STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
ENERGY FACILITY SITING BOARD

IN RE: INVENERGY THERMAL DEVELOPMENT LLC's APPLICATION TO CONSTRUCT THE CLEAR RIVER ENERGY CENTER IN BURRILLVILLE, RHODE ISLAND **DOCKET No. SB-2015-06**

PRE-FILED DIRECT TESTIMONY OF MARK WIITANEN

(JUNE 30, 2017)

SUMMARY

Mark Wiitanen, P.E. is a Senior Project Manager and Vice President of HDR, Inc. and testifies regarding the overall design of the Clear River Energy Center ("CREC") and the required resources (electric transmission, supply of fuels, supply of water, etc.). He describes that CREC will support the priority criteria in the Rhode Island Energy Facility Siting Act. Specifically, explains the following: using natural gas as a primary fuel while further supporting the growing renewable energy industry; maximizing efficiency as the cleanest most efficient natural gas project in the region; using low levels of high quality water; utilizing existing energy and support facility infrastructure; producing the lowest levels of air emissions; producing low levels of wastewater discharge; producing low levels of solid waste; and having a dual fuel capability.

LIST OF EXHIBITS

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
ENERGY FACILITY SITING BOARD

IN RE: INVENERGY THERMAL DEVELOPMENT LLC's APPLICATION TO CONSTRUCT THE CLEAR RIVER ENERGY CENTER IN BURRILLVILLE, RHODE ISLAND **DOCKET No. SB-2015-06**

INVENERGY THERMAL DEVELOPMENT LLC'S PRE-FILED DIRECT TESTIMONY OF MARK WIITANEN OF HDR, INC.

I. INTRODUCTION

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

A. My name is Mark Wiitanen. I am a Senior Project Manager and Vice President, at HDR, Inc. ("HDR"), located at 5405 Data Court, Ann Arbor, MI 48108.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING?

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

Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE.

A. I received a bachelor's degree in electrical engineering from Michigan Technological University. I am a Registered Professional Engineer in the states of Michigan, Florida and Illinois. I perform consulting engineering in the electric power generation industry related to combustion turbine based energy projects. A detailed description of my educational background and professional experience is included in my CV is attached as **Exhibit MW-1**.

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

A. I have previously served as an expert witness for the zoning and conditional use permitting of a nominal 1500 MW natural gas-fired combined cycle power plant located in Pennsylvania.

II. PROJECT DETAILS

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

A. I will describe the overall design of the facilities, and the required resources (electric transmission, supply of fuels, supply of water). I will also testify that the Project will support the priority criteria in the Energy Facility Siting Act, namely – using natural gas as a primary fuel while further supporting the growing renewable energy industry; maximizing efficiency as the cleanest most efficient natural gas project in the region; using low levels of high quality water; utilizing existing energy and support facility infrastructure; producing the lowest levels of air emissions on lb per MW hr produced basis; producing low levels of wastewater discharge; producing low levels of solid waste; and having a dual fuel capability.

Q. SECTION 3 OF THE APPLICATION DESCRIBES THE FACILITIES, EQUIPMENT AND STRUCTURES THAT ARE PLANNED FOR THE CREC PROJECT. PLEASE SUMMARIZE THESE FOR THE BOARD AND EXPLAIN THE STATUS OR UPDATES THAT YOU WANT THE BOARD TO BE AWARE OF.

A. As summarized by Mr. Niland, the Project site will consist of two trains of combined cycle equipment with each train being comprised of a combustion turbine, steam turbine and generator located within a building and a 345 kV transformer, a heat recovery steam generator and an air cooled condenser located outdoors. In addition, the Project will have an electrical switchyard that has three 345 kV breakers to connect the output from the two transformers to the single 345 kV transmission line that is described in more detail in the joint application made with National grid for the new transmission line, (Docket SB-2017-01). Other buildings include a common auxiliary

boiler that is used to create heating steam for a more rapid start up, an administration / control building and warehouse, a 1,050,000 gallon raw water storage tank, 1.8 million gallon demineralized water storage tank, a single 160,000 gallon waste water storage tank, a single two million gallon oil storage tank located within a containment area and a water truck unloading station and an area for the mobile ion exchange demineralized water treatment trailers. The Project will also have a gas metering area that includes meters, pressure regulation valves and small gas compressors (three 50% capacity compressors located inside a small building) that will be used if the Algonquin pipeline gas pressure should be lower than the required pressure needed to supply gas to the combustion turbines.

Q. PLEASE DESCRIBE THE TURBINE EQUIPMENT THAT INVENERGY INTENDS TO UTILIZE.

A. After filing its Application, Invenergy selected a General Electric model 7HA.02 Combustion Turbine ("CT") power island package that consists of the CT, steam turbine and generator on a common shaft. The scope of the power island package also includes the heat recovery steam generator and other ancillary equipment such as CT lubrication oil package etc.

Q. PLEASE EXPLAIN HOW THE SELECTION OF THIS GE TURBINE IMPACTS THE EMISSIONS EXPECTED?

A. The GE 7HA.02 CT is the most efficient combustion turbine available on the market today and its selection will make the CREC the most efficient power plant in New England. This selection also allows the Project to provide to RIDEM a guarantee from the manufacturer (GE) on the expected emissions from CREC. As a result of this selection, we modified our air permit application to reflect the selected manufacturer. Additionally, in response to questions and concerns raised during the public hearings we have modified the application to limit the number of days the Facility could run on fuel oil from 30 days per CT to 15 days. Additionally, we reduced the number of hours the unit could run its duct burners from unlimited to 6,100 hours per year per

train. We also reduced the number of hours the auxiliary boiler can operate from 4,576 hours to 2,400 hours to reflect that the auxiliary boiler will only run during start-up operations and when the unit is shutdown but is in a ready state to start when called upon. These changes will lead to further reductions in air emissions that were originally forecasted in the Application. Mr. Feinblatt will describe in more detail the air emissions reductions and benefits associated with this selection of turbine.

Q. WILL THIS SPECIFIC TURBINE BE REVIEWED BY RIDEM AS PART OF THE MAJOR SOURCE PERMIT APPLICATION?

A. Yes. As Mr. Feinblatt will describe in more detail, the turbine will be reviewed as part of the air permit application. Invenergy is committed to comply with all State and Federal Air Pollution Control requirements and will utilize the so-called Best Available Control Technology under the guidance of RIDEM's Office of Air Resources.

Q. PLEASE SUMMARIZE THE NOISE THAT IS ANTICIPATED TO BE PRODUCED FROM THIS TURBINE WHEN OPERATING, AND WHAT EFFORTS INVENERGY WILL UTILIZE TO MINIMIZE ANY NOISE IMPACTS TO THE AREA?

A. The specifics of the noise analysis will be addressed by Mr. Hankard. With that said, the Application describes the acoustic analysis that was conducted initially, with consideration for the requirements of the local town noise ordinance, and the anticipated acoustic design for the project. Invenergy also surveyed the noise levels that the EFSB has adopted with regard to other major source electric generation projects (OSP, RISE, Tiverton), where the Board adopted acceptable limits ranging from 40 to 43 dBA from the nearest residence. Mr. Hankard's testimony will describe this in more detail, as well as to update the analysis that he conducted as the Project moved through the local advisory process with Town Planning, and in response to public comments.

Based on feedback from the Town of Burrillville's ("Town") experts and public comment, Invenergy is going to implement changes to the design of CREC in order to meet the A weighted

43 dBA required in the Town's noise ordinance. As I understand it, the Town's noise ordinance generally limits noise levels to an equivalent level of 43 dBA from the nearest residence, and Invenergy will meet this requirement, as described in more detail by Mr. Hankard. Additionally, to the extent required, Invenergy requested a variance from the octave limits called for in the Town's noise ordinance, a request that the Town's independent noise expert agreed with. I believe the Town's Planning Board agreed, but that this was not acted upon by the Town's Zoning Board. To the extent required, Invenergy is requesting a variance from the Board. In that regard, I understand that the Town's ordinance allows for the exemption if the Project will conform to another statewide standard, which I expect would be a limit set by this Board as it considers the evidence in this proceeding.

Q. TURNING TO WATER SUPPLY FOR THE FACILITY, ARE YOU FAMILIAR WITH OTHER POWER PROJECTS THAT USE TRUCKED WATER AS THEIR MAIN SOURCE OF WATER SUPPLY?

A. Mr. Niland addressed the Ocean State Power plant in Burrillville. I am familiar with other facilities that rely on trucked water to meet their process needs. These include: the 90 MW Orange Grove plant in San Diego and the 100 MW Imperial Irrigation District Niland plant located in Niland, California.[1] The low volume water needs of the CREC design support the feasibility of the water supply to be delivered by truck. The application of trucked delivered water for construction and industrial applications is common at the CREC level of daily volumes.

Q. PLEASE DESCRIBE THE STORMWATER CONTROL ASPECTS OF THE PROJECT AND THE REVISED WATER SUPPLY.

A. The proposed water supply plan did not have any impact on the Project's storm water

[1] The Order of Approval for the Orange Grove plant is available at http://www.energy.ca.gov/2009publications/CEC-800-2009-003/CEC-800-2009-003-CMF.PDF. A description of the Imperial Irrigation District Niland plant is available at https://www.powereng.com/projects/100-mw-niland-gas-turbine-plant/.

control aspects or design. The proposed 67 acre CREC site is situated on existing gently sloping, forested upland and wetland areas in northeast Providence County, Rhode Island. Improvement of the site will result in increased impervious area and changes to existing land use cover types and, as such, will require the implementation of a stormwater management program in accordance with the RIDEM Rhode Island Stormwater Design and Installation Standards Manual ("RIDEM Manual"), last amended March 2015. These details are described in more detail in the testimony of Chad Jacobs of HDR Inc. and Jim Riordan of ESS. In sum, the proposed improvements are divided into two general areas; the powerblock area and the site access road and laydown area. The powerblock area will drain into stormwater basin designed in accordance with the RIDEM Manual. The proposed stormwater pond will be lined with an impermeable material and designed to include an outlet structure to control the peak flowrate from the proposed Project. The site access road is proposed to drain to a dry swale paralleling the road to the north. The Dry Swale will provide Water Quality treatment, and flow into a proposed detention pond situated north of the road. The site access road is not considered a Land Use with Higher Potential Pollutant Load ("LUHPPL") and, as such, the access road detention pond is not proposed to be lined. The site access road is proposed to be constructed using a variable height retaining wall. The details of the storm water management system design will be described more fully by Mr. Chad Jacobs.

Q. THE EFSB STATUTE OBLIGATES THE BOARD TO GIVE PRIORITY TO PROJECTS THAT MEET CERTAIN CRITERIA. I WILL LIST THEM EACH FOR YOU AND ASK YOU FOR YOUR OPINION. THE FIRST CRITERIA IS FOR PROJECTS THAT USE NATURAL GAS AS THEIR PRIMARY FUEL. DO YOU HAVE AN OPINION AS TO WHETHER CREC WILL MEET THAT CRITERION?

A. Yes. The CREC Project will use natural gas as its primary fuel and therefore certainly meets this criterion.

Q. THE EFSB STATUTE LISTS "USING LOW LEVELS OF HIGH QUALITY WATER" AS A PRIORITY CONCERN FOR THE BOARD. DO YOU HAVE AN OPINION AS TO WHETHER CREC WILL MEET THAT CRITERION?

A. Yes. As a result of dramatic advancements in technology, the CREC Project is able to vastly reduce its water demands, as compared to power generation projects of even just a few years ago. So the CREC Project certainly meets this criterion, as it will be using very low levels of water to produce vast amounts of energy to supply electric customers in Rhode Island and the region.

Q. NEXT, THE EFSB STATUE LISTS UTILIZING EXISTING ENERGY INFRASTRUCTURE. DO YOU HAVE AN OPINION AS TO WHETHER CREC WILL MEET THAT CRITERION?

A. Yes. One of the compelling reasons Invenergy selected this site was the fact that there exists substantial energy infrastructure in place, with access to the natural gas resource next to the site via the long existing Algonquin gas compressor station. Also, the electric transmission infrastructure exists very close to the Project site, and Invenergy is able to utilize the existing National Grid Right of Way to utilize their high voltage (345kV) transmission infrastructure that was just upgraded as part of the Interstate Reliability Project. The CREC Project will utilize all this existing energy and support facility infrastructure.

Q. NEXT, THE EFSB STATUE LISTS AS A PRIORITY PROJECTS THAT PRODUCE LOW LEVELS OF AIR EMISSIONS. DO YOU HAVE AN OPINION AS TO WHETHER CREC WILL MEET THAT CRITERION?

A. Yes. Since CREC will be the most efficient power generation project in New England, its emissions will be the lowest of any fossil fuel fired power generation on a pound per MWHr basis of energy produced.

Q. NEXT, THE EFSB STATUE LISTS AS A PRIORITY PROJECTS THAT PRODUCE LOW LEVELS OF WASTEWATER DISCHARGE. DO YOU HAVE AN OPINION AS TO WHETHER CREC WILL MEET THAT CRITERION?

A. Yes. The Project is air cooled and as such does not use water for cooling. In doing so it does not produce waste water that would be associated with such use. Additionally, with the revised water plan the Project will recycle process water from the steam system to the maximum extent possible, thus reducing process waste water and the Project will use mobile ion exchange demineralized water treatment trailers that will not produce waste water on site. The ion exchange media in these trailers will be regenerated off site.

Q. NEXT, THE EFSB STATUE LISTS AS A PRIORITY PROJECTS THAT PRODUCE LOW LEVELS OF SOLID WASTE DISCHARGE. DO YOU HAVE AN OPINION AS TO WHETHER CREC WILL MEET THAT CRITERION?

A. Yes. The Project does not produce solid waste as part of its process to generate electricity. There will be some solid waste that is would be associated with maintenance activities like changing filters in some of the system like oil filters and water filters. Additionally, with the revised water plan the Project will recycle process water from the steam system to the maximum extent possible thus reducing process waste water and the Project will use

Q, FINALLY, THE EFSB LISTS AS A PRIORITY PROJECTS THAT HAVE A DUAL FUEL CAPABILITY. DO YOU HAVE AN OPINION AS TO WHETHER CREC WILL MEET THAT CRITERION?

A. Yes. The project will have dual fuel capability which will provide added reliability to the electric generation system in New England. Invenergy configured the project to have this capability so that it would be able to continue to produce electricity in the event that natural gas was unavailable.

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes.

EXHIBIT MW-1

Mark Wiitanen, PE

Senior Project Manager/Vice President

Thirty years progressive design and project engineering experience within a multiple discipline consulting engineering environment. Broad based background of engineering, procurement, construction, startup and operations within the fossil power generation industry. Leadership role performed on retrofit projects for coal fueled stations and combustion turbine based peaking and combined cycle plants.

EDUCATION
Bachelor of Science, Electrical Engineering, Michigan Technological University, 1987

REGISTRATIONS
Professional Engineer, Florida, United States, No. 55122

Professional Engineer, Illinois, United States, No. 062049425

Professional Engineer, Michigan, United States, No. 6201037826

RELEVANT EXPERIENCE

Ares/PPMS – Hill Top Energy Center Provided Owner's Engineer services to support the development of a 620 MW combined cycle power plant, utilizing natural gas fired GE 7HA.02 based Rapid Response Power Lite single-shaft technology equipped with duct burners, surface condenser, mechanical draft cooling tower and balance of plant equipment. All associated electrical, natural gas, water and wastewater interconnection facilities are included in the project. Additional activities included execution of a 2.9 mile 500 kV transmission line interconnection EPC package, assessments of river water pre-treatment technologies, plant cycling/fast start considerations, emissions control equipment and balance of plant system designs.
Role: Project Manager

Ares/PPMS – Birdsboro Power Project Provided Owner's Engineer services to support the development and construction of 485 MW combined cycle power plant, utilizing natural gas fired GE 7HA.02 based Rapid Response Power Lite single-shaft technology equipped with surface condenser, mechanical draft cooling tower and balance of plant equipment. All associated electrical, natural gas, water and wastewater interconnection facilities are included in the project. Additional activities included execution of a 4.1 mile 230 kV transmission line and three breaker ring bus interconnection EPC package, assessments of waste water treatment technologies, plant cycling/fast start considerations, emissions control equipment and balance of plant system designs.
Role: Project Manager

Ares/PPMS – St. Joseph Energy Center Provided Owner's Engineer services to support the construction of a 2 on 1 710 MW combined cycle power plant, utilizing natural gas-fired Siemens F class combustion turbine generator packages with heat recovery steam generators, steam turbine, surface condenser, mechanical draft cooling tower and balance of plant equipment. All associated electrical, natural gas, water and wastewater interconnection facilities are included in the project. Additional activities included assessments of water treatment technologies, plant cycling/fast start considerations, emissions control equipment and balance of plant system designs.
Role: Project Manager

Invenergy – Lackawanna Energy Center Provided Owner's Engineer services to support the development and construction of three single-shaft unit 1500MW combined cycle power plant, utilizing natural gas fired GE 7HA.02 based Rapid Response Lite technology equipped with air-cooled condensers and balance of plant equipment. All associated electrical, natural gas, water and wastewater

interconnection facilities are included in the project. Additional activities included assessments of natural gas compression and gas delivery technologies, plant cycling/fast start considerations, emissions control equipment and balance of plant system designs.
Role: Project Manager

Sempra Generation Mesquite Generating Station. Responsible for the electrical engineering aspects of the Mesquite Generating Station Project. The station is a 1,250 MW two block 2-on-1 combined cycle facility utilizing GE 7FA combustion turbines, highly duct-fired triple pressure HRSG and GE D11 modular steam turbines with reheat. Project included 230/500 kV switchyard, GSU transformers, unit auxiliary transformers, 5 kV switchgear, 480 V unit substations, motor control centers, station battery, UPS, protective relay panels, and Westinghouse Ovation DCS. Assignment included extensive raw water and cycle makeup treatment systems to operate with well water. The project is a zero discharge facility.
Role: Lead Electrical Engineer

LG&E KU Services Cane Run Generating Station, Unit 7 HDR provided Owner's Engineer services to support the development of a 2 on 1 640 MW combined cycle power plant, utilizing natural gas-fi red F class combustion turbine generator packages. HDR is also providing engineering design for refurbishment of the existing river water intake structure in support. The scope of work includes demolition of existing equipment and clean out of intake structure. Installation of two new vertical wet pit pumps, two new dual flow traveling providing system design, equipment specifications, construction documents and construction support.
Role: Project Manager

LG&E KU Services Green River Generating Station, Unit 5. Project Manager. Serving as Owner's engineer, HDR supported the development of a 2-on-1, 700 MW combined cycle power plant located at the Green River site in Central City, Kentucky. The Unit 5 development proposed to utilize two natural gas-fired advanced class combustion turbine generator packages equipped with heat recovery steam generators, steam turbine generator, mechanical draft cooling tower and balance of plant equipment. All associated electrical, natural gas, water and wastewater interconnection facilities were considerations included as part of project development.
Role: Project Manager

LG&E KU Services NBU Project. Project Manager. Conceptual engineering and permitting support for project development of next generation base-load generation facility to be operational in 2015. Assignment includes evaluation of supercritical pulverized coal and natural gas combined cycle technology for ultimate site installation of 2,400 MW. Assignment included conceptual design for site infrastructure and common facilities to support a multiple block integrated gasification combined cycle development.
Role: Project Manager

Kissimmee Utility Authority Cane Island Park, Unit 3. Responsible for the Electrical Engineering for a 250 MW one-on-one combined cycle GE 7FA combustion turbine, supplemental duct-fired triple pressure HRSG and GE A10 modular steam turbine with reheat. The project included expansion of 230 kV breaker and a half switchyard and Westinghouse Ovation DCS.
Role: Lead Electrical Engineer/Engineering Manager

Skygen DePere Energy Center. Responsible for electrical engineering for a 180 MW dual fuel simple cycle peaking station located at DePere Energy Center. The project involved a GE 7FA combustion turbine and included 138 kV switchyard with GSU transformer and station auxiliary transformer, 5 kV switchgear, 480 V unit substations, station battery, UPS, A-B SLC503 BOP control system with MODBUS interface to GE Mark V turbine control system for operator interface.
Role: Lead Electrical Engineer

LG&E KU Services Trimble County, Unit 2. Owner's Engineer for the LG&E Energy Project Engineering group to perform EPC contractor pre-qualification for a rate based 750 MW supercritical coal-fired unit to be located at the existing Trimble County site. Specific duties include development of pre-qualification questionnaire and evaluation criteria for project execution under separate boiler island and turbine island EPC contracts.
Role: Project Manager

ALCOA Jamalco Unit 3 Powerhouse Addition. Full conceptual [FEL3] level detailed design supporting expansion of alumina refinery power facility to include the addition of a 40 MW back-pressure steam turbine, two 50 MW dual fuel P&W SwiftPac combustion turbines with duct fired two pressure HRSG. Project scope also includes integration of common facilities, 138 kV GIS substation, 13.8 kV electrical distribution and Foxboro DCS.
Role: Project Manager

Michigan State University T.B. Simon Power Plant, Unit 5&6. Engineering Manager. Expansion of university combined heat and power facility to include addition of 24 MW automatic extraction condensing steam turbine, 14 MW Solar Titan combustion turbine with duct fired single pressure HRSG. Project scope includes integration of common facilities, 15 kV electrical distribution and ABB/Bailey INFI 90 DCS into an existing four unit coal fired plant. Additional responsibilities include preliminary engineering to support project development and submittal of air permit application.
Role: Engineering Manager

Consumers Energy Next Generation Program. Owners Engineer for the 800 MW supercritical PRB coal-fired unit to be located at the existing Karn/Weadock site. Specific duties include development of the plant electrical system design and transmission system interconnection documents.
Role: Lead Electrical Engineer