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Dominion

September 16, 2015

BY: OVERNIGHT MAIL

Patrick Butler
Regional Supervisor
Raleigh Regional Office
NCDENR Division of Air Quality
Suite 101
3800 Barrett Drive
Raleigh, NC 27609

RE: Northampton Compressor Station
New Source Permit

Dear Mr. Butler:

Atlantic Coast Pipeline, LLC proposes to construct and operate the Atlantic Coast Pipeline, an approximately 556-mile-long interstate natural gas transmission pipeline system designed to meet growing energy needs in Virginia and North Carolina. Enclosed is an application for a new natural gas compressor station to be located in Northampton County, North Carolina. The Northampton Compressor Station will include the following equipment:

- Solar Taurus 70 combustion turbine;
- Solar Centaur 50L combustion turbine;
- Solar Centaur 40 combustion turbine;
- Caterpillar G3516 emergency generator;
- Boiler rated at 6.3 MMBtu/hr;
- Accumulator tank with a capacity of 2,500 gallons;
- Hydrocarbon waste tank with a capacity of 1,500 gallons;
- Aqueous ammonia storage tank with a capacity of 8,000 gallons;

The application also includes various operational natural gas releases associated with station components and piping fugitive emissions related to equipment proposed at the Northampton Compressor Station.

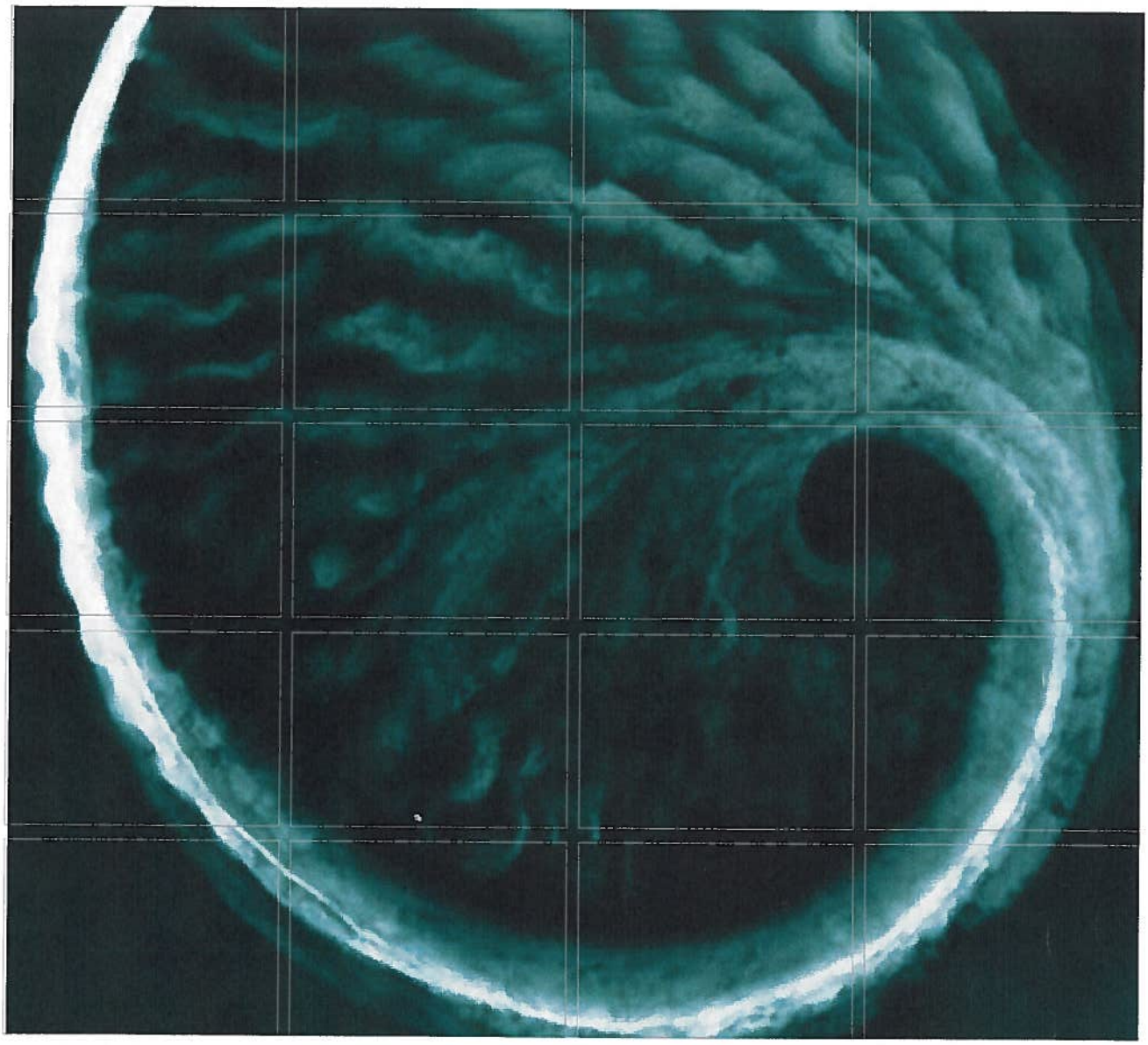
Enclosed with this permit application is the fee in the amount of $50.

Should you have any questions or need additional in the formation, please feel free to contact William Scarpinato at (804) 273-3019 or via email at william.a.scarpinato@dom.com.

Sincerely,

Robert M. Bisha

Robert M. Bisha
Project Director, Atlantic Coast Pipeline
Dominion Environmental Services



Prepared For:

Atlantic Coast Pipeline

Atlantic Coast Pipeline, LLC

Atlantic Coast Pipeline Project
Permit Application
Northampton Compressor Station
Northampton County, North Carolina

September 2015

Environmental Resources Management
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1.0 INTRODUCTION

1.1 BACKGROUND

Atlantic Coast Pipeline, LLC (ACP, LLC) proposes to construct and operate the Atlantic Coast Pipeline (ACP), an approximately 556-mile-long interstate natural gas transmission pipeline system designed to meet growing energy needs in Virginia and North Carolina. The proposed project has the capacity to deliver 1.5 billion standard cubic feet of natural gas per day (bscf/d) from Pennsylvania and West Virginia to power generation facilities and other end-users.

In support of the ACP, Dominion Transmission Inc. (DTI), a subsidiary of Dominion, proposes to construct and operate the Northampton Compressor Station in Northampton County, North Carolina to provide compression to support the transmission of natural gas.

1.2 APPLICATION OVERVIEW

ACP, LLC submits this construction/operating permit application to the North Carolina Department of Environment and Natural Resources (NC DENR) for the authority to construct and operate the Northampton Compressor Station in Northampton County, North Carolina. This permit application narrative is provided to add clarification and/or further detail to the information in the permit application forms provided by NC DENR.

Concurrent with the submittal of this air quality application, other required environmental permits and approvals are being pursued with the appropriate regulatory agencies.

This section (Section 1) contains introductory information. Section 2 presents a description of the Northampton Compressor Station and its associated equipment. The estimated emissions of regulated pollutants from the equipment and operating scenarios are presented in Section 3. Section 4 addresses federal regulatory requirements applicable to project sources and Section 5 provides a review of State regulatory requirements. Section 6 provides ACP, LLC's proposed compliance demonstration methods.

This application also contains:

- Appendix A – NC DENR Permit Application Forms;
- Appendix B – Facility Plot Plan;
- Appendix C – Potential to Emit Calculations;
- Appendix D - Vendor Specifications; and
- Appendix E – Secretary of State Registration.

2.0 FACILITY AND PROJECT DESCRIPTION

2.1 NORTHAMPTON COMPRESSOR STATION

The Northampton Compressor Station will be located in Northampton County, North Carolina to provide compression to support the transport of natural gas. The proposed project will require the construction of a new facility subject to the requirements of 15A NCAC 02Q.0300 - Construction and Operation Permits.

ACP, LLC seeks authorization for the construction and operation of:

- One (1) Solar Taurus 70 Combustion Turbine (CT-01);
- One (1) Solar Centaur 50L Combustion Turbine (CT-02);
- One (1) Solar Centaur 40 Combustion Turbine (CT-03);
- One (1) Caterpillar G3516 Emergency Generator (EG-01) rated at 1,416 hp;
- One (1) Boiler (WH-01) rated at 6.3 Million British Thermal Units per hour (MMBtu/hr);
- One (1) Accumulator Tank (TK-1) with a capacity of 2,500 gallons;
- One (1) Hydrocarbon Waste Tank (TK-2) with a capacity of 1,500 gallons;
- One (1) Aqueous Ammonia Storage Tank (TK-3) with a capacity of 8,000 gallons; and
- Various operational natural gas releases associated with station fugitive components (Fug-01) and piping fugitive emissions (Fug-02) related to the equipment proposed at the Northampton Compressor Station.

A map displaying the location of the Northampton Compressor Station is provided as Figure 2.1. A process flow diagram (PFD) for the Northampton Compressor Station is provided as Figure 2.2.

FIGURE 2.1 NORTHAMPTON COMPRESSOR STATION LOCATION MAP

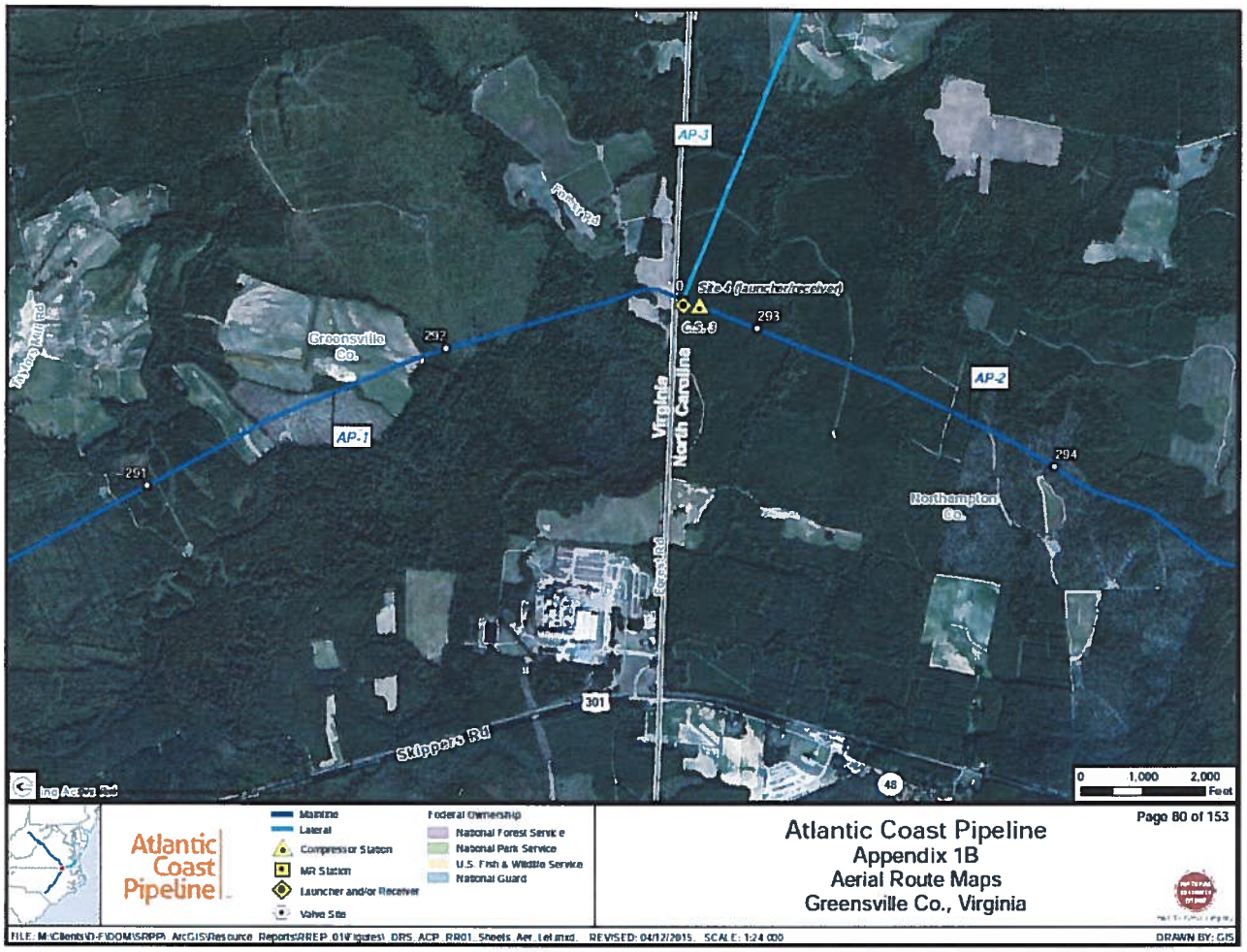
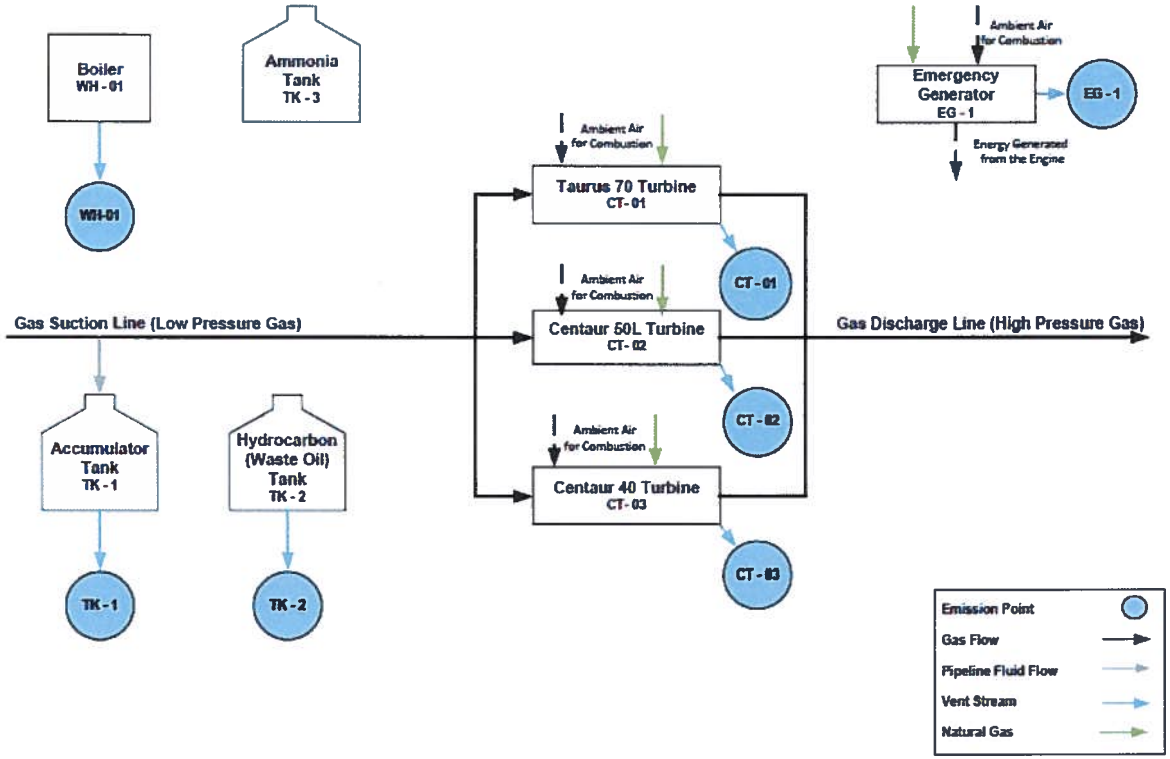


FIGURE 2.2 PROCESS FLOW DIAGRAM



2.2 *AGGREGATION DETERMINATION*

The Northampton Compressor Station will be operated by DTI. Stationary sources of air pollutants may require aggregation of total emission levels if these sources share the same industrial grouping, are operating under common control, and are classified as contiguous or adjacent properties. Other than the interstate pipeline, which is specifically exempt from the requirement to aggregate as stated in the preamble to the 1980 PSD regulations, there are no facilities that would be considered adjacent to the Northampton Compressor Station and thus no other sources must be aggregated with the Northampton Compressor Station.

3.0 PROJECT EMISSIONS INFORMATION

As discussed in Section 2.1 of this application, ACP, LLC seeks the authority to construct and operate new emission sources. This section provides a description of the basis for the estimation of emissions from these sources.

3.1 COMBUSTION TURBINES

The proposed natural gas-fired turbines to be installed at the Northampton Compressor Station will be equipped with Solar's SoLoNOx dry low NO_x combustor technology as well as add-on emission controls including selective catalytic reduction (SCR) for NO_x and oxidation catalyst for CO and VOC.

Emissions for the Solar Turbines assume that the units will operate up to 8,760 hours per year and up to 100% rated output. Pre-control (SCR and oxidation catalyst) emissions of nitrogen oxides (NO_x), carbon monoxide (CO) and volatile organic compounds (VOC) are based on emission rates provided by Solar. VOC emissions are conservatively estimated as 10% of uncombusted hydrocarbon (UHC). Solar also provided emission estimates for UHC, carbon dioxide (CO_2), formaldehyde, and total hazardous air pollutants.

The pre-control emission rates for normal operating conditions are as follows (all emissions rates are in terms of parts per million dry volume (ppmvd) @ 15% O_2):

- 9 ppmvd NO_x for the Centaur 50L and Taurus 70;
- 25 ppvd NO_x for the Centaur 40;
- 25 ppmvd CO for the Centaur 50L and Taurus 70;
- 50 ppmvd CO for the Centaur 40;
- 25 ppmvd UHC; and
- 2.5 ppmvd VOC.

The proposed SCR will further reduce the NO_x emission rate for each of the proposed turbines to 5 ppmvd at 15% O2.

Per vendor estimates, the oxidation catalyst will provide additional control for CO, to achieve 5 ppmvd CO @ 15% O2. The catalyst will also control organic compound emissions and will provide an estimated 50% control for VOC and formaldehyde.

Vendor estimates for SCR and oxidation catalyst performance are provided in Appendix D.

At very low load and cold temperature extremes, the turbine system must be controlled differently in order to assure stable operation. The required adjustments to the turbine controls at these conditions cause emissions of NO_x,

CO and VOC to increase (emission rates of other pollutants are unchanged). The only times when low-load operation (non-normal SoLoNOx operation) is expected to occur are during periods of startup and shutdown. Solar has provided emissions estimates during start-up and shutdown (see Solar Product Information Letter (PIL) 170, included as part of the vendor attachments to this application for more detail).

Similarly, Solar has provided emissions estimates for low temperature operation (inlet combustion air temperature less than 0^0 F and greater than -20^0 F). Table 3.1 provides estimated pre-control emissions from the turbines at low temperature conditions.

TABLE 3.1 ***PRE-CONTROL TURBINE LOW TEMPERATURE EMISSION RATES (< 0^0 F AND > -20^0 F)[1]***

Solar Model	Applicable Load	NOx, ppm	CO, ppm	UHC, ppm
Taurus 70 Centaur 50L	50-100% load	120	150	50
Centaur 40	80-100% load	120	150	50

1. *Emissions Estimates from Table 2 of Solar PIL 167.*
2. *Centaur 50L emissions based on Centaur 50 Emissions Rates*

ACP, LLC reviewed historic meteorological data from the previous five years for the region to estimate the worst case number of hours per year under sub-zero (less than 0° F but greater than -20° F) conditions. The annual hours of operation during sub-zero conditions were conservatively assumed to be not more than 50 hours per year.

A summary of the potential emissions of NO_x, CO, and VOC during normal operations and low temperature scenarios is provided in Table 3.2.

TABLE 3.2 TURBINE CONTROLLED SHORT-TERM EMISSION RATES

Pollutant	Operating Scenario	CT-01 Solar Taurus 70 Turbine lb/hr	CT-02 Solar Centaur 50L Turbine lb/hr	CT-03 Solar Centaur 40 Turbine lb/hr
NO_x	Normal	1.77	1.10	0.94
	Low Temp.	23.6	14.7	12.5
CO	Normal	1.06	0.66	0.57
	Low Temp.	6.36	3.96	3.42
VOC	Normal	0.155	0.095	0.08
	Low Temp.	0.310	0.19	0.16

The emission rates presented in Table 3.2 are estimates based on the emissions factors provided by Solar multiplied by the control efficiency expected from the installation of the SCR (approximately 80% NO_x control for the Solar Centaur 40 Turbine and 44% NO_x control for the Solar Taurus 70 and Centaur 50L Turbines) and oxidation catalyst (approximately 50% VOC control for all turbines, 90% CO control for the Solar Centaur 40 Turbine, and 80% CO control for the Solar Taurus 70 and Centaur 50L Turbines).

Potential turbine emissions also include conservatively assumed uncontrolled potential emissions from start-up and shutdown events calculated using emission data provided by Solar. Although these emissions are provided as uncontrolled for the purposes of potential to emit estimations, ACP, LLC expects that some control may be achieved by the combustion turbine control devices during the start-up and shutdown events. Ton per year potential emission estimates are based on an assumed count of 100 start-up and 100 shutdown events per year. The duration of each start-up and shutdown is expected to be approximately 10 minutes per event. Thus, it is assumed that there will be approximately 33.3 hours of start-up and shutdown event time when the unit may not be operating in SoLoNOx mode. Table 3 of Solar PIL 170 was used as basis for emissions during these events.

A summary of the potential emissions during start-up and shutdown events is presented in Tables 3.3 and 3.4.

To practically track these events and associated emissions, ACP, LLC proposes to keep track of the total number of hours of non-SoLoNOx mode (a parameter monitored by the turbine control logic) and utilize an average start-up / shutdown emission rate (equivalent lb/hr based on 10 minutes per event). The proposed compliance demonstration is provided in Section 6 of this application.

TABLE 3.3 TURBINE POTENTIAL EMISSIONS DURING START-UP EVENTS

Pollutant	CT-01 Solar Taurus 70 Turbine		CT-02 Solar Centaur 50L Turbine		CT-03 Solar Centaur 40 Turbine	
	lb/event	tpy	lb/event	tpy	lb/event	Tpy
NO_x	0.800	0.0400	0.800	0.0400	0.700	0.0350
CO	73.1	3.66	69.1	3.46	64.4	3.22
VOC	0.840	0.0420	0.800	0.0400	0.740	0.0370
CO_2	519	26.0	469	23.5	392	19.6
CH_4	3.36	0.168	3.20	0.160	2.96	0.148
CO_2e	603	30.2	549	27.5	466	23.3

TABLE 3.4 TURBINE POTENTIAL EMISSIONS DURING SHUTDOWN EVENTS

Pollutant	CT-01 Solar Taurus 70 Turbine		CT-02 Solar Centaur 50L Turbine		CT-03 Solar Centaur 40 Turbine	
	lb/event	tpy	lb/event	tpy	lb/event	tpy
NO_x	1.10	0.0550	0.400	0.0200	0.300	0.0150
CO	93.4	4.67	35.4	1.77	30.2	1.51
VOC	1.06	0.0530	0.400	0.0200	0.340	0.0170
CO_2	575	28.8	217	10.9	181	9.05
CH_4	4.24	0.212	1.60	0.0800	1.36	0.0680
CO_2e	681	34.1	257	12.9	215	10.8

Table 3.5 includes the facility's potential emissions for the combustion turbines including normal continuous operation controlled by SoLoNOx mode, SCR, and oxidation catalyst, low temperature operation controlled by the SCR and oxidation catalyst as well, as the uncontrolled emissions associated with start-up and shutdown events.

TABLE 3.5 TURBINE POTENTIAL EMISSIONS

Pollutant	CT-01 Solar Taurus 70 Turbine	CT-02 Solar Centaur 50L Turbine	CT-03 Solar Centaur 40 Turbine
	tpy	tpy	tpy
NO_x	8.35	5.20	4.44
CO	13.1	8.19	7.29
VOC	0.775	0.477	0.405
SO_2	1.43	0.894	0.760

PM_{Filt}	2.42	1.51	1.29
$PM_{10\text{-}Filt}$	2.42	1.51	1.29
$PM_{2.5\text{-}Filt}$	2.42	1.51	1.29
PM_{Cond}	5.99	3.74	3.18
CO_2	50,035	31,329	26,747
CH_4	4.00	2.50	2.14
N_2O	1.26	0.788	0.671
CO_2e	50,511	31,627	27,000
NH_3	5.77	3.58	3.02
Total HAP	0.525	0.352	0.286
Formaldehyde	0.496	0.332	0.271

3.2 *EMERGENCY GENERATOR*

Emissions for the natural gas fired emergency generator assume up to 100 hours of operation per year and are calculated using EPA's AP-42 emission factors.

A summary of the emissions associated with the emergency generator are provided in Table 3.6.

TABLE 3.6 EMERGENCY GENERATOR POTENTIAL EMISSIONS

Pollutant	EG-01 Caterpillar 3516 tpy
NO_x	0.312
CO	0.295
VOC	0.0375
SO_2	0.0003
PM_{Filt}	0.0214
$PM_{10\text{-}Filt}$	0.0214
$PM_{2.5\text{-}Filt}$	0.0214
PM_{Cond}	0.006
CO_2	77.9
CH_4	0.290
CO_2e	85.1
Total HAP	0.0143
Formaldehyde	0.0099

3.3 *BOILER*

The proposed natural gas boiler will be used to provide building heat (space heating) only, and will have a maximum heat input capacity of 6.3 MMBtu/hr.

The boiler will use Low NOx Burners (LNB). Emissions for the proposed natural gas-fired Boiler are calculated using EPA's AP-42 emission factors for Natural Gas Combustion (Section 1.4) conservatively assuming 8,760 hours per year. 15A NCAC 02Q.0102(c)(2)(B)(iv) provides an exemption from the requirement to obtain an air permit for fuel combustion equipment with a heat input rating less than 10 MMBtu/hr that is used solely for space heating. As such, the proposed boiler is exempt from permitting requirements.

The potential emissions from the boiler are provided in Table 3.7.

TABLE 3.7 PROPOSED BOILER POTENTIAL EMISSIONS

Pollutant	WH-01 Boiler tpy
NO_x	1.35
CO	2.27
VOC	0.149
SO_2	0.0162
PM_{-Filt}	0.0514
$PM_{10-Filt}$	0.0514
$PM_{2.5-Filt}$	0.0514
PM_{-Cond}	0.154
CO_2	3,246
CH_4	0.0622
N_2O	0.0595
CO_2e	3,266
Total HAP	0.0511
Hexane	0.0487

3.4 FUGITIVE EMISSIONS

The proposed project will include fugitive components including valves, flanges, pumps, etc. Emission factors for fugitive components were based on EPA's report on equipment leaks for oil and gas production facilities[i]. It is expected that this facility will comply with recently proposed New Source Performance Standard Subpart OOOOa which incorporates leak detection

[i] USEPA, 1995. "Emission factors from Protocol for Equipment Leak Emission Estimates," EPA-453/R-95-017 Table 2.4, Oil and Gas Production Operations Average Emission Factors.

monitoring. However, no credit for any reduced emissions has been taken in the numbers below.

Additionally, ACP, LLC has estimated emissions from blowdown events. ACP, LLC will minimize these events whenever possible, but blowdown of the machines and piping will sometimes occur for safety reasons and to ensure protection of equipment. ACP, LLC has also conservatively included estimated emissions from one site-wide blowdown event in these emission calculations. Such events are not routine, but typically occur once every five years.

The total fugitive emissions are summarized in Table 3.8.

TABLE 3.8 PROPOSED FUGITIVE COMPONENT POTENTIAL EMISSIONS

Pollutant	FUG-01 Fugitive Leaks - Blowdowns tpy	FUG-02 Fugitive Leaks - Piping tpy
VOC	18.8	20.0
CO_2	19.5	20.7
CH_4	643	683
CO_2e	16,092	17,106
Total HAP	1.06	1.13

3.5 STORAGE TANKS

The Northampton Compressor Station will operate three (3) aboveground storage tanks (ASTs). TK-1 (Accumulator Storage Tank) will have a capacity of 2,500 gallons and will receive and store pipeline liquids captured by the station's separators and filter-separators. The emissions associated with the operation of this accumulator storage tank are estimated using E&P Tanks to ensure capture of any flash emissions (which the EPA TANKS program cannot estimate). ACP, LLC has estimated that this storage tank will complete five (5) turnovers per year.

TK-2 (Hydrocarbon Waste Tank) will have a capacity of 1,500 gallons and will receive liquids from the compressor building and auxiliary building floor drains. The emissions associated with the operation of this hydrocarbon waste tank were calculated using EPA's TANKS program. ACP, LLC has estimated that this storage tank will complete five (5) turnovers per year.

The potential VOC emissions associated with the proposed new storage tanks, TK-1 and TK-2, are 0.35 tpy (0.08 lb/hr). Detailed emission calculations are provided in Appendix C of this document.

TK-3 (Aqueous Ammonia Storage Tank) will have a capacity of 8,000 gallons and will be used to supply aqueous ammonia to SCRs. 15A NCAC 02Q.0102(c)(1)(D)(iii) provides an exemption from the requirement to obtain an air permit for storage tanks used solely to store inorganic liquids. As such, Ammonia Storage Tank TK-3 is exempt from air permitting requirements.

3.6 *PROJECT EMISSIONS*

The potential emissions associated with the proposed new equipment at Northampton Compressor Station are summarized in Table 3.9 in tons per year. Detailed emission calculations are provided in Appendix C of this document.

TABLE 3.9 FACILITY-WIDE POTENTIAL EMISSIONS (TPY)

	Criteria Pollutants								Greenhouse Gases				Ammonia	Total
Unit ID	NO_x	CO	VOC	SO_2	PM_{Filt}	$PM_{10-Filt}$	$PM_{2.5-Filt}$	PM_{Cond}	CO_2	CH_4	N_2O	CO_2e	NH_3	HAP
CT-01	8.35	13.0	0.775	1.43	2.42	2.42	2.42	5.99	50,035	4.00	1.26	50,511	5.77	0.525
CT-02	5.20	8.19	0.477	0.894	1.51	1.51	1.51	3.74	31,329	2.50	0.788	31,627	3.58	0.352
CT-03	4.44	7.29	0.405	0.760	1.29	1.29	1.29	3.18	26,747	2.14	0.671	27,000	3.02	0.286
EG-01	0.312	0.295	0.0375	0.0003	0.0214	0.0214	0.0214	0.006	77.9	0.290	0	85.1	0	0.0143
WH-01	1.35	2.27	0.149	0.0162	0.0514	0.0514	0.0514	0.154	3,246	0.0622	0.0595	3,266	0	0.0511
FUG-01	-	-	18.8	-	-	-	-	-	19.5	643	-	16,092	-	1.06
FUG-02	-	-	20.0	-	-	-	-	-	20.7	683	-	17,106	-	1.13
TK-1	-	-	0.350	-	-	-	-	-	-	-	-	-	-	-
TK-2	-	-	1.32E-05	-	-	-	-	-	-	-	-	-	-	-
Total	**19.7**	**31.1**	**41.1**	**3.10**	**5.29**	**5.29**	**5.29**	**13.1**	**111,475**	**1,335**	**2.78**	**145,686**	**12.4**	**3.42**

4.0 FEDERAL REGULATORY REQUIREMENTS

4.1 NEW SOURCE PERFORMANCE STANDARDS (NSPS)

NSPS have been established by the EPA to limit air pollutant emissions from certain categories of new and modified stationary sources. The NSPS regulations are contained in 40 CFR Part 60 and cover many different source categories, and applicable categories are described below.

4.1.1 *40 CFR 60 Subpart Dc – Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units*

Subpart Dc applies to steam generating units for which construction, modification, or reconstruction is commenced after June 9, 1989 and that have a maximum design heat capacity of 100 MMBtu/hr or less, but greater than or equal to 10 MMBtu/hr. The new boiler will have a heat input capacity of 6.3 MMBtu/hr and thus is not subject to this regulation.

4.1.2 *40 CFR 60 Subpart Kb - Standards of Performance for Volatile Organic Liquid Storage Vessels*

This regulation applies to volatile organic liquid storage vessels with storage capacities greater than or equal to 75 cubic meters (19,812 gallons) for which construction, reconstruction, or modification commenced after July 23, 1984. There are no petroleum storage vessels with capacities greater than 19,812 gallons planned at the Northampton Compressor Station, and this regulation is therefore not applicable to the facility.

4.1.3 *40 CFR 60 Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines*

NSPS Subpart JJJJ was promulgated on Jan 8, 2008 and is applicable to new stationary spark ignition internal combustion engines depending upon model year and size category. The new emergency generator is subject to the NO_x, CO and VOC requirements of this subpart and will comply with the emission standards under this subpart.

4.1.4 *40 CFR 60 Subpart KKKK – Standards of Performance for Stationary Combustion Turbines*

NSPS 40 CFR Part 60 Subpart KKKK regulates stationary combustion turbines with a heat input rating of 10 MMBtu/hr or greater that commence construction, modification, or reconstruction after February 18, 2005. Subpart KKKK limits emissions of NO_x as well as the sulfur content of fuel that is combusted from subject units.

The proposed Solar combustion turbines will be subject to the requirements of this subpart. Subpart KKKK specifies several subcategories of turbines, each with different NO_x emissions limitations. The proposed turbines fall within the "medium sized" (> 50MMBtu/hr, < 850 MMBtu/hr) category for natural gas turbines. "Medium sized" turbines must meet a NO_x limitation of 25 parts per million by volume (ppmv) at 15 percent oxygen (O_2), and "small sized, mechanical drive" turbines must meet a NO_x limitation of 100 ppmv at 15 percent O_2 under the requirements of Subpart KKKK and units must minimize emissions consistent with good air pollution control practices during startup, shutdown and malfunction.

Solar provides an emissions guarantee of 9 parts per million volume dry (ppmvd) NO_x at 15 percent O_2 for the proposed SoLoNO$_x$ equipped units. These guarantees apply at all times except during periods of start-up and shutdown and periods with ambient temperatures below 0°F. In addition, SCR will be installed to lower emissions for all turbines to further reduce NO_x emissions to 5 ppmvd at 15 % O_2, except during periods of start-up and shutdown and periods with ambient temperatures below 0°F.

ACP, LLC plans to conduct stack tests for NO_x emissions to demonstrate compliance with the Subpart KKKK emissions limits.

The NSPS Subpart KKKK emission standard for SO_2 is the same for all turbines, regardless of size and fuel type. All new turbines are required to meet an emission limit of 110 nanogram per joule (ng/J) (0.90 pounds [lbs]/megawatt-hr) or a sulfur limit for the fuel combusted of 0.06 lbs/MMBtu. The utilization of natural gas as fuel ensures compliance with the SO_2 standard due to the low sulfur content of natural gas.

4.1.5 *40 CFR 60 Subparts OOOO and OOOOa – Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution*

Subpart OOOO currently applies to affected facilities that commenced construction, reconstruction, or modification after August 23, 2011. Subpart OOOO establishes emissions standards and compliance schedules for the control of VOCs and SO_2 emissions for affected facilities producing, transmitting, or distributing natural gas. Compressors located between the wellhead and the point of custody transfer to the natural gas transmission and storage segment are subject to this Subpart. Custody transfer is defined as the transfer of natural gas after processing and/or treatment in the producing operations. The station is located after the point of custody transfer, and therefore centrifugal compressors driven by the proposed turbines are not currently subject to this regulation. Storage vessels located in the natural gas transmission and storage segment that have the potential for VOC emissions equal to or greater than 6 tpy are also subject to this Subpart. All storage vessels will emit less than this threshold, and thus will not be subject to this regulation.

On August 18, 2015, EPA proposed amendments to 40 CFR 60, Subpart OOOO and proposed an entirely new Subpart OOOOa. If finalized, revisions proposed for Subpart OOOO would apply to oil and natural gas production, transmission, and distribution affected facilities that were constructed, reconstructed, and modified between August 23, 2011 and the Federal Register publication date (anticipated September 2015). Conversely, if finalized, Subpart OOOOa will apply to oil and natural gas production, transmission, and distribution affected facilities that are constructed, reconstructed, and modified after the Federal Register date. The proposed NSPS Subpart OOOOa would establish standards for both VOC and methane.

Based on the expected date of publication in the Federal Register, it is anticipated this project will be required to comply with the requirements of NSPS Subpart OOOOa. There is uncertainty if Subpart OOOOa will become final or what the final requirements will specifically include; however, the proposal contains provisions that would affect additional sources at the proposed facilities beyond Subpart OOOO. While storage tanks remain covered, Subpart OOOOa also includes provisions intended to reduce emissions from centrifugal compressors and equipment leaks from transmission and storage facilities. For centrifugal compressors, Subpart OOOOa proposes the use of dry seals or the control of emissions if wet seals are used. Dry seals are already planned for use in all proposed compressors. For equipment leaks, Subpart OOOOa proposes requiring periodic surveys using optical gas imaging (OGI) technology and subsequent repair of any identified leaks. The project will comply with all applicable leak detection provisions of proposed Subpart OOOOa.

4.2 *NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAP)*

NESHAP regulations established in 40 CFR Part 61 and Part 63 regulate emission of air toxics. NESHAP standards primarily apply to major sources of Hazardous Air Pollutants (HAPs), though some Subparts of Part 63 have been revised to include area (non-major) sources. The NESHAP regulations under 40 CFR Part 61 establish emission standards on the pollutant basis whereas 40 CFR Part 63 establishes the standards on a source category basis. The Northampton Compressor Station will not emit any single HAP in excess of 10 tpy and will not emit combined HAPS in excess of 25 tpy, and will therefore be designated as an area source of HAPs.

4.2.1 *40 CFR 63 Subpart HHH – National Emissions Standards for Hazardous Air Pollutants from Natural Gas Transmission and Storage Facilities*

This regulation applies to certain affected facilities at major HAP sources. The Station will be an area HAP source. Therefore, this regulation is not applicable.

4.2.2 *40 CFR 63 Subpart DDDDD – National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers And Process Heaters*

Industrial, commercial, or institutional boilers or process heaters located at a major source of HAPs are subject to this Subpart. The Northampton Compressor Station will not be a major source of HAPs, and therefore will not be subject to this Subpart.

4.2.3 *40 CFR 63 Subpart JJJJJJ – National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources*

This Subpart applies to area sources of HAPs. The Northampton Compressor Station will be an area source of HAPs; however, gas-fired boilers as defined by this Subpart are not subject to any requirements under this rule. As such, this subpart does not apply.

4.2.4 *40 CFR 63 Subpart YYYY – National Emissions Standards for Hazardous Air Pollutants for Stationary Combustion Turbines*

Stationary combustion turbines located at major sources of HAP emissions are subject to this Subpart. The Northampton Compressor Station will be an area HAP source. Therefore, this regulation is not applicable.

4.2.5 *40 CFR 63 Subpart ZZZZ – National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines*
The emergency generator is subject to the NESHAP requirements under 40 CFR Part 63 Subpart ZZZZ (and applies to both major and area sources of HAPs). However, the NESHAP refers to the NSPS for all applicable requirements. Therefore, compliance with the NSPS requirements ensures compliance with the NESHAP requirements.

4.3 *PREVENTION OF SIGNIFICANT DETERIORATION (PSD) AND NON-ATTAINMENT NEW SOURCE REVIEW*

The NC DENR State Regulations address federal regulations where the state of North Carolina has been delegated enforcement authority, including Prevention of Significant Deterioration (PSD) permitting (15A NCAC 02D.0530).

The Northampton Compressor Station will be located in Northampton County. The air quality of Northampton County is designated by the U.S. EPA as either "better than normal standards" or "unclassified/attainment" for all criteria pollutants (40 CFR 81.318). As such, new construction or modifications that result in emission increases are potentially subject to the PSD permitting regulations.

PSD applicability depends on the existing status of a facility (i.e. major or minor source) and the net emissions increase associated with the project. The major source threshold for PSD applicability for a facility is 250 tons per year (tpy) of each regulated pollutant unless the source is included on a list of 28 specifically defined industrial source categories for which the PSD "major" source threshold is 100 tpy. Since the Northampton Compressor Station is not one of the 28 listed sources, the PSD major source threshold is 250 tpy of any pollutant regulated by the Clean Air Act (CAA). Potential emissions of each criteria pollutant from the proposed facility will not exceed 250 tpy, as shown in Section 3. Therefore, the facility and project are not subject to PSD review.

4.4 *TITLE V OPERATING PERMIT*

See Section 5.0 for Title V applicability information.

4.5 *MAINTENANCE EMISSIONS AND FEDERAL ROUTINE MAINTENANCE, REPAIR AND REPLACEMENT PROVISIONS (RMRR)*

As part of normal operations of the Northampton Compressor Station, ACP, LLC will routinely conduct activities associated with maintenance and repair of the facility equipment. These maintenance and repair activities will include, but will not be limited to, compressor engine startup/shutdowns, calibrating equipment, changing orifice plates, deadweight testing, emergency power generator run times, changing equipment filters (e.g., oil filters, separator filters), and use of portable gas/diesel engines for air compressors and lube guns.

Furthermore, in order to ensure the reliability of natural gas deliveries to their customers, ACP, LLC may conduct equipment and component replacement activities that conform to the currently applicable federal laws and regulations.

4.6 *CHEMICAL ACCIDENT PREVENTION AND RISK MANAGEMENT PROGRAMS (RMP)*

The Northampton Compressor Station will not be subject to the Chemical Accident Prevention Provisions (40 CFR 68.1), as no chemicals subject to regulation under this Subpart will be present onsite. The aqueous ammonia stored in TK-3 will have a concentration of less than 20%.

4.7 *ACID RAIN REGULATIONS*

The Northampton Compressor Station will not sell electricity and is a non-utility facility. Therefore, the facility will not be subject to the federal acid rain regulations found at 40 CFR Parts 72 through 77.

4.8 *STRATOSPHERIC OZONE PROTECTION REGULATIONS*

Subpart F, Recycling and Emissions Reductions, of 40 CFR Part 82, Protection of Stratospheric Ozone, generally requires that all repairs, service, and disposal of appliances containing Class I or Class II ozone depleting substances be conducted by properly certified technicians. The facility will comply with this regulation as applicable.

4.9 *GREENHOUSE GAS REPORTING*

On November 8, 2010, the USEPA finalized GHG reporting requirements under 40 CFR Part 98. Subpart W of 40 CFR Part 98 requires petroleum and natural gas facilities with actual annual GHG emissions equal to or greater than 25,000 metric tons CO_2e to report GHG from various processes within the facility. Following this project, is expected that the station will be subject to GHG emissions reporting. If the emissions threshold is met or exceeded, ACP, LLC will comply with the applicable GHG reporting requirements.

5.0 *STATE REGULATORY APPLICABILITY*

This section outlines the NC State air quality regulations that could be reasonably expected to apply to the Northampton Compressor Station, and presents an applicability determination for each of these regulations based on activities planned at the Station and the emissions of regulated air pollutants associated with this project. This review is presented to supplement and/or add clarification to the information provided in the NC DENR permit application forms.

The NC DENR State Regulations address federal regulations where the state of North Carolina has been delegated enforcement authority, including Prevention of Significant Deterioration (PSD) permitting, Title V permitting, New Source Performance Standards (NSPS), and National Emission Standards for Hazardous Air Pollutants (NESHAP). The regulatory requirements in reference to the Northampton Compressor Station are described in Table 5.1 below.

TABLE 5.1 STATE REGULATORY APPLICABILITY

Regulatory Citation	Applicable Requirement	Compliance Approach
Construction and Operation Permits (15A NCAC 02Q.0300)	Requires sources to obtain air permits via the guidelines and rules established in 02Q.0300 prior to construction.	The enclosed permit application for a combined construction and operating permit satisfies the requirements of this regulation for the proposed Northampton Compressor Station.
Sulfur Dioxide Emissions from Combustion Sources (15A NCAC 02D.0516)	Limits SO_2 from any source of combustion that is discharged to the atmosphere to no more than 2.3 pounds of SO_2 per MMBtu input.	The use of pipeline quality natural gas as fuel for all of the facility's fuel combustion sources constitutes compliance with this rule. In addition, if a source is subject to an NSPS or NESHAP SO_2 emission standard, the source shall comply with the NSPS or NESHAP SO_2 emission standard rather than this Rule.
Control of Nitrogen Dioxide and Nitrogen Oxides Emissions (15A NCAC 02D.0519)	Limits NO_x emissions from sulfuric acid plants and boilers with a capacity of 250 MMBtu/hour or more combusting oil, gas, coal, or a combination of these fuels.	The new boiler will have a maximum heat input capacity of 6.3 MMBtu/hr, and thus is not subject to this regulation.
Control of Visible Emissions (15A NCAC 02D.0521)	Limits opacity emissions from fuel burning operations and industrial processes, including testing of emergency generators. For sources manufactured after July 1, 1971, visible emissions shall not be more than 20 percent opacity when averaged over a six-minute period. In addition, if a source is subject to an NSPS or NESHAP opacity emission standard, the source shall comply with the NSPS or NESHAP opacity emission standard rather than this Rule.	All sources will comply with the provisions of this rule by the combustion of pipeline quality natural gas.
Prevention of Significant Deterioration (15A NCAC 02D.0530)	Establishes Prevention of Significant Deterioration regulations.	The facility and project are not subject to PSD review. See Section 4 for the PSD regulatory evaluation for Northampton Compressor Station.
Excess Emissions Reporting and Malfunctions (15A NCAC 02D.0535)	Establishes State-specific requirements, definitions, and reporting requirements for equipment and emission control device excess emissions.	The Northampton Compressor Station will comply with these requirements as applicable. In addition, sources subject to an NSPS or NESHAP rule are not subject to this regulation, unless excess emissions exceed an emission limit established in a permit limit issued under 15A NCAC 02Q.0700 that is more stringent than the applicable NSPS or NESHAP rule.

Regulatory Citation	Applicable Requirement	Compliance Approach
Particulates from Fugitive Dust Emission Sources (15A NCAC 02D.0540)	Facilities required to obtain a permit under 15A NCAC 02Q or subject to requirements under 15A NCAC 02D shall not cause or allow fugitive dust emissions to cause or contribute to substantive complaints.	The Northampton Compressor Station will comply with all applicable requirements, including reporting requirements in the event of substantive fugitive dust complaints.
Monitoring, Recordkeeping, and Reporting 15A NCAC 02D.0600	This regulation sets forth general monitoring, recordkeeping, and reporting requirements applicable to sources subject to the requirements of 15A NCAC 02D or 15A NCAC 02Q.	The Northampton Compressor Station will comply with all applicable requirements in this regulation.
Volatile Organic Compounds (15A NCAC 02D.0900)	This regulation sets forth work practice requirements for sources (e.g., solvents) emitting VOCs.	The Northampton Compressor Station is not expected to emit greater than 15 pounds VOC per day, and is therefore only potentially subject to sections .0925 and .0958 of this regulation. However, all storage tanks at the facility will have a capacity less than 39,000 gallons, and the facility is therefore not subject to section .0925. The facility will comply with all applicable requirements of section .0958.
Control of Toxic Air Pollutants (15A NCAC 02D.1100 and 02Q.0700)	This regulation requires facilities emitting toxic air pollutants greater than designated thresholds to obtain air toxics permits.	The Northampton Compressor Station 's natural gas fired combustion sources will have an aggregate allowable heat input value less than 450 MMBtu/hour and will be the only sources of benzene at the facility. As such, no air dispersion modeling has been included with this permit application and a permit to emit toxic air pollutants will not be required (15 NCAC 02Q.0702).
Nitrogen Oxides (15A NCAC 02D.1400)	This regulation sets forth various requirements for sources emitting NO_x.	15A NCAC 02D.1408 applies to stationary combustion turbines located at major sources of NO_x emissions located in certain counties. As Northampton County is excluded from this list, the proposed turbines are not subject to these requirements. 15A NCAC 02D.1409 and .1423 apply to internal combustion engines (ICE), which are defined as "reciprocating ICE". As the turbines do not meet this definition, these requirements do not apply. Emergency generators are not subject to this rule (15A NCAC 02D.1402(h)(3)). The boiler is exempt from air permitting requirements, and is therefore also exempt from these requirements (15A NCAC 02D.1402(h)(1)).

Regulatory Citation	Applicable Requirement	Compliance Approach
Title V Procedures (15A NCAC 02Q.0500)	This regulation outlines the NC DENR Title V Permitting Program.	The Northampton Compressor Station's criteria pollutant PTE will not exceed the applicable Title V major source threshold of 100 tpy per criteria pollutant. In addition, the facility's HAP PTE will not exceed 10 tpy per individual HAP, and will not exceed 25 tpy for combined HAPs. Therefore, the Northampton Compressor Station will be a minor source of emissions with respect to the Title V Operating Program.

6.0 *PROPOSED COMPLIANCE DEMONSTRATIONS*

The following methods are proposed for demonstrating ongoing compliance for the sources described in this application:

Compressor Turbines (CT-01 through CT-03)

NO_x

Annual stack testing (or semi-annual testing as allowed) will be completed to demonstrate compliance with the NSPS Subpart KKKK emissions limits (NO_2 emissions).

Compliance with the combustion turbines potential to emit will be demonstrated on a 12-month rolling total basis by the sum of the following emissions:

- Normal Operation: The average emission rate from the most recent stack test (lb/hour) times the number of hours operating in SoLoNOx mode (mode indication provided and recorded by control logic on turbine).
- Low Temperature (< 0° F) Operation: The proposed controlled emission rates (lb/hr, see Table 3.2) determined using the Solar provided emissions factor multiplied by the control efficiency of the SCR times the number of hours when inlet combustion air for turbine was measured to be below 0 degrees F.
- Startup and Shutdown Emissions (< 50% load): The Solar-provided emission rates (see Tables 3.3 and 3.4) divided by Solar-assumed duration for startups and shutdowns (1/6 of an hour each) times the number of hours operating in non-SoLoNOx mode (mode indication provided and recorded by control logic on the turbine).

CO, VOC, $PM_{10}/PM_{2.5}$:

Initial stack testing will be completed to determine $PM_{10}/PM_{2.5}$ emission rates (lb/MMBtu). Fuel firing will be tracked and used to calculate annual (rolling 12-month total) ton per year emissions.

Initial stack testing will be competed to determine VOC and CO emission rates. Compliance with the combustion turbines potential to emit will be demonstrated on a 12-month rolling total basis by the sum of the following emissions:

- Normal Operation: The average emission rate from the most recent stack test (lb/hour) times the number of hours operating in SoLoNOx mode (mode indication provided and recorded by control logic on turbine).

- Low Temperature (< 0° F) Operation: The proposed controlled emission rates (lb/hr, see Table 3.2) determined using the Solar provided emissions factor multiplied by the control efficiency of the oxidation catalyst times the number of hours when inlet combustion air for turbine was measured to be below 0 degrees F.

- Startup and Shutdown Emissions (< 50% load): The Solar-provided emission rates (see Tables 3.3 and 3.4) divided by Solar-assumed duration for startups and shutdowns (1/6 of an hour each) times the number of hours operating in non-SoLoNOx mode (mode indication provided and recorded by control logic on the turbine).

GHG:

Total annual fuel volume will be tracked to determine total MMBtu of firing. This value times the EPA Mandatory Reporting Rule natural gas emission factor (40 CFR Part 98 Subpart C) times the Global Warming Potential (40 CFR Part 98 Subpart A) will be used to calculate ton per year CO_2e emissions.

Emergency Generator

Records of the monthly emergency and non-emergency use will be maintained to confirm compliance with the annual limit for non-emergency operation. If a non-certified engine is installed or if a certified engine is installed but operated as non-certified an initial stack test and testing every 8760 operating hours or three years (whichever comes first) will be conducted.

Other Combustion Sources

If not otherwise specified above, the amount of fuel fired in units and/or hours of operation will be tracked and multiplied by the appropriate emission factor to calculate emissions on an annual basis.

APPENDICES

APPENDIX A

NC DENR PERMIT APPLICATION FORMS

FORM A1

FACILITY (General Information)

REVISED 05/25/12 — NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate — A1

NOTE- APPLICATION WILL NOT BE PROCESSED WITHOUT THE FOLLOWING:

☑ Local Zoning Consistency Determination (if required) ☐ Facility Reduction & Recycling Survey Form (Form A4) ☑ Application Fee
☑ Responsible Official/Authorized Contact Signature ☑ Appropriate Number of Copies of Application ☐ P.E. Seal (if required)

RECEIVED SEP 17 2015

GENERAL INFORMATION

Legal Corporate/Owner Name:	Atlantic Coast Pipeline, LLC
Site Name:	Northampton Compressor Station
Site Address (911 Address) Line 1:	
Site Address Line 2:	
City: Pleasant Hill	State: North Carolina
Zip Code:	County: Northampton

NC DENR Raleigh Regional Office

CONTACT INFORMATION

Permit/Technical Contact:		***Facility/Inspection Contact:***	
Name/Title:	William Scarpinato	Name/Title:	
Mailing Address Line 1:	5000 Dominion Boulevard	Mailing Address Line 1:	
Mailing Address Line 2:	2 NE	Mailing Address Line 2:	
City: Glen Allen	State: VA Zip Code: 23060	City:	State: Zip Code:
Phone No. (area code)	804-273-3019 Fax No. (area code) 804-273-2601	Phone No. (area code)	Fax No. (area code)
Email Address:	william.a.scarpinato@dom.com	Email Address:	

Responsible Official/Authorized Contact:		***Invoice Contact:***	
Name/Title:	Leslie Hartz	Name/Title:	William Scarpinato
Mailing Address Line 1:	707 E. Main Street	Mailing Address Line 1:	5000 Dominion Boulevard
Mailing Address Line 2:		Mailing Address Line 2:	2 NE
City: Richmond	State: VA Zip Code: 23219	City: Glen Allen	State: VA Zip Code: 23060
Phone No. (area code)	804-771-4468 Fax No. (area code)	Phone No. (area code)	804-273-3019 Fax No. (area code) 804-273-2601
Email Address:	leslie.hartz@dom.com	Email Address:	william.a.scarpinato@dom.com

APPLICATION IS BEING MADE FOR

☑ New Non-permitted Facility/Greenfield ☐ Modification of Facility (permitted) ☐ Renewal with Modification
☐ Renewal (TV Only)

FACILITY CLASSIFICATION AFTER APPLICATION (Check Only One)

☐ General ☑ Small ☐ Prohibitory Small ☐ Synthetic Minor ☐ Title V

FACILITY (Plant Site) INFORMATION

Describe nature of (plant site) operation(s): **Facility ID No. :** TBD

Proposed new (greenfield) natural gas pipeline compressor station.

Primary SIC/NAICS Code:	4922/486210	Current/Previous Air Permit No. N/A	Expiration Date:
Facility Coordinates:	Latitude: 36.543874	Longitude: -77.505712	

Does this application contain confidential data? YES ☐ NO ☑ ***If yes, please contact the DAQ Regional Office prior to submitting this application.*** **(See Instructions)**

PERSON OR FIRM THAT PREPARED APPLICATION

Person Name:	Robert Sawyer	Firm Name:	Environmental Resources Management
Mailing Address Line 1:	75 Valley Stream Parkway	Mailing Address Line 2:	Suite 200
City: Malvern	State: PA	Zip Code: 19355	County: Chester
Phone No. (area code)	410-266-0006 Fax No. (area code)	Email Address:	robert.sawyer@erm.com

SIGNATURE OF RESPONSIBLE OFFICIAL/AUTHORIZED CONTACT

Name (typed):	Leslie Hartz	Title:	VP Pipeline Construction
X Signature(Blue Ink):		Date:	9/11/15

Attach Additional Sheets As Necessary

FORMs A2, A3

EMISSION SOURCE LISTING FOR THIS APPLICATION - A2

112r APPLICABILITY INFORMATION - A3

EMISSION SOURCE LISTING: New, Modified, Previously Unpermitted, Replaced, Deleted

EMISSION SOURCE ID NO.	EMISSION SOURCE DESCRIPTION	CONTROL DEVICE ID NO.	CONTROL DEVICE DESCRIPTION
Equipment To Be ADDED By This Application (New, Previously Unpermitted, or Replacement)			
CT-01	Taurus 70-10802S Compressor Turbine	CT-01-SCR	Selective Catalyst Reduction
		CT-01-OC	Oxidation Catalyst
CT-02	Centaur 50-6200LS Compressor Turbine	CT-02-SCR	Selective Catalyst Reduction
		CT-02-OC	Oxidation Catalyst
CT-03	Centaur 40-4700S Compressor Turbine	CT-03-SCR	Selective Catalyst Reduction
		CT-03-OC	Oxidation Catalyst
EG-01	Caterpillar G3516 Emergency Generator	N/A	
TK-1	Accumulator Storage Tank	N/A	
Fug-01	Fugitive Leaks - Blowdowns	N/A	
Fug-02	Fugitive Leaks - Piping	N/A	
Existing Permitted Equipment To Be MODIFIED By This Application			
N/A			
Equipment To Be DELETED By This Application			
N/A			

112(r) APPLICABILITY INFORMATION A 3

Is your facility subject to 40 CFR Part 68 "Prevention of Accidental Releases" - Section 112(r) of the Federal Clean Air Act? No

If No, please specify in detail how your facility avoided applicability: No chemicals subject to regulation under this Subpart will be present onsite. The aqueous ammonia stored in TK-3 (exempt from permitting) will have an ammonia concentration of less than 20%.

If your facility is Subject to 112(r), please complete the following:

A. Have you already submitted a Risk Management Plan (RMP) to EPA Pursuant to 40 CFR Part 68.10 or Part 68.150?

Yes No Specify required RMP submittal date: _____ If submitted, RMP submittal date: _____

B. Are you using administrative controls to subject your facility to a lesser 112(r) program standard?

Yes No If yes, please specify: _____

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSIONS SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

VISED 12/01/01 | NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate | **B**

SSION SOURCE DESCRIPTION: Taurus 70-10802S Compressor Turbine	EMISSION SOURCE ID NO: CT-01
	CONTROL DEVICE ID NO(S): CT-01-SCR and CT-01-OC
OPERATING SCENARIO 1 of 1	EMISSION POINT (STACK) ID NO(S): EP-01

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Natural gas fired compressor turbine used to boost the pressure of natural gas in a transmission pipeline.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

☐ Coal,wood,oil, gas, other burner (Form B1)	☐ Woodworking (Form B4)	☐ Manufact. of chemicals/coatings/inks (Form B7)
☑ Int.combustion engine/generator (Form B2)	☐ Coating/finishing/printing (Form B5)	☐ Incineration (Form B8)
☐ Liquid storage tanks (Form B3)	☐ Storage silos/bins (Form B6)	☐ Other (Form B9)

START CONSTRUCTION DATE: April 2017	OPERATION DATE: November 2018	DATE MANUFACTURED: 2016 or Later
MANUFACTURER / MODEL NO.: Solar Turbines Taurus 70-10802S	EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR	
IS THIS SOURCE SUBJECT TO? NSPS (SUBPART?): Yes, KKKK NESHAP (SUBPART?): No MACT (SUBPART?): No		
PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25		
EXPECTED ANNUAL HOURS OF OPERATION: 8,760	VISIBLE STACK EMISSIONS UNDER NORMAL OPERATION:	<20 % OPACITY

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)	Mfg/AP-42	1.92	8.41	1.92	8.41	1.92	8.41
PARTICULATE MATTER<10 MICRONS (PM_{10})	Mfg/AP-42	1.92	8.41	1.92	8.41	1.92	8.41
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)	Mfg/AP-42	1.92	8.41	1.92	8.41	1.92	8.41
SULFUR DIOXIDE (SO2)	AP-42	0.33	1.43	0.33	1.43	0.33	1.43
NITROGEN OXIDES (NOx)	Mfg	1.91	8.35	3.41	14.95	1.91	8.35
RBON MONOXIDE (CO)	Mfg	2.99	13.08	7.33	32.11	2.99	13.08
LATILE ORGANIC COMPOUNDS (VOC)	Mfg	0.18	0.78	0.33	1.46	0.18	0.78
LEAD							
OTHER							

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT AND CAS NO.		SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) tons/yr
1,3-Butadiene	106-99-0	AP-42	0.00002	0.0001	0.00003	0.0001	0.00002	0.0001
Acetaldehyde	75-07-0	AP-42	0.002	0.01	0.003	0.01	0.002	0.01
Acrolein	107-02-8	AP-42	0.0003	0.001	0.0005	0.002	0.0003	0.001
Benzene	71-43-2	AP-42	0.0005	0.002	0.001	0.004	0.0005	0.002
Ethylbenzene	100-41-4	AP-42	0.001	0.01	0.003	0.01	0.001	0.01
Formaldehyde	50-00-0	Mfg.	0.11	0.50	0.23	0.99	0.11	0.50
Naphthalene	91-20-3	AP-42	0.0001	0.0002	0.0001	0.0004	0.0001	0.0002
PAH		AP-42	0.0001	0.0004	0.0002	0.001	0.0001	0.0004

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

INDICATE EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS

TOXIC AIR POLLUTANT AND CAS NO.		EF SOURCE	lb/hr	lb/day	lb/yr
1,3-Butadiene	106-99-0	AP-42	0.00002	0.0004	0.15
Acetaldehyde	75-07-0	AP-42	0.002	0.04	13.78
Acrolein	107-02-8	AP-42	0.0003	0.01	2.20
Ammonia	7664-41-7	Mfg.	1.32	31.68	11,563.20
Benzene	71-43-2	AP-42	0.0005	0.01	4.13
Formaldehyde	50-00-0	Mfg.	0.11	2.72	992.03
Toluene	108-88-3	AP-42	0.005	0.12	44.78
ene	1330-20-7	AP-42	0.003	0.06	22.05

achments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSIONS SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 12/01/01 — NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate — **B**

EMISSION SOURCE DESCRIPTION: Taurus 70-10802S Compressor Turbine, continued	EMISSION SOURCE ID NO: CT-01
	CONTROL DEVICE ID NO(S): CT-01-SCR and CT-01-OC
OPERATING SCENARIO 1 of 1	EMISSION POINT (STACK) ID NO(S): EP-01

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Natural gas fired compressor turbine used to boost the pressure of natural gas in a transmission pipeline.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

☐ Coal,wood,oil, gas, other burner (Form B1)	☐ Woodworking (Form B4)	☐ Manufact. of chemicals/coatings/inks (Form B7)
☑ Int.combustion engine/generator (Form B2)	☐ Coating/finishing/printing (Form B5)	☐ Incineration (Form B8)
☐ Liquid storage tanks (Form B3)	☐ Storage silos/bins (Form B6)	☐ Other (Form B9)

START CONSTRUCTION DATE: April 2017	OPERATION DATE: November 2018	DATE MANUFACTURED: 2016 or Later
MANUFACTURER / MODEL NO.: Solar Turbines Taurus 70-10802S	EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR	
IS THIS SOURCE SUBJECT TO? NSPS (SUBPART?): Yes, KKKK NESHAP (SUBPART?): No MACT (SUBPART?): No		
PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25		
EXPECTED ANNUAL HOURS OF OPERATION: 8,760	VISIBLE STACK EMISSIONS UNDER NORMAL OPERATION: <20 % OPACITY	

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)	Mfg/AP-42						
PARTICULATE MATTER<10 MICRONS (PM_{10})	Mfg						
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)	Mfg						
SULFUR DIOXIDE (SO2)	AP-42						
NITROGEN OXIDES (NOx)	Mfg						
CARBON MONOXIDE (CO)	Mfg						
VOLATILE ORGANIC COMPOUNDS (VOC)	Mfg						
LEAD							
OTHER							

See Form B, Page 1, for criteria pollutant totals for this source

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT AND CAS NO.		SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) tons/yr
Propylene oxide	75-56-9	AP-42	0.001	0.005	0.002	0.01	0.001	0.005
Toluene	108-88-3	AP-42	0.005	0.02	0.010	0.04	0.005	0.02
Xylene	1330-20-7	AP-42	0.003	0.01	0.005	0.02	0.003	0.01

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

INDICATE EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS

TOXIC AIR POLLUTANT AND CAS NO.	EF SOURCE	lb/hr	lb/day	lb/yr

See Form B, Page 1, for TAP totals for this source

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B2

EMISSION SOURCE (INTERNAL COMBUSTION ENGINES/GENERATORS)

REVISED 12/01/01 — **NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate** — **B2**

EMISSION SOURCE DESCRIPTION: Taurus 70-10802S Compressor Turbine	EMISSION SOURCE ID NO: CT-01
	CONTROL DEVICE ID NO(S): CT-01-SCR and CT-01-OC
OPERATING SCENARIO 1 of 1	EMISSION POINT (STACK) ID NO(S): EP-01

CHECK ALL THAT APPLY ☐ EMERGENCY ☐ SPACE HEAT ☐ ELECTRICAL GENERATION ☐ PEAK SHAVER ☑ OTHER (DESCRIBE): Natural Gas Compressor Turbine

GENERATOR OUTPUT (KW): N/A

ANTICIPATED ACTUAL HOURS OF OPERATION AS PEAK SHAVER (HRS/YR): N/A

ENGINE OUTPUT (HP): 11,882

TYPE ICE: ☐ GASOLINE ENGINE ☐ DIESEL ENGINE UP TO 600 HP ☐ DIESEL ENGINE GREATER THAN 600 HP ☐ DUAL FUEL ENGINE ☑ OTHER (DESCRIBE): Natural Gas Compressor Turbine (complete below)

ENGINE TYPE ☐ RICH BURN ☑ LEAN BURN

EMISSION REDUCTION MODIFICATIONS ☐ INJECTION TIMING RETARD ☐ PREIGNITION CHAMBER COMBUSTION ☐ OTHER _____

OR STATIONARY GAS TURBINE (complete below)

FUEL ☑ NATURAL GAS ☐ OIL ☐ OTHER (DESCRIBE):_____

CYCLE: ☐ COGENERATION ☑ SIMPLE ☐ REGENERATIVE ☐ COMBINED

CONTROLS: ☐ WATER-STEAM INJECTION ☐ UNCONTROLLED ☑ LEAN-PREMIX

NATURAL GAS PIPELINE COMPRESSOR OR TURBINE (complete below)

ENGINE TYPE: ☐ 2-CYCLE LEAN BURN ☐ 4-CYCLE LEAN ☑ TURBINE ☐ 4-CYCLE RICH BURN ☐ OTHER (DESCRIBE): _____

CONTROLS: COMBUSTION MODIFICATIONS (DESCRIBE): _____

NONSELECTIVE CATALYTIC REDUCTION ☐ SELECTIVE CATALYTIC REDUCTION ☑

CLEAN BURN AND PRECOMBUSTION CHAMBER ☐ UNCONTROLLED ☐

and oxidation catalyst

FUEL USAGE (INCLUDE STARTUP/BACKUP FUEL)

FUEL TYPE	UNITS	MAXIMUM DESIGN CAPACITY (UNIT/HR)	REQUESTED CAPACITY LIMITATION (UNIT/HR)
Natural Gas	MMBtu	96.00	N/A

FUEL CHARACTERISTICS (COMPLETE ALL THAT ARE APPLICABLE)

FUEL TYPE	BTU/UNIT	UNITS	SULFUR CONTENT (% BY WEIGHT)
Natural Gas	1,020	scf	0.0005

MANUFACTURER'S SPECIFIC EMISSION FACTORS (IF AVAILABLE)

POLLUTANT	NOX	CO	PM	PM10	VOC	Formaldehyde
EMISSION FACTOR LB/UNIT	3.20	5.30	1.92	1.92	0.30	0.00288
UNIT	hour	hour	hour	hour	hour	MMBtu

DESCRIBE METHODS TO MINIMIZE VISIBLE EMISSIONS DURING IDLING, OR LOW LOAD OPERATIONS:

COMMENTS:

Attach Additional Sheets As Necessary

FORM C3

CONTROL DEVICE (THERMAL OR CATALYTIC)

REVISED 12/01/01 | NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate | C3

AS REQUIRED BY 15A NCAC 2Q .0112, THIS FORM MUST BE SEALED BY A PROFESSIONAL ENGINNER (P.E.) LICENSED IN NORTH CAROLINA.

CONTROL DEVICE ID NO: CT-01-SCR and CT-01-OC	CONTROLS EMISSIONS FROM WHICH EMISSION SOURCE ID NO(S): CT-01
EMISSION POINT (STACK) ID NO(S): EP-01	POSITION IN SERIES OF CONTROLS 1 NO. OF UNITS 1
MANUFACTURER: TBD	MODEL NO:
MANUFACTURE DATE: TBD	PROPOSED OPERATION DATE: November 2018
OPERATING SCENARIO:	PROPOSED CONSTRUCTION DATE: April 2017
1 of 1	

TYPE: AFTERBURNER | REGENERATIVE THERMAL OXIDATION | RECUPERATIVE THERMAL OXIDATION

X CATALYTIC OXIDATION

EXPECTED LIFE OF CATALYST (YRS): TBD	METHOD OF DETECTING WHEN CATALYST NEEDS REPLACMENT: TBD

CATALYST MASKING AGENT IN AIR STREAM: HALOGEN | SILICONE | PHOSPHOROUS COMPOUND | HEAVY METAL

TBD | SULFUR COMPOUND | OTHER_____ | NONE

TYPE OF CATALYST: TBD	CATALYST VOL (FT^3): TBD	VELOCITY THROUGH CATALYST (FPS): TBD

SCFM THROUGH CATALYST:

DESCRIBE CONTROL SYSTEM, INCLUDING RELATION TO OTHER CONTROL DEVICES AND SOURCES, AND ATTACH DIAGRAM OF SYSTEM:

Selective Catalyst Reduction and Oxidation Catalyst

POLLUTANT(S) COLLECTED:	NO_x	CO	VOC	Formaldehyde
BEFORE CONTROL EMISSION RATE (LB/HR):				
CAPTURE EFFICIENCY:	%	%	%	%
CONTROL DEVICE EFFICIENCY:	44 %	80 %	50 %	50 %
OVERALL SYSTEM EFFICIENCY:	%	%	%	%
EFFICIENCY DETERMINATION CODE:				
TOTAL EMISSION RATE (LB/HR) :				

PRESSURE DROP (IN. H2O): MIN MAX	OUTLET TEMPERATURE (°F): MIN MAX
INLET TEMPERATURE (°F): MIN MAX	RESIDENCE TIME (SECONDS):
INLET AIR FLOW RATE (ACFM): (SCFM):	COMBUSTION TEMPERATURE (°F):
COMBUSTION CHAMBER VOLUME (FT^3):	INLET MOISTURE CONTENT (%):
% EXCESS AIR:	CONCENTRATION (ppmv) _____INLET _____OUTLET
AUXILIARY FUEL USED:	TOTAL MAXIMUM FIRING RATE (MILLION BTU/HR):
MAXIMUM ANNUAL FUEL USE: UNITS:	MAXIMUM HOURLY FUEL USE: UNITS:
ACTUAL ANNUAL FUEL USE: UNITS:	ACTUAL HOURLY FUEL USE: UNITS:

DESCRIBE METHOD USED TO INCREASE MIXING:

DESCRIBE METHOD TO INSURE ADEQUATE START-UP TEMPERATURE:

DESCRIBE TEMPERATURE MONITORING DEVICES AND PROCEDURES:

STACK TESTING PORTS: G NO G YES (INLET AND OUTLET)

DESCRIBE MAINTENANCE PROCEDURES:

DESCRIBE ANY AUXILIARY MATERIALS INTRODUCED INTO THE CONTROL SYSTEM:

ATTACH A DIAGRAM OF THE RELATIONSHIP OF THE CONTROL DEVICE TO ITS EMISSION SOURCE(S):

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSIONS SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

EVISED 12/01/01 — NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate — **B**

ISSION SOURCE DESCRIPTION: Centaur 50-6200LS Compressor Turbine	EMISSION SOURCE ID NO: CT-02
	CONTROL DEVICE ID NO(S): CT-02-SCR and CT-02-OC
OPERATING SCENARIO 1 of 1	EMISSION POINT (STACK) ID NO(S): EP-02

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Natural gas fired compressor turbine used to boost the pressure of natural gas in a transmission pipeline.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

☐ Coal,wood,oil, gas, other burner (Form B1)	☐ Woodworking (Form B4)	☐ Manufact. of chemicals/coatings/inks (Form B7)
☑ Int.combustion engine/generator (Form B2)	☐ Coating/finishing/printing (Form B5)	☐ Incineration (Form B8)
☐ Liquid storage tanks (Form B3)	☐ Storage silos/bins (Form B6)	☐ Other (Form B9)

START CONSTRUCTION DATE: April 2017	OPERATION DATE: November 2018	DATE MANUFACTURED: 2016 or Later
MANUFACTURER / MODEL NO.: Solar Turbines Centaur 50-6200LS	EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR	
IS THIS SOURCE SUBJECT TO? NSPS (SUBPART?): Yes, KKKK NESHAP (SUBPART?): No MACT (SUBPART?): No		
PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25		
EXPECTED ANNUAL HOURS OF OPERATION: 8,760	VISIBLE STACK EMISSIONS UNDER NORMAL OPERATION: <20 % OPACITY	

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)	Mfg/AP-42	1.20	5.26	1.20	5.26	1.20	5.26
PARTICULATE MATTER<10 MICRONS (PM_{10})	Mfg/AP-42	1.20	5.26	1.20	5.26	1.20	5.26
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)	Mfg/AP-42	1.20	5.26	1.20	5.26	1.20	5.26
SULFUR DIOXIDE (SO2)	AP-42	0.20	0.89	0.20	0.894	0.20	0.89
NITROGEN OXIDES (NOx)	Mfg	1.19	5.20	2.13	9.31	1.19	5.20
ARBON MONOXIDE (CO)	Mfg	1.87	8.19	4.57	20.04	1.87	8.19
LATILE ORGANIC COMPOUNDS (VOC)	Mfg	0.11	0.48	0.20	0.89	0.11	0.48
LEAD							
OTHER							

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT AND CAS NO.		SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) tons/yr
1,3-Butadiene	106-99-0	AP-42	0.00001	0.00005	0.00002	0.0001	0.00001	0.00005
Acetaldehyde	75-07-0	AP-42	0.001	0.005	0.002	0.01	0.001	0.005
Acrolein	107-02-8	AP-42	0.0002	0.001	0.0003	0.001	0.0002	0.001
Benzene	71-43-2	AP-42	0.0003	0.001	0.001	0.003	0.0003	0.001
Ethylbenzene	100-41-4	AP-42	0.0008	0.004	0.002	0.01	0.001	0.004
Formaldehyde	50-00-0	Mfg.	0.08	0.33	0.15	0.66	0.08	0.33
Naphthalene	91-20-3	AP-42	0.00003	0.0002	0.0001	0.0003	0.00003	0.0002
PAH		AP-42	0.0001	0.0003	0.0001	0.001	0.0001	0.0003

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

INDICATE EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS

TOXIC AIR POLLUTANT AND CAS NO.		EF SOURCE	lb/hr	lb/day	lb/yr
1,3-Butadiene	106-99-0	AP-42	0.00001	0.0003	0.10
Acetaldehyde	75-07-0	AP-42	0.001	0.03	9.23
Acrolein	107-02-8	AP-42	0.0002	0.004	1.48
Ammonia	7664-41-7	Mfg.	0.82	19.63	7,165.68
Benzene	71-43-2	AP-42	0.0003	0.008	2.77
Formaldehyde	50-00-0	Mfg.	0.08	1.82	664.78
Toluene	108-88-3	AP-42	0.003	0.12	44.78
lene	1330-20-7	AP-42	0.002	0.06	22.05

achments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSIONS SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 12/01/01 | NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate | **B**

EMISSION SOURCE DESCRIPTION: Centaur 50-6200LS Compressor Turbine	EMISSION SOURCE ID NO: CT-02
	CONTROL DEVICE ID NO(S): CT-02-SCR and CT-02-OC
OPERATING SCENARIO 1 of 1	EMISSION POINT (STACK) ID NO(S): EP-02

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Natural gas fired compressor turbine used to boost the pressure of natural gas in a transmission pipeline.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ☐ Woodworking (Form B4)
- ☐ Manufact. of chemicals/coatings/inks (Form B7)
- ☑ Int.combustion engine/generator (Form B2)
- ☐ Coating/finishing/printing (Form B5)
- ☐ Incineration (Form B8)
- ☐ Liquid storage tanks (Form B3)
- ☐ Storage silos/bins (Form B6)
- ☐ Other (Form B9)

START CONSTRUCTION DATE	April 2017	OPERATION DATE:	November 2018	DATE MANUFACTURED:	2016 or Later
MANUFACTURER / MODEL NO.:	Solar Turbines Centaur 50-6200LS	EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR			
IS THIS SOURCE SUBJECT TO? NSPS (SUBPART?): Yes, KKKK NESHAP (SUBPART?): No MACT (SUBPART?): No					
PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25					
EXPECTED ANNUAL HOURS OF OPERATION: 8,760		VISIBLE STACK EMISSIONS UNDER NORMAL OPERATION:			<20 % OPACITY

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)	Mfg/AP-42						
PARTICULATE MATTER<10 MICRONS (PM_{10})	Mfg						
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)	Mfg						
SULFUR DIOXIDE (SO2)	AP-42						
NITROGEN OXIDES (NOx)	Mfg						
CARBON MONOXIDE (CO)	Mfg						
VOLATILE ORGANIC COMPOUNDS (VOC)	Mfg						
LEAD							
OTHER							

See Form B, Page 1, for criteria pollutant totals for this source

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT AND CAS NO.		SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) tons/yr
Propylene oxide	75-56-9	AP-42	0.001	0.003	0.002	0.01	0.001	0.003
Toluene	108-88-3	AP-42	0.003	0.02	0.01	0.03	0.003	0.02
Xylene	1330-20-7	AP-42	0.002	0.01	0.003	0.01	0.002	0.01

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

INDICATE EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS

TOXIC AIR POLLUTANT AND CAS NO.	EF SOURCE	lb/hr	lb/day	lb/yr

See Form B, Page 1, for TAP totals for this source

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B2

EMISSION SOURCE (INTERNAL COMBUSTION ENGINES/GENERATORS)

REVISED 12/01/01 **NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate** **B2**

EMISSION SOURCE DESCRIPTION: Centaur 50-6200LS Compressor Turbine	EMISSION SOURCE ID NO:	CT-02
	CONTROL DEVICE ID NO(S):	CT-02-SCR and CT-02-OC
OPERATING SCENARIO 1 of 1	EMISSION POINT (STACK) ID NO(S):	EP-02

CHECK ALL THAT APPLY ☐ EMERGENCY ☐ SPACE HEAT ☐ ELECTRICAL GENERATION ☐ PEAK SHAVER ☑ OTHER (DESCRIBE): Natural Gas Compressor Turbine

GENERATOR OUTPUT (KW): N/A | ANTICIPATED ACTUAL HOURS OF OPERATION AS PEAK SHAVER (HRS/YR): N/A

ENGINE OUTPUT (HP): 6,642

TYPE ICE: ☐ GASOLINE ENGINE ☐ DIESEL ENGINE UP TO 600 HP ☐ DIESEL ENGINE GREATER THAN 600 HP ☐ DUAL FUEL ENGINE ☑ OTHER (DESCRIBE): Natural Gas Compressor Turbine (complete below)

ENGINE TYPE ☐ RICH BURN ☑ LEAN BURN

EMISSION REDUCTION MODIFICATIONS ☐ INJECTION TIMING RETARD ☐ PREIGNITION CHAMBER COMBUSTION ☐ OTHER _____

OR STATIONARY GAS TURBINE (complete below)

FUEL ☑ NATURAL GAS ☐ OIL ☐ OTHER (DESCRIBE):_____

CYCLE: ☐ COGENERATION ☑ SIMPLE ☐ REGENERATIVE ☐ COMBINED

CONTROLS: ☐ WATER-STEAM INJECTION ☐ UNCONTROLLED ☑ LEAN-PREMIX

NATURAL GAS PIPELINE COMPRESSOR OR TURBINE (complete below)

ENGINE TYPE: ☐ 2-CYCLE LEAN BURN ☐ 4-CYCLE LEAN ☑ TURBINE ☐ 4-CYCLE RICH BURN ☐ OTHER (DESCRIBE): _____

CONTROLS: COMBUSTION MODIFICATIONS (DESCRIBE): _____

NONSELECTIVE CATALYTIC REDUCTION ☐ SELECTIVE CATALYTIC REDUCTION ☑

CLEAN BURN AND PRECOMBUSTION CHAMBER ☐ UNCONTROLLED ☐

and oxidation catalyst

FUEL USAGE (INCLUDE STARTUP/BACKUP FUEL)

FUEL TYPE	UNITS	MAXIMUM DESIGN CAPACITY (UNIT/HR)	REQUESTED CAPACITY LIMITATION (UNIT/HR)
Natural Gas	MMBtu	60.0	N/A

FUEL CHARACTERISTICS (COMPLETE ALL THAT ARE APPLICABLE)

FUEL TYPE	BTU/UNIT	UNITS	SULFUR CONTENT (% BY WEIGHT)
Natural Gas	1,020	scf	0.0005

MANUFACTURER'S SPECIFIC EMISSION FACTORS (IF AVAILABLE)

POLLUTANT	NOX	CO	PM	PM10	VOC	Formaldehyde
EMISSION FACTOR LB/UNIT	1.98	3.30	1.20	1.20	0.19	0.00288
UNIT	hour	hour	hour	hour	hour	MMBtu

DESCRIBE METHODS TO MINIMIZE VISIBLE EMISSIONS DURING IDLING, OR LOW LOAD OPERATIONS:

COMMENTS:

Attach Additional Sheets As Necessary

FORM C3

CONTROL DEVICE (THERMAL OR CATALYTIC)

REVISED 12/01/01 | NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate | C3

AS REQUIRED BY 15A NCAC 2Q .0112, THIS FORM MUST BE SEALED BY A PROFESSIONAL ENGINNER (P.E.) LICENSED IN NORTH CAROLINA.

CONTROL DEVICE ID NO: CT-02-SCR and CT-02-OC	CONTROLS EMISSIONS FROM WHICH EMISSION SOURCE ID NO(S): CT-02
EMISSION POINT (STACK) ID NO(S): EP-02	POSITION IN SERIES OF CONTROLS 1 NO. OF UNITS 1
MANUFACTURER: TBD	MODEL NO:
MANUFACTURE DATE: TBD	PROPOSED OPERATION DATE: November 2018
OPERATING SCENARIO:	PROPOSED CONSTRUCTION DATE: April 2017
1 of 1	

TYPE: AFTERBURNER | REGENERATIVE THERMAL OXIDATION | RECUPERATIVE THERMAL OXIDATION

X CATALYTIC OXIDATION

EXPECTED LIFE OF CATALYST (YRS): TBD	METHOD OF DETECTING WHEN CATALYST NEEDS REPLACMENT: TBD

CATALYST MASKING AGENT IN AIR STREAM: HALOGEN | SILICONE | PHOSPHOROUS COMPOUND | HEAVY METAL

TBD | SULFUR COMPOUND | OTHER_____ | NONE

TYPE OF CATALYST: TBD	CATALYST VOL (FT^3): TBD	VELOCITY THROUGH CATALYST (FPS): TBD

SCFM THROUGH CATALYST:

DESCRIBE CONTROL SYSTEM, INCLUDING RELATION TO OTHER CONTROL DEVICES AND SOURCES, AND ATTACH DIAGRAM OF SYSTEM:

Selective Catalyst Reduction and Oxidation Catalyst

POLLUTANT(S) COLLECTED:	NO_x	CO	VOC	Formaldehyde
BEFORE CONTROL EMISSION RATE (LB/HR):				
CAPTURE EFFICIENCY:	%	%	%	%
CONTROL DEVICE EFFICIENCY:	44 %	80 %	50 %	50 %
OVERALL SYSTEM EFFICIENCY:	%	%	%	%
EFFICIENCY DETERMINATION CODE:				
TOTAL EMISSION RATE (LB/HR) :				

PRESSURE DROP (IN. H2O): MIN MAX	OUTLET TEMPERATURE (°F): MIN MAX
INLET TEMPERATURE (°F): MIN MAX	RESIDENCE TIME (SECONDS):
INLET AIR FLOW RATE (ACFM): (SCFM):	COMBUSTION TEMPERATURE (°F):
COMBUSTION CHAMBER VOLUME (FT^3):	INLET MOISTURE CONTENT (%):
% EXCESS AIR:	CONCENTRATION (ppmv) _____INLET _____OUTLET
AUXILIARY FUEL USED:	TOTAL MAXIMUM FIRING RATE (MILLION BTU/HR):
MAXIMUM ANNUAL FUEL USE: UNITS:	MAXIMUM HOURLY FUEL USE: UNITS:
ACTUAL ANNUAL FUEL USE: UNITS:	ACTUAL HOURLY FUEL USE: UNITS:

DESCRIBE METHOD USED TO INCREASE MIXING:

DESCRIBE METHOD TO INSURE ADEQUATE START-UP TEMPERATURE:

DESCRIBE TEMPERATURE MONITORING DEVICES AND PROCEDURES:

STACK TESTING PORTS: G NO G YES (INLET AND OUTLET)

DESCRIBE MAINTENANCE PROCEDURES:

DESCRIBE ANY AUXILIARY MATERIALS INTRODUCED INTO THE CONTROL SYSTEM:

ATTACH A DIAGRAM OF THE RELATIONSHIP OF THE CONTROL DEVICE TO ITS EMISSION SOURCE(S):

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSIONS SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 12/01/01 — NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate — **B**

EMISSION SOURCE DESCRIPTION: Centaur 40-4700S Compressor Turbine	EMISSION SOURCE ID NO: CT-03
	CONTROL DEVICE ID NO(S): CT-03-SCR and CT-03-OC
OPERATING SCENARIO 1 of 1	EMISSION POINT (STACK) ID NO(S): EP-03

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Natural gas fired compressor turbine used to boost the pressure of natural gas in a transmission pipeline.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ☐ Woodworking (Form B4)
- ☐ Manufact. of chemicals/coatings/inks (Form B7)
- ☑ Int.combustion engine/generator (Form B2)
- ☐ Coating/finishing/printing (Form B5)
- ☐ Incineration (Form B8)
- ☐ Liquid storage tanks (Form B3)
- ☐ Storage silos/bins (Form B6)
- ☐ Other (Form B9)

START CONSTRUCTION DATE:	April 2017	OPERATION DATE:	November 2018	DATE MANUFACTURED:	2016 or Later
MANUFACTURER / MODEL NO.:	Solar Turbines Centaur 40-4700S	EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR			
IS THIS SOURCE SUBJECT TO? NSPS (SUBPART?): Yes, KKKK NESHAP (SUBPART?): No MACT (SUBPART?): No					
PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25					
EXPECTED ANNUAL HOURS OF OPERATION: 8,760		VISIBLE STACK EMISSIONS UNDER NORMAL OPERATION: <20 % OPACITY			

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)	Mfg/AP-42	1.02	4.47	1.02	4.47	1.02	4.47
PARTICULATE MATTER<10 MICRONS (PM_{10})	Mfg/AP-42	1.02	4.47	1.02	4.47	1.02	4.47
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)	Mfg/AP-42	1.02	4.47	1.02	4.47	1.02	4.47
SULFUR DIOXIDE (SO2)	AP-42	0.17	0.76	0.17	0.76	0.17	0.76
NITROGEN OXIDES (NOx)	Mfg	1.01	4.44	5.02	22.01	1.01	4.44
CARBON MONOXIDE (CO)	Mfg	1.66	7.29	6.92	30.31	1.66	7.29
VOLATILE ORGANIC COMPOUNDS (VOC)	Mfg	0.09	0.41	0.17	0.76	0.09	0.41
LEAD							
OTHER							

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT AND CAS NO.		SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) tons/yr
1,3-Butadiene	106-99-0	AP-42	0.00001	0.00004	0.00002	0.0001	0.00001	0.00004
Acetaldehyde	75-07-0	AP-42	0.001	0.004	0.002	0.01	0.001	0.004
Acrolein	107-02-8	AP-42	0.0001	0.0006	0.0003	0.001	0.0001	0.001
Benzene	71-43-2	AP-42	0.0003	0.001	0.001	0.002	0.0003	0.001
Ethylbenzene	100-41-4	AP-42	0.001	0.003	0.001	0.01	0.001	0.003
Formaldehyde	50-00-0	Mfg.	0.06	0.27	0.12	0.54	0.06	0.27
Naphthalene	91-20-3	AP-42	0.00003	0.0001	0.0001	0.0002	0.00003	0.0001
PAH		AP-42	0.00005	0.0002	0.0001	0.000	0.0000	0.0002

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

INDICATE EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS

TOXIC AIR POLLUTANT AND CAS NO.		EF SOURCE	lb/hr	lb/day	lb/yr
1,3-Butadiene	106-99-0	AP-42	0.00001	0.0002	0.08
Acetaldehyde	75-07-0	AP-42	0.0009	0.02	7.51
Acrolein	107-02-8	AP-42	0.0001	0.003	1.20
Ammonia	7664-41-7	Mfg.	0.69	16.56	6,044.40
Benzene	71-43-2	AP-42	0.0003	0.006	2.25
Formaldehyde	50-00-0	Mfg.	0.062	1.48	541.00
Toluene	108-88-3	AP-42	0.003	0.07	24.42
Xylene	1330-20-7	AP-42	0.001	0.03	12.02

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSIONS SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

EVISED 12/01/01 — NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate — **B**

ISSION SOURCE DESCRIPTION: Centaur 40-4700S Compressor Turbine	EMISSION SOURCE ID NO: CT-03
	CONTROL DEVICE ID NO(S): CT-03-SCR and CT-03-OC
OPERATING SCENARIO 1 of 1	EMISSION POINT (STACK) ID NO(S): EP-03

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Natural gas fired compressor turbine used to boost the pressure of natural gas in a transmission pipeline.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ☐ Woodworking (Form B4)
- ☐ Manufact. of chemicals/coatings/inks (Form B7)
- ☑ Int.combustion engine/generator (Form B2)
- ☐ Coating/finishing/printing (Form B5)
- ☐ Incineration (Form B8)
- ☐ Liquid storage tanks (Form B3)
- ☐ Storage silos/bins (Form B6)
- ☐ Other (Form B9)

START CONSTRUCTION DAT April 2017	OPERATION DATE: November 2018	DATE MANUFACTURED: 2016 or Later
MANUFACTURER / MODEL NO.: Solar Turbines Centaur 40-4700S	EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR	
IS THIS SOURCE SUBJECT TO? NSPS (SUBPART?): Yes, KKKK NESHAP (SUBPART?): No MACT (SUBPART?): No		
PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25		
EXPECTED ANNUAL HOURS OF OPERATION: 8,760	VISIBLE STACK EMISSIONS UNDER NORMAL OPERATION:	<20 % OPACITY

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)	Mfg/AP-42						
PARTICULATE MATTER<10 MICRONS (PM_{10})	Mfg						
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)	Mfg						
SULFUR DIOXIDE (SO2)	AP-42						
NITROGEN OXIDES (NOx)	Mfg						
RBON MONOXIDE (CO)	Mfg						
OLATILE ORGANIC COMPOUNDS (VOC)	Mfg						
LEAD							
OTHER							

See Form B, Page 1, for criteria pollutant totals for this source

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT AND CAS NO.		SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) tons/yr
Propylene oxide	75-56-9	AP-42	0.001	0.003	0.001	0.01	0.001	0.003
Toluene	108-88-3	AP-42	0.003	0.01	0.01	0.02	0.003	0.01
Xylene	1330-20-7	AP-42	0.001	0.01	0.003	0.01	0.001	0.01

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

INDICATE EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS

TOXIC AIR POLLUTANT AND CAS NO.	EF SOURCE	lb/hr	lb/day	lb/yr

See Form B, Page 1, for TAP totals for this source

achments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B2

EMISSION SOURCE (INTERNAL COMBUSTION ENGINES/GENERATORS)

REVISED 12/01/01 **NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate** **B2**

EMISSION SOURCE DESCRIPTION: Centaur 40-4700S Compressor Turbine	EMISSION SOURCE ID NO:	CT-03
	CONTROL DEVICE ID NO(S):	CT-03-SCR and CT-03-OC
OPERATING SCENARIO 1 of 1	EMISSION POINT (STACK) ID NO(S):	EP-03

CHECK ALL THAT APPLY ☐ EMERGENCY ☐ SPACE HEAT ☐ ELECTRICAL GENERATION ☐ PEAK SHAVER ☑ OTHER (DESCRIBE): Natural Gas Compressor Turbine

GENERATOR OUTPUT (KW): N/A | ANTICIPATED ACTUAL HOURS OF OPERATION AS PEAK SHAVER (HRS/YR): N/A

ENGINE OUTPUT (HP): 5,023

TYPE ICE: ☐ GASOLINE ENGINE ☐ DIESEL ENGINE UP TO 600 HP ☐ DIESEL ENGINE GREATER THAN 600 HP ☐ DUAL FUEL ENGINE ☑ OTHER (DESCRIBE): Natural Gas Compressor Turbine (complete below)

ENGINE TYPE ☐ RICH BURN ☑ LEAN BURN

EMISSION REDUCTION MODIFICATIONS ☐ INJECTION TIMING RETARD ☐ PREIGNITION CHAMBER COMBUSTION ☐ OTHER _____

OR STATIONARY GAS TURBINE (complete below)

FUEL ☑ NATURAL GAS ☐ OIL ☐ OTHER (DESCRIBE):_____

CYCLE: ☐ COGENERATION ☑ SIMPLE ☐ REGENERATIVE ☐ COMBINED

CONTROLS: ☐ WATER-STEAM INJECTION ☐ UNCONTROLLED ☑ LEAN-PREMIX

NATURAL GAS PIPELINE COMPRESSOR OR TURBINE (complete below)

ENGINE TYPE: ☐ 2-CYCLE LEAN BURN ☐ 4-CYCLE LEAN ☑ TURBINE ☐ 4-CYCLE RICH BURN ☐ OTHER (DESCRIBE): _____

CONTROLS: COMBUSTION MODIFICATIONS (DESCRIBE): _____

NONSELECTIVE CATALYTIC REDUCTION ☐ SELECTIVE CATALYTIC REDUCTION ☑

CLEAN BURN AND PRECOMBUSTION CHAMBER ☐ UNCONTROLLED ☐

and oxidation catalyst

FUEL USAGE (INCLUDE STARTUP/BACKUP FUEL)

FUEL TYPE	UNITS	MAXIMUM DESIGN CAPACITY (UNIT/HR)	REQUESTED CAPACITY LIMITATION (UNIT/HR)
Natural Gas	MMBtu	51.0	N/A

FUEL CHARACTERISTICS (COMPLETE ALL THAT ARE APPLICABLE)

FUEL TYPE	BTU/UNIT	UNITS	SULFUR CONTENT (% BY WEIGHT)
Natural Gas	1,020	scf	0.0005

MANUFACTURER'S SPECIFIC EMISSION FACTORS (IF AVAILABLE)

POLLUTANT	NOX	CO	PM	PM10	VOC	Formaldehyde
EMISSION FACTOR LB/UNIT	4.70	5.70	1.02	1.02	0.16	0.00288
UNIT	hour	hour	hour	hour	hour	MMBtu

DESCRIBE METHODS TO MINIMIZE VISIBLE EMISSIONS DURING IDLING, OR LOW LOAD OPERATIONS:

COMMENTS:

Attach Additional Sheets As Necessary

FORM C3

CONTROL DEVICE (THERMAL OR CATALYTIC)

REVISED 12/01/01 | NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate | C3

AS REQUIRED BY 15A NCAC 2Q .0112, THIS FORM MUST BE SEALED BY A PROFESSIONAL ENGINNER (P.E.) LICENSED IN NORTH CAROLINA.

CONTROL DEVICE ID NO: CT-03-SCR and CT-03-OC	CONTROLS EMISSIONS FROM WHICH EMISSION SOURCE ID NO(S): CT-03
EMISSION POINT (STACK) ID NO(S): EP-03	POSITION IN SERIES OF CONTROLS 1 NO. OF UNITS 1
MANUFACTURER: TBD	MODEL NO:
MANUFACTURE DATE: TBD	PROPOSED OPERATION DATE: November 2018
OPERATING SCENARIO:	PROPOSED CONSTRUCTION DATE: April 2017
1 of 1	

TYPE: AFTERBURNER | REGENERATIVE THERMAL OXIDATION | RECUPERATIVE THERMAL OXIDATION

X CATALYTIC OXIDATION

EXPECTED LIFE OF CATALYST (YRS): TBD	METHOD OF DETECTING WHEN CATALYST NEEDS REPLACMENT: TBD

CATALYST MASKING AGENT IN AIR STREAM: HALOGEN | SILICONE | PHOSPHOROUS COMPOUND | HEAVY METAL

TBD | SULFUR COMPOUND | OTHER_____ | NONE

TYPE OF CATALYST: TBD	CATALYST VOL (FT^3): TBD	VELOCITY THROUGH CATALYST (FPS): TBD

SCFM THROUGH CATALYST:

DESCRIBE CONTROL SYSTEM, INCLUDING RELATION TO OTHER CONTROL DEVICES AND SOURCES, AND ATTACH DIAGRAM OF SYSTEM:

Selective Catalyst Reduction and Oxidation Catalyst

POLLUTANT(S) COLLECTED:	NO_x	CO	VOC	Formaldehyde
BEFORE CONTROL EMISSION RATE (LB/HR):				
CAPTURE EFFICIENCY:	%	%	%	%
CONTROL DEVICE EFFICIENCY:	80 %	90 %	50 %	50 %
OVERALL SYSTEM EFFICIENCY:	%	%	%	%
EFFICIENCY DETERMINATION CODE:				
TOTAL EMISSION RATE (LB/HR) :				

PRESSURE DROP (IN. H2O): MIN MAX	OUTLET TEMPERATURE (°F): MIN MAX
INLET TEMPERATURE (°F): MIN MAX	RESIDENCE TIME (SECONDS):
INLET AIR FLOW RATE (ACFM): (SCFM):	COMBUSTION TEMPERATURE (°F):
COMBUSTION CHAMBER VOLUME (FT^3):	INLET MOISTURE CONTENT (%):
% EXCESS AIR:	CONCENTRATION (ppmv) _____INLET _____OUTLET
AUXILIARY FUEL USED:	TOTAL MAXIMUM FIRING RATE (MILLION BTU/HR):
MAXIMUM ANNUAL FUEL USE: UNITS:	MAXIMUM HOURLY FUEL USE: UNITS:
ACTUAL ANNUAL FUEL USE: UNITS:	ACTUAL HOURLY FUEL USE: UNITS:

DESCRIBE METHOD USED TO INCREASE MIXING:

DESCRIBE METHOD TO INSURE ADEQUATE START-UP TEMPERATURE:

DESCRIBE TEMPERATURE MONITORING DEVICES AND PROCEDURES:

STACK TESTING PORTS: G NO G YES (INLET AND OUTLET)

DESCRIBE MAINTENANCE PROCEDURES:

DESCRIBE ANY AUXILIARY MATERIALS INTRODUCED INTO THE CONTROL SYSTEM:

ATTACH A DIAGRAM OF THE RELATIONSHIP OF THE CONTROL DEVICE TO ITS EMISSION SOURCE(S):

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSIONS SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 12/01/01 — NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate — **B**

EMISSION SOURCE DESCRIPTION: Caterpillar G3516 Emergency Generator	EMISSION SOURCE ID NO: EG-01
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO 1 of 1	EMISSION POINT (STACK) ID NO(S): EP-04

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Natural gas fired emergency generator used to provide power during emergency periods when the primary source of power to the facility is unavailable.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ☐ Woodworking (Form B4)
- ☐ Manufact. of chemicals/coatings/inks (Form B7)
- ☑ Int.combustion engine/generator (Form B2)
- ☐ Coating/finishing/printing (Form B5)
- ☐ Incineration (Form B8)
- ☐ Liquid storage tanks (Form B3)
- ☐ Storage silos/bins (Form B6)
- ☐ Other (Form B9)

START CONSTRUCTION DAT	April 2017	OPERATION DATE:	November 2018	DATE MANUFACTURED:	2016 or Later
MANUFACTURER / MODEL NO.:	Caterpillar G3516	EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR			
IS THIS SOURCE SUBJECT TO? NSPS (SUBPART?): Yes, JJJJ NESHAP (SUBPART?): No MACT (SUBPART?): Yes, ZZZZ					
PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25					
EXPECTED ANNUAL HOURS OF OPERATION: 100		VISIBLE STACK EMISSIONS UNDER NORMAL OPERATION:		<20 % OPACITY	

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)	Mfg/AP-42	10.76	0.54	10.76	0.54	10.76	0.54
PARTICULATE MATTER<10 MICRONS (PM_{10})	Mfg/AP-42	10.76	0.54	10.76	0.54	10.76	0.54
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)	Mfg/AP-42	10.76	0.54	10.76	0.54	10.76	0.54
SULFUR DIOXIDE (SO2)	AP-42	0.14	0.01	0.14	0.01	0.14	0.01
NITROGEN OXIDES (NOx)	Mfg	124.84	6.24	124.84	6.24	124.84	6.24
CARBON MONOXIDE (CO)	Mfg	117.96	5.90	117.96	5.90	117.96	5.90
VOLATILE ORGANIC COMPOUNDS (VOC)	Mfg	14.98	0.75	14.98	0.75	14.98	0.75
LEAD							
OTHER							

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT AND CAS NO.		SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) tons/yr
1,1,2,2-Tetrachloroethane	79-34-5	AP-42	0.0002	0.00001	0.0002	0.00001	0.0002	0.00001
1,1,2-Trichloroethane	79-00-5	AP-42	0.0002	0.00001	0.0002	0.00001	0.0002	0.00001
1,1-Dichloroethane	75-34-3	AP-42	0.0001	0.00001	0.0001	0.00001	0.0001	0.00001
1,2-Dichloroethane	107-06-2	AP-42	0.0002	0.00001	0.0002	0.00001	0.0002	0.00001
1,2-Dichloropropane	78-87-5	AP-42	0.0002	0.00001	0.0002	0.00001	0.0002	0.00001
1,3-Butadiene	106-99-0	AP-42	0.003	0.0001	0.003	0.0001	0.003	0.0001
1,3-Dichloropropene	542-75-6	AP-42	0.0002	0.00001	0.0002	0.00001	0.0002	0.00001
2,2,4-Trimethylpentane	540-84-1	AP-42	0.003	0.0002	0.003	0.0002	0.003	0.0002

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

INDICATE EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS

TOXIC AIR POLLUTANT AND CAS NO.		EF SOURCE	lb/hr	lb/day	lb/yr
1,1,2,2-Tetrachloroethane	79-34-5	AP-42	0.0002	0.01	0.02
1,2-Dichloroethane	107-06-2	AP-42	0.0001	0.00	0.02
1,3-Butadiene	106-99-0	AP-42	0.003	0.07	0.30
Acetaldehyde	75-07-0	AP-42	0.03	0.67	2.80
Acrolein	107-02-8	AP-42	0.03	0.67	2.80
Benzene	71-43-2	AP-42	0.007	0.17	0.70
Benzo(a)pyrene	50-32-8	AP-42	0.00000002	0.0000005	0.000002
Carbon Tetrachloride	56-23-5	AP-42	0.0002	0.01	0.02

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSIONS SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 12/01/01 — NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate — **B**

EMISSION SOURCE DESCRIPTION: Caterpillar G3516 Emergency Generator	EMISSION SOURCE ID NO: EG-01
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO 1 of 1	EMISSION POINT (STACK) ID NO(S): EP-04

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Natural gas fired emergency generator used to provide power during emergency periods when the primary source of power to the facility is unavailable.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ☐ Woodworking (Form B4)
- ☐ Manufact. of chemicals/coatings/inks (Form B7)
- ☑ Int.combustion engine/generator (Form B2)
- ☐ Coating/finishing/printing (Form B5)
- ☐ Incineration (Form B8)
- ☐ Liquid storage tanks (Form B3)
- ☐ Storage silos/bins (Form B6)
- ☐ Other (Form B9)

START CONSTRUCTION DAT	April 2017	OPERATION DATE:	November 2018	DATE MANUFACTURED:	2016 or Later
MANUFACTURER / MODEL NO.:	Caterpillar G3516	EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR			
IS THIS SOURCE SUBJECT TO? NSPS (SUBPART?): Yes, JJJJ NESHAP (SUBPART?): No MACT (SUBPART?): Yes, ZZZZ					
PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25					
EXPECTED ANNUAL HOURS OF OPERATION: 100		VISIBLE STACK EMISSIONS UNDER NORMAL OPERATION: <20 % OPACITY			

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)	Mfg/AP-42						
PARTICULATE MATTER<10 MICRONS (PM_{10})	Mfg						
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)	Mfg						
SULFUR DIOXIDE (SO2)	AP-42						
NITROGEN OXIDES (NOx)	Mfg						
CARBON MONOXIDE (CO)	Mfg						
VOLATILE ORGANIC COMPOUNDS (VOC)	Mfg						
LEAD							
OTHER							

See Form B, Page 1, for criteria pollutant totals for this source

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT AND CAS NO.		SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) tons/yr
Acetaldehyde	75-07-0	AP-42	0.03	0.001	0.03	0.001	0.03	0.001
Acrolein	107-02-8	AP-42	0.03	0.001	0.03	0.001	0.03	0.001
Benzene	71-43-2	AP-42	0.01	0.0003	0.01	0.0003	0.01	0.0003
Biphenyl	92-52-4	AP-42	0.00001	0.000001	0.0000	0.000001	0.00001	0.000001
Carbon Tetrachloride	56-23-5	AP-42	0.0002	0.00001	0.0002	0.00001	0.0002	0.00001
Chlorobenzene	108-90-7	AP-42	0.0002	0.00001	0.0002	0.00001	0.0002	0.00001
Chloroform	67-66-3	AP-42	0.0002	0.00001	0.0002	0.00001	0.0002	0.00001
Ethylbenzene	100-41-4	AP-42	0.0004	0.00002	0.00	0.00002	0.0004	0.00002

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

INDICATE EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS

TOXIC AIR POLLUTANT AND CAS NO.		EF SOURCE	lb/hr	lb/day	lb/yr
Chlorobenzene	108-90-7	AP-42	0.0002	0.004	0.02
Chloroform	67-66-3	AP-42	0.0002	0.004	0.02
Ethylene Dibromide	106-93-4	AP-42	0.0003	0.0063	0.03
Formaldehyde	50-00-0	AP-42	0.20	4.77	19.89
Hexane (or n-Hexane)	110-54-3	AP-42	0.002	0.04	0.16
Methylene Chloride	75-09-2	AP-42	0.0005	0.01	0.05
Phenol	108-95-2	AP-42	0.0002	0.004	0.02

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSIONS SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 12/01/01 — NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate — **B**

EMISSION SOURCE DESCRIPTION: Caterpillar G3516 Emergency Generator	EMISSION SOURCE ID NO: EG-01
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO 1 of 1	EMISSION POINT (STACK) ID NO(S): EP-04

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Natural gas fired emergency generator used to provide power during emergency periods when the primary source of power to the facility is unavailable.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ☐ Woodworking (Form B4)
- ☐ Manufact. of chemicals/coatings/inks (Form B7)
- ☑ Int.combustion engine/generator (Form B2)
- ☐ Coating/finishing/printing (Form B5)
- ☐ Incineration (Form B8)
- ☐ Liquid storage tanks (Form B3)
- ☐ Storage silos/bins (Form B6)
- ☐ Other (Form B9)

START CONSTRUCTION DAT	April 2017	OPERATION DATE:	November 2018	DATE MANUFACTURED:	2016 or Later
MANUFACTURER / MODEL NO.:	Caterpillar G3516	EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR			
IS THIS SOURCE SUBJECT TO? NSPS (SUBPART?): Yes, JJJJ		NESHAP (SUBPART?): No		MACT (SUBPART?): Yes, ZZZZ	
PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25		MAR-MAY 25		JUN-AUG 25	SEP-NOV 25
EXPECTED ANNUAL HOURS OF OPERATION: 100		VISIBLE STACK EMISSIONS UNDER NORMAL OPERATION:			<20 % OPACITY

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)	Mfg/AP-42						
PARTICULATE MATTER<10 MICRONS (PM_{10})	Mfg						
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)	Mfg						
SULFUR DIOXIDE (SO2)	AP-42						
NITROGEN OXIDES (NOx)	Mfg						
CARBON MONOXIDE (CO)	Mfg						
VOLATILE ORGANIC COMPOUNDS (VOC)	Mfg						
LEAD							
OTHER							

See Form B, Page 1, for criteria pollutant totals for this source

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT AND CAS NO.		SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) tons/yr
Ethylene Dibromide	106-93-4	AP-42	0.0003	0.00001	0.0003	0.00001	0.0003	0.00001
Formaldehyde	50-00-0	AP-42	0.20	0.01	0.20	0.01	0.20	0.01
Hexane (or n-Hexane)	110-54-3	AP-42	0.002	0.0001	0.002	0.0001	0.002	0.0001
Methanol	67-56-1	AP-42	0.009	0.0004	0.01	0.0004	0.01	0.0004
Methylene Chloride	75-09-2	AP-42	0.001	0.00003	0.001	0.00003	0.001	0.00003
Naphthalene	91-20-3	AP-42	0.0003	0.00002	0.0003	0.00002	0.0003	0.00002
PAH		AP-42	0.0005	0.00002	0.0005	0.00002	0.0005	0.00002
Phenol	108-95-2	AP-42	0.0002	0.00001	0.0002	0.00001	0.0002	0.00001

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

INDICATE EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS

TOXIC AIR POLLUTANT AND CAS NO.		EF SOURCE	lb/hr	lb/day	lb/yr
Styrene	100-42-5	AP-42	0.0002	0.005	0.02
Toluene	108-88-3	AP-42	0.003	0.08	0.35
Vinyl Chloride	75-01-4	AP-42	0.0001	0.002	0.01
Xylene	1330-20-7	AP-42	0.001	0.02	0.10

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSIONS SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 12/01/01 — NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate — **B**

EMISSION SOURCE DESCRIPTION: Caterpillar G3516 Emergency Generator	EMISSION SOURCE ID NO: EG-01
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO 1 of 1	EMISSION POINT (STACK) ID NO(S): EP-04

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Natural gas fired emergency generator used to provide power during emergency periods when the primary source of power to the facility is unavailable.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ☐ Woodworking (Form B4)
- ☐ Manufact. of chemicals/coatings/inks (Form B7)
- ☑ Int.combustion engine/generator (Form B2)
- ☐ Coating/finishing/printing (Form B5)
- ☐ Incineration (Form B8)
- ☐ Liquid storage tanks (Form B3)
- ☐ Storage silos/bins (Form B6)
- ☐ Other (Form B9)

START CONSTRUCTION DAT	April 2017	OPERATION DATE:	November 2018	DATE MANUFACTURED:	2016 or Later
MANUFACTURER / MODEL NO.:	Caterpillar G3516	EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR			
IS THIS SOURCE SUBJECT TO? NSPS (SUBPART?): Yes, JJJJ NESHAP (SUBPART?): No MACT (SUBPART?): Yes, ZZZZ					
PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25					
EXPECTED ANNUAL HOURS OF OPERATION: 100		VISIBLE STACK EMISSIONS UNDER NORMAL OPERATION:			<20 % OPACITY

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)	Mfg/AP-42						
PARTICULATE MATTER<10 MICRONS (PM_{10})	Mfg						
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)	Mfg						
SULFUR DIOXIDE (SO2)	AP-42						
NITROGEN OXIDES (NOx)	Mfg						
CARBON MONOXIDE (CO)	Mfg						
VOLATILE ORGANIC COMPOUNDS (VOC)	Mfg						
LEAD							
OTHER							

See Form B, Page 1, for criteria pollutant totals for this source

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT AND CAS NO.		SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) tons/yr
Styrene	100-42-5	AP-42	0.0002	0.00001	0.0002	0.00001	0.0002	0.00001
Toluene	108-88-3	AP-42	0.003	0.0002	0.003	0.0002	0.003	0.0002
Vinyl Chloride	75-01-4	AP-42	0.0001	0.000004	0.0001	0.000004	0.0001	0.000004
Xylene	1330-20-7	AP-42	0.001	0.00005	0.001	0.00005	0.001	0.00005

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

INDICATE EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS

TOXIC AIR POLLUTANT AND CAS NO.	EF SOURCE	lb/hr	lb/day	lb/yr

See Form B, Pages 1-3, for TAP totals for this source

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B2

EMISSION SOURCE (INTERNAL COMBUSTION ENGINES/GENERATORS)

REVISED 12/01/01 **NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate** **B2**

EMISSION SOURCE DESCRIPTION: Caterpillar G3516 Emergency Generator	EMISSION SOURCE ID NO:	EG-01
	CONTROL DEVICE ID NO(S):	NA
OPERATING SCENARIO 1 of 1	EMISSION POINT (STACK) ID NO(S):	EP-04

CHECK ALL THAT APPLY ☑ EMERGENCY ☐ SPACE HEAT ☐ ELECTRICAL GENERATION ☐ PEAK SHAVER ☐ OTHER (DESCRIBE):

GENERATOR OUTPUT (KW): 1,000 ANTICIPATED ACTUAL HOURS OF OPERATION AS PEAK SHAVER (HRS/YR): N/A

ENGINE OUTPUT (HP): 1,416

TYPE ICE: ☐ GASOLINE ENGINE ☐ DIESEL ENGINE UP TO 600 HP ☐ DIESEL ENGINE GREATER THAN 600 HP ☐ DUAL FUEL ENGINE ☑ OTHER (DESCRIBE) natural gas fired emergency generator (complete below)

ENGINE TYPE ☐ RICH BURN ☑ LEAN BURN

EMISSION REDUCTION MODIFICATIONS ☐ INJECTION TIMING RETARD ☐ PREIGNITION CHAMBER COMBUSTION ☑ OTHER Air/fuel ratio

OR STATIONARY GAS TURBINE (complete below)

FUEL ☐ NATURAL GAS ☐ OIL ☐ OTHER (DESCRIBE):_____

CYCLE: ☐ COGENERATION ☐ SIMPLE ☐ REGENERATIVE ☑ COMBINED

CONTROLS: WATER-STEAM INJECTION ☐ UNCONTROLLED ☐ LEAN-PREMIX

NATURAL GAS PIPELINE COMPRESSOR OR TURBINE (complete below)

ENGINE TYPE: ☐ 2-CYCLE LEAN BURN ☐ 4-CYCLE LEAN ☐ TURBINE ☐ 4-CYCLE RICH BURN ☐ OTHER (DESCRIBE): _____

CONTROLS: ☐ COMBUSTION MODIFICATIONS (DESCRIBE): _____ NONSELECTIVE CATALYTIC REDUCTION SELECTIVE CATALYTIC REDUCTION CLEAN BURN AND PRECOMBUSTION CHAMBER UNCONTROLLED

FUEL USAGE (INCLUDE STARTUP/BACKUP FUEL)

FUEL TYPE	UNITS	MAXIMUM DESIGN CAPACITY (UNIT/HR)	REQUESTED CAPACITY LIMITATION (UNIT/HR)
Natural Gas	MMBtu	12.5	N/A

FUEL CHARACTERISTICS (COMPLETE ALL THAT ARE APPLICABLE)

FUEL TYPE	BTU/UNIT	UNITS	SULFUR CONTENT (% BY WEIGHT)
Natural Gas	1,020	scf	0.0005

MANUFACTURER'S SPECIFIC EMISSION FACTORS (IF AVAILABLE)

POLLUTANT	NOX	CO	PM	PM10	VOC	OTHER
EMISSION FACTOR g/hp-hr	2.00	1.89	NA	NA	0.24	
UNIT	g/hp-hr	g/hp-hr			g/hp-hr	

DESCRIBE METHODS TO MINIMIZE VISIBLE EMISSIONS DURING IDLING, OR LOW LOAD OPERATIONS:

COMMENTS:

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSIONS SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 12/01/01 — NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate — **B**

EMISSION SOURCE DESCRIPTION: TK-1 Accumulator Storage Tank	EMISSION SOURCE ID NO: TK-1
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO 1 of 1	EMISSION POINT (STACK) ID NO(S): NA

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
TK-1 will have a capacity of 2,500 gallons and will receive liquids from the compressor engine fluids filter.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ☐ Int.combustion engine/generator (Form B2)
- ☐ Liquid storage tanks (Form B3)
- ☐ Woodworking (Form B4)
- ☐ Coating/finishing/printing (Form B5)
- ☐ Storage silos/bins (Form B6)
- ☐ Manufact. of chemicals/coatings/inks (Form B7)
- ☐ Incineration (Form B8)
- ☑ Other (Form B9)

START CONSTRUCTION DAT	April 2017	OPERATION DATE:	November 2018	DATE MANUFACTURED:	2016 or Later
MANUFACTURER / MODEL NO.:	NA	EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR			
IS THIS SOURCE SUBJECT TO? NSPS (SUBPART?): No		NESHAP (SUBPART?): No		MACT (SUBPART?): No	
PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25		MAR-MAY 25		JUN-AUG 25	SEP-NOV 25
EXPECTED ANNUAL HOURS OF OPERATION: 8,760		VISIBLE STACK EMISSIONS UNDER NORMAL OPERATION:			% OPACITY

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)	-	-	-	-	-	-	-
PARTICULATE MATTER<10 MICRONS (PM_{10})	-	-	-	-	-	-	-
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)	-	-	-	-	-	-	-
SULFUR DIOXIDE (SO2)	-	-	-	-	-	-	-
NITROGEN OXIDES (NOx)	-	-	-	-	-	-	-
CARBON MONOXIDE (CO)	-	-	-	-	-	-	-
VOLATILE ORGANIC COMPOUNDS (VOC)	Mass balance	0.08	0.35	0.08	0.35	0.08	0.35
LEAD							
OTHER							

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT AND CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) tons/yr
NA							

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

INDICATE EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS

TOXIC AIR POLLUTANT AND CAS NO.	EF SOURCE	lb/hr	lb/day	lb/yr
NA				

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B3

EMISSION SOURCE (LIQUID STORAGE TANK)

REVISED 12/01/01 | NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate | B3

EMISSION SOURCE DESCRIPTION: Accumulator Storage Tank	EMISSION SOURCE ID NO: TK-1
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO 1 of 1	EMISSION POINT (STACK) ID NO(S): EP-05

EACH STORAGE TANK

DESCRIBE IN DETAIL THE STORAGE TANK (ATTACH FLOW DIAGRAM):
TK-1 will have a capacity of 2,500 gallons and will receive liquids from the compressor engine fluids filter.

LIQUID STORED: Liquids from compressor engine fluids filter		LIQUID MOLECULAR WEIGHT (LB/LB-MOLE): TBD
TANK CAPACITY (GAL): 2,500		VAPOR MOLECULAR WEIGHT (LB/LB-MOLE): TBD
AVERAGE LIQUID SURFACE TEMPERATURE (F): 77		VAPOR PRESSURE AT AVE. LIQUID SURFACE TEMP (PSIA): 7.70 (Reid)
MIN. LIQUID SURFACE TEMP (F): 44	MAX. LIQUID SURFACE TEMP (F): 80	MAX. TRUE VAPOR PRESS. (PSIA): 7.70 (Reid)
BULK LIQUID TEMPERATURE (F):	BREATHER VENT SETTINGS (PSIG) ____ VACUUM ____ PRESSURE	
SHELL DIAMETER (FT): 4.6	SHELL CONDITION: X GOOD ___ POOR	IS TANK HEATED: ___ YES X NO
SHELL COLOR: Grey/Light	MAXIMUM THROUGHPUT (GAL/YR): 12,500	MAXIMUM TURNOVERS PER YEAR: 5.00
WORKING VOLUME (GAL): 2,500	ACTUAL THROUGHPUT (GAL/YR): 12,500	ACTUAL TURNOVERS PER YEAR: 5.00
MAX. FILLS PER DAY: TBD	MAX. FILLING RATE (GAL/MIN): TBD	MIN. DURATION OF FILL (HR/FILL): TBD

VERTICAL FIXED ROOF TANKS

SHELL HEIGHT (FT): 20	ROOF TYPE: X CONE OR ___ DOME	ROOF HEIGHT (FT): 4.61
AVERAGE LIQUID HEIGHT (FT): 10	ROOF CONDITION: X GOOD OR _____ POOR	
MAXIMUM LIQUID HEIGHT (FT): 20	ROOF COLOR: Grey	

HORIZONTAL TANKS

SHELL LENGTH (FT): NA	IS TANK UNDERGROUND ?: ___ YES X NO

FLOATING ROOF TANKS

DESCRIBE PERTINENT TANK DATA SUCH AS DECKS, RIM-SEALS, LIQUID DENSITY @ 60 DEG F:

NA

DESCRIBE ANY MONITORING OR WARNING DEVICES (SUCH AS LEAK AND FUME DETECTION INSTRUMENTATION):

NA

COMMENTS:

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSIONS SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 12/01/01 | NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate | **B**

EMISSION SOURCE DESCRIPTION: Fugitive Leaks - Blowdowns	EMISSION SOURCE ID NO: Fug-01
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO 1 of 1	EMISSION POINT (STACK) ID NO(S): NA

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Fugitive Emissions from station blowdowns.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

☐ Coal,wood,oil, gas, other burner (Form B1) ☐ Woodworking (Form B4) ☐ Manufact. of chemicals/coatings/inks (Form B7)
☐ Int.combustion engine/generator (Form B2) ☐ Coating/finishing/printing (Form B5) ☐ Incineration (Form B8)
☐ Liquid storage tanks (Form B3) ☐ Storage silos/bins (Form B6) ☑ Other (Form B9)

START CONSTRUCTION DAT	April 2017	OPERATION DATE:	November 2018	DATE MANUFACTURED:	2016 or Later
MANUFACTURER / MODEL NO.:	NA	EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR			
IS THIS SOURCE SUBJECT TO? NSPS (SUBPART?): No NESHAP (SUBPART?): No MACT (SUBPART?): No					
PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25					
EXPECTED ANNUAL HOURS OF OPERATION: 8,760		VISIBLE STACK EMISSIONS UNDER NORMAL OPERATION: % OPACITY			

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)	-	-	-	-	-	-	-
PARTICULATE MATTER<10 MICRONS (PM_{10})	-	-	-	-	-	-	-
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)	-	-	-	-	-	-	-
SULFUR DIOXIDE (SO2)	-	-	-	-	-	-	-
NITROGEN OXIDES (NOx)	-	-	-	-	-	-	-
CARBON MONOXIDE (CO)	-	-	-	-	-	-	-
VOLATILE ORGANIC COMPOUNDS (VOC)	Mass balance	4.30	18.84	4.30	18.84	4.30	18.84
LEAD							
OTHER							

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT AND CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) tons/yr
Hexane 110-54-3	Mass balance	0.24	1.06	0.24	1.06	0.24	1.06

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

INDICATE EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS

TOXIC AIR POLLUTANT AND CAS NO.	EF SOURCE	lb/hr	lb/day	lb/yr
Hexane 110-54-3	Mass balance	0.24	5.81	2120.00

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B9

EMISSION SOURCE (OTHER)

REVISED: 12/01/01 **NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate** **B9**

EMISSION SOURCE DESCRIPTION: Fugitive Leaks - Blowdowns	EMISSION SOURCE ID NO: Fug-01
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO: 1 of 1	EMISSION POINT (STACK) ID NO(S): NA

DESCRIBE IN DETAIL THE PROCESS (ATTACH FLOW DIAGRAM):

Fugitive Emissions from station blowdowns.

MATERIALS ENTERING PROCESS - CONTINUOUS PROCESS		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	APACITY (UNIT/H	LIMITATION(UNIT/HR)
Natural gas	NA	NA	NA

MATERIALS ENTERING PROCESS - BATCH OPERATION		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	?ACITY (UNIT/BA	LIMITATION (UNIT/BATCH)
NA			

MAXIMUM DESIGN (BATCHES / HOUR): NA

REQUESTED LIMITATION (BATCHES / HOUR): NA (BATCHES/YR): NA

FUEL USED: NA	TOTAL MAXIMUM FIRING RATE (MILLION BTU/HR): NA
MAX. CAPACITY HOURLY FUEL USE: NA	REQUESTED CAPACITY ANNUAL FUEL USE: NA

COMMENTS:

Attach Additional Sheets as Necessary

FORM B

SPECIFIC EMISSIONS SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 12/01/01 — NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate — **B**

EMISSION SOURCE DESCRIPTION: Fugitive Leaks - Piping	EMISSION SOURCE ID NO: Fug-02
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO 1 of 1	EMISSION POINT (STACK) ID NO(S): NA

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Fugitive Emissions from station piping leaks.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

☐ Coal,wood,oil, gas, other burner (Form B1)	☐ Woodworking (Form B4)	☐ Manufact. of chemicals/coatings/inks (Form B7)
☐ Int.combustion engine/generator (Form B2)	☐ Coating/finishing/printing (Form B5)	☐ Incineration (Form B8)
☐ Liquid storage tanks (Form B3)	☐ Storage silos/bins (Form B6)	☑ Other (Form B9)

START CONSTRUCTION DAT April 2017	OPERATION DATE: November 2018	DATE MANUFACTURED: 2016 or Later
MANUFACTURER / MODEL NO.: NA	EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR	
IS THIS SOURCE SUBJECT TO? NSPS (SUBPART?): No NESHAP (SUBPART?): No MACT (SUBPART?): No		
PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25		
EXPECTED ANNUAL HOURS OF OPERATION: 8,760	VISIBLE STACK EMISSIONS UNDER NORMAL OPERATION: % OPACITY	

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)	-	-	-	-	-	-	-
PARTICULATE MATTER<10 MICRONS (PM_{10})	-	-	-	-	-	-	-
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)	-	-	-	-	-	-	-
SULFUR DIOXIDE (SO2)	-	-	-	-	-	-	-
NITROGEN OXIDES (NOx)	-	-	-	-	-	-	-
CARBON MONOXIDE (CO)	-	-	-	-	-	-	-
VOLATILE ORGANIC COMPOUNDS (VOC)	EPA	4.57	20.03	4.57	20.03	4.57	20.03
LEAD							
OTHER							

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT AND CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS) tons/yr
Hexane 110-54-3	Mass Balance	0.26	1.13	0.26	1.13	0.26	1.13

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

INDICATE EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS

TOXIC AIR POLLUTANT AND CAS NO.	EF SOURCE	lb/hr	lb/day	lb/yr
Hexane 110-54-3	Mass Balance	0.26	6.19	2,260.00

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B9

EMISSION SOURCE (OTHER)

REVISED: 12/01/01 | **NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate** | **B9**

EMISSION SOURCE DESCRIPTION: Fugitive Leaks - Piping	EMISSION SOURCE ID NO: Fug-02
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO: 1 of 1	EMISSION POINT (STACK) ID NO(S): NA

DESCRIBE IN DETAIL THE PROCESS (ATTACH FLOW DIAGRAM):
Fugitive Emissions from station piping leaks.

MATERIALS ENTERING PROCESS - CONTINUOUS PROCESS		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	APACITY (UNIT/H	LIMITATION(UNIT/HR)
Natural gas	NA	NA	NA

MATERIALS ENTERING PROCESS - BATCH OPERATION		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	PACITY (UNIT/BA	LIMITATION (UNIT/BATCH)
NA			

MAXIMUM DESIGN (BATCHES / HOUR): NA	
REQUESTED LIMITATION (BATCHES / HOUR): NA	(BATCHES/YR): NA
FUEL USED: NA	TOTAL MAXIMUM FIRING RATE (MILLION BTU/HR): NA
MAX. CAPACITY HOURLY FUEL USE: NA	REQUESTED CAPACITY ANNUAL FUEL USE: NA

COMMENTS:

Attach Additional Sheets as Necessary

FORM D1

FACILITY-WIDE EMISSIONS SUMMARY

REVISED 12/01/01 | NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate | D1

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION - FACILITY-WIDE

AIR POLLUTANT EMITTED	EXPECTED ACTUAL EMISSIONS (AFTER CONTROLS / LIMITATIONS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITATIONS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITATIONS) tons/yr
PARTICULATE MATTER (PM)	18.68	18.68	18.68
PARTICULATE MATTER < 10 MICRONS (PM_{10})	18.68	18.68	18.68
PARTICULATE MATTER < 2.5 MICRONS ($PM_{2.5}$)	18.68	18.68	18.68
SULFUR DIOXIDE (SO2)	3.09	3.09	3.09
NITROGEN OXIDES (NOx)	24.23	52.51	24.23
CARBON MONOXIDE (CO)	34.46	88.36	34.46
VOLATILE ORGANIC COMPOUNDS (VOC)	41.62	43.07	41.62
LEAD			
OTHER			

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION - FACILITY-WIDE

HAZARDOUS AIR POLLUTANT EMITTED	CAS NO.	EXPECTED ACTUAL EMISSIONS (AFTER CONTROLS / LIMITATIONS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITATIONS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITATIONS) tons/yr
1,1,2,2-Tetrachloroethane	79-34-5	0.00001	0.00001	0.00001
1,1,2-Trichloroethane	79-00-5	0.00001	0.00001	0.00001
1,1-Dichloroethane	75-34-3	0.00001	0.00001	0.00001
1,2-Dichloroethane	107-06-2	0.00001	0.00001	0.00001
1,2-Dichloropropane	78-87-5	0.00001	0.00001	0.00001
1,3-Butadiene	106-99-0	0.0003	0.0005	0.0003
-Dichloropropene	542-75-6	0.00001	0.00001	0.00001
2,2,4-Trimethylpentane	540-84-1	0.0002	0.0002	0.0002
Acetaldehyde	106-99-0	0.02	0.03	0.02
Acrolein	75-07-0	0.004	0.006	0.004
Benzene	71-43-2	0.005	0.010	0.005
Biphenyl	92-52-4	0.000001	0.000001	0.000001
Carbon Tetrachloride	56-23-5	0.00001	0.00001	0.00001

TOXIC AIR POLLUTANT EMISSIONS INFORMATION - FACILITY-WIDE

INDICATE REQUESTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS. EMISSIONS ABOVE THE TOXIC PERMIT EMISSION RATE (TPER) IN 15A NCAC 2Q .0711 MAY REQUIRE AIR DISPERSION MODELING. USE NETTING FORM D2 IF NECESSARY.

TOXIC AIR POLLUTANT EMITTED	CAS NO.	lb/hr	lb/day	lb/year	Modeling Required ? Yes	Modeling Required ? No	Note
1,1,2,2-Tetrachloroethane	79-34-5	0.0002	0.01	0.02		x	1
1,2-Dichloroethane	107-06-2	0.0001	0.00	0.02		x	1
1,3-Butadiene	106-99-0	0.003	0.07	0.62		x	1
Acetaldehyde	75-07-0	0.03	0.75	33.32		x	1
Acrolein	75-07-0	0.03	0.69	7.69		x	1
Ammonia	7664-41-7	2.83	68.04	24,773.28		x	1
Benzene	71-43-2	0.01	0.19	9.86		x	1
Benzo(a)pyrene	50-32-8	0.00000002	0.0000005	0.000002		x	1
Carbon Tetrachloride	56-23-5	0.0002	0.01	0.02		x	1
Chlorobenzene	108-90-7	0.0002	0.004	0.02		x	1
Chloroform	67-66-3	0.0002	0.004	0.02		x	1
Ethylene Dibromide	106-93-4	0.0003	0.01	0.03		x	1
Formaldehyde	50-00-0	0.45	10.79	2,217.70		x	1
xane (or n-Hexane)	110-54-3	0.24	5.85	2,120.16		x	1

COMMENTS:

Note 1: The combustion sources proposed for the Northampton Compressor Station are exempt from NC DENR Air Toxics permitting requirements per 15A NCAC 02Q.0702(a)(25), as the aggregate allowable natural gas heat input value for these sources is less than 450 MMBtu/hr, and they will be the only source of benzene at the facility.

FORM D1

FACILITY-WIDE EMISSIONS SUMMARY

REVISED 12/01/01 | NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate | D1

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION - FACILITY-WIDE

AIR POLLUTANT EMITTED	EXPECTED ACTUAL EMISSIONS (AFTER CONTROLS / LIMITATIONS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITATIONS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITATIONS) tons/yr
PARTICULATE MATTER (PM)	*See Form D1, Page 1, for criteria pollutant totals.*		
PARTICULATE MATTER < 10 MICRONS (PM_{10})			
PARTICULATE MATTER < 2.5 MICRONS ($PM_{2.5}$)			
SULFUR DIOXIDE (SO2)			
NITROGEN OXIDES (NOx)			
CARBON MONOXIDE (CO)			
VOLATILE ORGANIC COMPOUNDS (VOC)			
LEAD			
OTHER			

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION - FACILITY-WIDE

HAZARDOUS AIR POLLUTANT EMITTED	CAS NO.	EXPECTED ACTUAL EMISSIONS (AFTER CONTROLS / LIMITATIONS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITATIONS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITATIONS) tons/yr
Chlorobenzene	108-90-7	0.00001	0.00001	0.00001
Chloroform	67-66-3	0.00001	0.00001	0.00001
Ethylbenzene	100-41-4	0.01	0.02	0.01
Ethylene Dibromide	106-93-4	0.00001	0.00001	0.00001
Formaldehyde	75-07-0	1.11	2.21	1.11
Hexane (or n-Hexane)	110-54-3	1.06	1.06	1.06
Methanol	67-56-1	0.0004	0.0004	0.0004
Methylene Chloride	75-09-2	0.00003	0.00003	0.00003
Napthalene	91-20-3	0.001	0.001	0.001
PAH		0.001	0.002	0.001
Phenol	108-95-2	0.00001	0.00001	0.00001
Propylene oxide	75-56-9	0.01	0.02	0.01
Styrene	100-42-5	0.00001	0.00001	0.00001
Toluene	108-88-3	0.05	0.10	0.05

TOXIC AIR POLLUTANT EMISSIONS INFORMATION - FACILITY-WIDE

INDICATE REQUESTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS. EMISSIONS ABOVE THE TOXIC PERMIT EMISSION RATE (TPER) IN 15A NCAC 2Q .0711 MAY REQUIRE AIR DISPERSION MODELING. USE NETTING FORM D2 IF NECESSARY.

TOXIC AIR POLLUTANT EMITTED	CAS NO.	lb/hr	lb/day	lb/year	Modeling Required ? Yes	Modeling Required ? No	Note
Methylene Chloride	75-09-2	0.0005	0.01	0.05		x	1
Phenol	108-95-2	0.0002	0.004	0.02		x	1
Styrene	100-42-5	0.0002	0.005	0.02		x	1
Toluene	108-88-3	0.01	0.36	99.55		x	1
Vinyl Chloride	75-01-4	0.0001	0.002	0.01		x	1
Xylene	1330-20-7	0.01	0.16	48.94		x	1

COMMENTS:

Note 1: The combustion sources proposed for the Northampton Compressor Station are exempt from NC DENR Air Toxics permitting requirements per 15A NCAC 02Q.0702(a)(25), as the aggregate allowable natural gas heat input value for these sources is less than 450 MMBtu/hr, and they will be the only source of benzene at the facility.

FORM D1

FACILITY-WIDE EMISSIONS SUMMARY

REVISED 12/01/01 — NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate — D1

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION - FACILITY-WIDE

AIR POLLUTANT EMITTED	EXPECTED ACTUAL EMISSIONS (AFTER CONTROLS / LIMITATIONS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITATIONS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITATIONS) tons/yr
PARTICULATE MATTER (PM)	*See Form D1, Page 1, for criteria pollutant totals.*		
PARTICULATE MATTER < 10 MICRONS (PM_{10})			
PARTICULATE MATTER < 2.5 MICRONS ($PM_{2.5}$)			
SULFUR DIOXIDE (SO2)			
NITROGEN OXIDES (NOx)			
CARBON MONOXIDE (CO)			
VOLATILE ORGANIC COMPOUNDS (VOC)			
LEAD			
OTHER			

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION - FACILITY-WIDE

HAZARDOUS AIR POLLUTANT EMITTED	CAS NO.	EXPECTED ACTUAL EMISSIONS (AFTER CONTROLS / LIMITATIONS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITATIONS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITATIONS) tons/yr
Vinyl Chloride	75-01-4	0.000004	0.000004	0.000004
Xylene	1330-20-7	0.024468	0.05	0.02

TOXIC AIR POLLUTANT EMISSIONS INFORMATION - FACILITY-WIDE

INDICATE REQUESTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS. EMISSIONS ABOVE THE TOXIC PERMIT EMISSION RATE (TPER) IN 15A NCAC 2Q .0711 MAY REQUIRE AIR DISPERSION MODELING. USE NETTING FORM D2 IF NECESSARY.

TOXIC AIR POLLUTANT EMITTED	CAS NO.	lb/hr	lb/day	lb/year	Modeling Required ? Yes	No

See Form D1, Pages 2 and 3, for for TAP totals

COMMENTS:

Note 1: The combustion sources proposed for the Northampton Compressor Station are exempt from NC DENR Air Toxics permitting requirements per 15A NCAC 02Q.0702(a)(25), as the aggregate allowable natural gas heat input value for these sources is less than 450 MMBtu/hr, and they will be the only source of benzene at the facility.

FORM D2

AIR POLLUTANT NETTING WORKSHEET

evised:12/01/01 | NCDENR/Division of Air Quality - Application for Air Permit to Construct/Operate | D2

PURPOSE OF NETTING: X AIR TOXICS PSD (100/250 tons per year) PSD SIGNIFICANT LEVELS

AIR POLLUTANT: All (See Form D1) CAS NO.:

EMISSION SOURCE ID NOS.: Facility-Wide

SECTION A - EMISSION OFFSETTING ANALYSIS FOR MODIFIED/NEW SOURCES

Summarize in this section using the B forms	EMISSIONS - USE APPROPRIATE COLUMNS ONLY		
	LB/YEAR	LB/DAY	LB/HR
MODIFICATION INCREASE	See comments below		
- MINUS -	- MINUS -	- MINUS -	- MINUS -
MODIFICATION DECREASE			
= EQUALS =	= EQUALS =	= EQUALS =	= EQUALS =
NET CHANGE FROM MODIFICATION			

SECTION B - FACILITY-WIDE EMISSION NETTING ANALYSIS

CREDITABLE INCREASE	See comments below		
- MINUS -	- MINUS -	- MINUS -	- MINUS -
CREDITABLE DECREASE			
= EQUALS =	= EQUALS =	= EQUALS =	= EQUALS =
NET CREDITABLE CHANGE			

SECTION C - FACILITY-WIDE EMISSIONS

TOTAL FACILITY EMISSIONS	See comments below		
TPER LEVELS (2Q .0711)			

CHECK HERE IF AN AIR DISPERSION MODELING ANALYSIS IS REQUIRED

COMMENTS:

The combustion sources proposed for the Northampton Compressor Station are exempt from NC DENR Air Toxics permitting requirements per 15A NCAC 02Q.0702(a)(25), as the aggregate allowable natural gas heat input value for these sources is less than 450 MMBtu/hr, and they will be the only source of benzene at the facility.

FORM D4

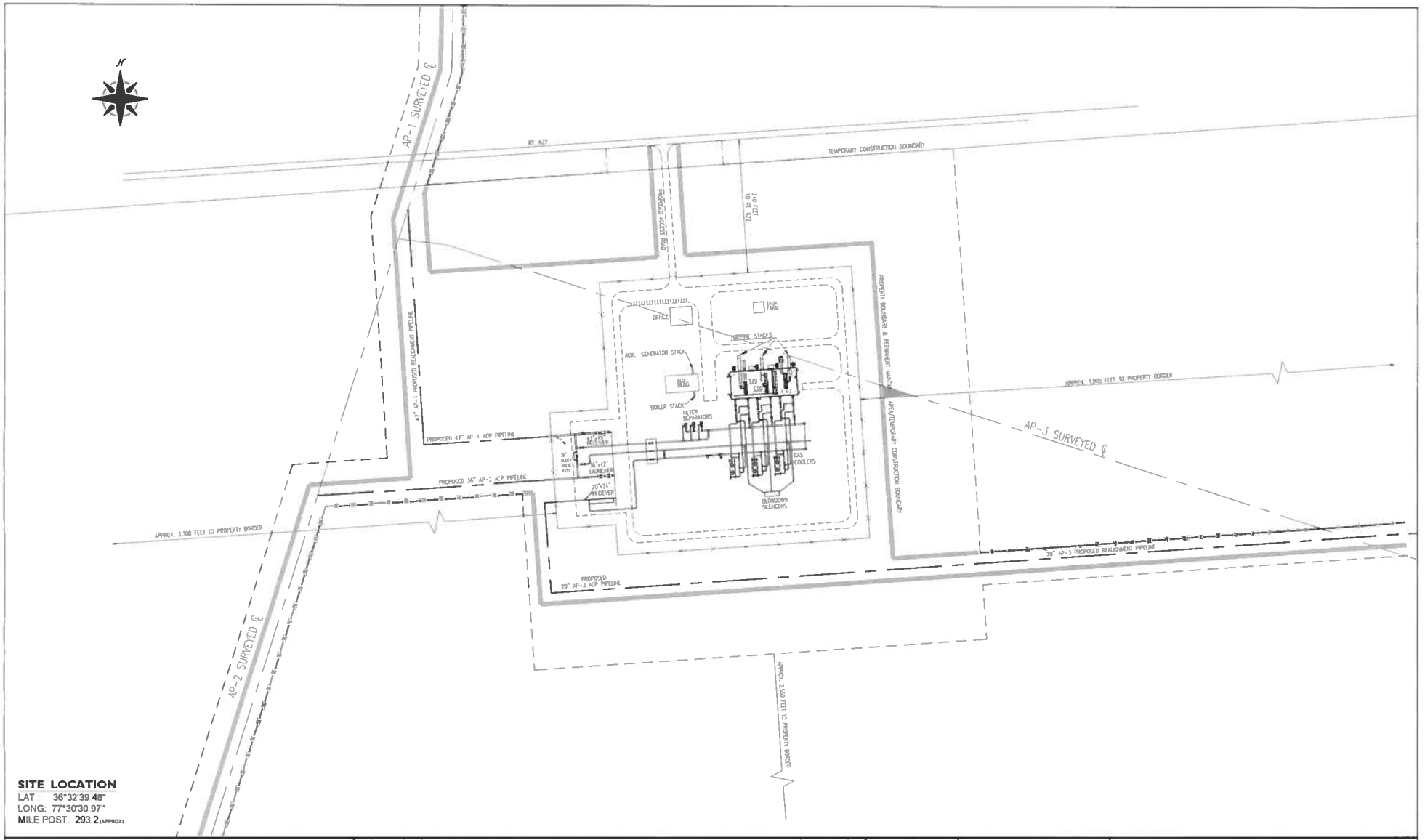
EXEMPT AND INSIGNIFICANT ACTIVITIES SUMMARY

ACTIVITIES EXEMPTED PER 2Q .0102 OR INSIGNIFICANT ACTIVITIES PER 2Q .0503 FOR TITLE V SOURCES

	DESCRIPTION OF EMISSION SOURCE	SIZE OR PRODUCTION RATE	BASIS FOR EXEMPTION OR INSIGNIFICANT ACTIVITY
1.	Natural Gas Boiler (used for building heat)	6.3 MMBtu/hr	Per 15A NCAC 2Q.0102(c)(2)(B)(iv), fuel combustion equipment (except internal combustion engines and equipment burning waste oil) with a heat input rating less than 10 million Btu per hour used solely for space heating is exempt from permitting.
2.	TK-2, Hydrocarbon Waste Tank, will receive and store used oil used in oil-filled operational equipment throughout the facility.	1,500 gallons	Per 15A NCAC 02Q.0102(c)(1)(D)(i), storage tanks used solely to store used motor oil, lubricants, and cooling oils are exempt from permitting.
3.	TK-3, Aqueous Ammonia Storage Tank, will be used to supply aqueous ammonia to the SCRs.	8,000 gallons	Per 15A NCAC 02Q.0102(c)(1)(D)(iii), storage tanks used solely to store inorganic liquids are exempt from permitting.
4.			
6.			
7.			
8.			
9.			
10.			

APPENDIX B

FACILITY PLOT PLAN



SITE LOCATION
LAT: 36°32'39.48"
LONG: 77°30'30.97"
MILE POST: 293.2 (APPROX.)

GENERAL NOTES AND COMMENTS

ISSUED FOR REVIEW
7/7/15

LEGEND
- PROPOSED ACP PIPELINE
- TEMPORARY CONSTRUCTION DISTURBANCE
- PERMANENT MAINTAINED AREA
- PROPOSED FENCE

SCALE: 1" = 100'

SYM	DATE	BY	REVISION INFORMATION	PROJECT/TASK	APP.
A	7/6/15	WC	REVISED PER DTI COMMENTS / ISSUED FOR REVIEW		
B	6/29/15	BLD	REVISED PER DTI COMMENTS / ISSUED FOR REVIEW		
C	6/19/15	WC	MODIFIED LP LAYOUT		
D	6/2/15	APS	MODIFIED LP LAYOUT		
E	4/7/15	AB	ADDED LAUNCHER/RECEIVER AND BLOCK VALVE		
F	12/10/14	APS	ISSUED FOR FERC PRE FILING		

SEAL

I3 Engineering and Consulting, LLC
INTEGRITY · INITIATIVE · INNOVATION

DRAWN:	AB	12/10/14
CHECKED:	DLM	12/10/14
APP. FOR DES:		
APP. FOR CONST.:		
SCALE:	1"=100'	

Atlantic Coast Pipeline, LLC
445 West Main St. Clarksburg, West Virginia 26301 / Phone: (304) 623-8000

TITLE: NORTHHAMPTON COMPRESSOR STATION
PRELIMINARY SITE PLAN

DISTRICT:	COUNTY: NORTHAMPTON	STATE: NC	GROUP	DWG. NO.	REV.
				2085A	F

DWG FILE: DOM/Compressor Station/CS3 Rev E

APPENDIX C

POTENTIAL TO EMIT CALCULATIONS

Table C-1 Permit to Construct Application Project Equipment List
ACP Northampton Compressor Station - Northampton County, North Carolina

Emission Point ID	Source	Manufacturer	Model/Type	Rated Capacity
CT-01	Compressor Turbine	Solar Turbines	Taurus 70-10802S	11,882 hp
CT-02	Compressor Turbine	Solar Turbines	Centaur 50-6200LS	8,414 hp
CT-03	Compressor Turbine	Solar Turbines	Centaur 40-4700S	5,023 hp
EG-01	Emergency Generator	Caterpillar	G3516	1,416 hp
WH-01	Boiler	TBD	TBD	6.3 MMBtu/hr
FUG-01	Fugitive Leaks - Blowdowns	-	-	-
FUG-02	Fugitive Leaks - Piping	-	-	-
TK-1	Accumulator Tank	-	-	2,500 gal
TK-2	Hydrocarbon (Waste Oil) Tank	--	--	1,500 gal
TK-3	Ammonia Tank	--	--	8,000 gal

Table C-2 Potential Emissions From Combustion Sources

ACP Northampton Compressor Station - Northampton County, North Carolina

Turbine Operational Parameters:

Normal Hours of Operation:	8,677
Hours at Low Load (<50%)	0
Hours of Low Temp. (< 0 deg. F)	50
Hours of Start-up/Shut-down	33.3
Total Hours of Operation (hr/yr):	8,760

Emergency Generator Operational Hours:

Normal Hours of Operation:	100

Boiler/Heater Operational Parameters:

Normal Hours of Operation:	8,760

Pre-Control Potential to Emit

Combustion Sources	Power Rating	Units	Fuel	Criteria Pollutants (tpy)								GHG Emissions (tpy)				Ammonia (tpy)	HAP (tpy)
				NOx	CO	VOC	SO2	PMF	PMF-10	PMF-2.5	PMC	CO2	CH4	N2O	CO2e	NH3	Total HAP
Solar Taurus 70 Turbine	11,882	hp	Natural Gas	14.9	23.8	1.36	1.43	2.42	2.42	2.42	5.99	49,980	3.62	1.26	50,446	5.77	0.525
Solar Centaur 50L Turbine	8,414	hp	Natural Gas	9.2	14.8	0.834	0.894	1.51	1.51	1.51	3.74	31,295	2.26	0.788	31,587	3.58	0.352
Solar Centaur 40 Turbine	5,023	hp	Natural Gas	22.0	25.6	0.702	0.760	1.29	1.29	1.29	3.18	26,718	1.92	0.671	26,966	3.02	0.286
Caterpillar G3516 Egen	1,416	hp	Natural Gas	0.312	0.295	0.0375	0.0003	0.0214	0.0214	0.0214	0.006	77.9	0.290	0	85.1	0	0.0143
Boiler	6.3	MMBtu/hr	Natural Gas	1.35	2.27	0.149	0.0162	0.0514	0.0514	0.0514	0.154	3246	0.0622	0.0595	3266	0	0.0511
Total (tons/yr)				**47.7**	**66.8**	**3.08**	**3.10**	**5.3**	**5.3**	**5.3**	**13.07**	**111,317**	**8.15**	**2.78**	**112,350**	**12.4**	**1.23**

Turbine Control Efficiencies

Control Technology	NOx	CO	VOC
Selective Catalytic Reduction (Centaur 40)	80%	-	-
Selective Catalytic Reduction (All Others)	44%	-	-
Oxidation Catalyst (Centaur 40)	-	90%	50%
Oxidation Catalyst (All Others)	-	80%	50%

Post-Control Potential to Emit

Combustion Sources	Power Rating	Units	Fuel	Criteria Pollutants (tpy)								GHG Emissions (tpy)				Ammonia (tpy)	HAP (tpy)
				NOx	CO	VOC	SO2	PMF	PMF-10	PMF-2.5	PMC	CO2	CH4	N2O	CO2e	NH3	Total HAP
Solar Taurus 70 Turbine	11,882	hp	Natural Gas	8.25	4.76	0.680	1.43	2.42	2.42	2.42	5.99	49,980	3.62	1.26	50,446	5.77	0.525
Solar Centaur 50L Turbine	8,414	hp	Natural Gas	5.14	2.96	0.417	0.894	1.51	1.51	1.51	3.74	31,295	2.26	0.788	31,587	3.58	0.352
Solar Centaur 40 Turbine	5,023	hp	Natural Gas	4.39	2.56	0.351	0.760	1.29	1.29	1.29	3.18	26,718	1.92	0.671	26,966	3.02	0.286
Caterpillar G3516 Egen	1416	hp	Natural Gas	0.312	0.295	0.0375	0.0003	0.0214	0.0214	0.0214	0.006	77.9	0.290	0	85.1	0	0.0143
Boiler	6.3	MMBtu/hr	Natural Gas	1.35	2.27	0.149	0.0162	0.0514	0.0514	0.0514	0.154	3,246	0.0622	0.0595	3,266	0	0.0511
Total (tons/yr)				**19.4**	**12.8**	**1.63**	**3.10**	**5.3**	**5.3**	**5.3**	**13.07**	**111,317**	**8.15**	**2.78**	**112,350**	**12.4**	**1.229**

Notes:

(1) Turbine emissions are calculated by the following formula: ER * Run Hours / 2000 * (1 - Control Efficiency)
ER = Emission Rate for particular equipment and pollutant (lbs/hr)
2000 = the amount of lbs in a ton

(2) Emergency Generator emissions are calculated by the following formula: Power Rating * Run Hours * EF / 2000
Power Rating = Engine hp rating (hp)
EF = Emission Factor from either manufacturer's data or AP-42 (lb/hp-hr)
2000 = the amount of lbs in a ton

(3) Boiler/Heater emissions calculated by the following formula: EF * Power Rating * Run Hours / HHV / 2000
EF = AP-42 Emission Factor (lb/MMSCF)
Power Rating = Boiler/Heater Heat Capacity (MMBtu/hr)
HHV = Natural Gas High Heating Value (1020 MMBtu/MMSCF)

(4) Turbines are equipped with Selective Catalytic Reduction (SCR) and oxidation catalyst for control of NOx (44%), CO (80%), and VOC (50%)

(5) Taurus Centaur 40 oxidation catalyst has a control of 90% for CO

(6) Emergency generator engine hp taken from manufacturer data

(7) Boiler assumed to have low-NOx burners

(8) See the "HAP Emissions" worksheet for a more detailed breakdown of HAP emissions

(9) See Emissions Factors table for Emissions Factors for each operating scenario.

(10) Each start-up/shut-down event assumed to last 10 minutes

Table C-3 Event Based Potential Emissions From Combustion Sources
ACP Northampton Compressor Station - Northampton County, North Carolina

Start-up Emissions

Combustion Sources	Power Rating	Units	Fuel	Start-up Events	Criteria Pollutants (tpy)			GHG Emissions (tpy)		
					NOx	CO	VOC	CO2	CH4	CO2e
Solar Taurus 70 Turbine	11,882	hp	Natural Gas	100	0 0400	3 66	0 0420	26 0	0 168	30 2
Solar Centaur 50L Turbine	8,414	hp	Natural Gas	100	0 0400	3 46	0 0400	23 5	0 160	27.5
Solar Centaur 40 Turbine	5,023	hp	Natural Gas	100	0 0350	3 22	0 0370	19 8	0.148	23 3
Total (tons/yr)					0.115	10.33	0.119	69.0	0.476	80.9

Shutdown Emissions

Combustion Sources	Power Rating	Units	Fuel	Shutdown Events	Criteria Pollutants (tpy)			GHG Emissions (tpy)		
					NOx	CO	VOC	CO2	CH4	CO2e
Solar Taurus 70 Turbine	11,882	hp	Natural Gas	100	0 0550	4 67	0 0530	28 8	0 212	34.1
Solar Centaur 50L Turbine	8,414	hp	Natural Gas	100	0 0200	1.77	0 0200	10 9	0 0800	12 9
Solar Centaur 40 Turbine	5,023	hp	Natural Gas	100	0 0150	1 51	0 0170	9 05	0 0680	10 8
Total (tons/yr)					0.090	7.950	0.090	48.7	0.360	57.7

Total SUSD Emissions (tons/yr)					0.205	18.28	0.209	117.7	0.836	139

Compressor Blowdown Emissions

Source Designation:	FUG-01

Blowdown Start-up Events

Blowdown from Start-up	38000	scf/event
Volumetric flow rate	385	scf-lbmol
Methane Molecular Weight	16	lb-lbmol
Methane Percent Weight	93%	%
Start-up Blowdown	1891	lb/event

Blowdown Shutdown Events

Blowdown from Shutdown	63000	scf/event
Volumetric flow rate	385	scf-lbmol
Methane Molecular Weight	16	lb-lbmol
Methane Percent Weight	93%	%
Shutdown Blowdown	2803	lb/event

Gas Composition

Pollutant	Molecular Weight (lb/lb-mol)	Molar (Volume) Fraction (mol%)	Wt. Fraction[1] (wt. %)
Total Stream Molecular Weight	16.89		
Non-VOC			
Carbon Dioxide	44.01	1.041%	2.71%
Nitrogen	28.01	0.994%	1.63%
Methane	16.04	94.21%	89.47%
Ethane	30.07	2.923%	5.20%
VOC			
Propane	44.10	0.546%	1.43%
n-Butane	58.12	0.084%	0.29%
IsoButane	58.12	0.079%	0.27%
n-Pentane	72.15	0.022%	0.09%
IsoPentane	72.15	0.024%	0.10%
n-Hexane	78.11	0.032%	0.13%
n-Heptane	100.21	0.049%	0.29%
Total VOC Fraction			2.62%
Total HAP Fraction			0.13%

Blowdown from Startup Events

Combustion Sources	Start-up Events	VOC	GHG Emissions (tpy)			HAPs
			CO2	CH4	CO2e	
Solar Taurus 70 Turbine	100	2.216	2.293	75.634	1,893	0.125
Solar Centaur 50L Turbine	100	2.216	2.293	75.634	1,893	0.125
Solar Centaur 40 Turbine	100	2.216	2.293	75.634	1,893	0.125
Total (tons/yr)		6.649	6.880	227	5,679	0.375

Blowdown from Shutdown Events

Combustion Sources	Startup Events	VOC	GHG Emissions (tpy)			HAPs
			CO2	CH4	CO2e	
Solar Taurus 70 Turbine	100	3.675	3 80	125 39	3,139	0 207
Solar Centaur 50L Turbine	100	3.675	3 80	125 39	3,139	0.207
Solar Centaur 40 Turbine	100	3.675	3 80	125 39	3,139	0 207
Total (tons/yr)		11.024	11.41	376	9,416	0.622

Site-Wide Blowdown Events

Site-Wide Blowdown	2,000,000	scf/event
Volumetric flow rate	385	scf-lbmol
Methane Molecular Weight	16	lb-lbmol
Methane Percent Weight	93%	%
Site-Wide Blowdown	88,990	lb/event

Blowdown from Site Wide Events

Combustion Sources	Startup Events	VOC	GHG Emissions (tpy)			HAPs
			CO2	CH4	CO2e	
ACP-3	1	1.167	1.21	39 8	996	0 066
Total (tons/yr)		1.167	1.21	39.8	996	0.066

Total Blowdown Emissions (tons/yr)	18.8	19.5	643	16,092	1.06

Table C-4 Combustion Source Criteria Pollutant Emission Factors

ACP Northampton Compressor Station - Northampton County, North Carolina

Solar Turbine Normal Operation Emission Factors (lb/hr)															
Equipment Name	Fuel	Units	NOx	CO	VOC	SO2	PMF	PMF-10	PMF-2.5	PMC	CO2	CH4	N2O	CO2e	NH3
Solar Centaur 40 Turbine	Natural Gas	lb/hr	4.70	5.70	0.160	0.173	0.294	0.294	0.294	0.727	6100	0.439	0.153	6157	0.690
Solar Centaur 50L Turbine	Natural Gas	lb/hr	1.98	3.30	0.190	0.204	0.345	0.345	0.345	0.855	7145	0.516	0.180	7212	0.818
Solar Taurus 70 Turbine	Natural Gas	lb/hr	3.18	5.30	0.310	0.326	0.553	0.553	0.553	1.37	11411	0.826	0.288	11517	1.32

Notes
(1) Pre-Control Emission Rates for NOx, CO, VOC, PMF, PMC, and CO2 taken from Solar Turbine Data at 100% load and 0 degrees F
(2) Emission Factors for SO2, CH4, N2O taken from AP-42 in (lbs/MMBtu) and multiplied by turbine fuel throughput by Solar Turbine at 100% load and 0 degree F to get Emission Rates
(3) Assume PMF=PMF-10=PMF-2.5; Filterable and Condensable based on Solar Turbine Emission Factor and ratio of AP-42 Table 3.1 factors
(4) NH3 emission rates based on a 10 ppm ammonia slip from the SCR based on manufacturer information
(5) CO2e emission rate calculated by multiplying each GHG (CO2, CH4, N2O) by its Global Warming Potential (GWP) and adding them together
(6) CO2 GWP = 1; CH4 GWP = 25; N2O GWP = 298 [40 CFR Part 98]

Solar Turbine Alternate Operation Emission Factors (lb/hr)								
			< 0 degrees F			Solar Turbine Low Load F		
Equipment Name	Fuel	Units	NOx	CO	VOC	NOx	CO	VOC
Solar Centaur 40 Turbine	Natural Gas	lb/hr	62.7	34.2	0.320	36.6	2,280	6.40
Solar Centaur 50L Turbine	Natural Gas	lb/hr	26.4	19.8	0.380	15.4	1,320	7.60
Solar Taurus 70 Turbine	Natural Gas	lb/hr	42.4	31.8	0.620	24.7	2,120	12.4

Notes
(1) Pre-Control low temperature Emission Rates for NOx, CO, VOC. Conservatively assume 120 ppm NOx, 150 ppm CO, and 5 ppm VOC (10% of UHC) per Table 2 of Solar PIL 167
(2) Pre-Control low load Emission Rates for NOx, CO, VOC. Conservatively assume 70 ppm NOx, 10,000 ppm CO, and 100 ppm VOC (10% of UHC) per Table 4 of Solar PIL 167

Solar Turbine Start-up and Shutdown Emission Factors (lb/event)														
			Start-up EFs						Shutdown EFs					
Equipment Name	Fuel	Units	NOx	CO	VOC	CO2	CH4	CO2e	NOx	CO	VOC	CO2	CH4	CO2e
Solar Centaur 40 Turbine	Natural Gas	lb/event	0.700	64.4	0.740	392	2.96	466	0.300	30.2	0.340	181	1.36	215
Solar Centaur 50L Turbine	Natural Gas	lb/event	0.800	69.1	0.800	469	3.20	549	0.400	35.4	0.400	217	1.60	257
Solar Taurus 70 Turbine	Natural Gas	lb/event	0.800	73.1	0.840	519	3.36	603	1.10	93.4	1.06	575	4.24	681

Notes
(1) Start-up and Shutdown Emissions based on Solar Turbines Incorporated Product Information Letter 170: Emission Estimates at Start-up, Shutdown, and Commissioning for SoLoNOx Combustion Products (13 June 2012). Emission Estimates do not include SO2, PM, N2O, or any HAPs.
(2) VOCs assumed to be 20% of UHC and CH4 assumed to be 80% of UHC.
(3) CO2e emission rate calculated by multiplying each GHG (CO2, CH4) by its Global Warming Potential (GWP) and adding them together
(4) CO2 GWP = 1; CH4 GWP = 25; [40 CFR Part 98]

Engine and Boiler Emission Factors															
Equipment Type	Fuel	Units	NOx	CO	VOC	SO2	PMF	PMF-10	PMF-2.5	PMC	CO2	CH4	N2O	CO2e	NH3
Boiler < 100 MMBtu	Natural Gas	lb/MMscf	50	84	5.5	0.6	1.9	1.9	1.9	5.7	120000	2.3	2.2	120713	0.00
Space & Water Heaters	Natural Gas	lb/MMscf	100	84	5.5	0.6	1.9	1.9	1.9	5.7	120000	2.3	2.2	120713	0.00
Engine 2 SLB	Natural Gas	lb/MMBtu	3.17	0.386	0.12	0.000588	0.0384	0.0384	0.0384	0.00991	110	1.45	0	146	0.00
1000 KW Caterpillar Egen	Natural Gas	lb/hp-hr	0.004408	0.004166	0.000529	4.62E-06	0.0003018	0.00030179	0.000302	7.79E-05	1.0998	0.0041	0	1	0.00

Notes
(1) NOx, CO, VOC, and PMF-10 Emission Factors for Boilers < 100 MMBtu from ETI Combustion Analysis June 2015
(2) All other emission factors for natural gas boilers taken from AP-42 Tables 1.4-1 & 1.4-2
(3) Emission Factors for Space & Water Heaters taken from AP-42 Tables 1.4-1 & 1.4-2
(4) Emission Factors for 2 SLB engine taken from AP-42 Table 3.2-1
(5) NOx, CO, VOC, CO2, and CH4 emission factors for Caterpillar Egens taken from Caterpillar Manufacturer data
(6) SO2, PMF, PMF-10, PMF-2.5, PMC, and N2O Emission factors for Caterpillar Egens taken from AP-42 Table 3.2-1 and converted using manufacturer fuel data
(7) Assume PMF=PMF-10=PMF-2.5
(8) CO2e emission rate calculated by multiplying each GHG (CO2, CH4, N2O) by its Global Warming Potential (GWP) and adding them together
(9) CO2 GWP = 1; CH4 GWP = 25; N2O GWP = 298 [40 CFR 98]

Table C-5 Hazardous Air Pollutant (HAP) Emissions From Combustion Sources
ACP Northampton Compressor Station - Northampton County, North Carolina

Annual HAP Emissions (lb/yr)								
Quantity @ ACP-3		1	1	1	1	1	1	1
Pollutant	HAP?	Solar Centaur 40 Turbine	Solar Centaur 50L Turbine	Solar Taurus 70 Turbine	Boiler < 100 MMBtu	Boiler < 100 MMBtu	Boiler < 100 MMBtu	1000 KW Caterpillar Egen
1,1,2,2-Tetrachloroethane	Yes							0.024
1,1,2-Trichloroethane	Yes							0.019
1,1-Dichloroethane	Yes							0.014
1,2,3-Trimethylbenzene	No							0.013
1,2,4-Trimethylbenzene	No							0.040
1,2-Dichloroethane	Yes							0.015
1,2-Dichloropropane	Yes							0.016
1,3,5-Trimethylbenzene	No							0.006
1,3-Butadiene	Yes							0.295
1,3-Dichloropropene	Yes							0.016
2,2,4-Trimethylpentane	Yes							0.305
2-Methylnaphthalene	No				0.001	0.000	0.000	0.008
3-Methylchloranthrene	No				0.000	0.000	0.000	
7,12-Dimethylbenz(a)anthracene	No				0.001	0.000	0.000	
Acenaphthene	No				0.000	0.000	0.000	0.000
Acenaphthylene	No				0.000	0.000	0.000	0.001
Acetaldehyde	Yes							2.796
Acrolein	Yes							2.803
Anthracene	No				0.000	0.000	0.000	0.000
Benz(a)anthracene	No				0.000	0.000	0.000	0.000
Benzene	Yes				0.114	0.009	0.004	0.699
Benzo(a)pyrene	No				0.000	0.000	0.000	0.000
Benzo(b)fluoranthene	No				0.000	0.000	0.000	0.000
Benzo(e)pyrene	No							0.000
Benzo(g,h,i)perylene	No				0.000	0.000	0.000	0.000
Benzo(k)fluoranthene	No				0.000	0.000	0.000	0.000
Biphenyl	Yes							0.001
Butane	No				113.622	9.018	3.607	1.711
Butyr/Isobutyraldehyde	No							0.157
Carbon Tetrachloride	Yes							0.022
Chlorobenzene	Yes							0.016
Chloroethane	Yes							
Chloroform	Yes							0.017
Chrysene	No				0.000	0.000	0.000	0.000
Cyclohexane	No							0.111
Cyclopentane	No							0.034
Dibenzo(a,h)anthracene	No				0.000	0.000	0.000	
Dichlorobenzene	Yes				0.065	0.005	0.002	
Ethane	No				167.728	13.312	5.325	25.544
Ethylbenzene	Yes							0.039
Ethylene Dibromide	Yes							0.026
Fluoranthene	No				0.000	0.000	0.000	0.000
Fluorene	No				0.000	0.000	0.000	0.001
Formaldehyde	Yes	541.000	664.779	992.029	4.058	0.322	0.129	19.888
Hexane (or n-Hexane)	Yes				97.391	7.729	3.092	0.160
Indeno(1,2,3-c,d)pyrene	No				0.000	0.000	0.000	0.000
Isobutane	No							1.351
Methanol	Yes							0.894
Methylcyclohexane	No							0.122
Methylene Chloride	Yes							0.053
n-Nonane	No							0.011
n-Octane	No							0.027
Naphthalene	Yes				0.033	0.003	0.001	0.035
PAH	Yes							0.048
Pentane (or n-Pentane)	No				140.675	11.165	4.466	0.551
Perylene	No							0.000
Phenanthrene	No				0.001	0.000	0.000	0.001
Phenol	Yes							0.015
Propane	No				86.569	6.871	2.748	10.340
Propylene Oxide	Yes							
Pyrene	No				0.000	0.000	0.000	0.000
Styrene	Yes							0.020
Tetrachloroethane	No							
Toluene	Yes				0.184	0.015	0.006	0.347
Vinyl Chloride	Yes							0.009
Xylene	Yes							0.097
Arsenic	Yes				0.011	0.001	0.000	
Barium	No				0.238	0.019	0.008	
Beryllium	Yes				0.001	0.000	0.000	
Cadmium	Yes				0.060	0.005	0.002	

Table C-5 Hazardous Air Pollutant (HAP) Emissions From Combustion Sources
ACP Northampton Compressor Station - Northampton County, North Carolina

Annual HAP Emissions (lb/yr)								
Quantity @ ACP-3		**1**	**1**	**1**	**1**	**1**	**1**	**1**
Pollutant	**HAP?**	**Solar Centaur 40 Turbine**	**Solar Centaur 50L Turbine**	**Solar Taurus 70 Turbine**	**Boiler < 100 MMBtu**	**Boiler < 100 MMBtu**	**Boiler < 100 MMBtu**	**1000 KW Caterpillar Egen**
Chromium	Yes				0.076	0.006	0.002	
Cobalt	Yes				0.005	0.000	0.000	
Copper	No				0.046	0.004	0.001	
Manganese	Yes				0.021	0.002	0.001	
Mercury	Yes				0.014	0.001	0.000	
Molybdenum	No				0.060	0.005	0.002	
Nickel	Yes				0.114	0.009	0.004	
Selenium	Yes				0.001	0.000	0.000	
Vanadium	No				0.124	0.010	0.004	
Zinc	No				1.569	0.125	0.050	
Lead	Yes				0.027	0.002	0.001	
Total HAPs		572.934	704.019	1050.586				
Total HAP/unit (lb/yr)		**572.934**	**704.019**	**1050.586**	**102**	**8.11**	**3.24**	**29**
Total HAP/unit (TPY)		**0.286**	**0.352**	**0.525**	**0.051**	**0.004**	**0.002**	**0.014**

Hazardous Air Pollutant

Notes:
(1) Emissions above are on a per unit basis
(2) Calculations for the Caterpillar emergency generator assume 100 hours of operation; all other calculations assume 8,760 hours of operation
(3) Heat rates for Solar Turbines taken from Solar Datasheets
(4) Solar turbines have a 50% HAP control efficiency due to the Oxidation Catalyst

Table C-6 Combustion Source HAP Emission Factors
ACP Northampton Compressor Station - Northampton County, North Carolina

Pollutant	HAP?	Emission Factors				
		Solar Centaur 40 Turbine	Solar Centaur 50L Turbine	Solar Taurus 70 Turbine	Boiler < 100 MMBtu	1000 KW Caterpillar Egen
		lb/MMBtu	lb/MMBtu	lb/MMBtu	lb/MMscf	lb/hp-hr
1,1,2,2-Tetrachloroethane	Yes					1.7E-07
1,1,2-Trichloroethane	Yes					1.3E-07
1,1-Dichloroethane	Yes					9.9E-08
1,2,3-Trimethylbenzene	No					9.0E-08
1,2,4-Trimethylbenzene	No					2.8E-07
1,2-Dichloroethane	Yes					1.1E-07
1,2-Dichloropropane	Yes					1.1E-07
1,3,5-Trimethylbenzene	No					4.6E-08
1,3-Butadiene	Yes					2.1E-06
1,3-Dichloropropene	Yes					1.1E-07
2,2,4-Trimethylpentane	Yes					2.2E-06
2-Methylnaphthalene	No				2.4E-05	5.4E-08
3-Methylchloranthrene	No				1.8E-06	
7,12-Dimethylbenz(a)anthracene	No				1.6E-05	
Acenaphthene	No				1.8E-06	3.4E-09
Acenaphthylene	No				1.8E-06	8.1E-09
Acetaldehyde	Yes					2.0E-05
Acrolein	Yes					2.0E-05
Anthracene	No				2.4E-06	1.8E-09
Benz(a)anthracene	No				1.8E-06	8.5E-10
Benzene	Yes				2.1E-03	4.9E-06
Benzo(a)pyrene	No				1.2E-06	1.4E-11
Benzo(b)fluoranthene	No				1.8E-06	2.2E-11
Benzo(e)pyrene	No					6.0E-11
Benzo(g,h,i)perylene	No				1.2E-06	6.3E-11
Benzo(k)fluoranthene	No				1.8E-06	1.1E-11
Biphenyl	Yes					1.0E-08
Butane	No				2.1E+00	1.2E-05
Butyr/Isobutyraldehyde	No					1.1E-06
Carbon Tetrachloride	Yes					1.5E-07
Chlorobenzene	Yes					1.1E-07
Chloroethane	Yes					
Chloroform	Yes					1.2E-07
Chrysene	No				1.8E-06	1.7E-09
Cyclohexane	No					7.8E-07
Cyclopentane	No					2.4E-07
Dibenzo(a,h)anthracene	No				1.2E-06	
Dichlorobenzene	Yes				1.2E-03	
Ethane	No				3.1E+00	1.8E-04
Ethylbenzene	Yes					2.7E-07
Ethylene Dibromide	Yes					1.9E-07
Fluoranthene	No				3.0E-06	9.2E-10
Fluorene	No				2.8E-06	4.3E-09
Formaldehyde	Yes	2.9E-03	2.9E-03	2.9E-03	7.5E-02	1.4E-04
Hexane (or n-Hexane)	Yes				1.8E+00	1.1E-06
Indeno(1,2,3-c,d)pyrene	No				1.8E-06	2.5E-11
Isobutane	No					9.5E-06
Methanol	Yes					6.3E-06
Methylcyclohexane	No					8.6E-07
Methylene Chloride	Yes					3.7E-07
n-Nonane	No					7.8E-08
n-Octane	No					1.9E-07
Naphthalene	Yes				6.1E-04	2.5E-07
PAH	Yes					3.4E-07
Pentane (or n-Pentane)	No				2.6E+00	3.9E-06
Perylene	No					1.3E-11
Phenanthrene	No				1.7E-05	9.0E-09
Phenol	Yes					1.1E-07
Propane	No				1.6E+00	7.3E-05
Propylene Oxide	Yes					
Pyrene	No				5.0E-06	1.5E-09
Styrene	Yes					1.4E-07
Tetrachloroethane	No					
Toluene	Yes				3.4E-03	2.5E-06
Vinyl Chloride+A32	Yes					6.3E-08
Xylene	Yes					6.8E-07
Arsenic	Yes				2.0E-04	
Barium	No				4.4E-03	
Beryllium	Yes				1.2E-05	
Cadmium	Yes				1.1E-03	

Table C-6 Combustion Source HAP Emission Factors

ACP Northampton Compressor Station - Northampton County, North Carolina

Pollutant	HAP?	Emission Factors				
		Solar Centaur 40 Turbine	Solar Centaur 50L Turbine	Solar Taurus 70 Turbine	Boiler < 100 MMBtu	1000 KW Caterpillar Egen
		lb/MMBtu	lb/MMBtu	lb/MMBtu	lb/MMscf	lb/hp-hr
Chromium	Yes				1.4E-03	
Cobalt	Yes				8.4E-05	
Copper	No				8.5E-04	
Manganese	Yes				3.8E-04	
Mercury	Yes				2.6E-04	
Molybdenum	No				1.1E-03	
Nickel	Yes				2.1E-03	
Selenium	Yes				2.4E-05	
Vanadium	No				2.3E-03	
Zinc	No				2.9E-02	
Lead	Yes				5.0E-04	
Total HAPs		3.1E-03	3.1E-03	3.1E-03		

Hazardous Air Pollutant

Notes:
(1) Emission factors for Solar and Capstone natural gas turbines from AP-42 Table 3.1-3
(2) Emission factors for natural gas boilers from AP-42 Tables 1.4-2, 1.4-3, and 1.4-4
(3) Emission factors for 2 SLB natural gas engines and Caterpillar natural gas emergency generators taken from AP-42 Table 3.2-1
(4) Emission factors for Solar natural gas turbines and Caterpillar natural gas emergency generators converted using 1 KWh = 3412 Btu and 1 kw = 1.341 hp
(5) Emission Factors (lb/MMBtu) for Formaldehyde and Total HAPs for Solar Turbines from Solar PIL 168

Table C-7 Potential Emissions From Fugitive Leaks
ACP Northampton Compressor Station - Northampton County, North Carolina

Fugitive Emissions (FUG)

Source Designation:	FUG-02

Operational Parameters:

Annual Hours of Operation (hr/yr):	8,760

Compressor Fugitive Emissions Rate

Equipment	Service	CH_4 Emission Factor[1] ton/comp-hr	CH_4 Weight Fraction[1]	Fug Emission Rate tpy
Solar Turbine	Gas	2.67E-02	0.934	250.2

1. Default methane basis and emission factor taken from Table 6-6 of Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Gas Industry, API, August 2009.
2. Sample calculations: Hours of operation (hr/yr) * EF (ton / compressor -hr) / Methane Fraction

Pipeline Natural Gas Fugitive Emissions

Equipment	Service	Emission Factor[1] lb/hr/source	Source Count[2]	Total HC Potential Emissions lb/hr	Total HC Potential Emissions tpy	VOC Weight Fraction	VOC Emissions tpy	CO_2 Weight Fraction	CO_2 Emissions tpy	CH_4 Weight Fraction	CH_4 Emissions tpy	HAP Weight Fraction	HAP Emissions tpy
Valves	Gas	4.50E-03	646	2.91	12.7	0.026	0.334	0.0271	0.345	0.895	11.4	1.48E-03	1.88E-02
Compressors	Gas	5.71E+01	3	171	751	0.026	19.7	0.0271	20.4	0.895	672	1.48E-03	1.11E+00
Pump Seals	Gas	2.40E-03		0.00	0.00	0.026	0.00	0.0271	0.00	0.895	0.00	1.48E-03	0.00E+00
Others (compressors and others)	Gas	8.80E-03		0.00	0.00	0.026	0.00	0.0271	0.00	0.895	0.00	1.48E-03	0.00E+00
Connectors	Gas	2.00E-04	1	2.00E-04	8.76E-04	0.026	2.30E-05	0.0271	2.38E-05	0.895	7.84E-04	1.48E-03	1.30E-06
Flanges	Gas	3.90E-04	340	0.133	0.581	0.026	0.015	0.0271	0.016	0.895	0.520	1.48E-03	8.59E-04
Open-ended lines	Gas	2.00E-03		0.00	0.00	0.026	0.00	0.0271	0.00	0.895	0.00	1.48E-03	0.00E+00
			Total	174	764	-	20.0	-	20.7	-	683	-	1.13E+00

1. EPA Protocol for Equipment Leaks Emissions Estimate (EPA-453/R-95-017) Table 2-4: Oil and Gas Production Operations Emission Factors.
2. Component count based on Basic Systems Engineering Estimate.

Sample Calculations:

Potential Emissions (lb/hr) = Emission Factor (lb/hr/source) * Source Count

Potential Emissions (tons/yr) = $(lb/hr)_{Potential}$ × Hours of Operation (hr/yr) × (1 ton/2,000 lb)

Table C-8 Tank Emissions
ACP Northampton Compressor Station - Northampton County, North Carolina

Source Designation:	TK-1, TK-2, TK-3

Tank Parameters

Source	Type of Tank	Contents	Capacity (gal)	Throughput gal/yr	Tank Diam. ft	Tank Length ft	Paint Color	Paint Condition
TK-1	Horizontal, fixed	Produced Fluids	2,500	12,500	4.61	20	Light Grey	Good
TK-2	Horizontal, fixed	Lube Oil	1,500	7,500	4.12	10	Light Grey	Good

Total Emissions

Source	VOC Emissions							
	Flashing Losses		Working Losses		Breathing Losses		Total Losses	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
TK-1[1]	--	--	--	--	--	--	0.080	0.350
TK-2[2]	NA	NA	7.76E-07	3.40E-06	2.24E-06	9.80E-06	3.01E-06	1.32E-05

1. Losses were calculated for TK-1 using E&P Tanks Software. See attached for output.
2. Losses were calculated for TK-2 using EPA's TANKS 4.09d software with default breather vent settings.
3. Losses (Emissions) from TK-3 8,000-gallon Ammonia tank assumed to be insignficant.

Table C-9 Project Potential Emissions

ACP Northampton Compressor Station - Northampton County, North Carolina

Combustion Sources	ID	Criteria Pollutants (tpy)								GHG Emissions (tpy)				Ammonia (tpy)	HAP (tpy)
		NOx	CO	VOC	SO2	PMF	PMF-10	PMF-2.5	PMC	CO2	CH4	N2O	CO2e	NH3	Total HAP
Solar Taurus 70 Turbine	CT-01	8.35	13.1	0.775	1.43	2.42	2.42	2.42	5.99	50035	4.00	1.26	50511	5.77	0.525
Solar Centaur 50L Turbine	CT-02	5.20	8.19	0.477	0.894	1.51	1.51	1.51	3.74	31329	2.50	0.788	31627	3.58	0.352
Solar Centaur 40 Turbine	CT-03	4.44	7.29	0.405	0.760	1.29	1.29	1.29	3.18	26747	2.14	0.671	27000	3.02	0.286
Caterpillar G3516 Egen	EG-01	0.312	0.295	0.0375	0.0003	0.0214	0.0214	0.0214	0.006	77.9	0.290	0.0	85.1	0	0.0143
Boiler	WH-01	1.35	2.27	0.149	0.0162	0.0514	0.0514	0.0514	0.154	3246	0.0622	0.0595	3266	0	0.0511
Fugitive Leaks - Blowdowns	FUG-01	-	-	18.84	-	-	-	-	-	19.49	643		16,092	-	1.063
Fugitive Leaks - Piping	FUG-02	-	-	20.0	-	-	-	-	-	20.7	683	-	17,106	-	1.13
Accumulator Tank	TK-1	-	-	0.350	-	-	-	-	-	-	-	-	-	-	-
Hydrocarbon (Waste Oil) Tank	TK-2	-	-	1.32E-05	-	-	-	-	-	-	-	-	-	-	-
Total (tons/yr)		**19.7**	**31.1**	**41.1**	**3.10**	**5.3**	**5.3**	**5.3**	**13.1**	**111,475**	**1,335**	**2.78**	**145,686**	**12.4**	**3.42**

```
*****************************************************************************************
*     Project Setup Information                                                         *
*****************************************************************************************
Project File              : M:\Projects\D\Dominion\Atlantic Coastal Pipeline and Supply Header
Pipeline\Draft Rule 13 - APC1\Emission Calcs\TK-1 - Produced Fluids Tank.ept
Flowsheet Selection       : Oil Tank with Separator
Calculation Method        : AP42
Control Efficiency        : 100.0%
Known Separator Stream    : Low Pressure Gas
Entering Air Composition  : No

Date                      : 2015.07.13


*****************************************************************************************
*     Data Input                                                                        *
*****************************************************************************************

Separator Pressure        : 552.00[psig]
Separator Temperature     : 77.00[F]
Molar GOR                 : 0.0500
Ambient Pressure          : 14.70[psia]
Ambient Temperature       : 70.00[F]
C10+ SG                   : 0.8990
C10+ MW                   : 166.00

-- Low Pressure Gas ------------------------------------------------------------------
   No.    Component            mol %
   1      H2S                  0.0000
   2      O2                   0.0000
   3      CO2                  1.0410
   4      N2                   0.9940
   5      C1                  94.2060
   6      C2                   2.9230
   7      C3                   0.5460
   8      i-C4                 0.0790
   9      n-C4                 0.0840
   10     i-C5                 0.0240
   11     n-C5                 0.0220
   12     C6                   0.0320
   13     C7+                  0.0490
   14     Benzene              0.0000
   15     Toluene              0.0000
   16     E-Benzene            0.0000
   17     Xylenes              0.0000
   18     n-C6                 0.0000
   19     224Trimethylp        0.0000
```

```
   C7+ Molar Ratio: C7  :     C8  :     C9  :     C10+
                    1.0000    1.0000    1.0000    1.0000

-- Sales Oil -----------------------------------------------------------------
Production Rate           : 0.8[bbl/day]
Days of Annual Operation  : 365 [days/year]
API Gravity               : 46.0
Reid Vapor Pressure       : 7.70[psia]
Bulk Temperature          : 80.00[F]

-- Tank and Shell Data -------------------------------------------------------
Diameter                  : 5.08[ft]
Shell Height              : 11.90[ft]
Cone Roof Slope           : 0.06
Average Liquid Height     : 2.50[ft]
Vent Pressure Range       : 0.06[psi]
Solar Absorbance          : 0.54

-- Meteorological Data -------------------------------------------------------
Page  1------------------------------------------------------------- E&P TANK
City                      : Charleston, WV
Ambient Pressure          : 14.70[psia]
Ambient Temperature       : 70.00[F]
Min Ambient Temperature   : 44.00[F]
Max Ambient Temperature   : 65.50[F]
Total Solar Insolation    : 1123.00[Btu/ft^2*day]


*****************************************************************************
*     Calculation Results                                                   *
*****************************************************************************

-- Emission Summary ----------------------------------------------------------
Item                Uncontrolled   Uncontrolled
                    [ton/yr]       [lb/hr]
Total HAPs          0.010          0.002
Total HC            0.425          0.097
VOCs, C2+           0.383          0.087
VOCs, C3+           0.350          0.080

Uncontrolled Recovery Info.
       Vapor        21.2300 x1E-3  [MSCFD]
       HC Vapor     19.9800 x1E-3  [MSCFD]
       GOR          26.05          [SCF/bbl]

-- Emission Composition ------------------------------------------------------
No  Component       Uncontrolled   Uncontrolled
```

		[ton/yr]	[lb/hr]
1	H2S	0.002	0.000
2	O2	0.000	0.000
3	CO2	0.022	0.005
4	N2	0.001	0.000
5	C1	0.043	0.010
6	C2	0.032	0.007
7	C3	0.083	0.019
8	i-C4	0.033	0.008
9	n-C4	0.102	0.023
10	i-C5	0.039	0.009
11	n-C5	0.047	0.011
12	C6	0.015	0.003
13	C7	0.014	0.003
14	C8	0.006	0.001
15	C9	0.001	0.000
16	C10+	0.000	0.000
17	Benzene	0.001	0.000
18	Toluene	0.000	0.000
19	E-Benzene	0.000	0.000
20	Xylenes	0.000	0.000
21	n-C6	0.010	0.002
22	224Trimethylp	0.000	0.000
	Total	0.451	0.103

-- Stream Data ----------

No.	Component	MW	LP Oil mol %	Flash Oil mol %	Sale Oil mol %	Flash Gas mol %	W&S Gas mol %	Total Emissions mol %
1	H2S	34.80	0.0508	0.0349	0.0030	0.6834	0.1835	0.5755
2	O2	32.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	CO2	44.01	0.2437	0.0907	0.0000	6.3467	0.0001	4.9770
4	N2	28.01	0.0102	0.0005	0.0000	0.3990	0.0001	0.3129
5	C1	16.04	0.9543	0.1475	0.0000	33.1362	0.0001	25.9849
6	C2	30.07	0.6701	0.3531	0.0000	13.3133	0.0001	10.4401
7	C3	44.10	2.1827	1.7648	0.4600	18.8508	16.8782	18.4251
8	i-C4	58.12	1.1269	1.0450	0.6191	4.3934	9.6293	5.5234
9	n-C4	58.12	4.6091	4.4100	3.1320	12.5490	33.6645	17.1061
10	i-C5	72.15	3.1066	3.0997	2.8099	3.3810	11.9899	5.2389
11	n-C5	72.15	5.0558	5.0823	4.8107	4.0000	14.9972	6.3734
12	C6	86.16	4.1726	4.2520	4.3657	1.0044	4.1822	1.6902
13	C7	100.20	10.3655	10.6043	11.1500	0.8388	3.6780	1.4516

14	C8	114.23	10.8426	11.1074	11.7774	0.2806	1.2761	0.4954
15	C9	128.28	5.5127	5.6497	6.0063	0.0497	0.2328	0.0892
16	C10+	166.00	45.9695	47.1217	50.1681	0.0099	0.0486	0.0182
17	Benzene	78.11	0.5685	0.5808	0.6057	0.0778	0.3297	0.1322
18	Toluene	92.13	0.2132	0.2183	0.2311	0.0082	0.0362	0.0142
19	E-Benzene	106.17	0.0711	0.0729	0.0774	0.0009	0.0041	0.0016

20	Xylenes	106.17	0.6802	0.6971	0.7408	0.0075	0.0344	0.0133
21	n-C6	86.18	3.5939	3.6672	3.7955	0.6694	2.8351	1.1368
22	224Trimethylp	114.24	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	MW		123.89	126.03	129.50	38.64	63.78	44.07
	Stream Mole Ratio		1.0000	0.9755	0.9688	0.0245	0.0067	0.0312
	Heating Value	[BTU/SCF]				2044.13	3547.91	2368.67
	Gas Gravity	[Gas/Air]				1.33	2.20	1.52
	Bubble Pt. @ 100F	[psia]	56.28	19.66	6.19			
	RVP @ 100F	[psia]	126.75	78.89	38.81			
	Spec. Gravity @ 100F		0.800	0.803	0.810			

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	TK-2
City:	
State:	West Virginia
Company:	
Type of Tank:	Horizontal Tank
Description:	Used Oil Aboveground Storage Tank

Tank Dimensions

Shell Length (ft):	15.05
Diameter (ft):	4.12
Volume (gallons):	1,500.00
Turnovers:	5.00
Net Throughput(gal/yr):	7,500.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	Gray/Light
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Charleston, West Virginia (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

TK-2 - Horizontal Tank

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Used Oil	All	61.57	52.97	70.18	57.22	0.0001	0.0001	0.0001	380.0000			200.00	

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

TK-2 - Horizontal Tank

Annual Emission Calcaulations	
Standing Losses (lb):	0.0196
Vapor Space Volume (cu ft):	127.7971
Vapor Density (lb/cu ft):	0.0000
Vapor Space Expansion Factor:	0.0618
Vented Vapor Saturation Factor:	1.0000
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	127.7971
Tank Diameter (ft):	4.1200
Effective Diameter (ft):	8.8875
Vapor Space Outage (ft):	2.0600
Tank Shell Length (ft):	15.0500
Vapor Density	
Vapor Density (lb/cu ft):	0.0000
Vapor Molecular Weight (lb/lb-mole):	380.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0001
Daily Avg. Liquid Surface Temp. (deg. R):	521.2427
Daily Average Ambient Temp. (deg. F):	54.9833
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	516.8933
Tank Paint Solar Absorptance (Shell):	0.5400
Daily Total Solar Insulation Factor (Btu/sqft day):	1,250.5726
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0618
Daily Vapor Temperature Range (deg. R):	34.4127
Daily Vapor Pressure Range (psia):	0.0000
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0001
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0001
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0001
Daily Avg. Liquid Surface Temp. (deg R):	521.2427
Daily Min. Liquid Surface Temp. (deg R):	512.6395
Daily Max. Liquid Surface Temp. (deg R):	529.8458
Daily Ambient Temp. Range (deg. R):	21.5333
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	1.0000
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0001
Vapor Space Outage (ft):	2.0600
Working Losses (lb):	0.0068
Vapor Molecular Weight (lb/lb-mole):	380.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0001
Annual Net Throughput (gal/yr.):	7,500.0000
Annual Turnovers:	5.0000
Turnover Factor:	1.0000
Tank Diameter (ft):	4.1200

Working Loss Product Factor:	1.0000
Total Losses (lb):	0.0264

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

TK-2 - Horizontal Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Used Oil	0.01	0.02	0.03

APPENDIX D

VENDOR SPECIFICATIONS

Solar Turbines Emissions Estimates

Taurus 70-10802S

Assumptions: pipeline natural gas, sea level, 4"/4" inlet/outlet losses, nominal performance

50% load																
Temp, F	HP	fuel flow, mmbtu/hr LHV	Thermal Eff, %	NOx (ppm)	NOx (lb/hr)	CO (ppm)	CO (lb/hr)	UHC (ppm)	UHC (lb/hr)	VOC (ppm)	VOC (lb/hr)	CO2 lb/hr	PM10/2.5 lb/mmbtu	PM10/2.5 lb/hr	Exhaust Temp (F)	Exhaust Flow (lb/hr)
0	5941	63.54	23.79	9	2.3	25	3.9	25	2.2	2.5	0.2	8321	0.02	1.4	910	199,373
59	5430	56.92	24.27	9	2.0	25	3.4	25	2.0	2.5	0.2	7407	0.02	1.3	991	170,275
100	4341	49.58	22.28	9	1.7	25	3.0	25	1.7	2.5	0.2	6336	0.02	1.1	1045	149576
75% load																
Temp, F	HP	fuel flow, mmbtu/hr LHV	Thermal Eff, %	NOx (ppm)	NOx (lb/hr)	CO (ppm)	CO (lb/hr)	UHC (ppm)	UHC (lb/hr)	VOC (ppm)	VOC (lb/hr)	CO2 lb/hr	PM10/2.5 lb/mmbtu	PM10/2.5 lb/hr	Exhaust Temp (F)	Exhaust Flow (lb/hr)
0	8912	76.91	29.49	9	2.8	25	4.7	25	2.7	2.5	0.3	10063	0.02	1.7	898	224,735
59	8145	68.47	30.27	9	2.5	25	4.2	25	2.4	2.5	0.2	8905	0.02	1.5	957	194,658
100	6512	59.08	28.05	9	2.1	25	3.5	25	2.0	2.5	0.2	7544	0.02	1.3	1019	165855
100% load																
Temp, F	HP	fuel flow, mmbtu/hr LHV	Thermal Eff, %	NOx (ppm)	NOx (lb/hr)	CO (ppm)	CO (lb/hr)	UHC (ppm)	UHC (lb/hr)	VOC (ppm)	VOC (lb/hr)	CO2 lb/hr	PM10/2.5 lb/mmbtu	PM10/2.5 lb/hr	Exhaust Temp (F)	Exhaust Flow (lb/hr)
0	11882	87.27	34.64	9	3.2	25	5.3	25	3.1	2.5	0.3	11411	0.02	1.9	864	366,922
59	10860	79.24	34.87	9	2.8	25	4.8	25	2.8	2.5	0.3	10301	0.02	1.7	908	334,207
100	8683	68.40	32.30	9	2.4	25	4.1	25	2.3	2.5	0.2	8730	0.02	1.5	945	298619

Solar Turbines Emissions Estimates

Centaur 50-6200LS

Assumptions: pipeline natural gas, 150' elevation, 5"/8" inlet/outlet losses, nominal performance

Temp, F	HP	fuel flow, mmbtu/hr LHV	Thermal Eff, %	NOx (ppm)	NOx (lb/hr)	CO (ppm)	CO (lb/hr)	UHC (ppm)	UHC (lb/hr)	VOC (ppm)	VOC (lb/hr)	CO2 lb/hr	PM10/2.5 lb/mmbtu	PM10/2.5 lb/hr	Exhaust Temp (F)	Exhaust Flow (lb/hr)
50% load																
0	3321	39.27	21.54	9	1.4	25	2.4	25	1.4	2.5	0.1	5155	0.02	0.9	837	139,384
59	3006	35.20	21.73	9	1.3	25	2.1	25	1.2	2.5	0.1	4591	0.02	0.8	915	119,683
100	2426	30.76	20.06	9	1.1	25	1.8	25	1.0	2.5	0.1	3938	0.02	0.7	966	103305
75% load																
Temp, F	HP	fuel flow, mmbtu/hr LHV	Thermal Eff, %	NOx (ppm)	NOx (lb/hr)	CO (ppm)	CO (lb/hr)	UHC (ppm)	UHC (lb/hr)	VOC (ppm)	VOC (lb/hr)	CO2 lb/hr	PM10/2.5 lb/mmbtu	PM10/2.5 lb/hr	Exhaust Temp (F)	Exhaust Flow (lb/hr)
0	4981	47.21	26.85	9	1.7	25	2.9	25	1.6	2.5	0.2	6189	0.02	1.0	849	152,889
59	4509	42.05	27.29	9	1.5	25	2.5	25	1.5	2.5	0.2	5479	0.02	0.9	908	133,124
100	3639	36.70	25.23	9	1.3	25	2.2	25	1.2	2.5	0.1	4695	0.02	0.8	959	115664
100% load																
Temp, F	HP	fuel flow, mmbtu/hr LHV	Thermal Eff, %	NOx (ppm)	NOx (lb/hr)	CO (ppm)	CO (lb/hr)	UHC (ppm)	UHC (lb/hr)	VOC (ppm)	VOC (lb/hr)	CO2 lb/hr	PM10/2.5 lb/mmbtu	PM10/2.5 lb/hr	Exhaust Temp (F)	Exhaust Flow (lb/hr)
0	6642	54.55	30.98	9	2.0	25	3.3	25	1.9	2.5	0.2	7145	0.02	1.2	871	161,184
59	6012	50.72	30.16	9	1.8	25	3.1	25	1.7	2.5	0.2	6803	0.02	1.1	956	144,840
100	4852	44.43	27.78	9	1.6	25	2.6	25	1.5	2.5	0.2	5679	0.02	1.0	1004	127484

Solar Turbines Emissions Estimates

Centaur 40-4700S

Assumptions: pipeline natural gas, sea level, 4"/4" inlet/outlet losses, nominal performance

50% load																
Temp, F	HP	fuel flow, mmbtu/hr LHV	Thermal Eff, %	NOx (ppm)	NOx (lb/hr)	CO (ppm)	CO (lb/hr)	UHC (ppm)	UHC (lb/hr)	VOC (ppm)	VOC (lb/hr)	CO2 lb/hr	PM10/2.5 lb/mmbtu	PM10/2.5 lb/hr	Exhaust Temp (F)	Exhaust Flow (lb/hr)
0	2511	32.29	19.78	25	3.2	50	3.9	25	1.1	2.5	0.1	4259	0.02	0.7	726	140,550
59	2278	29.85	19.41	25	3.0	50	3.6	25	1.0	2.5	0.1	3911	0.02	0.7	818	122,244
100	1735	26.09	16.92	25	2.6	50	3.1	25	0.9	2.5	0.1	3355	0.02	0.6	876	106980
75% load																
Temp, F	HP	fuel flow, mmbtu/hr LHV	Thermal Eff, %	NOx (ppm)	NOx (lb/hr)	CO (ppm)	CO (lb/hr)	UHC (ppm)	UHC (lb/hr)	VOC (ppm)	VOC (lb/hr)	CO2 lb/hr	PM10/2.5 lb/mmbtu	PM10/2.5 lb/hr	Exhaust Temp (F)	Exhaust Flow (lb/hr)
0	3767	39.31	24.39	25	3.9	50	4.8	25	1.4	2.5	0.1	5177	0.02	0.9	736	156,668
59	3417	35.41	24.55	25	3.5	50	4.3	25	1.2	2.5	0.1	4635	0.02	0.8	810	136,464
100	2602	30.78	21.51	25	3.0	50	3.7	25	1.0	2.5	0.1	3955	0.02	0.7	873	117366
100% load																
Temp, F	HP	fuel flow, mmbtu/hr LHV	Thermal Eff, %	NOx (ppm)	NOx (lb/hr)	CO (ppm)	CO (lb/hr)	UHC (ppm)	UHC (lb/hr)	VOC (ppm)	VOC (lb/hr)	CO2 lb/hr	PM10/2.5 lb/mmbtu	PM10/2.5 lb/hr	Exhaust Temp (F)	Exhaust Flow (lb/hr)
0	5023	46.39	30.23	25	4.7	50	5.7	25	1.6	2.5	0.2	6100	0.02	1.0	779	164,995
59	4556	42.27	29.51	25	4.2	50	5.1	25	1.5	2.5	0.2	5526	0.02	0.9	840	148,793
100	3470	35.07	27.45	25	3.4	50	4.2	25	1.2	2.5	0.1	4503	0.02	0.8	873	127331

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PIL 167
Product Information Letter

SoLoNOx Products: Emissions in Non-SoLoNOx Modes

Leslie Witherspoon
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PURPOSE

Solar's gas turbine dry low NOx emissions combustion systems, known as *SoLoNOx*™, have been developed to provide the lowest emissions possible during normal operating conditions. In order to optimize the performance of the turbine, the combustion and fuel systems are designed to reduce NOx, CO and unburned hydrocarbons (UHC) without penalizing stability or transient capabilities. At very low load and cold temperature extremes, the *SoLoNOx* system must be controlled differently in order to assure stable operation. The required adjustments to the turbine controls at these conditions cause emissions to increase.

The purpose of this Product Information Letter is to provide emissions estimates, and in some cases warrantable emissions for NOx, CO and UHC, at off-design conditions.

Historically, regulatory agencies have not required a specific emissions level to be met at low load or cold ambient operating conditions, but have asked what emissions levels are expected. The expected values are necessary to appropriately estimate emissions for annual emissions inventory purposes and for New Source Review applicability determinations and permitting.

COLD AMBIENT EMISSIONS ESTIMATES

Solar's standard temperature range warranty for gas turbines with *SoLoNOx* combustion is ≥ 0°F (–20°C). The *Titan*™ 250 is an exception, with a lower standard warranty at ≥ –20°F (–29°C). At ambient temperatures below 0°F, many of Solar's turbine engine models are controlled to increase pilot fuel to improve flame stability and emissions are higher. Without the increase in pilot fuel at temperatures below 0°F the engines may exhibit combustor rumble, as operation may be near the lean stability limit.

If a cold ambient emissions warranty is requested, a new production turbine configured with the latest combustion hardware is required. For most models this refers to the inclusion of Cold Ambient Fuel Control Logic.

Emissions warranties are not offered for ambient temperatures below –20°F (–29°C). In addition, cold ambient emissions warranties cannot be offered for the *Centaur*® 40 turbine.

Table 1 provides expected and warrantable (upon Solar's documented approval) emissions levels for Solar's *SoLoNOx* combustion turbines. All emissions levels are in ppm at 15% O_2. Refer to Product Information Letter 205 for *Mercury*™ 50 turbine emissions estimates.

For information on the availability and approvals for cold ambient temperature emissions warranties, please contact Solar's sales representatives.

Table 2 summarizes "expected" emissions levels for ambient temperatures below 0°F (–20°C) for Solar's *SoLoNOx* turbines that do not have current production hardware or for new production hardware that is not equipped with the cold ambient fuel control logic. The emissions levels are extrapolated from San Diego factory tests and may vary at extreme temperatures and as a result of variations in other parameters, such as fuel composition, fuel quality, etc.

For more conservative NOx emissions estimate for new equipment, customers can refer to the New Source Performance Standard (NSPS) 40CFR60, subpart KKKK, where the allowable NOx emissions level for ambient temperatures < 0°F (–20°F) is 150 ppm NOx at 15% O_2. For pre-February 18, 2005, *SoLoNOx* combustion turbines subject to 40CFR60 subpart GG, a conservative estimate is the appropriate subpart GG emissions level. Subpart GG levels range from 150 to 214 ppm NOx at 15% O_2 depending on the turbine model.

Table 3 summarizes emissions levels for ambient temperatures below –20°F (–29°C) for the *Titan* 250.

Table 1. Warrantable Emissions Between 0°F and –20°F (–20° to –29°C) for New Production

Turbine Model	Fuel System	Fuel	Applicable Load	NOx, ppm	CO, ppm	UHC, ppm
Centaur 50	Gas Only	Gas	50 to 100% load	42	100	50
	Dual Fuel	Gas	50 to 100% load	72	100	50
Taurus™ 60	Gas Only or Dual Fuel	Gas	50 to 100% load	42	100	50
Taurus 65	Gas Only	Gas	50 to 100% load	42	100	50
Taurus 70	Gas Only or Dual Fuel	Gas	50 to 100% load	42	100	50
Mars® 90	Gas Only	Gas	50 to 100% load	42	100	50
Mars 100	Gas Only or Dual Fuel	Gas	50 to 100% load	42	100	50
Titan 130	Gas Only or Dual Fuel	Gas	50 to 100% load	42	100	50
Titan 250	Gas Only	Gas	40 to 100% load	25	50	25
	Gas Only	Gas	40 to 100% load	15	25	25
Centaur 50	Dual Fuel	Liquid	65 to 100% load	120	150	75
Taurus 60	Dual Fuel	Liquid	65 to 100% load	120	150	75
Taurus 70	Dual Fuel	Liquid	65 to 100% load	120	150	75
Mars 100	Dual Fuel	Liquid	65 to 100% load	120	150	75
Titan 130	Dual Fuel	Liquid	65 to 100% load	120	150	75

Table 2. Expected Emissions below 0°F (–20°C) for SoLoNOx Combustion Turbines

Turbine Model	Fuel System	Fuel	Applicable Load	NOx, ppm	CO, ppm	UHC, ppm
Centaur 40	Gas Only or Dual Fuel	Gas	80 to 100% load	120	150	50
Centaur 50	Gas Only	Gas	50 to 100% load	120	150	50
	Dual Fuel	Gas	50 to 100% load	120	150	50
Taurus 60	Gas Only or Dual Fuel	Gas	50 to 100% load	120	150	50
Taurus 65	Gas Only	Gas	50 to 100% load	120	150	50
Taurus 70	Gas Only or Dual Fuel	Gas	50 to 100% load	120	150	50
Mars 90	Gas Only	Gas	80 to 100% load	120	150	50
Mars 100	Gas Only or Dual Fuel	Gas	50 to 100% load	120	150	50
Titan 130	Gas Only or Dual Fuel	Gas	50 to 100% load	120	150	50
Centaur 40	Dual Fuel	Liquid	80 to 100% load	120	150	75
Centaur 50	Dual Fuel	Liquid	65 to 100% load	120	150	75
Taurus 60	Dual Fuel	Liquid	65 to 100% load	120	150	75
Taurus 70	Dual Fuel	Liquid	65 to 100% load	120	150	75
Mars 100	Dual Fuel	Liquid	65 to 100% load	120	150	75
Titan 130	Dual Fuel	Liquid	65 to 100% load	120	150	75

Table 3. Expected Emissions below –20°F (–29°C) for the Titan 250 SoLoNOx Combustion Turbine

Turbine Model	Fuel System	Fuel	Applicable Load	NOx, ppm	CO, ppm	UHC, ppm
Titan 250	Gas Only	Gas	40 to 100% load	70	150	50

COLD AMBIENT PERMITTING STRATEGY

There are several permitting options to consider when permitting in cold ambient climates. Customers can use a tiered permitting approach or choose to permit a single emission rate over all temperatures. Historically, most construction and operating permits were silent on the ambient temperature boundaries for *SoLoNOx* operation.

Some customers have used a tiered permitting strategy. For purposes of compliance and annual emissions inventories, a digital thermometer is installed to record ambient temperature. The amount of time is recorded that the ambient temperature falls below 0°F. The amount of time below 0°F is then used with the emissions estimates shown in Tables 1 and 2 to estimate "actual" emissions during sub-zero operation.

A conservative alternative to using the NOx values in Tables 1, 2 and 3 is to reference 40CFR60 subpart KKKK, which allows 150 ppm NOx at 15% O_2 for sub-zero operation.

For customers who wish to permit at a single emission rate over all ambient temperatures, inlet air heating can be used to raise the engine inlet air temperature (T_1) above 0°F. With inlet air heating to keep T_1 above 0°F, standard emission warranty levels may be offered.

Inlet air heating technology options include an electric resistance heater, an inlet air to exhaust heat exchanger and a glycol heat exchanger.

If an emissions warranty is desired and ambient temperatures are commonly below –20°F (–29°C), inlet air heating can be used to raise the turbine inlet temperature (T_1) to at least –20°F. In such cases, the values shown in Table 1 can be warranted for new production.

EMISSIONS ESTIMATES IN NON-SOLONOX MODE (LOW LOAD)

At operating loads < 50% (<40% load for the *Titan* 250) on natural gas fuel and < 65% (< 80% load for *Centaur* 40) on liquid fuels, *SoLoNOx* engines are controlled to increase stability and transient response capability. The control steps that are required affect emissions in two ways: 1) pilot fuel flow is increased, increasing NOx emissions, and 2) airflow through the combustor is increased, increasing CO emissions. Note that the load levels are approximate. Engine controls are triggered either by power output for single-shaft engines or gas producer speed for two-shaft engines.

A conservative method for estimating emissions of NOx at low loads is to use the applicable NSPS: 40CFR60 subpart GG or KKKK. For projects that commence construction after February 18, 2005, subpart KKKK is the applicable NSPS and contains a NOx level of 150 ppm @ 15% O_2 for operating loads less than 75%.

Table 4 provides estimates of NOx, CO, and UHC emissions when operating in non-SoLoNOx mode for natural gas or liquid fuel. The estimated emissions can be assumed to vary linearly as load is decreased from just below 50% load for natural gas (or 65% load for liquid fuel) to idle.

The estimates in Table 4 apply for any product for gas only or dual fuel systems using pipeline quality natural gas. Refer to Product Information Letter 205 for *Mercury* 50 emissions estimates.

Table 4. Estimated Emissions in non-SoLoNOx Mode

Ambient	Fuel System	Engine Load	NOx, ppm	CO, ppm	UHC, ppm
***Centaur* 40/50, *Taurus* 60/65/70, *Mars* 90/100, *Titan* 130**					
≥ –20°F (–29°C)	Natural Gas	Less than 50%	70	8,000	800
		Idle	50	10,000	1,000
< –20°F (–29°C)	Natural Gas	Less than 50%	120	8,000	800
		Idle	120	10,000	1,000
***Titan* 250**					
≥ –20°F (–29°C)	Natural Gas	Less than 40%	50	25	20
		Idle	50	2,000	200
< –20°F (–29°C)	Natural Gas	Less than 40%	70	150	50
		Idle	70	2,000	200
***Centaur* 50, *Taurus* 60/70, *Mars* 100, *Titan* 130**					
≥ –20°F (–29°C)	Liquid	Less than 65%	120	1,000	100
		Idle	120	10,000	3,000
< –20°F (–29°C)	Liquid	Less than 65%	120	1,000	150
		Idle	120	10,000	3,000
***Centaur* 40**					
≥ –20°F (–29°C)	Liquid	Less than 80%	120	1,000	100
		Idle	120	10,000	3,000
< –20°F (–29°C)	Liquid	Less than 80%	120	1,000	150
		Idle	120	10,000	3,000

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PIL 168
Product Information Letter

Volatile Organic Compound, Sulfur Dioxide, and Formaldehyde Emission Estimates

Leslie Witherspoon
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PURPOSE

This Product Information Letter summarizes methods that are available to estimate emissions of volatile organic compounds (VOC), sulfur dioxide (SO_2), and formaldehyde from gas turbines. Emissions estimates of these pollutants are often necessary during the air permitting process.

INTRODUCTION

In absence of site-specific or representative source test data, Solar refers customers to a United States Environmental Protection Agency (EPA) document titled "AP-42" or other appropriate EPA reference documents. AP-42 is a collection of emission factors for different emission sources. The emission factors found in AP-42 provide a generally accepted way of estimating emissions when more representative data are not available. The most recent version of AP-42 (dated April 2000) can be found at:

http://www.epa.gov/ttn/chief/ap42/ch03/index.html

Solar does not typically warranty the emission rates for VOC, SO_2 or formaldehyde.

Volatile Organic Compounds

Many permitting agencies require gas turbine users to estimate emissions of VOC, a subpart of the unburned hydrocarbon (UHC) emissions, during the air permitting process. Volatile organic compounds, non-methane hydrocarbons (NMHC), and reactive organic gases (ROG) are some of the many ways of referring to the non-methane (and non-ethane) portion of an "unburned hydrocarbon" emission estimate.

For natural gas fuel, Solar's customers use 10-20% of the UHC emission rate to represent VOC emissions. The estimate of 10-20% is based on a ratio of total non-methane hydrocarbons to total organic compounds. The use of 10-20% provides a conservative estimate of VOC emissions. The balance of the UHC is assumed to be primarily methane.

For liquid fuel, it is appropriate to estimate that 100% of the UHC emission estimate is VOC.

Sulfur Dioxide

Sulfur dioxide emissions are produced by conversion of sulfur in the fuel to SO_2. Since Solar does not control the amount of sulfur in the fuel, we are unable to predict SO_2 emissions without a site fuel composition analysis. Customers generally estimate SO_2 emissions with a mass balance calculation by assuming that any sulfur in the fuel will convert to SO_2. For reference, the typical mass balance equation is shown below.

Variables: wt % of sulfur in fuel
Btu/lb fuel (LHV*)
MMBtu/hr fuel flow (LHV)

$$\frac{\text{lb } SO_2}{\text{hr}} = \left(\frac{\text{wt\% Sulfur}}{100}\right)\left(\frac{\text{lb fuel}}{\text{Btu}}\right)\left(\frac{10^6 \text{ Btu}}{\text{MMBtu}}\right)\left(\frac{\text{MMBtu fuel}}{\text{hr}}\right)\left(\frac{\text{MW } SO_2}{\text{MW Sulfur}}\right)$$

As an alternative to the mass balance calculation, EPA's AP-42 document can be used. AP-42 (Table 3.1-2a, April 2000) suggests emission factors of 0.0034 lb/MMBtu for gas fuel (HHV*) and 0.033 lb/MMBtu for liquid fuel (HHV).

*LHV = Lower Heating Value; HHV = Higher Heating Value

Formaldehyde

In gas turbines, formaldehyde emissions are a result of incomplete combustion. Formaldehyde

in the exhaust stream is unstable and very difficult to measure. In addition to turbine characteristics including combustor design, size, maintenance history, and load profile, the formaldehyde emission level is also affected by:

- Ambient temperature
- Humidity
- Atmospheric pressure
- Fuel quality
- Formaldehyde concentration in the ambient air
- Test method measurement variability
- Operational factors

The emission factor data in Table 1 is an excerpt from an EPA memo: "Revised HAP Emission Factors for Stationary Combustion Turbines, 8/22/03." The memo presents hazardous air pollutant (HAP) emission factor data in several categories including: mean, median, maximum, and minimum. The emission factors in the memo are a compilation of the HAP data EPA collected during the Maximum Achievable Control Technology (MACT) standard development process. The emission factor documentation shows there is a high degree of variability in formaldehyde emissions from gas turbines, depending on the manufacturer, rating size of equipment, combustor design, and testing events. To estimate formaldehyde emissions from gas turbines, users should use the emission factor(s) that best represent the gas turbines actual / planned operating profile. Refer to the memo for alternative emission factors.

Table 1. EPA's Total HAP and Formaldehyde Emission Factors for <50 MW Lean-Premix Gas Turbines burning Natural Gas

(Source: Revised HAP Emission Factors for Stationary Combustion Turbines, OAR-2002-0060, IV-B-09, 8/22/03)

Pollutant	Engine Load	95% Upper Confidence of Mean, lb/MMBtu HHV	95% Upper Confidence of Data, lb/MMBtu HHV	Memo Reference
Total HAP	> 90%	0.00144	0.00258	Table 19
Total HAP	All	0.00160	0.00305	Table 16
Formaldehyde	> 90%	0.00127	0.00241	Table 19
Formaldehyde	All	0.00143	0.00288	Table 16

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PIL 170
Product Information Letter

Emission Estimates at Start-up, Shutdown, and Commissioning for SoLoNOx Combustion Products

Leslie Witherspoon
Solar Turbines Incorporated

PURPOSE

The purpose of this Product Information Letter (PIL) is to provide emission estimates for start-up and shutdown events for *Solar*® gas turbines with *SoLoNOx*™ dry low emissions combustion systems. The commissioning process is also discussed.

INTRODUCTION

The information presented in this document is representative for both generator set (GS) and compressor set/mechanical drive (CS/MD) combustion turbine applications. Operation of duct burners and/or any add-on control equipment is not accounted for in the emissions estimates. Emissions related to the start-up, shutdown, and commissioning of combustion turbines will not be guaranteed or warranted.

Combustion turbine start-up occurs in one of three modes: cold, warm, or hot. On large, utility size, combustion turbines, the start-up time varies by the "mode". The start-up duration for a hot, warm, or cold *Solar* turbine is less than 10 minutes in simple-cycle and most combined heat and power applications.

Heat recovery steam generator (HRSG) steam pressure is usually 250 psig or less. At 250 psig or less, thermal stress within the HRSG is minimized and, therefore, firing ramp-up is not limited. However, some combined heat and power plant applications will desire or dictate longer start-up times, therefore emissions assuming a 60-minute start are also estimated.

A typical shutdown for a *Solar* turbine is <10 minutes. Emissions estimates for an elongated shutdown, 30-minutes, are also included.

Start-up and shutdown emissions estimates for the *Mercury*™ 50 engine are found in PIL 205.

For start-up and shutdown emissions estimates for conventional combustion turbines, landfill gas, digester gas, or other alternative fuel applications, contact Solar's Environmental Programs Department.

START-UP SEQUENCE

The start-up sequence, or getting to *SoLoNOx* combustion mode, takes three steps:

1. Purge-crank
2. Ignition and acceleration to idle
3. Loading / thermal stabilization

During the "purge-crank" step, rotation of the turbine shaft is accomplished with a starter motor to remove any residual fuel gas in the engine flow path and exhaust. During "igni-

tion and acceleration to idle," fuel is introduced into the combustor and ignited in a diffusion flame mode and the engine rotor is accelerated to idle speed.

The third step consists of applying up to 50% load[1] while allowing the combustion flame to transition and stabilize. Once 50% load is achieved, the turbine transitions to *SoLoNOx* combustion mode and the engine control system begins to hold the combustion primary zone temperature and limit pilot fuel to achieve the targeted nitrogen oxides (NOx), carbon monoxide (CO), and unburned hydrocarbons (UHC) emission levels.

Steps 2 and 3 are short-term transient conditions making up less than 10 minutes.

SHUTDOWN PROCESS

Normal, planned cool down/shutdown duration varies by engine model. The *Centaur*® 40, *Centaur* 50, *Taurus*™ 60, and *Taurus* 65 engines take about 5 minutes. The *Taurus* 70, *Mars*® 90 and 100, *Titan*™ 130 and *Titan* 250 engines take about 10 minutes. Typically, once the shutdown process starts, the emissions will remain in *SoLoNOx* mode for approximately 90 seconds and move into a transitional mode for the balance of the estimated shutdown time (assuming the unit was operating at full-load).

START-UP AND SHUTDOWN EMISSIONS ESTIMATES

Tables 1 through 5 summarize the estimated pounds of emissions per start-up and shutdown event for each product. Emissions estimates are presented for both GS and CS/MD applications on both natural gas and liquid fuel (diesel #2). The emissions estimates are calculated using empirical exhaust characteristics.

COMMISSIONING EMISSIONS

Commissioning generally takes place over a two-week period. Static testing, where no combustion occurs, usually requires one week and no emissions are expected. Dynamic testing, where combustion will occur, will see the engine start and shutdown a number of times and a variety of loads will be placed on the system. It is impossible to predict how long the turbine will run and in what combustion / emissions mode it will be running. The dynamic testing period is generally followed by one to two days of "tune-up" during which the turbine is running at various loads, most likely within low emissions mode (warranted emissions range).

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[1] 40% load for the *Titan* 250 engine on natural gas. 65% load for all engines on liquid fuel (except 80% load for the *Centaur* 40).

Table 1. Estimation of Start-up and Shutdown Emissions (lbs/event) for SoLoNOx Generator Set Applications
10 Minute Start-up and 10 Minute Shutdown
Natural Gas Fuel

Data will NOT be warranted under any circumstances

	Centaur 40 4701S				Centaur 50 6201S				Taurus 60 7901S				Taurus 65 8401S			
	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)
Total Emissions per Start (lbs)	0.6	58.1	3.3	359	0.8	75.0	4.3	454	0.8	78.5	4.5	482	0.9	85.8	4.9	523
Total Emissions per Shutdown (lbs)	0.3	25.5	1.5	160	0.4	31.1	1.8	194	0.4	34.7	2.0	217	0.4	38.2	2.2	237

	Taurus 70 10801S				Mars 90 13002S GSC				Mars 100 16002S GSC				Titan 130 20501S				Titan 250 30002S			
	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)
Total Emissions per Start (lbs)	1.1	103.9	5.9	634	1.4	129.0	7.4	868	1.6	151.2	8.6	952	2.1	195.6	11.2	1,194	2.5	22.7	1.5	1,925
Total Emissions per Shutdown (lbs)	1.3	110.7	6.3	689	1.7	147.9	8.4	912	1.9	166.8	9.5	1,026	2.4	210.0	12.0	1,303	3.0	19.9	1.5	1,993

Assumes ISO conditions: 59F, 60% RH, sea level, no losses

Assumes unit is operating at full load prior to shutdown.

Assumes natural gas fuel; ES 9-98 compliant.

Table 2. Estimation of Start-up and Shutdown Emissions (lbs/event) for SoLoNOx Generator Set Applications
60 Minute Start-up and 30 Minute Shutdown
Natural Gas Fuel

Data will NOT be warranted under any circumstances

	Centaur 40 4701S				Centaur 50 6201S				Taurus 60 7901S				Taurus 65 8401S			
	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)
Total Emissions per Start (lbs)	4.1	219.4	13.0	3,420	5.0	272.4	16.1	4,219	5.7	299.8	17.8	4,780	6.1	326.5	19.3	5,074
Total Emissions per Shutdown (lbs)	1.8	121.1	7.1	1,442	2.3	163.3	9.5	1,834	2.5	163.5	9.6	1,994	2.6	177.2	10.4	2,119

	Taurus 70 10801S				Mars 90 13002S				Mars 100 16002S				Titan 130 20501S				Titan 250 30002S			
	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)
Total Emissions per Start (lbs)	7.6	410.3	24.2	6,164	10.5	570.8	33.7	8,641	11.3	583.5	34.6	9,691	13.8	740.4	43.8	11,495	14.6	75.5	7.3	16,253
Total Emissions per Shutdown (lbs)	3.3	223.0	13.0	2,588	4.3	277.0	16.2	3,685	4.8	308.1	18.0	4,056	6.0	405.3	23.7	4,826	6.2	52.6	4.1	7,222

Assumes ISO conditions: 59F, 60% RH, sea level, no losses.

Assumes unit is operating at full load prior to shutdown.

Assumes natural gas fuel; ES 9-98 compliant.

Table 3. Estimation of Start-up and Shutdown Emissions (lbs/event) for SoLoNOx CS/MD Applications

10 Minute Start-up and 10 Minute Shutdown

Natural Gas Fuel

Data will NOT be warranted under any circumstances

	Centaur 40 4702S				Centaur 50 6102S				Taurus 60 7802S			
	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)
Total Emissions per Start (lbs)	0.7	64.4	3.7	392	0.8	69.1	4.0	469	0.7	64.3	3.7	410
Total Emissions per Shutdown (lbs)	0.3	30.2	1.7	181	0.4	35.4	2.0	217	0.4	33.0	1.9	204

	Taurus 70 10302S				Mars 90 13002S CSMD				Mars 100 16002S CSMD				Titan 130 20502S				Titan 250 30002S			
	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)
Total Emissions per Start (lbs)	0.8	73.1	4.2	519	1.2	109.3	6.2	805	1.4	123.5	7.1	829	1.9	176.9	10.1	1,161	2.6	26.2	1.7	1,794
Total Emissions per Shutdown (lbs)	1.1	93.4	5.3	575	1.5	132.6	7.6	817	1.7	149.2	8.5	920	2.4	207.6	11.9	1,272	2.9	19.1	1.4	1,918

Assumes ISO conditions: 59F, 60% RH, sea level, no losses.

Assumes unit is operating at full load prior to shutdown.

Assumes natural gas fuel; ES 9-98 compliant.

Table 4. Estimation of Start-up and Shutdown Emissions (lbs/event) for SoLoNOx Generator Set
10 Minute Start-up and 10 Minute Shutdown
Liquid Fuel (Diesel #2)

Data will NOT be warranted under any circumstances

	Centaur 40 4701S				Centaur 50 6201S				Taurus 60 7901S			
	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)
Total Emissions per Start (lbs)	1.3	44.5	7.4	473	1.7	59.0	9.8	601	1.7	59.8	9.9	636
Total Emissions per Shutdown (lbs)	0.6	17.3	2.8	211	0.7	21.2	3.4	256	0.8	23.5	3.8	286

	Taurus 70 10801S				Mars 100 16002S GSC				Titan 130 20501S			
	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)
Total Emissions per Start (lbs)	2.3	78.5	13.0	823	3.4	114.1	18.8	1,239	4.3	147.5	24.4	1,547
Total Emissions per Shutdown (lbs)	2.5	73.6	12.0	889	3.8	111.4	18.1	1,331	4.7	139.1	22.6	1,677

Assumes ISO conditions: 59F, 60% RH, sea level, no losses.

Assumes unit is operating at full load prior to shutdown.

Assumes #2 Diesel fuel; ES 9-98 compliant.

Table 5. Estimation of Start-up and Shutdown Emissions (lbs/event) for SoLoNOx Generator Set
60 Minute Start-up and 30 Minute Shutdown
Liquid Fuel (Diesel #2)

Data will NOT be warranted under any circumstances

	Centaur 40 4701S				Centaur 50 6201S				Taurus 60 7901S			
	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)
Total Emissions per Start (lbs)	11.7	194.7	30.9	4,255	15.2	271.9	43.3	5,302	14.7	282.6	45.0	5,962
Total Emissions per Shutdown (lbs)	4.4	84.7	13.6	1,816	6.7	164.3	27.0	2,334	6.3	159.0	26.0	2,515

	Taurus 70 10801S				Mars 100 16002S				Titan 130 20501S			
	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)	NOx (lbs)	CO (lbs)	UHC (lbs)	CO2 (lbs)
Total Emissions per Start (lbs)	18.4	360.3	57.4	7,375	29.1	552.0	87.7	11,685	34.4	677.0	108.0	13,731
Total Emissions per Shutdown (lbs)	8.0	207.8	34.1	3,156	12.3	302.6	49.4	4,970	15.0	388.5	63.7	5,876

Assumes ISO conditions: 59F, 60% RH, sea level, no losses.

Assumes unit is operating at full load prior to shutdown.

Assumes #2 Diesel fuel; ES 9-98 compliant.

SCR CATALYST DESIGN DATASHEET

ENQUIRY DETAILS	
Enquiry Number	32237
Revision	0
Date of Revision	26-May-2015
Project Name	Atlantic Coast Pipeline
Project Location	Northampton
Application	Simple Cycle
Number of SCRs	17

PROCESS DATA													
Design Case			Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9	Case 10	Case 11	Case 12
Customer Design Case			Centaur 40	Centaur 40	Centaur 50L	Centaur 50L	Taurus 60	Taurus 60	Taurus 70	Taurus 70	Mars 100	Mars 100	Titan 130	Titan 130
Percent Load		Percent	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Fuel Case		Percent	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
EXHAUST GAS EMISSIONS DATA (BEFORE COOLING)														
Exhaust Gas Mass Flowrate, Wet		lb/h	164994	127403	161184	127484	186860	151704	247255	179824	367228	289445	437956	341226
Exhaust Gas Volumetric Flowrate, Wet		ACFM	87269	73508	91761	80971	107807	96052	139492	112383	207193	177388	254955	215260
Exhaust Gas Temperature		degrees F	779.0	873.0	871.0	1004.0	888.0	999.0	858.0	980.0	859.0	953.0	900.0	993.0
Exhaust Gas Composition														
Component	MW													
O2	31.999	vol% (wet)	15.78	15.29	14.80	14.08	14.50	13.93	14.39	13.88	14.73	14.23	14.40	13.69
H2O	18.015	vol% (wet)	4.67	8.15	5.55	9.21	5.81	9.34	5.91	9.39	5.61	9.08	5.90	9.55
N2	28.013	vol% (wet)	76.23	73.41	75.66	73.01	75.78	72.96	75.74	72.93	75.85	73.06	75.75	72.88
CO2	44.010	vol% (wet)	2.41	2.27	2.86	2.63	3.00	2.90	3.05	2.93	2.90	2.76	3.04	3.01
Ar	39.948	vol% (wet)	0.91	0.86	0.91	0.87	0.91	0.87	0.91	0.87	0.91	0.87	0.91	0.87
			100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Emissions from the Source	@ %O2	15												
Reference applicable for ppmvd and mg/Nm3 (dry)														
Nox as NO2		ppmvd	25.00	25.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00
Nox as NO2		lb/h	4.66	3.44	1.95	1.55	2.38	1.89	3.20	2.26	4.51	3.44	5.66	4.43
CO		ppmvd	50.00	50.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
CO		lb/h	5.67	4.19	3.31	2.63	4.02	3.20	5.42	3.83	7.62	5.81	9.58	7.49
SO2		ppmvd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SO2		lb/h	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SO3		ppmvd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SO3		lb/h	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
COOLING AIR DATA														
Cooling Air Mass Flowrate, Wet		lb/h	7181.2	27800.1	29270.9	57444.9	38705.3	67013.0	40077.2	73373.3	60074.6	104237.6	98593.9	147099.4
Cooling Air Volumetric Flowrate, Wet		ACFM	1387	6438	5653	13303	7475	15518	7739	16991	11601	24139	19040	34064
Ambient Air Temperature		degrees F	0.00	100.00	0.00	100.00	0.00	100.00	0.00	100.00	0.00	100.00	0.00	100.00
Relative Humidity		Percent	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00
EXHAUST GAS EMISSIONS DATA (AFTER COOLING)														
Exhaust Gas Mass Flowrate, Wet		lb/h	172175	155203	190455	184929	225585	218717	287332	253197	427303	393683	536550	488325
Exhaust Gas Volumetric Flowrate, Wet		ACFM	88898	80938	98384	96292	116559	113920	148553	131945	220785	205195	277243	254464
Exhaust Gas Temperature (after cooling)		degrees F	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
Exhaust Gas Composition														
Component	MW													
O2	31.999	vol% (wet)	15.99	16.15	15.73	15.95	15.59	15.82	15.29	15.68	15.59	15.78	15.59	15.62
H2O	18.015	vol% (wet)	4.48	7.38	4.72	7.55	4.84	7.67	5.11	7.79	4.84	7.70	4.84	7.84
N2	28.013	vol% (wet)	76.30	73.71	76.21	73.65	76.16	73.61	76.05	73.55	76.15	73.59	76.16	73.54
CO2	44.010	vol% (wet)	2.31	1.87	2.43	1.97	2.50	2.03	2.63	2.10	2.50	2.04	2.49	2.12
Ar	39.948	vol% (wet)	0.91	0.88	0.91	0.88	0.91	0.88	0.91	0.88	0.91	0.88	0.91	0.88
			100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Emissions from the Source	@ %O2	15												
Reference applicable for ppmvd and mg/Nm3 (dry)														
Nox as NO2		ppmvd	25.00	25.06	9.00	9.04	9.00	9.04	9.00	9.04	9.00	9.03	9.00	9.04
Nox as NO2		lb/h	4.66	3.44	1.95	1.55	2.38	1.89	3.20	2.26	4.51	3.44	5.66	4.43
CO		ppmvd	50.00	50.13	25.00	25.11	25.00	25.11	25.00	25.10	25.00	25.09	25.00	25.11
CO		lb/h	5.67	4.19	3.31	2.63	4.02	3.20	5.42	3.83	7.62	5.81	9.58	7.49
SO2		ppmvd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SO2		lb/h	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SO3		ppmvd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SO3		lb/h	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Particulates		kg/h	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trace Elements		mg/Nm3 (dry)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC		ppmvd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Amount of Nox as NO2		Percent	50	50	50	50	50	50	50	50	50	50	50	50
Nox Reduction		Percent	80.00	80.00	44.44	44.44	44.44	44.44	44.44	44.44	44.44	44.44	44.44	44.44
Dilution Air Required		lb/h	327	327	327	327	327	327	327	327	327	327	327	327
Dilution Air Required		SCFM	68	68	68	68	68	68	68	68	68	68	68	68
Aqueous Ammonia Requirement		lb/h	11	8	6	5	7	6	10	7	14	10	17	13
Aqueous Ammonia Requirement		gal/month	1046	772	569	452	692	551	932	659	1311	1000	1648	1286
Total Mass Injected by SCR		lb/h	338	335	333	332	334	333	337	334	341	337	344	340
Exhaust Gas Mass Flowrate, Wet at SCR catalyst		lb/h	172513.1	155538.2	190787.8	185260.6	225919.5	219049.7	287668.9	253531.1	427643.2	394020.0	536894.1	488665.8
Exhaust Gas Vol Flowrate, Wet at SCR Catalyst		ACFM	89073	81113	98556	96465	116732	114093	148727	132119	220962	205371	277421	254642
Performance Warranties	@ %O2	15												
Reference applicable for ppmvd and mg/Nm3 (dry)														
Nox as NO2		ppmvd	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Nox as NO2		lb/h	0.93	0.69	1.09	0.86	1.32	1.05	1.78	1.26	2.50	1.91	3.15	2.46
NH3 Slip		ppmvd	10.00	10.03	10.00	10.04	10.00	10.04	10.00	10.04	10.00	10.04	10.00	10.04
NH3 Slip		lb/h	0.69	0.51	0.80	0.64	0.98	0.78	1.32	0.93	1.85	1.41	2.33	1.82
AFCU Selected			AQEL15	AQEL15	AQEL15	AQEL15	AQEL15	AQEL15	AQEL15	AQEL15	AQEL15	AQEL15	AQEL15	AQEL15
SO2 to SO3 Conversion		Percent	VTA	VTA	VTA	VTA	VTA	VTA	VTA	VTA	VTA	VTA	VTA	VTA
Pressure Drop across the catalyst		inH2O	VTA	VTA	VTA	VTA	VTA	VTA	VTA	VTA	VTA	VTA	VTA	VTA

** VTA = Vendor to Advise*

SITE/AMBIENT CONDITIONS		
Design Ambient Temperature	100	degrees F
Design Ambient Pressure	407	inH2O
Site Elevation	1500	ft
Gauge Duct Pressure	20.00	inH2O
Relative Humidity	60	Percent

AFCU DESIGN		
Reagent	Aqueous Ammonia	
Reagent Concentration	19.00	%w/w

G3516

GAS ENGINE TECHNICAL DATA

CATERPILLAR®

ENGINE SPEED (rpm):	1800	RATING STRATEGY:	STANDARD
COMPRESSION RATIO:	11:1	APPLICATION:	Genset
AFTERCOOLER TYPE:	SCAC	RATING LEVEL:	STANDBY
AFTERCOOLER WATER INLET (°F):	130	FUEL:	Nat Gas
JACKET WATER OUTLET (°F):	210	FUEL SYSTEM:	LPG IMPCO
ASPIRATION:	TA		WITH AIR FUEL RATIO CONTROL
COOLING SYSTEM:	JW+OC, AC	FUEL PRESSURE RANGE(psig):	1.5-5.0
CONTROL SYSTEM:	EIS	FUEL METHANE NUMBER:	85
EXHAUST MANIFOLD:	ASWC	FUEL LHV (Btu/scf):	905
COMBUSTION:	Low Emission	ALTITUDE CAPABILITY AT 77°F INLET AIR TEMP. (ft):	3501
NOx EMISSION LEVEL (g/bhp-hr NOx):	2.0	POWER FACTOR:	0.8
		VOLTAGE(V):	240-480

RATING		NOTES	LOAD	100%	75%	50%
GENSET POWER	(WITHOUT FAN)	(1)(2)	ekW	1000	750	500
GENSET POWER		(1)(2)	kVA	1250	937	625
ENGINE POWER	(WITHOUT FAN)	(2)	bhp	1416	1059	707
GENERATOR EFFICIENCY		(1)	%	94.7	95.0	94.8
GENSET EFFICIENCY(@ 1.0 Power Factor)	(ISO 3046/1)	(3)	%	31.7	30.5	28.1
THERMAL EFFICIENCY		(4)	%	52.4	54.7	58.6
TOTAL EFFICIENCY (@ 1.0 Power Factor)		(5)	%	84.1	85.2	86.7
ENGINE DATA						
GENSET FUEL CONSUMPTION	(ISO 3046/1)	(6)	Btu/ekW-hr	10917	11314	12254
GENSET FUEL CONSUMPTION	(NOMINAL)	(6)	Btu/ekW-hr	11128	11533	12492
ENGINE FUEL CONSUMPTION	(NOMINAL)	(6)	Btu/bhp-hr	7859	8170	8831
AIR FLOW (77°F, 14.7 psia)	(WET)	(7) (8)	ft3/min	2988	2240	1522
AIR FLOW	(WET)	(7) (8)	lb/hr	13248	9934	6747
FUEL FLOW (60°F, 14.7 psia)			scfm	205	159	115
COMPRESSOR OUT PRESSURE			in Hg(abs)	70.1	60.4	47.0
COMPRESSOR OUT TEMPERATURE			°F	309	269	201
AFTERCOOLER AIR OUT TEMPERATURE			°F	134	131	131
INLET MAN. PRESSURE		(9)	in Hg(abs)	62.6	48.5	34.9
INLET MAN. TEMPERATURE	(MEASURED IN PLENUM)	(10)	°F	138	135	134
TIMING		(11)	°BTDC	18	18	18
EXHAUST TEMPERATURE - ENGINE OUTLET		(12)	°F	876	873	879
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia)	(WET)	(13) (8)	ft3/min	8086	6062	4155
EXHAUST GAS MASS FLOW	(WET)	(13) (8)	lb/hr	13810	10371	7063
EMISSIONS DATA - ENGINE OUT						
NOx (as NO2)		(14)(15)	g/bhp-hr	2.00	2.00	2.00
CO		(14)(16)	g/bhp-hr	1.89	1.90	1.95
THC (mol. wt. of 15.84)		(14)(16)	g/bhp-hr	2.36	2.47	2.82
NMHC (mol. wt. of 15.84)		(14)(16)	g/bhp-hr	0.35	0.37	0.42
NMNEHC (VOCs) (mol. wt. of 15.84)		(14)(16)(17)	g/bhp-hr	0.24	0.25	0.28
HCHO (Formaldehyde)		(14)(16)	g/bhp-hr	0.28	0.28	0.28
CO2		(14)(16)	g/bhp-hr	499	507	525
EXHAUST OXYGEN		(14)(18)	% DRY	7.5	7.2	6.9
LAMBDA		(14)(18)		1.49	1.43	1.35
ENERGY BALANCE DATA						
LHV INPUT		(19)	Btu/min	185475	144166	104103
HEAT REJECTION TO JACKET WATER (JW)		(20)(27)	Btu/min	49148	41900	34467
HEAT REJECTION TO ATMOSPHERE		(21)	Btu/min	6831	5682	4553
HEAT REJECTION TO LUBE OIL (OC)		(22)(27)	Btu/min	8040	6854	5638
HEAT REJECTION TO EXHAUST (LHV TO 77°F)		(23)(24)	Btu/min	51104	38351	26562
HEAT REJECTION TO EXHAUST (LHV TO 248°F)		(23)	Btu/min	39125	29274	20234
HEAT REJECTION TO AFTERCOOLER (AC)		(25)(28)	Btu/min	9329	5510	1919
PUMP POWER		(26)	Btu/min	971	971	971

CONDITIONS AND DEFINITIONS

Engine rating obtained and presented in accordance with ISO 3046/1. (Standard reference conditions of 77°F, 29.60 in Hg barometric pressure.) No overload permitted at rating shown. Consult the altitude deration factor chart for applications that exceed the rated altitude or temperature.

Emission levels are at engine exhaust flange prior to any after treatment. Values are based on engine operating at steady state conditions, adjusted to the specified NOx level at 100% load. Tolerances specified are dependent upon fuel quality. Fuel methane number cannot vary more than ± 3.

For notes information consult page three.

FUEL USAGE GUIDE

CAT METHANE NUMBER	30	35	40	45	50	55	60	65	70	75	80	85
SET POINT TIMING	-	-	-	-	-	-	-	-	15	16	17	18
DERATION FACTOR	0	0	0	0	0	0	0	0	1	1	1	1

ALTITUDE DERATION FACTORS AT RATED SPEED

INLET AIR TEMP °F	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
130	1	1	0.99	0.96	0.92	0.89	0.85	0.82	0.79	0.76	0.73	0.70	0.67
120	1	1	1	0.97	0.94	0.90	0.87	0.83	0.80	0.77	0.74	0.71	0.68
110	1	1	1	0.99	0.95	0.92	0.88	0.85	0.81	0.78	0.75	0.72	0.69
100	1	1	1	1	0.97	0.93	0.90	0.86	0.83	0.80	0.76	0.73	0.70
90	1	1	1	1	0.99	0.95	0.91	0.88	0.84	0.81	0.78	0.75	0.72
80	1	1	1	1	1	0.97	0.93	0.89	0.86	0.83	0.79	0.76	0.73
70	1	1	1	1	1	0.99	0.95	0.91	0.88	0.84	0.81	0.78	0.74
60	1	1	1	1	1	1	0.97	0.93	0.89	0.86	0.82	0.79	0.76
50	1	1	1	1	1	1	0.99	0.95	0.91	0.87	0.84	0.81	0.77

ALTITUDE (FEET ABOVE SEA LEVEL)

AFTERCOOLER HEAT REJECTION FACTORS (ACHRF)

INLET AIR TEMP °F	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
130	1.40	1.46	1.54	1.61	1.68	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70
120	1.32	1.38	1.45	1.52	1.59	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62
110	1.23	1.30	1.37	1.44	1.51	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53
100	1.15	1.22	1.29	1.35	1.42	1.44	1.44	1.44	1.44	1.44	1.44	1.44	1.44
90	1.07	1.14	1.20	1.27	1.34	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36
80	1	1.06	1.12	1.19	1.25	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
70	1	1	1.04	1.10	1.17	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19
60	1	1	1	1.02	1.08	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
50	1	1	1	1	1	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02

ALTITUDE (FEET ABOVE SEA LEVEL)

FUEL USAGE GUIDE:

This table shows the derate factor and full load set point timing required for a given fuel. Note that deration and set point timing reduction may be required as the methane number decreases. Methane number is a scale to measure detonation characteristics of various fuels. The methane number of a fuel is determined by using the Caterpillar methane number calculation program.

ALTITUDE DERATION FACTORS:

This table shows the deration required for various air inlet temperatures and altitudes. Use this information along with the fuel usage guide chart to help determine actual engine power for your site.

ACTUAL ENGINE RATING:

To determine the actual rating of the engine at site conditions, one must consider separately, limitations due to fuel characteristics and air system limitations. The Fuel Usage Guide deration establishes fuel limitations. The Altitude/Temperature deration factors and RPC (reference the Caterpillar Methane Program) establish air system limitations. RPC comes into play when the Altitude/Temperature deration is less than 1.0 (100%). Under this condition, add the two factors together. When the site conditions do not require an Altitude/ Temperature derate (factor is 1.0), it is assumed the turbocharger has sufficient capability to overcome the low fuel relative power, and RPC is ignored. To determine the actual power available, take the lowest rating between 1) and 2).

1) Fuel Usage Guide Deration
2) 1-((1-Altitude/Temperature Deration) + (1-RPC))

AFTERCOOLER HEAT REJECTION FACTORS(ACHRF):

To maintain a constant air inlet manifold temperature, as the inlet air temperature goes up, so must the heat rejection. As altitude increases, the turbocharger must work harder to overcome the lower atmospheric pressure. This increases the amount of heat that must be removed from the inlet air by the aftercooler. Use the aftercooler heat rejection factor (ACHRF) to adjust for inlet air temp and altitude conditions. See note 28 for application of this factor in calculating the heat exchanger sizing criteria. Failure to properly account for these factors could result in detonation and cause the engine to shutdown or fail.

NOTES:

1. Generator efficiencies, power factor, and voltage are based on standard generator. [Genset Power (ekW) is calculated as: Engine Power (bkW) x Generator Efficiency], [Genset Power (kVA) is calculated as: Engine Power (bkW) x Generator Efficiency / Power Factor]
2. Rating is with two engine driven water pumps. Tolerance is (+)3, (-)0% of full load.
3. ISO 3046/1 Genset efficiency tolerance is (+)0, (-)5% of full load % efficiency value based on a 1.0 power factor.
4. Thermal Efficiency is calculated based on energy recovery from the jacket water, lube oil, and exhaust to 248°F with engine operation at ISO 3046/1 Genset Efficiency, and assumes unburned fuel is converted in an oxidation catalyst.
5. Total efficiency is calculated as: Genset Efficiency + Thermal Efficiency. Tolerance is ±10% of full load data.
6. ISO 3046/1 Genset fuel consumption tolerance is (+)5, (-)0% of full load data. Nominal genset and engine fuel consumption tolerance is ± 3.0% of full load data.
7. Air flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of ± 5 %.
8. Inlet and Exhaust Restrictions must not exceed A&I limits based on full load flow rates from the standard technical data sheet.
9. Inlet manifold pressure is a nominal value with a tolerance of ± 5 %.
10. Inlet manifold temperature is a nominal value with a tolerance of ± 9°F.
11. Timing indicated is for use with the minimum fuel methane number specified. Consult the appropriate fuel usage guide for timing at other methane numbers.
12. Exhaust temperature is a nominal value with a tolerance of (+)63°F, (-)54°F.
13. Exhaust flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of ± 6 %.
14. Emissions data is at engine exhaust flange prior to any after treatment.
15. NOx tolerances are ± 18% of specified value.
16. CO, CO2, THC, NMHC, NMNEHC, and HCHO values are "Not to Exceed" levels. THC, NMHC, and NMNEHC do not include aldehydes. An oxidation catalyst may be required to meet Federal, State or local CO or HC requirements.
17. VOCs - Volatile organic compounds as defined in US EPA 40 CFR 60, subpart JJJJ
18. Exhaust Oxygen tolerance is ± 0.5; Lambda tolerance is ± 0.05. Lambda and Exhaust Oxygen level are the result of adjusting the engine to operate at the specified NOx level.
19. LHV rate tolerance is ± 3.0%.
20. Heat rejection to jacket water value displayed includes heat to jacket water alone. Value is based on treated water. Tolerance is ± 10% of full load data.
21. Heat rejection to atmosphere based on treated water. Tolerance is ± 50% of full load data.
22. Lube oil heat rate based on treated water. Tolerance is ± 20% of full load data.
23. Exhaust heat rate based on treated water. Tolerance is ± 10% of full load data.
24. Heat rejection to exhaust (LHV to 77°F) value shown includes unburned fuel and is not intended to be used for sizing or recovery calculations.
25. Heat rejection to aftercooler based on treated water. Tolerance is ±5% of full load data.
26. Pump power includes engine driven jacket water and aftercooler water pumps. Engine brake power includes effects of pump power.
27. Total Jacket Water Circuit heat rejection is calculated as: (JW x 1.1) + (OC x 1.2). Heat exchanger sizing criterion is maximum circuit heat rejection at site conditions, with applied tolerances. A cooling system safety factor may be multiplied by the total circuit heat rejection to provide additional margin.
28. Total Aftercooler Circuit heat rejection is calculated as: AC x ACHRF x 1.05. Heat exchanger sizing criterion is maximum circuit heat rejection at site conditions, with applied tolerances. A cooling system safety factor may be multiplied by the total circuit heat rejection to provide additional margin.

ENGINE POWER (bhp):	1416	COOLING SYSTEM:	JW+OC, AC
ENGINE SPEED (rpm):	1800	AFTERCOOLER WATER INLET (°F):	130
EXHAUST MANIFOLD:	ASWC	JACKET WATER OUTLET (°F):	210

Free Field Mechanical and Exhaust Noise

SOUND PRESSURE LEVEL (dB)											
			Octave Band Center Frequency (OBCF)								
100% Load Data			dB(A)	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Mechanical Sound	Distance from the Engine (ft)	3.3	100	95	96.6	92.8	94	96.1	93.3	90.1	84.4
		23.0	90.4	85.4	87	83.2	84.4	86.5	83.7	80.5	74.8
		49.2	85.1	80.1	81.7	77.9	79.1	81.2	78.4	75.2	69.5
Exhaust Sound	Distance from the Engine (ft)	4.9	115.4	104.7	105.7	112.4	110.6	108.3	108.2	108	106.1
		23.0	102	92.4	95.4	100.2	96.7	95.4	94.7	94.6	91.8
		49.2	95.4	85.8	88.8	93.6	90	88.8	88.1	87.9	85.2

SOUND PARAMETER DEFINITION:

Data Variability Statement:

Sound data presented by Caterpillar has been measured in accordance with ISO 6798 in a Grade 3 test environment. Measurements made inaccordance with ISO 6798 will result in some amount of uncertainty. The uncertainties depend not only on the accuracies with which sound pressurelevels and measurement surface areas are determined, but also on the 'near-field error' which increases for smaller measurement distances and lowerfrequencies. The uncertainty for a Grade 3 test environment, that has a source that produces sounds that are uniformly distributed in frequency over thefrequency range of interest, is equal to 4 dB (A-weighted). This uncertainty is expressed as the largest value of the standard deviation.

APPENDIX E

SECRETARY OF STATE REGISTRATION

NORTH CAROLINA
Department of the Secretary of State

To all whom these presents shall come, Greetings:

I, Elaine F. Marshall, Secretary of State of the State of North Carolina, do hereby certify the following and hereto attached to be a true copy of

CERTIFICATE OF AUTHORITY

OF

ATLANTIC COAST PIPELINE, LLC

the original of which was filed in this office on the 3rd day of November, 2014.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal at the City of Raleigh, this 9th day of September, 2015.

Elaine F. Marshall

Secretary of State

Scan to verify online.

SOSID: 1410169
Date Filed: 11/3/2014 10:30:00 AM
Elaine F. Marshall
North Carolina Secretary of State

C2014 304 02235

State of North Carolina
Department of the Secretary of State

APPLICATION FOR CERTIFICATE OF AUTHORITY FOR LIMITED LIABILITY COMPANY

Pursuant to §57D-7-03 of the General Statutes of North Carolina, the undersigned limited liability company hereby applies for a Certificate of Authority to transact business in the State of North Carolina, and for that purpose submits the following:

1. The name of the limited liability company is Atlantic Coast Pipeline, LLC;

   and if the limited liability company name is unavailable for use in the State of North Carolina, the name the limited liability company wishes to use is _____.

2. The state or country under whose laws the limited liability company was formed is Delaware.

3. Principal office information: *(Select either a or b.)*

   a. ☒ The limited liability company has a principal office.

   The principal office telephone number: 804-819-2000.

   The street address and county of the principal office of the limited liability company is:

   Number and Street: 120 Tredegar Street

   City: Richmond State: VA Zip Code: 23219 County: _____

   The mailing address, ***if different from the street address***, of the principal office of the corporation is:

   Number and Street: _____

   City: _____ State: ____ Zip Code: _____ County: _____

   b. ☐ The limited liability company does not have a principal office.

4. The name of the registered agent in the State of North Carolina is: C T Corporation System.

5. The street address and county of the registered agent's office in the State of North Carolina is:

   Number and Street: 150 Fayetteville Street, Box 1011

   City: Raleigh State: NC Zip Code: 27601 County: Wake

6. The North Carolina mailing address, ***if different from the street address***, of the registered agent's office in the State of North Carolina is:

   Number and Street: _____

   City: _____ State: NC Zip Code: _____ County: _____

Directors/Officers Report

As of November 03, 2014

Atlantic Coast Pipeline, LLC

Officers

Michele L. Cardiff

Vice President (Chief Accounting Officer)

Primary Address
701 East Cary Street
Richmond, Virginia 23219

G. Scott Hetzer

Vice President and Treasurer

Primary Address
100 Tredegar Street
Richmond, Virginia 23219

Henry P Linginfelter

Vice President

Primary Address
120 Tredegar Street
Richmond, Virginia 23219

Carter M. Reid

Vice President and Secretary

Primary Address
100 Tredegar Street
Richmond, Virginia 23219

Karen W. Doggett

Assistant Secretary

Primary Address
100 Tredegar Street
Richmond, Virginia 23219

John L. Newman

Assistant Treasurer

Primary Address
100 Tredegar Street
Richmond, Virginia 23219

Managers

Anne E. Bomar

Manager & Vice President

Primary Address
120 Tredegar Street
Richmond, Virginia 23219

Phillip C Grigsby

Manager & Vice President

Primary Address
120 Tredegar Street
Richmond, Virginia 23219

Karl W Newlin

Manager & Vice President

Primary Address
120 Tredegar Street
Richmond, Virginia 23219

7. The names, titles, and usual business addresses of the current company officials of the limited liability company are: *(use attachment if necessary)*

Name and Title	*Business Address*
Anne E. Bomar, Manager & Vice President	120 Tredegar Street, Richmond, VA 23219
Phillip C. Grigsby, Manager & Vice President	120 Tredegar Street, Richmond, VA 23219
Karl W. Newlin, Manager & Vice President	120 Tredegar Street, Richmond, VA 23219
Henry P. Linginfelter, Vice President	120 Tredegar Street, Richmond, VA 23219
See Attachment.	

8. Attached is a certificate of existence (or document of similar import), duly authenticated by the secretary of state or other official having custody of limited liability company records in the state or country of formation. **The Certificate of Existence must be less than six months old. A photocopy of the certification cannot be accepted.**

9. If the limited liability company is required to use a fictitious name in order to transact business in this State, a copy of the resolution of its managers adopting the fictitious name is attached.

10. (Optional): Please provide a business e-mail address: *Privacy Redaction*. The Secretary of State's Office will e-mail the business automatically at the address provided above at no cost when a document is filed. The e-mail provided **will not** be viewable on the website. For more information on why this service is offered, please see the instructions for this document.

11. This application will be effective upon filing, unless a delayed date and/or time is specified: _____.

This the 3 day of November, 20 14

Atlantic Coast Pipeline, LLC
Name of Limited Liability Company

Signature of Company Official

Karen W. Doggett, Assistant Secretary
Type or Print Name and Title

Notes:
1. **Filing fee is $250.** This document must be filed with the Secretary of State.

CORPORATIONS DIVISION P.O. BOX 29622 RALEIGH, NC 27626-0622
(Revised January 2014) *(Form L-09)*

Delaware

The First State

I, JEFFREY W. BULLOCK, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY "ATLANTIC COAST PIPELINE, LLC" IS DULY FORMED UNDER THE LAWS OF THE STATE OF DELAWARE AND IS IN GOOD STANDING AND HAS A LEGAL EXISTENCE SO FAR AS THE RECORDS OF THIS OFFICE SHOW, AS OF THE TWENTY-NINTH DAY OF OCTOBER, A.D. 2014.

AND I DO HEREBY FURTHER CERTIFY THAT THE ANNUAL TAXES HAVE NOT BEEN ASSESSED TO DATE.

Jeffrey W. Bullock, Secretary of State

5593371 8300

141346545

AUTHENTICATION: 1819205

DATE: 10-29-14

You may verify this certificate online at corp.delaware.gov/authver.shtml