Golden Spread
Electric Cooperative, Inc.
A Touchstone Energy® Cooperative

July 25, 2013

Mr. Jeffrey Robinson
Chief, Air Permits Section
Attention: Ms. Melanie Magee
U.S. Environmental Protection Agency, Region 6 (6PD-R)
1445 Ross Avenue
Dallas, TX 75202-2733

Re: Application for a Prevention of Significant Deterioration (PSD) Air Quality Permit for Greenhouse Gas (GHG) Pollutants – Update to Permit Application for New Gas Turbine
Golden Spread Electric Cooperative, Inc.
Antelope Station, Abernathy, Hale County, Texas

Dear Mr. Robinson:

As we have discussed with Ms. Melanie Magee, Golden Spread Electric Cooperative, Inc. (GSEC) is submitting the enclosed application updates for a PSD permit for the new gas turbine unit to be located in GSEC's existing Antelope Station in Hale County, Texas. The updates include the following:

- Reconfiguration of the unit siting on the Antelope Station property, and correction of the property line shown on the area map,
- Addition of a 1500 kW backup diesel generator,
- Addition of a 5.5 MM BTU/hr natural gas fuel gas heater.

These updates result in changes to various pages of the application; the revised and added pages of the application are enclosed. The PSD permit application submitted to the Texas Commission on Environmental Quality (TCEQ) for non-GHG pollutants is being similarly updated.

GSEC will continue to work closely with Ms. Magee and other EPA staff to answer questions and issues as they arise. Our air quality consultant Pat Murin can be contacted any time to respond to questions and issues. Both myself and other GSEC technical and management staff are also available to respond to questions and issues that may develop during the permit application review.

We appreciate the efforts of EPA on this project, and look forward to continuing to work with Ms. Magee and other Region 6 staff.

Sincerely yours,

Jeff Pippin
Senior Asset Manager, Production
Golden Spread Electric Cooperative, Inc.

Enclosure

Update to Application for Prevention of Significant Deterioration Permit for Greenhouse Gases for Antelope Station
Golden Spread Electric Cooperative, Inc.
Abernathy, Texas

Submitted to:

U.S. Environmental Protection Agency, Region 6
Dallas, TX

July 2013

Golden Spread
Electric Cooperative, Inc.
A Touchstone Energy® Cooperative

TABLE OF CONTENTS

The seal appearing on this document was authorized by Patrick J. Murin, P.E. 67271 on 7/25/2013
P.E. Expiration Date: 12/31/2013

Murin Environmental Inc.
TBPE Registration No. F-7702
Firm Registration Expiration Date: 3/31/2014

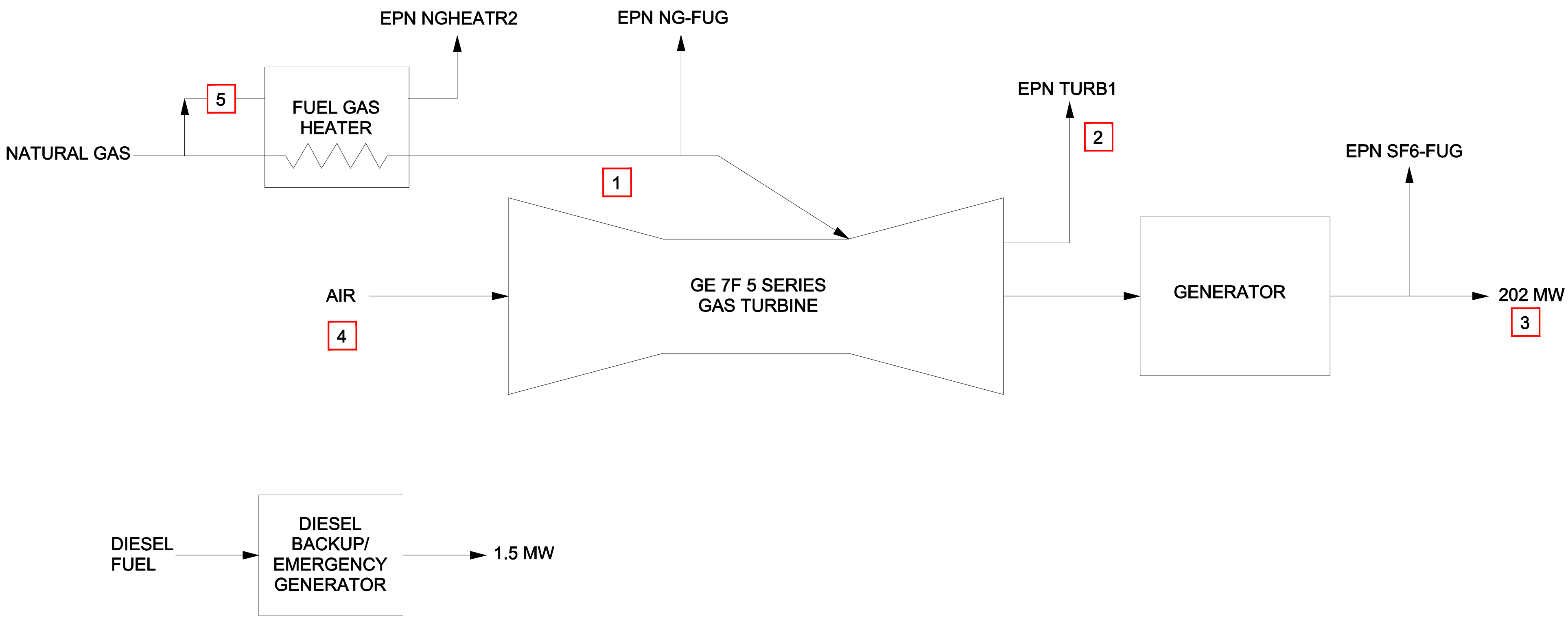
2.0 PROCESS DESCRIPTION AND PROCESS FLOW DIAGRAM

The process flow diagram illustrates the process steps in the proposed gas turbine system.

The proposed gas turbine will be a GE 7F 5-Series gas-fired combustion turbine. Supply air will be compressed by the integral 14-stage compressor. Natural gas fuel will be combusted in GE's DLN 2.6 combustion system and the combustion exhaust gases will power the 3-stage expansion turbine. The turbine is air cooled, and an evaporative air cooler and/or chiller is also used for inlet air cooling during summer peak ambient air temperatures.

The gas turbine will exhaust through stack Emission Point Number (EPN) TURB1 and will release both GHG and non-GHG air pollutants. The GHG pollutant sulfur hexafluoride (SF_6) will be released in low-volume leaks from circuit breakers as EPN SF_6-FUG. Leaks from the natural gas supply equipment (EPN NG-FUG) will release mostly GHG emissions but a small amount of non-GHG emissions. A natural gas heater is an indirect-fired water batch heater used to heat the natural gas fuel above the dewpoint. It is fueled with natural gas and discharges through EPN NGHEATR-2. An emergency/backup diesel generator discharges through EPN EMERGEN. Non-GHG emissions will not be covered in this permit.

PROCESS FLOW DIAGRAM

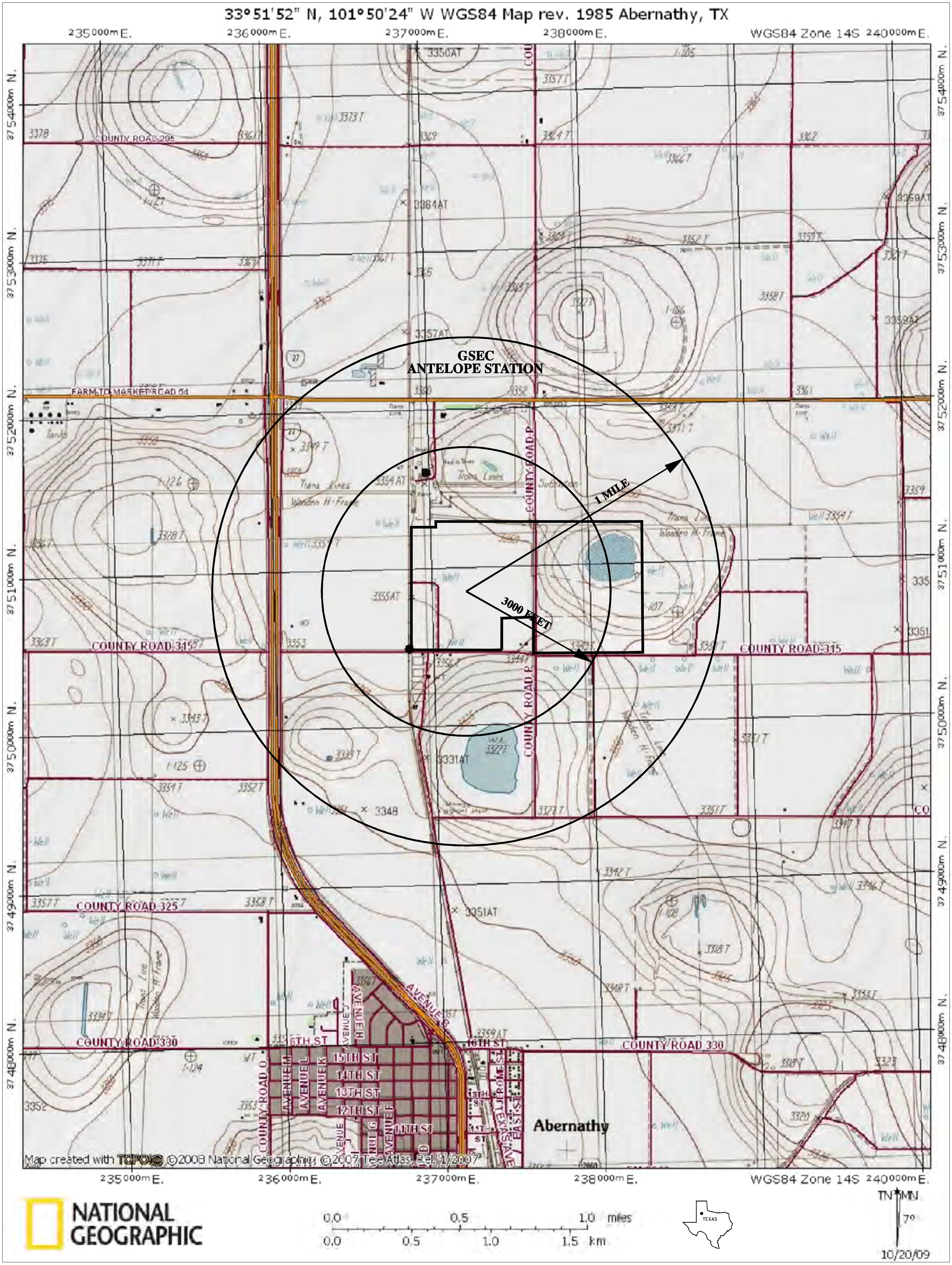


Drawn By	Eng. By	Date		REV
DWW	PJM	12/19/12 - 7/25/13	GSEC - Antelope	4
H:\Clients\MUR4615\GSEC-ANTALOPE\FLOW			Name FLOW	

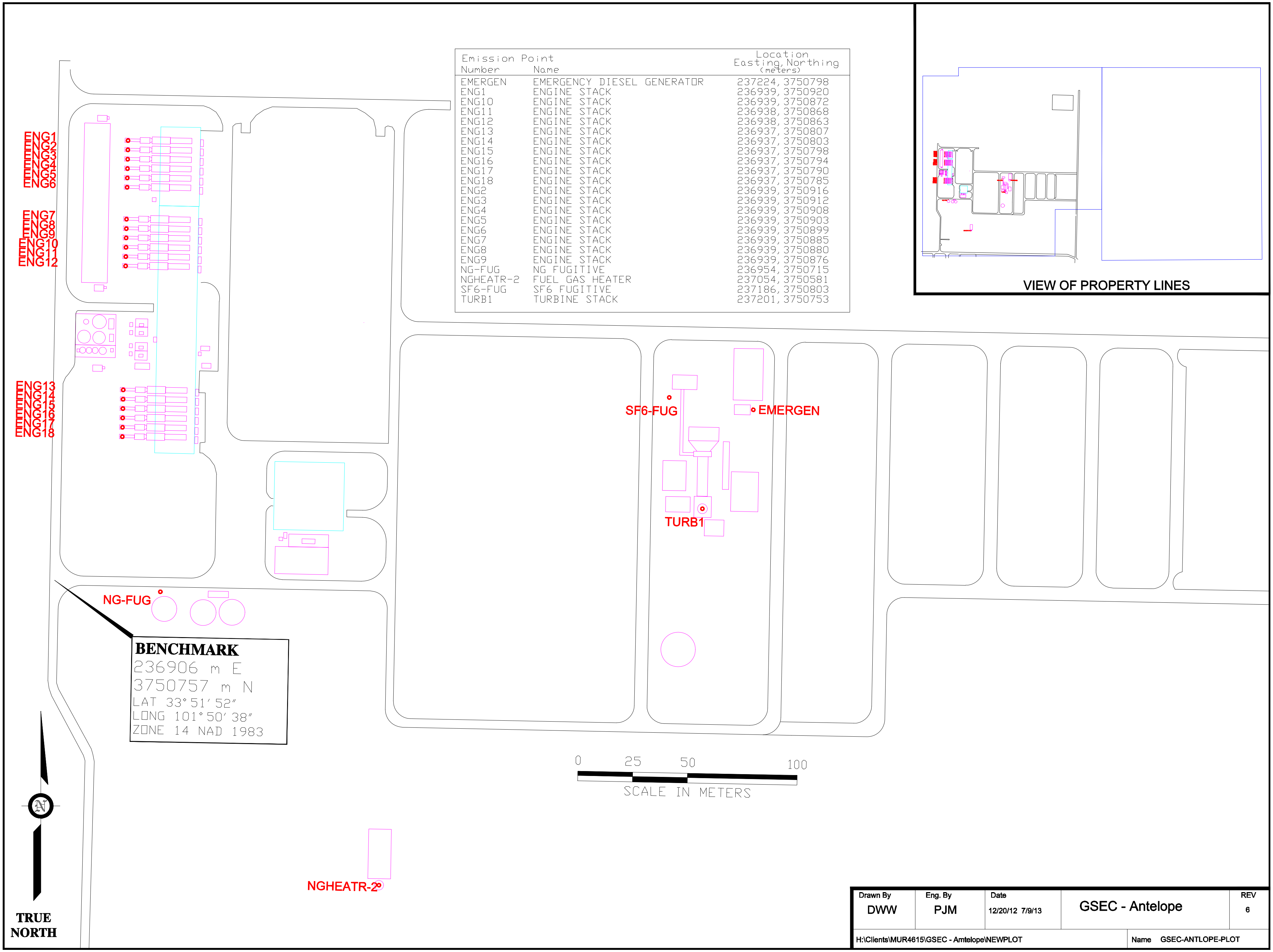
3.0 SITE INFORMATION

As shown in the Area Map, Antelope Station is located north of County Road 315, east of I-27 and bounded on the east by County Road P in Hale County, Texas. The location is approximately 1.6 miles north of the City of Abernathy.

The preliminary plot plan shows the location of the proposed unit at Antelope.



33°51'52" N, 101°50'24" W WGS84 Map rev. 1985 Abernathy, TX
WGS84 Zone 14S
GSEC
ANTELOPE STATION
1 MILE
3000 FEET
FARM-TO-MARKET ROAD 54
COUNTY ROAD 295
COUNTY ROAD 315
COUNTY ROAD 325
COUNTY ROAD 330
COUNTY ROAD P
COUNTY ROAD O
AVENUE B
Abernathy
Map created with TOPO!® ©2008 National Geographic; ©2007 Tele Atlas, Rel. 1/2007
NATIONAL GEOGRAPHIC
0.0 0.5 1.0 miles
0.0 0.5 1.0 1.5 km
TEXAS
TN MN
7°
10/20/09



Emission Point Number	Name	Location Easting, Northing (meters)
EMERGEN	EMERGENCY DIESEL GENERATOR	237224, 3750798
ENG1	ENGINE STACK	236939, 3750920
ENG10	ENGINE STACK	236939, 3750872
ENG11	ENGINE STACK	236938, 3750868
ENG12	ENGINE STACK	236938, 3750863
ENG13	ENGINE STACK	236937, 3750807
ENG14	ENGINE STACK	236937, 3750803
ENG15	ENGINE STACK	236937, 3750798
ENG16	ENGINE STACK	236937, 3750794
ENG17	ENGINE STACK	236937, 3750790
ENG18	ENGINE STACK	236937, 3750785
ENG2	ENGINE STACK	236939, 3750916
ENG3	ENGINE STACK	236939, 3750912
ENG4	ENGINE STACK	236939, 3750908
ENG5	ENGINE STACK	236939, 3750903
ENG6	ENGINE STACK	236939, 3750899
ENG7	ENGINE STACK	236939, 3750885
ENG8	ENGINE STACK	236939, 3750880
ENG9	ENGINE STACK	236939, 3750876
NG-FUG	NG FUGITIVE	236954, 3750715
NGHEATR-2	FUEL GAS HEATER	237054, 3750581
SF6-FUG	SF6 FUGITIVE	237186, 3750803
TURB1	TURBINE STACK	237201, 3750753

Drawn By	Eng. By	Date		REV
DWW	PJM	12/20/12 7/9/13	GSEC - Antelope	6

H:\Clients\MUR4615\GSEC - Amtelope\NEWPLOT

Name GSEC-ANTLOPE-PLOT

4.0 GHG EMISSIONS

As noted in the Process Description, the new sources of GHG emissions on the site will include the following:

- The combustion turbine
- Natural gas line equipment fugitive releases
- SF_6 leaks from circuit breakers
- Backup/emergency diesel generator
- Natural gas heater

GHG emissions from these sources are summarized in Table 1. The bases for and calculations of these emissions are further discussed below and in Tables 2 through 6. The new turbine at Antelope Station will not emit two of the six pollutant categories which comprise GHG pollutants, namely hydrofluorocarbons or perfluorocarbons. The plant will emit some amount of each of the remaining four categories of GHG pollutants (CO_2, CH_4, N_2O, and SF_6), but emissions of CO_2 comprise 98.7% of the total annual tons of GHG pollutants as CO_2-e, and 99.97% of the mass emissions of GHG pollutants.

4.1 Gas Turbine

GHG emissions from the combustion turbine comprise CO_2, CH_4, and N_2O. Emissions of CO_2 and CH_4 during normal operations are those estimated from turbine manufacturer data. Emissions of N_2O are estimated from the EPA's *Compilation of Air Pollutant Emission Factors* (AP-42, 5th Edition) and the maximum fuel usage rates. GHG emissions of CO_2 and N_2O during startup and shutdown operations were conservatively estimated to be the same as those in normal operations. CH_4 emissions during startup and shutdown operations were estimated from turbine manufacturer data. Actual GHG emissions in these operations will be less, based on the lower firing rate of natural gas. Table 2 provides the emission calculation bases and example calculations.

4.2 Natural Gas Line Fugitives

Natural gas line fugitive emissions are determined from the number of pipeline components such as control and relief valves, flanges, and sampling connections, and emission factors in 40 CFR 98 Table W-1A. The speciation of the fugitive releases uses data on the maximum composition of GHG components in the natural gas supply. Table 3 provides the emission calculation bases and example calculations.

4.3 SF_6 Leaks from Circuit Breakers

Leaks of SF_6 are based on the amount of SF_6 in circuit breakers at the power plant and a standard leak rate of 0.5% per year, which corresponds to the use of modern design circuit breakers and a comprehensive leak monitoring program. Table 4 provides the emission calculation bases and example calculations.

4.4 Backup/Emergency Diesel Generator

GHG emissions from the emergency generator are based on the vendor maximum fuel usage rates and vendor emission factors, excepting that emission factors from AP-42 were used for emissions of CO_2. Table 5 provides emission calculation bases and example calculations.

4.5 Natural Gas Heater

Emissions from the natural gas heater are based on the maximum fuel firing rate and emission factors from AP-42. Table 6 provides emission calculation bases and example calculations.

	Turbine 1			NG-Fugitives		SF_6 Fug	Fuel Gas Heater		Emergency Generator		TOTAL	
	Normal, lb/hr	SSM, lb/hr	Total, tons/yr	lb/hr	tons/yr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	tons/yr	PSD Significant Increase Levels, tons/yr
CO_2	232,749	232,749	532,007	0.018	0.079		647.06	1,479	2,558	127.89	533,614	N/A
CH_4	12.00	178.20	124.97	0.93	4.07		0.012	0.028	0.15	0.010	129.08	N/A
N_2O	5.82	5.82	13.3				0.012	0.027			13.33	N/A
SF_6						0.0073					0.0073	N/A
GHG	232,767	232,933	532,145	0.95	4.15	0.0073	647.08	1,479	2,558	127.90	533,756	100,000
CO_2-e	234,806	237,767	538,754	19.5	85.55	174.47	651.01	1,488	2,561	128.00	540,630	100,000

Gas-Fired Generator - Cummins QSK50-G4 NR2

Maximum Gross Generator Output , kW	1477
Maximum Fuel Consumption, gal/hr	109.4
Maximum Fuel Consumption (calculated), MM Btu/hr[1]	15.316
Maximum Brake Horsepower, bhp	2205
Annual Hours of Non-Emergency Operation	100

Criteria and GHG Pollutants

	CH_4	CO_2	CO_2-e
Emission Factor, g/bhp-hr	0.03	526.18	N/A
Emission Factor, lbs/MM Btu (AP-42 Table 3.4-3,4)	N/A	N/A	N/A
Hourly emissions, lbs/hr	0.15	2557.8	2561
Annual emissions, tons/yr	0.01	127.89	128

Tabulation of GHG Warming Potential Equivalency Factors (40 CFR Part 98 Subpart A, Table A-1)

CO_2	1	kg CO_2-e/kg CO_2
CH_4	21	kg CO_2-e/kg CH_4

Example Calculation of GHG_e Hourly Emissions

(2,558 lb CO2/hr) X (1lb CO2-e/lb CO2) + (0.15 lbs CH4/hr) X (21 lb CO2-e/lb CH4) = 2,561 lbs CO_2-e/hr

Example Calculation of Hourly Emissions

Vendor Data: (2205 bhp) X (526.176 g CO2/bhp-hr) X (1 lb/453.6 g) = 2557.8 lbs CO_2/hr

Example Calculation of Annual Emissions

(2557.8 lbs CO2/hr) X (100 hours/yr) X (1 ton/2000 lbs) = 127.89 tons CO_2/yr

[1]Based on 140,000 BTU (HHV)/gal.

Heater Bases

Heat Content of Fuel:	1,020 Btu/scf
Total Heater Fuel Firing Capacity:	5.5 MM Btu/hr
Total Heater Gas Capacity:	5,392 scfh
Maximum Operating Hours per year:	4,572
Maximum Annual Burner Gas Capacity:	24.65 MM scf/yr

Emission Factors and Emission Calculations for Gas Combustion Pollutants

Constituent	Emission Factor (lb/MM scf)	Source of Emission Factor	Emissions, lb/hr	Emissions, ton/yr
CO_2	1.20E+05	AP-42, Table 1.4-2	647.1	1479.0
CH_4	2.30	AP-42, Table 1.4-2	1.24E-02	2.83E-02
N_2O	2.2	AP-42, Table 1.4-2	0.0119	2.72E-02
GHG	N/A	N/A	647.1	1479.1
CO_2-e	N/A	N/A	651.0	1488.0

Basis for Calculations:
Emissions (lb/hr) = [Emission Factor (lb/MM scf)] X [Fuel Usage (scf/hr)] X [MM scf/1000000 scf]
Emissions (ton/yr) = [Hourly Emissions (lb/hr)] X [Maximum Annual Operating Hours (hours/yr)] X [1 ton/2000 lb]
Emissions (lb/yr) = [Hourly Emissions (lb/hr)] X [Maximum Annual Operating Hours (hours/yr)]
Emission factors are from the EPA's ***Compilation of Air Pollutant Emission Factors*** , 5th Edition, "Section 1.4, Natural Gas Combustion", for uncontrolled small boilers.

5.0 PSD APPLICABILITY SUMMARY

As shown in Table 1, the proposed gas turbine will emit 533,756 tons/yr of GHG pollutants and 540,630 tons/yr of CO_2-e. Because these emissions exceed the GHG major modification definition of 75,000 tons/yr, GSEC is required to obtain a pre-construction air quality permit for the GHG emissions from the proposed turbine under the PSD rules from the EPA. The proposed gas turbine is also subject to PSD review by the Texas Commission on Environmental Quality (TCEQ) for non-GHG emissions, since, as shown in Table 1F, it will also be a major source of CO emissions, and emissions of NOx and particulate matter less than 10 microns in diameter and less than 2.5 microns in diameter will exceed their PSD significant emission rates. These non-GHG emissions, and those with emission rates below the respective PSD significant emission rates, are subject to the State of Texas pre-construction authorization requirements, and authorizations for those associated facilities and emissions will be obtained separately from the TCEQ.

Sources and emissions subject to PSD permitting requirements because of their potential to release GHG emissions are subject only to some of the requirements of the PSD rules. The primary requirement of a PSD permit for GHG emissions is to require that the permitted facilities use the Best Available Control Technology (BACT) for controlling GHG emissions. The resulting PSD permit specifies emission levels reflecting the use of BACT, including emissions monitoring and other requirements to ensure that the BACT emission levels are maintained during operations. An analysis of and rationale for BACT for the GHG emissions from the new gas turbine facility at Antelope Station are provided in Section 6.0.

GHG emissions from the proposed gas turbine facility are not subject to other PSD permit requirements. The facility is not subject to an analysis of ambient air impacts because there are no National Ambient Air Quality Standards or PSD Ambient Air Increments for GHG emissions. It is not subject to preconstruction ambient air monitoring because of the nature of GHG emissions and their potential global impact; there is no benefit for the gathering of local ambient air monitoring data on GHG pollutants. EPA's permitting guidance for GHG also indicates there is no need to conduct analyses of additional impacts on Class I areas, soils and vegetation because quantifying the impacts attributable to a single source is not feasible with current climate change models.[3]

[3] U.S. EPA, PSD and Title V Permitting Guidance for Greenhouse Gases, EPA-457/B-11-001, March 2011.

TCEQ

TABLE 1F
AIR QUALITY APPLICATION SUPPLEMENT

Permit No.: **109148 / PSDTX1358**	Application Submittal Date: **January, 2013; rev July, 2013**							
Company: **Golden Spread Electric Cooperative, Inc.**								
RN: **RN105862510**	Facility Location: **Plant site is north of County Road 315, east of I-27, and bounded on the east by County Road P, about 1.6 miles north of the City of Abernathy, Texas**							
City: **Abernathy**	County: **Hale**							
Permit Unit I.D.: **Antelope Station Turbine 1**	Permit Name: **Antelope Station Turbine 1**							
Permit Activity: ☒ New Source ☐ Modification								
Complete for all Pollutants with a Project Emission Increase.	**POLLUTANTS**							
	Ozone							
	VOC	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**NO_X**	**SO_2**	**CO_2-e**
Existing Site Nonattainment Permit?	No	No	No	No	No	No	No	No
Existing Site PSD Permit?	No	No	No	No	No	No	No	No
Existing site PTE (tpy)?	216.49	173.11	234.32	124.75	124.75	173.11	42.19	363,814
Proposed project emission increases[1]?	31.56	142.52	261.88	21.39	21.39	142.52	6.25	540,630
Is the existing site a major source?	No	No	No	No	No	No	No	Yes
If not, is the project a major source by itself?	No	No	Yes	No	No	No	No	Yes
If site is major source, is project increase significant?	No	Yes	Yes	Yes	Yes	Yes	No	Yes
If netting required, estimated start of construction: **N/A since only affected unit is a new gas turbine facility**								
5 years prior to start of construction **N/A**	contemporaneous							
Estimated start of operation **N/A**	period							
Net contemporaneous change, including proposed project (tpy)	31.56	142.52	261.88	21.39	21.39	142.52	6.25	540,630
Major NSR Applicable?	No	Yes	Yes	Yes	Yes	Yes	No	Yes

Senior Asset Manager, Production

Signature *Title* *Date* 7/25/2013

[1] Sum of proposed emissions minus baseline emissions, increases only.

The representations made above and on the accompanying tables are true and correct to the best of my knowledge.

TCEQ - 10154 (Revised 04/12) Table 1F
These forms are for use by facilities subject to air quality permit requirements and may be revised periodically. (APDG 5912v2)

6.0 BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

6.3.5 Select the BACT.

Use of modern circuit breaker technology and a comprehensive leak detection and disposition program constitutes BACT. The comprehensive program will involve inventory and use tracking, leak detection by hand-held halogen detectors, and low-gas density alarms. It will also include a recycling program so that SF_6 is evacuated into portable cylinders rather than vented to atmosphere.

6.4 Emergency Generator

The diesel fired emergency generator will normally operate less than 100 hours per year in non-emergency operations. GHG from the Emergency Generator will amount to 128 tons/yr of CO_2-e emissions, and 127.90 tons/yr of GHG emissions on a mass basis.

6.4.1 Identify all available control technologies.

There are two options for control of GHG emissions from the emergency generator. The first is to implement the add-on CCS option. The second is to maintain and operate the emergency generator properly, according to manufacturer recommendations and good combustion practice.

6.4.2 Eliminate technically infeasible options.

The use of CCS is not technically feasible for the emergency generator due to the generator's infrequent but critical operating requirements for quick response, short-duration operation; the operating period for the generator would usually end before the CCS absorption unit has reached normal operation. Except for its periodic testing, the emergency generator is intended to operate only for emergency situations when grid power may not be available, when its entire electrical output is required for the emergency situation. No CCS systems have been demonstrated for use on emergency generators.

Maintaining and operating the generator properly is technically viable, as demonstrated by widespread use of these units.

6.4.3 Rank remaining control technologies.

The only option is the base option to maintain and operate the generator properly, according to manufacturer recommendations and good combustion practice.

6.4.4 Evaluate the most effective controls and document the results.

GHG emission estimates for the emergency generator reflect the base option to maintain and operate the generator properly. There are no cost impacts for this option. Energy usage for the generator is comparable to that of a simple cycle gas turbine. There are no adverse environmental effects from the limited operation of the generator.

6.4.5 Select the BACT.

BACT is to maintain and operate the generator properly according to manufacturer recommendations, and to operate at the minimal schedule proposed in the permit application.

6.5 Natural Gas Heater

The natural gas heater will normally operate only during cold weather periods. GHG from the Emergency Generator will amount to less than 1488 tons/yr of CO_2-e emissions, and 1479.1 tons/yr of GHG emissions on a mass basis.

6.5.1 Identify all available control technologies.

There are three options for control of GHG emissions from the natural gas heater. The first is to implement the add-on CCS option. The second is to use an alternate design to the indirect-fired water bath heater. The third is to maintain and operate the emergency generator properly, according to manufacturer recommendations and good combustion practice.

6.5.2 Eliminate technically infeasible options.

The use of CCS is not technically feasible for the natural gas heater due to the heater's limited operation only during cold weather periods, and due to the small size of the combustion unit. No CCS systems have been demonstrated for use on heaters of this size nor on heaters of this configuration.

Due to process safety considerations, and due to the low heat demand needed to increase the temperature of the turbine natural gas fuel above the dewpoint, heaters in this type of application are nearly always of the indirect-fired water bath configuration. This type of heater achieves an energy transfer efficiency of 70-80%. Higher efficiency direct-fired heaters are not considered to be technically feasible due to process safety issues, and to control issues which can lead to overheating the natural gas stream.

Maintaining and operating the heater properly is technically viable, as demonstrated by widespread use of these units.

6.5.3 Rank remaining control technologies.

The only option is the base option to maintain and operate the heater properly, according to manufacturer recommendations and good combustion practice.

6.5.4 Evaluate the most effective controls and document the results.

GHG emission estimates for the natural gas heater reflect the base option to maintain and operate the heater properly. There are no cost impacts for this option. Energy impacts are comparable to other heaters of this type. There are no adverse environmental effects from the operation of the heater.

6.5.5 Select the BACT.

BACT is to maintain and operate the heater properly according to manufacturer recommendations.

6.6 Proposed Emission and Production Limits, Monitoring, and Maintenance Requirements

Table 7 shows the emission and production limits, monitoring, and maintenance requirements proposed to support BACT.

Emission Source	Emission and Production Limits	Monitoring Requirements	Maintenance Requirements
Gas turbine	• 538,754 tons/yr CO_2-e • 238,296 lbs/h CO_2-e • 923,443 MWh (gross)/yr • 1217 lbs CO_2-e/MWh (gross) @ max. load • 1514 lbs CO_2-e/MWh (gross) @ any load from 50% to 100% load	• Determine hourly and annual GHG emissions using 40 CFR 98.43 • Determine and record annual GHG emissions on a rolling 12-month basis • Determine and record lbs CO_2-e/MWh (gross) as a rolling 30-day average • Record gross electricity output in MWh/yr on a rolling 12-month basis	• Operate and maintain all equipment according to manufacturer recommendations
Natural Gas Piping Fugitive Leaks	• 85.55 tons/yr CO_2-e	• Record leak observations reporting by operating and maintenance staff	• Operate and maintain all equipment according to manufacturer recommendations
SF_6 Fugitive Leaks	• 174 tons/yr CO_2-e	• Use inventory records to determine SF_6 and CO_2-e emissions on a calendar year basis • Monitor for leaks using halogen detector on a monthly basis	• Implement a recycling program so that SF_6 is evacuated into portable cylinders rather than vented to atmosphere. • Operate and maintain all equipment according to manufacturer recommendations
Emergency Generator	• 128 tons/yr CO_2-e	• Determine annual GHG emissions using 40 CFR 98.33 on a calendar year basis	• Operate and maintain all equipment according to manufacturer recommendations
Natural Gas Heater	• 1488 tons/yr CO_2-e	• Determine annual GHG emissions using 40 CFR 98.33 on a calendar year basis	• Operate and maintain all equipment according to manufacturer recommendations

Table 7. Proposed Emission and Production Limits, Monitoring, and Maintenance Requirements