39.

All solid waste created by the construction and operation of the CREC will be disposed of by the Applicant. Therefore, the Program finds that construction and operation of the CREC will not impact Burrillville's municipal solid waste collection service.

7. Visual Impacts

The Program finds that visual impacts caused by the construction and operation of the Project will be relatively limited.

Invenergy conducted a preliminary visual assessment for the Project. This assessment employed a "viewshed analysis" for a five-mile radius surrounding the site of the proposed Facility and used simulations to make it possible to demonstrate how the Project will appear in the view once complete.

Any visual impacts to surrounding areas would be caused by view of the structures comprising the Clear River Energy Center including two exhaust stacks that are projected to be approximately 200 feet in height, and the proposed new and expanded transmission lines associated with the Project. These include a 6-mile long 345kV transmission line that will be constructed along an existing right of way to the two existing 345 kV transmission lines north-west of the Facility, the construction of a new 345kV overhead transmission line approximately 0.8 miles in length along a new right-of-way from the switchyard located at the Facility to the existing National Grid 345 ROW located west of the Facility, and upgrades to Line 3361, a 10.8-mile line from the Sherman Road Switching Station to ANP Blackstone.

The Applicant identified 175 aesthetic resources within a 5-mile radius of the Project. The Application defines aesthetic resources as, "publically accessible places which are considered to have scenic value."[41] The aesthetic resources identified include historic districts and structures, cemeteries, scenic areas, conservation lands, and state recreational areas. The Applicant then determined areas in which the Project could potentially be visible based on topography and vegetation, and identified which aesthetic resources may be impacted.

The Applicant's viewshed analysis indicated that under current conditions (i.e. existing vegetation), the CREC would be visible within approximately one percent of the visual study area, and most that area would only have a partial view. With existing vegetation, the Project's exhaust stacks would be visible to 23 of the 175 visual resources.

The Program conducted a geospatial analysis to augment the Applicant's five-mile radius viewshed analysis, in which it utilized E-911 data to determine the total number of structures within the study area. The Program then analyzed the number of structures within the subset of

[41] *Rhode Island Energy Facility Siting Board Application: Clear River Energy Center, Burrillville, Rhode Island.* Invenergy Thermal Development, LLC, 28 October 2015, 106.

areas from which the Applicant determined the Project may be visible. The analysis concluded that approximately 5,600 E-911 structures are located within a five-mile radius of the Project site (see Figure 1). Of those 5,600 structures, 177 fall within the area from which the Project is potentially visible (see Figure 2).

Table 3 identifies the 177 structures by type:

Structure Type	**Number of Structures**
Residential	137
Accessory Buildings)	30
Commercial	1
Industrial	1
Public, Government	1
Utility	1
Unclassified	6
Total	**177**

The Applicant's viewshed analysis does not appear to include an assessment of visual impacts of the new and upgraded transmission lines and towers. However, according to the Application, all transmission line construction will occur within an existing right-of-way that is adjacent to existing transmission lines, or within a new right-of-way that is within the Project site. While the removal of trees to accommodate a wider right-of-way in some may create some visual impact, the overall effect is mitigated by the presence of the existing structures.

Figure 1. E-911 Structures within a 5-mile Radius of the Project

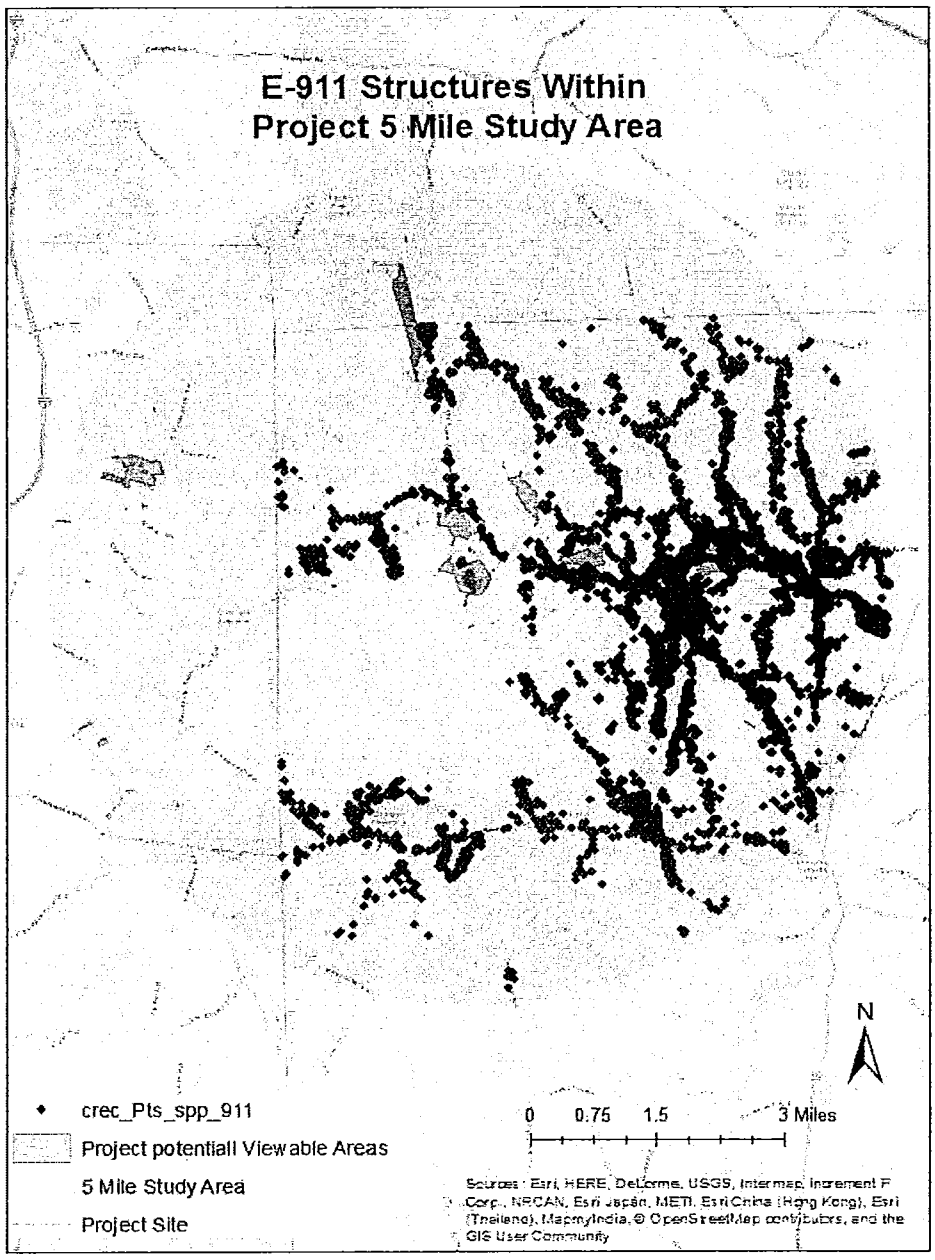
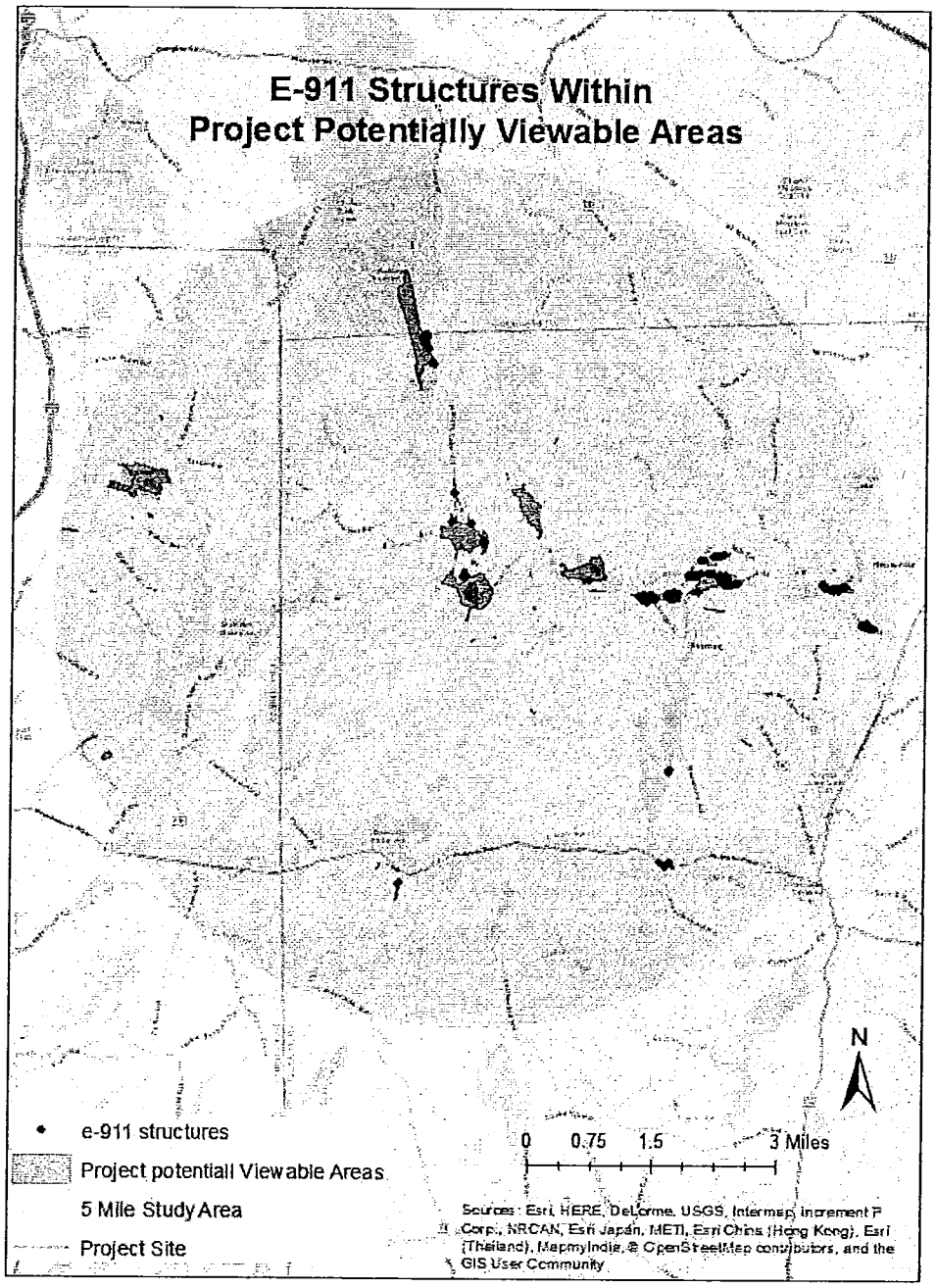


Figure 2. Areas from which the Project may be Visible



PART THREE: STATE GUIDE PLAN CONSISTENCY

The State Guide Plan (SGP) was established by Rhode Island General Law 42-11-10(d), which states:

> *State guide plan.* The state guide plan shall be comprised of functional elements or plans dealing with land use; physical development and environmental concerns; economic development; energy supply, access, use, and conservation; human services; and other factors necessary to accomplish the objective of this section. The state guide plan shall be a means for centralizing and integrating long-range goals, policies, and plans. State agencies concerned with specific subject areas, local governments, and the public shall participate in the state guide planning process, which shall be closely coordinated with the budgeting process.

The SGP is intended to provide a degree of continuity and permanent policy direction for the state's future development. It is not a single plan but a collection of plans referred to as SGP "elements." The State Guide Plan currently consists of twenty-five functional elements. The State Planning Council is the entity authorized with adopting plans as elements of the State Guide Plan.

For purposes of determining "consistency and compliance with the State Guide Plan," the Program examined the goals, objectives, and policies of the SGP elements since it is these components of the SGP that best present the State's intended future.

Given the breadth of the State Guide Plan, it is inevitable that certain goals and policies will come into conflict with other goals and policies. As such, a finding of "State Guide Plan consistency" cannot realistically be based on a project being completely consistent with each and every individual goal, objective, and policy found in the SGP. While each State Guide Plan goal or policy is considered, the final recommendation regarding State Guide Plan consistency is based on the Project's consistency with the *overall* direction of the SGP.

In reviewing the Project against the various elements of the State Guide Plan, Program staff determined that they could be grouped into three broad categories:

1. The element is relevant to the Project and the topic is not directly covered by another agency's advisory opinion;
2. The element is relevant to the Project and, per EFSB order, the topic is covered by another agency's advisory opinion; or
3. The element is not applicable to the Project.

For those elements that were found to be relevant and not directly covered by another agency's advisory opinion, Program staff has provided an element by element assessment of the Project's

consistency with the relevant goals, objectives, and policies of the element. These elements include:

1. Energy 2035: Rhode Island State Energy Plan
2. Rhode Island Rising: A Plan for People Places and Prosperity
3. Land Use 2025: Rhode Island's State Land Use Policies & Plan
4. State Housing Plan
5. Transportation 2035
6. Rhode Island Water 2030
7. State Historical Preservation Plan
8. The Cultural Heritage and Land Management Plan for the Blackstone Valley National Heritage Corridor
9. Rhode Island Goals and Policies

For those elements that were found to be relevant and, per EFSB order, the topic is covered by another agency's advisory opinion, the Program believed that it would be premature to make a determination of consistency if expert opinions of those other agencies were not available, particularly given the numerous questions of fact that were at hand. Therefore, the Program deferred on issuing findings of consistency for these elements. These SGP elements primarily involve environmental and recreational considerations which are to be evaluated by the Department of Environmental Management and others. These elements include:

1. Rivers Policy and Classification Plan
2. Nonpoint Source Pollution Management Plan
3. Blackstone Region Water Resources Management Plan
4. Forest Resources Management Plan
5. Urban and Community Forestry Plan
6. Ocean State Outdoors: Rhode Island's Comprehensive Outdoor Recreation Plan
7. A Greener Path: Greenspace & Greenways for Rhode Island's Future

Several elements were found not to be applicable to the Project either because they are directed to a portion of the state outside of the Project area or because they do not contain any content relevant to the Project. As such, these elements were not further considered in this review. These include:

1. Comprehensive Conservation & Management Plan for Narragansett Bay
2. Howard Center Master Plan, Phase I

3. Resource Management in the Reuse of Former Navy Lands
4. Rhode Island Strategic Housing Plan
5. Solid Waste 2038: Rhode Island's Solid Waste Management Plan
6. Policy Statement: Proposals for New or Restructured Public Transit Facilities / Services
7. State Airport Systems Plan
8. Rhode Island Rail Plan
9. Waterborne Transportation Plan

What follows summarizes the purpose of each of the relevant State Guide Plan elements, identifies the goals, objectives, and/or policies particularly relevant to the Project, discusses how the Project relates to the element's goals, objectives, and policies, and concludes with a series of findings.

A. Energy 2035: Rhode Island State Energy Plan (adopted October 8, 2015)

While all State Guide Plan elements have equal weight, *Energy 2035: Rhode Island State Energy Plan* (the "Plan") is the most directly relevant to the Project. As noted in the introduction, the Energy Facility Siting Board requested the Statewide Planning Program, "in coordination with the Rhode Island Office of Energy Resources," to render an advisory opinion, conducting "a particular examination of the Facility's consistency and compliance with the State Energy Plan." The following opinion was prepared primarily by the Office of Energy Resources, as the experts in this topic and main authors and implementers of the Plan, with assistance from the Program. The Program concurs with the findings of the Office of Energy Resources, as described below.

Overview

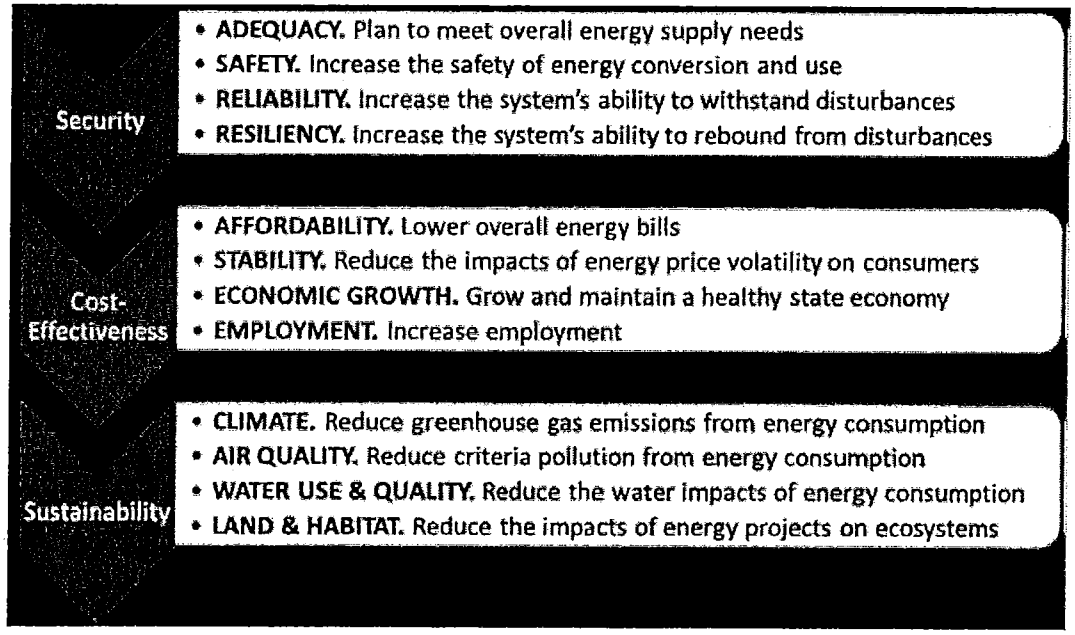
Energy 2035 describes the existing energy system for the state, identifies Rhode Island's key energy issues, and sets goals and policies to improve energy security, cost-effectiveness, and sustainability in all sectors of energy production and consumption. It is intended to advance the effectiveness of public and private stewardship of the state's use of energy resources and identifies activities needed to keep the energy systems on which the state depends functioning optimally.

Evaluating the Project's consistency and compliance with *Energy 2035* requires an understanding of the Plan's intended scope and application within the context of energy policy decision-making. The research philosophy of the Plan is described in the following excerpt from *Energy 2035*'s "Introduction and Vision" section:

> To reflect the uncertainties associated with forecasting for a dynamic energy system, the Project Team and Advisory Council deliberately chose a directional

approach, rather than a specific approach, in establishing the Plan's vision, goals, and strategies. With the understanding that "all models are wrong, but some are useful," the Team structured a data-driven scenario modeling analysis that would help policy-makers understand order-of-magnitude impacts and sensitivities—that is, the range of credible outcomes Rhode Island might expect from strategic investments in alternative demand and supply of energy resources. The team developed goals and performance measure targets that were quantitative enough for meaningful measurement, but not specific enough to risk immediate irrelevance. The team proposed a comprehensive set of policies and strategies to improve Rhode Island's energy system and achieve performance measure targets set in the Plan, but shied away from prescriptive actions and discrete tactics, which will be addressed in the implementation of the plan, including development of policy and program design." (pg. 7)

The purpose of *Energy 2035* is to provide a context for decision-making by setting a long-term vision and establishing high-level "goal posts". *Energy 2035* groups its twelve goals under the three themes of security, cost-effectiveness, and sustainability as follows:



Energy 2035 also contains performance metric targets, policies, and strategies to assist in achieving the desired goals.

Findings

After careful consideration the Office of Energy Resources and the Program finds the Project to be consistent with *Energy 2035*. More specifically:

1. **The Plan makes no specific prohibition against the construction of new electric generating units that qualify as major energy facilities under R.I.G.L. § 42-98-3(d) located in Rhode Island;**
2. **The Plan emphasizes a balance between long-term efforts to transform energy systems and near-term steps to maintain energy system reliability, within the context of a regional wholesale energy system;**[42]
3. **The Project is consistent with the Plan's goals and performance measure targets; and**
4. **The Project is consistent with the Plan's policy themes and strategies.**

Each conclusion is explained in more detail, below.

No Prohibition of New Major Electric Generating Facilities

As discussed earlier, the purpose of the Plan is to provide context for future decision-making by setting a long-term vision and establishing high-level goals. Consistent with this approach, it is important to note that the Plan does not issue prescriptive guidance around specific individual projects that should or should not be built. In particular, *Energy 2035* does not contain any goals or policies specific to the construction or siting of new electric generating units that qualify as major energy facilities under R.I.G.L. § 42-98-3(d), nor does the Plan include a prohibition of such facilities.

Emphasis on Balance of Long-term Efforts and Near-term Steps

The Plan sets a bold, long-term vision for achieving a secure, cost-effective, and sustainable energy future. As detailed in the Plan, this vision – and associated goals, performance metric targets, policies, and strategies – clearly contemplates a concerted transition to an energy system that incorporates more energy efficiency, renewable energy, and alternative fuels, consistent with established State laws. The Plan, however, explicitly states in multiple instances that achieving the Plan's long-term vision should not come at the expense of near-term steps necessary to maintain the security and reliability of our state and regional energy systems (pgs. iii, 1, 5, 7). The Plan emphasizes the need for a balanced approach that meets the immediate and short term needs of our energy system, while also setting the state on a long-term path towards energy system transformation:

[42] Rhode Island, along with most other states in the Northeast, restructured their electric utilities in the 1990's, departing from the traditional vertically integrated utilities, and implementing a competitive wholesale electricity market. The independent system operator (ISO-NE), rather than local electric utilities, now has primary responsibility for ensuring resource adequacy through the wholesale markets.

> "Because the impact of long-term planning and investment choices will reverberate for decades to come, we must be especially prudent and strategic as we address the weighty energy policy decisions that face us today. At the same time, the Plan's long-range orientation is not meant to preclude near- and intermediate-term steps that can be taken to ensure the optimal maintenance of Rhode Island and New England's energy system." (pg. 7).

The Project has been proposed in response to a market signal issued through the regional Forward Capacity Market (FCM) and was awarded a capacity supply obligation. As noted in the Application, the FCM is the existing and appropriate mechanism to determine system need for power capacity among member states within ISO-NE (Application, pgs. 115-118). The FCM incorporates energy efficiency and renewable installations in the Forward Capacity Auction 10, accounting for state investments in these resources. All resources that clear the FCA have a firm obligation to perform when needed by ISO-NE to satisfy the region's reliability requirements, or suffer severe financial penalties.[43] Because the need for additional regional generating capacity has been determined by the ISO through the FCM, it is clear that the Project is consistent with "near- and intermediate-term steps that can be taken to ensure the optimal maintenance of Rhode Island and New England's energy system." (Application, pg. 7).

Consistent with Goals and Performance Measure Targets

As noted above, the Plan establishes 12 qualitative goals, covering the themes of energy security, cost-effectiveness, and sustainability. The Plan also establishes the following three overarching, quantitative performance measure targets, by which progress towards the goals can be gauged:

1. Increase fuel diversity in each sector above 2013 levels;
2. Produce economy-wide net benefits; and,
3. Reduce greenhouse gas emissions by 45% below 1990 levels.

The performance measure targets relate to the Plan's three main themes, and were developed using a scenario modeling process that assessed plausible future outcomes for Rhode Island's energy system under different resource and technology end-states. The performance measure targets are intended as a means to measure consistency with the Plan's goals, and therefore this assessment focuses on whether the Facility assists with and/or prevents the state from achieving the targets.

[43] ISO-NE's "Pay-for-Performance" rules, first implemented in FCA#9, create a strong financial incentive for all capacity resources to maximize performance and availability during stressed system conditions. Penalties for non-performance paid by underperforming resources are redistributed to over-performing resources.

Background Information on the Performance Measure Targets

In order to provide context for evaluating the consistency of the Facility with the performance measure targets, it is important to offer background on the data and sources used to develop the performance measure targets.

Three main sources of information were used to develop the Plan's performance measure targets: a scenario modeling analysis, a review of best practices, and stakeholder feedback. The scenario modeling formed the primary quantitative basis for the performance measure targets. The scenario modeling comprised three unique, independently viable scenarios intended to bracket a range of plausible future outcomes for Rhode Island's energy system under different resource and technology end-states. The modeling results were directly used to determine feasible values for performance measure targets for each of the Plan's three themes: energy security, cost-effectiveness, and sustainability.

It is important to note a few key aspects of the electric sector modeling performed for the Plan. First, the electric sector was modeled on a regional basis. This is appropriate, since ISO-NE manages New England's electric transmission grid and electric generators on an integrated, regional basis. Electricity used within Rhode Island may be imported from other states, and conversely, electricity produced by Rhode Island's generating resources may flow to other states. There are power flows in both directions between New England and neighboring regions, as well. Therefore, Navigant[44] used a capacity expansion model set up to represent the entire ISO-NE region as an integrated system for which the Rhode Island electrical system was only one component (Navigant, pg. 15). This is significant because the scenario modeling results, which informed the Plan's performance measure targets, reflect changes in the regional power generation mix, not simply the generation portfolio located within Rhode Island state borders.

Second, the base case build-out of the model contemplated the addition of further regional natural gas capacity under business-as-usual conditions. The scenario modeling used a base case forecast that included assumptions for regional buildout of capacity and what fuel that capacity would use based on load growth, capital costs, fuel costs, existing RPS laws, resource limitations, and expert assumptions (Navigant, pg. 56). The projected base case was developed, in part, using the ISO-NE CELT[45] forecast of New England's electric load and resources that was available at the time the model was finalized, sometime before publication of the Navigant report in September 2013. The base case build-out contained increases in regional combined-cycle gas, combustion-turbine gas, biomass, wind, and solar capacity. In particular, the base case

[44] Navigant is an expert consultant team retained by the state to perform quantitative analysis and scenario modeling for the Plan.
[45] Capacity, Energy, Loads, and Transmission

build-out assumes 1,292 MW additions of natural gas capacity[46] (Navigant, pg. 56). It is important to note that, "A fundamental assumption for this project is that Rhode Island policies do not change ISO-NE builds directly" (Navigant, pg. 55). In other words, Navigant assumed that under base case conditions, 1,292 MW of incremental natural gas capacity, would be added to the regional electric grid between 2013 and 2035 under every scenario to maintain system reliability. Within this construct, it is reasonable to consider the Facility as representing a portion of this natural gas generating capacity that was anticipated to be built under base case conditions within the Navigant modeling – a market-driven outcome of the broader ISO capacity market that was expected to occur within the region under business-as-usual conditions. This is significant because all scenario modeling results that were used to inform the performance metric targets were reported with respect to the base case modeling results, the base case included the addition of natural gas generating capacity, and the modeling results showed that Rhode Island could achieve fuel diversity, economic benefit, and greenhouse gas objectives even with the addition of regional natural gas capacity in the ISO-NE system.

The Plan acknowledges that forecasting energy markets is an exercise in uncertainty; projections are based on market dynamics and infrastructure conditions that are continuously changing. However, this does not render the study or its conclusions moot. For example, since the model was developed, about 2,800 MW of baseload nuclear and coal units have either retired or announced their intended closure or retirement.[47] This reduction in capacity only further increases the need across the region for additional baseload resources like the proposed Facility.

Fuel Diversity

The Plan sets a performance measure target to gauge success in achieving energy security goals: "increase fuel diversity in each sector above 2013 levels" (pg. 38). The Plan defines fuel diversity as, "a risk management strategy that seeks to mitigate the potentially harmful effects of disproportionate reliance on certain fuels by expanding the portfolio of demand and supply sources used to provide energy services. Fuel diversity is measured here in terms of percentage market share of the dominant fuel source in each sector. For the electric sector, this percentage is measured in terms of in-state generation plus electricity imports, with the sources attributed to imports prorated by each source's share in the overall regional mix." (pg. 38).

OER and the Program finds that the Facility will not prevent Rhode Island from achieving the Plan's energy security performance measure target.

[46] Navigant refers to these capacity additions as "Non-RI ISO-NE Build-Out in BAU," however, for all intents and purposes, these additions could be considered wholesale capacity additions added anywhere in the ISO-NE footprint, including Rhode Island.

[47] Vermont Yankee (620 MW) announced in August 2013 that it would retire by the end of 2014. Pilgrim nuclear power plant (690 MW) announced in October 2015 that it would retire no later than June 2019. Brayton Point station (1,530 MW) announced in September 2013 that it would retire by the end of May 2017.

Figure 26 on page 43 of the Plan shows the state's projected fuel diversity in 2035, compared to a 2013 baseline, under each of the scenarios modeled for the Plan. For the electric sector, the scenario results show the opportunity to reduce dependence on in-state natural gas generation from 93% in 2013 to between 50% and 87%, depending on the scenario. Within the electricity dispatch model used for the scenario modeling, the most cost-effective method to reduce reliance on in-state natural gas generation was to increase electricity imports into Rhode Island (Navigant, pg. 11). The scenario results reflect the use of this strategy, which was executed by using an objective function imposed on the dispatch model. In practice, however, Rhode Island does not exercise any control on the dispatch and run-times of in-state power plants; that is the role of ISO-NE. Therefore, the Plan metric provided of "percentage in-state generation plus electricity imports" may not necessarily provide a useful measuring stick for Rhode Island with regard to electric fuel diversity.

However, even though the Facility may cause a short-term increase in the percentage market share of in-state natural gas in the electric sector above 2013 levels (in-state generation plus electricity imports), Rhode Island's ongoing commitment to clean energy investments leaves ample room to achieve the fuel diversity performance measure target by 2035. For instance, the Facility in no way is a barrier to ongoing programs and recent initiatives that Rhode Island has undertaken to diversify its sources of electricity and expand energy efficiency. These programs include, but are not limited to:

- Expansion of Rhode Island's Renewable Energy Standard[48]
- Extension of the Least Cost Procurement Policy, through 2024[49]
- Implementation of the Renewable Energy Growth Program[50]
- Rhode Island's participation in a multi-state Clean Energy RFP, a regional effort (along with CT and MA) to procure clean energy resources, authorized under the Affordable Clean Energy Security Act (R.I.G.L. Ch. 39-31.)[51]

The continuation and implementation of these important clean energy policies and programs, as well as the potential for future activities to further expand energy efficiency and renewable energy, should allow Rhode Island to achieve its fuel diversity performance measure target by 2035.

[48] http://webserver.rilin.state.ri.us/BillText/BillText16/SenateText16/S2185A.pdf
[49] http://webserver.rilin.state.ri.us/Statutes/TITLE39/39-1/39-1-27.7.HTM
[50] Rhode Island General Laws 39-26.6.
[51] This RFP was approved as compliant with Rhode Island General Laws 39-31, the Affordable Clean Energy Security Act, by the Rhode Island Public Utilities Commission in Docket 4570, Order 22365, effective September 22, 2015.

Cost-Effectiveness

The Plan sets a performance measure target to gauge success in achieving cost-effectiveness goals: produce "economy-wide net benefits. The Plan defines net benefits as the product of an economic policy that prioritizes prudent, strategic energy system investments that generate long-term energy savings and more stable energy costs for consumers, businesses, and institutions in Rhode Island. Net benefits are measured in terms of total, economy-wide power and fuel expenditures, minus capital expenditures relative to business-as-usual projections, discounted over the period spanning 2013 to 2035, and expressed in millions of 2012 dollars" (pg. 46).

The Facility will help Rhode Island achieve the Plan's cost-effectiveness performance measure target by contributing to the reduction of wholesale energy and capacity costs to Rhode Island ratepayers. Energy cost savings will result because the Facility will be one of the most efficient generators in the region, displacing electricity from less efficient (and more expensive) generators whenever it runs. Adding to the supply of new capacity in the FCM lowers the clearing price, and hence the costs to customers. According to the Applicant's initial market projections, the Facility was expected to "save Rhode Island ratepayers $284 million in capacity and energy costs, or more than $70 million annually" in its first four years of operation (2019-2022) (Invenergy, pg. 119). Subsequently, Invenergy submitted pre-filed testimony of Ryan Hardy of PA Consultants on April 22, 2016, revising the initial savings estimates in light of the delay by one year in the in-service date of the second Facility unit. Mr. Hardy revised the forecasted capacity cost savings downward to $170 million and the energy cost savings downward to $41 million. In testimony filed under Rhode Island Public Utilities Commission Docket 4609, the Division of Public Utilities witness Seth Parker filed testimony in which he examined the basis for Mr. Hardy's estimates of wholesale cost savings[52]. Mr. Parker concluded that the purported wholesale price savings were reasonable, but the capacity cost savings were likely overstated. Nonetheless, Mr. Parker agreed that in sum, Rhode Island consumers will benefit from lower costs due to CREC, but not to the extent estimated by Invenergy's consultant. Moreover, pre-filed testimony submitted by CLF in PUC Docket 4609 also determined that there may be capacity and energy cost benefits to Rhode Island ratepayers.

Because the Facility is anticipated to reduce electricity costs borne by Rhode Island ratepayers, the Facility will help increase net economic benefits above an alternative "business-as-usual" scenario in which the Facility is not built.

Sustainability

The Plan sets a performance measure target to gauge success in achieving sustainability goals: "reduce greenhouse gas emissions by 45 percent below 1990 levels by 2035" (pg. 51). The Plan

[52] Pre-filed Testimony of Seth Parker. State of Rhode Island and Providence Plantations Public Utilities Commission in RE: Invenergy Thermal Development LLC Application to Construct and Operate the Clear River Energy Center, Burrillville Rhode Island.

defines GHG reductions as "a long-term, fundamental obligation to increase the human and environmental health of our state and planet. GHG reductions are measured in terms of the reduction in system GHGs resulting from Rhode Island policy, using CO_2 emissions as a proxy indicator for overall greenhouse gas emissions. For instance, Rhode Island receives credit for GHG reductions due to out-of-state renewable generation financed through increased RPS requirements, even though the in-state generation mix and emissions profile is not significantly altered. GHG reductions that occur from lower demand or in-state fuel switching also count toward emissions reductions." (pg. 51). OER and the Program finds that the Facility will not prevent Rhode Island from achieving the Plan's sustainability performance measure target for the following reasons:

1. The sustainability performance metric was based directly on scenario modeling results that demonstrated that Rhode Island could achieve a 45% reduction in greenhouse gas emissions below 1990 levels by 2035 (calculated on a consumption basis) even with the addition of regional gas generating capacity over that time period, as was assumed in the base case ISO-NE build-out in the electric dispatch model. In the scenario that achieved a 45% economy-wide reduction in GHGs, Rhode Island reduced electric sector GHGs by 56% below 2013 levels, mainly by procuring out-of-state renewable energy credits (pg. 52).[53] Therefore, because the sustainability performance measure target is based on reduction in system GHGs due to Rhode Island policy, construction of the Facility would not prevent Rhode Island from achieving the Plan sustainability performance measure target, as long as the State maintains its dedicated commitment to aggressive energy efficiency and renewable energy policies. For example, we note that within its last two legislative sessions, the Rhode Island General Assembly extended the State's Least Cost Procurement policy as well as the State's Renewable Energy Standard. Moreover, since the Facility will be one of the most efficient gas-fired resources in the region, it will produce lower GHG emissions per MWh generated than the less-efficient fossil-fired generation that it displaces in the ISO-NE system.

2. The sustainability performance measure target is based on an economy-wide metric of greenhouse gas reductions, therefore, regardless of any electric-sector energy efficiency or renewable energy policies the State pursues, the State still has very significant opportunities for greenhouse gas emissions reductions in the thermal and transportation sectors, which account for nearly three-quarters of the State's GHG emissions according to the Plan (pg. 2).

[53] GHG reduction targets are often stated relative to a 1990 baseline. According to the Plan (Pg. 54), Rhode Island's economy-wide GHG emissions in 1990 were 11.38 million tons, and according to the Navigant modeling, Rhode Island's 2013 economy-wide GHG emissions were calculated to be between 11.39 million tons and 11.46 million tons, depending on the scenario (see GHG Emissions tab of "RISEP Scenario Modeling Results Tables and Graphs" MS Excel spreadsheet, accessible at www.energy.ri.gov/energyplan).

3. The Resilient Rhode Island Act establishes a schedule of GHG reduction targets for Rhode Island. The Executive Climate Change Coordinating Council (EC4), charged with developing the plan to meet these targets, has adopted a "consumption-based" rather than a "generation-based" accounting system to determine progress and compliance with the targets.[54] Consumption-based accounting considers GHG emissions associated with electricity used within the state, whereas generation-based accounting considers GHG emissions from the fossil generators within the footprint of the state. Because electricity in New England is dispatched by the regional operator (ISO-NE) and transmitted across state and regional boundaries through the integrated transmission system, the consumption-based method better reflects measures and programs that can be implemented through state-jurisdictional entities.

Consistent with Policies and Strategies

To meet its goals, *Energy* 2035 puts forward twenty strategies in six major policy areas, recommending an "all-of-the-above" clean energy framework. The policies and strategies are intended "to provide decision makers with a complete picture of the near- and long-term actions Rhode Island should consider in each sector of the economy—electric, thermal, and transportation" (pg. 56). OER and the Program finds that the Project is consistent with the Plan's policies and strategies that are applicable to this Facility, as described below.

Energy Efficiency

Within the policy area of "energy efficiency," one policy in particular is relevant to the Project, "Continue electric and natural gas Least-Cost Procurement." Consistent with this strategy, the Legislature's recent extension of the State's Least-Cost Procurement policy through 2024 will continue to require electric and gas distribution companies to invest in all cost-effective energy efficiency before procuring more expensive conventional supplies. Cost-effective energy efficiency measures reduce electric load, which not only reduces emissions of GHG, but also costs to consumers. Neither the granting of a license to construct this Facility, nor future operation of that Facility, will directly change this policy, which is a foundational aspect of Rhode Island's energy policy portfolio. Conversely, if state-wide electric load is reduced through energy efficiency, the Facility may operate less, but this is entirely a risk borne by the Facility, not electric customers or the electric distribution companies.

Electric

Two strategies within the "electric" policy area, "Expand the Renewable Energy Standard" and "Expand renewable energy procurement," are applicable. These strategies recommend that Rhode Island continue its committed leadership and support for robust renewable energy

[54] We note that the EC4's economy-wide Plan is currently under development and not due until December 31, 2016.

policies. This commitment is manifested through the State's participation in the regional procurement of clean energy resources (enabled through Rhode Island General Laws 39-31, the Affordable Clean Energy Security Act), the expansion of the Renewable Energy Standard, and the extension of the Renewable Energy Fund,[55] among other programs and initiatives. Maintaining the state's dedication to these critical markets and technologies will keep the state on a path toward long-term decarbonization and achieving its greenhouse gas goals. Approval of the Facility will not interfere with the state's ability to continue investing in these areas. The Facility will be privately financed and developed, and will not divert investments away from renewable energy programs supported by existing state energy policies and initiatives. Moreover, the Facility will not interfere with the day-to-day and hourly operation of the renewable resources either supported directly by state ratepayers through Rhode Island's programs, or renewable projects located in the ISO-NE footprint more generally. These resources are self-scheduled, and produce energy whenever the renewable fuel source is available, e.g., whenever the wind blows or the sun shines. The energy production of these renewable resources would not be displaced or curtailed by the Facility or any other fossil generator that is dispatched on an hourly basis by ISO-NE.

Over the intermediate term, the Facility is also consistent with the Plan's vision of transforming the energy system to increase supply diversification, including increasing the penetration of renewable resources (pg. 63). Wind (both on-shore and off-shore) and solar renewable resources are intermittent, meaning that they are not dispatched by ISO-NE on an hourly basis, but generate electricity when the wind blows or the sun shines. Other controllable resources must provide ancillary services that can ramp up or down as needed to balance system energy output and follow electric load. As noted in the Application (pg. 6), the Facility will have fast start and high ramp rate (flexible) generating capabilities that will facilitate integration of new and existing renewable generation onto the power grid.

Regional Energy Costs

With regard to addressing high and volatile regional energy costs, the Plan recommends that Rhode Island continue to partner closely with other New England states to address regional energy supply challenges and identify cost-effective strategies to mitigate the impacts of rising energy costs. In recent years, the region has experienced energy price volatility due to the growing use of natural gas for power generation combined with limited pipeline capacity delivering gas into New England. The Plan recommends that Rhode Island work with neighboring states to pursue the full range of available options, from energy efficiency investments to infrastructure solutions. In fact, the state has done just that, as evidenced by its participation – and PUC approval of – a multi-state Clean Energy Request for Proposals to identify clean energy and/or clean energy transmission projects that offer the potential for the

[55] http://webserver.rilin.state.ri.us/BillText/BillText16/SenateText16/S2450B.pdf

procuring states to meet their shared clean energy goals in a cost-effective manner consistent with individual, state-specific procurement statutes.

Approval of the Facility is also consistent with this strategy in that it is anticipated to reduce wholesale energy and capacity costs system-wide and to Rhode Island ratepayers. Furthermore, the Facility will have ultra-low sulfur distillate as a backup fuel, and this dual-fuel capability will help mitigate winter price spikes in the region when gas pipelines are congested or gas deliveries are curtailed.

Sustainability

Both of the strategies within the policy category of "sustainability" are relevant to the Project: "Continue participating in RGGI," and "Develop a carbon reduction strategy."

The Regional Greenhouse Gas Initiative (RGGI) is the first market-based cap and trade program in the United States designed to reduce electric power sector greenhouse gas emissions. RGGI establishes an annual cap for total greenhouse gas emissions among the participating states, and the cap declines annually. The annual RGGI cap is independent of the quantity of fossil-fired generation within the RGGI footprint or within any state. As a power generator greater than 25 MW, the Facility would be subject to RGGI and be required to purchase emissions allowances through quarterly auctions for each ton of CO_2 that it emits. The proceeds are invested by participating states in energy efficiency and clean energy programs that deliver economic benefits to consumers throughout the region.

The second strategy, to develop a carbon reduction strategy, recommends that Rhode Island evaluate a cost-effective portfolio of policies to meet statutory near- and long-term greenhouse gas emissions reduction targets. This strategy directly refers to the legislative authorization established by the Resilient Rhode Island Act to develop an implementation strategy to achieve the statutory greenhouse gas reduction targets.

The Plan identifies the need for 45% greenhouse gas reductions below 1990 levels by 2035, which is also codified in the Resilient Rhode Island Act. The 2035 reduction target is consistent with the scenario modeling results, which demonstrated that "it is feasible to reduce Rhode Island consumption-based greenhouse gas emissions by approximately 45 percent below 2013 levels by 2035" (pg. 153).[56] Therefore, approval of the Facility would not prevent Rhode Island from developing a viable implementation strategy to achieve the 2035 reduction target, which was formulated under a consumption-based accounting methodology for the electric sector. In fact, such a Plan is in the process of being developed under the direction of the RI Executive Climate Change Coordinating Council (EC4), and is expected to be completed by December 31, 2016.

[56] See Footnote #53.

B. Rhode Island Rising: A Plan for People Places and Prosperity (adopted December 2014)

Overview

Rhode Island Rising presents an analysis and discussion of economic development opportunities facing the state. It is intended to be a state-level economic development plan. On the topic of energy, *Rhode Island Rising* defers to *Energy 2035: Rhode Island State Energy Plan* for specific energy policy recommendations while emphasizing the need for Rhode Island to be resilient and competitive. The Plan recognizes that economic development requires a reliable energy infrastructure providing energy at competitive costs over the short-term as well as the potential for long-term economic benefits resulting from the development of sustainable, clean, and renewable energy systems.

Findings

The Program finds that the Project is consistent with this State Guide Plan element. See Part Two, sections A through C and the above findings on *Energy 2035* for specific findings supporting the Project's consistency with this element of the State Guide Plan.

C. Land Use 2025: Rhode Island's State Land Use Policies & Plan (adopted April 13, 2006)

Overview

Land Use 2025 brings together other content from several State Guide Plan elements such as natural resources, economic development, housing, and transportation to guide conservation and land development in the state. It articulates goals, objectives, and strategies to guide current and future land use planning using different development approaches for urban and rural areas. It is intended as a policy guide for directing growth to areas most capable of supporting current and future developed uses and to direct growth away from areas less suited for development. The core development pattern that *Land Use 2025* is directed at is the spread of relatively low-density housing and commercial highway development into the more rural areas of the state. The cornerstone of *Land Use 2025* is the principle that the state will "contain sprawl, and that housing, commerce, and social interaction will be concentrated in dense centers of varying scales, marked by quality design."

Land Use 2025 contains a Future Land Use Map (FLUM) that visually depicts this intent. The map contains an Urban Services Boundary (USB) that shows a projection where areas with public services supporting higher development density presently exist, or are generally desirable. Within the USB, most land is served by public water service; many areas also have public sewer service. Also included on the FLUM are potential areas for the development of local growth centers. What was not specifically included in establishing the USB was the location of existing or proposed energy infrastructure. It is important to note the FLUM is a generalized portrayal of desired state land use policy, and is not intended to be applied to specific development proposals.

Findings

The Program finds that the Project 1) would be appropriately located; 2) would not detract from *Land Use* 2025's vision of maintaining a rural / urban distinction within the state's communities; and 3) would further portions of *Land Use 2025* Goal 4: First class supporting infrastructure that protects the public's health, safety, and welfare, fosters economic well-being, preserves and enhances environmental quality, and reinforces the distinction between urban and rural areas. Therefore, the Program finds the Project to be consistent with *Land Use 2025*.

The Program believes that the Project is appropriately located, consistent with *Land Use 2025* Objective LUO 4D: "Locate new infrastructure in appropriate areas" and is not inconsistent with *Land Use 2025* Objective LUO 1A: "Focus growth within the urban services boundary and in centers of different sizes and types; support traditional centers instead of new development". In consideration of what qualifies as an "appropriate area", the Program has taken into consideration the Project's need to connect to a source of natural gas for fuel and to an electrical transmission line for distribution of the electricity produced. The importance of close proximity to such existing infrastructure minimizes the need to construct new infrastructure to make such connections and furthers an economical means of production. As noted in the Application, the Project is located adjacent to existing energy infrastructure systems; namely, the Spectra Algonquin natural gas pipeline and National Grid's electrical transmission lines. Indeed, the area can already be considered as an energy center given the presence of these assets as well as those of Ocean State Power. The appropriateness of the location is reinforced by Invenergy's proposal to tie into the nearby sewer and water infrastructure in Pascoag.

With respect to Objective LUO 1A to "Focus growth within the urban services boundary," the Project is located approximately 1.3 miles from the northwest segment of a village-centered Urban Services Boundary in Burrillville. However, the Program concludes that the chosen site, by providing immediate access to an existing gas pipeline, thereby reducing the need to extend infrastructure elsewhere, and, the fact that the USB is not intended to be absolute determinant for any specific project, means the Project is not inconsistent with *Land Use 2025*'s objective of focusing growth within Urban Service Boundaries.

In addition, the Program finds that the Project will not detract from *Land Use* 2025's vision of maintaining a rural / urban distinction within the state's communities as expressed in *Land Use 2025* Goal 1: "A sustainable Rhode Island that is beautiful, diverse, connected and compact with a distinct quality of place in our urban and rural centers", and *Land Use 2025* Objective LUO 3C: "Maintain and protect the rural character of various parts of Rhode Island". In the context of *Land Use 2025*, the major threat to rural character is sprawling residential development and commercial strip development. The construction of the CREC will impact the project site itself but in the context of the "rural character" of Burrillville, its impact will be minimal. The construction of the CREC would not impede the larger vision of a Rhode Island that is beautiful,

diverse, connected and compact with a distinct quality of place in our urban and rural centers. As reported by Edward Pimentel of Pimentel Consulting, Inc., "Although CREC will own in excess of 67-acres, less than one-half or approximately 29.44-acres will be dedicated to the operation proper. The operation will be aligned along the rear (westerly) portion of the property, thereby maintaining in excess of 37.6-acres in a naturally vegetated state. The site will have a naturally vegetated frontage which will provide screening from the residences situated along Wallum Lake Road." In addition to the site being vegetatively screened, its use for electrical generation would not be likely to promote the residential or commercial sprawl that *Land Use 2025* seeks to minimize.

The Program finds that the Project furthers *Land Use 2025* Goal 4: First class supporting infrastructure that protects the public's health, safety, and welfare, fosters economic well-being, preserves and enhances environmental quality, and reinforces the distinction between urban and rural areas. The primary feature of the Project is the construction of the CREC, a new high-efficiency electric generation facility. This new supporting infrastructure will serve the public's health, safety, and welfare, by helping to meet its demand for energy. As noted in Part Two, Sections A and C, the Project will promote both direct and indirect economic growth as well as supplying electricity to local and regional businesses which helps to foster economic well-being. This same feature also applies to achieving "a vibrant sustainable economy" (*Land Use 2025* Goal 1) and "provid[ing] abundant economic opportunities" (*Land Use 2025* Goal 3).

D. State Housing Plan (adopted March 2000)

Overview

The *State Housing* Plan establishes state goals and policies for housing. It serves as a guide to aid the public and private sectors in providing affordable housing, in standard condition, and in a suitable living environment, for all Rhode Island residents, with special emphasis on the housing needs of lower-income households and individuals.

Findings

The Program finds that the Project would not adversely affect the amount of housing available for occupation within the Town of Burrillville; therefore, the Program finds this Project to be consistent with this State Guide Plan element. Specifically:

The Project is consistent with *State Housing Plan* Goal 1-1-1B: "Ensure the provision of a sufficient number of housing units to meet population needs." The Project site is vacant and therefore no existing housing would be directly affected by construction of the CREC.

The Project is not inconsistent with *State Housing Plan* Policy 1-2-3 B: "Enhance and preserve historic and other aspects of neighborhoods and communities which add identity and character." Staff conducted a geospatial analysis to determine the distance between the nearest housing and

the Facility (the figures are approximate and are based on a measurement from the Facility's perimeter). Program staff determined that the nearest residences off of Wallum Lake Road are located approximately 1,850 feet from the Facility and the nearest residences on Jackson School House Road are approximately 2,500 feet from the Facility. As noted in Part Two, Section D, although the exhaust stack will be visible from certain residential areas, the impact is expected to be limited. Staff also considered potential noise impacts to residential areas but notes that the Facility must adhere to the Town noise ordinance.

With regard to the historic character of neighborhoods and communities, the Harrisville Historic District ("Historic District") is approximately 3.5 miles from the site. Based on an assessment by the Rhode Island Historical Preservation and Heritage Commission[57], the only aspect of the CREC that would be visible from the Historic District would be the top of the exhaust stacks and would not detract from its historical character.

E. Transportation 2035 (adopted December 13, 2012)

Overview

This State Guide Plan element provides a long-range framework, goals, policies, and recommendations for the movement of both goods and people. It encompasses the highway system, public transit, transportation system management, bicycle travel, pedestrian, intermodal, and regional transportation needs.

Findings

The Project is not anticipated to have any permanent or long-term negative impacts on the state's transportation system; therefore, the Program finds the Project to be consistent with this State Guide Plan element.

Based on Invenergy's Application, the Project will generate increased traffic consisting of both truck and passenger vehicles and may contribute to an increase in non-recurring congestion and delays on a number of roads over the 30 month construction period of the Facility. This type of delay and congestion is event related which is anticipated and temporary. However, an increase in non-recurring congestion does not necessarily mean that a project is inconsistent with *Transportation 2035*; specifically, Objective H.1.c: "Minimize congestion" and Policy H.2.c: "Minimize recurring and non-recurring congestion through increased use of other travel modes, effective incident management and access management, and traffic flow improvements". Section 6.8.3 of the application commits Invenergy "to identifying and mitigating potential traffic related issues associated with the construction and operation of the Facility. Invenergy and its contractors will coordinate closely with the Rhode Island Department of Transportation

[57] RIHPHC Advisory Opinion, 1 July 1016

(RIDOT) and the Town of Burrillville to develop and implement a pragmatic Traffic Management Plan." This commitment to mitigation is an important factor in considering consistency with *Transportation 2035* in that it fulfills the objective of *minimizing* congestion.

With respect to specific impacts, the Department of Transportation has been ordered by the Board to provide an advisory opinion specifically considering the "potential impacts upon traffic and road conditions associated with the Facility during construction and operation." At the time of this writing, the DOT has not issued its findings or opinion. Given this, the Program defers to DOT regarding traffic and road impacts.

F. Rhode Island Water 2030 (adopted June 14, 2012)

Overview

Overall, *Rhode Island Water 2030* describes the potable water resources of the state, and sets goals and policies for the management of issues pertaining to them. It focuses on critical policy and emerging trends for potable water systems at all management and planning levels. It is intended to serve as the foundation for coordinated water supply management and decision making. It identifies where our drinking water comes from, the various types of drinking water systems in the state, and the organizational and managerial responsibilities of our water systems. It overviews the roles and responsibilities of State agencies relative to water allocation but does not address in detail the functions and values of the raw natural resource or the protection of its quality as this subject matter is addressed through other State Guide Plan Elements. It also does not offer policy considerations for the siting of specific types of water users.

Findings

The Project proposes using a non-potable water supply source for its industrial needs and as such it is not inconsistent with *Water 2030's* focus on the management of potable water systems.

Several other agencies have been ordered by the EFSB to provide advisory opinions relating to drinking water supply and quality, including the Department of Health ("DOH"), and the Department of Environmental Management ("DEM"). The Program defers to the expertise of the DOH regarding the quality of the water to be finished and the appropriateness of its application for specific uses. The Program recognizes that the proposed withdrawals from the identified source could impact the natural environment and the availability of water resources for other uses to one degree or another. It feels however that it would be inappropriate for it to comment on these aspects prior to the release of the advisory opinion that has been requested on these matters from the DEM. The Program views DEM as the leading expert in this field from both a scientific and regulatory perspective and thinks it appropriate to defer to it in determining any potential impacts.

Even with the caveats noted above and given that the Project is proposing to rely on a contaminated well site in meeting its industrial water needs, **the Program finds that the Project could further the implementation of several strategies contained in *Rhode Island Water 2030*.** Specifically:

- WRM-1 Policy 4, Strategy B: Ensure that the quality of water provided is matched to the quality needed for proposed uses.
- WRM-1 Policy 4, Strategy C: Minimize the use of potable water for non-potable purposes.

G. State Historical Preservation Plan (adopted June 25, 1996); **and**

The Cultural Heritage and Land Management Plan for the Blackstone Valley National Heritage Corridor (adopted September 1990)

Overview

Rhode Island's *State Historical Preservation Plan* explains how the state organizes information about historic properties, sets policies for preservation, and identifies strategies for carrying out its policies.

The *Cultural Heritage and Land Management Plan for the Blackstone Valley National Heritage Corridor* was written by the Blackstone Valley National Heritage Corridor Commission to fulfill a Congressional mandate to, "develop and implement a plan to accomplish Corridor purposes" which included standards and criteria for the preservation of property and policies for land use management. To demonstrate the State's support for the Corridor, the *Cultural Heritage and Land Management Plan* was also adopted as a State Guide Plan element.

Findings

The Program finds the Project to be consistent with these two State Guide Plan elements.

According to the application, there are no historic buildings, properties, or monuments on the proposed site. Furthermore, the Rhode Island Historical Preservation and Heritage Commission issued the following advisory opinion to the Board on 1 July, 2016:

> We have concluded that the project as currently designed will have no effect on any significant archaeological resources, and that it will have no effect on any significant above-ground historic properties.

This is supported by the Rhode Island Geographical Information System data which does not show any historic site points, buildings, properties, or monuments listed on the National Register of Historic Places by the RI Historic Preservation Commission's statewide inventory of cultural resources on the proposed site.

H. Rhode Island Goals and Policies (adopted November 13, 1974)

Overview

Rhode Island Goals and Policies presents a broad series of goals and policies for the physical, economic, and social development of Rhode Island, including economic development, energy, and environmental considerations. The purpose of these goals and policies are to establish a framework to guide the formulation of plans and implementation of programs.

Findings

Given the breadth of the previously reviewed State Guide Plan elements, the goals and policies contained within this element are largely duplicative. They include Energy, Economic Development, Land Use, Water, and Outdoor Recreation. All of the previous findings would also be applicable here. With the same caveat noted elsewhere concerning the Applicant receiving all required permits, **the Program finds the Project to be consistent with this State Guide Plan element.** In particular, given the Project's proposed proximity to the pre-existing gas pipeline and major electrical transmission infrastructure, the Project furthers *Rhode Island Goals and Policies* Physical Development Policy 1-3: **Minimize the adverse impact of power generation and transmission facilities on the environment by careful planning and capitalizing on potential compatible uses to the greatest extent possible.**

PART FOUR: ADVISORY OPINION AND RECOMMENDATIONS

As noted in the Introduction, the Program was instructed to provide the Board with an advisory opinion on:

1. the socio-economic impact of the proposed Facility, including its construction and operation;
2. the Facility's consistency and compliance with the State Guide Plan; and
3. in coordination with the Rhode Island Office of Energy Resources, a particular examination of the Facility's consistency and compliance with the State Energy Plan.

A. SOCIO-ECONOMIC IMPACTS

The Statewide Planning Program's socio-economic impact assessment concludes that the Project will have an overall positive socio-economic impact, based on the individual findings identified below.

The Program finds that construction and operation of the CREC:

- will reduce regional wholesale capacity and energy prices and that the Project will lower electricity costs for Rhode Island consumers;
- will have a positive impact on the state's businesses;
- will result in positive revenue benefits to the State;
- will have a positive impact on the Town of Burrillville's municipal revenue;
- is not likely to result in any significant population changes within the Town of Burrillville;
- will not unfairly impact Federally-protected populations;
- will have no significant impact to the number of housing units that exist within the Town of Burrillville;
- will have little to no impact on school and library services;
- may have a slightly increased demand on routine EMT, fire, and police personnel for purposes of coordination of emergency plans and services;

- is likely to have minimal to no impact on any solid waste management services that the Town may provide; and,
- visual impacts caused by the construction and operation of the Project will be relatively limited.

B. STATE GUIDE PLAN CONSISTENCY

The Program finds that the proposed Clear River Energy Center is consistent with the State Guide Plan including the State's energy plan, *Energy 2035*, based on the findings:

- The Plan makes no specific prohibition against the construction of new electric generating units that qualify as major energy facilities under R.I.G.L. § 42-98-3(d) located in Rhode Island;
- The Plan emphasizes a balance between long-term efforts to transform energy systems and near-term steps to maintain energy system reliability, within the context of a regional wholesale energy system;
- The Project is consistent with the Plan's goals and performance measure targets; and,
- The Project is consistent with the Plan's policy themes and strategies.

However, this finding of consistency is contingent upon Invenergy receiving all necessary State and Federal permits.

C. ADVISORY OPINION RECOMMENDATION

As noted throughout, the Program limited its assessment to content matters that did not overlap or duplicate that requested of other entities and in several instances defers to the particular expertise solicited by the EFSB through the additional advisory opinions that it requested. As such the Program recommends that the EFSB in finalizing its perspective as to the socio-economic impact and State Guide Plan consistency of the project, view this opinion in light of the forthcoming information that was not otherwise available to the Program at the time of this report's production.

APPENDIX A: LETTER OF SUPPORT FOR TESTIMONY OF SETH G. PARKER

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Administration
STATEWIDE PLANNING PROGRAM
One Capitol Hill
Providence, RI 02908 - 5872

July 14, 2016

Commissioner Margaret Curran, Chairperson
Commissioner Marion Gold
Commissioner Herbert F. DeSimone, Jr,
Public Utilities Commission
89 Jefferson Blvd.
Warwick, RI 02888

Re: Invenergy Thermal Development LLC/Clean River Energy Center Application, EFSB Docket NO. SB-2015-06, PUC Docket No. 4069

Dear Commissioners:

In anticipation of the Commission's review of testimony in this matter, and in accordance with the directive of the Energy Facilities Siting Board's Preliminary Decision and Order (p. 9) which mandates that:

> The Public Utilities Commission (PUC) with participation of the Division of Public Utilities and Carriers (Division), OER and the Division of Planning of the Department of Administration must render a single advisory opinion of the need for the Project and whether the Project is cost-justified consistent with the objective of ensuring that the construction and operation of the facility will be in compliance with all applicable laws, rules and regulations.

Please know that the Division of Planning's Statewide Planning Program has reviewed the proposed testimony to be offered in this matter by the Division and by OER and is in support of its content.

Sincerely,

Jared Rhodes
RI Statewide Planning Program, Chief

CERTIFICATE OF SERVICE

I certify that the original and four copies of this correspondence were filed with the clerk of the Public Utilities Commission, 89 Jefferson Blvd., Warwick, RI 02888, In addition, electronic copies of this letter were served via e mail on the service list for this Docket. I certify that all of the above occurred on **July 14, 2016.**

_____

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

PUBLIC UTILITIES COMMISSION

In Re:	Invenergy Thermal Development LLC	)	
	Application to Construct and	)	
	Operate the Clear River Energy	)	Docket 4609
	Center, Burrillville, Rhode Island	)	

PREFILED TESTIMONY OF

SETH G. PARKER

Summary:

The prefiled testimony of Mr. Parker addresses specific issues identified by the Energy Facility Siting Board ("EFSB") in its Preliminary Decision and Order in case SB-2015-06 regarding the Application for the Clear River Energy Center ("CREC") submitted by Invenergy Thermal Development LLC ("Invenergy"). These issues are (i) the need for the proposed Facility, (ii) whether it is cost-justified to the consumer, and (iii) whether cost-effective efficiency and conservation ("EE&C") opportunities provide an appropriate alternative. Mr. Parker was also asked to (iv) consider whether renewable resource development would be affected by CREC and (v) review and comment on testimony submitted by the Conservation Law Foundation ("CLF") on the issues of need and costs.

Mr. Parker generally concludes that (i) CREC is needed; (ii) CREC will reduce regional wholesale capacity and energy prices but not as much as Invenergy has claimed; (iii) CREC will lower electricity costs for Rhode Island consumers; (iv) cost-effective EE&C opportunities would not be impeded and should not be viewed as an alternative; (v) renewable resource development would not be impeded; and (vi) CLF's testimony reveals fundamental misunderstandings of the regional power system, contains calculation errors, and fails to recognize how the Rhode Island Public Utilities Commission ("PUC") determines need within the context of New England's competitive power system.

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INTRODUCTION

Q. Please state your name, title, and occupation.

A. I am Seth G. Parker, a Vice President and Principal of Levitan & Associates, Inc. ("LAI"). I joined LAI in 1998. I am an economic and financial manager with 38 years of international experience in power and fuel project development, evaluation, financing, and transactions.

Q. Please summarize your professional background and experience.

A. My responsibilities at LAI include modeling and analyses of utility and non-utility power and fuel projects, competitive market design, regulatory policy, contract structuring, power plant economics, and asset valuation assignments. Prior to joining LAI, I worked as a consultant and officer of Stone & Webster Management Consultants, Inc., where I was responsible for due diligence evaluations of proposed power, fuel, and infrastructure projects in the U.S. and abroad for various financial institutions. I also worked in the Treasurer's Office at Pacific Gas & Electric, and was involved in project development and financing activities at ThermoElectron Energy Systems and J. Makowski Associates, Inc.

My educational background includes an Sc.B. in Applied Mathematics / Economics from Brown University, and an M.B.A. in Finance / Operation Research from the Wharton Graduate School at the University of Pennsylvania. I taught undergraduate-level finance as an adjunct faculty lecturer, have taken additional coursework in Basic Gas Turbine Technology and International Political Economics, and regularly lecture at two Swiss universities. My resume is provided as Exhibit SGP-1.

Q. Please describe Levitan & Associates, Inc.

A. LAI is a management consulting firm specializing in power market design, power and fuel project evaluations, pipeline infrastructure, and competitive energy economics. Since its founding in

1989, LAI has conducted numerous assignments in New England and other markets throughout the U.S. and Canada on diverse matters pertaining to generation and transmission project evaluations, wholesale energy and capacity price forecasts, retail price impacts, competitive power market design, asset valuation, bulk power security, power and fuel procurements, contract structures, gas/electric interdependencies, natural gas infrastructure, and risk management. LAI's clients include utilities, generators, Independent System Operators ("ISOs"), Regional Transmission Organizations ("RTOs"), end-users, state regulatory commissions, and financial institutions. LAI is located at 100 Summer Street, Suite 3200, Boston, MA, 02110.

Q. Have you previously testified before the Rhode Island PUC?

A. Yes. I submitted expert witness reports and testified before the PUC on power market economics pertaining to the Block Island Offshore Wind Project, including the Power Purchase Agreement with Narraganset Electric.

Q. Did you prepare this testimony yourself?

A. I personally conducted or supervised the work of LAI staff that assisted me in preparing portions of the underlying analyses in my testimony and exhibits.

Q. On whose behalf are you offering this testimony?

A. This testimony is offered on behalf of the Division of Public Utilities and Carriers ("DPUC") and the Office of Energy Resources ("OER"), which are participating in this docket before the PUC in accordance with statutory requirements.

Q. What has the PUC been asked to provide to the EFSB?

A. In its Preliminary Decision and Order in its Docket SB-2015-06, the EFSB directed that various Rhode Island agencies and government subdivisions issue advisory opinions to support a final decision regarding the CREC Application. On page 15, the PUC was directed to "...render an advisory opinion as to (i) the need for the proposed Facility; (ii) 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 of the requirements of the laws, rules, and regulations; and (iii) whether cost-effective efficiency and conservation opportunities provide an appropriate alternative to the proposed Facility." In addition, the PUC was also directed, on page 9, to "...expressly consider...the adequacy and dependability of the natural gas supply to the facility" as part of the need determination. I have been retained to assist the DPUC and OER in addressing these issues on an independent basis.

Q. Did the DPUC and OER also ask you to consider CREC's impact on renewable resource development and to review and comment on testimony submitted by CLF?

A. Yes, I assessed the impact of CREC on Rhode Island's renewable resource initiatives and reviewed and commented on the pre-filed testimonies submitted by CLF witnesses Robert F. Fagan and Christopher T. Stix.

Q. Do you have particular knowledge about the Rhode Island and New England power markets?

A. Yes. I have conducted and participated in numerous economic and power market studies for ISO-NE participants during my career including: (i) evaluating the feasibility of converting the Salem Harbor station to natural gas; (ii) assessing the economics of the Deepwater Block Island offshore wind project; (iii) supporting the purchase of the Holyoke hydroelectric station; (iv) evaluating financial and power market issues of the Vermont Yankee nuclear plant; and (v) forecasting wholesale power market impacts for the New England Clean Power Link, a proposed 1,000 MW HVDC cable to import renewable power from Canada.

LAI has conducted additional studies of existing and proposed generation, transmission, and gas pipeline projects, environmental analyses, reliability assessments, and wholesale power procurements in Rhode Island and other New England states. In many cases, these projects raise

issues of need and, if constructed, would affect the region's wholesale energy and capacity markets that are administered by ISO-New England ("ISO-NE").

Q. What is ISO-NE and what are its responsibilities?

A. ISO-NE is the independent, not-for-profit company, authorized by the Federal Energy Regulatory Commission ("FERC"), responsible for the safe and reliable operation of the bulk power system, i.e. the generating plants and the high voltage transmission network, in New England. In particular, ISO-NE: (i) administers the competitive wholesale pricing markets for energy, capacity, and ancillary services under rules and regulations established through a regional stakeholder process and approved by FERC; (ii) coordinates energy flows across the transmission network; and (iii) conducts planning studies to ensure long-term system reliability.

CREC IS NECESSARY TO MEET THE NEEDS OF RHODE ISLAND AND THE NEW ENGLAND REGION

CREC Will Help Meet Local and ISO-NE Resource Adequacy Requirements

Q. What statutory criterion did the EFSB direct the PUC to address concerning the need for CREC?

A. The EFSB defined the criterion in Issue 1 on page 9 of its Preliminary Decision and Order 86: "Is the proposed facility necessary to meet the needs of the state and/or region for energy of the type to be produced by the proposed Facility?" This criterion is taken directly from §42-98-11(b) of the Rhode Island Energy Facility Siting Act.

Q. How does the PUC determine need in this context?

A. The PUC has long recognized that the determination of need must reflect the realities of the New England power system. In its November 24, 1998 Advisory Opinion to the Energy Facility Siting Board in Docket No. 2818 regarding the Hope Energy application ("Hope Opinion"), the PUC quoted the DPUC:

> Traditionally in Rhode Island, need determinations for new electric generating facilities have been performed using measure of projected supply vis a vis demand for the utility building or purchasing power from the plant... The Commission is well aware of the new era of competitive rather than regulatory economics.
>
> In this new era, determination of need for generating plants is to be performed by the free market rather than by regulators... Even if sufficient generation exists, replacement of inefficient old plants with clean, efficient new plants may have economic as well as environmental value. Absent a gap between supply and demand, new plants may still be considered "needed" by the region. In the end, it is the market that will supply the answers...

Q. Did the PUC endorse the DPUC's view on how the need for new generating plants should be determined?

A. Yes. On the bottom of page 7 in the Hope Opinion, the PUC referred back to its November 21, 1997 Advisory Opinion to the EFSB for the Tiverton combined cycle project and noted "'obvious inconsistencies and anachronisms" between Rhode Island's Energy Facilities Siting Act ("EFSA") and the Utility Restructuring Act of 1996 ("URA")..." The Utility Restructuring Act recognizes and promotes the benefits of competition in the electricity industry. In the Hope Opinion, the PUC went on to state "...we opined that the more recently enacted URA effectively repealed by implication the much older "need" assessment provisions of the EFSA (Id.). Our opinion on this issue has not changed."

Q. On what information did you rely to address the question of whether CREC is necessary to meet the needs of the state and/or the region?

A. I reviewed the information submitted by Invenergy in its Application regarding the claimed need for CREC, prepared data requests, and reviewed Invenergy's responses to understand the claim that CREC is needed. I also reviewed and analyzed ISO-NE's methodology for determining the region's Net Installed Capacity Requirement ("NICR"), Local Sourcing Requirement ("LSR"), the sloped demand curve used in Forward Capacity Auction 10 ("FCA 10"), and the results of FCA 10 in order to evaluate CREC's potential contribution to assure resource adequacy in New England via its participation in the ISO-NE capacity market.[1]

Q. How did Invenergy support the claim that CREC is needed?

A. Invenergy supported the need for CREC by claiming that it will help modernize and replace New England's aging generation infrastructure. Among the benefits that Invenergy claimed on page 2 of its October 28, 2015 transmittal letter to the EFSB, Invenergy claimed that CREC will:

> Modernize and replace aging generation infrastructure: the Facility will be the most efficient power generator in the New England market to date and will replace older, more polluting, less efficient and less flexible modes of power generation that the region currently relies upon.

Q. Does Invenergy claim that CREC will address market needs?

A. Yes. According to Invenergy, CREC will provide (i) capacity to help ISO-NE meet its reliability requirements and (ii) fast start and flexibility, i.e. high ramp rates, to help ISO-NE meet its operational requirements.

Q. Do you agree with Invenergy regarding the market needs and the CREC contribution to meeting them?

[1] The terms NICR and LSR are defined later on in this testimony.

A. In general, yes. ISO-NE procures installed capacity in the Forward Capacity Market ("FCM") to ensure resource adequacy, a critical reliability requirement. One of the two CREC units offered in FCA 10 cleared that auction and was assigned a year Capacity Supply Obligation ("CSO") for the Capacity Commitment Period June 1, 2019 to May 31, 2020. ISO-NE is depending on the first CREC unit starting on June 1, 2019.

In addition to providing capacity to assure resource adequacy, generating resources also provide fast start, flexibility, and other performance characteristics for ISO-NE to meet its operational requirements. As the electric industry and wholesale markets evolve, particularly due to the growing penetration of wind power and other renewable resources, these performance characteristics are becoming more important for ISO-NE's system operators to manage the New England bulk power system. CREC's performance characteristics should help ISO-NE meet its operational requirements.

Q. How does ISO-NE determine the capacity market needs?

A. Prior to every FCA, ISO-NE probabilistically calculates the NICR, i.e. the regional capacity procurement target, to establish the amount of capacity needed to meet New England's reliability requirements for the associated Capacity Commitment Period.[2] ISO-NE set the NICR for FCA10 at 34,151 MW. ISO-NE also determined if there would be any import-constrained zones within the region.

Q. Was Rhode Island located in an import-constrained zone?

A. Yes, Rhode Island was modeled within an import-constrained zone in the last two FCAs. ISO-NE modeled two Capacity Zones in FCA 10 for 2019/2020: the import-constrained

[2] ISO-NE's reliability criterion is described as the probability "...of disconnecting non-interruptible customers (a loss of load expectation or 'LOLE') , on average, no more than once every ten years (an LOLE of 0.1 days per year)" on page 9 of ISO-NE's Installed Capacity Requirement, Local Sourcing Requirements and Capacity Requirement Values for the System-Wide Capacity Demand Curve for the 2019/20 Capacity Commitment Period of January 2016 ("2019/20 ICR Values Report").

Southeastern New England ("SENE") Capacity Zone and the Rest-of-Pool Capacity Zone.[3] SENE includes Northeastern Massachusetts/Boston, and Southeastern Massachusetts/Rhode Island ("SEMA/RI"). ISO-NE modeled SEMA/RI as an import-constrained zone in FCA 9 for 2018/2019, partly due to the announced retirement of Brayton Point. In response to that announcement, transmission upgrades were planned in Rhode Island to increase SEMA/RI's import capability. Those upgrades, along with the addition of new capacity resources, will relieve SEMA/RI import constraints, but the combined SENE zone remains import-constrained.

Q. Does capacity have a higher value in an import-constrained capacity zone than in other zones?

A. Potentially, yes. If there is insufficient capacity within the zone and the LSR becomes binding at some price in the FCA, the constrained zone may clear at a capacity price higher than for the rest of the ISO-NE system, providing a price signal for more investment in that zone, e.g. SEMA/RI or SENE, and making qualified capacity resources such as CREC more valuable.

Q. Have capacity prices in Rhode Island cleared above the rest of the ISO-NE system?

A. Yes. SEMA/RI cleared at a price above the rest of the ISO-NE system in FCA 9, demonstrating that capacity located in Rhode Island can be more valuable. Such high prices are consistent with the competitive structure of New England's wholesale electricity markets and provide signals to incentivize new investment at the appropriate location and time. Over the long run, as new resource investments are made and/or demand changes, these capacity prices should stabilize across the region.

Q. Can ISO-NE procure capacity in excess of the NICR or LSR?

A. Yes, ISO-NE can, and did, procure capacity in excess of the NICR for FCA 10. Under the system-wide sloping demand curve construct, ISO-NE may clear an FCA with either an excess or a

[3] The Rest-of-Pool includes the remainder of the ISO-NE system, in this case everywhere but SENE.

deficiency of capacity compared to the NICR. ISO-NE cleared a total of 35,567 MW of capacity resources, 1,416 MW over the NICR, in FCA 10. The SENE Capacity Zone cleared 11,349 MW of resources, 1,321 MW over its LSR.

Q. Do consumers benefit from procuring more capacity than what is required for meeting the NICR reliability criterion?

A. Yes. Capacity in excess of NICR provides higher reliability for the region, which benefits consumers. For example, according to Table 4 of the ISO-NE 2019/20 ICR Values Report, if 37,053 MW had been procured in FCA 10, the reserve margin (without Hydro Quebec) would have been equal to 24.1%, which corresponds to the LOLE of 1-in-87. More capacity resources would benefit consumers by lowering the probability of blackouts and other service interruptions. The sloped demand curve construct recognizes this reliability value of such capacity. High reserve margins would probably result in lower energy prices as well, to the extent that at least some of the additional capacity have competitive operating costs. Moreover, the more capacity that clears, the lower the capacity clearing price and the total capacity cost for consumers.

Q. Has FERC recognized the reliability benefits associated with capacity procurement under the sloped demand curve construct?

A. Yes. In paragraph 30 of its Order in Docket ER-14-1639 approving the ISO-NE system-wide sloped demand curve, FERC stated:

> As to the specific parameters of the demand curve (i.e., the price cap and foot), ISO-NE has demonstrated through its Monte Carlo simulation analysis that its proposed sloped demand curve can reasonably be expected to elicit sufficient capacity to meet its stated reliability objective of a 1-in-10 LOLE on average over time. We disagree with parties that suggest that meeting the 1-in-10 LOLE standard on average over time is unjust and unreasonable and that the demand curve must be designed to meet

the 1-in-10 LOLE standard in all years... As noted above, the Filing Parties' proposal sets the reliability objective, which we accept here. [4]

In its Order, FERC accepted that the amount of procured capacity under a system-wide sloped demand curve construct may fluctuate around the NICR, so that in some years ISO-NE could have excess capacity while in others it could have a deficiency. FERC accepted that the 1-in-10 LOLE reliability criterion should be met, on average, over the long term.

Q. Does New England need all the capacity, including CREC unit 1, which cleared FCA 10 to assure reliability?

A. Yes, it does. In response to the DPUC data request ("DR") 3-9, Invenergy and its consultant PA Consulting Group, Inc. ("PA") stated that the "...system need is determined by the fulsome FCM process and not by simply procuring capacity at, or above, the NICR." They further explained that "In clearing FCA 10, by definition, the CREC was determined to be part of the most cost effective solution to meet ISO-NE's system needs."

Q. Do you agree with Invenergy and PA that all the capacity that cleared FCA 10 is needed for reliability?

A. Yes, I do. ISO-NE assigned CSOs to all of those resources, including CREC unit 1, so they are needed for reliability by definition, even capacity above the NICR that provide a positive reliability value and cost savings for New England consumers.

Q. Does the fact that SENE cleared above the LSR in FCA 10 have any impact on CREC's need determination?

A. No. The SENE LSR value represents the minimum amount of capacity needed in that capacity zone given its projected load and limited transmission import capabilities. Adding CREC

[4] LOLE is defined in footnote 2 on page 10.

unit 1 to the SENE resource mix enhances the reliability of SENE, Rhode Island, and the entire region.

According to ISO-NE's methodology, the LSR is calculated as the capacity needed to satisfy the higher of the Local Resource Adequacy ("LRA") requirement or the Transmission Security Analysis ("TSA") requirement.[5] In FCA 10, the SENE LSR was set based on the TSA requirement, which was higher than the LRA requirement. ISO-NE performed a series of deterministic studies under stressed system conditions to determine the SENE TSA requirement at a level sufficient to cover most reasonably anticipated events, but that does not guarantee that all of the available resources located within SENE will always meet the system needs. Therefore, any resources procured in excess of the SENE TSA requirement would provide needed reliability in light of transmission limitations.

Q. Does the fact that CREC unit 2 did not clear FCA 10 have any impact on the determination of need?

A. No. According to page 9 of PA consultant Ryan Hardy's prefiled testimony, CREC unit 2 will be offered in the next FCA 11. If and when CREC unit 2 clears an FCA and receives a CSO, the need would be confirmed because ISO-NE would rely on it to economically meet the region's reliability need. EFSB approval of the Invenergy Application would effectively allow the competitive generation market, acting through the FCAs, to determine the need for CREC unit 2. This would be consistent with the PUC's Hope Opinion. If CREC unit 2 does not clear, it will most likely not be constructed and Rhode Island ratepayers will not bear any costs or realize any benefits.

Q. Do you agree with the PA's projections that CREC unit 2 will clear FCA 11?

[5] According to ISO-NE's 2019/20 ICR Values Report, page 18, "The LRA is a probabilistic resource adequacy analysis of the minimum amount of capacity that needs to be located in an import-constrained zone when modeling the New England system as two zones – the zone under study and the 'Rest of New England.' The TSA Requirement is an analysis that ISO-NE uses to maintain operational reliability when reviewing de-list bids of resources within the FCM auctions. The system must meet both resource adequacy and transmission security requirements..."

A. I do not have enough data to agree or to disagree with PA. I reviewed the PA capacity market forecast, including the projections that CREC unit 2 will clear FCA 11, but I was not provided with all the inputs and assumptions used in its proprietary model. Without this data, and the postulated supply curve in particular, it is not possible to make any definitive conclusions on PA's projection that CREC unit 2 will clear FCA 11. Moreover, FCA clearing prices are difficult to predict due to unforeseeable changes in plant technology, ISO-NE procedures, power plant development and retirements, state and federal regulations, etc. However, the chances of CREC unit 2 clearing in FCA 11 will be enhanced if it has a lower capital cost (due to avoiding costs for shared plant facilities that will be constructed for CREC unit 1) that lowers its capacity price bid.

Q. Can you offer an example of the unforeseeable changes that make it difficult to forecast FCA clearing prices?

Yes. On June 28, 2016, FERC issued an Order in Docket ER16-1434-000 accepting the ISO-NE and NEPOOL Demand Curve Design Improvements proposal to modify the sloped system demand curve used in FCAs. The straight line sloped demand curve used in FCA 10 will be replaced by a substantially different hybrid demand curve comprised of a curved segment, a horizontal segment, and a straight sloping line segment over a transitional period from FCA 11 through FCA 13. Sloped demand curves will be applied on a zonal level as well. This is a material change that will make forecasting wholesale capacity clearing prices difficult.

CREC Will Help Meet ISO-NE Operational Requirements

Q. What are ISO-NE's current and future operational challenges that need to be met by generators?

A. In 2010, ISO-NE launched the Strategic Planning Initiative ("SPI") to address threats to the reliable supply of electricity. These threats included (i) increasing reliance on natural gas as an interruptible fuel source for power plants and the consequential potential for reduced operational performance during stressed system conditions, (ii) the large number of aging, economically-challenged, oil- and coal-fired generators that provide fuel diversity to the resource mix, and (iii) greater future needs for flexible supply resources to balance the intermittent output of renewable resources. These operational challenges remain and may persist well into the future.

Q. What operational characteristics of generators are considered most valuable from the ISO-NE perspective?

A. Consistent with the SPI objectives, ISO-NE values flexibility, dependability, and diversity of its resources. If system conditions change unexpectedly and rapidly, e.g. following a contingency or an abrupt and unforeseen change in intermittent resources energy output, system operators must rely on flexible, fully dispatchable resources. These flexible resources should be capable of fast start and high ramps within a wide range of output, as well as of providing voltage and frequency control. In many cases, these operational responses must occur quickly and automatically because there is very little time for communications between the system operators and the resource operators.

In addition, ISO-NE values dual-fuel capability or other fuel arrangements that contribute to fuel assurance and can mitigate the effects of any gas transportation interruptions that may occur. Finally, ISO-NE values resources located in import-constrained capacity zones more highly than in export-constrained zones where resource output may be restricted during stressed system conditions.

Q. Does Invenergy assert that CREC will be capable of meeting such operational needs?

A. Yes, it does. According to Invenergy's October 28, 2015 transmittal letter to the EFSB, "The fast start and flexible generation capability will support the integration of new and existing renewable generation onto the power grid." Invenergy went into more detail on page 8 of its Application:

> The New England ISO needs to balance the variable output from wind and solar resources, in order for the power system to operate properly. In order to do this, the ISO must hold generating units in reserve, or have access to units that have highly flexible operating characteristics that allows them to adjust output to meet changing conditions. This means that the generation fleet needs to evolve as more renewables are added. This includes the ability of generators to react to rapid and sizeable swings in electricity output as well as having additional fast-start capacity held in reserve. The CREC Project supports these security, cost effectiveness and sustainability goals recommended in the RI State Energy Plan by complementing and supporting the introduction of more renewable generation resources.

Q. Has Invenergy provided any details regarding the fast start ability of CREC?

A. Invenergy did not provide any specific information about the plant in its Application, but in its response to DPUC DR3-1, Invenergy confirmed that the CREC combined cycle units will utilize 7HA.02 gas turbines manufactured by General Electric ("GE"). Invenergy stated that the start-up time to minimum emissions compliance load, i.e. 103 MW on gas and 156 MW on oil, is 13 minutes for cold, warm, or hot starts, and that GE will contractually guarantee these start-up times.[6]

Q. Why is the particular gas turbine model important?

A. Gas turbines are at the heart of a combined cycle plant. Gas turbines burn virtually all of the fuel and generate about two-thirds of the total plant output. The exhaust from the gas turbines generates steam that in turn generates additional output from the steam turbine-generator. Thus the operating characteristics of the gas turbine selected by Invenergy are critical in determining the

[6] The minimum emissions compliance load is the minimum load at which a gas turbine can operate stably and safely while satisfying air emission limits.

performance of the CREC combined cycle units in the context of the ISO-NE system and CREC's impact on wholesale capacity and energy prices.

Q. Has Invenergy provided any details regarding the flexibility of CREC?

A. In its response to DPUC DR3-1, Invenergy claimed CREC will have a ramp rate, e.g. be able to increase or decrease output, by 50 MW/minute per gas turbine. I agree that this ramp rate can be considered highly flexible and would help ISO-NE accommodate the variable output of the growing amount of wind and solar resources in the region. Invenergy stated that GE will contractually guarantee these ramp rates.

Q. In summary, do you agree with Invenergy that CREC will be capable of meeting ISO-NE's operational needs?

A. Now that I know CREC will utilize GE 7HA.02 gas turbines and their performance characteristics, I anticipate that CREC will be a flexible generator capable of meeting ISO-NE's operational needs. As a combined-cycle generator with a very low heat rate and consuming low-cost gas, I also expect it will be economically dispatched much of the time rather than being utilized as a peaking or quick-start resource. Moreover, CREC will have back-up fuel oil that may be economic if gas prices spike.

ISO-NE obtains ancillary services from resources to meet its operational needs; CREC should be able to provide many of those ancillary services.[7] According to discussions with Invenergy, CREC will be able to provide 30-minute operating reserves and 10-minute spinning reserves, but will not be called upon to provide 10-minute non-spinning reserves. CREC will also be able to provide regulation and voltage control ancillary services, but is not planning to provide

[7] ISO-NE's 2015 Annual Markets Report, May 25, 2016, discussed the following ancillary services: real-time operating reserves, forward reserves, frequency regulation, and the winter reliability program.

black-start capability.[8] Based on the available information, I agree with Invenergy that CREC will be capable of meeting many of ISO-NE's operational needs.

CREC Will Have a Reliable and Dependable Fuel Supply

Q. What is your view on the additional issue raised by the EFSB in Issue 1: "...the reliability of the resulting power...including the adequacy and dependability of the natural gas supply to the facility?

A. According to Invenergy's responses to DPUC DR3-3 through 3-5, CREC will interconnect directly to the Algonquin Gas Transmission mainline through a dedicated quarter-mile lateral that will avoid potential delivery interruptions due to constraints on the lateral. The Algonquin mainline runs from northern New Jersey through Connecticut, northwestern Rhode Island, and onward to Boston. It is one of the primary interstate pipeline systems serving New England.

CREC plans to have a three-part fuel supply: (i) gas supply and firm transportation sufficient to operate one combined cycle unit at full load; (ii) gas supply and interruptible transportation with no more than 20 days of interruptions annually to operate the second unit at full load; and (iii) two, one million gallon storage tanks for back-up fuel oil, enough to operate one unit for 72 hours at full load.

For the first unit, Invenergy proposed to obtain 75,000 Dth/day of firm supply from a marketer (or other supplier) and firm transportation through an agreement with Algonquin for deliveries to Burrillville. As an option, Invenergy proposed obtaining a firm supply and transportation from one or more marketers who hold firm transportation capacity on Algonquin. In either case, CREC unit 1 would have firm, year-round gas supply and transportation.

[8] Information provided by Invenergy during the phone call with LAI on June 7, 2016.

For the second unit, Invenergy believes that its firm transportation agreement with Algonquin would give it "...rights to a Priority Secondary Interruptible Supply..." from Algonquin for an additional 75,000 Dth/day. Invenergy explained that this is a higher level of service than standard interruptible service. Alternatively, Invenergy would enter into a gas supply and transportation agreement with a gas marketer with limited transportation interruptions (5 to 20 days per year) based on the marketer's gas supply and transportation rights. The resulting mix of firm and interruptible gas delivery arrangements, backed by onsite liquid fuel oil supplies, should provide reliable fuel supplies for CREC.

Q. Does Invenergy have an agreement with Algonquin that sets out the commitment to connect the plant and provide firm transportation?

A. Yes, Invenergy executed a Memorandum of Understanding ("MOU") with Algonquin that lays out the general principles for Algonquin to provide firm transportation and delivery for 75,000 Dth/day from Ramapo, New York to Burrillville, Rhode Island, including the dedicated lateral, to serve the first CREC unit. To accomplish this, Algonquin would hold an "open season" to accommodate other bidders looking for firm transportation via incremental expansion on Algonquin's mainline in the same time frame. The MOU is not a binding commitment but is standard practice at this point in CREC's development.

Q. Would the gas quantity envisioned under the MOU with Algonquin be sufficient for one CREC unit at full load?

A. In most cases, yes. Invenergy provided Predicted Unit Performance data as Exhibit 1 to its response to DPUC DR3, which indicates that each CREC combined cycle unit will require the

following quantities of natural gas assuming new and clean conditions:[9] [begin confidential information]

Summer w/o duct firing	[redacted] Dth/day	
Summer w/ duct firing	[redacted] Dth/day	
Winter w/o duct firing	[redacted] Dth/day	[end confidential information]

Under typical summer conditions without duct firing, the MOU quantity should be sufficient to operate one combined cycle unit for 24 continuous hours. It would be extremely unlikely for CREC to operate at full load with duct firing for a 24 hour period in summer months. It would also be unlikely that CREC would operate at full load for a 24 hour period winter months. Therefore the MOU quantity should be sufficient under virtually all conditions.[10]

Q. Would CREC be dependent upon expansions to the Algonquin mainline being completed in time?

A. Yes. Invenergy's first firm supply and transportation option assumes Algonquin conducts an open season process for an expansion on its mainline. This process would be subject to a FERC certification process and the expansion would require state and local construction permits. Such open season processes occur regularly and should not be problematic for relatively small expansions such as this.

Under Invenergy's second option for firm supply and transportation in which Invenergy made arrangements with marketers holding firm transportation capacity rights on the Algonquin system, this open season process would be avoided. For example, Invenergy could enter into a gas management arrangement where the counterparty would release firm transportation capacity in the

[9] ISO-NE is a summer-peaking system, so duct firing would be much more likely during summer months than winter months. Hence the Unit Performance data provided by Invenergy did not include winter operations with duct firing.
[10] Degradation over time results in lower fuel requirements, so is not an issue.

secondary market. Some of that capacity could be dependent on other pipeline expansion projects currently being developed by Algonquin:

(i) The Algonquin Incremental Market ("AIM") project will increase deliveries into New England by 342,000 Dth/day. AIM has received all of its permits and approvals, is under construction, and is expected to be completed later this year.

(ii) The Atlantic Bridge ("AB") project is proposed to increase deliveries through New England and into the Canadian Maritimes by a further 132,700 Dth/day. AB is still under development and is making progress. On May 2, 2016, FERC issued an Environmental Assessment that determined AB would not cause any significant harm, a key step in receiving its FERC certificate, which is expected later this year. Algonquin expects AB to be completed by November 2017.

Q. Please clarify how the Algonquin open season expansion differs from the AIM and AB projects.

A. In order for Invenergy to obtain the firm gas transportation as described in the MOU, Algonquin would hold an open season for expanding its mainline in which Invenergy would bid for 75,000 Dth/day. This open season expansion is separate from the AIM and AB expansion projects that are fully subscribed, i.e. gas utilities and other shippers have already entered into agreements for all of the firm transportation capacity that was offered.

Q. Could the utilities, marketers, and other shippers holding firm transportation capacity on the AIM and AB projects release some of that capacity?

A. Yes, they could release some of their capacity on a firm basis or subject to recalls, i.e. interruptions, during the winter months. In the event of an interruption, Invenergy would have to utilize a portion of its two million gallons of back-up fuel oil to ensure both CREC units could operate.

Q. Is Invenergy's claim that interruptible transportation would be limited to 5 to 20 days per year an advantage compared to other interruptible arrangements?

A. Yes. The Algonquin mainline is heavily utilized and can have much more than 20 days of interruptions during winters with long, very cold conditions. Invenergy's proposed transportation arrangement is designed to limit CREC's exposure to interruptions to no more than 5 to 20 days.

Q. Is CREC's fuel storage tank plan reasonable and appropriate for a reliable and dependable fuel supply?

A. Yes. CREC will include two tanks, each holding one million gallons of ultra-low sulfur diesel fuel oil, that Invenergy claimed should be sufficient to operate one combined cycle unit for 72 hours. I have confirmed that two full tanks would be sufficient for at least 72 of operation utilizing Invenergy's Unit Performance data during winter months.

Q. What is ISO-NE's Pay-for-Performance construct, and will CREC's back-up fuel supply enable it to meet those requirements?

A. After an extended cold spell in January, 2014, ISO-NE became concerned that capacity resources were not performing adequately to ensure system reliability during scarcity conditions, i.e. when there is insufficient energy and reserves. Gas transportation interruptions were a particular problem as pipelines served their customers who had firm transportation rights. To address this problem, ISO-NE proposed and FERC accepted the Pay-for-Performance construct to provide financial incentives under a two-settlement capacity payment structure to reward capacity resources that provide energy and reserves during scarcity conditions. Having a back-up fuel oil supply should enable CREC to provide energy and reserves in such conditions and thus be eligible for the additional capacity payments. Pay-for-Performance is expected to be in effect on March 15, 2018.[11]

[11] http://www.iso-ne.com/static-assets/documents/2015/09/er15-2208-000.pdf.

CREC IS COST-JUSTIFIED AND WILL PROVIDE ECONOMIC BENEFITS

CREC is Cost-Justified and Will Be a Low Cost Producer

Q. What statutory criterion did the EFSB direct the PUC to address concerning CREC's cost of capacity and energy?

A. The EFSB defined Issue 2 on page 9 of its Preliminary Decision and Order 86: "Is the proposed facility (A) cost-justified and can it be expected to produce energy at the lowest reasonable cost to the consumer..." This criterion, taken from §42-98-11(b) of the EFSA, must be understood in the context of New England's deregulated and competitive generation market as I explained earlier.[12] Parenthetically, while both the EFSA and the EFSB's Preliminary Decision and Order 86 refer only to energy, I interpreted the criteria to include capacity as well as energy. In any event, Invenergy did not address these criteria directly in its Application.

Q. Is the cost-justified criterion appropriate in New England's deregulated and competitive generation market?

A. No, not since the regional power industry was restructured. With few exceptions, generators in New England are merchant plants and not owned by utilities; their costs and risks are not directly borne by ratepayers. Merchant generators, such as the proposed CREC, must compete in the ISO-NE's competitive power markets. Ratepayers only pay for capacity and energy that ISO-NE determines to be cost-effective through its wholesale procurement and pricing mechanisms.

The competitive power market here in New England will determine whether CREC is cost-justified. If its capacity and energy bids are accepted, CREC will provide and be paid for those products, effectively determining that CREC is cost-justified. If Invenergy believes that projected

[12] The PUC explicitly recognized this in the Hope Opinion, understanding that the EFSA was enacted prior to electric utility restructuring in New England and prior to Rhode Island's Utility Restructuring Act.

revenues will be sufficient to cover CREC's operating costs and allow it to recover its investment costs, CREC will be built. If Invenergy believes its revenues will not be sufficient, CREC will not be built. In either event, Invenergy, not Rhode Island consumers, will be at risk.

Q. Why is the lowest reasonable cost criterion not appropriate in New England's deregulated and competitive generation market?

A. Generating plants with different technologies typically have different cost structures, e.g. capital cost, fixed operating expenses, and variable operating expenses, yet all of these plants may be considered cost-justified because of their particular attributes, e.g. flexibility, quick start capability, reliability, fuel, and price stability, and the needs of the power systems in which they operate. For example, a gas-fired combined cycle plant (such as CREC) could provide responsive performance and low energy costs (assuming low gas costs) while wind projects may have higher capital costs but lower operating costs and zero emissions. A simplistic criterion of lowest reasonable cost fails to account for all of these factors.

Q. Did Invenergy directly address these criteria or provide another argument to support its request for EFSB approval?

A. Invenergy neither explicitly claimed that CREC is cost-justified nor would produce capacity and energy at the lowest reasonable cost. Instead, in its Application and in the prefiled testimony of Ryan Hardy, Invenergy claimed that CREC would lower wholesale capacity and energy prices in New England and that Rhode Island consumers would benefit from these lower prices. The Application also claimed that CREC's operational characteristics would be beneficial to the region as more wind resources are developed. Those operational benefits were addressed earlier in my testimony.

Q. Will CREC be a low cost generator in New England?

A. Yes. First, I agree with Invenergy's claim on page 6 of its Application that CREC will "...provide new, highly advanced generating technology that will be one of the most efficient generators in New England..." This claim is supported by Invenergy's selection of GE 7HA.02 gas turbines, consistent with Hardy Exhibit RH-3 (the PA energy memo of April 22, 2016). A combined cycle plant utilizing such H-class gas turbines will be more efficient than most existing generation plants in New England. Second, an efficient plant that burns natural gas (that itself is relatively inexpensive in most hours of the year) should make CREC a low-cost generator in this region. Plus, as I mentioned earlier, the back-up fuel oil will mitigate occasional gas price spikes should they occur.

Rhode Island Consumers Will Benefit from Lower Wholesale Capacity and Energy Prices

Q. How did you evaluate Invenergy's claims that CREC would lower wholesale capacity and energy prices in New England and Rhode Island consumers would benefit from such lower prices?

A. I reviewed the information submitted by Invenergy with the estimated capacity and energy savings for Rhode Island consumers and prepared data requests and reviewed Invenergy's responses. It appears that the assumptions and calculations of capacity and energy savings were entirely prepared by Invenergy's consultants, PA.

Q. Did you conduct an independent estimate of reduced wholesale capacity and energy prices?

A. No, it was decided that I should analyze the estimates PA prepared for Invenergy, identify strengths and weaknesses in those calculations, and render an opinion for the PUC.

Q. Please describe Invenergy's initial estimate of the capacity and energy cost savings.

A. On page 119 of its Application, Invenergy estimated "In the first four years of operation (2019-2022), market projections indicate that CREC would save Rhode Island ratepayers $284 million in capacity and energy costs, or more than $70 million annually." This initial estimate was prepared by PA, which forecasted wholesale capacity and energy prices for New England under two scenarios, with and without CREC beginning June 1, 2019, and then compared those results to estimate CREC's impact on wholesale capacity and energy prices. PA claimed:

> The additional CREC capacity would result in capacity cost savings of nearly $220 million in this timeframe, with energy cost savings of approximately $65 million as CREC displaces less efficient 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.

Q. What support did Invenergy provide for its initial estimate of the capacity and energy cost savings?

A. The Application included two PA memos as Supplemental Exhibits to support these estimates, but they do not accomplish this. The first memo of July 29, 2015 described PA's methodology for forecasting capacity prices and how the forecasted capacity price for FCA 10 compared to the actual capacity price for FCA 9. However, it did not sufficiently explain how PA calculated the expected decline in wholesale capacity prices due to CREC. The second memo of June 16, 2015 summarized PA's general methodology for forecasting wholesale energy prices and presented its projection of CREC's energy revenues. It also did not sufficiently explain how PA calculated the expected decline in wholesale energy prices due to CREC.

Q. According to Mr. Hardy's testimony, will CREC's output be 850-1,000 MW as stated in the Application?

A. It appears that CREC output will be at the upper end of this range. According to plant data provided with Invenergy's response to DPUC DR3-1, the net plant output (with both combined cycle units after internal plant uses and losses) will be [redacted] MW [confidential] firing on gas during the summer months. In addition, the combined cycle units will be able to burn an additional quantity of gas in the heat recovery steam generator (referred to as duct firing) to increase steam production and net plant output to [redacted] MW [confidential] in the summer months. During the winter months, the net plant output will be [redacted] MW on gas and [redacted] MW on oil.[confidential]

These output values are based on CREC being in "new and clean" condition, before any degradation takes place. Plant performance values are often provided this way, especially for design and contract performance purposes. Consistent with Invenergy's response to DPUC DR3-1, degradation will naturally occur over time and reduce plant output and efficiency. Periodic major maintenance will restore plant output and efficiency close to the original new and clean values. Even with average degradation, I expect the CREC output to be at the upper end of the output range in the Application.

Q. Please describe how wholesale capacity and energy prices are determined in New England.

A. Prices for capacity and energy, New England's two most important wholesale power products, are set by ISO-NE under FERC-approved competitive pricing mechanisms. Capacity is the ability of generation resources to produce energy when needed to meet consumer demand; demand-side resources accomplish the same goal by reducing consumer demand. Energy is the actual electricity generated and delivered to consumers to meet their demand. These products are procured in the ISO-NE wholesale markets for ultimate retail sale by utilities and other load-serving entities.

Wholesale capacity prices are set annually three years in advance via FCAs administered by ISO-NE. All generators that clear in the FCA, i.e. whose offers are selected by ISO-NE, are awarded CSOs that obligate them to submit daily energy offers in the Capacity Commitment Period three years hence.[13] The capacity revenues paid to generators are a function of the wholesale capacity price set in the FCA, the resource's capacity, and the resource's performance in that future Capacity Commitment Period.

Wholesale energy prices are primarily set daily in ISO-NE's Day-Ahead Market.[14] Generators submit hourly energy bids and are paid for the energy they deliver in each hour in which they are dispatched by ISO-NE. These wholesale capacity and energy prices are locational in that they may differ throughout New England to reflect transmission and other operational constraints.

Q. How would changes in wholesale capacity and energy prices affect Rhode Island consumers?

A. ISO-NE collects monies from utilities and other load-serving entities in New England to pay generators and other capacity resources for capacity and energy. Thus every consumer's bill includes a portion of ISO-NE's wholesale capacity and energy costs.[15] Rhode Island consumers pay their share of the wholesale energy and capacity costs based on their usage.

Q. Did Invenergy revise its initial estimated reductions in wholesale capacity and energy costs?

A. Yes, Invenergy submitted prefiled testimony of Ryan Hardy of PA on April 22, 2016, who revised the initial estimates in light of an expected delay in the second CREC unit from June 1, 2019

[13] Under ISO-NE rules, existing capacity resources submit "bids" and proposed resources submit "offers" in FCAs; I have tried but may not have always used these terms accurately in my testimony.

[14] ISO-NE also operates a Real Time Market for energy that continuously balances supply and demand, but those payments to generators are a fraction of the Day-Ahead energy payments.

[15] Consumer bills also include ISO-NE ancillary service costs and retail costs for delivery via the local distribution system and other local utility services.

to June 1, 2020 due to its failure to be selected in ISO-NE's FCA 10. Mr. Hardy revised the forecasted capacity cost savings downward from $220 million to $170 million and the energy cost savings downward from $65 million to $41 million. Mr. Hardy also provided revised PA memos as Exhibits RH-2 and RH-3 that updated the PA memos provided with the Application.

Invenergy Exaggerated the Capacity Cost Reduction Benefit

Q. Please specify Invenergy's updated estimate of capacity cost savings due to CREC.

A. In his prefiled testimony that included Invenergy's updated estimate of capacity cost savings due to CREC, PA consultant Ryan Hardy estimated the savings to be $170 million in total over four Capacity Commitment Periods, June 1, 2019- May 31, 2023.[16] He provided Exhibit RH-2 to support his estimate. Additional confidential supporting materials were presented in response to DPUC DR2-1.

Q. Does Mr. Hardy's memo, Exhibit RH-2, support PA's estimated capacity cost savings due to CREC?

A. No. This memo duplicated PA's July 29, 2015 memo in the Application that described its methodology for forecasting wholesale capacity prices and added a brief review of FCA 10 results along with an outlook for FCA 11. This memo noted that the actual FCA 10 capacity price was very close to PA's forecast in its July 29, 2015 memo included with the Application. However, as with the original July 29, 2015 memo, Mr. Hardy's memo provided very little useful information describing how wholesale capacity prices decline due to CREC, so it does not support Invenergy's estimated capacity cost savings for Rhode Island consumers.

[16] A Capacity Commitment Period, June 1 through May 31 of the following year, is the annual period for which ISO-NE awards CSOs.

Q. In light of the lack of support for Invenergy's estimate of capacity cost savings for Rhode Island consumers, how did you assess the reasonableness of the estimate?

A. I prepared three sets of data requests for Invenergy that provided answers to some of our questions. In response to our first set of data requests, Invenergy provided a spreadsheet that summarized the change in wholesale capacity prices due to CERC for the period 2019-2022 and how much Rhode Island consumers would pay. In response to more detailed questions in our second set of data requests, Invenergy provided more information about its capacity pricing methodology. Although PA was unwilling to provide certain information because of confidentiality concerns, I spoke to Mr. Hardy and other PA consultants who furthered my understanding of their methodology. I also reviewed data requests submitted by other participants and Invenergy's responses.

Q. What was Invenergy's estimate of the reduction in wholesale capacity costs due to CREC?

A. Mr. Hardy estimated that CREC unit 1 reduced FCA 10 wholesale capacity prices by [redacted]/kW-month [confidential] for the 2019/20 Capacity Commitment Period, and CREC unit 2 would reduce FCA 11 wholesale capacity prices by [redacted]/kW-month [confidential], as summarized in Table 1 below. [begin confidential information]

Table 1. Rhode Island Wholesale Capacity Prices ($/kW-month)

FCA	Commitment Period	Without CREC	With CREC	Reduction due to CREC
FCA 10	2019/20	[redacted]	[redacted]	[redacted]
FCA 11	2020/21	[redacted]	[redacted]	[redacted]
FCA 12	2021/22	[redacted]	[redacted]	[redacted]
FCA 13	2022/23	[redacted]	[redacted]	[redacted]

[end confidential information]

Q. Was PA's assumption that the capacity savings will occur over a four-year period of time reasonable?

A. Yes. In Invenergy's response to DPUC DR2-1, Invenergy provided values for 2019-2022 that indicate virtually all of the wholesale capacity cost reduction would occur during the first four years of operation. On page 119 of its Application, Invenergy alluded to the fact that future capacity development after CREC becomes operational would affect the persistence of the wholesale capacity cost reduction, i.e. the capacity price reduction will cease once the ISO-NE capacity market "rebalances" with CREC. This is a reasonable assumption.

Q. Was PA's methodology for calculating the reduction in wholesale capacity prices reasonable?

A. For the most part, yes. PA essentially simulated the FCA pricing mechanism by starting with previous FCA results, adding in new offers based on their net revenue requirements, and removing resources that have announced their retirement. This is a reasonable approach.

Q. Are PA's estimated reductions in wholesale capacity prices reasonable?

A. I believe that PA's estimates are exaggerated. First, PA explained that it assumed a vertical capacity supply curve in the region where it crosses the demand curve.[17] ISO-NE does not reveal supply offer data or illustrate the FCA supply curves that are made up of these confidential offers, so it is not easy to reconstruct the actual supply curve slope. By assuming a vertical supply curve, however, PA maximized the capacity price reduction, $1.55/kW-month, due to CREC unit 1. If the supply curve was sloped in the region where it intersected the demand curve, the capacity price reduction would necessarily be lower. At the other extreme, a horizontal supply curve segment would result in CREC unit 1 having virtually no impact on the FCA 10 clearing price. As I discuss

[17] Conference call between LAI and PA on May 12, 2016.

later in my testimony, I suggest that neither of the two extreme cases should be relied upon in determining the capacity price reduction attributable to CREC unit 1.

Second, ISO-NE explained that by accepting a non-rationable capacity resource, i.e. a resource whose entire offer quantity must be accepted, in FCA 10, ISO-NE had to reject a set of less expensive (under $7.03/kW-mo) offers that would not have provided enough capacity to allow the supply curve to intersect with the demand curve without CREC unit 1. With CREC unit 1, however, they would have increased the excess of capacity, so ISO-NE rejected them.[18] Without CREC unit 1, some or all of those rejected resources would have cleared and the FCA 10 capacity clearing price would likely have been higher than $7.03/kW-month. As a result, the savings due to CREC unit 1 would have been lower than estimated by PA.

Third, PA did not explain how CREC could cause a wholesale capacity price reduction of [confidential] [redacted]/kW-month in FCA 11, more than double the reduction of [confidential] [redacted]/kW-month in FCA 10. PA must have again assumed a vertical supply curve in the range where it intersects with the demand curve, which would maximizing impact of CREC in FCA 11. PA's [confidential] [redacted]/kW-month price reduction could only be possible if the price-setting alternative resource (absent CREC) would be offered at a price of [confidential] [redacted]/kW-month (see Table 1 above). However, there would likely be some new resources that would fill the CREC gap of 970 MW at a lower price. PA's implicit assumption that only CREC could offer at [confidential] [redacted]/kW-month and all other new resources would offer at a much higher price is unrealistic.

Fourth, CREC unit 2 may not clear FCA 11, particularly if the clearing price is lower than the FCA 10 price. In this case, the capacity benefits attributable to CREC unit 2 will be delayed until it clears a future FCA.

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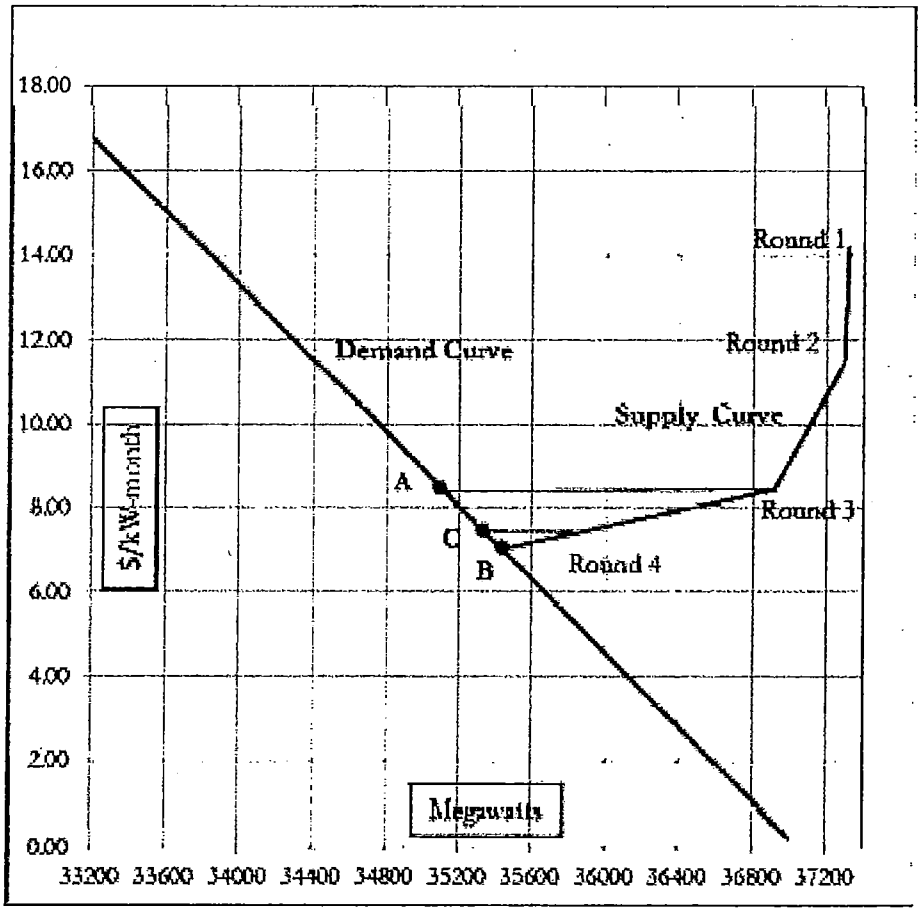
[18] This is described in more detail on page 8 of Robert Ethier's testimony, Attachment C in FCA 10 Results in FERC Docket ER16-1041.

Q. Regarding your first criticism, what makes you believe that the supply curve is not vertical?

A. I have plotted the descending clock auction data ISO-NE provided for FCA 10 in the ISO-NE's Forward Capacity Auction Results Filing in FERC Docket ER16-1041 dated February 11, 2016 ("FCA 10 Results"), i.e. the capacity prices and quantities remaining at the end of the first four auction rounds. As you can see from Figure 1 below, the portion of the supply curve lying above the demand curve has a slope that is neither flat nor vertical. I note, however, that ISO-NE does not provide data for the alternative resource offers that have dropped out in the last round when the price was declining from $8.50/kW-mo; therefore I cannot reconstruct the supply curve with complete accuracy.

Figure 1. FCA 10 Demand and Supply Curves



Q. How did you utilize this data to check PA's estimated capacity price reduction for FCA 10?

A. I performed the following steps to analyze PA's estimated capacity price reduction for FCA 10. First, PA estimated that without CREC unit 1, FCA 10 would have cleared at [confidential] [redacted]/kW-month, a reduction of $1.55/kW-month, but this would not have been possible now that we know the third round of FCA 10 ended at $8.50/kW-month. At most, the savings due to CREC unit 1 would be based on the difference between the prices of Points A ($8.50/kW-mo) and B ($7.03/kW-mo), or $1.47/kW-month.

Second, if CREC unit 1 had not been offered, some of the resources that dropped out in the last round would have stayed in the auction and FCA 10 would have cleared at some price in the range between Point A ($8.50/kW-month with 1,733 MW of excess capacity) after round 3 and Point B ($7.03/kW-month) after round 4. Without CREC unit 1, the FCA 10 supply curve would have shifted to the left by 485 MW and the market would have cleared somewhere between Point A and Point B. Since 485 MW is less than one-third of the excess capacity after round 3, it is reasonable to believe that FCA 10 would have cleared closer to the bottom end of the range, i.e. closer to $7.03/kW-month. The resulting price is illustrated by Point C in Figure 1.

Third, capacity that was rejected due to CREC unit 1 would have stayed in FCA 10, shifting the supply curve to the right and further lowering the clearing price. The net effect of my analysis is that the actual wholesale capacity benefit for Rhode Island consumers for FCA 10 is likely around one-quarter to one-half of PA's estimate.

Q. Were you able to analyze PA's estimated capacity price reduction for FCAs 11 – 13?

A. No, I could not without detailed modeling data from PA and ISO-NE's parameters for those future auctions that have not yet been established.

Q. In summary, is the PA estimate of capacity cost savings due to CREC reasonable?

A. My criticisms of PA's approach, e.g. assuming a vertical supply curve that maximizes the wholesale capacity price reduction, applies to PA's total wholesale capacity savings estimate of $170 million for 2019-2022. I cannot tell if the actual savings would be one-quarter to one-half of PA's total savings estimate, per my analysis of FCA 10. In summary, I believe the actual wholesale capacity savings would be less than PA estimated, but would still provide a material savings for Rhode Island consumers. Importantly, while the PUC has been presented with a range of potential capacity savings stemming from CREC, it must be recognized that *any* savings ultimately realized as a result of constructing CREC will accrue to consumers without shifting investment risk on to them. This is a key benefit of utility restructuring and competitive wholesale markets, which Rhode Island adopted through its Utility Restructuring Act of 1996.

Invenergy's Estimated Energy Cost Reduction Appears Reasonable

Q. Please confirm Invenergy's updated estimate of energy cost savings due to CREC.

A. In his prefiled testimony, PA consultant Ryan Hardy estimated the savings to be $41 million over the four years 2019-2022. He provided Exhibit RH-3 to support his updated estimate.

Q. Does the PA memo Exhibit RH-3 support PA's updated estimate of energy cost savings due to CREC?

A. No. Exhibit RH-3 duplicated most of PA's original June 16, 2015 memo in the Application that described its methodology for forecasting wholesale energy prices. It also updated PA's projection of CREC's energy revenues, but as with the original memo, Exhibit RH-3 did not provide any useful information describing how wholesale energy prices decline with CREC. Thus it does not support Invenergy's updated estimated energy cost savings for Rhode Island consumers.

Q. In light of Exhibit RH-3 not supporting Invenergy's estimate of the reduction in wholesale energy prices, how did you assess the reasonableness of the estimate?

A. I prepared data requests for Invenergy that provided answers to this and other questions. I also reviewed data requests submitted by other participants and Invenergy's responses.

Q. Did Invenergy provide a more detailed estimate of the reduction in wholesale energy costs due to CREC?

A. Yes. Based on the data provided in response to DPUC DR2-1, Invenergy estimates that CREC unit 1 will reduce wholesale energy prices by an average of [confidential] [redacted]/MWh for the seven month period June-December 2019 and more in succeeding years, assuming CREC Unit 2 becomes operational in June of 2020, as summarized in Table 2 below. [begin confidential information]

Table 2. Rhode Island Wholesale Energy Prices ($/MWh)

Calendar Year	Without CREC	With CREC	Reduction due to CREC
2019	[redacted]	[redacted]	[redacted]
2020	[redacted]	[redacted]	[redacted]
2021	[redacted]	[redacted]	[redacted]
2022	[redacted]	[redacted]	[redacted]

[end confidential information]

Q. Is the four-year period in which Mr. Hardy estimated wholesale energy price reductions the same four-year period for his estimated wholesale capacity price reductions?

A. Not exactly. Mr. Hardy's wholesale capacity price calculations were over a four-year period of June 1, 2019 through May 31, 2023. However, his wholesale energy price calculations were over a three and one-half year period of June 1, 2019 through December 31, 2022. This is a minor discrepancy.

Q. Will Rhode Island consumers benefit from reduced wholesale energy costs beyond 2022?

A. Yes. Unlike the capacity market that will rebalance after a few years, I would expect that CREC will displace higher cost and less efficient generation resources for many years due to its high efficiency relative to other power plants in the ISO-NE system.

Q. Were PA's methodology and key modeling assumptions for calculating the reduction in wholesale energy prices reasonable?

A. Yes. According to the PA memo provided as Exhibit RH-3, PA utilized an industry-standard chronological dispatch simulation model, AURORAxmp, to forecast hourly energy prices with and without CREC. LAI utilizes the same model and finds it to be reliable. The key assumptions specified in Exhibit RH-3 regarding market structure, fuel prices, environmental regulations, supply and demand forecasts, the cost and performance of new entry, and transmission all appear to be reasonable.[19] While there are many other assumptions that go into an energy price forecast, I am satisfied that the key assumptions in Exhibit RH-3 are reasonable. Moreover, since the goal of this forecast is the change in wholesale energy prices, rather than the absolute price, any small disagreement in these assumptions would not be critical.

Invenergy's Claim CREC Will Reduce Electricity Costs for Rhode Island Consumers Is Vague But the Savings Should Be Meaningful

[19] PA assumed all future combined cycle plants would have heat rates typical of F-class gas turbines, i.e. be less efficient, than CREC's H-class gas turbines, thereby maintaining CREC's operating cost advantage throughout PA's 20-year forecast. This is not significant in this docket because Invenergy presented estimated wholesale energy savings for only four years.

Q. Did you review Invenergy's related claim on page 8 of the Application that "Rhode Island ranks 7th highest in average price of electricity to end-use customers in the nation" and "CREC is expected to result in a reduction of electricity prices for end-use customers"?

A. Yes. I briefly reviewed Invenergy's claim and generally agree that Rhode Island has high electricity costs. According to data presented by the US Energy Information Agency, Rhode Island had the 9th highest average cost in 2013 and the 5th highest average cost in 2014. However, I found Invenergy's claim to be somewhat vague. First, the price of electricity for Rhode Island consumers shown in Table 3.2-1 of the Application includes wholesale and retail costs. As I explained throughout my testimony, CREC will lower wholesale capacity and energy costs somewhat, but will not affect the retail portion of consumer bills. Second, Invenergy did not estimate how much the average electricity price will go down for consumers, so it is difficult to assess how Rhode Island's ranking will be impacted by CREC.

Q. Did you try to estimate the significance of the consumer savings due to CREC?

A. Yes, in a very rough fashion. The US Energy Information Administration reported that total electricity sales to Rhode Island consumers were $1.3 billion in 2015.[20] In his prefiled testimony, Mr. Hardy estimated that CREC would provide $210 million in savings over four years, or about $52 million per year in 2019-2022. Ignoring the difference in timing, that dollar savings represents about a 4% savings for consumers. When adjusted to reflect PA's exaggerated wholesale capacity price savings and the likely growth in the dollar value of electricity sales as higher gas prices drive up wholesale energy prices, the percentage savings for Rhode Island consumers would be small but meaningful.

[20] Electric Power Monthly, February 2016, Table 5.5.B.

Q. Will the consumer savings occur "...under a wide range of reasonable factual assumptions involving the types and costs of fuel to be used" as directed by the EFSB on page 10 of its Preliminary Decision and Order in its Docket SB-2015-06?

A. Yes. The range of expected delivered gas prices is relatively narrow over the next few years due to continued shale gas production, and there's no evidence that CREC's fuel plan will change. Rhode Island consumers should benefit from a small but meaningful reduction in wholesale capacity and energy costs under any reasonable set of fuel assumptions.

CREC WILL NOT IMPEDE COST-EFFECTIVE ENERGY EFFICIENCY, CONSERVATION, OR RENEWABLE RESOURCE ALTERNATIVES

Q. What criteria did the EFSB direct the PUC to address concerning EE&C alternatives?

A. In its instructions to non-jurisdictional agencies, the EFSB requested the PUC to opine on "...whether cost effective efficiency and conservation opportunities provide an appropriate alternative to the proposed Facility."

Q. What are Rhode Island's long term EE&C goals?

A. The Rhode Island State Planning Council formally adopted Energy 2035 - Rhode Island State Energy Plan ("Energy 2035") that describes proposed policies to maximize energy efficiency in order to "...achieve its vision of a secure, cost-effective, and sustainable energy future" by achieving a number of consistent long term goals. EE&C is critical, according to page 60 of Energy 2035:

> Energy efficiency is the state's centerpiece policy for achieving the Energy 2035 Vision. The state is already a nationally recognized leader in energy efficiency, due to its "Least-Cost Procurement" mandate for electric and natural gas resource acquisition planning. Least-Cost Procurement ensures that Rhode Island maximizes

the use of the lowest-risk, lowest-cost, and arguably most sustainable energy resource available: energy efficiency.

As Rhode Island looks ahead to 2035, the State should reaffirm its commitment to leadership in energy efficiency by instituting an economy-wide, all-fuels approach to least-cost resource acquisition. To begin with, Rhode Island should continue securing all cost-effective electric and natural gas energy efficiency by renewing the existing Least-Cost Procurement mandate past 2018.

Q. Was Least-Cost Procurement extended past 2018?

A. Yes, the Rhode Island General Assembly extended it to 2024 during the 2015 legislative session.

Q. How did Invenergy address this issue of EE&C alternatives?

A. In section 8.0, Conformance with Rhode Island Energy Policy on page 122 of its Application, Invenergy claimed that CREC is "...fully in conformance with Rhode Island Energy Policy" as defined by Energy 2035:

> Energy 2035 has many goals and policies that will set the energy programs in Rhode Island for the near future. Energy 2035 emphasizes as key to the overall program initiatives for increasing energy efficiency, need for integration of renewables, need to achieve reductions in greenhouse gases and need to modernize the electric grid to support transfers of energy within the region and ensure the overall reliability of the energy supply within New England.

Invenergy addressed the question of whether cost-effective EE&C opportunities provide an appropriate alternative more directly in section 10.1.2, Renewable Technology Alternatives, on page 128 of its Application. Invenergy described renewable resource as well as EE&C alternatives, and highlighted Rhode Island's leadership in end user EE. However, Invenergy stated that it is "...highly unlikely, or feasible, to rely exclusively on additional end user improvements to energy

efficiency as an alternative to the need for new generation..." given potential plant retirements and load growth.

Q. Does Rhode Island have a statutory requirement for implementing cost-effective EE&C programs?

A. Yes. Rhode Island's Comprehensive Energy Conservation, Efficiency, and Affordability Act of 2006 (General Law §39-1-27.7) established the state's landmark "Least-Cost Procurement" policy. According to page 78 of Energy 2035:

> The Act created a groundbreaking mandate termed "Least-Cost Procurement" – a policy that requires Rhode Island electric and natural gas distribution companies to invest in all cost-effective energy efficiency before the acquisition of additional supply. This strategy is "least-cost" because energy-saving measures—such as higher-efficiency lighting, HVAC systems, and appliances; insulation; air sealing—cost approximately 4 cents per kWh over their lifetime while electric supply costs between 8 cents and 12 cents per kWh.

Q. Is there evidence that Rhode Island electric utilities are implementing cost-effective EE&C programs?

A. Yes. National Grid, the principal electric utility serving Rhode Island, has been implementing cost-effective EE&C measures to satisfy the PUC's Least-Cost Procurement requirements in the Three-Year Energy Efficiency Procurement Plan for 2015-2017 per Order 21781 issued in Docket 4522 on December 19, 2014. Under Least-Cost Procurement, annual electric and natural gas energy efficiency programs are developed to achieve the full economic potential of cost-effective demand-side load reductions. National Grid filed its most recent Energy Efficiency Program Plan for 2016 with the PUC in Docket 4580 on October 15, 2015, in which it proposed to invest $87.5 million for electric EE&C. According to that document, National Grid expected each $1 of costs to provide $1.77 in benefits for Rhode Island consumers, and "The

electric plans are expected to produce lifetime savings of 1,792,431 MWh, which translates into lifetime bill savings of approximately $320 million."

Q. Does ISO-NE account for planned Rhode Island's EE&C programs?

A. Yes. ISO-NE makes Passive Demand Resources, i.e. EE, adjustments to its long-term load forecast in its system planning studies and incorporates the results in the annual Capacity, Energy, Loads, and Transmission ("CELT") and Regional System Plan reports. The 10 year EE forecast is developed by ISO-NE based on the projected budgets of state-sponsored EE programs.

Q. What are the projected levels of EE penetration in Rhode Island for the next 10 years?

A. According to the 2016 Energy-Efficiency Forecast 2020-2025 developed by ISO-NE, EE programs in Rhode Island will reduce summer peak loads by 110 MW and have 747 GWh in cumulative energy savings over the period from 2020 through 2025. These projections are incremental to the near-term (through 2019) EE projections that are based on the CSOs assigned to the EE resources in the FCM.

Q. Are Rhode Island's long-term projected EE investments presumed to be cost-effective?

A. Yes. The EE projections in the ISO-NE forecast are based on the most recent state-approved EE budgets and are assumed to continue in future years. The New England states, including Rhode Island, are committed to EE programs that are determined to be cost-effective.

Q. Will CREC unit 1 clearing FCA 10 affect the cost-effective EE programs planned for 2019/2020 and beyond?

A. No. ISO-NE's selection of CREC unit 1 may have resulted in rejecting new EE capacity resources, but those rejected resources would be less cost-effective than CREC; otherwise they

would have been selected in lieu of CREC unit 1 in FCA 10.[21] Cost-effective EE programs are typically infra-marginal, i.e. do not set the capacity clearing price, and clear the FCAs as price-takers.

Q. Are there any potential cost-effective EE&C resources that have not cleared an FCA that can be procured instead of CREC and provide commensurate benefits?

A. I am not aware of any incremental EE&C resources that could adequately replace CREC's capacity. Moreover, under Least-Cost Procurement, annual electric and natural gas energy efficiency programs are developed to achieve the full economic potential of cost-effective demand-side load reductions. By definition, therefore, all cost-effective EE&C resources are already being procured in Rhode Island.

Q. Do you have an opinion whether cost-effective EE&C opportunities provide appropriate alternatives to CREC?

A. Yes. I believe that CREC will not hinder the development of cost-effective EE&C opportunities, because National Grid is required to, and is in fact implementing, cost-effective EE&C measures pursuant to Rhode Island regulations. EE&C opportunities will continue to be implemented regardless of CREC and should not be viewed as alternatives to CREC.

Q. Do you have an opinion whether renewable resource development will be affected by CREC?

A. Yes. Rhode Island currently has an active suite of renewable resource programs. A prime example is the 30 MW Block Island Wind Farm, the nation's first commercial offshore wind project, whose impacts will be felt throughout the entire New England region and not just in Rhode Island. In addition, I am aware of the following specific renewable resource programs:

(i) Under the Rhode Island Distributed Generation Standard Contracts program (Chapter 39-26.2 of the Rhode Island General Laws), National Grid was directed to enter into

[21] ISO-NE rejected a set of smaller offers in FCA 10 but did not define their type or location.

fifteen year contracts for 40 MW of in-state wind, solar PV, and anaerobic digestion projects by year-end 2014.

(ii) The Rhode Island Renewable Energy Growth Program (Chapter 39-26.6) was designed to expand the Distributed Generation Standard Contracts program by an additional 160 MW by allowing customers to sell their generation output under long-term tariffs at fixed prices through year-end 2019.

(iii) The Rhode Island Renewable Energy Standard (Chapter 39-26) requires all electricity suppliers to provide a certain percentage of their retail sales from renewable energy resources and was recently extended and expanded from 14.5% by 2019 to 38.5% by 2035.

(iv) Rhode Island also supports renewable resource development through a Net Metering program (Chapter 39-26.4) for behind-the-meter systems up to 10 MW.

(v) Rhode Island exempts residential and manufacturing properties that install renewable energy systems from tangible property taxes on systems; a single statewide tangible tax rate for commercial renewable energy systems will be established by OER by November 30, 2015 and must be used by all municipalities by January 2, 2017. (Chapters 44-3-3 and 44-5-3).

(vi) Under the Affordable Clean Energy Security Act (Chapter 39-31), National Grid is authorized to participate in the issuance of regional competitive solicitations for clean energy resources and transmission, and is actively engaged in a multi-state procurement effort pursuant to that statute that was reviewed and approved by the PUC in Docket 4570.

I see no reason why any of the Rhode Island renewable resource programs listed above would be negatively affected by CREC.

Q. Have renewable resources participated and cleared in FCAs?

A. Yes. For example, ISO-NE's FCA 10 Results lists 51 new wind and solar projects that were awarded CSOs for the 2019/20 Capacity Commitment Period. Importantly, all new wind and solar resources qualified by ISO-NE for FCA 10 actually cleared according to the ISO-NE FERC Informational Filing posted on February 23, 2016. The total offered and cleared new wind and solar

capacity was about 73 MW, well below the 200 MW/year limit established by FERC for the Renewable Technology Resources exempt from the Minimum Offer Price Rule ("MOPR") that would otherwise trigger a review and potential mitigation of their capacity bids. This exemption allows any unused portion of the 200 MW not subject to the MOPR to be carried forward for up to three years for a possible total of 600 MW. Accordingly, as much as nearly 528 MW of new renewables can enter in FCA 11 without price offer review and mitigation, so they are virtually guaranteed to clear, with or without CREC.[22] This further supports my opinion that CREC will not interfere with Rhode Island's renewable resource programs.

CLF WITNESS FAGAN MADE SERIOUS ERRORS IN HIS CONCLUSIONS ON NEED

Mr. Fagan Does Not Fully Understand ISO-NE's Reliability Need and Capacity Procurement Process

Q. Did you review the pre-filed direct testimony of Robert M. Fagan of Synapse Energy Economics on behalf of CLF concerning the reliability need of CREC and what were your general conclusions?

A. Yes, I reviewed Mr. Fagan's testimony. He appears to have ignored the PUC's Hope Opinion and does not seem to fully understand ISO-NE's capacity procurement process. He over-estimated the role of distributed resources and renewables in the resource mix ISO-NE can rely upon to ensure system reliability, and under-estimated the role of conventional generating resources. Consistent with his views, he erroneously concluded that CREC is not needed for reliability.

[22] ISO-NE Presentation at NEPOOL Reliability Committee FCA 10 2019/2020 CCP Results Summary and Trends dated March 23, 2016.

Q. What did Mr. Fagan claim was ISO-NE's reliability need?

A. On page 4 of his testimony, Mr. Fagan claimed "The ISO NE forward capacity market (FCM) auction is not indicative of reliability need, or even economic need, for the plant." On pages 11-12, he claimed ISO-NE's "Physical reliability needs are defined, in the near-term...by the installed capacity requirement for the New England system as a whole, and by the local sourcing requirement."

Q. Do you agree with Mr. Fagan's understanding of ISO-NE's reliability need?

A. No. Mr. Fagan views the ICR as a fixed requirement, consistent with the vertical demand curve utilized in capacity procurements prior to FCA 9. Since then, ISO-NE and its stakeholders have recognized the reliability and economic benefits of having more capacity at lower prices, i.e. the sloped demand curve used in FCA 9 and FCA 10. The ICR (or NICR) is no longer a fixed procurement target or a single need determinant; it is the FCA parameter corresponding to the probabilistically-determined capacity required to meet the 1-in-10 LOLE reliability criterion.

Q. Please explain the capacity need under the sloped demand curve.

A. The FCAs are designed to clear the amount of capacity that the ISO-NE system needs to ensure reliability while minimizing total capacity costs to be paid by consumers. As I explained earlier, the sloped demand curve allows ISO-NE to procure capacity in excess of the NICR. Capacity resources that clear are assigned CSOs by ISO-NE and are therefore needed. At the same time, capacity resources offered at prices exceeding the clearing price do not clear, are not assigned CSOs, and are not needed.

Q. Does this concept of capacity need with a sloped demand curve contradict Mr. Fagan's understanding?

A. Yes. Mr. Fagan claimed on page 4 that ISO-NE's "...most recent forward capacity auction cleared (or, established a financial obligation for) 1,416 MW more that the reliability requirement....

This result indicates a surplus capacity in excess of reliability requirements." Mr. Fagan's view of need as a fixed quantity is consistent with the vertical demand curve that was eliminated prior to FCA 9.[23] Moreover, he fails to recognize the reliability benefits or the cost-saving benefits of procuring capacity in excess of the NICR with a sloped demand curve.

Q. On pages 11-12, Mr. Fagan claims that the fact that CREC unit 1 cleared FCA 10 does not necessarily mean that CREC is needed for reliability. Do you agree?

A. No. FCA 10 cleared over 35,000 MW of new and existing capacity and assigned them CSOs. Mr. Fagan claimed that the CSO is merely "...a financial obligation – but that it doesn't mean the resource is physically needed for reliability." This ignores ISO-NE's longstanding capacity procurement process to ensure resource adequacy. Moreover, in suggesting that CREC's CSO "...can be sold or traded, to other parties..." Mr. Fagan ignores the fact that this would still leave New England with a "surplus" of "unneeded" capacity.

As I stated earlier, a CSO is an ISO-NE-assigned obligation, whether CLF portrays it as physical or financial. CREC unit 1 has a CSO and is therefore needed for system reliability. If and when CREC unit 2 clears an FCA and is awarded a CSO, it too will be needed for system reliability.

Mr. Fagan's Understanding of Need Is Inconsistent with the PUC's Current Position

Q. Did Mr. Fagan address need consistent with the PUC's position as expressed in the Hope Opinion?

A. No, Mr. Fagan did not address need as it is expressed in the Hope Opinion that reflects Rhode Island's Utility Restructuring Act and New England's competitive wholesale power market construct.

[23] FERC Order Accepting Tariff Revisions in Docket ER14-1639-000, May 30, 2014.

Q. Is Mr. Fagan's belief that need is determined by the NICR and LSR consistent with the PUC's old view of need and inconsistent with the PUC's today's view of need?

A. Yes, Mr. Fagan appears to view need as it was expressed in the EFSA, prior to the restructuring of the New England power system, i.e. as a fixed quantity. Since the Hope Opinion, the PUC has changed its view of need and no longer considers it to be a fixed quantity. In the Hope Opinion, the PUC stated "...we opined that the more recently enacted URA effectively repealed by implication the much older 'need' assessment provisions of the EFSA (Id.)." New England's competitive wholesale capacity market utilizes a sloped demand curve that allows ISO-NE to procure more capacity than the NICR, which benefits Rhode Island customers. The parameters of the sloped demand curve are carefully selected to ensure that the 1-in-10 LOLE reliability criterion is met on a long term, average basis. Accordingly, the NICR and the LSR values are the long term reliability targets that do not need to be precisely met in each individual FCA.

Mr. Fagan's Claim that EE and BTM PV Could Displace the Output of CREC is Wrong and Does Not Obviate the Need for CREC

Q. What are Mr. Fagan's projections of EE and BTM PV in New England and Rhode Island? Do you agree with him?

A. On page 13 of his Testimony, Mr. Fagan stated: "Energy efficiency and behind-the-meter solar PV result in declining net peak load and declining annual net energy needs in New England and Rhode Island... The existence of these resources alone – energy efficiency and behind-the-meter solar PV – lowers forecast net demand."

I agree that EE and BTM PV lower the forecasted peak load, but only BTM PV lowers the NICR which is used in the FCAs. EE is counted as a capacity resource in the FCM; ISO-NE does not reduce the NICR by EE to avoid double-counting.

Q. Do you agree with Mr. Fagan that "Energy efficiency and behind-the-meter solar PV result in declining...annual net energy needs..." and eliminate the need for CREC?

A. No. Some EE measures are designed to shift consumption from on-peak time periods onto the off-peak time periods with no effect on the total energy consumption. More importantly, ISO-NE already includes EE as Passive Demand Resources and BTM PV to reduce peak demand in its FCAs.

Q. Do you have any observations on Mr. Fagan's discussion of historical data and forecasts for net peak load and annual energy starting on page 12?

A. Yes. First, historical net peak load and annual energy data (Fagan Figures 1 and 2) are interesting but not germane to the PUC's determination of need. That determination should be in light of future conditions. Second, Mr. Fagan spends a lot of time discussing the 2016 CELT forecast of annual gross and net energy for load (Figures 3 – 6) but capacity needs are driven by the net peak load forecast (Figures 7 and 8). Forecasts of gross and net energy for load are not germane to ISO-NE's need for capacity. The NICR forecast, which probabilistically incorporates the peak load forecast, is germane.

Q. On page 20, Mr. Fagan claimed "To the extent new grid-scale renewable resources are built, the net energy needs from conventional natural gas-fired resources would decline even more..." Do you agree?

A. This statement is consistent with ISO-NE's economic dispatch of resources as I discuss in more detail below. However, reliability need is driven by peak load requirements, not energy.

Moreover, even if more renewables are built, their inherent intermittency would increase ISO-NE's need for flexible and responsive resources, like CREC.

Q. Did Mr. Fagan address the ISO-NE operational reliability needs in his testimony?

A. No, he did not. As I explained earlier, I believe CREC will be a valuable component of the bulk power system that can be used to compensate for the intermittent energy output of BTM PV and renewable resources in New England.

Q. On pages 20 and 24, Mr. Fagan claimed that EE, BTM PV, and renewables can "...displace the energy otherwise provided by the proposed Invenergy plant." Do you agree?

A. No, this concept is inconsistent with the way the ISO-NE works. These resources can reduce ISO-NE's overall energy needs, but cannot displace energy from a particular plant. EE and BTM PV reduce energy and peak load requirements, while renewable resources (assuming low variable costs) will always be dispatched before fossil-fuel fired plants (ignoring locational requirements, reserves, and other security constraints). None of these resources displace the energy output of a particular plant. Additional low cost energy in the ISO-NE system would reduce the output from virtually all of the more expensive energy sources, not just CREC. I note, however, that EE, BTM PV, and renewables are not always available to displace energy demand, so conventional, dispatchable resources will always be required to maintain system reliability. In any event, if CREC is not dispatched as often as Invenergy claims, then it would be a problem for Invenergy, not Rhode Island consumers.

Q. On page 22, Mr. Fagan expressed his concerns about the "putative" need for CREC if the system peak load declines. Do you share Mr. Fagan's concerns?

A. No. First, in the near-term, new resources can clear in the FCAs if their capacity offers are low enough, regardless of peak load and NICR growth. Second, many plants have retired in New

England and will continue to retire, increasing the opportunity for new resources to clear even with a declining NICR. Third, Mr. Fagan's claim that the peak load could decline in the future is inconsistent with ISO-NE's forecast.

In the long-term, after CREC becomes operational, the FCM process will determine whether CREC will be needed or not. If CREC clears in future FCAs and is awarded CSOs, it will be needed. If CREC fails to get a CSO in the future, it will not be needed and Invenergy would be at risk, not Rhode Island customers.

Q. On pages 24-27 Mr. Fagan claimed that "...the solar PV forecast contained in the current 2016 CELT forecast is conservative..." which will put "...downward pressure on the need for new capacity resources." Do you agree?

A. I am reluctant to second-guess ISO-NE's forecast of BTM PV. This forecast was vetted through a regional stakeholder process in which all stakeholders could participate. ISO-NE's monthly BTM PV forecast was included on pages 27-28 of the 2019/20 ICR Values Report and was accepted by FERC. I do not believe Mr. Fagan has greater insight in future BTM PV development on New England than ISO-NE.

Mr. Fagan's Opinions on Long-Term Resource Forecasts Are Not Relevant to the DPUC Determination of Need

Q. On page 28, Mr. Fagan claimed: "ISO-NE regional planning forecasts of capacity requirements do not indicate any specific need for the Invenergy plant." Do you agree?

A. Mr. Fagan presented a straw man argument, since these forecasts are not resource-specific. ISO-NE is not a stakeholder and is not biased for or against any technology or resource category. ISO-NE administers the FCA where all capacity resources compete on a level field.

Q. In Figure 12, Mr. Fagan provided ISO-NE's projected resource surplus/shortage data in the Capacity Commitment Periods from 2020/2021 to 2024/2025 and claimed there is a "...resource surplus beginning 2020, and into the middle of the next decade." Do you agree?

A. No, Mr. Fagan mischaracterized the ISO-NE data. First, I note Mr. Fagan's data indicates ISO-NE's peak load is growing from 30,182 MW in 2020/2021 to 31,455 MW in 2024/2025. Second, the resource surplus is relative to the NICR, and we've already explained that ISO-NE can and does procure capacity in excess of the NICR for the benefit of New England consumers. Only by ignoring ISO-NE's adoption of a sloped demand curve could Mr. Fagan claim the resource surplus indicates no need for CREC.

Third, footnote (d) of Mr. Fagan's Figure 12, which is ISO-NE's System-Wide Resource Needs, states that "additional resources would be required if additional resources retired or less capacity imports obtain CSOs." As I've pointed out, there have been some significant retirements of sizeable power generating facilities in recent years, and more are possible. According to page 11 of ISO-NE's 2016 Regional Electricity Outlook, "More than 4,200 MW of the region's nongas generating capacity has retired or plans to retire soon." These plants include Salem Harbor, Vermont Yankee, Pilgrim, Brayton Point, Mt. Tom, and Norwalk. In addition, ISO-NE considers an additional 6,000 MW to be at risk of retiring, including Yarmouth, Merrimack, Newington, Schiller, Mystic 7, West Springfield, Canal, Middletown, Montville, New Haven, and Bridgeport 3. Mr. Fagan should not assume that the region's current resource surplus will persist "...into the middle of the next decade."

Q. In his final claim, Mr. Fagan claimed that Invenergy did not "...examine long-term resource issues...to any level of detail." Do you agree?

A. This is another straw man argument. First, Invenergy was not required or directed to examine long-term resource issues. Second, CREC unit 1 was awarded a CSO in FCA 10; ISO-NE is now relying on CREC unit 1 to commence operations on June 1, 2019. Third, ISO-NE's capacity procurement process, designed to assure system reliability, is conducted for one year at a time, three years in advance of the Capacity Commitment Period. ISO-NE does not make long-term resource commitments.

CLF WITNESS STIX MADE SERIOUS ERRORS ON CREC CAPACITY BENEFITS AND OFFERED NO SUPPORT FOR HIS CONCLUSION ON ENERGY BENEFITS

Mr. Stix Does Not Understand ISO-NE's Capacity Procurement Process

Q. Did you review the pre-filed direct testimony of Christopher T. Stix of CLF and what were your general conclusions?

A. Yes, I reviewed Mr. Stix's testimony. He appears to have some fundamental misunderstandings of ISO-NE's capacity procurement process, some of them serious, which leads me to question his calculations of consumer savings. While he and I agree that Invenergy's estimated savings for Rhode Island consumers are likely exaggerated, I disagree with many of Mr. Stix's analyses and conclusions.

Q. What is your first observation about Mr. Stix's testimony?

A. Mr. Stix focused a large part of his testimony on Invenergy's initial $280 million savings estimate instead of Invenergy's updated estimate of $210 million. He eventually acknowledged that Invenergy provided an updated estimate but criticized Invenergy for not correcting "...its gross error in a timely way." As we know, Invenergy witness Hardy presented the updated savings

estimate in his testimony of April 22, 2016. I believe this timing issue is minor and does not warrant further discussion.

Q. What is your next concern about Mr. Stix's testimony?

A. Mr. Stix appears to have a fundamental misunderstanding of ISO-NE's capacity procurement process. On page 8 where he discussed FCA 10, Mr. Stix claimed that the amount of "...capacity it needs and wants to procure in the upcoming FCA...is called the Installed Capacity Requirement (ICR). The ICR is the largest amount of electricity that ISO believes it could possibly require for system reliability at the time of year when electricity load is greatest."

First, as a point of clarification, the FCM capacity requirement is the NICR, not the ICR as is labeled by Mr. Stix. The NICR takes into account the reliability contribution of Hydro Quebec. The ICR for FCA 10 was 35,126 MW; the NICR was 34,151 MW, or 975 MW lower. This is a minor issue of terminology.

Mr. Stix's second mistake is more serious when he claims "The ICR is the largest amount of electricity that the ISO believes it could possibly require for system reliability..." In fact, the reverse is true. Section III.12.1 of the ISO-NE Tariff defines the ICR as follows:

> The ISO shall determine the Installed Capacity Requirement such that the probability of disconnecting non-interruptible customers due to resource deficiency, on average, will be no more than once in ten years. Compliance with this resource adequacy planning criterion shall be evaluated probabilistically, such that the Loss of Load Expectation ("LOLE")...shall be no more than 0.1 day each year.

ISO-NE establishes the ICR as the *minimum* amount of capacity to meet the 1-in-10 reliability standard in light of total forecasted load requirements for the New England Control Area. According to page 15 of the 2019/20 ICR Values Report, ISO-NE uses the GE Multi-Area Reliability Simulation Model ("MARS"), a sophisticated "...computer program that uses a sequential

Monte Carlo simulation to probabilistically compute the resource adequacy of a bulk electric power system by simulating the random behavior of both load and resources."

Third, he compounded his misunderstanding by stating on page 9 "...the ISO had determined that during CCP-10...electricity load in New England would go above 34,151 MW, on average less than once every 10 years..." This is a gross misinterpretation of the 1-in-10 LOLE reliability criterion. Mr. Stix wrongfully equates the ICR to the peak load not being exceeded more than once in 10 years. The 1-in-10 LOLE reliability criterion is the probability of disconnecting non-interruptible load due to a resource deficiency accounting for all available measures, including activating reserves, voltage reduction, voluntary load curtailment, full utilization of the tie benefits, and requesting emergency support from the neighboring control areas. The 1-in-10 LOLE reliability criterion has virtually nothing to do with the probability that load will be above the ICR. In fact, ISO-NE assumes a 50/50 load forecast when it sets the ICR, explicitly recognizing that the peak load could be higher than is assumed in the ICR calculations 50% of the time.[24]

Q. Does Mr. Stix's misunderstanding of ISO-NE's capacity procurement process undermine his analysis?

A. Yes. Mr. Stix does not appear to understand that the ICR (or NICR) is the minimum amount of capacity required for reliability, is unaware of ISO-NE's probabilistic modeling process, and confuses the 1-in-10 LOLE planning criterion with the chance that load will be above the ICR. I believe these misunderstandings are fundamental and undermine his analysis.

Mr. Stix's Calculations of the Expected Capacity Benefits Contain Errors

[24] Load uncertainty is just one probabilistic variable in ISO-NE's reliability planning process. On pages 16-17 of the 2019/20 ICR Values Report, ISO-NE lists many probabilistic and deterministic variables included in its reliability model, including load, forced and scheduled outage rates, deratings, seasonal capability adjustments, maintenance requirements, operating procedures, and interconnections with adjacent systems.

Q. What is your next concern regarding Mr. Stix's testimony?

A. On page 14, Mr. Stix claimed that ISO-NE "...would still have obtained more capacity in the zone that included Rhode Island [SENE] than the ISO needed..." even without CREC. However, he failed to consider the reliability benefits or the consumer savings under the FCA sloped demand curve he himself described thoroughly on pages 10-11 of his testimony. In designing the sloped demand curve, ISO-NE explicitly recognized the higher reliability value of procuring more capacity than the NICR, as I have already addressed in this testimony.

Moreover, the consumer savings from procuring more capacity than the NICR should not be ignored. Under the FCA 10 sloped demand curve, more capacity means a lower clearing price and a lower total capacity cost for consumers. This effect can be demonstrated by the following simplified calculations of the total FCA 10 capacity costs paid by New England consumers under two scenarios: (i) actual FCA 10 results with 35,567 MW cleared at $7.03/kW-month, and (ii) assuming FCA 10 cleared at the NICR of 34,151 MW at the associated price of $12.62/kW-month.[25] As shown in Table 3, the actual total FCA 10 capacity cost for New England consumers will be $3 billion, while the total cost would have been more than $5 billion if FCA 10 cleared at the NICR. By procuring capacity in excess of the NICR in FCA 10, ISO-NE saved New England customers more than $2 billion.

Table 3. Sample FCA 10 Results

	Capacity (MW)	Clearing Price ($/kW-mo)	Total Cost (billions)
Cleared Capacity	35,567	$ 7.03	$3.00
NICR Capacity	34,151	$12.62	$5.17

Q. Does that mean if ISO-NE procured exactly the NICR amount in FCA 10, costs for Rhode Island consumers would be higher?

[25] See Robert Ethier's testimony, Attachment C in the ISO-NE's FCA 10 Results, FERC Docket ER16-1041-000.

A. Yes. Rhode Island consumers would have to pay more if FCA 10 cleared at the NICR, compared to the actual result.

Q. Do you agree with Mr. Stix's claim that ISO-NE "over-procured" capacity in FCA 10 for SENE?

A. No. Having a sloped demand curve means that ISO-NE may procure capacity above the NICR from time to time. This is by design, and it is inaccurate to characterize this as a flaw in ISO-NE's capacity procurement process.

Q. What was Mr. Stix's estimate of the capacity cost savings for Rhode Island consumers due to CREC, and how does it compare to Invenergy's estimate?

A. On page 18 of his testimony, Mr. Stix estimated that CREC would save Rhode Island consumers between "...close to zero and just $36 million." I note that his upper end, $36 million, is very close to Invenergy's estimate of just under [Confidential] [redacted] million for the 2019/20 Capacity Commitment Period based on the Clear River Cost to Load – Post FCA 10 spreadsheet that Invenergy submitted in response to DPUC DR 2-1.

Q. Do you agree that the actual savings for Rhode Island consumers could be less than [confidential] [redacted] million (according to Invenergy) or less than $36 million (according to Stix) for the 2019/20 Delivery Year?

A. Yes, as I explained earlier in my testimony, the actual FCA 10 savings depend on the slope of the supply curve in the region around the demand curve, among other factors. Without knowing that slope, I cannot know the point where the supply and demand curves intersect without CREC, and thus the capacity cost savings for Rhode Island consumers.

Q. After presenting his estimate of capacity cost savings, what did Mr. Stix address next in his testimony?

Mr. Stix pointed out two of Invenergy's "incorrect" assumptions on pages 22-24. First, Invenergy assumed CREC's entire 997 MW capacity would clear in FCA 10. The claim that this assumption was incorrect was made with the benefit of hindsight; I consider this to be a minor issue.

Second, Mr. Stix claimed there would be "...at least 735 MW of capacity other than Invenergy bidding into the auction..." based on the fact that round 3 of FCA 10 was completed with 1,732 MW of excess capacity at an $8.50/kW-month price.[26] The amount of capacity that would stay in FCA 10 with CREC could not have been known in advance, so this is a minor issue as well. However, we agree with Mr. Stix that Invenergy's assumption of no other resources offering in the same price range was unreasonable.

Q. Did Mr. Stix next present his estimated results for FCA 11?

A. Yes. Mr. Stix presented his assumptions and estimated results for FCA 11. First, Mr. Stix assumed that the modified demand curve submitted by ISO-NE to FERC on April 15, 2016 will be in effect for FCA 11.[27] Next, he estimated the NICR at 33,851 MW, 300 MW lower than in FCA 10. Third, he assumed all capacity that cleared FCA 10 would enter FCA 11 as existing resources, new renewable resources of 600 MW, and retirements of 363 MW for a total of 35,804 MW clearing FCA 11.

Q. Do you believe Mr. Stix's assumptions related to FCA 11 are reasonable?

A. No, Mr. Stix made many assumptions that are not much more than guesswork. First, Mr. Stix's NICR estimate for FCA 11 is poorly supported and is based on the 2016 CELT peak forecast for summer 2020 being 611 MW lower than the 2015 CELT. Mr. Stix converted the 611 MW peak load reduction into a 300 MW NICR reduction for FCA 11. However, his simplistic approach of

[26] 1,732 MW of excess capacity less 997 MW of CREC still leaves 735 MW remaining after round 3 of FCA 10.

[27] FERC approved the ISO-NE modified demand curve proposal in Docket ER16-1434-000 on June 28, 2016.

setting the NICR ignores the complex aspects of ISO-NE's reliability methodology as I described earlier in my testimony.[28]

Second, Mr. Stix assumed that a new 600 MW Clear Energy Connect project would clear in FCA 11 in addition to the existing capacity that cleared in FCA 10. Mr. Six did not provide any support for this new project and even admitted it is not in the ISO-NE Interconnection Queue. There are other projects in the ISO-NE Queue that are further along in their development; I do not know why he claimed this assumption as "conservative."

Third, Mr. Stix estimated retirements based on 27 MW of Non-Price Retirements and Permanent De-List bids for FCA 11 plus the average amount of accepted Static De-List capacity, 336 MW, in the past five FCAs. These accepted Static De-List Bids varied significantly in those FCAs and Mr. Stix ignored the fact that the individual Static De-List Bids became effective at different prices; averaging them is overly simplistic.

Q. How did Mr. Stix derive the FCA 11 clearing price of $5.50/kW-month based on these assumptions?

A. According to pages 38-41 of his testimony, Mr. Stix first combined his estimates for existing (including CREC unit 1), new, and retired capacity to estimate that 35,804 MW would clear in FCA 11 at $5.50/kW-month. He next removed 485 MW of CREC unit 1 and arrived at an FCA 11 clearing quantity of 35,319 MW and a clearing price of $6.64/kW-month (without both CREC units). Lastly, Mr. Stix added 970 MW for both CREC units to the supply curve. Mr. Stix determined that FCA 11 "...would clear with all of Invenergy's now-projected contribution of 970 MW...at $5.50/kW-month..." Even though he did not specify the capacity clearing quantity with

[28] The 2019/20 ICR Values Report goes on to explain "...the GE MARS Monte Carlo process repeatedly simulates the year using multiple replications and evaluates the impacts of a wide-range of possible random combinations of resource outages

both CREC units, he earlier determined that the $5.50/kW-month price corresponds to 35,804 MW clearing FCA 11.[29]

Q. Has Mr. Stix changed his opinion regarding the cleared FCA 11 capacity since he submitted his testimony?

A. It appears so. In response to Invenergy's DR1-10, Mr. Stix explained that the CFA 11 demand "...curve reaches the Dynamic De-List price of $5.50 at 35,580 MW. A this point, I estimate the existing capacity will delist to keep the price at $5.50/kW-month." Even though Mr. Stix still believes the FCA 11 clearing price with CREC will be $5.50/kW-month, somehow the clearing quantity dropped from 35,804 MW in his testimony to 35,580 MW in his response.

Q. Is the $6.64/kW-month price determined by Mr. Stix without CREC consistent with his revised estimate that 35,580 MW will clear in FCA 11 with both CREC units?

A. No. If the total CREC capacity of 970 MW is deducted from 35,580 MW, the total amount of capacity that would clear FCA 11 without CREC would be 34,610 MW. In response to Invenergy's DR1-10 Mr. Stix explained that "the [demand] curve is horizontal at $7.03 from 34,510 MW to the point 35,232 MW." The clearing quantity of 34,610 MW without CREC is in this range and therefore the corresponding FCA 11 clearing price would be $7.03/kW-month, not $6.64/kW-month.

Q. Isn't Mr. Stix concerned that ISO-NE would be "over-procuring" capacity in FCA 11?

A. No, the "over-procurement" of 1,729 MW above the NICR did not seem to bother Mr. Stix. We note that in Mr. Stix's analysis this amount is not affected by CREC unit 2.[30]

Q. What were Mr. Stix conclusions about the CREC capacity benefits in FCA 11?

---

[29] This implies that dynamic de-list bids have offset part of the CREC capacity (35,319 MW w/o CREC + 970 MW CREC = 36,289 MW, which exceeds 35,804 MW).

[30] The 1,729-MW "excess" of capacity is calculated by deducting 33,851 MW of NICR from 35,580 MW.

A. Mr. Stix concluded that the maximum benefit from FCA 11 attributable to CREC would be $28 million, based on the $5.50/kW-month clearing price with CREC and $6.64/kW-month without CREC.

Q. Did Mr. Stix update his FCA 11 savings estimate in his response to Invenergy DR 1-10?

A. No. Mr. Stix neglected to update his maximum FCA 11 savings estimate of $28 million in his testimony. The clearing quantity of 35,095 MW (or less) without CERC that I estimated above based on Mr. Stix's response to Invenergy DR 1-10 implies a $7.03/kW-month price without CREC. This, in turn, results in a larger wholesale capacity price differential between the $5.50/kW-month clearing price with CREC and the higher $7.03/kW-month without CREC. This should raise Mr. Stix's maximum FCA 11 savings estimate.

Q. Do you agree with Mr. Stix's estimated wholesale capacity price benefits?

A. No. As I described above, there is too much uncertainty with the assumptions used by Mr. Stix and too many questions about his calculations for me to agree to his estimated FCA 11 results. His claims concerning the FCA wholesale capacity clearing prices with CREC and without CREC are not well supported, particularly his assumptions of the quantity of Dynamic De-List Bids that must be accepted for FCA 11 to conclude. Mr. Stix's claim that FCA 11 would clear at $5.50/kW-month with or without CREC unit 2 can only be viable with inconsistent quantities of Dynamic De-List Bids.

Q. Do you agree with Mr. Stix on page 45 that "...it is impossible, with the facts that are publicly known, to derive a precise figure" for the capacity cost savings due to CREC?

A. Yes, it is not possible to derive a precise figure to estimate a capacity cost savings. However, there is so much uncertainty and guesswork in Mr. Stix's calculations that I would characterize his

estimated results as unreliable. Moreover, Mr. Stix's contention that the lower end of the customer savings for FCAs 10 and 11 could be "close to zero" is undoubtedly too conservative.

Mr. Stix's Conclusion on the Expected Energy Benefits is Subjective

Q. Did Mr. Stix also criticize Invenergy's estimated energy savings?

A. Yes, he compared the estimated wholesale energy price reductions for four proposed power projects in New England and argued that if all these claimed reductions came to pass, "they will depress energy clearing prices so far that there just won't be any meaningful margin left in the business." Moreover, he claimed that the resulting lower energy margins would drive up capacity prices. However, he did not claim that Invenergy's estimated savings of "nearly $10 million annually" for Rhode Island consumers was incorrect or unreasonable.

Q. Do the four projects Mr. Stix included shed any light on the reasonableness of Invenergy's estimated energy price reduction?

A. Yes. First, Invenergy's estimate of $2.36/MWh is in the middle of the range presented by Mr. Stix. Second, if we consider just the first three projects that are combined cycles that should have similar capacity factors, the estimated energy price reduction for CREC is below the other two when their size is considered.[31] Thus the data presented Mr. Stix seems to indicate that Invenergy's estimated energy savings is not unreasonable.

Q. Do you agree with Mr. Stix that if these and other proposed plants are built they will lower energy prices and cause capacity prices to rise?

[31] One project, Medway, is a 200 MW gas turbine peaker that will likely have a much lower capacity factor than the combined cycle plants. According to the project website, Medway will "...only run when demand for electricity is unusually high – during "peak" demand times such as very cold winter or hot summer days."

A. He may be correct that building many new, efficient power plants may cause wholesale capacity prices to rise, but this is irrelevant to this matter. Mr. Stix explained "...this is exactly how the ISO-run markets were designed to operate." However, Mr. Stix neither quantitatively evaluated Invenergy's estimated energy savings nor provided any factual support for his subjective claim that falling energy margins will cause capacity prices to rise.

Perhaps more fundamentally, I am unsure if such a relationship between wholesale capacity and energy prices is relevant to Invenergy's Application for CREC. Regardless of the veracity of Mr. Stix's claim, I still believe that CREC will provide net savings for Rhode Island consumers.

Q. Does this conclude your testimony?

A. Yes.

APPENDIX B: INFORMATION REQUESTS

DOA REQUEST 1

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
Department of Administration
DIVISION OF LEGAL SERVICES
One Capitol Hill, 4th Floor
Providence, RI 02908-5890

Tel: (401) 222-8880
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Jennifer Sternick, Esq.
Chief of Legal Services

April 20, 2016

Alan M. Shoer, Esq.
Adler, Pollock & Sheehan, P.C.
One Citizens Plaza, 8th Floor
Providence, RI 02903

Re: Invenergy Thermal Development LLC/Clean River Enrgy Center Application, EFSB Docket NO. SB-2015-06

Dear Attorney Shoer:

I represent the statewide planning program in this matter. The Department of Administration, Division of Planning requests the inputs used in the input-output modeling described in section 5 of the application, for both the IMPLAN and the JEDI models.

Thank you for your assistance with this request.

Sincerely,

Jennifer S. Sternick

Cc: Matthew McCabe

INVENERGY RESPONSE TO DOA REQUEST 1

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May 4, 2016

Via Electronic Mail and Hand Delivery

Jennifer S. Sternick
Chief of Legal Services
Rhode Island Department of Administration
One Capitol Hill, Fourth Floor
Providence, RI 02908

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

Dear Ms. Sternick:

On behalf of Invenergy Thermal Development LLC and the Clear River Energy Project ("Invenergy"), please find enclosed the information requested in your letter dated April 20, 2016, regarding the Economic Impact Analysis of the Project.[1]

Please note that Invenergy requests that these documents be treated as confidential and proprietary information, pursuant to R.I. Gen. Laws § 38-2-2(4)(B).[2] The requested materials contain PA Consulting, Inc's ("PA") confidential analysis, market assumptions and modeling methodology used to support the EFSB application that utilize the IMPLAN and the JEDI models. This information is also highly sensitive commercial forecasting information, and, if disclosed to the public and/or competitors, would harm Invenergy's competitive position in the wholesale electricity market.

Accordingly, Invenergy requests that the Department treat the enclosed materials as confidential and/or proprietary information.

If you have any questions, please do not hesitate to contact me at (401) 274-7200.

Very truly yours,

ALAN M. SHOER
ashoer@apslaw.com

Enclosures

[1] In your letter you requested "the inputs used in the input-output modeling described in section 5 of the application, both for the IMPLAN and the JEDI models."

[2] R.I. Gen. Laws § 38-2-2(4)(B) provides that the following records shall not be deemed public: "Trade secrets and commercial or financial information obtained from a person, firm, or corporation which is of a privileged or confidential nature."

PAGE REDACTED PURSUANT TO RIGL § 38-2-2(4)(B)

DOA REQUEST 2

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
Department of Administration
DIVISION OF LEGAL SERVICES
One Capitol Hill, 4th Floor
Providence, RI 02908-5890

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Jennifer Sternick, Esq.
Chief of Legal Services

May 5, 2016

Alan M. Shoer, Esq.
Adler, Pollock & Sheehan, P.C.
One Citizens Plaza, 8th Floor
Providence, RI 02903

Re: Invenergy Thermal Development LLC/Clean River Energy Center Application, EFSB Docket NO. SB-2015-06

Dear Attorney Shoer:

Thank you for the information you recently provided. I am forwarding the following questions from Statewide Planning:

- Table 5.1-3 on page 25 of the Clear River Energy Center (CERC) Application includes figures for the "Employment Impact (FTEs per year)" projected for Rhode Island. For each category of FTE listed (Construction Period, Facility Operations, and Cost Savings to Customer), please provide the number of FTEs that are considered direct, indirect and induced based on the definitions provided in the section. Additionally, please provide:
    - The percentage of the FTEs that will be available to persons with less than a high-school diploma, with a high-school diploma but without a bachelor's degree, with a bachelor's degree, and with an advanced degree;
    - The general, estimated salary levels of all projected FTEs;
    - The percentage of FTEs that will be permanent v. those projected to be temporary; and
    - The sectors and/or industries of the projected FTEs.
- Please explain the "Rhode Island Economic Output" shown in Table 5.1-3 in greater detail. Other than the earnings impact also shown in the Table, what other economic impacts are accounted for in the overall economic output shown? How many millions of dollars are associated with each factor that contributes to the "Rhode Island Economic Output"?
- The CERC application states that Rhode Island ratepayers are expected to save approximately $70 million in energy costs, annually, with the construction of the facility. Please provide details on how many ratepayers would share the savings, the average

annual savings per ratepayer, and, if possible, the income distribution of the ratepayers in question.

- Table 5.1-3 shows the number of FTEs per year in Rhode Island associated with "cost savings to customer." Is it correct to assume that these FTEs are associated with Rhode Islander's spending of the projected $70 million annual savings in energy costs, as alluded to on page 22, section 5.1.1 Overview, item #3? When comparing the "cost savings to customers" FTEs per year in Rhode Island with the total number of such FTEs in the region, as shown in Table 5.1-4 on page 27, it appears that the all of the "cost savings to customers" are assumed to be in Rhode Island. Is that a correct interpretation? If so, what methodology was used to determine that all spending of the $70m annual savings to Rhode Island energy ratepayers would benefit Rhode Island businesses?

Thank you for your assistance with this request.

Sincerely,

Jennifer S. Sternick

Cc: Jared Rhodes

INVENERGY RESPONSE TO DOA REQUEST 2

ADLER POLLOCK & SHEEHAN P.C.

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May 23, 2016

Via Electronic Mail and Hand Delivery

Jennifer S. Sternick
Chief of Legal Services
Rhode Island Department of Administration
One Capitol Hill, Fourth Floor
Providence, RI 02908

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

Dear Ms. Sternick:

On behalf of Invenergy Thermal Development LLC, enclosed please find its responses to the Division of Statewide Planning's 2nd Set of Data Requests in connection with the above matter.

If you have any questions, please do not hesitate to contact me at (401) 274-7200.

Very truly yours,

ALAN M. SHOER
ashoer@apslaw.com

Enclosure

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STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

DEPARTMENT OF ADMINISTRATION
DIVISION OF PLANNING

IN RE: Application of Invenergy Thermal Development : LLC's Proposal for Clear River Energy Center : EFSB Dkt. No.: SB-2015-06

INVENERGY THERMAL DEVELOPMENT LLC'S RESPONSES TO THE DIVISION OF STATEWIDE PLANNING'S 2ND SET OF DATA REQUESTS

REQUEST NO. 2-1:

(A) Table 5.1-3 on page 25 of the Clear River Energy Center (CERC) Application includes figures for the "Employment Impact (FTEs per year)" projected for Rhode Island. For each category of FTE listed (Construction Period, Facility Operations, and Cost Savings to Customer), please provide the number of FTEs that are considered direct, indirect and induced based on the definitions provided in the section. Additionally, please provide:

(B) The percentage of the FTEs that will be available to persons with less than a high-school diploma, with a high-school diploma but without a bachelor's degree, with a bachelor's degree, and with an advanced degree;

(C) The general, estimated salary levels of all projected FTEs;

(D) The percentage of FTEs that will be permanent v. those projected to be temporary; and

(E) The sectors and/or industries of the projected FTEs.

RESPONSE NO. 2-1:

RESPONSE SUBPART A:

Clear River Employment Impact (FTEs per year)

Base Case

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Construction Period																			
Direct	26	388	492	129															
Indirect	10	143	181	48															
Induced	14	203	257	68															
Total FTEs	49	734	930	245	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Facility Operation																			
Direct				15	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Indirect				45	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78
Induced				25	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
Total FTEs	0	0	0	85	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145
Energy Market Cost Savings																			
Direct																			
Indirect																			
Induced				498	733	419	159												
Total FTEs	0	0	0	498	733	419	159	0	0	0	0	0	0	0	0	0	0	0	0
Total FTEs - All Categories	49	734	930	827	878	564	304	145	145	145	145	145	145	145	145	145	145	145	145

RESPONSE SUBPART B:

- PA Consulting's ("PA") employment impact analysis did not evaluate the projected level of education or training associated with the jobs created. As far as the expected minimum staffing requirements, Invenergy Thermal Development LLC ("Invenergy") expects the following makeup of the staff
- Less than high school degree – **None**
- With high school diploma – All 20 O&M Technicians and 1 Admin
- With bachelor's degree – Plant Management staff (4 positions - Plant Mgr, Plant Engineer, Ops Mgr, Maintenance Mgr). This includes specialized training which is roughly equivalent to a bachelor's degree.
- With advanced degree - **None**

RESPONSE SUBPART C:

Average annual salary per full-time employee (2018$) that were used in the analysis:

Plant Construction phase: ~$126,000

Plant Operations phase: ~$76,000

Power market cost savings (induced jobs only): ~$52,000

RESPONSE SUBPART D:

Construction jobs, by nature, are generally considered to be "temporary," as are those associated with cost-savings to customers. Those jobs associated with plant operation would be permanent in nature. Approximately 800 full-time equivalent positions will be created during the construction phase (i.e., annualized FTE positions assumed to last over the entire course of the 30-month construction period). Cost savings to customers are projected to generate an average of 450 additional temporary jobs per year between 2019 and 2022. There will be 145 permanent jobs (direct, indirect, and induced) associated with ongoing plant operation in Rhode Island.

RESPONSE SUBPART E:

PA did not analyze the specific impact on individual sectors or industries. However, during the construction phase, the industries expected to be most heavily impacted would be construction as well as professional services, wholesale and retail trade, manufacturing and food services. During the ongoing plant operation, the professional services sector is expected to the most heavily impacted sector.

RESPONDENT: **Ryan Hardy, PA Consulting**
Dr. Edinaldo Tebaldi, Bryant University

DATE: **May 23, 2016**

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

DEPARTMENT OF ADMINISTRATION
DIVISION OF PLANNING

IN RE: Application of Invenergy Thermal Development : LLC's Proposal for Clear River Energy Center : EFSB Dkt. No.: SB-2015-06

INVENERGY THERMAL DEVELOPMENT LLC'S RESPONSES TO THE DIVISION OF STATEWIDE PLANNING'S 2ND SET OF DATA REQUESTS

REQUEST NO. 2-2:

Please explain the "Rhode Island Economic Output" shown in Table 5.1-3 in greater detail. Other than the earnings impact also shown in the Table, what other economic impacts are accounted for in the overall economic output shown? How many millions of dollars are associated with each factor that contributes to the "Rhode Island Economic Output"?

RESPONSE NO. 2-2:

The economic output is a measure of the market value of all commodities and services produced (direct, indirect and induced) in the economy. It can also be measured as the sum of intermediate inputs plus value added (compensation paid to labor, taxes paid and profit). The economic output estimates presented in the report measure the intermediate input sales plus labor income, profit and fiscal benefits to the state of Rhode Island associated with the construction and operation of the facility (including the induced impacts resulting from partial reinjection of the electricity bill savings into the local economy). Two thirds of the economic output associated with the construction of the facility and one third of the economic output created by operation of the facility would be through labor income (new or increased) to local workers. PA has not otherwise attempted to break down economic output any further than the direct, indirect and induced impacts shown in the table.

RESPONDENT: **Ryan Hardy, PA Consulting**
Dr. Edinaldo Tebaldi, Bryant University

DATE: **May 23, 2016**

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

DEPARTMENT OF ADMINISTRATION
DIVISION OF PLANNING

IN RE: Application of Invenergy Thermal Development : LLC's Proposal for Clear River Energy Center : EFSB Dkt. No.: SB-2015-06

INVENERGY THERMAL DEVELOPMENT LLC'S RESPONSES TO THE DIVISION OF STATEWIDE PLANNING'S 2ND SET OF DATA REQUESTS

REQUEST NO. 2-3:

The CERC application states that Rhode Island ratepayers are expected to save approximately $70 million in energy costs, annually, with the construction of the facility. Please provide details on how many ratepayers would share the savings, the average annual savings per ratepayer, and, if possible, the income distribution of the ratepayers in question.

RESPONSE NO: 2-3:

As detailed in the Pre-Filed Testimony of Ryan Hardy under Docket 4609, the assumed plant specifications and construction schedule have changed since this economic analysis was completed. The changes would be expected to roughly offset one another from an economic impact perspective during construction – with lower equipment and materials cost offset by higher per kW construction costs. It should be noted that the projected energy and capacity cost savings to the ratepayer were updated to $210 million during the 2019-2022 timeframe or an average of $52.5 million per year.

Identifying the distribution of these savings per customer or across income groups requires a complex rates analysis that PA has not completed. Energy and capacity market costs are ultimately passed directly through to the customer. Any change in the market that reduces energy and capacity prices will reduce customer bills.

RESPONDENT: **Ryan Hardy, PA Consulting**
Dr. Edinaldo Tebaldi, Bryant University

DATE: **May 23, 2016**

REQUEST NO. 2-4:

Table 5.1-3 shows the number of FTEs per year in Rhode Island associated with "cost savings to customer." Is it correct to assume that these FTEs are associated with Rhode Islander's spending of the projected $70 million annual savings in energy costs, as alluded to on page 22, section 5.1.1 Overview, item #3? When comparing the "cost savings to customers" FTEs per year in Rhode Island with the total number of such FTEs in the region, as shown in Table 5.1-4 on page 27, it appears that the all of the "cost savings to customers" are assumed to be in Rhode Island. Is that a correct interpretation? If so, what methodology was used to determine that all spending of the $70m annual savings to Rhode Island energy ratepayers would benefit Rhode Island businesses?

RESPONSE NO. 2-4:

Yes, the FTEs shown in Table 5.1-3 represent the induced impacts associated with the annual energy and capacity cost savings to Rhode Island ratepayers from 2019-2022. In analyzing electricity cost savings to customers, PA has considered only the cost savings to Rhode Island customers. It is worth noting that the study did not assume that all savings accrue to Rhode Islanders. There would also be significant savings to customers elsewhere in New England; however, PA has only accounted for the Rhode Islanders' portion in this analysis. As a result, while Table 5.1-3 accurately reflects Rhode Island-only economic impacts, Table 5.1-4 understates the capacity and energy cost savings (and thus the economic output impact) to the surrounding region.

RESPONDENT: **Ryan Hardy, PA Consulting**
Dr. Edinaldo Tebaldi, Bryant University

DATE: **May 23, 2016**

DOA REQUEST 3

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
Department of Administration
DIVISION OF LEGAL SERVICES
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Jennifer Sternick, Esq.
Chief of Legal Services

May 6, 2016

Alan M. Shoer, Esq.
Adler, Pollock & Sheehan, P.C.
One Citizens Plaza, 8th Floor
Providence, RI 02903

Re: Invenergy Thermal Development LLC/Clean River Energy Center Application, EFSB Docket NO. SB-2015-06

Dear Attorney Shoer:

I am forwarding the following additional question from Statewide Planning:

What are the estimated local tax revenues that will accrue to the Town of Burrillville as a result of the Clear River Energy Center? Ideally, we would like to know the initial revenue from operating year one and an annual average over a twenty-year period.

Thank you for your assistance with this request..

Sincerely,

Jennifer S. Sternick

Cc: Jared Rhodes

INVENERGY RESPONSE TO DOA REQUEST 3

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June 3, 2016

Via E-mail and Regular Mail

Jennifer S. Sternick
Chief of Legal Services
Division of Legal Services
One Capital Hill, 4th Floor
Providence, RI 02908-5890

RE: Invenergy Thermal Development LLC/Clean River Energy Center Application,
EFSB Docket No. SB-2015-06

Dear Chief Counsel Sternick:

This is in response to your question posed in your letter of May 6, 2016. You requested the following information to assist in your Department's role in the advisory opinion process before the R.I. Energy Facilities Siting Board:

> "What are the estimated local tax revenues that will accrue to the Town of Burrillville as a result of the Clear River Energy Center? Ideally, we would like to know the initial revenue from operating year one and an annual average over a twenty-year period."

For a response to this question and on behalf of Invenergy please note that the estimated local tax revenues that will accrue to the Town of Burrillville are the subject of on-going confidential discussions between the Town and Invenergy. We will provide you with further details at the appropriate time to supplement this response.

Very truly yours,

ALAN M. SHOER
ashoer@apslaw.com

405180\003\741854.v1

DOA REQUEST 4

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
Department of Administration
DIVISION OF LEGAL SERVICES
One Capitol Hill, 4th Floor
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Jennifer Sternick, Esq.
Chief of Legal Services

June 3, 2016

Alan M. Shoer, Esq.
Adler, Pollock & Sheehan, P.C.
One Citizens Plaza, 8th Floor
Providence, RI 02903

Re: Invenergy Thermal Development LLC/Clean River Energy Center Application, EFSB Docket No. SB-2015-06

Dear Attorney Shoer:

I am forwarding the following additional questions from Statewide Planning:

1. Our interpretation of the Map shown in Figure 6.12-2 on page 109 of the application is that the areas shown in red labeled as "Project Potentially visible Based on Topography and Vegetation" are the *only* areas where the stacks may be visible within a 5-mile radius of the proposed facility. We would like verification of that interpretation.
2. Would the applicant be able to send us the GIS layer used to create this Map so that we can perform some additional analysis?

Thank you for your assistance with this request.

Sincerely,

Jennifer S. Sternick

Cc: Jared Rhodes

INVENERGY RESPONSE TO DOA REQUEST 4

MASSACHUSETTS
100 Fifth Avenue
5th Floor
Waltham, MA 02451
p 781.419.7696

RHODE ISLAND
10 Hemingway Drive
2nd Floor
East Providence, RI 02915
p 401.434.5560

NEW HAMPSHIRE
170 Commerce Way
Suite 200
Portsmouth, NH 03801
p 603.205.8511

VIRGINIA
999 Waterside Drive
Suite 2525
Norfolk, VA 23510
p 757.777.3777

July 13, 2016

Ms. Jennifer S. Sternick
Chief of Legal Services
Rhode Island Department of Administration
Division of Legal Services
One Capitol Hill, 4th Floor
Providence, Rhode Island 02908-5890

Re: Clear River Energy Center
Visual Assessment Response to Inquiry

Dear Ms. Sternick:

In response to clarifications requested by Statewide Planning with respect to figures provided in the visual assessment EFSB filing (Docket No. SB-2015-06), we respectfully submit the following responses.

1. *Our interpretation of the Map shown in Figure 6.12-2 on page 109 of the application is that the areas shown in red labeled as "Project Potentially visible Based on Topography and Vegetation" are the only areas where the stacks may be visible within a 5-mile radius of the proposed facility. We would like verification of that interpretation.*

Response to Question 1:

As outlined in section 2.3 of the visual report, the viewshed analysis provides a graphic representation of "geographic areas within which there is a reasonable probability of project visibility." The viewshed analysis is based on USGS NLCD 2011 Data and USGS National Elevation Dataset 10 meter digital elevation models. This data was reviewed for accuracy utilizing the most recent publically available aerial photographs (2014 at the time of analysis) and the data general reflected the conditions present in 2014. Therefore, the results of the viewshed analysis represent a reasonable assumption of visibility. This was further confirmed by field review.

2. *Would the applicant be able to send us the GIS layer used to create this Map so that we can perform some additional analysis?*

Response to Question 2:

The GIS raw data files used in the viewshed analysis are provided on the following file transfer site. Please note that these files represent the proposed project at the time of the application submittal and may not reflect the exact current project plans.

https://essgroup.sharefile.com/d-sa459649e00844ff9

Let us know if you have any additional questions.

Sincerely,

ESS GROUP, INC.

Gordon W. Perkins
Visual Assessment Specialist

SUMMARY OF CONFERENCE CALL WITH INVENERGY CONSULTANTS

From: Rhodes, Jared (DOA)
Sent: Friday, June 03, 2016 8:54 AM
To: 'AShoer@apslaw.com' <AShoer@apslaw.com>
Cc: Nelson, Kevin (DOA) <Kevin.Nelson@doa.ri.gov>; Greeley, Caitlin (DOA) <Caitlin.Greeley@doa.ri.gov>; Dion, Paul (DOR) <paul.dion@revenue.ri.gov>
Subject: Invenergy Economic Impact Conference Call Follow-Up

Good morning Alan,

First and foremost please accept my gratitude for arranging the above referenced conference call that took place this past Tuesday at 2:00. By way of background participants in the call, in addition to you and I, included Ryan Hardy, Mark Repsher, Edinaldo Tebaldi, Mason Smith, Kevin Nelson, Caitlin Greeley, and Paul Dion.

Overall staff here at the Statewide Planning Program found the conversation very helpful in clarifying the following:

- The economic benefits analysis is based on the original plan which contemplated a shorter construction period for the full facility; however, the overall benefits would remain approximately the same.
- All cost savings are for RI only.
- Cost savings for businesses are allocated to residential customers.

In addition, we also discussed the following items that required a follow-up:

- Ryan indicated that he would send DOA the updated filing that contains updated Tables 5.1-3 and 5.1-4 which he has subsequently done.
- The PA consulting team will confirm the inputs that were fed into the Implan model and send the information to DOA through Alan.
- Clarification of what is meant by the "state of Rhode Island" on page 3 of Invenergy's response to DOA's questions dated May 23, 2016. Specifically in this context, does "state of Rhode Island" refer to the government of the State or to the activity within its borders?

Your time is much appreciated and we look forward to receiving clarification on the items referenced above.

Regards,

Jared Rhodes

APPENDIX C

TOWN OF BURRILLVILLE

Office of Town Clerk
Louise R. Phaneuf
Town Clerk

Telephone: (401) 568-43
FAX: (401) 568-(
E-mail: townclerk@bur
RI Relay 1-800-745-5

Burrillville Town Council Opposes Legislation Requiring Town Wide Referendum on Power Plan Tax Treaty (Agreement)

Warns Legislation Jeopardizes Up to $180 million in Negotiated Tax Relief for Town

Burrillville, Rhode Island: The Burrillville Town Council opposes legislation currently under consideration in the General Assembly which would require a town wide referendum on a possible tax treaty with Invenergy should the Energy Facility Siting Board (EFSB) approve construction of new power plant in the Town.

The Town Council is not the decision maker on approval for the power plant proposal.

However, while the EFSB is considering the proposal, the Town does have leverage to demand a tax treaty that protects its residents. The Town has been negotiating such a treaty. While it is not finalized, the agreement does guarantee between $92 million and $180 million in tax payments to the Town. It demands financial protection for residents who live near the proposed power plant and locks in place a long- term decommissioning plan to protect the town's interest well into the future. These are all crucial elements of an agreement that the Town must have in place to protect its residents in case the EFSB approves Invenergy's application.

The ill-conceived legislation before the General Assembly that purports to give residents a voice in the matter - in fact does the opposite.

- It weakens the Town Council's ability to protect its residents and obtain financial compensation for hosting the proposed power plant.
- It strips the Town Council's negotiating leverage that can force Invenergy to compensate the town
- It jeopardizes efforts to put financial safeguards in place for residents near the proposed power plant and compromises an agreement for the decommissioning of the plant in the future

The legislation will not stop the proposed power plant from locating in Burrillville, or even require the power plant to consider residents' wishes. It could however, take away a stable, fixed tax agreement that locks- in millions in payments to the

Town. Instead, should the EFSB approve the power plant the Town will have lost its negotiating leverage. If the power plant was forced onto the tax rolls it would create endless and very expensive litigation that could last for years and cost the taxpayers many millions of dollars.

For those reasons, the Burrillville Town Council does not support this legislation, and will continue with the process that is already in place to finalize a tax agreement that seeks to protect the financial interest of its residents in the event the EFSB approves the power plant.

Curricula Vitae of Statewide Planning Program Witnesses

JARED L. RHODES II

89 Hazard Avenue
East Providence, Rhode Island, 02914
(401) 499-6663

QUALIFICATIONS

Extensive municipal land use planning and implementation experience. First hand knowledge of the challenges presented in achieving State land use goals through the current regulatory approach which relies on municipal support and by-in for successful implementation. Solid understanding of municipal needs in overcoming these challenges. Rare experience in working to promote coordinated municipal land use planning at the regional/watershed level within the State of Rhode Island. Demonstrated ability to effectively work with municipalities, non-profit entities, various divisions of State and Federal government, as well as with private developers in achieving diverse land use goals.

Excellent supervisory, managerial, organizational and personal skills. Experienced facilitator, mediator, outreach coordinator and strategic planner. Technically sound data analyst. Strong written and verbal communication, public speaking, and public relations abilities. Successful grant writer, having secured $2.2 million in awards for the City of Cranston alone. Proven project manager with track record for completing tightly regulated, quality projects on budget with high levels of public participation and multiple funding sources under stringent deadlines. Proficient in, ESRI's ArcGIS, Adobe Photoshop, Microsoft XP, and Office 2003 including Access, Excel, Outlook, PowerPoint and Word.

EDUCATION

MASTER OF COMMUNITY PLANNING - University of Rhode Island, 1996.

BACHELOR OF ARTS, MARINE AFFAIRS - University of Rhode Island, 1993.

EXPERIENCE

RHODE ISLAND, STATEWIDE PLANNING PROGRAM – *Chief, 02/12/07 – Present.* Program responsibilities include staffing the State Planning Council and maintenance of its official State Guide Plan and Land Use Plan, review and approval of local community comprehensive plans to ensure consistency between state and local planning initiatives on issues relating to land use, housing, economic development, natural and cultural resources, services and facilities, circulation/transportation, and recreation and open space preservation; production of the State's Ground Transportation and Transportation Improvement Programs which schedule the expenditure of millions of dollars of Federal Highway funds to specific state and local highway, transit, pedestrian, bicycle, freight, enhancement and Congestion Mitigation and Air Quality projects; and the administration of the State's Comprehensive Economic Development Strategy. Direct responsibility for the management of a staff of 24 and an annual budget of over three million. Serve as the Program's representative on the Rhode Island Historic Preservation and Heritage Commission and the Rhode Island Enterprise Zone Council.

CITY OF CRANSTON, RHODE ISLAND – *Planning Director, 2005 - 2007.* Served as the Planning Director for Rhode Island's third largest municipality. Primary responsibilities included coordinating all aspects of the implementation, administration, maintenance and update of the City's: Local Comprehensive Plan in accordance with the provisions of R.I.G.L. 45-22.2; Subdivision and Land Development Regulations in accordance with R.I.G.L. 45-23; Site Plan Review procedures in accordance with the requirements of Chapter 17.84 of the City Code; and the Department's zoning ordinance amendment and variance review responsibilities in accordance with R.I.G.L. 45-24. Responsible for the drafting of the City's Annual Capital Budget and Improvement Program which averages $10.3 million per fiscal year and programs the funding for all planned municipal capital expenditures over a five year time frame. Direct supervisory and management responsibility for the Planning Department's staff of five and average annual budget of $342,545. Responsible for conducting numerous planning studies, for the preparation of various plans and relied upon heavily for advice on topics ranging from land use management, transportation and housing provision to municipal service and facility provision, environmental protection and open space preservation.

Furthered the City's reputation as a leader in the Planning field through the significant turnover of 50% of its professional staff and loss of 35 years of institutional knowledge. Undertook a complete assessment and reorganization of staffing work flows, record keeping procedures and the physical layout and accompaniments of the office itself. Secured numerous quality of life benefits for the City's residents through the conducting of 173 comprehensive plan consistency and amendment reviews; the processing of 87 subdivision and land development proposals; 101 Site Plan Review applications and 131 zoning reviews. A sample of the diverse benefits secured include: negotiations with a private developer to preserve 25 acres of open space as a condition of approval for the proposed subdivision of a 78 acre parcel of agricultural land; resolution of public noise, lighting, traffic, buffering and drainage concerns associated with the development of a 10 acre industrial parcel that directly abuts a single family residential neighborhood; and actions taken to require the provision of affordable housing opportunities on a significant parcel of public property which is being prepared for private sale and re-use.

RHODE ISLAND STATE PLANNING COUNCIL – *Rhode Island League of Cities and Towns Local Government Representative, March, 2006 to Present.* Appointed by Governor Carcieri to provide guidance on the formulation and implementation of the State Guide Plan; to assist in coordinating the planning and development activities of all state agencies; to amend and maintain standards and guidelines for the location of renewable energy sources; and to facilitate the coordination of strategic plans for the comprehensive management of the state's human, economic and physical resources. Currently serving on the Council's Land Use 2025 Implementation Committee.

Rhode Island CDBG Application Steering Committee

Rhode Island Historic Preservation and Heritage Commission

RHODE ISLAND GEOGRAPHIC INFORMATION SYSTEM (RIGIS) - *Executive Committee, 2000 - 2005.* Appointed by the State Planning Council to provide policy guidance, oversight, and coordination of those organizations using GIS technologies in Rhode Island. Sought to coordinate data development, adopt technical standards, set distribution policies for GIS products, promote the use of GIS and provide information and technical assistance to end users.

CITY OF CRANSTON, RHODE ISLAND – *Senior/Principal Planner, 1999 – 2005.* Hired in 1999 and entrusted with increasing responsibilities over the course of my tenure. Duties evolved from the role of technical assistant under close supervision to that of independent special projects manager with full public participation, grant writing, project design, budgeting, implementation and media relations responsibilities. A sample of noteworthy initiatives include the following:

- *Pawtuxet Cove Dredging Effort* – Authored the formal request which placed this project on state and federal agendas. Convened, and coordinated a steering committee of local property owners, marine trades representatives, municipal officials, state and federal regulators and elected officials to supply the momentum needed to bring the effort to fruition. Resolved the cost prohibitive contaminated materials disposal issue by facilitating an agreement between the State and the Army Corps of Engineers to allow for the disposal of 90,000 cubic yards of Pawtuxet spoils in the Providence River's Contained Aquatic Disposal (CAD) cells. Worked with the State's Federal Delegation to secure the Act of Congress that was needed to resolve the private encroachment issues that were preventing the project from proceeding and to acquire the necessary federal funding appropriation.
- *Pawtuxet Village Traffic Calming and Enhancement Project* – Coordinated with the City of Warwick, numerous private consultants; the RI. Department of Transportation and others such as the RI. Historic Preservation and Heritage Commission to design, fund, bid and build this 1.6 million dollar improvement effort. Project goals included reducing vehicle speeds and conflicts, improving pedestrian safety and enhancing the historic aesthetics of the village through a coordinated multi-municipal approach to physical design. Issues addressed included detailed vehicular traffic, pedestrian and parking impact studies. Improvements included the installation of stamped concrete brick sidewalks throughout; ornate crosswalks in similar fashion with bumpouts as traffic calming measures; roadway repaving; refurbishment and extension of the existing period lighting system; and the provision of various public amenities including street trees, public benches and improved signage.
- *Stillhouse Cove Restoration and Beautification Project* – Served as Project Manager for this $650,000 effort. Secured and administered $330,000 in grants from four different funding sources. Responsible for all aspects of the design, permitting, bid specification, advertisement, award and construction processes. Facilitated the resolution of a highly controversial public design debate between two competing stakeholder groups. Major project elements included the restoration of a 3.5 acre salt marsh, replacement of the City's failed storm water management system and the construction of an extensive rip rap seawall to protect the abutting arterial roadway, emergency evacuation route and public utilities from further coastal erosion.
- *Cranston Hazard Mitigation Plan* – Supervised subordinates in the production of this federally required planning initiative. Completed a detailed risk assessment using innovative GIS techniques to quantify, for the first time ever, those specific populations and properties at risk from natural hazards such as overland flooding and hurricane storm surge. Set forth a series of hazard mitigation goals for the City of Cranston and detailed specific implementation actions that could be undertaken to mitigate potential losses. Facilitated the approval and adoption of this plan by the Cranston City Council and Federal Emergency Management Agency thereby qualifying the City to participate in federal hazard mitigation grant programs.
- *Capital Facilities and Water District Impact Fee Assessments* – Analyzed Cranston's existing impact fee programs for conformance with the State's Impact Fee Enabling Act. Completed a residential and commercial buildout analysis at the census tract level to identify the City's growth potential under current regulations. Projected the anticipated time to buildout and produced future population estimates in ten year increments through 2020. Undertook detailed facilities needs assessments that gauged the adequacy of current municipal service provision. Utilized buildout results, existing facility inventories, level of service standards and population projections to

assess the future need for additional capital facilities.

- *2001 Political Redistricting Initiative* - Saved the city approximately $45,000 by undertaking the State mandated political redistricting process in-house as opposed to relying on the services of an outside contractor. Utilized the GIS to produce the mapping and voter registration logs required to comply with State law. Information produced assisted in the identification and correction of long standing voter registration anomalies between local and state records which would have otherwise went unresolved.
- U.S. *Census Data Compilation and Analysis* - Completed a ten year population projection for this city of approximately 80,000 that proved to be accurate within .5%, upon release of the 2000 U.S. Census. Supervised and assisted subordinates in the production of the City's decennial demographic report titled *Population Trends 2000*. Completed various professional analyses of building permit, population, ethnicity, educational attainment, income, labor, employment and housing trends.
- *Other Technical Support Initiatives* - Served as a catalyst for the development of the Cranston GIS and web based document management systems. Relied upon citywide for support with GIS analysis, map production, digital photo manipulation, presentation preparation and document design, formatting and layout. Provided extensive support to the Department of Economic Development in identifying available properties ripe for development initiatives and produced numerous statistical analyses, graphics and marketing materials for its use.

AMERICAN PLANNING ASSOCIATION, RHODE ISLAND CHAPTER (RIAPA) – *Secretary/Vice President, 1999-2005.* RIAPA is compromised of approximately 175 planning professionals from both the public and private sectors. Its mission is to positively shape the planning profession by providing a forum for the understanding and application of sound planning principles within the State of Rhode Island. Elected to the position of Secretary in 1999 and to that of Vice President in 2003, a summary of my contributions to the Chapter include the following:

- *Co-Chair, 2005 Southern New England Regional Planning Conference Committee*. Developed and implemented a detailed ten month work program for the execution of this $50,000, two day annual event which was attended by 314 planners from across the region. Responsibilities included all aspects of financial planning, fundraising, program development, service and facilities contracting, professional publications production and outreach. Upon completion the conference far exceeded all other previous events by generating $30,000 in profits which were dispersed back to the participating Chapters' for reinvestment into the profession.
- *Facilitator, 2004 – 2007 Strategic Management Plan*. Facilitated the development of the Chapter's first ever strategic management plan. Efforts resulted in the drafting and adoption of an organizational mission statement, identification of Chapter goals and the detailing of 25 prioritized objectives and action items to be undertaken over both the short and long term planning horizons. The plan has since proved to be a great asset to the Chapter in focusing its limited resources on those projects that deliver the highest return to its members.
- *Coordinator, 2004 Bylaw Review and Update*. Undertook a complete rewrite of the Chapter's official bylaws to account for the changing nature of the organization, its available resources and prioritized objectives.
- *Planners Day on Capital Hill*. Represented the Chapter at the National Associations bi-annual lobbying event held in Washington D.C. Formally trained in the conducting of legislative advocacy initiatives. Established professional relationships with the Offices of Rhode Island's Federal Delegation and advocated for adoption of sound planning related legislation at the federal level. Connected national legislative planning initiatives with real world examples of the benefits and impacts of proposed legislation on Rhode Island's 39 cities and towns.

COASTAL RESOURCES CENTER / RHODE ISLAND SEA GRANT - *Planning Specialist, 1995 - 1999.* Served as professional staff to the Aquidneck Island Planning Commission. Charged with building the capacity of the organization to undertake true regional/watershed based land use planning initiatives on behalf of the Town of Middletown, City of Newport, the Town of Portsmouth, the United States Navy Base at Newport; and other non-governmental entities including the Aquidneck Island Land Trust and the Newport County Chamber of Commerce. Formally recognized for creation of the West Side Master Planning Task Force and for the establishment of a focused strategy for the development of the recently completed West Side Master Plan. Performed all other administrative functions of the Commission including meeting preparation and organization, production of minutes, public outreach and education efforts and secured its first dedicated funding sources and office space.

CERTIFICATES AND AWARDS

- American Planning Association Rhode Island Chapter, Marilyn F. Cohen, AICP, Chapter President, 2004. Award in appreciation for outstanding service and contribution to the profession.
- Environmental Systems Research Institute, Inc., Jack Dangermond, President, 2003. For successful completion of the three day training program entitled *Migrating to ArcGIS 8.3*.

- University of Rhode Island, Robert L. Carothers, President, 1996. In recognition of dedicated work on behalf of the Partnership for the Coastal Environment.
- Rhode Island Harbormaster Association - For the completion of the Harbormaster Training Program, 1993.

ERIK K. GODWIN

Office of Regulatory Reform
Department of Administration
One Capitol Hill, Providence, RI 02908
(401) 574-8422 Erik.Godwin@omb.ri.gov

PROFESSIONAL EXPERIENCE

Director, Office of Regulatory Reform, State of Rhode Island ***2015 – present***

ORR reviews all state executive branch regulations for economic, scientific, and statistical integrity in order to maximize the societal net benefit of Rhode Island's regulatory system. The office also provides analytical expertise to entities across state government.

Taubman Center for Public Policy, Brown University ***2013 – 2015***

- ***Director, Applied Social, Economic, and Regulatory Analysis Group (ASERA)***
  ASERA partners with government institutions, non-profit organizations, and other entities to provide technical expertise, policy analysis, and program evaluation. Recent projects include:
  - A comprehensive economic, regulatory, and financial analysis of the Water and Sewer Enterprise Fund for Everett, Massachusetts.
  - An evaluation of Rhode Island's E-911 emergency services and dispatch architectures commissioned by the Senate's Shared Services Commission.
- ***Lecturer, Masters of Public Policy (MPP) and Public Administration (MPA) programs***
  Topics include: state and municipal policy, public finance, regulation and compliance, benefit-cost analysis, environmental policy, budgeting, and program evaluation.

Consultant, U.S. Office of Personnel Management ***2001 – present***

- Design and deliver training seminars to local, state, federal, and foreign government officials.
  Topics include: regulatory design and analysis, budgeting, budget performance integration, bureaucratic oversight, environmental and health policy, and statistical/measurement validity.
- Create custom management and analysis training modules to meet agency-specific needs in regulatory policymaking, quantitative analysis, information systems, and statistical analysis. Recent clients include EPA (Superfund Office), VA, USDA, the FBI, and DoD.

Assistant Professor, Department of Political Science, Texas A&M University ***2008 – 2013***

- Conducted research and taught in the areas of quantitative analysis, regulatory policy, bureaucratic systems, and interest group influence.

Consultant, Policy Navigation Group ***2006 – 2008***

- Provided cost-benefit analyses, statistical analyses, and regulatory expertise to federal agencies and private entities.

Instructor (Quantitative Policy Analysis), Department of Political Science, Duke University ***2005***

- Taught upper-division course on benefit-cost analysis, finance, statistics, and program evaluation.

Lobbyist, The EOP Group, Inc, Washington, D.C. ***2000-2004***

- Engaged in executive branch lobbying for Fortune 100 companies in the following industries: aerospace, pharmaceuticals, biotechnology, energy (fossil and nuclear), chemical manufacturing, agriculture, and education.
- Provided strategic political advice and technical expertise to clients seeking to change the design and/or implementation of regulations.

Policy Analyst, Office of Management and Budget, Washington, D.C. ***1998-2000***

- Served as the principal White House analyst for regulatory policy in the following areas: energy, radiation and indoor air, health, pesticides, education, and transportation.
- Evaluated the economic and statistical integrity of more than 300 federal and state policies, including: Yucca Mountain, the Waste Isolation Pilot Project, DOE's Chronic Beryllium Disease Prevention Program, EPA's Atrazine regulations, and the US Coast Guard's Anti-Terrorism Port rules.
- Negotiated with members of federal and state governments, the public, industry, and interest groups to reach workable compromises that satisfied both public and private needs.

Associate, Industrial Economics Inc. Cambridge, MA. ***1997-1998***

- Conducted financial and economic analyses for EPA and DOJ.

PUBLICATIONS

Godwin, Erik and Nathan Ilderton. 2014. "Presidential Defense: Decisions and Strategies to Preserve the Status Quo." *Political Research Quarterly*; 67: 715-728.

Godwin, R. Kenneth, Scott Ainsworth, and Erik Godwin. (2012). *Lobbying and the Policymaking Process: What Interest Groups Want and How They Get It*. CQ Press.

Gray, Virginia, David Lowery, James Monogan, and Erik Godwin. 2010. "Incrementing Toward Nowhere: Universal Health Care Coverage in the States." *Publius*; 40:82-113.

Hicklin, Alisa and Erik Godwin. 2009. "Agents of Change: The Role of Public Managers in Public Policy." *Policy Studies Journal*; 37:13-20.

Godwin, Erik, R. Kenneth Godwin, and Scott Ainsworth. 2007. "Is Lobbying Rational or Just a Waste of Money?" in Allan J. Cigler and Burdett A. Loomis, eds., Interest Group Politics, 7th edition, CQ Press.

Gray, Virginia, David Lowery, and Erik Godwin. 2007. "The Political Management of Managed Care: Explaining Variation in State HMO Regulations." *Journal of Health Politics, Policy, and Law*.32:3.

Gray, Virginia, David Lowery, and Erik Godwin. 2007. "Public Preferences and Organized Interests in Health Policy: State Pharmacy Assistance Programs as Innovations." *Journal of Health Politics, Policy, and Law*. 32(1).

Lowery, David, Virginia Gray, Jennifer Wolak, Erik Godwin, and Whitt Kilburn. 2005. "Reconsidering the Countermobilization Hypothesis: Health Policy Lobbying in the American States." *Political Behavior*. 27(2).

EDUCATION

Ph.D. in Political Science, University of North Carolina, Chapel Hill ***2008***

M.A., Political Science, University of North Carolina, Chapel Hill ***2005***

M.P.P., University of Michigan, Ann Arbor ***1997***

Oxford University, Oxford, England ***1995***
Post-baccalaureate research in environmental economics.

B.A., Wake Forest University ***1994***

ELLEN G. COOL

SUMMARY

A consultant with 30 years of experience advising electric and gas companies, state regulatory authorities, and large energy end users. Principal expertise includes management of wholesale power and fuel procurement and contracting, project financial management, environmental compliance, project siting and permitting, regulatory policy and analysis, and working group facilitation.

PROFESSIONAL EXPERIENCE

1999 - **Levitan & Associates, Inc.**
Vice President & Principal
Managing Consultant
Executive Consultant
Senior Consultant

1990 - 1999 **Harding Lawson Associates / ABB Environmental Services, Inc.**
Principal and Northeast Area Manager
Senior Program Manager

1988 - 1990 **TRC Consultants**
Project Manager

1986 - 1988 **Woodward Clyde Consultants, Inc.**
Project Manager

1985 - 1986 **Converse Environmental East**
Project Hydrogeologist

1982 **Chevron Resources Company**
Geologist

1979 - 1980 **U.S. Environmental Protection Agency**
Staff Scientist

CONSULTING ASSIGNMENTS

Advisor to CT DEEP and to RI DPUC on the Clean Energy RFP, a regional procurement undertaken by CT, MA, and RI to procure long term contracts for new renewable resources, transmission, and large-scale hydropower resources.

Advisor to the Rhode Island Office of Energy Resources (OER) regarding the greenhouse gas impacts ascribable to the operation of a proposed 1,000 MW combined

cycle plant. Participated in a public workshop, and supported the preparation of OER's Advisory Opinion to the Energy Facilities Siting Board.

As a subcontractor to the Kaye Scholer law firm, engaged by the Maryland Public Service Commission to assist in the development of regulations implementing the Maryland Offshore Wind Energy Act of 2013. Prepared qualitative and financial criteria for the screening and selection of offshore wind projects, consistent with statute and state policy objectives.

Managed LAI's support to the Connecticut Department of Energy and Environment (CT DEEP) in two rounds of procurements for new Class 1 and other clean, renewable energy resources under long term contracts. Developed qualitative and quantitative evaluation criteria consistent with authorizing legislation. Analyzed of bid prices and market value of products and ranked proposals based on established criteria.

On behalf of the Connecticut Public Utilities Regulatory Authority (formerly Department of Public Utility Control), provide technical support for quarterly wholesale procurements by the state's two investor-owned utilities, including full requirements for default service. Support design of auction, development of wholesale purchase agreements, portfolio design, calculation of benchmark prices, and establishment of credit and collateral requirements. Provided testimony before the Commission regarding procurement integrity and compliance of the procurement with PURA procedures and statutory criteria.

On behalf of the Connecticut Public Utilities Regulatory Authority, facilitated a Working Group charged with developing a Procurement Plan for Standard Service to serve residential and small C&I customers who rely on the distribution company for electric supplies.

Managed LAI's participation as extension of Staff and as the Prosecutorial Unit for the Connecticut Public Utilities Regulatory Authority's procurement of new in-state peaking generation. Identified the quantity and operating performance criteria to provide requisite ancillary services for the load zone. Supported a collaborative effort to develop the RFP, proposal selection criteria, model terms and conditions, and pricing algorithm for a long-term Contract for Differences (CfD). Conducted bidder due diligence and quantitatively evaluated net benefits to ratepayers of competing proposals over a 30-year contract term. Provided written and verbal testimony before the Commission regarding our recommended projects for selection during the contested phase of the proceeding. Resulted in the development of 520 MW of peaking generation under long-term CfDs with the utilities.

Participated in scenario analysis and evaluated permit requirements for dual fuel operation as part of LAI's assignment on behalf of the Eastern Interconnection Planning Collaborative, a comprehensive study of pipeline and storage adequacy affecting bulk power security.

On behalf of the Connecticut Public Utilities Regulatory Authority, participated in settlement discussions and provided technical support regarding modifications to the CfDs for peaking generation necessitated by ISO New England market rule changes.

On behalf of the Connecticut Public Utilities Regulatory Authority, provided oversight and technical assistance in the utilities' solicitation of long term contracts for energy, capacity and RECs. Developed methods for evaluation of bids from wind farms and wood biomass plants. Provided written and oral testimony before the Commission regarding the hedge benefits of long term contracts within the utilities' portfolios, as well as other procurement options.

Advised the Connecticut Office of Consumer Counsel in the merger proceedings involving Northeast Utilities and NStar.

On behalf of the Connecticut Office of Consumer Counsel, reviewed the Integrated Resource Plans filed by the state's two investor-owned utilities and by the Connecticut Energy Advisory Board. Provided written and oral testimony before the Connecticut Commission regarding the policy and planning recommendations over a 10-year horizon.

Assisted the New Jersey Board of Public Utilities and the Governor's Office prepare the state's Energy Management Plan. The Plan broadly considered the buildout of backbone transmission projects, in-state supply and demand-side resources, including the prospective retirement of Oyster Creek nuclear facility, the environmental and job-creation benefits of the state's RPS including the solar carve-out, and expansion of the state's natural gas infrastructure.

Assisted the Long Island Power Authority with multiple competitive solicitations for new generation and HVDC transmission to serve the Island. Performed due diligence on respondents, coordinated LAI's financial analysis of rival bids, evaluated the feasibility of fuel delivery alternatives and the permitability of cable projects and gas interconnections.

On behalf of the New Jersey Board of Public Utilities, designed and implemented a solicitation to procure up to 2,000 MW of new combined cycle capacity under the Long Term Capacity Agreement Pilot Program. Evaluated permit and other development risks. Quantified net environmental benefits due to displacement of less efficient fossil generation across the region. Testified before the BPU regarding the outcome of the procurement and net environmental benefits to New Jersey.

On behalf of an investor-owned utility in the Northeast, prepared a strategic evaluation of options for its fossil generation fleet. Prepared ranges of capital and operating costs associated with probable new environmental requirements under a range of future scenarios.

On behalf of Allegheny Power, served as Independent Procurement Monitor during the solicitation of full requirements wholesale power supplies for eligible customers in Virginia. Reviewed procurement documents and protocols, monitored procurement

integrity through the evaluation and award of bids, and prepared a procurement report for filing with the Virginia State Corporation Commission.

On behalf of the four Massachusetts investor owned utilities, prepared long term forecasts of energy, capacity, and REC prices to be used as benchmarks in the utilities' solicitation of renewable energy under long-term contracts as required by the Green Communities Act of 2008. Advised the utilities regarding potential energy market price suppression impacts of long-term renewable contracts.

Conducted due diligence on a portfolio of wind projects located in New England and New York on behalf of an investment bank. Evaluated energy production and deliverability issues affecting project revenues.

On behalf of NSTAR, prepared filings to the Massachusetts Energy Facilities Siting Board for a proposed 345-kV transmission line. Evaluated the need and quantified the economic benefits of the proposed project versus project alternatives, including generation and demand response. Assisted counsel with discovery and provided written and oral testimony before the Board.

On behalf of the Rhode Island Economic Development Corporation, developed a database of off-shore wind PPA prices, net metering tariff rates, and feed-in tariffs across the U.S. and Europe in connection with the economic evaluation of the Deepwater Block Island offshore wind project.

On behalf of PowerOptions, advised the non-profit corporation regarding the development of a program to install solar photovoltaic facilities on member institutions' sites across Massachusetts under PPA arrangements.

On behalf of the Maryland Public Service Commission, evaluated alternative strategies for meeting the state's growing power demands and meet its Renewable Portfolio Standards through contracting alternatives, new generation, transmission expansion, and demand-side options. Prepared long-term forecasts for the cost of environmental compliance, including greenhouse gas controls and RECs.

On behalf of a large New England water utility, managed a competitive procurement for retail power supplies for all of its pumping, reservoir, and office facilities. Projected the savings offered by competitive retail supplier relative to the electric utility's standard offer service. Worked with counsel to negotiate contract terms and conditions.

Assisted a developer prepare filings to the Massachusetts Energy Facilities Siting Board for a proposed peaking generation project. Evaluated net impact on regional air emissions ascribable to the project and the need for new quick-start resources in northeastern Massachusetts to provide locational forward reserves. Evaluated alternative fueling strategies and fuel assurance for the project.

On behalf of the Long Island Power Authority, prepared an independent analysis of the environmental impacts and benefits of the Broadwater floating storage and regasification unit proposed for the middle of Long Island Sound.

Assisted Cornell University develop its Energy Master Plan. Evaluated the risk-adjusted economic value-added of technology alternatives for expanding the steaming capacity of the university's central heating plant, and assessed the environmental benefit of each alternative in terms of net emissions.

Prepared an expert report regarding valuation of a high-deliverability gas storage project. Advised client on opportunities for enhanced trading, marketing and contract administration.

Facilitated collaborative meetings among diverse stakeholders chartered by Connecticut Public Act 02-95. Provided a comprehensive plan and environmental policy recommendations to the State Legislature regarding submarine cables and gas pipelines across Long Island Sound and aboveground and underground transmission lines in Southwest Connecticut.

On behalf of ISO New England, analyzed fuel diversity, reliability issues, and compliance costs arising from environmental and other regulatory initiatives.

Assisted New York University with a competitive solicitation to select an on-site cogeneration project developer. Advised client on alternative project delivery structures.

Researched biomass fuel supply economics for a proposed cogeneration project to be fueled by a combination of waste wood and woody crop.

Evaluated environmental permit conditions and regulatory requirements that restrict or limit backup fuel oil use for new and existing gas-fired generation, as part of a reliability study of the natural gas infrastructure in ISO New England.

Evaluated revenue and earnings forecasts for two energy services companies as part of a due diligence assessment for the acquisition of non-regulated affiliates of a northeast utility company.

Advised a recycled paper manufacturer on electricity procurement and production alternatives, technologies for utilizing the mill's rejects stream, natural gas transportation alternatives, and permitability of proposed on-site energy projects. Managed a competitive procurement to construct on-site generation. Evaluated requirements with respect to New York State's SEQRA process, air permit modifications, Article VII, wetlands regulations, and SPDES.

Evaluated alternative energy production strategies and related environmental permitting constraints for the State University of New York campuses as part of a university system-wide review of energy procurement opportunities in New York's competitive energy market.

Analyzed non-utility generator contract reformation initiatives for Potomac Electric Power Co.

Evaluated environmental constraints associated with the feasibility of inside-the-fence cogeneration for Phelps Dodge at a primary rod mill production plant, including NEPA requirements for gas pipeline construction.

Provided litigation support, including project viability assessment, following termination of a Purchase and Sale Agreement for the acquisition of a nuclear power plant.

Analyzed effluent and flow data for three of NYSEG's coal-fired power plants in New York for compliance with the facilities' SPDES water discharge permit requirements.

Assessed risk profile and contract alternatives associated with construction of a natural gas lateral to a proposed cogen plant for National Institutes of Health.

Advised Massachusetts Water Resources Authority on reliability requirements for back-up generator systems under the EPA NPDES program.

Evaluated incremental costs of the Holyoke Hydroelectric Project resulting from conditions imposed by the Massachusetts DEP Water Quality Certification.

Developed engineering approaches and designs to comply with environmental regulations pertaining to former manufactured gas plant sites in Massachusetts, Maine, New Hampshire, and New Jersey for Bay State Gas Company, NEES, and PSE&G.

Quantified potential environmental liabilities in numerous due diligence reviews for acquisitions and divestitures of energy, railroad, and manufacturing company assets, both in the U.S. and Europe.

Evaluated and optimized engineering design of product recovery system for environmental compliance at Mobil and Coastal refineries in New Jersey.

Provided expert witness testimony for a pump manufacturer's defense against the local water department's groundwater contamination damage claim.

Evaluated risk/reward profile for site restoration and redevelopment options of a 40-acre parcel in Providence, R.I.

EDUCATION

Harvard University, Cambridge, MA
A.B., Geological Sciences

University of Washington, Seattle, WA
M.S., Ph.D., Geological Sciences

PRESENTATIONS & PUBLICATIONS

2012. "Influence of State Policymaking on New England's Wholesale Markets – RGGI" Northeast Energy and Commerce Association, 11th Annual Power Markets Conference, Westborough, MA, October 24, 2012.

2009. "How to Shop for Power." MassBusiness, p. 16 (with M.J. DeCourcey).

2000. "Backup Power Risk Factors Impacting the Commercial Merit of Combined Heat and Power": Proceedings, 91st Annual Conference of the International District Energy Association, Montreal, Quebec, June 10-13, pp. 169-182.

1998. "Innovative and Cost-Effective Dual Phase Extraction using a Vacuum Truck and Standard Monitoring Wells": Amherst Soils Conference, October (with D.M. McCabe, R.K. Maggiani, F. W. Lilley).

1994. "The 1,000-Mile-Long Site: Managing and Evaluating Environmental Liabilities for the Railroad Industry." Presented at the New England Environmental Expo, Boston, MA, April (with K.A. Nelson).

1993. "Integrated Risk Management: A Tool for Strategic Decision-Making." Presented at Air & Hazardous Waste Management Conference. Hartford, CT, October 20 (with M.J. Murphy).

1992. "Reduce Sampling Errors: Careful Extraction Method Can Improve Accuracy of Soil Analyses" *Soils*; January-February; pp. 16-18.

1990. "The Interpretation of Free-Phase Floating Toluene Contamination at a Hydrologically Complex Site"; New England Environmental Expo, Proceedings (with McCabe, D.M.).

1989. "Vein Formation, Fluid Flow, and Wall Rock Geochemistry at the Lucky Friday Mine, Coeur d'Alene Mining District, Idaho"; 28th International Geological Congress, Washington, D.C. Proceedings; Vol. 1; pp. 1-323 - 1-324.

1985. (Gitlin, E.C.). "Sulfide Remobilization During Low Temperature Alteration of Seafloor Basalts", *Geochimica et Cosmochimica Acta*, 49; pp. 1567-1580.

1985. (Gitlin, E.C.). "Alteration and Fluid Flow Around a Sulfide-Carbonate-Quartz Vein, Lucky Friday Mine, Northern Idaho"; Geological Society of America, Abstracts with Program 17; pp. 593.

1985. (Gitlin, E.C.). "Small-Scale Heterogeneities in Stillwater Anorthosite II". Lunar and Planetary Science XVI; Lunar and Planetary Institute; Houston, Texas (with P.A. Salpas, I.S. McCallum, and L.A. Haskin).

Trainer, ABB Project Risk Workshop, July 1994

ASSOCIATIONS

Northeast Energy and Commerce Association, Inc., Board Member and Vice President, Policy

ISO New England Environmental Advisory Group