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May 17, 2016

Via Federal Express/Electronic Mail

Todd Anthony Bianco, EFSB Coordinator
RI Energy Facilities Siting Board
89 Jefferson Blvd.
Warwick, RI 02888

Re: Invenergy Docket No. SB-2015-06

Dear Mr. Bianco:

On behalf of Invenergy, enclosed please find an original and ten copies of Invenergy Thermal Development LLC's Responses to The Town of Burrillville's 7th Set of Data Requests.

Please let me know if you have any questions.

Very truly yours,

ALAN M. SHOER
ashoer@apslaw.com

Enclosures

cc: Service List

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
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IN RE:	**INVENERGY THERMAL DEVELOPMENT LLC**	**:**	
	APPLICATION TO CONSTRUCT AND	**:**	
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INVENERGY THERMAL DEVELOPMENT LLC'S RESPONSES TO THE TOWN OF BURRILLVILLE'S 7TH SET OF DATA REQUESTS

7-1 **Property Line and Fence Line Location**

The Clear River Energy Center's ("CREC") property line and/or fence location(s) appear to be inconsistent between not only different document submissions, but also within individual documents themselves. Compliance with certain air quality regulations and standards is dependent upon estimated ambient air concentrations at points along both the property line and the fence line. A change in the location of either line used in the final model approved by Rhode Island Department of Environmental Management ("RIDEM") in support of issuing the air construction permit may require performance of a revised air dispersion modeling compliance demonstration.

Please provide a legal description of the property line and fence line used in the model results submitted to and approved by RIDEM as demonstrating compliance with applicable standards and the basis for issuing the proposed facility's air quality construction permit. This will allow for a clear comparison by Town officials of the approved property line and/or fence line with the legal description included with the deed that will be recorded in the Town's Land Evidence Records.

RESPONSE 7-1: The facility's proposed property line has changed since the air modeling report was submitted to RIDEM as the project design and layout have been optimized to minimize impacts. The attached Site Arrangement figure shows the revised proposed facility property line which has been submitted to, and is currently under review by, the Town of Burrillville Planning Board.

The property line changes will not impact the results of the air modeling results submitted to RIDEM because the modeled impact values presented in the modeling summary tables, which are the values used for the compliance demonstrations, were at receptors located beyond both the original and the revised facility property lines.

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

DATE: May 17, 2016

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7-2

Proposed use of Ultra-Low Sulfur Diesel (ULSD) as a Secondary Fuel in the Combustion Turbines

Please clarify when the facility will use ULSD in the combustion turbines as a fuel. Specifically, please identify whether the use ULSD will be a contractual obligation or a choice presented to facility operators on any given day.

The conflicting text includes the use of the word "unavailable" in the RI Energy Facility Siting Board ("EFSB") Application, Section 1.2, Page 1: "Each gas turbine will fire natural gas as a primary fuel and ultra-low sulfur diesel (ULSD) fuel as a backup fuel from two-1,000,000 gallon on-site storage tanks for limited periods when natural gas is unavailable." And in Section 3.1, Page 6: "Each gas turbine will fire natural gas as a primary fuel and ultra-low sulfur diesel (ULSD) fuel as a backup fuel for limited periods when natural gas is unavailable." Typically, using the word "unavailable" in this situation would mean that natural gas is not available for use as a fuel.

However, the EFSB Application, Section 3.10, Page 18 states: "Additionally, if during the winter season natural gas supplies coming into New England are in short supply or constrained, the gas turbines can be fired by ultra-low sulfur distillate ("ULSD"), as requested by Independent System Operator New England ("ISO-NE")."

Finally, the EFSB Application, Appendix C, Water Balance contains the third drawing in the set submitted, HDR Drawing WMB-04, Rev. C, "Water Mass Balance — 1 CT on GAS, 1 CT on Fuel Oil". This would appear to indicate that while one combustion turbine uses ULSD as a fuel, the other combustion turbine will still be using natural gas as a fuel. In addition, the drawing set does not include a 4th drawing showing a scenario of both combustion turbines firing ULSD concurrently.

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RESPONSE 7-2

Unavailability of natural gas is defined as when there is insufficient gas for the project to meet its capacity obligation and as such could be subject to penalties under Market Rule 1, Section III.13.7 "Performance Payments and Charges in the Forward Capacity Market, otherwise known as "Pay for performance." Use of ULSD will be a contractual obligation under the "Pay for Performance" construct of the ISO NE Tariff. CREC expects combustion turbine ULSD use will be limited to that needed to maintain oil system readiness and times when natural gas is unavailable. The potential loss of natural gas is expected to be unlikely and if it were to occur would be short lived. Natural gas will be deemed to be unavailable when the natural gas supplier (Spectra) informs Invenergy Thermal Development LLC ("Invenergy") that the natural gas supply is being curtailed or if there is a Force Majeure event. The availability natural gas is monitored by ISO-NE, who may declare a "Cold Weather Event", a "Cold Weather Watch", or a "Cold Weather Warning", as defined in:

http://www.iso-ne.com/markets-operations/system-forecast-status/current-system-status/alert-descriptions

Attached is a Water Mass Balance showing both combustion turbines firing ULSD concurrently. Complete loss of natural gas is not expected, but if it were to occur, this mode of operation will be limited to the capacity of the PUD well (700 GPM) and use of our onsite raw water and demineralized water storage tanks to provide the water injection into the combustion turbines. As mentioned above, we do not expect to operate in this mode as the project expects to have firm gas supply for one of the combustion turbines, ("CT") so only one CT will run on oil at a time.

RESPONDENT: John Niland, Invenergy Thermal Development LLC

DATE: May 17, 2016

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7-3 **Proposed Air Permit Limits for use of ULSD in the Combustion Turbines**

Please clarify the proposed permit operation limit(s) proposed for the combustion turbines when using ULSD.

- How is "the equivalent total ULSD fuel usage of up to 60 days per year at base load" calculated?
- What is the basis for calculating daily ULSD fuel usage?
- Does the facility propose an annual ULSD operation limit of 720-hours per year at steady state for each combustion turbine?
- Does the facility propose an annual ULSD startup & shutdown operation limit of 20-hours per year for each combustion turbine?

Table 1 shows estimated annual emissions from each combustion turbine when using ULSD based upon using an Annual Operation value of 720-hours/year. An annual operating rate of 720-hours is equivalent to 30-days (720-hours * (1-day/24-hours) = 30-days). An annual operating rate of 60-days is equivalent to 1440-hours (60-days * (24-hrs/1-day) = 1440-hours). Is the facility proposing to limit ULSD operation on an individual combustion turbine basis at 30-days/year or on an aggregate basis of 60-days/year to be split between the two combustion turbines on not necessarily a 50:50 basis?

RESPONSE 7-3 Invenergy is not proposing an annual limit on the number of days of combustion turbine ULSD usage per year nor is Invenergy proposing individual ULSD usage limits for each turbine. Invenergy is proposing to limit total ULSD usage by both combustion turbines to the equivalent usage of 60 days at base load. This will be calculated by multiplying the maximum single turbine ULSD usage rate at base load (gallons per hour) times 24 hours per day (gallons per day) times 60 days (gallons per 60 days).

Invenergy is not proposing a limit on the number of hours of ULSD startup and shutdown time per year. Invenergy is proposing that the annual emissions from the facility during startup and shutdown periods be limited to the total potential emissions presented in the air permit

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application for startup and shutdown periods.

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

DATE: May 17, 2016

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7-4 **ULSD Storage Tanks**

Please clarify the number of tanks, capacity of each tank, and size/dimensions of each tank proposed for storage of ULSD at the site. Conflicting values are present in the document submissions, including, but not limited to, the following:

- EFSB Application, Section 3.1, Page 6: "The ULSD will be stored in two 1,000,000-gallon on-site storage tanks."
- EFSB Application, Section 3.5.3, Page 13: "...two 1,000,000 gallon above ground ULSD storage tanks...approximately 30 feet tall and 80 feet in diameter."
- EFSB Application, Section 6.1.2, Page 36: "The facility will include a pair of a [sic] 1,000,000-gallon aboveground ULSD storage tanks... potential fugitive VOC emissions (working losses and breathing losses) associated with the ULSD storage tanks at the Facility have been estimated using the EPA's TANKS program. Appendix A of the Major Source Permit Application (See Appendix B) contains a summary of the results and the data printouts from the TANKS analysis for the ULSD storage tanks."
- EFSB Application, Appendix B, Major Source Permit Application, Section 1.2, Page 1: "Each gas turbine will fire natural gas as a primary fuel and ultra-low sulfur diesel (ULSD) fuel as a backup fuel from a 2,000,000 gallon on-site storage tank for limited periods when natural gas is unavailable."
- EFSB Application, Appendix B, Major Source Permit Application, Section 2.6, Page 4 "The Facility will include a 2,000,000 gallon aboveground ULSD storage tank..."
- EFSB Application, Appendix B, Major Source Permit Application, Appendix A-Emission Data Summaries, "TANKS 4.0.9d, Emissions Report - Detail Format, Tank Identification and Physical Characteristics"

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Identification

User Identification: Invenergy ULSD Storage Tank
City: Burrillville
State: Rhode Island
Company: Invenergy, LLC
Type of Tank: Vertical Fixed Roof Tank
Description: Invenergy Rhode Island Energy Center
Burrillville, Rhode Island

Tank Dimensions

Shell Height (ft): 35.00
Diameter (ft): 120.00
Liquid Height (ft): 24.00
Avg. Liquid Height (ft): 24.00
Volume (gallons): 2,000,000.00
Turnovers: 18.42
Net Throughput(gal/yr): 36,846,720.00

RESPONSE 7-4 Initially the project design included a single 2,000,000 gallon storage tank. The current design of the facility includes two 1,000,000 gallon above-ground ULSD storage tanks. Each tank will be approximately 80 feet in diameter and 30 feet tall.

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

DATE: May 17, 2016

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7-5 **Emission Calculations – General**
Please explain why the Combustion Turbine potential emissions for Criteria Pollutants are estimated using Annual Operation (per Unit) values of 8020-hours/year for Natural Gas and 740-hours/year for ULSD, but potential emissions for Non-Criteria Pollutant are estimated using 8040-hours/year for Natural Gas and 720-hours for ULSD.

RESPONSE 7-5 The criteria pollutant potential emissions were estimated for each combustion turbine based on 7,865 hours per year firing natural gas at steady-state, 720 hours per year firing ULSD at steady-state, 155 hours per year firing natural gas during startup and shutdown, and 20 hours per year firing ULSD during startup and shutdown. The criteria potential emission rates during steady state operation and during startup and shutdown periods on both fuels were provided by the turbine manufacturer.

The non-criteria pollutant potential emissions were estimated for each combustion turbine based on 8,040 total hours per year firing natural gas and 720 total hours per year firing ULSD during steady-state operation only. Based on the available emission factors, the non-criteria pollutant emissions from the combustion turbines will be proportional to fuel usage, and will therefore be lower during startup and shutdown periods, because less fuel is being burned. To be conservative, the non-criteria pollutant potential emissions were estimated assuming steady-state operations only, which would include up to 8,040 hours firing natural gas and up to 720 hours of firing ULSD per turbine per year.

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

DATE: May 17, 2016

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7-6 Please provide a calculation showing the equivalent steady-state emission rate in lb/hr at full-load during typical operational conditions the "Proposed Emissions" values listed in Table 1 for the Combustion Turbine, specifically:

NO,	2.0-ppmvd @ 02 for Diesel	15%	02 for Natural Gas and 5.0-ppmvd @15%
CO	2.0-ppmvd @ 02 for Diesel	15%	02 for Natural Gas and 5.0-ppmvd @15%
VOC	1.7-ppmvd @ 02 for Diesel	15%	02 for Natural Gas and 5.0-ppmvd @15%

RESPONSE 7-6

NO_X (as NO_2) example calculations for NG and ULSD:

$$2.0\ ppmvd = \frac{2.0\ dscf_{gas}}{10^6\ dscf_{stack}} \times \frac{46\ lb}{lb \cdot mol} \times \frac{8{,}710\ dscf_{stack}}{MMBtu} \times \frac{1 lb \cdot mol}{386\ dscf_{gas}} \times \frac{20.9}{20.9 - 15} \times \frac{3{,}393\ MMBtu}{hr} = 24.9 \frac{lb}{hr}$$

$$5.0\ ppmvd = \frac{5.0\ dscf_{gas}}{10^6\ dscf_{stack}} \times \frac{46\ lb}{lb \cdot mol} \times \frac{9{,}190\ dscf_{stack}}{MMBtu} \times \frac{1 lb \cdot mol}{383\ dscf_{gas}} \times \frac{20.9}{20.9 - 15} \times \frac{3{,}507\ MMBtu}{hr} = 68.6 \frac{lb}{hr}$$

CO example calculations for NG and ULSD:

$$2.0\ ppmvd = \frac{2.0\ dscf_{gas}}{10^6\ dscf_{stack}} \times \frac{28\ lb}{lb \cdot mol} \times \frac{8{,}710\ dscf_{stack}}{MMBtu} \times \frac{1 lb \cdot mol}{386\ dscf_{gas}} \times \frac{20.9}{20.9 - 15} \times \frac{3{,}393\ MMBtu}{hr} = 15.1 \frac{lb}{hr}$$

$$5.0\ ppmvd = \frac{5.0\ dscf_{gas}}{10^6\ dscf_{stack}} \times \frac{28\ lb}{lb \cdot mol} \times \frac{9{,}190\ dscf_{stack}}{MMBtu} \times \frac{1 lb \cdot mol}{383\ dscf_{gas}} \times \frac{20.9}{20.9 - 15} \times \frac{3{,}507\ MMBtu}{hr} = 41.8 \frac{lb}{hr}$$

VOC (as CH_4) example calculations for NG and ULSD:

$$1.7\ ppmvd = \frac{1.7\ dscf_{gas}}{10^6\ dscf_{stack}} \times \frac{16\ lb}{lb \cdot mol} \times \frac{8{,}710\ dscf_{stack}}{MMBtu} \times \frac{1 lb \cdot mol}{386\ dscf_{gas}} \times \frac{20.9}{20.9 - 15} \times \frac{3{,}393\ MMBtu}{hr} = 7.4 \frac{lb}{hr}$$

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$$5.0\ ppmvd = \frac{5.0\ dscf_{gas}}{10^6\ dscf_{stack}} \times \frac{16\ lb}{lb \cdot mol} \times \frac{9{,}190\ dscf_{stack}}{MMBtu} \times \frac{1 lb \cdot mol}{383\ dscf_{gas}} \times \frac{20.9}{20.9 - 15} \times \frac{3{,}507\ MMBtu}{hr} = 23.9 \frac{lb}{hr}$$

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

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7-7 **Emission Calculations — Emission Factors**
Emission factors used to calculate estimated emissions and submitted to RIDEM were difficult to verify, as no references were provided. For emission factors based on US EPA AP-42, please specify Chapter and Table for each emission factor or group of emission factors.

For those emission factors used in the calculations that are not based on AP-42, please provide a copy of the reference document used as source for the emission factor(s).

RESPONSE 7-7 The criteria pollutant emission rates from all project emissions sources were provided by the equipment manufacturer. The combustion turbine ammonia and sulfuric acid emission rates were also provided by the equipment manufacturer. The metals emissions from gas turbine ULSD usage were estimated using Siemens Westinghouse's Survey of Ultra-Trace Metals in Gas Turbine Fuels (2004), which is attached. The gas turbine formaldehyde emissions were provided by the equipment manufacturer based on the MACT standard for combustion turbines (91 ppb@15%O_2) previously proposed by the EPA, but currently stayed by court order.

All of the other non-criteria pollutant emission rates from each emissions source were estimated using emission factors from the EPA's AP-42 Compilation of Emission Factors.

The following tables from AP-42 were used:

AP-42 Chapter 1.4, Table 1.4-3: Emission Factors for Speciated Organic Compounds from Natural Gas Combustion

AP-42 Chapter 1.4, Table 1.4-4: Emission Factors for Metals from Natural Gas Combustion

AP-42 Chapter 3.1, Table 3.1-3: Emission Factors for Hazardous Air Pollutants from Natural Gas-Fired Stationary Gas Turbines

AP-42 Chapter 3.1, Table 3.1-4: Emission Factors for Hazardous Air

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Pollutants from Distillate Oil-Fired Stationary Gas Turbines

AP-42 Chapter 3.1, Table 3.1-5: Emission Factors for Metallic Hazardous Air Pollutants from Distillate Oil-Fired Stationary Gas Turbines

AP-42 Chapter 3.3, Table 3.3-2: Speciated Organic Compound Emission Factors for Uncontrolled Diesel Engines

AP-42 Chapter 3.4, Table 3.4-3: Speciated Organic Compound Emission Factors for Large Uncontrolled Stationary Diesel Engines

AP-42 Chapter 3.4, Table 3.4-4: PAH Emission Factors for Large Uncontrolled Stationary Diesel Engines

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

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7-8 The partial-stayed EPA MACT Standard for Combustion Turbines (40 CFR 63, Subpart YYYY) published on March 5, 2004 limited formaldehyde emissions to 91 ppbvd @ 15% 02 when firing natural gas, as well as during the firing of oil. Please provide rationale for selecting the stayed MACT Standard as the emission factor source during firing of natural gas described in Section 5.3.10, but not ULSD.

RESPONSE 7-8 The combustion turbine formaldehyde emission factor, which was provided by the equipment manufacturer, utilized the stayed MACT Standard as the emission factor source during both natural gas firing and ULSD firing.

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

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7-9 It is unclear how the EPA MACT Standard limit for formaldehyde of 91 ppbvd @ 15% 02 relates to the Combustion Turbine natural gas uncontrolled formaldehyde emission factor. Please provide calculation showing the method of determining the 2.2-1b/MMBtu formaldehyde emission factor listed in Table A-2.

RESPONSE 7-9

$$91\ ppbvd = \frac{91\ dscf_{gas}}{10^9\ dscf_{stack}} \times \frac{30.031\ lb}{lb \cdot mol} \times \frac{8{,}710\ dscf_{stack}}{MMBtu} \times \frac{1lb \cdot mol}{386.1\ dscf_{gas}} \times \frac{20.9}{20.9 - 15} = 2.2 \times 10^{-4} \frac{lb}{MMBtu}$$

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

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7-10 For sources using an oxidation catalyst, the EPA MACT Standard for formaldehyde of 91 ppbvd @ 15% 02 is the limit for controlled emissions. Since the proposed facility intends to use an oxidation catalyst as a control device, please provide rationale for basing the uncontrolled formaldehyde emission factor on the MACT Standard's limit for controlled formaldehyde emissions.

RESPONSE 7-10 The combustion turbine formaldehyde emission factor was provided by the equipment manufacturer.

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

DATE: May 17, 2016

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7-11 It is unclear how the CO2 emission rates were calculated for the combustion turbines. Please provide the calculation methodology for the natural gas 814-1b/MW-hr and the ULSD 1227-1b/MW-hr values listed in Section 4.4.3.

RESPONSE 7-11 The average CO_2 emission rate while firing natural gas will be 781 lb/MW-hr. The average CO_2 emission rates for each fuel were calculated using CO_2 lb/hr emission rates and MW output values provided by the equipment manufacturer for base load operation as follows:

Natural Gas
399,000 lb/hr/turbine x 2 turbines / 1,021.183 MW = 781 lb/MW-hr

ULSD
577,000 lb/hr/turbine x 2 turbines / 940.536 MW = 1,227 lb/MW-hr

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

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7-12 Please clarify whether the combustion turbine's natural gas emission rate is 814-1b/MW-hr as described in Section 4.4.3 or 781-1b/MW-hr as listed on Table 1.

RESPONSE 7-12 The combustion turbine's annual average natural gas emission is 781 lb/MW-hr.

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

DATE: May 17, 2016

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7-13 Table 2 shows Acrolein potential emissions at 6.1-1b/yr for the Combustion Turbines (CT) when using Natural Gas (NG). Table A-2 lists the Acrolein emission factor (EF) as 6.4E-06-1b/MMBtu for the CT when using NG. Table A-2 also lists a Maximum Unit Heat Input of 3,393-MMBtu/hr, an Annual Operation value of 8,040-hr/yr, and an Acrolein control efficiency of 90% for the CT when using NG. Using the basic calculation methodology shown below, annual Acrolein potential emissions are estimated to be 34.9-1b/yr. Please clarify whether an alternate calculation methodology was used for estimating potential Acrolein emissions from the CT when using NG.

(Acrolein EF) * (Max Unit Heat Input) * (Annual Operation) * (1- Control Efficiency) * (# CT)

(6.4E-06-1b/MMBtu) * (3,393-MMBtu/hr) * (8,040-hr/yr) * (1 — 0.90) * (2 CT)

0.021715-1b/hr) * (8,040-hr/yr) * (1 — 0.90) * (2 CT)

(174.6-1b/yr) * (1 — 0.90) * (2 CT)

(17.46-1b/yr) * (2 CT)

(34.9-1b/yr)

RESPONSE 7-13 The potential emissions of acrolein from the combustion turbines while firing natural gas will be 35 pounds per year, as listed in Table A-2 and calculated using the same calculation methodology detailed above.

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

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7-14 Please clarify whether a control device is proposed for installation on the Emergency Generator, since the estimated Benzene emission rate calculated using the method shown above is an order of magnitude less than the values contained in Table 2.

RESPONSE 7-14 The emergency generator will not be equipped with a control device. The potential benzene emissions from the emergency generator were listed as 4.5 pounds per year in Table 2. The potential emissions of benzene from the emergency generator were estimated as follows:

$[7.76 \times 10^{-4}$ lb/MMBtu] x [19.5 MMBtu/hr] x [300 hours/yr] = 4.5 lb/yr

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

DATE: May 17, 2016

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7-15 **BACT/LAER Selection**

EFSB Application, Appendix B, Major Source Permit Application, Section 4.1, Page 23 states that "A BACT Determination is a top-down process in which all available control technologies for that pollutant and emission source are identified. Each control technology is then evaluated for its technical feasibility and those demonstrated to be technically infeasible are eliminated from consideration. The remaining control technologies are then ranked in descending order of control effectiveness. The most effective remaining control technology is deemed to be BACT unless it is demonstrated that technical considerations, or the associated energy, environmental, or economic impacts justify a conclusion that the control technology is not available for the source." Subsequent text within the application document indicates that "Appendix B contains a listing of the recent BACT determinations considered for this analysis." While Appendix B-BACT/LAER Documentation of the Major Source Permit Application does contain a summary table of emission rates and/or emission factors, no documentation of the full and complete "top-down" process, such as the ranking of control technologies "in descending order of control effectiveness" is provided in Appendix B. Please provide.

RESPONSE 7-15 The available control technologies for the types of sources associated with this project are well established. All available control technologies for each emission source and pollutant which have been previously applied to similar sources were discussed in Section 4.3. In each case, the most effective control technologies available were used based on the source type and its proposed use. Consistent with EPA BACT guidelines, when the most effective control technology is used (top-case BACT), a detailed evaluation of the less effective control technologies is not required.

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

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AIR DISPERSION MODELING REPORT

7-16 **AERMOD Emission Sources**
The Auxiliary Boiler is not included as a source in the AERMOD input files used to predict off-site criteria pollutant for neither the SteadyState nor the Soils scenarios. Please explain the rationale for excluding one of the primary criteria pollutant emission sources proposed for the site.

RESPONSE 7-16 The auxiliary boiler will only operate prior to and during combustion turbine startup periods and will not operate during normal, steady-state combustion turbine operating periods. Therefore, the auxiliary boiler was included in the modeling of startup conditions, but not included in any modeling of steady state facility operation.

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

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7-17 The diesel storage tank(s) is/are not included as an emission source for the Air Toxics modeling. Please explain why the TANKS program was not used to estimate emissions of speciated compounds from the ULSD storage tank(s) and included as an on-site emission source when using AERMOD.

RESPONSE 7-17 The fugitive VOC emissions associated with the ULSD storage tanks were estimated using the TANKS program. The Air Dispersion Modeling Protocol submitted for the project, which was approved by RIDEM, did not include the ULSD tanks as a source to be included in the air toxics modeling because it is not expected that any temporary, intermittent, localized fugitive VOC emissions resulting from the use of the ULSD storage tanks would make a measurable contribution to any off-site ambient air impacts predicted from the project.

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

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7-18 **Figure 3 General Arrangement**
Please clarify whether Combustion Source No. "AE-8 LP Fuel Gas Dew Point Heater" listed in "Air Emission Sources (Combustions Sources)" table/text box: is proposed for installation at the facility. If proposed for installation, please describe purpose, size, and rationale for not including this source in the model report text, emission calculations, modeling files, air permit application, etc.

RESPONSE 7-18 Only a single dew point heater is needed for the Project. Invenergy has determined that it will not install a second dew point heater that was labeled as AE-8 LP Fuel Gas Dew Point Heater at the facility. The purpose of the Dew Point Heater is to heat the fuel when the pipeline gas pressure is greater than approximately 700 psig, when this happens the pressure needs to be reduced to match the pressure required by the combustion turbine and the pressure reduction creates a cooling effect that must be controlled to prevent freezing of the gas pressure regulator.

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

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7-19 "Air Emission Sources (Combustions Sources)" table/text box lists northing and easting coordinates that appear to be based on the UTM Coordinate System, Zone 19 N. Please verify that the table note "* UTM Coordinates are for Zone 19 T" is an error, since Zone 19 T is not a valid zone descriptor for the UTM Coordinate system, and most likely is an erroneous reference to the zone description system related to the USNG/MGRS (United States National Grid/Military Grid Reference System) coordinate system, since the USNG coordinate format is 19T BG 71822 49656, rather than N4,649,656N E271,822. Please explain/clarify.

RESPONSE 7-19 All UTM northing/easting coordinates are based on the UTM Coordinate System, Zone 19 N.

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

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7-20 Twenty-six (26) structures were included in the BPIP-Prime analysis. All structures listed on Figure 3 General Arrangement "Building and Equipment List" table/text box with heights 20-feet and above are included in the analysis. In addition, the 15-foot tall ammonia tank has been included in the BPIP-Prime analysis. Please provide the rationale for excluding other structures proposed for the site with heights equal to the ammonia tank, such as the Fire Pump Building, Emergency Generator, and Hydrogen Tube Trailer.

RESPONSE 7-20 Consistent with EPA and RIDEM modeling guidance, the AERMOD analysis only evaluated the impacts of plumes potentially entrapped within cavity regions of those structures for which there is a potential for the cavities to extend off-site. Other structures for which there are no potential for the cavities to extend off-site were not included in the analysis.

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

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7-21 **Figure 6 Receptor Grid** displays a receptor layout that includes polar grid receptor array and what appear to be discrete receptors placed along a boundary line. However, the boundary line presented in Figure 6 is not consistent with either the "Proposed Property Line" nor the "40'-0" Setback From Property Line" displayed on Figure 2 Site Layout. This inconsistency in the location of the boundary receptors shown on Figure 6 is also apparent when compared to the hatched area on Figure 4 Topographic Map and the outlined area on Figure 5 Surrounding Land Use (3 km). Please explain/clarify.

RESPONSE 7-21 CREC's proposed property line has changed since the air modeling report was submitted to RIDEM as the project design and layout have been optimized to minimize impacts. The attached Site Arrangement figure shows the revised proposed facility property line which has been submitted to and is currently under review by the Town of Burrillville Planning Board.

The property line changes will not impact the results of the air modeling results submitted to RIDEM because the modeled impact values presented in the modeling summary tables, which are the values required to demonstrate compliance, were at receptors located beyond both the original and the revised facility property lines.

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

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7-22 **AERMOD Receptors**

All model input files for AERMOD contain discrete boundary line receptors that are consistent with the Figure 6, but not consistent with Figures 2, 4, and 5. In addition, it is unknown whether this set of discrete receptor locations is meant to represent the proposed Property Line or Fence Line which is inconsistently represented (as noted above). Please explain/clarify.

RESPONSE 7-22 CREC's proposed property line has changed since the air modeling report was submitted to RIDEM as the project design and layout have been optimized to minimize impacts. The attached Site Arrangement figure shows the revised proposed facility property line which has been submitted to and is currently under review by the Town of Burrillville Planning Board.

The property line changes will not impact the results of the air modeling results submitted to RIDEM because the modeled impact values presented in the modeling summary tables, which are the values required to demonstrate compliance, were at receptors located beyond both the original and the revised facility property lines.

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

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7-23 **Figure 8 Significant Impact Area** appears to show stack locations that are inconsistent with the emission sources locations identified and displayed on **Figure 3 General Arrangement.** Specifically, Figure 8 appears to show an emission point to the east of HRSG Exhaust Stack 1 (AE-1). In addition, Figure 8 appears to display the location of seven (7) discrete emission points, which is different than the six (6) stationary sources listed in **Section 4.4 Screening Results** that were part of the "refined modeling with AERMOD (that) was performed to assess the total ambient pollutant concentrations" from the project. In addition, there are only six (6) discrete emission sources/points listed on **Table 1 Potential Criteria Pollutant Emissions and Table 3 Modeling Input Parameters.** Please explain/clarify.

RESPONSE 7-23 The six sources listed on Table 1 and Table 3 were the only emission sources included in the modeling analysis.

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

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7-24 **Table 3 Modeling Input Parameters** lists physical and operational details for emission sources and their stacks. Each emission source has Stack Location coordinates provided using UTM northing and easting values (Zone 19). However, none of the stack locations used for BPIP-Prime or AERMOD are the same as those listed on Table 3. Please explain this discrepancy.

RESPONSE 7-24 The stack location coordinates are the ones used for BPIP-Prime and AERMOD. Table 3 was not updated to reflect the stack coordinates from the most recent General Arrangement. Invenergy has determined that it will not install an AE-8 LP Fuel Gas Dew Point Heater installation at the facility.

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

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7-25 **Table 4 GEP Stack Height Analysis Summary and Table 5 Cavity Analysis** reference individual stacks using an abbreviated naming convention of ES-1, ES-2, EG, DP Heater, Aux Boiler, and FP. Some of the abbreviated names are easily associated with a corresponding emission source such as 'Aux Boiler' for the Auxiliary Boiler; however, there does not appear to be any way to verify that ES-1 represents Gas Turbine/HRSG/Duct Burner 1, since the abbreviated names are not included on Table 3 Modeling Input Parameters where details for individual stacks are listed. Please clarify the abbreviated naming convention and the associated stacks.

RESPONSE 7-26 The abbreviated naming convention was as follows:
ES-1: HRSG Exhaust Stack 1
ES-2: HRSG Exhaust Stack 2
EG: Emergency Generator
DP Heater: Dew Point Heater
Aux Boiler: Auxiliary Boiler
FP: Fire Pump

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7-26 **Table 16 Air Toxics Modeling Results Summary** lists various air toxic hourly emission rate values for the HRSG Duct Burners. However, the HRSG Duct Burners were not listed as an individual emission source within the air toxic modeling files, and thus are not represented in the unit emission rate impact table by source. Comparison to RIDEM APCR No. 22 Acceptable Ambient Levels is not valid unless all relevant emission sources are included. Please explain/clarify.

RESPONSE 7-26 Although the HRSG duct burners are separate sources of emissions, they exhaust from the same stacks as the combustion turbines. Each of the HRSG exhaust stacks was modeled as a single emission source which included the combined emissions from the associated combustion turbine and HRSG duct burner.

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7-27 For the comparison to RIDEM APCR No. 22 Acceptable Ambient Levels that was included in Table 16, it is difficult to evaluate without example calculations showing methodology for estimating ambient air impact levels from each source for each pollutant for each period of comparison. Please provide.

RESPONSE 7-27 Example calculation for annual 1-3-Butadiene:

GT/HRSG-1&2 (Natural Gas)
[2.92 x 10^{-4} lb/hr] x [453.6 g/lb] x [1 hr/60 min] x [1 min/60 sec] x [0.15676 ug/m3/g/sec] x [8,040 hrs/yr] / [8,760 hrs/yr] = 5.29 x 10^{-6} ug/m^3

GT/HRSG-1&2 (ULSD)
[1.12 x 10^{-2} lb/hr] x [453.6 g/lb] x [1 hr/60 min] x [1 min/60 sec] x [0.14672 ug/m3/g/sec] x [720 hrs/yr] / [8,760 hrs/yr] = 1.70 x 10^{-5} ug/m^3

Fire Pump
[8.21 x 10^{-5} lb/hr] x [453.6 g/lb] x [1 hr/60 min] x [1 min/60 sec] x [17.31881 ug/m3/g/sec] x [300 hrs/yr] / [8,760 hrs/yr] = 6.13 x 10^{-6} ug/m^3

Total Impact: [5.29 x 10^{-6}] + [1.70 x 10^{-5}] + [6.13 x 10^{-6}] = 2.84 x 10^{-5} ug/m^3

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Health Risk Assessment Protocol (HRAP), dated June 26, 2015

7-28 Section 1.2 indicates that vendor for combustion turbines will be selected before major source permit finalized, but the major source permit was submitted concurrent with this document (permit also dated June 26, 2015). The turbine equipment is identified in subsequent HRA (dated Jan. 27, 2016), Section 1.2. Please verify that the equipment identified in HRA Section 1.2 is the selected equipment and representative of what is modeled in the air modeling report and the air permit application.

RESPONSE 7-29 CREC will consist of two General Electric 7HA.02 gas turbines. AERSCREEN was applied to determine the gas turbine and operating condition which resulted in the highest predicted ambient air impact concentrations for each pollutant and averaging period. This screening analysis was applied for each of the three turbines (GE, Siemens, MHI) being considered at the time for the project.

The turbine and operating condition which exhibited the highest modeled impact concentration for each pollutant and averaging period was then modeled using AERMOD for the compliance determinations. The use of the turbine and operating condition with the highest predicted impact concentration for each pollutant and averaging period, which was approved by RIDEM, produced modeling results that were conservative and applicable regardless of which turbine was selected for the project. For any pollutant averaging period for which the Siemens or MHI turbine was used to demonstrate compliance, the modeled impacts from the GE turbine will be lower than the values presented, providing further assurance of compliant operation.

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

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7-29	Section 2.1 notes 90% reduction in HAPs by oxidation catalyst (OC). Please provide basis of this assumption.
RESPONSE 7-29	The 90% in reduction in HAPs by the oxidation catalyst was provided by the equipment manufacturer.
RESPONDENT:	Michael Feinblatt, ESS Group, Inc.
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7-30 Section 2.1 states the facility will only use diesel when natural gas "unavailable". As noted above, please define or provide information on when natural gas is "unavailable".

RESPONSE 7-30 Unavailability of natural gas is defined as when there is insufficient gas for the project to meet its capacity obligation and as such could be subject to penalties under Market Rule 1, Section III.13.7 "Performance Payments and Charges in the Forward Capacity Market, otherwise known as "Pay for performance." Use of ULSD will be a contractual obligation under the "Pay for Performance" construct of the ISO NE Tariff. CREC expects combustion turbine ULSD use will be limited to that needed to maintain oil system readiness and times when natural gas is unavailable. The potential loss of natural gas is expected to be unlikely and if it were to occur would be short lived. Natural gas will be deemed to be unavailable when the natural gas supplier (Spectra) informs Invenergy Thermal Development LLC ("Invenergy") that the natural gas supply is being curtailed or if there is a Force Majeure event. The availability natural gas is monitored by ISO-NE, who may declare a "Cold Weather Event", a "Cold Weather Watch", or a "Cold Weather Warning", as defined in:

http://www.iso-ne.com/markets-operations/system-forecast-status/current-system-status/alert-descriptions.

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

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7-31 HRAP states that diesel use is being proposed up to 60 days / year. However, subsequent HRA states that diesel will only be fired 720 hours/year or 30 days on page 4 (which represents a decrease from amount stated in HRAP). However, page 5/Section 2.1 of HRA states that turbines will be permitted for up to 60 days of diesel firing. Please clarify inconsistent statements.

RESPONSE 7-31 Invenergy is not proposing an annual limit on the number of days of combustion turbine ULSD usage per year nor is Invenergy proposing individual ULSD usage limits for each turbine. Invenergy is proposing to limit total ULSD usage by both combustion turbines to the equivalent usage of 60 days at base load. This will be calculated by multiplying the maximum single turbine ULSD usage rate at base load (gallons per hour) times 24 hours per day (gallons per day) times 60 days (gallons per 60 days).

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7-32 Section 3.0, the Lifespan of the facility is identified as 25-30 years and was used to determine exposure scenario for pollutants. This may understate actual exposure to contaminants if plant operates longer. That is, this is significantly less than typical "human lifespan" exposure scenario used in most risk assessments. Please provide basis or source of this assumption.

RESPONSE 7-32 The use of this timeframe, which was approved by RIDEM, was consistent with Section II.A of RIDEM's "Guideline for Assessing Health Risks from Proposed Air Pollution Sources" states the following:

"The focus of the risk assessment is the impact to the theoretical "most exposed individual" ("MEI"). For the purpose of this guideline, RI DEM is defining MEI as a person who lives for thirty years, including childhood, at the location of the facility's maximally impacted residential receptor …"

Section 3(1) of the RIDEM Guideline states the following:

"All multi-pathway risk assessment must focus on the MEI, a theoretical person who lives for thirty years, including childhood, at the facility's residential (or potentially residential) point of maximum impact …"

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

DATE: May 17, 2016

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7-33 Section 3.2 states that RIDEM indicated focus of study was to be PAH, PBTs, and metals. Please provide the source of this statement or reference RIDEM correspondence.

RESPONSE 7-33 Attached is an email from Ms. Barbara Morin of RIDEM dated April 9 2015 which states the following:

"As discussed above, the multiple exposure pathway analysis portion of the assessment should focus on metals and PBTs. EPA's list of PBTs is at http://www2.epa.gov/toxics-release-inventory-tri-program/persistent-bioaccumulative-toxic-pbt-chemicals-covered-tri . Note that the EPA list includes polycyclic aromatic hydrocarbons (PAHs)."

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

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7-34 Section 5.2.4 states that no farms in 5 miles. RIDEM subsequent comments dispute this statement. The Sensitive Receptor List included in the HRA Table 4 was the same list as provided in HRAP. RIDEM's comments indicated that some farms observed during a cursory review were missing from list. However, no receptors were added to HRA list from original HRAP. Please provide rationale for no additional receptors being added to list when RIDEM states that farms can be seen in a "cursory review".

RESPONSE 7-34 Following RIDEM comments, additional review identified several area farms. The individual pollutant deposition rates at the impacted farms were used as the basis for the Crop, Beef, Dairy, Pig, Chicken, and Egg Ingestion values for all residential receptors in the HRA study area. No additional receptors were added to the list, but all pollutant exposure input values were affected by the use of these ingestion values. The CREC health risk assessment conservatively assumed that the impacted residents exclusively ingested locally grown meat and dairy products because there are local farms in the area.

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

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Health Risk Assessment Report (HRA), dated January 27, 2016

7-35 Cover letter indicates that RIDEM conditionally approved Air Dispersion Modeling Protocol within July 27, 2015 correspondence. Please provide a copy of this letter, if available.

RESPONSE 7-35 Attached is a copy of the July 27, 2015 RIDEM letter.

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

DATE: May 17, 2016

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7-36 Cover letter indicates that RIDEM's Guidelines for Assessing Health Risk from Proposed Air Pollution Sources document was finalized October 21, 2015 and notes that a January 5, 2016 telephone call from RIDEM's Mr. Doug McVay verified that the Health Risk Assessment Protocol was approved based on revised Guidelines document. Please provide any documentation and/or correspondence indicating that the Guidelines document has been formally approved/issued by RIDEM, in addition to a published version of the Guidelines. Further, please provide any written correspondence from RIDEM which states that the HRAP was approved.

RESPONSE 7-36 The October 21, 2015 revised RIDEM Guideline is attached and can be found on the RIDEM web-site at the following hyperlink:

http://www.dem.ri.gov/programs/benviron/air/pdf/riskguid15.pdf

The HRAP was verbally approved by the Chief of RIDEM's Office of Air Resources by telephone on January 5, 2016.

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

DATE: May 17, 2016

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7-37 As stated above, Section 2.0 of HRA states that diesel will only be fired 720 hours/year or 30 days on page 4 (which represents a decrease from amount stated in HRAP). However, page 5/Section 2.1 states that turbines will be permitted for up to 60 days of diesel firing. Please clarify inconsistent statements.

RESPONSE 7-37 Invenergy is not proposing an annual limit on the number of days of combustion turbine ULSD usage per year nor is Invenergy proposing individual ULSD usage limits for each turbine. Invenergy is proposing to limit total ULSD usage by both combustion turbines to the equivalent usage of 60 days at base load. This will be calculated by multiplying the maximum single turbine ULSD usage rate at base load (gallons per hour) times 24 hours per day (gallons per day) times 60 days (gallons per 60 days).

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

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7-38 Section 2.0 of HRA narrative states that facility will be major source for CO2, which was not mentioned in Protocol. Please clarify how or why this change from HRAP occurred.

RESPONSE 7-38 The definition of "Major Stationary Source" in RIDEM Air Pollution Control Regulation No. 9 (Section 9.5.1(f)) does not include a major source threshold for CO_2 emissions. Section 9.1.41(e) states that beginning July 1, 2011, the pollutant greenhouse gas emissions ("GHG") will be subject to regulation at a new stationary source that will emit or have the potential to emit 100,000 tpy CO_{2e}. The CREC will be a major stationary source with the potential to emit 100,000 tpy CO_{2e}, and thus its GHG emissions are subject to the applicable RIDEM major source permitting requirements contained in Sections 9.4 and 9.5 of Air Pollution Control Regulation No. 9.

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

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7-39 Please provide additional information regarding the calculation of ammonia emissions contained within Table 3.

RESPONSE 7-39 *NH3 example calculations for NG and ULSD:*

$$ppmvd = \frac{2.0\ dscf_{gas}}{10^6\ dscf_{stack}} \times \frac{17\ lb}{lb \cdot mol} \times \frac{8{,}710\ dscf_{stack}}{MMBtu} \times \frac{1lb \cdot mol}{386\ dscf_{gas}} \times \frac{20.9}{20.9 - 15} \times \frac{3{,}393\ MMBtu}{hr} = 9.2\frac{lb}{hr}$$

$$ppmvd = \frac{2.0\ dscf_{gas}}{10^6\ dscf_{stack}} \times \frac{17\ lb}{lb \cdot mol} \times \frac{9{,}190\ dscf_{stack}}{MMBtu} \times \frac{1lb \cdot mol}{383\ dscf_{gas}} \times \frac{20.9}{20.9 - 15} \times \frac{3{,}507\ MMBtu}{hr} = 10.1\frac{lb}{hr}$$

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7-40 HRAP initially stated one (1) 2MM gallon diesel fixed roof AST will be utilized. HRA, states two (2) 2MM gallon diesel AST. Please provide TANKS emission calculation output sheets and provide any documentation relating to size, number, and configuration of proposed diesel AST(s). Please clarify/explain.

RESPONSE 7-40 The current design of the facility includes two 1,000,000 gallon above-ground ULSD storage tanks. Each tank will be approximately 80 feet in diameter and 30 feet tall. The fugitive VOC emissions associated with the ULSD storage tanks were estimated using the TANKS program. The TANKS data printouts for the two ULSD storage tanks are attached.

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

DATE: May 17, 2016

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7-41 Section 3.1, Sensitive Receptor List included as Table 4 contains same information as in HRAP. However, RIDEM's comments indicated that some farms were observed during a cursory review were missing from list. No receptors were added to this HRA list from HRAP. Please provide rationale for no additional receptors being added to list when RIDEM states that fainis can be seen in a "cursory review".

RESPONSE 7-41 Following RIDEM comments, additional review identified several area farms. The individual pollutant deposition rates at the impacted farms were used as the basis for the Crop, Beef, Dairy, Pig, Chicken, and Egg Ingestion values for all residential receptors in the HRA study area. No additional receptors were added to the list, but all pollutant exposure input values were affected by the use of these ingestion values. The CREC health risk assessment conservatively assumed that the impacted residents exclusively ingested locally grown meat and dairy products because there are local farms in the area.

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7-42 Section 4.1, More recent meteorological data is being used (2010-2014) within HRA rather than what was specified in HRAP (2007-2011). Please provide any RIDEM/Permitee correspondence relating to this change in model data.

RESPONSE 7-43 RIDEM's July 27, 2015 letter conditionally approving the project's Air Dispersion Modeling Protocol (attached) stated that "OAR's pre-processed five years off-site meteorological data shall be used for air toxics modeling. Those data are provided by OAR." The more recent meteorological data subsequently provided by OAR was used for the air toxics modeling which formed the basis of the health risk assessment.

RESPONDENT: Michael Feinblatt, ESS Group, Inc.

DATE: May 17, 2016

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INVENERGY THERMAL DEVELOPMENT LLC
By its Attorneys,

/s/ Alan M. Shoer

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Dated: May 17, 2016

CERTIFICATE OF SERVICE

I hereby certify that on May 17, 2016, I delivered a true copy of the foregoing responses to the Energy Facilities Siting Board via electronic mail to the parties on the attached service list.

/s/ Alan M. Shoer