**STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS**

**PUBLIC UTILITIES COMMISSION**

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

# PRE-FILED TESTIMONY OF JOHN NILAND

**Q. Please state your name, business title and business address**.

A. John Niland Director Business Development for Invenergy Thermal Development LLC, One South Wacker Drive Suite 1800 Chicago, IL 60606.

**Q. On whose behalf are you testifying?**

A. My testimony is on behalf of the applicant, Invenergy Thermal Development LLC, in support of its application for a license from the Rhode Island Energy Facilities Board to construct the Clear River Energy Center project in Burrillville, Rhode Island.

**Q. Please describe your educational background and professional experience.**

A. I have a degree in Mechanical Engineering from Northeastern University. I have over 30 years of experience in power project engineering, development and energy markets. I have experience with all manner of power generation technologies, including nuclear, coal fired, gas fired combined cycle and peaking facilities, solar and wind. For Invenergy, I am responsible for development activities for some of Invenergy's thermal development projects in the United States. My experience in the energy and utilities industry includes roles in business and project development, engineering, equipment procurement, project management, permitting, financing and construction. I have worked for Invenergy for over two and half years. Prior to Invenergy, I worked for (in reverse order) Pure Energy Resources, a small development business that developed the Bayonne Energy Center in Bayonne NJ where I was Vice President of Business Development; GreatPoint Energy, a start-up firm focused on commercializing a catalytic coal gasification process where I was Director of Business Development; NRG Inc. where I was Vice President of Business Development responsible for power development activities in the Northeast (CT and MA); Calpine Corporation where I was Director of Project Development for Calpine thermal projects located in the Eastern portion of the US and Ontario; and Stone & Webster where I was a Project Engineering Manager.

I have managed and participated in many power generation projects, resulting in over 5,000 MW of projects being developed and constructed in New York, Maine, Rhode Island, Pennsylvania, South Carolina, Ohio, Florida, Texas and Ontario, Canada. I have market knowledge and experience in multiple markets and NERC regions including: NY ISO (NYPA, LIPA), PJM (FirstEnergy), and NE ISO (CT DPUC), FRCC (TECO, FPL), SERC and Ontario, (OPA). I have routinely acted as the direct interface with government and regulatory agencies involved in the permitting and contracting for energy facilities.

From a design and construction experience standpoint, I was the Project Engineering manager responsible for the design of the Tiverton combined cycle project located in Tiverton, RI (along with its sister unit the Rumford Combined cycle project that was designed and constructed simultaneously in Rumford, Maine) when I was working for Stone & Webster Engineering Corporation. During my tenure at Stone & Webster, I was a project engineer involved with the design and construction of two nuclear power plants, Beaver Valley Unit 2 in Shippingport, Pennsylvania and Comanche Peak in Glen Rose, Texas.

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

A. On October 9, 2015, as supplemented on November 9, 2016, Invenergy filed its application with the Rhode Island Energy Facility Siting Board ("EFSB") to construct a 900 to 1,000 Megawatt ("MW") combined cycle dual-fueled generation facility ("Facility") called the Clear River Energy Center project ("CREC Project"), to be located in Burrillville, R.I., as described in more detail in the application.[1] In accordance with the Preliminary Order of the EFSB, the Board requested an advisory opinion from the Rhode Island Public Utilities Commission ("PUC") as to (1) the need for the proposed Facility; (2) whether it is cost-justified to the consumer consistent with the object of ensuring that the construction and operation of the Facility will be accomplished in compliance with all the requirements of the laws, rules and regulations; and (3) whether cost effective efficiency and conservation opportunities provide an appropriate alternative to the proposed Facility. Lastly, the Procedural Schedule requested that Invenergy also provide relevant portions of the EFSB filing to the PUC, and to identify and provide any necessary updates to the EFSB filing relevant to this PUC proceeding. These updates are being provided in Mr. Hardy's Pre-Filed Testimony and, where indicated below, in my Pre-Filed Testimony. My testimony is directed towards the alternatives analysis the PUC will be focusing on in its Advisory Opinion.

**Q. Please identify the specific sections of the Application for which you are sponsoring testimony in this proceeding.**

A. I can testify to several sections of the Application, including the Introduction Letter, Section 1 (Project Overview); Section 2 (Identification/Description of Applicant); Section 3 (Project Description/Support Facilities); Section 4 (Project Cost); Section 5 (Project Benefits);

[1] Relevant portions of the application with the EFSB are being filed with the PUC simultaneously with my Pre-Filed Testimony.

Section 7 (Need); Section 8 (RI Policy); Section 10 (Alternatives), among others. I refer the PUC to these sections in the Application.

As to the specific questions identified in the EFSB Preliminary Order directed to the PUC, I will be addressing the Alternatives analysis (which were addressed in Section 10 of the Application, titled "Study of Alternatives," pages 124-129), and I will explain how the alternatives analysis further supports the "need" for the project.

**Q. Please provide the PUC with a short summary of the background context that you used to complete the alternatives analysis performed for this Project.**

A. The Energy Policy Act of 1992 ("Act") granted states, including Rhode Island, the power to create competitive markets for electricity generation, thereby changing the electricity industry from regulated local monopolies providing all electric services (generation, transmission and distribution), into a network of independent competitive companies providing electricity generation with regulated utilities providing transmission and local distribution of electricity. As a result, in 1996, with the enactment of the Utility Restructuring Act ("URA"), Rhode Island became one of the first states in the nation to deregulate its wholesale electric generation industry.

In 2002, the State of Rhode Island adopted the Rhode Island Energy Plan 2002 ("Energy Plan 2002") to help Rhode Island determine how best to meet its future energy production and consumption needs. The objective was a reliable, low-cost and environmentally benign supply of energy to support economic growth and safeguard consumers from supply disruptions. The planning horizon for Energy Plan 2002 extended to the year 2020.

More recently, on October 8, 2015, Rhode Island's State Planning Council adopted the latest State Energy Plan: "Energy 2035: Rhode Island State Energy Plan" ("Energy 2035"),[2] with a planning horizon extending out to 2035. Energy 2035 is described as a product of a collaborative effort over a number of years by numerous private and public stakeholders. Energy 2035 is intended to guide the activities of the Rhode Island Office of Energy Resources and the Division of Planning by setting goals and policies to improve energy security, cost-effectiveness and sustainability in all sectors of energy production and consumption of the State of Rhode Island. Invenergy's CREC Project supports the goals and policies of Energy 2035, particularly as a means to support the rapid introduction of more renewable energy resources into the generation mix.

**Q. Please explain how the CREC Project supports the goals of the R.I. Energy 2035 Plan.**

A. A reliable electricity supply is a necessity to both Rhode Island and regional economies, as recognized by Energy 2035. Any new project needs to provide updated modern energy efficient electricity generation along with other benefits such as ratepayer savings which help support local and regional economies. Also, as described below, the CREC Project is essential as a means to support the planned growth of renewable energy generation so as to provide essential generation, due to the variability and intermittency of wind and solar energy resources (the predominant renewable generation technologies being deployed).

Rhode Island has few indigenous energy resources and must import most of the fuels from which its electricity is generated. Although renewables have experienced significant growth in the last

[2] The full plan is available at: http://www.planning.ri.gov/documents/LU/energy/energy15.pdf

few years and certainly are a planned resource for the future, renewables are not growing at a sufficient pace to fully replace the rate of retirements of older, less efficient electric generation facilities.

Many of these older electric generation facilities have lower energy efficiencies, do not employ modern emission controls and/or rely solely on more polluting fuels like oil and coal.

Until the total generation provided by renewables in New England (primarily wind and solar) grows to a sufficient level that will allow complete reliance upon renewable energy resources to meet the region's needs, other energy resources such as natural gas, must be used to provide the bulk of the energy supply and provide a "backstop" energy source to balance the intermittency of renewable energy resources.

**Q. How does the ISO-NE view the need for new efficient natural gas generation to support more reliance on renewable energy resources?**

A. According to the Independent System Operator for New England's ("ISO-NE") 2015 Regional Outlook: the ISO-NE recognized the variable nature of renewable energy resources, pointing out that

* Wind and solar resources will eventually help achieve federal and state environmental goals. Paradoxically, the operating characteristics of these renewables will increase reliance on fossil-fuel-fired natural gas generators, due to several realities, such as: wind and solar resources can have rapid and sizeable swings in electricity output due to wind speed, time of day, cloud cover, haze and temperature changes (which is why they are called variable or intermittent resources);

* These resources have a limited ability to serve peak load. Wind speeds can be at their lowest levels in the summer, while extreme cold and ice can also hinder output. Widespread use of solar power, meanwhile, will likely shift peak net load to later in the afternoon, just as output diminishes with the setting sun;

* To balance the variable output from wind and solar resources, the power system must hold more fast-start capacity in reserve. The types of units that can come on-line quickly are typically natural gas combined cycle and combustion turbine generators.[3]

Over time, the growth of renewable energy resources supplemented by energy storage, will hopefully expand to a level that will reduce dependency on natural gas fueled electric generation. However, as the ISO-NE recognized in its study, in the interim New England states, including Rhode Island, must rely on a mix of generation technologies and energy resources to meet the needs of the region.

Energy 2035 has many goals and policies that will set the energy programs in Rhode Island for the foreseeable future. The goals of Energy 2035 to maintain the overall reliability of the energy supply within New England is emphasized by its key overall program initiatives including;

- Increasing energy efficiency,
- Promote the ability to allow for additional integration of renewables,
- Policies directed to achieve reductions in greenhouse gases and
- Modernize the electric grid to ensure reliability is maintained.

[3] The full ISO-NE 2015 Regional Outlook Report is available at: http://www.iso-ne.com/static-assets/documents/2015/02/2015_reo.pdf

The CREC Project will support each of these initiatives. As will be explained in my testimony, Invenergy's alternatives analysis considered each of these initiatives.

**Q. What about the alternatives analysis in the context of the Resilient Rhode Island Act of 2014?**

A. Rhode Island passed the Resilient Rhode Island Act of 2014, which established a Climate Change Coordinating Council for the purposes of developing a strategic planning document to providing policy recommendations to help accomplish the goals and targets leading to reduce carbon emissions. That plan has not yet been developed as I understand it (the Act requires the plan to be developed by 12/31/2016). The alternatives analysis that Invenergy conducted establishes that the CREC Project will facilitate, support and accommodate the addition of more carbon free renewable generation to help Rhode Island meet the stated goals of the Resilient Rhode Island Act. The CREC Project will support the development and implementation of more renewable energy generation. The CREC Project will also contribute to significant reductions in carbon emissions (as well as other emissions), as more fully described in the Application as well as Mr. Hardy's testimony.

For these reasons, the CREC project and our alternatives analysis supports the goals of the Resilient Rhode Island Act of 2014. I also note that the Act obligates the Climate Change Coordinating Council to "work with other New England states to explore areas of mutual interest to achieve common goals," which supports our analysis that emission reductions must be viewed on a regional basis. The CREC Project is a viable option because it complies with the goals of the Act. Our alternative analysis is fully in conformance with Rhode Island Energy Policy.

**Q. Regarding alternatives considered for this Project, would you provide the PUC with a short summary of the basis for how the analysis was conducted?**

A. The power generation production process alternatives considered a variety of power generation technologies, including high efficiency gas fired combined cycle and combustion turbine peaking, renewable energy technologies (e.g., wind, solar, biomass, geothermal and hydropower), energy storage, energy efficiency and conservation, and the no-action alternative.

An analysis of alternatives necessarily begins with a definition of the objective being considered. For purposes of discussing technology alternatives, the major considerations we considered are the size of the energy need proposed to be met and the characteristics of operation, i.e., peaking, intermediate or baseload.

In this case, Invenergy has proposed a generating plant intended to meet the local and regional electric energy needs for new generations that are expected to increase in the coming years due mostly to retirements. The ISO-NE has identified that more than 4,000 MW of existing plants have announced their retirement and will come off line by June 2019. They also have identified a number of other plants that are "At Risk" of retirement in the coming years. These "At Risk" plants represent up to an additional 6,000 MW that will need to be replaced in the regional grid into which the CREC Project will be connected. The "At Risk" plants are older, fossil fuel plants that use oil or coal as their primary feedstock whose retirements will be caused by a number of factors including;

- The "At Risk" units are, on average, more than 50 years old and are basically at the end of their design life. Typically, older plants require additional maintenance in order to assure they can operate safely and reliably and this added maintenance comes at a higher fixed operating cost that the unit must budget for by increasing its fixed annual operating budget.

- Increasing operating costs due to modifications that will need to be installed to comply with environmental regulations like adding pollution control equipment such as scrubbers and emission controls.
- Increased variable operating costs due to environmental regulations like the Regional Greenhouse Gas Initiative ("RGGI").
- Potential negative economics resulting from new ISO-NE Tariff provisions called "Pay for Performance" which reinforce the plant's capacity supply obligation by imposing sizable penalties should they not operate when called upon.
- Limited operations due to their low efficiency and type of fuel and fuel cost, causing them to be more expensive to operate and as a result not dispatched which reduces revenues, in the face of rising fixed costs.

Many of the older fossil fuel power plants mentioned above that have been announced or expected to be retired are fueled by coal and or oil. As such, they have traditionally been looked to for baseload power supply, i.e., constant operation throughout the year subject only to maintenance outages.

**Q. Did the alternative analysis focus on a specific region of New England?**

A. Yes. We focused on the Southeast New England ("SENE") region. Any new resource must be selected by the ISO-NE through the ISO-NE's Forward Capacity Auction ("FCA") capacity procurement mechanism, to ensure that the ISO-NE power system has sufficient resources to reliably meet the future demand for electricity. The FCA is a market-based approach to determine both system-wide and localized needs for both existing and new generation capacity through a competitive auction process designed to select the portfolio of existing and new resources needed for system-wide and local reliability with the greatest social surplus. The overall system-wide and local reliability needs of the region can be determined by looking at prior auction results to see where there was insufficient generation to meet the demand which resulted in high clearing prices.

In the last few auctions, the SEMA/RI zone cleared at the cap price, which indicated there is a need for new generation within the zone. Additionally, this zone is an import transmission constrained zone, which means that in order to meet the needs for the zone, the new generation project must be located within the SEMA/RI zone. The SEMA/RI zone was expanded to include the Boston area prior to FCA 10, and the zone was renamed SENE which includes RI, eastern MA and Cape Cod. The SENE zone was chosen as the location for the new generation resource. While the focus was on meeting the needs of SENE zone, some of the alternate technologies were evaluated irrespective of locating them within the SENE zone.

**Q. What were the specific technologies that you evaluated?**

A. The power generation production process alternatives considered included conventional steam turbine cycle using fossil fuels (i.e., “rankine” cycle), renewable energy technologies (e.g., wind, solar, biomass, geothermal and hydropower), energy efficiency and conservation, and the no-action alternative.

- <u>Conventional Steam Turbine Cycle</u>: Conventional steam turbine cycle using fossil plants, coal or oil, were removed from consideration due to several costs and performance disadvantages. Their higher installed costs ($/Kw installed), their lower efficiency which leads to higher operating costs, the costs to comply with the anticipated environmental regulations (on a $/kW basis) were the highest among all of the alternative technologies. The characteristics of the technology that is used in these plants is such that they have long start times, relatively slow response times to changing power demand and as a result they are sometimes termed as being in-flexible and not able to compensate for the generation demand that a modern power supply network has when a large amount (greater than 10%) of renewable generation is present. The overall footprint of a comparably sized coal plant is significantly larger than that of a natural gas fired combined cycle plant.

- Wind Generation: Modern wind turbines represent a viable alternative to large bulk power fossil power plants as well as small-scale distributed systems. The key items that are needed for developing wind farms are land, regional expected wind speeds and access to electric transmission. The capacity for an individual wind turbine ("WT") today ranges from 400 watts up to 3.6 MW. The typical size for a land based wind turbine has grown over the years and is currently about 2.3 MW each for a new land based WT (210 WT's to produce 485 MW). WT's need to be spaced apart and as such require large land areas that is typically 120 to 150 acres per WT (1,000 feet of horizontal spacing and 5,000 feet of downwind spacing) which would mean that 58,000 to 116,400 acres would be needed in order to generate the up to 485 MW to 970 MW of electricity that the CREC Project would produce. While all of this land would not need to be under the control of the wind farm developer, but depending on the size of the wind turbines, the tracts of land that are needed – approximately two to five acres of directly impacted area per WT (approximately 900 acres for 485 MW of WT production for the turbine area, roads, substation, and transmission) and approximately 120 to 150 acres of indirectly impacted area (terrain and wind patterns spacing of the turbines so as to obtain optimal production) there is still quite a bit of land that is needed for each WT. This would present particular (and obvious) challenges for Rhode Island, a relatively small state in terms of land area. Wind speed is also a factor. Typically wind developers look for areas that have wind speeds in excess of 6.5 m/sec (at 80 meters) which for Rhode Island really only occurs along the coast or offshore. Without the proper wind resource (i.e. wind speed), the energy production is impacted which in turn drives up the cost for power production. The wind issues explain why large scale wind projects are not constructed in areas that do not have the proper wind resource. Given the cost to purchase land in Rhode Island, especially along the coast, land requirements would be problematic and costly. Wind farms also have other environmental issues that must be addressed, including bird mortality (especially for raptors), visual and noise impacts and rotating wind turbine blades that may produce shadow flicker. Onshore wind projects have also met substantial opposition from communities and have thus far been very difficult to site. For example, the U.S. Navy proposed to install 12 wind turbines on its Newport, Rhode Island property and was forced to abandon that plan due to difficulties in siting wind turbines on the property. Also, as the PUC is well aware, the offshore wind industry is at its very early stage in New England. For the relevant period of time associated with FCA 10 and beyond, there were no available large-scale wind projects completed and operational to qualify for the ISO-NE, especially in terms of the scale of MW that corresponds to the "need" that ISO-NE has identified. Further, off shore wind is still relatively expensive as concerns the price of electricity per the existing PPA, as the PUC explored in the context of the initial 35 MW Deepwater Wind project.[4]

[4] I note that Mr. Hardy's testimony explains how the CREC Project will lead to ratepayer cost reductions, another factor that the PUC will be concerned with in this proceeding.

- <u>Solar</u>: Both solar thermal and solar photovoltaic solar resources require large land areas in order to generate the approximate 485 to 970 MW of electricity proposed to be supplied by the Project.[5] Thermal solar development was not considered viable as this technology captures and concentrates the solar radiation with a receiver. The main receiver types are mirrors located around a central receiver (power tower), parabolic dishes and parabolic troughs collecting the sun's heat and using a central receiver that then utilizes the heat collected to generate steam and drive a steam turbine generator. Thermal solar requires more sun exposure (such as desert areas of the southwest). Thermal projects require five or more acres per MW, so 970 MW would require approximately 5,000 acres of land under ideal "desert-like" conditions and much more land under "Rhode Island-like" conditions. Given the available irradiation from the sun in Rhode Island, thermal solar was not deemed viable.

  Solar photovoltaic ("PV") technology uses photovoltaic "cells" to convert solar radiation directly to direct current electricity, which is then converted to alternating current. Approximately 5 to 7 acres of cleared land is needed for 1 MW of PV solar, so assuming that one was able to aggregate multiple 5 MW, the 485 MW of cleared capacity in the FCA 10 would require 97 separate 5 MW sites requiring 485 - 679 acres of land. While possible in theory, securing that many 5 MW sites (or larger sites) available in the time

[5] Most solar thermal technologies collect solar radiation then heat water to create steam to power a steam turbine generator. The primary systems that have been used in the United States capture and concentrate the solar radiation with a receiver. The three main receiver types are mirrors located around a central receiver (power tower), parabolic dishes and parabolic troughs. Another solar thermal technology collects the solar radiation in a salt pond and then uses the heat collected to generate steam and drive a steam turbine generator. Solar photovoltaic ("PV") technology uses photovoltaic "cells" to convert solar radiation directly to direct current electricity, which is then converted to alternating current. Solar thermal facilities are generally dispatchable while solar PV facilities are not.

frame required to meet the obligations established by ISO-NE is highly unlikely.[6] Also, it should be noted that although the nameplate capacity of these solar sites would be 5 MW each, the actual capacity that the ISO-NE recognizes for solar PV is only about 13% of nameplate due to variation in solar radiation, darkness, cloud cover etc. In order to actually provide 485 MW of capacity consisting of solar PV, one would need to have substantially more solar PV installed. Finally, solar energy technologies like PV cannot provide full-time availability due to the natural intermittent availability of sunlight. The inflexible and non-dispatchable nature of solar generation—its limited dependability (to produce power when its needed)—are defining differences between that electricity generating alternative and the CREC Project.

One way to help alleviate the expendability short coming is with energy storage facilities involving the use of batteries that can provide power for short periods of time. However, at larger scales it is neither cost effective nor economically viable to store and produce energy for time frames much beyond one hour. As the time for production increases beyond 30 minutes the number of batteries increases directly. To illustrate one example of this: Invenergy's Beech Ridge storage facility, which has a capacity to produce 31 MW for short periods for an overall production of 12 MW Hrs. The facility consists of sixteen container sized trailers (8 ft wide by 40 feet long) placed in an array that occupies approximately half an acre of property. A facility that is capable of producing 1,000 MW for an hour (1,000 MWHrs) would need to be 83 times the size of Beech Ridge, would encompass approximately 39 acres but would only be able to match the output of the

[6] For another example, the Ivanpah solar project in California generates 500 MW of electricity and required 5 square miles of cleared property. For reference, the Town of Burrillville is about 60 square miles, so the land required by solar to meet the MW of the CREC Project (1,000 MW) would need about 10 square miles of cleared open space land (no trees), or 1/6 of all of Burrillville. The CREC Project, by comparison, will utilize only approximately 67 acres of land.

CREC Project for one hour. Such a plan would have a capital cost more than twice that of the proposed CREC Project. Invenergy believes that storage does help promote an overall energy strategy, reliability, grid resiliency, power quality, increases renewable penetration, but it is used only for short term applications and cannot meet the long term (more than an hour) capacity needs that are required to be satisfied in order to meet load. With all the aforementioned characteristics and impacts, i.e., environmental trade-offs, solar energy technologies were considered as infeasible for the CREC Project's objectives.

- Biomass Generation: This technology uses a vegetation fuel source such as wood chips (scrap wood from broken pallets and crates, wood waste generated by pruning, trimming or land-clearing activities, forest management activities or dedicated woody crops) or agricultural waste. The fuel is burned to generate steam in a boiler that is then directed to a steam turbine. However, biomass facilities generate much greater quantities of air pollutant emissions than combined-cycle natural gas burning facilities on a per-MW basis, due to the inherently lower efficiency of the steam-electric generating technology. In addition, biomass plants are typically sized to generate less than 25 MW, which is substantially less than the capacity of the CREC Project, due to the economics of transporting the biomass fuel from distant locations. Accordingly, many biomass facilities would be required to meet the Invenergy's goal of generating approximately 1,000 MW. Land, infrastructure and transportation impacts would be significantly more damaging to the environment than the proposed CREC Project.

- Geothermal Technologies: This generation source uses steam or high-temperature water obtained from naturally occurring geothermal reservoirs to drive steam turbine/generators. Geothermal technology is limited to areas (like Iceland) where geologic conditions resulting in high subsurface water temperatures occur. There are no viable geothermal resources in the region. Therefore, geothermal technologies are not a feasible alternative to the CREC Project.

- Hydropower: These facilities require large quantities of water (either stored or run-off river flowing water) and sufficient topography to allow power generation as water drops in elevation and flows through a turbine to generate electricity. There are no rivers or bodies of water located in the region that would offer a viable source of water for power generation via flowing water because elevation changes are not present to the degree needed for efficient power generation. In order to create the necessary elevation differential, a full or partial dam (high-impact hydropower) would have to be constructed; however, unless extremely large areas are intended to be flooded to create a high enough dam, the power produced in such fashion would be limited. While hydropower is generally considered to be a baseload power source, except during times of drought, the lack of available locations where such a dam could be built would limit the size of any dam to a small size requiring many such installations to meet the demand needs in the region. With all the aforementioned characteristics and impacts, hydropower energy generation is not a feasible alternative to the CREC Project.

**Q. What is your view of the role of these renewable energy resources for further more long term development?**

A. Invenergy is a leading developer of renewable energy in the United States and understands the economics and land considerations of renewable energy as well as any company. Based on the limitations of land and wind resources listed above, adding large scale blocks of renewable power is difficult especially in a small state such as Rhode Island. So, it is likely that both solar and wind will continue to be added to the generation mix; however, this will be occurring gradually, in smaller units, and will take substantially more time to install to meet the same MW of demand that the ISO-NE requires.

However, even though the option of going just with alternatives of renewable energy was deemed not feasible in the short term, I want to emphasize that long-term development of renewables, especially of wind and solar resources in the region, should and will be pursued. In the future, with increasing investments in renewable energy resources (onshore and offshore wind and PV solar), the percentage of time that natural gas electric generation facilities will operate will likely be reduced, as a great percentage of the regions' energy supply will be met by increasing renewable energy resources. Invenergy is fully committed to joining this effort to grow more renewable energy resources to supply a greater amount of wholesale generation.

As a result, natural gas generating facilities must be designed to provide the future flexibility needed to provide high energy efficiency, quick startup capabilities. They must be load following features to balance the intermittency and variability of the growing renewable energy resources of the region. The CREC Project has been specifically and carefully designed to meet these future challenges, featuring fast start capabilities while under full emission control, allowing the CREC Project to fully integrate with the needs of the region by accommodating increasing renewable investments in the future.

**Q. Did you consider a "no action" approach as a feasible alternative in your analysis?**

A. Yes. As explained in the Application (Section 10.1.3), a "no action" approach was not recommended for several reasons. As explained above, the ISO-NE determined that there are insufficient resources to meet demand. The details are explained in the ISO-NE documents filed with the application and in PA Consulting, Inc.'s analysis. As explained in my testimony and in the Application, there are insufficient existing renewable resources to meet the needed demand. The announced and unannounced retirements and the forecast for further electricity demands of customers make it irresponsible to not take action. Taking "no action" would mean that the benefits of the carbon and other emissions reductions forecasted will be lost, and the region will be forced to rely upon existing, older, less efficient and more polluting resources. In sum, the "no action" alternative, while eliminating all impacts associated with the CREC Project, would not achieve the benefits of needed electrical energy resources and emissions reductions, not to mention other benefits, including ratepayer cost savings.

**Q. Did you conduct an analysis to determine if cost effective efficiency and conservation opportunities would provide an appropriate alternative to the proposed facility?**

A. Yes, and this analysis is explained, along with other comparative analyses to other generation options, including renewables, in Section 10 of the Invenergy Application.

**Q. What about "cost effective efficiency" alternatives. What is your analysis on this option?**

A. Energy efficiency is appropriate for both end users of electricity and the equipment that produces electricity. As for end users, Rhode Island is already a perennial national leader in end user energy efficiency. For example, in the most recent rankings by the American Council for an Energy Efficient Economy,[7] Rhode Island ranked number 4 in the nation. While Invenergy certainly supports efforts by Rhode Island to work on ways to further promote and encourage even greater efficiency efforts for end users, Rhode Island cannot rely exclusively on additional

[7] Available at: http://aceee.org/state-policy/scorecard

end user improvements for greater energy efficiency as an alternative to the need for new generation. The announced retirement of significant MW generation in the region, coupled with the ISO-NE forecast for growth in demand over the next several years makes end user reliance infeasible.

**Q. What about a mix approach of an option of going for 100% renewable energy, combined with efficiency or demand response as an alternative to the need for the Clear River Energy project?**

A. The problem is quantity of MW, or scale. As noted above, the ISO-NE determined that approximately 1,400 MW was required to meet the load demand established for FCA 10. 485 MW was awarded to the CREC Project. While some new wind development, including offshore wind and solar qualified in FCA 10, the amounts of these resources was very small in comparison (offshore wind totaling 35 MW representing 6.8 MW of capacity with a total of new wind projects awarded representing 27 MW of capacity) and new solar representing 44 MW of new projects. Demand response has been an integral part of the capacity market for several years. FCA 10 had a 371MW of new demand response as part of the 2,746 MW award. The region, including Rhode Island, is already extremely energy efficient (perhaps due to the very high electric rates as compared to the rest of the country and the hard work and efforts of state leadership and policy, such as the Office of Energy Resources, in coordination with National Grid, and many other groups and organizations). Renewable energy projects, as promoted by the RPS requirements and the Rhode Island Renewable Energy Growth program (limited to projects no larger than 5 MW), are all important but are still of relatively small scale compared to the overall demand required by ISO-NE.

For these reasons, Invenergy's alternative analysis suggests that supplying the energy demand required exclusively with renewables, efficiency or demand response is not practical and would not eliminate the need for other sources of power generation like CREC Project, to provide electric generation when the sun is not available or the wind is not blowing.

Having more renewables in the supply stack will certainly help the overall efficiency of the power generation in ISO-NE, so adding renewables is certainly a valuable constituent of regional energy production.

Our alternatives analysis shows that supporting those renewable projects with the most efficient gas-fired project is the best combination of generation technology available today to help promote the further development of renewable energy resources, combined with more conservation and energy efficiency.

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

A. Yes, it does.

# J O H N  E .  N I L A N D

## P R O F I L E

Energy professional with 30+ years of experience in power project engineering, development and energy markets. Described as having a dedicated work ethic, deep technical knowledge, exceptional interpersonal ability and a clean, systematic approach. Solid project management and client relationship skills. Managed and participated in many strategic projects, combining knowledge of technology with prior experience in design and contracting to consistently deliver results on time and within budget.

**Highlights of Achievements:**

- Project management experience of multi-discipline team (environmental, engineering, legal, commercial operations, financial, media and public relations), direct interface with regulatory and government agencies, (including providing expert testimony to PSC and legislative panels), third party management of gas and electric utility interfaces all within budget.
- Management of partnership relations with strategic partners including developers, private equity firms and energy companies including Siemens, GE, Mitsui, ArcLight Capital Partners LLC, while pursuing development opportunities.
- Market knowledge and experience includes NY ISO (NYPA, LIPA), PJM, (FirstEnergy), and NE ISO (MA DOER, and CT DPUC), FRCC (TECO, FPL), SERC and Ontario, (OPA).
- Project management and development resulting in over 5,000 MW of projects developed and constructed in NY, ME, RI, PA, SC, OH, FL and Ontario.
- Experience with all manner of power generation technologies and manufacturers (GE, Siemens, MHI) including combustion turbine peaking and combined cycle, IGCC, coal, nuclear, wind, solar and large scale energy storage.

## P R O F E S S I O N A L  E X P E R I E N C E

INVENERGY LLC — CHICAGO, IL — 2013-PRESENT
**DIRECTOR BUSINESS DEVELOPMENT**

- Pure Energy Infrastructure is focused on acquisition and repowering of existing assets and the deployment of flexible and renewable generation to meet specific utility needs.
- Responsibilities include company formation, capital fundraise program as it relates to providing the technical and development program plans and goals to potential equity investors.
- Provided numerous proposals to utilities, such as NYPA and other confidential clients for a variety of opportunities pertaining to repowering existing assets, combined cycle, combustion turbine peaking, solar and wind.

PURE ENERGY RESOURCES LLC — BURLINGTON, MA — 2008-2013
**VICE PRESIDENT BUSINESS DEVELOPMENT**

- Responsible for pursuing development opportunities with strategic partners including developers, private equity firms and energy companies.
- Responsibilities include identifying the specific development, M&A or RFP opportunities, management of the overall development process (design, siting, budgeting and contracting for the development opportunities), as well as interfacing with government and regulatory agencies involved in the permitting and contracting for the facilities.
- Involved in the development of the Bayonne Energy Center in Bayonne, NJ and lead market development opportunities in Ontario, (OPA) and NY ISO (zones A, B, G, J, K) examining opportunities in combustion turbine peaking, combined cycle, solar and wind.

GREATPOINT ENERGY — CAMBRIDGE, MA — 2007-2008
**DIRECTOR BUSINESS DEVELOPMENT**

- Responsible for overall development for efforts with GreatPoint Energy (GPE), a startup company involved with the commercialization of a catalytic coal gasification process.
- Responsible for pursuing development opportunities with strategic partners including developers, coal suppliers and power companies.
- Lead the development of the Mayflower Clean Energy Center, a pilot scale facility constructed at Dominion's Brayton Point Power station.

# JOHN E. NILAND

NRG ENERGY INC. PRINCETON, NJ 2006-2007
**VICE PRESIDENT BUSINESS DEVELOPMENT**

- Responsible for overall development and project management for development projects being proposed on existing NRG sites in Connecticut and Massachusetts.
- Responsibilities included government entity interface, project permitting, project finance support, contract negotiations, multi-discipline team management (environmental, engineering, legal, commercial operations, financial), media and public relations support, project budget development, and gas and electric utility interconnections.
- Accomplishments included participation in the CT DPUC 2006 RFP process whereby NRG was successful in the development of Devon (200 MW) and Middletown (200 MW) peaking projects and the development of CosCob expansion (22 MW).

CALPINE CORPORATION BOSTON, MA 1999-2006
**DIRECTOR PROJECT DEVELOPMENT, DIRECTOR ASSET MANAGEMENT, ENGINEERING MANAGER**

- As a Director of Project Development he was responsible for overall development and project management for several projects being in multiple states simultaneously. Projects included, Greenfield Energy, (1000 MW) in Ontario, Bethpage 3 on Long Island (80 MW), Columbia Energy in South Carolina (700 MW), Osprey (540 MW) in Florida, Hillabee, (700 MW) in Alabama, Fremont (700 MW) plant in Ohio and Ontelaunee (540 MW) in Pennsylvania. Accomplishments included successful development and financing for all projects.
- As Director of Asset Management, Mr. Niland was responsible for assets in the PJM region which included operations management, overall plant financial performance. Accomplishments included negotiated contract restructuring agreements with First Energy and PSEG that lead to the monetization of contracts for two facilities which created earnings of $108MM for the Corporation.
- As Engineering Manager (from August 1999 to December 2001) responsibilities included standard plant design development, project design and EPC support of development for several combined cycle projects.

STONE AND WEBSTER ENGINEERING CORPORATION BOSTON, MA 1981-1999
**PROJECT ENGINEERING MANAGER**

- Project Engineering Manager for two 265 MW combined cycle EPC projects being designed and constructed simultaneously (Tiverton and Rumford). Responsibilities include overall design, schedule, multi-discipline engineering management and performance analysis in support of project guarantees.
- Power Business Development Manager, Responsible for overall project bid preparation and RFP response, including project description, plant design and layout, target price and detailed estimate, performance analysis in support of project guarantees, consortium negotiations including, Division of Work, Consortium Agreements and Executive review presentation. Projects won included two 300MW coal fired power plants (Pha Lai II with EVN) and two combined cycle plants (Tiverton and Rumford).
- Project Engineer for several diverse projects utilizing coal, nuclear and natural gas. Clients included Duquesne Light, (Beaver Valley Unit 2), Texas Utilities, Virginia Power, TVA, Energy Management Inc. (EMI), Korea Atomic Energy Research Institute, East China Electric Power Design Institute, Shanghai, PRC. Responsibilities included project planning, bid estimate, budget control, system design and specifications for various power systems. Results included successful completion of the project within the estimated budget. Responsibilities included project planning and budget control, overview and direction of client engineering staff. Results included redesign of the facility's systems, and successful completion of the project within the estimated budget.

## EDUCATION

NORTHEASTERN UNIVERSITY, BOSTON, MA 1977-1981
**MECHANICAL ENGINEERING** **GRADUATED WITH HONOR**

UNIVERSITY OF MASSACHUSETTS BOSTON, MA 1974-1976
**MAJOR IN PHYSICS NO DEGREE RECIEVED**

## LICENSES AND REGISTRATIONS

PROFESSIONAL ENGINEER, MECHANICAL MASSACHUSETTS, MAINE, RHODE ISLAND (NOT CURRENTLY ACTIVE)