March 24th, 2014
Ms. Melanie Magee
Greenhouse Gas Permit Contact
U.S. EPA Region 6, (6PD-R)
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

RE: Greenhouse Gas Permit Response to Comments
Invenergy Thermal Development
Ector County Energy Center
Goldsmith, Ector County, Texas

Dear Ms. Magee:

As a follow up to the phone conversation with you and Ms. Anna Milburn on Friday, February 21, Invenergy has made several revisions to the Information represented in the Ector County Energy Center Greenhouse Gas Permit Application, originally submitted June 26th 2013. Specifically, Invenergy has provided:

- Revised GHG BACT numbers for the GE 7FA.03 turbine
- Adjusted mass emission rates for turbine startup/shutdown
- Justification for turbine selection
- Updated efficiency curves

Revised GHG BACT numbers for the GE 7FA.03 turbine
In Attachment A, you will find an updated Table 5-1 for the 7FA.03 turbine that includes revised BACT levels on both a Net and Gross basis. Please note that the compliance margins and lb CO_{2e} /MWh BACT levels for the 7FA.03 have been reduced from the original application. Based on Invenergy's history of constructing, commissioning, and operating eight 7FA.03 turbines in North America, we are confident in the unit's ability to meet the manufacture's stated design performance at the site specific conditions. Based on this operational experience, we have reduced the proposed design margin from 3.3% to 2.3% and the degradation margin downward from 6.0% to 4.0%. Invenergy has not adjusted the performance margin from the original application as this margin is based on the demands and requirements of the local electrical grid, and we see a high degree of volatility in electrical demand on the electrical grid in west Texas. The result of the decrease in the compliance margins for the 7FA.03 has resulted in a GHG BACT annual lb CO_{2e}/MWh emission limit that is significantly lower than in the initial application.

The margins in Table 5-1 have not been adjusted for the 7FA.05 turbine as Invenergy does not have any installation or operating experience of these units. Therefore we are requesting more conservative margins to cover any potential design, performance, or degradation issues that may arise with this relatively new technology. As represented in the initial application, the inclusion of the 7FA.05 turbine option is a second option in the event that the two 7FA.03 units that Invenergy currently owns are repurposed for another project.

Adjusted mass emission rates for turbine startup/shutdown
In Table 3-3 in the initial application, Invenergy represented that the CO_{2e} emissions during start up and shut down would occur at a rate of 78 tons of CO_{2e} per hr. Based on a detailed review of typical start up data from Invenergy's 7FA.03 peaking facilities, and since the typical startup time for a peaking turbine is less than one hour, it was determined that a permit limit of 21 tons of CO_{2e} per event would be achievable for both the 7FA.03 and the 7FA.05.

Please see the updated Table 3-3 in Attachment B.

Justification for turbine selection
The information included below is intended to further explain the benefits of the installation of the proposed GE 7FA.03 gas turbine at the Ector County Energy Center.

Invenergy has analyzed the characteristics of electrical demand on the ERCOT electrical grid in west Texas and specifically in the location of the proposed Ector County Energy Center. Our analysis indicates a need of approximately 300 MWs of peaking capacity to respond to the relatively volatile market. The 7FA.03 model gas turbines are very low cost units and fit this need quite nicely. Invenergy currently owns and holds two 7FA.03 gas turbines and has determined that the West Texas power market is the ideal area to install peaking turbines of this size.

When comparing the BACT limits of the 7FA.03 with the BACT limits of the 7FA.05, it is important to note that Invenergy's proposal to use the 7FA.03 variant would result in a potential to emit CO_{2e} that is several thousands of tons per year less than the 7FA.05 variant. Although the 7FA.05 has a lower lbs CO_{2e} /MWh emission rate at each turbine's respective base load, emissions of greenhouse gases from the 7FA.05 variant would be much larger, due to the unit having a significantly larger capacity than the 7FA.03, thereby resulting in more overall emissions. Assuming both units are operated at 2,500 hours per year, the 7FA.05 will produce 104,003 more tons of CO_{2e} on an annual basis, compared to the 7FA.03.

The chart in Attachment C depicts the efficiency of both the 7FA.03 and the 7FA.05, at site elevation, plotted against the MW output of each turbine. In addition to fewer overall emissions the 7FA.03 also boasts more efficient energy production, when compared to the 7FA.05, when producing between 90 and 135MW per unit. This attribute of the 7FA.03 unit is not obvious when only comparing base load heat rates or efficiencies of different turbine models. Based on the electrical demand of the area, Invenergy feels that this is an important operating characteristic of the 7FA.03. As electrical load varies and turbines are run partially loaded to meet system demands, there is no assurance that in this application, the 7FA.05 will operate more efficiently than the 7FA.03.

In addition to the overall emission production and efficiency of each unit, we have compared the capital and long term operating costs of each variant as illustrated in Attachment D. Based on this analysis, it is clear that any efficiency or emissions reduction available by using the 7FA.05 comes at a substantial cost. Based on the analysis conducted the installation of the 7FA.05 will provide, at base load, a 1.85 percentage point efficiency improvement with an increased capital cost of approximately $130 million dollars. The proposed 7FA.03 combustion turbines have already been purchased and are held in current inventory thus, the additional costs for the

7FA.05 are unusually large for this project due to the fact that additional capital will be needed to purchase the 7FA.05.

When levelizing the production of each unit on an annual basis and taking into account the annual plant costs, the higher upfront and operating expenses of the 7FA.05 result in a cost of $675 for every ton of CO_{2e} reduced. Please see the table in Attachment D for further illustration of the assumptions that went into calculating this number. Note also that this analysis has assumed the 7FA.03 is operated to its permit limit and the maximum number of megawatts are produced. In the event that fewer megawatt hours are modeled, the cost per ton of CO_{2e} saved further increases.

Updated efficiency curves
Please see the requested efficiency curves provided in Attachment E.

Updated Permit Application Tables
As a result of the changes listed above, as well as the revisions since Invenergy's original application to Table A-1 to Subpart A of Part 98 –Global Warming Potentials, updated Table 3-1 through 3-8 from the permit application have been provided for reference.

Thank you for your assistance in identifying these additional items needed to complete the permit review. Invenergy is committed to producing power using appropriate equipment in an efficient manner to satisfy market demand. Please let me know if there are any additional items that we can provide. Should you have any questions, please contact me at bosborne@zephyrenv.com, or 512-579-3815.

Sincerely,
Zephyr Environmental Corporation

Bryan Osborne
Project Manager

Attachments

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Attachment A
Updated Table 5-1 for 7FA.03

Table 5-1
GHG Emission Calculations - Calculation of Design Heat Rate and Output Limits for Simple Cycle Combustion
Ector County Energy Center

	Gross Basis	Net Basis*	
Base Heat Rate:	**10,480**	**10,586**	Btu/kWh (HHV)
Design Margin:	2.3%	2.3%	
Performance Margin:	5.0%	5.0%	
Degradation Margin:	4.0%	4.0%	
Adjusted Base Heat Rate with Compliance Margins:	**11,707**	**11,826**	Btu/kWh (HHV)

EPN	Base Heat Rate (Btu/kWhr)	Electrical Output Basis	Heat Input Required to Produce 1 MW (MMBtu/MWhr)	Pollutant	Emission Factor (lb/MMBtu)[1]	lb GHG/MWhr[2]	Global Warming Potential[3]	lb CO_2e/MWhr[4]
CT-1, CT-2 7FA.03	11,707	Gross	11.71	CO_2	118.857	1,391.51	1	1,391.51
				CH_4	2.2E-03	2.58E-02	21	5.42E-01
				N_2O	2.2E-04	2.58E-03	310	8.00E-01
				Total:		**1,391.5**		**1,392.8**
CT-1, CT-2 7FA.03	11,826	Net*	11.83	CO_2	118.86	1,405.60	1	1,405.60
				CH_4	2.2E-03	2.61E-02	21	5.48E-01
				N_2O	2.2E-04	2.61E-03	310	8.08E-01
				Total:		**1,405.6**		**1,407.0**

Gross basis heat rate taken from Design Basis Document; net basis heat rate calculated by Invenergy

*Net-based data provided for informational purposes only

Note

1. *CH_4 and N_2O GHG factors based on Table C-2 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.*
2. *CO_2 emissions based on 40 CFR Part 75, Appendix G, Equation G-4*

$W_{CO2} = (F_c \times H \times U_f \times MW_{CO2})/2000$

W_{CO2} = CO_2 emitted from combustion, tons/yr

F_c = Carbon based F-factor, 1040 scf/MMBtu

H = Heat Input (MMBtu/yr)

U_f = 1/385 scf CO_2/lbmole at 14.7 psia and 68 °F

MW_{CO2} = Molecule weight of CO_2, 44.0 lb/lbmole

3. *Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.*
4. *Example calculation: GHG emissions (lbs) x Global Warming Potential / 1 MW = lb CO_2e/MWhr*

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Attachment B
Updated Table 3-3 for Startup Emissions

Table 3-3
Startup GHG Emission Calculations - Simple Cycle Combustion Turbine
Ector County Energy Center

Startup/Shutdown Hourly GHG Emissions From Turbine

EPN	Heat Input During Startup[1] (MMBtu/event)	Pollutant	Emission Factor (lb/MMBtu)[2]	GHG Mass Emissions[3] (ton/event)	Global Warming Potential[4]	CO_2e (ton/event)
CT-1, CT-2 7FA.03	350.0	CO_2	118.86	21	1	21
		CH_4	2.2E-03	0.0004	21	0.0081
		N_2O	2.2E-04	0.0000	310	0.0120
CT-1, CT-2 7FA.05	350.0	CO_2	118.86	21	1	21
		CH_4	2.2E-03	0.0004	21	0.0081
		N_2O	2.2E-04	0.0000	310	0.0120
			Total:	**21**		**21**

Note

1. *The hourly heat input data for the 7FA.03 is based on Invenergy's current operating plant performance*
2. CH_4 and N_2O GHG factors based on Table C-2 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.
3. *CO_2 emissions based on 40 CFR Part 75, Appendix G, Equation G-4*

$W_{CO2} = (F_c \times H \times U_f \times MW_{CO2})/2000$

W_{CO2} = CO_2 emitted from combustion, tons/hr

F_c = Carbon based F-factor,1040 scf/MMBtu

H = Heat Input (MMBtu/hr)

U_f = 1/385 scf CO_2/lbmole at 14.7 psia and 68 $^\circ$F

MW_{CO2} = Molecule weight of CO_2, 44.0 lb/lb-mole

4. *Global Warming Potential factors from Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.*

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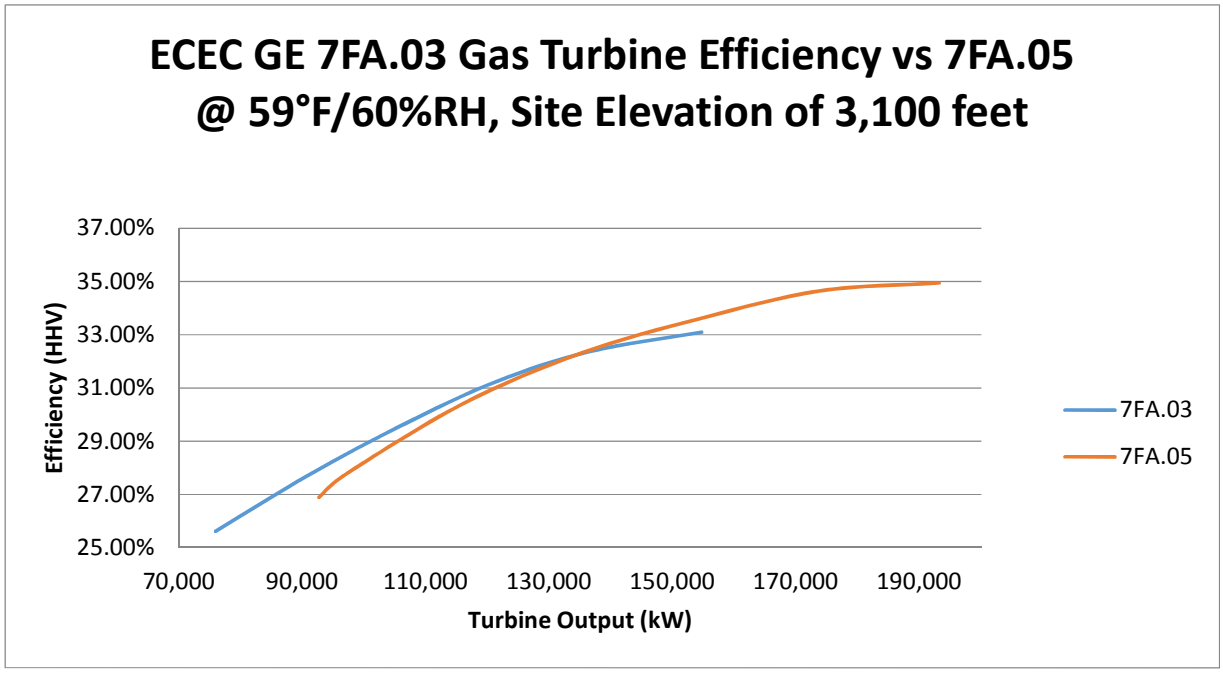
Attachment C
Efficiency Curves for 7FA.03 vs 7FA.05



Attachment D
Emission Cost Analysis of 7FA.03 and 7FA.05

Ector County Energy Center

		2x0 7FA.03 ISO	2x0 7FA.05 ISO	2x0 7FA.05 ISO
Annual Operating Hours		2500	1990.3	2500
Gross Output	MW	312	392	392
Net Output	MW	308	387	387
Annual Net Output	MWh/yr	770,827	770,823	968,225
Gross LHV Heat Rate	Btu/kWh	9,267	8,826	8,826
Net LHV Heat Rate	Btu/kWh	9,378	8,925	8,925
Net HHV Heat Rate	Btu/kWh	10,405	9,900	9,900
Fuel Consumption	MMBtu/yr	8,020,692	7,631,418	9,585,764
Fuel Price	$/MMBtu	$5.00	$ 5.00	$ 5.00
CO2 Emissions (Net)	lb-CO2e/MWh	1,383	1,316	1,316
CO2 Emissions (Net)	TPY	532,996	507,128	636,999
CT Unit Cost**	USD	$0	$57,712,000	$57,712,000
BOP Cost**	USD	$103,829,000	$114,829,000	$114,829,000
Total Owners Cost**	USD	$103,829,000	$230,253,000	$230,253,000
Total installed Cost in $/KW		$337	$595	$595
Fixed Charge Rate	%	12%	12%	12%
CO2 Emissions Difference to 7FA.03	(tpy)		-25,868	104,003

** Source: Thermoflow PEACE
CT cost assumed $0 for 7FA.03 as Invenergy maintains these units in it's current inventory.

Cost of Electricity				
Capital Recovery	$/kw-yr	$ 40.41	$ 71.34	$ 71.34
Fixed O&M	$/kw-yr	$ 19.46	$ 19.38	$ 19.38
Total fixed revenue required	**$/kw-yr**	**$ 59.87**	**$ 90.73**	**$ 90.73**
Fuel -Natural Gas	$/MWhr	$ 52.03	$ 49.50	$ 49.50
Variable O&M	$/MWhr	$ 3.50	$ 7.03	$ 7.03
Total variable revenue required	**$/MWhr**	**$ 55.53**	**$ 56.53**	**$ 56.53**
Capital Recovery	$MM/yr	$ 12.46	$ 27.63	$ 27.63
Fixed O&M	$MM/yr	$ 6.00	$ 7.51	$ 7.51
Fuel	$MM/yr	$ 40.10	$ 38.16	$ 47.93
Variable O&M	$MM/yr	$ 2.70	$ 5.42	$ 6.81
Total	**$MM/yr**	**$ 61.26**	**$ 78.71**	**$ 89.87**
All-in cost of electricty	**$/MWhr**	**$ 79.47**	**$ 102.12**	**$ 92.82**
Difference v. 7FA.03 option	$MM/yr		$ 17.45	$ 28.61
Cost of reduced CO2e	$/ton CO2e		**$ 675**	**N/A**

CO2e includes CO2, N20, and CH4 and is based on 40 CFR Part 75 and Part 98 Factors.
FOM and VOM costs are escalated at 2.2% annual rate. Inputs in this table are levelized over 20 years.
Output and heat rate values above are net of plant auxillary loads at 59*/60%RH and at site elevation
Fixed charge rate used above for evaluation consistent with long term investment considerations

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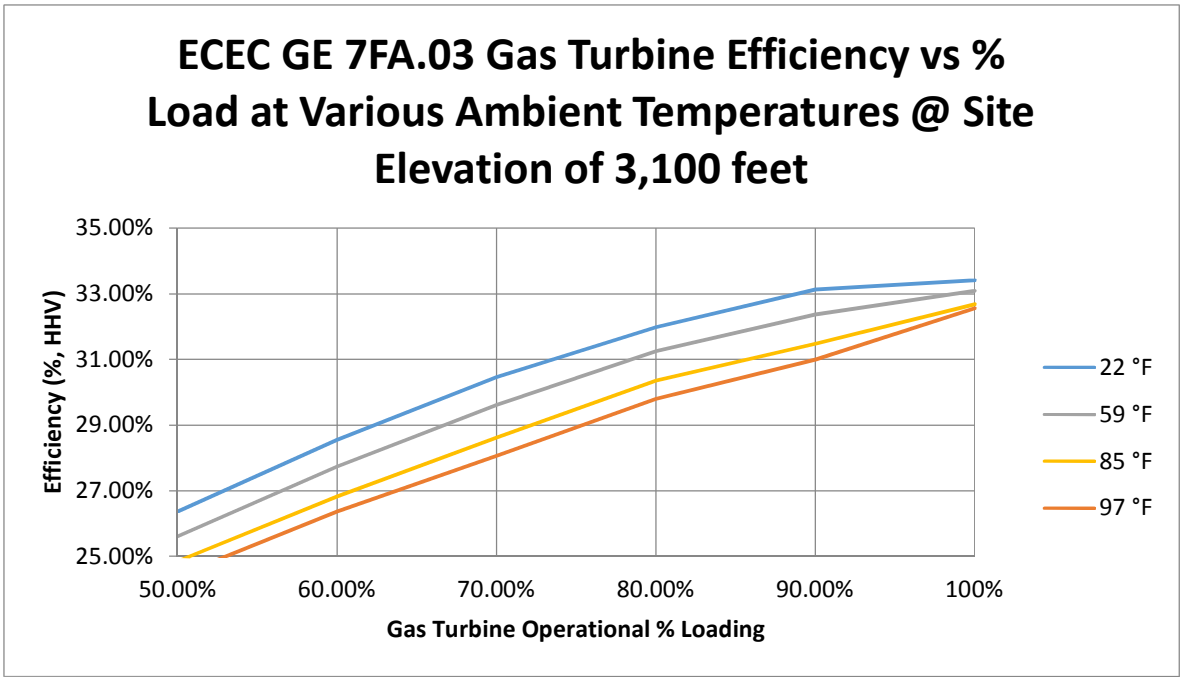
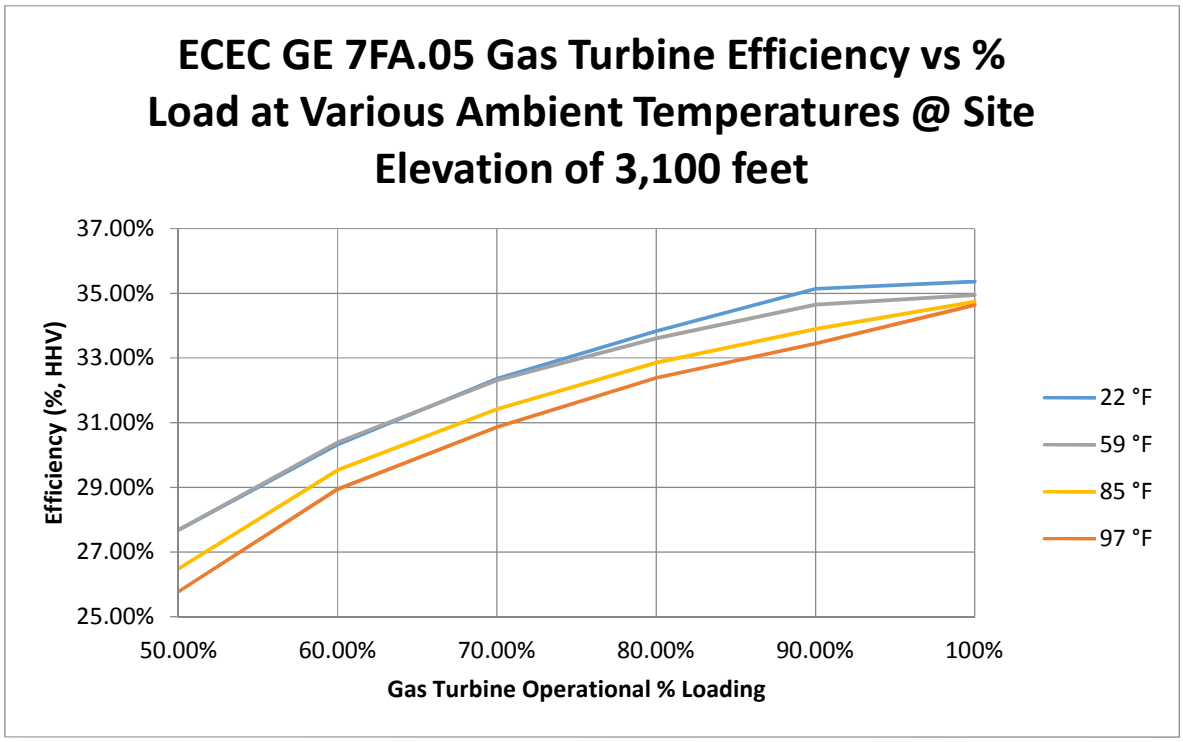
Attachment E
Updated Efficiency Curves for 7FA.03 and 7FA.05





Updated GHG Permit Application Tables

Table 3-1
Plantwide GHG Emission Summary
Ector County Energy Center

Name	EPN	GHG Mass Emissions ton/yr	CO_2e ton/yr
Combustion Turbine 1 -GE 7FA.03	CT-1	239,425	239,663
Combustion Turbine 2 -GE 7FA.03	CT-2	239,425	239,663
Dewpoint Heater	DPT HTR	2,630	2,633
Natural Gas Fugitives	NGFUG	10	252
MSS Fugitives	MSS FUG	0.13	3
Fire Water Pump	FWP	5	5
SF_6 Insulated Equipment	SF6-FUG	0.0007	17
Sitewide Emissions:		**481,495**	**482,237**

Name	EPN	GHG Mass Emissions ton/yr	CO_2e ton/yr
Combustion Turbine 1 -GE 7FA.05	CT-1	283,414	283,696
Combustion Turbine 2 -GE 7FA.05	CT-2	283,414	283,696
Dewpoint Heater	DPT HTR	2,630	2,633
Natural Gas Fugitives	NGFUG	10	252
MSS Fugitives	MSS FUG	0.13	3
Fire Water Pump	FWP	5	5
SF_6 Insulated Equipment	SF6-FUG	0.0007	17
Sitewide Emissions:		**569,473**	**570,302**

Table 3-2
GHG Annual Emission Calculations - Simple Cycle Combustion Turbine
Ector County Energy Center

EPN	Average Heat Input[1] (MMBtu/hr)	Annual Heat Input[2] (MMBtu/yr)	Pollutant	Emission Factor (lb/MMBtu)[3]	GHG Mass Emissions[4] (tpy)	Global Warming Potential[5]	CO_2e (tpy)
CT-1, CT-2 (each) 7FA.03	1,611	4,028,700	CO_2	118.86	239,420	1	239,420
			CH_4	2.2E-03	4.4	25	111.0
			N_2O	2.2E-04	0.4	298	132.3
CT-1, CT-2 (each) 7FA.05	1,908	4,768,881	CO_2	118.86	283,408	1	283,408
			CH_4	2.2E-03	5.3	25	131.4
			N_2O	2.2E-04	0.5	298	156.7
Maximum Totals (each turbine):					**283,414**		**283,696**

Note

1. *The average heat input is based on the HHV ISO heat input at 100% load firing, at 59° F ambient temperature.*
2. *Annual heat input based on 2,500 hours per year operation.*
3. *CH_4 and N_2O GHG factors based on Table C-2 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.*
4. *CO_2 emissions based on 40 CFR Part 75, Appendix G, Equation G-4*

$W_{CO2} = (F_c \times H \times U_f \times MW_{CO2})/2000$

W_{CO2} = CO_2 emitted from combustion, tons/yr

F_c = Carbon based F-factor,1040 scf/MMBtu

H = Heat Input (MMBtu/yr)

U_f = 1/385 scf CO_2/lbmole at 14.7 psia and 68 °F

MW_{CO2} = Molecule weight of CO_2, 44.0 lb/lb-mole

5. *Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting (3/18/14)*

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Table 3-3
Startup GHG Emission Calculations - Simple Cycle Combustion Turbine
Ector County Energy Center

Max Hourly GHG Emissions From Turbine Variants

EPN	Max Hourly Heat Input (MMBtu/hr)	Pollutant	Emission Factor (lb/MMBtu)[2]	GHG Mass Emissions[3] (ton/hr)	Global Warming Potential[4]	CO_2e (ton/hr)
CT-1, CT-2 (each) 7FA.03	1,698.7	CO_2	118.86	101	1	101
		CH_4	2.2E-03	0.0019	25	0.0468
		N_2O	2.2E-04	0.0002	298	0.0558
CT-1, CT-2 (each) 7FA.05	1,944.7	CO_2	118.86	116	1	116
		CH_4	2.2E-03	0.0021	25	0.0536
		N_2O	2.2E-04	0.0002	298	0.0639
Maximum Emission Total (each turbine):				**116**		**116**

Startup/Shutdown Hourly GHG Emissions From Turbine

EPN	Heat Input During Startup[1] (MMBtu/hr)	Pollutant	Emission Factor (lb/MMBtu)[2]	GHG Mass Emissions[3] (ton/hr)	Global Warming Potential[4]	CO_2e (ton/hr)
CT-1, CT-2 (each) 7FA.03	350.0	CO_2	118.86	21	1	21
		CH_4	2.2E-03	0.0004	25	0.0096
		N_2O	2.2E-04	0.0000	298	0.0115
CT-1, CT-2 (each) 7FA.05	350.0	CO_2	118.86	21	1	21
		CH_4	2.2E-03	0.0004	25	0.0096
		N_2O	2.2E-04	0.0000	298	0.0115
Maximum Emission Total (each turbine):				**21**		**21**

Note

1. *The hourly heat input data is the maximum heat rate from GE Performance Data for low load (50%) conditions*
2. CH_4 and N_2O GHG factors based on Table C-2 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.
3. *CO_2 emissions based on 40 CFR Part 75, Appendix G, Equation G-4*

$W_{CO2} = (F_c \times H \times U_f \times MW_{CO2})/2000$

W_{CO2} = CO_2 emitted from combustion, tons/hr

F_c = Carbon based F-factor,1040 scf/MMBtu

H = Heat Input (MMBtu/hr)

U_f = 1/385 scf CO_2/lbmole at 14.7 psia and 68 °F

MW_{CO2} = Molecule weight of CO_2, 44.0 lb/lb-mole

4. *Global Warming Potential factors from Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting (3/18/14)*

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Table 3-4
GHG Emission Calculations - Dewpoint Heater
Ector County Energy Center

GHG Potential To Emit Emissions From Natural Gas-Fired Auxiliary Boiler

EPN	Maximum Heat Input[1] (MMBtu/yr)	Pollutant	Emission Factor (lb/MMBtu)[2]	GHG Mass Emissions (tpy)	Global Warming Potential[3]	CO_2e (tpy)
DPT HTR	45,000	CO_2	116.89	2,630	1	2,630
		CH_4	2.2E-03	0.05	25	1.2
		N_2O	2.2E-04	0.005	298	1.5
			Total:	**2,630**		**2,633**

Note

1. *Annual fuel use and heating value of natural gas from Table A-10 State/PSD air permit application*
2. *Factors based on Table C-1 and C-2 of 40 CFR Part 98, Mandatory Greenhouse Gas Reporting.*
3. *Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting (3/18/14)*

Table 3-5
GHG Emission Calculations - Natural Gas Piping Fugitives
Ector County Energy Center

GHG Emissions Contribution From Fugitive Natural Gas Piping Components

EPN	Source Type	Fluid State	Count	Emission Factor[1] (scf/hr/comp)	CO_2[2] (tpy)	Methane[3] (tpy)	**Total (tpy)**
NGFUG	Valves	Gas/Vapor	300	0.121	0.084	6.313	-
	Flanges	Gas/Vapor	1,200	0.017	0.047	3.548	-
	Relief Valves	Gas/Vapor	5	0.193	0.002	0.168	-
	Open-Ended Lines	Gas/Vapor	10	0.031	0.0007	0.0539	-
	Compressors	Gas/Vapor	3	0.003	0.000021	0.00157	-
GHG Mass-Based Emissions					0.134	10.08	**10.22**
Global Warming Potential[4]					1	25	-
CO_2e Emissions					0.134	252.12	**252.25**

Note

1. *Emission factors from Table W-1A of 40 CFR 98 Mandatory Greenhouse Gas Reporting published in the May 21, 2012 Technical Corrections*
2. *CO_2 emissions based on vol% of CO_2 in natural gas* *0.46%*
3. *CH_4 emissions based on vol% of CH_4 in natural gas* *95.3%*
4. *Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting (3/18/14)*

Example calculation:

300 valves	0.123 scf gas	0.0046 scf CO2	lbmole	44 lb CO_2	8760 hr	ton =	0.08 ton/yr
	hr * valve	scf gas	385 scf	lbmole	yr	2000 lb	

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TABLE 3-6
Gaseous Fuel Venting During Turbine Shutdown/Maintenance and Small Equipment and Fugitive Component Repair/Replacement
Ector County Energy Center

Location	Initial Conditions			Final Conditions			Annual Emissions		Total (tpy)
	Volume[1] (ft^3)	Press. (psig)	Temp. (°F)	Press. (psig)	Temp. (°F)	Volume[2] (scf)	CO_2[3] (tpy)	CH_4[4] (tpy)	
Turbine Fuel Line Shutdown/Maintenance	138	600	50	0	68	6,710	0.0018	0.13	
Small Equipment/Fugitive Component Repair/Replacement	7	50	50	0	68	3	0.00000	0.00006	
GHG Mass-Based Emissions							0.0018	0.1330	**0.13**
Global Warming Potential[5]							1	25	
CO_2e Emissions							0.0018	3.3	**3.3**

1. Initial volume is calculated by multpilying the crossectional area by the length of pipe using the following formula: V_i = pi * [(diameter in inches/12)/2]^2 * length in feet = ft^3
2. Final volume calculated using ideal gas law $[(PV/ZT)_i = (PV/ZT)_f]$. $V_f = V_i (P_i/P_f) (T_f/T_i) (Z_f/Z_i)$, where Z is estimated using the following equation: $Z = 0.9994 - 0.0002P + 3E\text{-}08P^2$.
3. CO_2 emissions based on vol% of CO_2 in natural gas 0.46% from natural gas analysis
4. *CH_4 emissions based on vol% of CH_4 in natural gas* 95.3% from natural gas analysis
5. *Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting. (3/18/14)*

Example calculation:

6710 scf Nat Gas	0.005 scf CO2	lbmole	44 lb CO_2	ton =	=	0.0018 ton/yr CO_2
yr	scf Nat Gas	385 scf	lbmole	2000 lb		

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Table 3-7
GHG Emission Calculations - Fire Water Pump Engine
Ector County Energy Center

GHG Emissions Contribution From Diesel Combustion In Fire Water Pump Engine

Assumptions:

Annual Operating Schedule:	100	hours/year
Power Rating:	250	hp
Max Hourly Fuel Use:	4.8	gal/hr
Heating Value of No. 2 Fuel Oil[1]:	0.138	MMBtu/gal
Max Hourly Heat Input:	0.7	MMBtu/hr
Annual Heat Input:	66.7	MMBtu/yr

EPN	Heat Input (MMBtu/yr)	Pollutant	Emission Factor (lb/MMBtu)[2]	GHG Mass Emissions (tpy)	Global Warming Potential[3]	CO_2e (tpy)
FWP	66.7	CO_2	163.05	5.44	1	5.44
		CH_4	6.6E-03	0.0002	25	0.006
		N_2O	1.3E-03	0.0000	298	0.013
			Total:	**5.44**		**5.46**

Calculation Procedure

Annual Emission Rate = annual heat Input X Emission Factor X 2.2 lbs/kg X Global Warming Potential / 2,000 lbs/ton

Note

1. *Default high heat value based on Table C-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.*
2. *GHG factors based on Tables C-1 and C-2 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.*
3. *Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting. (3/18/14)*

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Table 3-8
GHG Emission Calculations - Electrical Equipment Insulated With SF_6
Ector County Energy Center

Assumptions

Insulated circuit breaker SF_6 capacity:	240	lb
Estimated annual SF_6 leak rate:	0.5%	by weight
Estimated annual SF_6 mass emission rate:	0.0006	ton/yr
Global Warming Potential[1]:	22,800	
Estimated annual CO_2e emission rate:	13.7	ton/yr

Note

Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting (3/18/14)

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