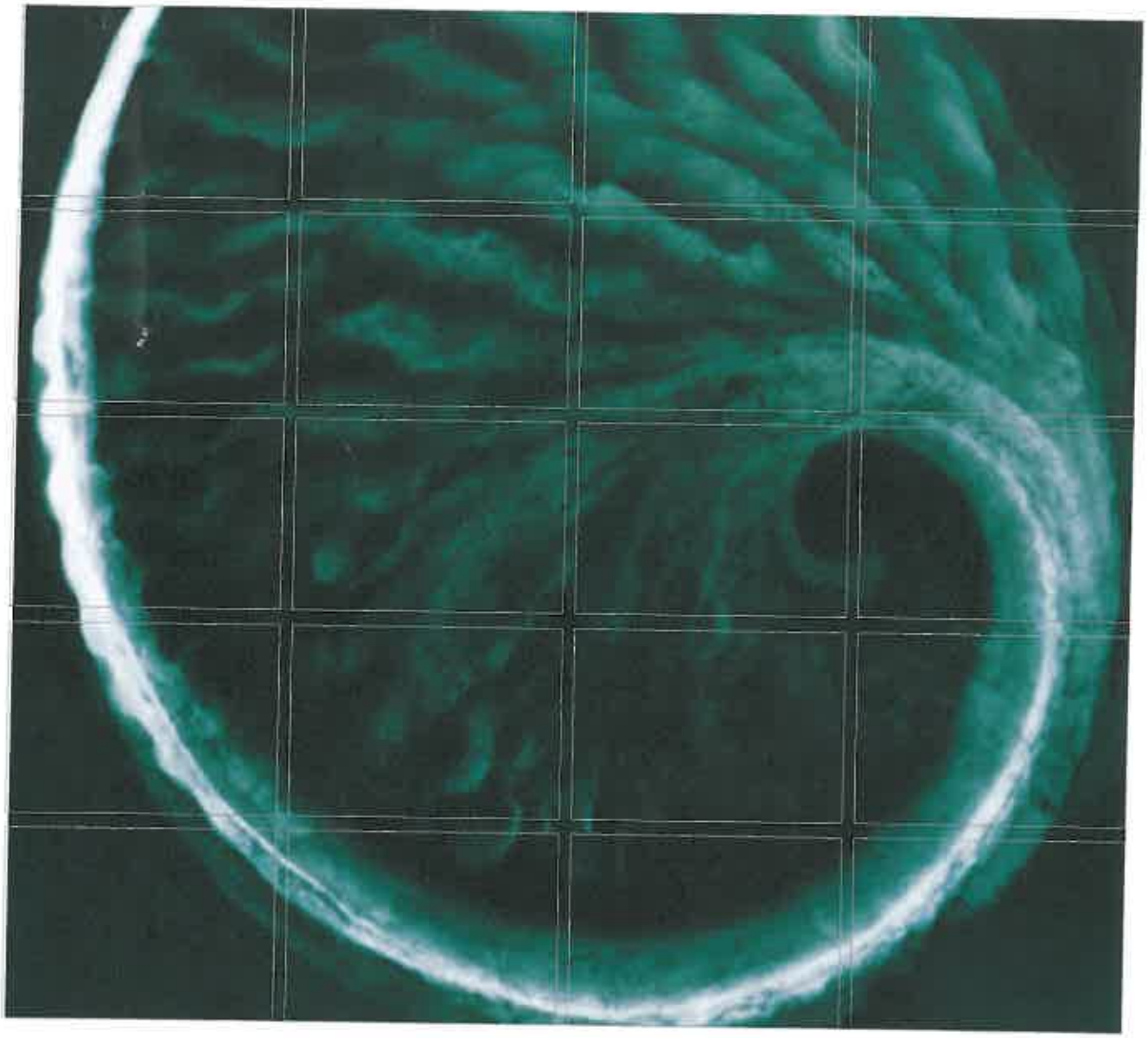

Prepared For:

Atlantic Coast Pipeline

Atlantic Coast Pipeline, LLC

Atlantic Coast Pipeline Project
Permit Application
Marts Compressor Station
Lewis County, WV

September 2015

Environmental Resources Management
75 Valley Stream Parkway, Suite 200
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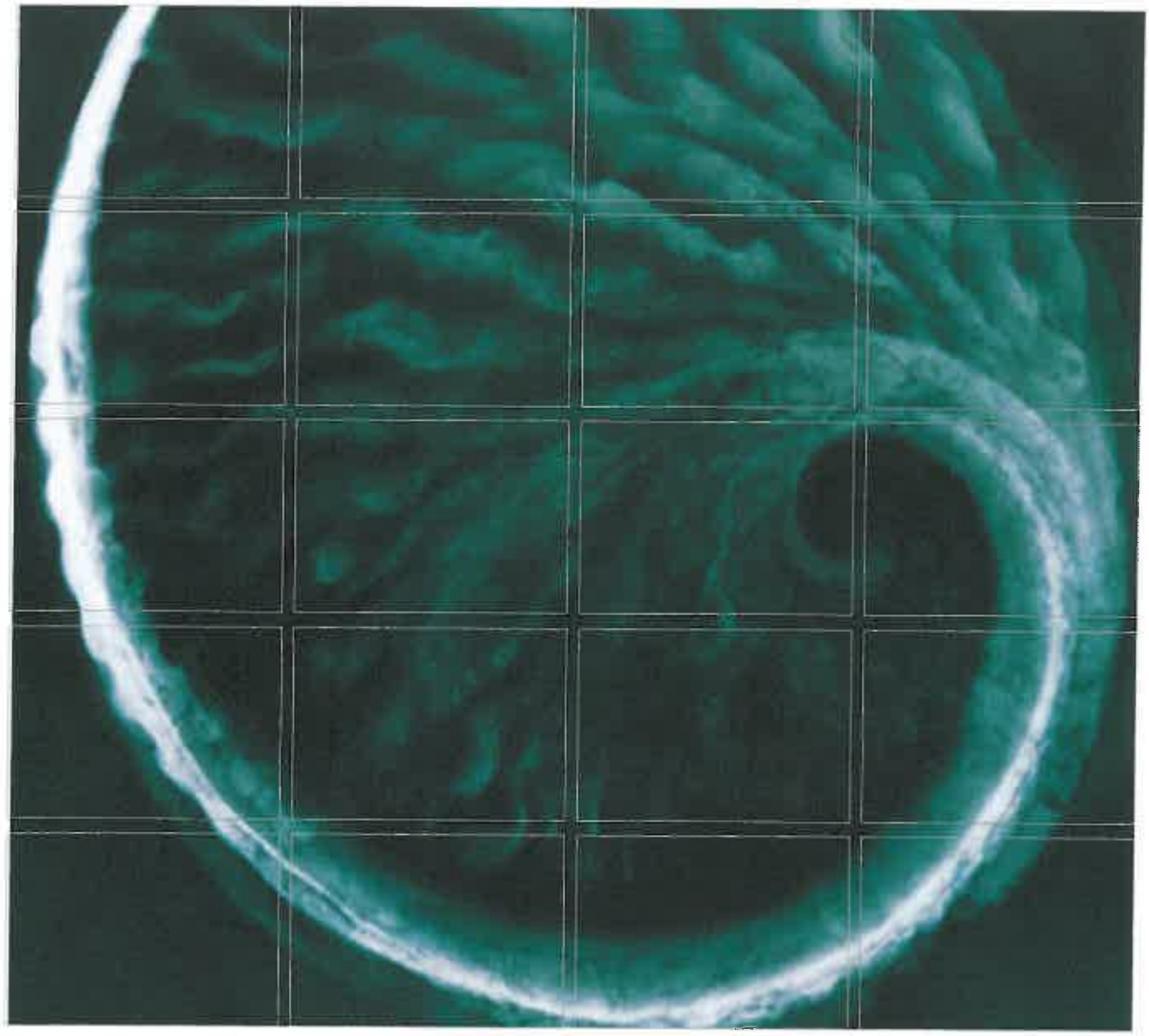

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1.0 INTRODUCTION

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 Marts Compressor Station (ACP-1) in Lewis County, West Virginia to provide compression to support the transmission of natural gas. Two adjacent metering and regulation (M&R) stations will also be operated by DTI and have been included in this application. Kincheloe is an M&R station associated with ACP and the CNX M&R Station is part of an additional DTI pipeline which is part of a separate, but related project, the Supply Header Project.

1.2 APPLICATION OVERVIEW

ACP, LLC submits this Rule 13 permit application to the West Virginia Department of Environmental Protections (WVDEP), Division of Air Quality (DAQ) for the authority to construct the Marts Compressor Station in Lewis County, West Virginia. This permit application narrative is provided to add clarification and/or further detail to the permit application forms provided by the DAQ.

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 Marts 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 provides a review of federal regulatory requirements applicable to project sources and Section 5 addresses an evaluation of the applicability of State regulatory requirements. Section 6 provides ACP, LLC's proposed compliance demonstration methods.

The Plan Approval application also contains WVDAQ Permit Application Forms as Appendix A.

2.0 FACILITY AND PROJECT DESCRIPTION

2.1 MARTS COMPRESSOR STATION

The Marts Compressor Station will operate in Lewis County, West Virginia 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 WV 45 CSR 13 – *"Permits for Construction, Modification, Relocation, And Operation of Stationary Sources of Air Pollutants"*. In addition to the Marts Compressor Station, the facility will also include nearby metering and regulating (M&R) stations (Kincheloe and CNX) in Lewis County, also operated by DTI.

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

- One (1) Solar Titan 130 Combustion Turbine (CT-1);
- One (1) Solar Mars 100 Combustion Turbine (CT-2);
- One (1) Solar Taurus 70 Combustion Turbine (CT-3);
- One (1) Solar Taurus 60 Combustion Turbine (CT-4);
- One (1) Caterpillar Emergency Generator (EG-1) rated at 2,046 hp;
- One (1) Boiler (WH-1) rated at 10.7 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 2,000 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 components (FUG-01), piping fugitive emissions (FUG-02), and loading rack emissions (LR-01) related to the equipment proposed at the Marts Compressor Station.

A map displaying the location of the Marts Compressor Station is provided in Figure 2.1 of this application.

FIGURE 2.1 MARTS COMPRESSOR STATION LOCATION MAP

2.2 *AGGREGATION DETERMINATION*

The Marts Compressor Station will be operated by Dominion Transmission Inc. 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. DTI will operate the Marts Compressor Station with the same industrial grouping as adjacent M&R stations. This application includes emission sources associated with the compressor station and the Kincheloe and CNX M&R stations. 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 other facilities that would be considered to the Marts Compressor Station and thus no other sources must be aggregated with the Marts 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 Marts 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;
- 25 ppmvd CO;
- 25 ppmvd unburned hydrocarbons (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% O_2.

Per vendor estimates, the oxidation catalyst will provide 80% control for CO, to achieve 5 ppmvd CO @ 15% O_2. 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 A.

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]***

Applicable Load	NOx, ppm	CO, ppm	UHC, ppm
50-100% load	120	150	50

1. *Emissions Estimates from Table 2 of Solar PIL 167.*

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 Titan 130 Turbine lb/hr	CT-02 Solar Mars 100 Turbine lb/hr	CT-03 Solar Taurus 70 Turbine lb/hr	CT-04 Solar Taurus 60 Turbine lb/hr
NO_x	Normal	3.17	2.60	1.77	1.33
	Low Temp.	42.2	34.7	23.6	17.8
CO	Normal	1.92	1.58	1.06	0.80
	Low Temp.	11.52	9.48	6.36	4.80
VOC	Normal	0.28	0.23	0.16	0.12
	Low Temp.	0.55	0.45	0.31	0.23

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 44% NO_x control) and oxidation catalyst (approximately 50% VOC control and 80% CO control).

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 proved 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 report.

TABLE 3.3 TURBINE POTENTIAL EMISSIONS DURING START-UP EVENTS

Pollutant	CT-01 Solar Titan 130 Turbine		CT-02 Solar Mars 100 Turbine		CT-03 Solar Taurus 70 Turbine		CT-04 Solar Taurus 60 Turbine	
	lb/event	tpy	lb/event	tpy	lb/event	tpy	lb/event	tpy
NO_x	1.9	0.095	1.4	0.070	0.8	0.040	0.7	0.035
CO	177	8.85	123.5	6.18	73.1	3.66	64.3	3.22
VOC	2.02	0.10	1.42	0.071	0.84	0.042	0.74	0.037
CO_2	1161	58.1	829	41.5	519	26.0	410	20.5
CH_4	8.08	0.40	5.68	0.284	3.36	0.168	2.96	0.148
CO_2e	1363	68.2	971	48.6	603	30.2	484	24.2

TABLE 3.4 PROPOSED TURBINE POTENTIAL EMISSIONS DURING SHUTDOWN EVENTS

Pollutant	CT-01 Solar Titan 130 Turbine		CT-02 Solar Mars 100 Turbine		CT-03 Solar Taurus 70 Turbine		CT-04 Solar Taurus 60 Turbine	
	lb/event	tpy	lb/event	tpy	lb/event	tpy	lb/event	tpy
NO_x	2.40	0.120	1.7	0.085	1.1	0.055	0.4	0.020
CO	208	10.4	149.2	7.46	93.4	4.67	33.0	1.65
VOC	2.38	0.119	1.70	0.085	1.06	0.053	0.380	0.019
CO_2	1272	63.6	920	46.0	575	28.8	204	10.2
CH_4	9.52	0.476	6.80	0.340	4.24	0.212	1.52	0.076
CO_2e	1510	75.5	1,090	54.5	681	34.1	242	12.1

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 Titan 130 Turbine	CT-02 Solar Mars 100 Turbine	CT-03 Solar Taurus 70 Turbine	CT-04 Solar Taurus 60 Turbine
	tpy	tpy	tpy	tpy
NO_x	15.0	12.3	8.35	6.28
CO	27.8	20.7	13.1	8.46
VOC	1.43	1.14	0.775	0.561
SO_2	2.58	2.12	1.43	1.08
PM_{Filt}	4.36	3.60	2.42	1.83
$PM_{10\text{-}Filt}$	4.36	3.60	2.42	1.83
$PM_{2.5\text{-}Filt}$	4.36	3.60	2.42	1.83

PM_{Cond}	10.8	8.90	5.99	4.53
CO_2	90,196	74,385	50,035	37,843
CH_4	7.40	6.00	4.00	2.96
N_2O	2.27	1.87	1.26	0.954
CO_2e	91,059	75,094	50,511	38,201
NH_3	10.2	8.12	5.77	4.29
Total HAP	0.962	0.785	0.525	0.410
Formaldehyde	0.908	0.742	0.496	0.387

3.2 *EMERGENCY GENERATOR*

Emissions for the natural gas fired emergency generator assume 100 hours of operation per year and are calculated using vendor specifications and 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 3516C tpy
NO_x	0.116
CO	0.451
VOC	0.123
SO_2	0.0004
PM_{Filt}	0.0279
$PM_{10\text{-}Filt}$	0.0279
$PM_{2.5\text{-}Filt}$	0.0279
PM_{Cond}	0.007
CO_2	103
CH_4	1.03
CO_2e	129
Total HAP	0.0213
Formaldehyde	0.0147

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 10.7 MMBtu/hr. The boiler will use Low NO_x 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.

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

TABLE 3.7 BOILER POTENTIAL EMISSIONS

Pollutant	WH-01 Boiler tpy
NO_x	2.30
CO	3.86
VOC	0.253
SO_2	0.0276
PM_{Filt}	0.0873
$PM_{10\text{-}Filt}$	0.0873
$PM_{2.5\text{-}Filt}$	0.0873
PM_{Cond}	0.262
CO_2	5,514
CH_4	0.106
N_2O	0.101
CO_2e	5546
Total HAP	0.0868
Formaldehyde	0.003
Hexane	0.0827

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 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

[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.*

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 POTENTIAL EMISSIONS ASSOCIATED WITH FUGITIVE COMPONENTS

Pollutant	FUG-01 Fugitive Leaks - Blowdowns tpy	FUG-02 Fugitive Leaks - Piping tpy
VOC	24.7	26.8
CO_2	25.6	27.7
CH_4	844	913
CO_2e	21,124	22,856
Total HAP	1.40	1.51

3.5 STORAGE TANKS

The Marts 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 2,000 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 are 0.35 tpy (0.08 lb/hr).

TK-3 (Aqueous Ammonia Storage Tank) will have a capacity of 8,000 gallons and will be used to supply aqueous ammonia to SCRs.

3.6 *TANK UNLOADING OPERATIONS*

The Marts Compressor Station will occasionally require tank unloading operations for the unloading of the on-site ASTs. Emissions from tank unloading operations have been calculated using AP-42 Section 4.2, Transportation and Marketing of Petroleum Liquids. The potential VOC emissions associated with the proposed loading rack are 0.006 tpy (5.25 lb/hr).

3.7 *PROJECT EMISSIONS*

The potential emissions associated with the proposed new equipment at the Marts Compressor Station are summarized in Table 3.9 in tons per year. Detailed emission calculations are provided in Appendix A (see Attachment N) 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}	$PM_{10\text{-}Filt}$	$PM_{2.5\text{-}Filt}$	PM_{Cond}	CO_2	CH_4	N_2O	CO_2e	NH_3	HAP
CT-01	15.0	27.8	1.43	2.58	4.36	4.36	4.36	10.8	90,196	7.40	2.27	91,059	10.2	0.962
CT-02	12.3	20.7	1.14	2.12	3.60	3.60	3.60	8.90	74,385	6.00	1.87	75,094	8.12	0.785
CT-03	8.35	13.1	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-04	6.28	8.46	0.561	1.08	1.83	1.83	1.83	4.53	37,843	2.96	0.954	38,201	4.29	0.410
EG-01	0.116	0.451	0.123	0.0004	0.0279	0.0279	0.0279	0.007	103	1.03	0.00	129	0.00	0.0213
WH-01	2.30	3.86	0.253	0.0276	0.0873	0.0873	0.0873	0.262	5,514	0.106	0.101	5,546	0.00	0.0868
FUG-01	-	-	24.7	-	-	-	-	-	25.6	844	-	21,124	-	1.40
FUG-02	-	-	26.8	-	-	-	-	-	27.7	913	-	22,856	-	1.51
TK-1	-	-	0.350	-	-	-	-	-	-	-	-	-	-	-
TK-2	-	-	1.76E-05	-	-	-	-	-	-	-	-	-	-	-
LR-01	-	-	0.006	-	-	-	-	-	-	-	-	-	-	5.77E-07
Total	44.4	74.4	56.1	7.24	12.3	12.3	12.3	30.5	258,130	1,779	6.46	304,519	28.4	5.70

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 10.7 MMBtu/hr boiler will be subject to this regulation. To demonstrate compliance with this rule, these sites will maintain and report fuel records certifying the fuel is in compliance with the NSPS Dc standards for SO_2.

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 Marts 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. All proposed equipment will be 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 to be located at compressor stations 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 Marts 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 Marts Compressor 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 Marts 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 Marts 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 Marts 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 Subpart JJJJ for all applicable requirements. Therefore, compliance with the NSPS Subpart JJJJ requirements ensures compliance with the NESHAP requirements.

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

The West Virginia State Regulations address federal regulations where the state of West Virginia has been delegated enforcement authority, including Prevention of Significant Deterioration (PSD) permitting

The Marts Compressor Station will be located in Lewis County. The air quality of Lewis 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 new facility is 250 tons per year (tpy) 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 Marts Compressor Station is not one of the 28 listed sources, the PSD major source threshold is 250 tpy of a criteria 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*

45 CSR 30 applies to the requirements of the federal Title V operating permit program (40 CFR 70). The major source thresholds with respect to the West Virginia Title V operating permit program regulations are 10 tons per year (tpy) of a single HAP, 25 tpy of any combination of HAP, and 100 tpy of all other regulated pollutants.

The potential emissions of all regulated pollutants are below the corresponding threshold(s) at this facility after the proposed project. Therefore, the Station is not a major source for Title V purposes.

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

As part of normal operations of the Marts 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), compressor engine and auxiliary equipment inspection and testing, 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 Marts 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 on site will have a concentration of less than 20%.

4.7 *ACID RAIN REGULATIONS*

The Marts 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, the Marts Compressor Station is expected to 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 State air quality regulations that could be reasonably expected to apply to the Marts Compressor Station and makes an applicability determination for each regulation 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 WVDEP Rule 13 permit application forms.

The West Virginia State Regulations address federal regulations where West Virginia has been delegated authority of enforcement, including Prevention of Significant Deterioration permitting, Title V permitting, New Source Performance Standards, and National Emission Standards for Hazardous Air Pollutants. The regulatory requirements in reference to the Marts Compressor Station are described in detail in Table 5-1.

TABLE 5.1 STATE REGULATORY APPLICABILITY

Regulatory Applicability	Applicable Requirement	Compliance Approach
Particulate Emissions (45 CSR 02)	The proposed project includes one (1) indirect heat exchanger (WH-1) rated at 10.7 MMBtu/hr that combusts natural gas.	ACP, LLC will comply with this Rule by operating the equipment with visible emissions less than 10% opacity.
Objectionable Odors (45 CSR 04)	Prevent the discharge of air pollutants that contribute to objectionable odors	Operations conducted at the compressor station are subject to this requirement. The facility is staffed and will use best practices to minimize odors.
Sulfur Oxides (45 CSR 10)	All fuel burning units will be subject to the weight emission standard for sulfur dioxide.	Compliance with this limit will be demonstrated by combustion pipeline quality natural gas and maintenance of a copy of the FERC Tariff Sheet.
Stationary Source Permitting (45 CSR 13)	A permit application is required to be submitted for the authority to construct and operate emission sources.	This permit application is being submitted for the authority to construct and operate the Marts Compressor Station.
Construction and Major Modification of Major Sources for the Prevention of Significant Deterioration (45 CSR 14)	Operation of equipment at this Marts Compressor Station will not exceed the PSD emission triggers.	See Section 4.0.
New Source Performance Standards (45 CSR 16)	The Station is required to comply with applicable NSPS Standards.	See Section 4.1

Regulatory Applicability	Applicable Requirement	Compliance Approach
Construction and Major Modification of Major Source Causing or Contributing to Nonattainment (45 CSR 19)	Lewis County, WV is in attainment for all pollutants with a National Ambient Air Quality Standard (NAAQS). Therefore, this regulation does not apply to the Marts Compressor Station.	NA
Hazardous Waste (45 CSR 25)	This Station does not qualify as a waste treatment, storage, and disposal facility and no hazardous waste will be burned at this Site; therefore, it is not subject to this hazardous waste rule.	NA
Title V Operating Permits (45 CSR 30)	The potential emissions of all regulated pollutants are below the corresponding threshold(s) at this facility after the proposed project. Therefore, the Station is not a major source for Title V purposes.	See Section 4.4
NESHAP Rues (45 CSR 34)	The Station is required to comply with applicable NESHAP Rules.	See Section 4.2
Control of Annual Nitrogen Oxide Emissions (45 CSR 39)	The Station will operate fossil-fuel fired combustion turbines; however, these turbines will not be used for the production of electricity and are therefore exempt from this Rule.	NA
Control of Ozone Season Nitrogen Oxide Emissions (45 CSR 40)	Turbines will not be used for the production of electricity and are therefore exempt from this Rule.	NA
Control of Annual Sulfur Dioxide Emissions (45 CSR 41)	Turbines will not be used for the production of electricity and are therefore exempt from this Rule.	NA

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-04)

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.

Boiler (WH-01)

The unit will maintain compliance with NSPS Subpart Dc (maintain records of fuel fired daily and sulfur content of gas).

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

WVDAQ AIR PERMIT APPLICATION FORMS

WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF AIR QUALITY

601 57th Street, SE
Charleston, WV 25304
(304) 926-0475
www.dep.wv.gov/daq

APPLICATION FOR NSR PERMIT AND TITLE V PERMIT REVISION (OPTIONAL)

PLEASE CHECK ALL THAT APPLY TO **NSR (45CSR13)** (IF KNOWN):

☒ **CONSTRUCTION** ☐ **MODIFICATION** ☐ **RELOCATION**
☐ **CLASS I ADMINISTRATIVE UPDATE** ☐ **TEMPORARY**
☐ **CLASS II ADMINISTRATIVE UPDATE** ☐ **AFTER-THE-FACT**

PLEASE CHECK TYPE OF **45CSR30 (TITLE V)** REVISION (IF ANY):

☐ **ADMINISTRATIVE AMENDMENT** ☐ **MINOR MODIFICATION**
☐ **SIGNIFICANT MODIFICATION**

IF ANY BOX ABOVE IS CHECKED, INCLUDE TITLE V REVISION INFORMATION AS **ATTACHMENT S** TO THIS APPLICATION

FOR TITLE V FACILITIES ONLY: Please refer to "Title V Revision Guidance" in order to determine your Title V Revision options (Appendix A, "Title V Permit Revision Flowchart") and ability to operate with the changes requested in this Permit Application.

Section I. General

1. Name of applicant *(as registered with the WV Secretary of State's Office)*:
Atlantic Coast Pipeline, LLC.

2. Federal Employer ID No. ***(FEIN)***:

3. Name of facility *(if different from above)*:
Marts Compressor Station

4. The applicant is the:
☒ **OWNER** ☐ **OPERATOR** ☐ **BOTH**

5A. Applicant's mailing address:
707 Main St.
Richmond, VA 23219

5B. Facility's present physical address:

6. **West Virginia Business Registration.** Is the applicant a resident of the State of West Virginia? ☒ **YES** ☐ **NO**
- If **YES,** provide a copy of the **Certificate of Incorporation/Organization/Limited Partnership** (one page) including any name change amendments or other Business Registration Certificate as **Attachment A.**
- If **NO,** provide a copy of the **Certificate of Authority/Authority of L.L.C./Registration** (one page) including any name change amendments or other Business Certificate as **Attachment A.**

7. If applicant is a subsidiary corporation, please provide the name of parent corporation: **Atlantic Coast Pipeline, LLC.**

8. Does the applicant own, lease, have an option to buy or otherwise have control of the *proposed site?* ☒ **YES** ☐ **NO**
- If **YES,** please explain: **The applicant is the owner of the site.**
- If **NO,** you are not eligible for a permit for this source.

9. Type of plant or facility (stationary source) to be **constructed, modified, relocated, administratively updated** or **temporarily permitted** (e.g., coal preparation plant, primary crusher, etc.):
Installation of a New Natural Gas Transmission Facility

10. North American Industry Classification System **(NAICS)** code for the facility:
486210

11A. DAQ Plant ID No. (for existing facilities only):	11B. List all current 45CSR13 and 45CSR30 (Title V) permit numbers associated with this process (for existing facilities only):

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

12A.

- For **Modifications, Administrative Updates** or **Temporary permits** at an existing facility, please provide directions to the *present location* of the facility from the nearest state road;
- For **Construction** or **Relocation permits,** please provide directions to the *proposed new site location* from the nearest state road. Include a **MAP** as **Attachment B**.

Traveling along US-19 S from West Milford, WV turn right onto Gooseman Rd. Turn left onto Kincheloe Run Road and then after 0.15 miles take a right onto Hollick Run Road. Take the next right and continue up a dirt road until you reach Marts Compressor Station.

12.B. New site address (if applicable):	12C. Nearest city or town:	12D. County:
No site address available at this time	**West Milford**	**Lewis**
12.E. UTM Northing (KM): **4,332.66**	12F. UTM Easting (KM): **545.53**	12G. UTM Zone: **17**

13. Briefly describe the proposed change(s) at the facility: **Construction of a Natural Gas Transmission Station**

14A. Provide the date of anticipated installation or change: – If this is an **After-The-Fact** permit application, provide the date upon which the proposed change did happen: **N/A**	14B. Date of anticipated Start-Up if a permit is granted: **2018**

14C. Provide a **Schedule** of the planned **Installation** of/**Change** to and **Start-Up** of each of the units proposed in this permit application as **Attachment C** (if more than one unit is involved).

15. Provide maximum projected **Operating Schedule** of activity/activities outlined in this application:
Hours Per Day **24** Days Per Week **7** Weeks Per Year **52**

16. Is demolition or physical renovation at an existing facility involved? ☐ **YES** ☒ **NO**

17. **Risk Management Plans.** If this facility is subject to 112(r) of the 1990 CAAA, or will become subject due to proposed changes (for applicability help see www.epa.gov/ceppo), submit your **Risk Management Plan (RMP)** to U. S. EPA Region III.

18. **Regulatory Discussion.** List all Federal and State air pollution control regulations that you believe are applicable to the proposed process *(if known)*. A list of possible applicable requirements is also included in Attachment S of this application (Title V Permit Revision Information). Discuss applicability and proposed demonstration(s) of compliance *(if known)*. Provide this information as **Attachment D.**

Section II. Additional attachments and supporting documents.

19. Include a check payable to WVDEP – Division of Air Quality with the appropriate **application fee** (per 45CSR22 and 45CSR13).

20. Include a **Table of Contents** as the first page of your application package.

21. Provide a **Plot Plan,** e.g. scaled map(s) and/or sketch(es) showing the location of the property on which the stationary source(s) is or is to be located as **Attachment E** (Refer to ***Plot Plan Guidance***) .
– Indicate the location of the nearest occupied structure (e.g. church, school, business, residence).

22. Provide a **Detailed Process Flow Diagram(s)** showing each proposed or modified emissions unit, emission point and control device as **Attachment F.**

23. Provide a **Process Description** as **Attachment G.**

– Also describe and quantify to the extent possible all changes made to the facility since the last permit review (if applicable).

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

24. Provide **Material Safety Data Sheets (MSDS)** for all materials processed, used or produced as **Attachment H.**

– For chemical processes, provide a MSDS for each compound emitted to the air.

25. Fill out the **Emission Units Table** and provide it as **Attachment I.**

26. Fill out the **Emission Points Data Summary Sheet (Table 1 and Table 2)** and provide it as **Attachment J.**

27. Fill out the **Fugitive Emissions Data Summary Sheet** and provide it as **Attachment K.**

28. Check all applicable **Emissions Unit Data Sheets** listed below:

☒ Bulk Liquid Transfer Operations	☐ Haul Road Emissions	☐ Quarry
☐ Chemical Processes	☐ Hot Mix Asphalt Plant	☐ Solid Materials Sizing, Handling and Storage Facilities
☐ Concrete Batch Plant	☐ Incinerator	☒ Storage Tanks
☐ Grey Iron and Steel Foundry	☐ Indirect Heat Exchanger	

☒ General Emission Unit, specify **Four natural gas combustion turbines, one natural gas boiler, one emergency generator**

Fill out and provide the **Emissions Unit Data Sheet(s)** as **Attachment L.**

29. Check all applicable **Air Pollution Control Device Sheets** listed below:

☐ Absorption Systems	☐ Baghouse	☐ Flare
☐ Adsorption Systems	☐ Condenser	☐ Mechanical Collector
☐ Afterburner	☐ Electrostatic Precipitator	☐ Wet Collecting System

☒ Other Collectors, specify Selective Catalyitic Reduction and Oxidation Catalyst

Fill out and provide the **Air Pollution Control Device Sheet(s)** as **Attachment M.**

30. Provide all **Supporting Emissions Calculations** as **Attachment N,** or attach the calculations directly to the forms listed in Items 28 through 31.

31. **Monitoring, Recordkeeping, Reporting and Testing Plans.** Attach proposed monitoring, recordkeeping, reporting and testing plans in order to demonstrate compliance with the proposed emissions limits and operating parameters in this permit application. Provide this information as **Attachment O.**

➢ Please be aware that all permits must be practically enforceable whether or not the applicant chooses to propose such measures. Additionally, the DAQ may not be able to accept all measures proposed by the applicant. If none of these plans are proposed by the applicant, DAQ will develop such plans and include them in the permit.

32. **Public Notice.** At the time that the application is submitted, place a **Class I Legal Advertisement** in a newspaper of general circulation in the area where the source is or will be located (See 45CSR§13-8.3 through 45CSR§13-8.5 and ***Example Legal Advertisement*** for details). Please submit the **Affidavit of Publication** as **Attachment P** immediately upon receipt.

33. **Business Confidentiality Claims.** Does this application include confidential information (per 45CSR31)?

☐ **YES** ☒ **NO**

➢ If **YES,** identify each segment of information on each page that is submitted as confidential and provide justification for each segment claimed confidential, including the criteria under 45CSR§31-4.1, and in accordance with the DAQ's ***"Precautionary Notice – Claims of Confidentiality"*** guidance found in the ***General Instructions*** as **Attachment Q.**

Section III. Certification of Information

34. **Authority/Delegation of Authority.** Only required when someone other than the responsible official signs the application. Check applicable **Authority Form** below:

☐ Authority of Corporation or Other Business Entity	☐ Authority of Partnership
☐ Authority of Governmental Agency	☐ Authority of Limited Partnership

Submit completed and signed **Authority Form** as **Attachment R.**

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

35A. **Certification of Information.** To certify this permit application, a Responsible Official (per 45CSR§13-2.22 and 45CSR§30-2.28) or Authorized Representative shall check the appropriate box and sign below.

Certification of Truth, Accuracy, and Completeness

I, the undersigned ☒ **Responsible Official** / ☐ **Authorized Representative,** hereby certify that all information contained in this application and any supporting documents appended hereto, is true, accurate, and complete based on information and belief after reasonable inquiry I further agree to assume responsibility for the construction, modification and/or relocation and operation of the stationary source described herein in accordance with this application and any amendments thereto, as well as the Department of Environmental Protection, Division of Air Quality permit issued in accordance with this application, along with all applicable rules and regulations of the West Virginia Division of Air Quality and W.Va. Code § 22-5-1 et seq. (State Air Pollution Control Act). If the business or agency changes its Responsible Official or Authorized Representative, the Director of the Division of Air Quality will be notified in writing within 30 days of the official change.

Compliance Certification

Except for requirements identified in the Title V Application for which compliance is not achieved, I, the undersigned hereby certify that, based on information and belief formed after reasonable inquiry, all air contaminant sources identified in this application are in compliance with all applicable requirements.

SIGNATURE _____ *(Please use blue ink)* DATE: 9/11/15 *(Please use blue ink)*

35B. Printed name of signee: Leslie Hartz		35C. Title: VP, Pipeline Construction
35D. E-mail: leslie.hartz@dom.com	36E. Phone: (804) 771-4460	36F. FAX:
36A. Printed name of contact person (if different from above): William Scarpinato		36B. Title: Manager-Environmental Services
36C. E-mail: William.A.Scapinato@dom.com	36D. Phone: (804) 273-3019	36E. FAX:

PLEASE CHECK ALL APPLICABLE ATTACHMENTS INCLUDED WITH THIS PERMIT APPLICATION

- ☒ Attachment A: Business Certificate
- ☒ Attachment B: Map(s)
- ☒ Attachment C: Installation and Start Up Schedule
- ☒ Attachment D: Regulatory Discussion
- ☒ Attachment E: Plot Plan
- ☒ Attachment F: Detailed Process Flow Diagram(s)
- ☒ Attachment G: Process Description
- ☒ Attachment H: Material Safety Data Sheets (MSDS)
- ☒ Attachment I: Emission Units Table
- ☒ Attachment J: Emission Points Data Summary Sheet
- ☒ Attachment K: Fugitive Emissions Data Summary Sheet
- ☒ Attachment L: Emissions Unit Data Sheet(s)
- ☒ Attachment M: Air Pollution Control Device Sheet(s)
- ☒ Attachment N: Supporting Emissions Calculations
- ☒ Attachment O: Monitoring/Recordkeeping/Reporting/Testing Plans
- ☒ Attachment P: Public Notice
- ☒ Attachment Q: Business Confidential Claims
- ☒ Attachment R: Authority Forms
- ☒ Attachment S: Title V Permit Revision Information
- ☒ Application Fee

Please mail an original and three (3) copies of the complete permit application with the signature(s) to the DAQ, Permitting Section at the address listed on the first page of this application. Please DO NOT fax permit applications.

FOR AGENCY USE ONLY – IF THIS IS A TITLE V SOURCE:

- ☐ *Forward 1 copy of the application to the Title V Permitting Group and:*
- ☐ *For Title V Administrative Amendments:*
  - ☐ *NSR permit writer should notify Title V permit writer of draft permit,*
- ☐ *For Title V Minor Modifications:*
  - ☐ *Title V permit writer should send appropriate notification to EPA and affected states within 5 days of receipt,*
  - ☐ *NSR permit writer should notify Title V permit writer of draft permit.*
- ☐ *For Title V Significant Modifications processed in parallel with NSR Permit revision:*
  - ☐ *NSR permit writer should notify a Title V permit writer of draft permit,*
  - ☐ *Public notice should reference both 45CSR13 and Title V permits,*
  - ☐ *EPA has 45 day review period of a draft permit.*

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

Attachment A

State of West Virginia

Certificate

I, Natalie E. Tennant, Secretary of State of the State of West Virginia, hereby certify that

ATLANTIC COAST PIPELINE, LLC

Control Number: 9A7TZ

a limited liability company, organized under the laws of the State of Delaware

has filed its "Application for Certificate of Authority" in my office according to the provisions of West Virginia Code §31B-10-1002. I hereby declare the organization to be registered as a foreign limited liability company from its effective date of November 7, 2014, until a certificate of cancellation is filed with our office.

Therefore, I hereby issue this

CERTIFICATE OF AUTHORITY OF A FOREIGN LIMITED LIABILITY COMPANY

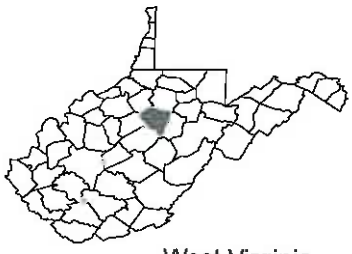
to the limited liability company authorizing it to transact business in West Virginia

Given under my hand and the Great Seal of the State of West Virginia on this day of November 7, 2014

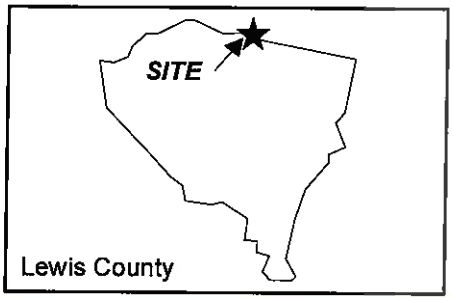
Natalie E Tennant

Secretary of State

Attachment B



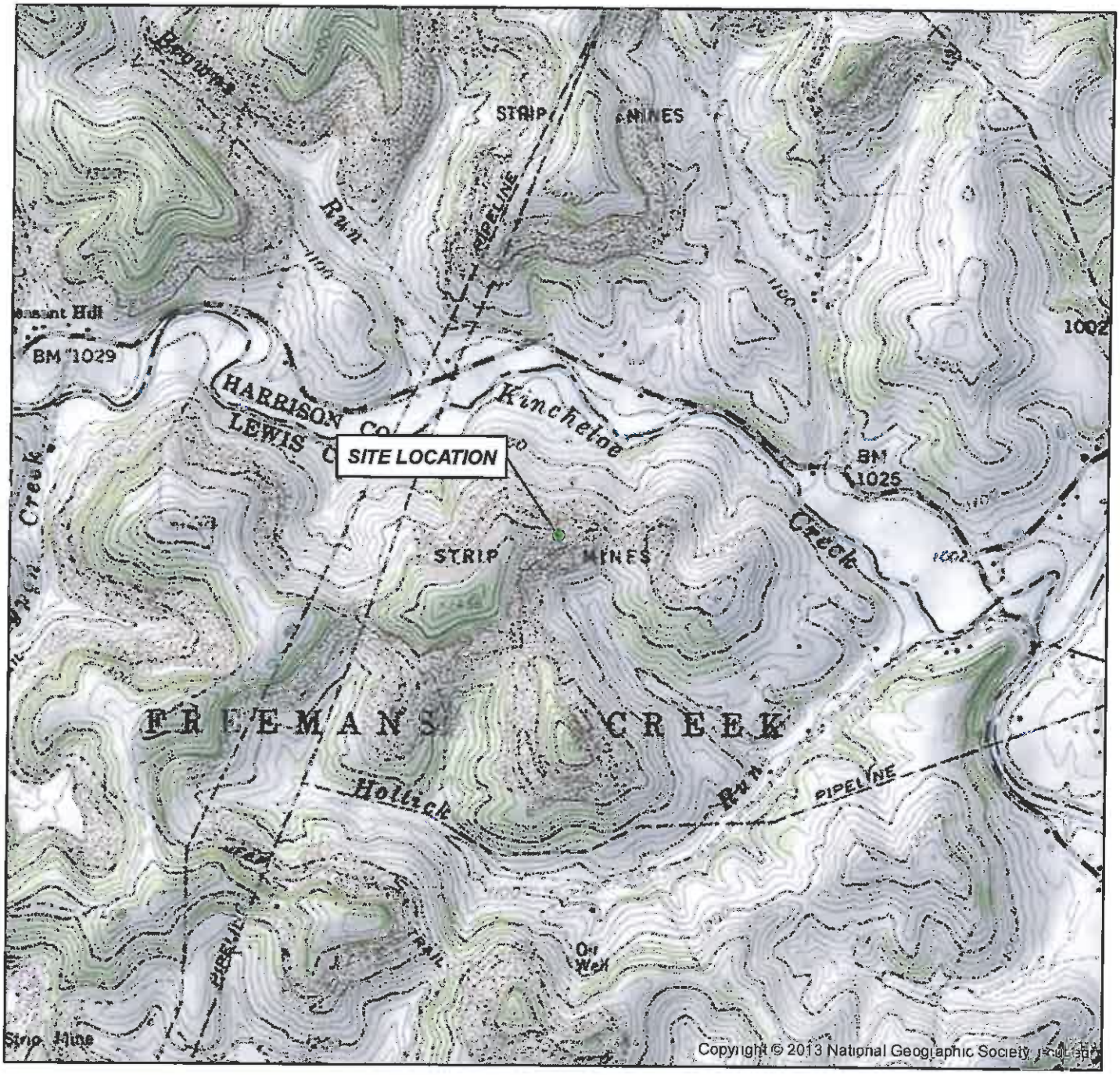
West Virginia



0 1,000 2,000 4,000 Feet

N

LAT. 39.14190 LON. -80.47318
LEWIS COUNTY
WEST VIRGINIA



USGS 1:24K 7.5' Quadrangle: West Milford, WV

SITE LOCATION MAP

Atlantic Coastal Pipeline Project

Marts Compressor Station
Atlantic Coastal Pipeline, LLC
Lewis County, West Virginia

ERM

Drawn By: SRV 7/15/15

Environmental Resources Management

GIS Review: GM
CHK'D: GM
0272413
ATTACHMENT B

J:\GIS\Projects\Dominion Tra...\on Inc_MXD\Attachment3_ACP1Station_SiteLocMap.mxd - 9/8/2015|SRV

Attachment C

Attachment C
Schedule of Installation

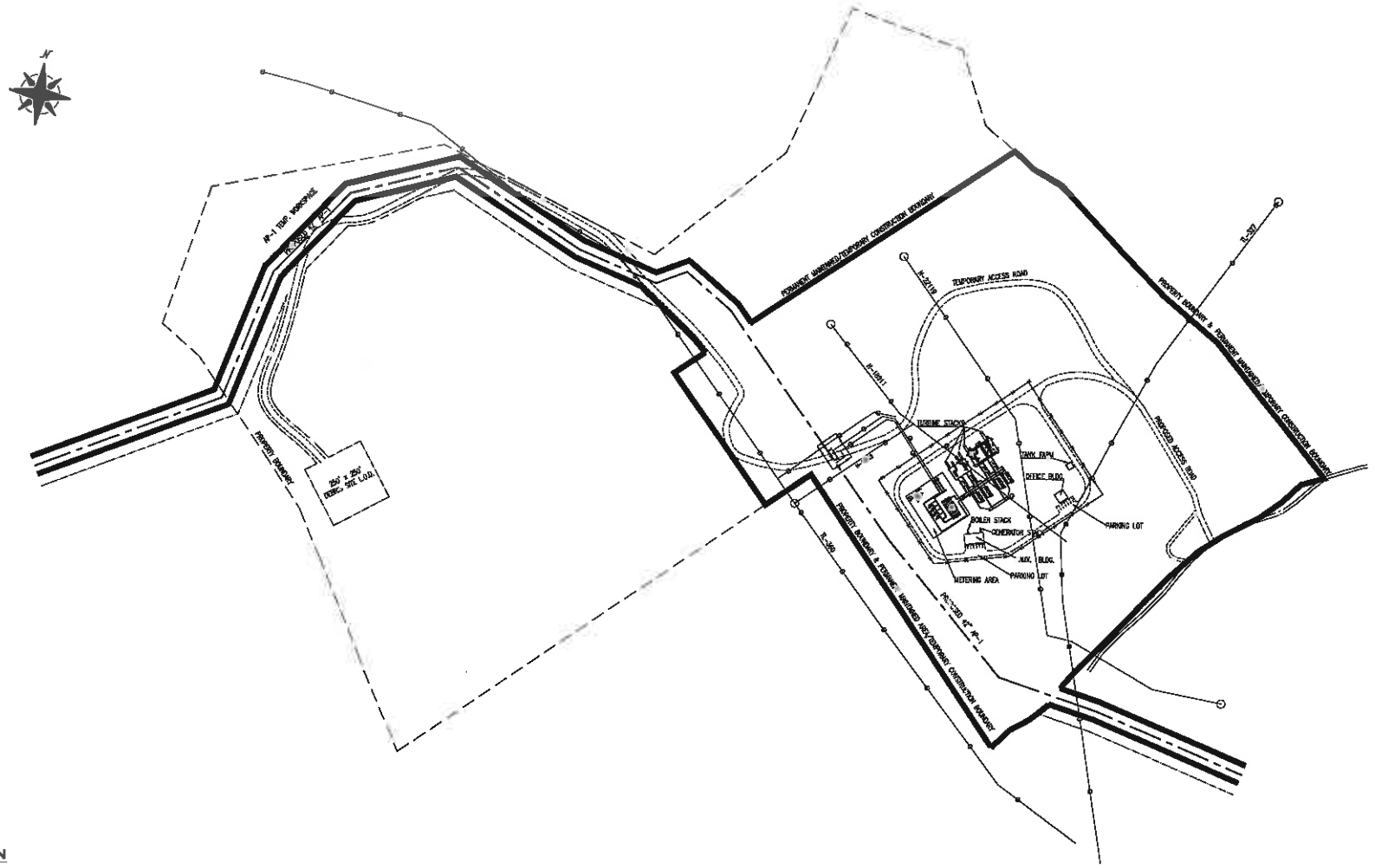
The ACP 1 Station is scheduled to commence construction in April 2017. The anticipated start-up date is November 2018.

Attachment D

Attachment D - Regulatory Discussion

A state and federal regulatory discussion has been included in the narrative preceding the WVDAQ Permit Application Forms.

Attachment E



SITE LOCATION
LAT: 39°08'18.94"
LONG: 80°27'41.31"
MILE POST: 7.3 (APPROX)

GENERAL NOTES AND COMMENTS:

ISSUED FOR REVIEW
7/7/15

200' 100' 0 200'
SCALE: 1" = 200'

LEGEND
- PROPOSED ACP PIPELINE
- TEMPORARY CONSTRUCTION DISTURBANCE
- PERMANENT MAINTAINED AREA
- PROPERTY BOUNDARY
- FENCE (PROPOSED)
- EXISTING PIPELINE

SYM.	DATE	BY	REVISION INFORMATION	PROJECTMANAGER	APP.
A	7/7/15	RC	REVISED PER DTI COMMENTS	DLM	
G	6/29/15	RC	REVISED PER DTI COMMENTS	DLM	
F	6/16/15	RC	REVISED PER DTI COMMENTS	DLM	
E	6/11/15	ARS	REVISED PER DTI COMMENTS	DLM	
D	4/29/15	RR/AR	UPDATE PIPELINE LOCATIONS	DLM	
C	12/5/14	ARS	ISSUED FOR FERC PRE-FILING		
B	12/3/14	ARS	ISSUED FOR REVIEW		

SEAL

DRAWN:	ARS	12/5/14
CHECKED:	DLM	12/5/15
APP. PIPELINE:		
APP. FOR SCHEDULE:		
SCALE:	1" = 200'	

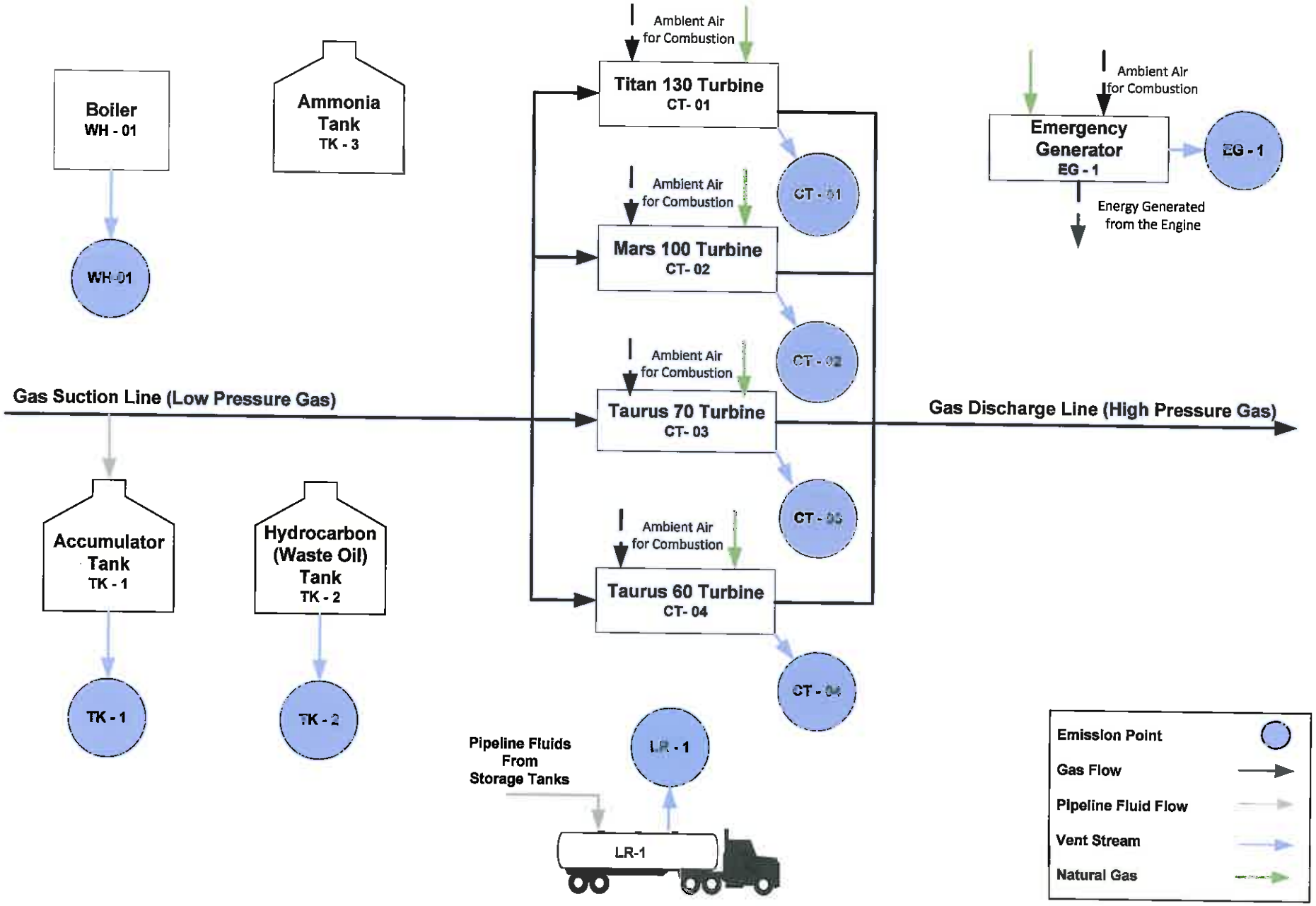
Atlantic Coast Pipeline, LLC
445 West Main St. Clarksburg, West Virginia 26301 / Phone: (304) 623-8000

TITLE: MARTS M&R/COMPRESSOR STATION
PRELIMINARY SITE PLAN

DISTRICT: HACKERS CREEK | COUNTY: LEWIS | STATE: WV | GROUP:
DRAWING: DOM/Compressor Station/CS1 Rev G
DWG. NO.: 2079A | REV.: H

Attachment F

Attachment F – Detailed Process Flow Diagram
Atlantic Coast Pipeline, LLC. – Marts Compressor Station



Attachment G

Attachment G

Process Description

Atlantic Coast Pipeline, LLC. is submitting this Rule 13 Permit Application for the Marts Compressor Station to comply with the permitting requirements of the state of West Virginia. Natural gas from the transmission pipeline is routed through this transmission station. The natural gas fueled internal combustion engines CT-01, CT-02, CT-03, and CT-4 provide the compression required for the transmission of natural gas along the Atlantic Coast Pipeline. The engines manufactured by Solar Turbines include a Titan 130-20502S, Mars 100-16000S, Taurus 70-10802S, and Taurus 60-7800S. The Marts Compressor Station will require an emergency generator (Caterpillar G3516C) with a capacity of 2,098 hp to provide backup power during emergency situations. A 10.7 MMBtu/hr boiler (WH-01) will be installed to provide process heat. Produced liquids are temporarily stored in the accumulator tank (TK - 1) until they can be removed off-site by the tank truck (LR-1). A hydrocarbon (waste oil) tank (TK-2), is also proposed to be at the Marts Compressor Station.

Attachment H

Attachment H – Material Safety Data Sheets

This Reg. 13 Permit Modification does not introduce any chemicals to the site. For this reason, an SDS is not included with this submission.

Attachment I

Attachment I

Emission Units Table

(includes all emission units and air pollution control devices that will be part of this permit application review, regardless of permitting status)

Emission Unit ID[1]	Emission Point ID[2]	Emission Unit Description	Year Installed/ Modified	Design Capacity	Type[3] and Date of Change	Control Device[4]
CT-01	CT-01	Turbine (Titan 130-20502S)	2018	21,765 bhp	New	SoLoNOx, SCR, Ox Cat
CT-02	CT-02	Turbine (Mars 100-16000S)	2018	17,574 bhp	New	SoLoNOx, SCR, Ox Cat
CT-03	CT-03	Turbine (Taurus 70-10802S)	2018	11,882 bhp	New	SoLoNOx, SCR, Ox Cat
CT-04	CT-04	Turbine (Taurus 60-7800S)	2018	8,414 bhp	New	SoLoNOx, SCR, Ox Cat
EG-01	EG-01	Emergency Generator (Caterpillar G3516C)	2018	2,098 bhp	New	None
WH-1	WH-1	Boiler	2018	10.7 MMBtu/hr	New	None
TK-1	TK-1	Accumulator Tank	2018	2,500 gallons	New	None
TK-2	TK-2	Hydrocarbon (Waste Oil) Tank	2018	2,000 gallons	New	None
TK-3	TK-3	Ammonia Tank	2018	8,000 gallons	New	None
LR-1	LR-1	Tank Unloading Operations	2018	--	New	None

[1] For Emission Units (or Sources) use the following numbering system:1S, 2S, 3S,... or other appropriate designation.
[2] For Emission Points use the following numbering system:1E, 2E, 3E, ... or other appropriate designation.
[3] New, modification, removal
[4] For Control Devices use the following numbering system: 1C, 2C, 3C,... or other appropriate designation.

Attachment J

Attachment J
EMISSION POINTS DATA SUMMARY SHEET

Table 1: Emissions Data

Emission Point ID No. *(Must match Emission Units Table-& Plot Plan)*	Emission Point Type[1]	Emission Unit Vented Through This Point *(Must match Emission Units Table & Plot Plan)*		Air Pollution Control Device *(Must match Emission Units Table & Plot Plan)*		Vent Time for Emission Unit *(chemical processes only)*		All Regulated Pollutants - Chemical Name/CAS[3] *(Speciate VOCs & HAPS)*	Maximum Potential Uncontrolled Emissions[4]		Maximum Potential Controlled Emissions[5]		Emission Form or Phase *(At exit conditions, Solid, Liquid or Gas/Vapor)*	Est. Method Used[6]	Emission Concentration[7] (mg/m^3)
		ID No.	Source	ID No.	Device Type	Short Term[2]	Max (hr/yr)		lb/hr	ton/yr	lb/hr	ton/yr			
CT-01	Upward Vertical Stack	CT-01	Turbine	NA	NA	NA	NA	CO	9.93	43.09	6.36	27.84	Gas	AP-42, Vendor Estimates	NA
								NO_x	6.14	26.63	3.43	15.01			
								SO_2	0.59	2.58	0.59	2.58			
								Total VOCs	0.56	2.41	0.33	1.43			
								$PM_{Filterable}$	1.01	4.36	1.00	4.36			
								$PM_{Condensable}$	2.49	10.80	2.46	10.80			
								$PM_{2.5}$	1.01	4.36	1.00	4.36			
								PM_{10}	1.01	4.36	1.00	4.36			
								Total HAPs	0.22	0.96	0.22	0.96			
								Ammonia	2.35	10.20	2.33	10.20			
								CO_2	20,763	90,075	20,593	90,196			
								CH_4	1.50	6.52	1.69	7.40			
								N_2O	0.52	2.27	0.52	2.27			
								CO_2e	20,956	90,915	20,790	91,059			
CT-02	Upward Vertical Stack	CT-02	Turbine	NA	NA	NA	NA	CO	8.17	35.46	4.73	20.73	Gas	AP-42, Vendor Estimates	NA
								NO_x	5.04	21.86	2.81	12.30			
								SO_2	0.49	2.12	0.48	2.12			
								Total VOCs	0.46	1.97	0.26	1.14			
								$PM_{Filterable}$	0.83	3.60	0.82	3.60			
								$PM_{Condensable}$	2.05	8.90	2.03	8.90			
								$PM_{2.5}$	0.83	3.60	0.82	3.60			
								PM_{10}	0.83	3.60	0.82	3.60			
								Total HAPs	0.18	0.79	0.18	0.79			
								Ammonia	1.87	8.12	1.85	8.12			
								CO_2	17,126	74,298	16,983	74,385			
								CH_4	1.24	5.37	1.37	6.00			
								N_2O	0.43	1.87	0.43	1.87			
								CO_2e	17,286	74,991	17,145	75,094			

CT-03	Upward Vertical Stack	CT-03	Turbine	NA	NA	NA	NA	CO	5.48	23.79	2.99	13.08	Gas	AP-42, Vendor Estimates	NA
								NO_x	3.42	14.86	1.91	8.35			
								SO_2	0.33	1.43	0.33	1.43			
								Total VOCs	0.31	1.36	0.18	0.78			
								$PM_{Filterable}$	0.56	2.42	0.55	2.42			
								$PM_{Condensable}$	1.38	5.99	1.37	5.99			
								$PM_{2.5}$	0.56	2.42	0.55	2.42			
								PM_{10}	0.56	2.42	0.55	2.42			
								Total HAPs	0.12	0.53	0.12	0.53			
								Ammonia	1.33	5.77	1.32	5.77			
								CO_2	11,521	49,980	11,423	50,035			
								CH_4	0.83	3.62	0.91	4.00			
								N_2O	0.29	1.26	0.29	1.26			
								CO_2e	11,628	50,446	11,532	50,511			
CT-04	Upward Vertical Stack	CT-04	Turbine	NA	NA	NA	NA	CO	4.14	17.95	1.93	8.46	Gas	AP-42, Vendor Estimates	NA
								NO_x	2.58	11.21	1.43	6.28			
								SO_2	0.25	1.08	0.25	1.08			
								Total VOCs	0.23	1.01	0.13	0.56			
								$PM_{Filterable}$	0.42	1.83	0.42	1.83			
								$PM_{Condensable}$	1.04	4.53	1.03	4.53			
								$PM_{2.5}$	0.42	1.83	0.42	1.83			
								PM_{10}	0.42	1.83	0.42	1.83			
								Total HAPs	0.09	0.41	0.09	0.41			
								Ammonia	0.99	4.29	0.98	4.29			
								CO_2	8,716	37,813	8,640	37,843			
								CH_4	0.63	2.73	0.68	2.96			
								N_2O	0.22	0.95	0.22	0.95			
								CO_2e	8,797	38,165	8,722	38,201			
EG-01	Upward Vertical Stack	EG-01	Emergency Generator	NA	NA	NA	NA	CO	1.80	0.45	0.10	0.45	Gas	AP-42, Vendor Estimates	NA
								NO_x	0.46	0.12	0.03	0.12			
								Total VOCs	0.49	0.12	0.03	0.12			
								$PM_{Filterable}$	0.11	0.03	0.01	0.03			
								$PM_{Condensable}$	0.03	0.007	0.002	0.01			
								$PM_{2.5}$	0.11	0.03	0.01	0.03			
								PM_{10}	0.11	0.03	0.01	0.03			
								Total HAPs	0.09	0.02	0.005	0.02			
								CO_2	411.54	102.88	23.49	102.88			
								CH_4	4.12	1.03	0.24	1.03			
								CO_2e	514.65	128.66	29.38	128.66			

WH-01	Upward Vertical Stack	WH-01	Boiler	NA	NA	NA	NA	CO	0.89	3.86	0.88	3.86	Gas	AP-42	NA
								NO_x	0.53	2.30	0.52	2.30			
								SO_2	0.01	0.03	0.01	0.03			
								Total VOCs	0.06	0.25	0.06	0.25			
								$PM_{Filterable}$	0.02	0.09	0.02	0.09			
								$PM_{Condensable}$	0.06	0.26	0.06	0.26			
								$PM_{2.5}$	0.02	0.09	0.02	0.09			
								PM_{10}	0.02	0.09	0.02	0.09			
								Total HAPs	0.02	0.09	0.02	0.09			
								CO_2	1,271	5,514	1,259	5,514			
								CH_4	0.02	0.11	0.02	0.11			
								N_2O	0.02	0.10	0.02	0.10			
								CO_2e	1,278	5,546	1,266	5,546			
LR-01	Upward Vertical Stack	LR-1	Loading Rack	NA	NA	NA	NA	Total VOCs	0.001	0.006	0.001	0.006	Gas	AP-42, Vendor Estimate	NA

The EMISSION POINTS DATA SUMMARY SHEET provides a summation of emissions by emission unit. Note that uncaptured process emission unit emissions are not typically considered to be fugitive and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET. Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions). Please complete the FUGITIVE EMISSIONS DATA SUMMARY SHEET for fugitive emission activities.

[1] Please add descriptors such as upward vertical stack, downward vertical stack, horizontal stack, relief vent, rain cap, etc.

[2] Indicate by "C" if venting is continuous. Otherwise, specify the average short-term venting rate with units, for intermittent venting (ie., 15 min/hr). Indicate as many rates as needed to clarify frequency of venting (e.g., 5 min/day, 2 days/wk).

[3] List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. **LIST** Acids, CO, CS_2, VOCs, H_2S, Inorganics, Lead, Organics, O_3, NO, NO_2, SO_2, SO_3, all applicable Greenhouse Gases (including CO_2 and methane), etc. **DO NOT LIST** H_2, H_2O, N_2, O_2, and Noble Gases.

[4] Give maximum potential emission rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

[5] Give maximum potential emission rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

[6] Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).

[7] Provide for all pollutant emissions. Typically, the units of parts per million by volume (ppmv) are used. If the emission is a mineral acid (sulfuric, nitric, hydrochloric or phosphoric) use units of milligram per dry cubic meter (mg/m^3) at standard conditions (68 °F and 29.92 inches Hg) (see 45CSR7). If the pollutant is SO_2, use units of ppmv (See 45CSR10).

Attachment J
EMISSION POINTS DATA SUMMARY SHEET

Table 2: Release Parameter Data								
Emission Point ID No. *(Must match Emission Units Table)*	Inner Diameter (ft.)	Exit Gas			Emission Point Elevation (ft)		UTM Coordinates (km)	
		Temp. (°F)	Volumetric Flow [1] (acfm) *at operating conditions*	Velocity (fps)	Ground Level *(Height above mean sea level)*	Stack Height [2] *(Release height of emissions above ground level)*	Northing	Easting
EG-01	0.5	840	311.74	61.12	1,273	5.00	4,332.66	545.53
WH-01	0.67	838	5,179.00	247.30	1,273	18.00	4,332.66	545.53
CT-01	8	750	277,243	93.32	1,273	61.03	4,332.66	545.53
CT-02	8	750	220,785	72.38	1,273	61.03	4,332.66	545.53
CT-03	8	750	148,553	132.36	1,273	50.01	4,332.66	545.53
CT-04	8	750	116,559	93.37	1,273	50.01	4,332.66	545.53

Attachment K

Attachment K

FUGITIVE EMISSIONS DATA SUMMARY SHEET

The FUGITIVE EMISSIONS SUMMARY SHEET provides a summation of fugitive emissions. Fugitive emissions are those emissions which could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening. Note that uncaptured process emissions are not typically considered to be fugitive, and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET.

Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions).

APPLICATION FORMS CHECKLIST - FUGITIVE EMISSIONS
1.) Will there be haul road activities? ☐ Yes ☒ No ☐ If YES, then complete the HAUL ROAD EMISSIONS UNIT DATA SHEET.
2.) Will there be Storage Piles? ☐ Yes ☒ No ☐ If YES, complete Table 1 of the NONMETALLIC MINERALS PROCESSING EMISSIONS UNIT DATA SHEET.
3.) Will there be Liquid Loading/Unloading Operations? ☒ Yes ☐ No ☒ If YES, complete the BULK LIQUID TRANSFER OPERATIONS EMISSIONS UNIT DATA SHEET.
4.) Will there be emissions of air pollutants from Wastewater Treatment Evaporation? ☐ Yes ☒ No ☐ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.
5.) Will there be Equipment Leaks (e.g. leaks from pumps, compressors, in-line process valves, pressure relief devices, open-ended valves, sampling connections, flanges, agitators, cooling towers, etc.)? ☒ Yes ☐ No ☐ If YES, complete the LEAK SOURCE DATA SHEET section of the CHEMICAL PROCESSES EMISSIONS UNIT DATA SHEET.
6.) Will there be General Clean-up VOC Operations? ☐ Yes ☒ No ☐ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.
7.) Will there be any other activities that generate fugitive emissions? ☐ Yes ☒ No ☐ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET or the most appropriate form.
If you answered "NO" to all of the items above, it is not necessary to complete the following table, "Fugitive Emissions Summary."

FUGITIVE EMISSIONS SUMMARY	All Regulated Pollutants - Chemical Name/CAS [1]	Maximum Potential Uncontrolled Emissions [2]		Maximum Potential Controlled Emissions [3]		Est. Method Used [4]
		lb/hr	ton/yr	lb/hr	ton/yr	
Haul Road/Road Dust Emissions Paved Haul Roads	N/A	N/A	N/A	N/A	N/A	N/A
Unpaved Haul Roads	N/A	N/A	N/A	N/A	N/A	N/.A
Storage Pile Emissions	N/A	N/A	N/A	N/A	N/A	N/A
Loading/Unloading Operations	VOCs	<0.01	<0.01	<0.01	<0.01	AP-42 Section 5.2
Wastewater Treatment Evaporation & Operations	N/A	N/A	N/A	N/A	N/A	N/A
Equipment Leaks	VOCs	11.76	51.53	11.76	51.53	EPA-453
General Clean-up VOC Emissions	N/A	N/A	N/A	N/A	N/A	N/A
Other	N/A	N/A	N/A	N/A	N/A	N/A

[1] List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS_2, VOCs, H_2S, Inorganics, Lead, Organics, O_3, NO, NO_2, SO_2, SO_3, all applicable Greenhouse Gases (including CO_2 and methane), etc. DO NOT LIST H_2, H_2O, N_2, O_2, and Noble Gases.

[2] Give rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

[3] Give rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

[4] Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).

Attachment L

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): **CT-01**

1. Name or type and model of proposed affected source:

   Solar Turbines,
   Titan 130-20502S
   170 MMBtu/hr

2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.

3. Name(s) and maximum amount of proposed process material(s) charged per hour:

   NA

4. Name(s) and maximum amount of proposed material(s) produced per hour:

   NA

5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants:

   NA

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable):

(a) Type and amount in appropriate units of fuel(s) to be burned:

Natural Gas Fuel – As Required

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

NA

(c) Theoretical combustion air requirement (ACF/unit of fuel):

NA @ **NA** °F and **NA** psia.

(d) Percent excess air: **NA**

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

NA

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

NA

(g) Proposed maximum design heat input: **NA** × 10^6 BTU/hr.

7. Projected operating schedule:

Hours/Day	**24**	Days/Week	**7**	Weeks/Year	**52**

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:

@ **NA** °F and **Ambient** psia

a. NO_X	**3.43**	lb/hr	**NA**	grains/ACF
b. SO_2	**0.59**	lb/hr	**NA**	grains/ACF
c. CO	**6.36**	lb/hr	**NA**	grains/ACF
d. $PM/PM_{10}/PM_{2.5}$	**1.00**	lb/hr	**NA**	grains/ACF
e. Hydrocarbons	**NA**	lb/hr	**NA**	grains/ACF
f. VOCs	**0.33**	lb/hr	**NA**	grains/ACF
g. Pb	**NA**	lb/hr	**NA**	grains/ACF
h. Specify other(s)				
CO_{2e}	**20,790**	lb/hr	**NA**	grains/ACF
Total HAPs	**0.22**	lb/hr	**NA**	grains/ACF
Total Ammonia	**2.33**	lb/hr	**NA**	grains/ACF
		lb/hr	**NA**	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
See Attachment O	**See Attachment O**
REPORTING	TESTING
See Attachment O	**See Attachment O**

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

NA

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): **CT-02**

1. Name or type and model of proposed affected source:

   Solar Turbines,
   Mars 100 16000S
   140 MMBtu/hr

2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.

3. Name(s) and maximum amount of proposed process material(s) charged per hour:

   NA

4. Name(s) and maximum amount of proposed material(s) produced per hour:

   NA

5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants:

   NA

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable):

(a) Type and amount in appropriate units of fuel(s) to be burned:

Natural Gas Fuel – As Required

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

NA

(c) Theoretical combustion air requirement (ACF/unit of fuel):

NA @ **NA** °F and **NA** psia.

(d) Percent excess air: **NA**

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

NA

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

NA

(g) Proposed maximum design heat input: **NA** $\times 10^6$ BTU/hr.

7. Projected operating schedule:

Hours/Day	**24**	Days/Week	**7**	Weeks/Year	**52**

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:

@ **NA** °F and **Ambient** psia

a.	NO_X	**2.79**	lb/hr	**NA**	grains/ACF
b.	SO_2	**0.48**	lb/hr	**NA**	grains/ACF
c.	CO	**2.77**	lb/hr	**NA**	grains/ACF
d.	$PM/PM_{10}/PM_{2.5}$	**2.14**	lb/hr	**NA**	grains/ACF
e.	Hydrocarbons	**NA**	lb/hr	**NA**	grains/ACF
f.	VOCs	**0.24**	lb/hr	**NA**	grains/ACF
g.	Pb	**NA**	lb/hr	**NA**	grains/ACF
h.	Specify other(s)				
	CO_{2e}	**17,130**	lb/hr	**NA**	grains/ACF
	Total HAPs	**0.04**	lb/hr	**NA**	grains/ACF
	Total Ammonia	**1.85**	lb/hr	**NA**	grains/ACF
			lb/hr	**NA**	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
See Attachment O	**See Attachment O**
REPORTING	TESTING
See Attachment O	**See Attachment O**

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

NA

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): **CT-03**

1. Name or type and model of proposed affected source: **Solar Turbines,** **Taurus 70-10802S** **94.5 MMBtu/hr**
2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.
3. Name(s) and maximum amount of proposed process material(s) charged per hour: **NA**
4. Name(s) and maximum amount of proposed material(s) produced per hour: **NA**
5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants: **NA**

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable):

(a) Type and amount in appropriate units of fuel(s) to be burned:

Natural Gas Fuel – As Required

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

NA

(c) Theoretical combustion air requirement (ACF/unit of fuel):

NA @ **NA** °F and **NA** psia.

(d) Percent excess air: **NA**

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

NA

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

NA

(g) Proposed maximum design heat input: **NA** $\times 10^6$ BTU/hr.

7. Projected operating schedule:

Hours/Day	**24**	Days/Week	**7**	Weeks/Year	**52**

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:

@ **NA** °F and **Ambient** psia

a. NO_X	**1.89**	lb/hr	**NA**	grains/ACF
b. SO_2	**0.33**	lb/hr	**NA**	grains/ACF
c. CO	**1.79**	lb/hr	**NA**	grains/ACF
d. $PM/PM_{10}/PM_{2.5}$	**1.44**	lb/hr	**NA**	grains/ACF
e. Hydrocarbons	**NA**	lb/hr	**NA**	grains/ACF
f. VOCs	**0.16**	lb/hr	**NA**	grains/ACF
g. Pb	**NA**	lb/hr	**NA**	grains/ACF
h. Specify other(s)				
CO_{2e}	**11,523**	lb/hr	**NA**	grains/ACF
Total HAPs	**0.03**	lb/hr	**NA**	grains/ACF
Ammonia	**1.32**	lb/hr	**NA**	grains/ACF
		lb/hr	**NA**	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
See Attachment O	**See Attachment O**
REPORTING	TESTING
See Attachment O	**See Attachment O**

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

NA

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): **CT-04**

1. Name or type and model of proposed affected source:

   Solar Turbines,
   Taurus 60-7800S
   71.4 MMBtu/hr

2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.

3. Name(s) and maximum amount of proposed process material(s) charged per hour:

   NA

4. Name(s) and maximum amount of proposed material(s) produced per hour:

   NA

5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants:

   NA

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable):

(a) Type and amount in appropriate units of fuel(s) to be burned:

Natural Gas Fuel – As Required

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

NA

(c) Theoretical combustion air requirement (ACF/unit of fuel):

NA @ **NA** °F and **NA** psia.

(d) Percent excess air: **NA**

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

NA

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

NA

(g) Proposed maximum design heat input: **NA** $\times 10^6$ BTU/hr.

7. Projected operating schedule:

Hours/Day	**24**	Days/Week	**7**	Weeks/Year	**52**

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:

@ **NA** °F and **Ambient** psia

a.	NO_X	**1.43**	lb/hr	**NA**	grains/ACF
b.	SO_2	**0.25**	lb/hr	**NA**	grains/ACF
c.	CO	**1.93**	lb/hr	**NA**	grains/ACF
d.	$PM/PM_{10}/PM_{2.5}$	**0.42**	lb/hr	**NA**	grains/ACF
e.	Hydrocarbons	**NA**	lb/hr	**NA**	grains/ACF
f.	VOCs	**0.13**	lb/hr	**NA**	grains/ACF
g.	Pb	**NA**	lb/hr	**NA**	grains/ACF
h.	Specify other(s)				
	CO_{2e}	**8,722**	lb/hr	**NA**	grains/ACF
	Total HAPs	**0.09**	lb/hr	**NA**	grains/ACF
	Ammonia	**0.98**	lb/hr	**NA**	grains/ACF
			lb/hr	**NA**	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
See Attachment O	**See Attachment O**
REPORTING	TESTING
See Attachment O	**See Attachment O**

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

NA

Attachment L

Affected Sources Data

NATURAL GAS COMPRESSOR/GENERATOR ENGINE DATA SHEET

Source Identification Number[1]		EG-01	
Engine Manufacturer and Model		CATERPILLAR G3516C	
Manufacturer's Rated bhp/rpm		2,046 BHP @1800 RPM	
Source Status[2]		New Source (NS)	
Date Installed/Modified/Removed[3]		2016	
Engine Manufactured/Reconstruction Date[4]		NA	
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No)[5]		No	
Engine, Fuel and Combustion Data	Engine Type[6]	LB4S	
	APCD Type[7]	NA	
	Fuel Type[8]	PG	
	H_2S (gr/100 scf)	0.25	
	Operating bhp/rpm	2,046 BHP @1800 RPM	
	BSFC (Btu/bhp-hr)	6,935	
	Fuel throughput (ft^3/hr)	16,080	
	Fuel throughput ($MMft^3$/yr)	8.04	
	Operation (hrs/yr)	500	
Reference[9]	Potential Emissions[10]	lbs/hr	tons/yr
Vendor Estimate	NO_X	0.03	0.12
Vendor Estimate	CO	0.10	0.45
Vendor Estimate	VOC	0.03	0.12
AP-42 Chapter 3.2	SO_2	<0.001	<0.001
AP-42 Chapter 3.2	PM_{10}	0.01	0.03
Vendor Estimate	Formaldehyde	2.41	0.60

Attachment L

Affected Sources Data

1. Enter the appropriate Source Identification Number for each natural gas-fueled reciprocating internal combustion compressor/generator engine located at the compressor station. Multiple compressor engines should be designated CE-1, CE-2, CE-3 etc. Generator engines should be designated GE-1, GE-2, GE-3 etc. If more than three (3) engines exist, please use additional sheets.

2. Enter the Source Status using the following codes:

NS	Construction of New Source (installation)	ES	Existing Source
MS	Modification of Existing Source	RS	Removal of Source

3. Enter the date (or anticipated date) of the engine's installation (construction of source), modification or removal.

4. Enter the date that the engine was manufactured, modified or reconstructed.

5. Is the engine a certified stationary spark ignition internal combustion engine according to 40CFR60 Subpart JJJJ. If so, the engine and control device must be operated and maintained in accordance with the manufacturer's emission-related written instructions. You must keep records of conducted maintenance to demonstrate compliance, but no performance testing is required. If the certified engine is not operated and maintained in accordance with the manufacturer's emission-related written instructions, the engine will be considered a non-certified engine and you must demonstrate compliance according to 40CFR§60.4243a(2)(i) through (iii), as appropriate.

   Provide a manufacturer's data sheet for all engines being registered.

6. Enter the Engine Type designation(s) using the following codes:

LB2S	Lean Burn Two Stroke	RB4S	Rich Burn Four Stroke
LB4S	Lean Burn Four Stroke		

7. Enter the Air Pollution Control Device (APCD) type designation(s) using the following codes:

A/F	Air/Fuel Ratio	IR	Ignition Retard
HEIS	High Energy Ignition System	SIPC	Screw-in Precombustion Chambers
PSC	Prestratified Charge	LEC	Low Emission Combustion
NSCR	Rich Burn & Non-Selective Catalytic Reduction	SCR	Lean Burn & Selective Catalytic Reduction

8. Enter the Fuel Type using the following codes:

PQ	Pipeline Quality Natural Gas	RG	Raw Natural Gas

9. Enter the Potential Emissions Data Reference designation using the following codes. Attach all referenced data to this *Compressor/Generator Data Sheet(s)*.

MD	Manufacturer's Data	AP	AP-42	
GR	GRI-HAPCalc™	OT	Other _____	(please list)

10. Enter each engine's Potential to Emit (PTE) for the listed regulated pollutants in pounds per hour and tons per year. PTE shall be calculated at manufacturer's rated brake horsepower and may reflect reduction efficiencies of listed Air Pollution Control Devices. Emergency generator engines may use 500 hours of operation when calculating PTE. PTE data from this data sheet shall be incorporated in the *Emissions Summary Sheet*.

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): **WH-01**

1. Name or type and model of proposed affected source: **Boiler** **10.7 MMBtu/hr**
2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.
3. Name(s) and maximum amount of proposed process material(s) charged per hour: **NA**
4. Name(s) and maximum amount of proposed material(s) produced per hour: **NA**
5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants: **NA**

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable):

(a) Type and amount in appropriate units of fuel(s) to be burned:

Natural Gas Fuel – As Required

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

NA

(c) Theoretical combustion air requirement (ACF/unit of fuel):

NA @ **NA** °F and **NA** psia.

(d) Percent excess air: **NA**

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

NA

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

NA

(g) Proposed maximum design heat input: **NA** × 10^6 BTU/hr.

7. Projected operating schedule:

Hours/Day	**24**	Days/Week	**7**	Weeks/Year	**52**

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:

@ **NA** °F and **Ambient** psia

a.	NO_X	**0.52**	lb/hr	**NA**	grains/AC F
b.	SO_2	**0.01**	lb/hr	**NA**	grains/AC F
c.	CO	**0.88**	lb/hr	**NA**	grains/AC F
d.	$PM/PM_{10}/PM_{2.5}$	**0.02**	lb/hr	**NA**	grains/AC F
e.	Hydrocarbons	**NA**	lb/hr	**NA**	grains/AC F
f.	VOCs	**0.06**	lb/hr	**NA**	grains/AC F
g.	Pb	**NA**	lb/hr	**NA**	grains/AC F
h.	Specify other(s)				
	CO_{2e}	**1,259**	lb/hr	**NA**	grains/AC F
	Total HAPs	**0.02**	lb/hr	**NA**	grains/AC F
	PM Condensable	**0.06**	lb/hr	**NA**	grains/AC F
			lb/hr	**NA**	grains/AC F

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
See Attachment O	**See Attachment O**
REPORTING	TESTING
See Attachment O	**See Attachment O**

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/ AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/ AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

NA

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

Provide the following information for each new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT www.epa.gov/tnn/tanks.html), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (http://www.epa.gov/tnn/chief/).

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name **Tank Area**	2. Tank Name **Pipeline Liquids Storage Tank**
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) **TK-1**	4. Emission Point Identification No. (as assigned on *Equipment List Form*) **NA**
5. Date of Commencement of Construction (for existing tanks) **2018**	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) **NA**	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode). **NA**	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): **NA**	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. **2,500 gal**	
9A. Tank Internal Diameter (ft) **4.61**	9B. Tank Internal Height (or Length) (ft) **20**
10A. Maximum Liquid Height (ft) **18**	10B. Average Liquid Height (ft) **10**
11A. Maximum Vapor Space Height (ft) **18**	11B. Average Vapor Space Height (ft) **10**
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. **2,500 gallons**	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
12,500 gal	**34.25 gal**

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)
5

15. Maximum tank fill rate (gal/min) **0.024**

16. Tank fill method ☒ Submerged ☐ Splash ☐ Bottom Loading

17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☒ Does Not Apply

17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year
NA	**NA**

18. Type of tank (check all that apply):
☒ Fixed Roof ___vertical X horizontal ___ flat roof ___ cone roof ___ dome roof
___ other (describe)
☐ External Floating Roof ___ pontoon roof ___ double deck roof
☐ Domed External (or Covered) Floating Roof
☐ Internal Floating Roof ___ vertical column support ___ self-supporting
☐ Variable Vapor Space ___ lifter roof ___ diaphragm
☐ Pressurized ___ spherical ___ cylindrical
☐ Underground
☐ Other (describe)

III. TANK CONSTRUCTION & OPERATION INFORMATION (optional if providing TANKS Summary

19. Tank Shell Construction:
☐ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☒ Other (describe) Welded

20A. Shell Color **Light Grey**	20B. Roof Color **Light Grey**	20C. Year Last Painted **N/A**

21. Shell Condition (if metal and unlined):
☒ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable

22A. Is the tank heated? ☐ YES ☒ NO

22B. If YES, provide the operating temperature (°F)

22C. If YES, please describe how heat is provided to tank.

23. Operating Pressure Range (psig):

24. Complete the following section for **Vertical Fixed Roof Tanks** ☒ Does Not Apply

24A. For dome roof, provide roof radius (ft)

24B. For cone roof, provide slope (ft/ft)

25. Complete the following section for **Floating Roof Tanks** ☒ Does Not Apply

25A. Year Internal Floaters Installed:

25B. Primary Seal Type: (check one) ☐ Metallic (Mechanical) Shoe Seal ☐ Liquid Mounted Resilient Seal ☐ Vapor Mounted Resilient Seal ☐ Other (describe):

25C. Is the Floating Roof equipped with a Secondary Seal? ☐ YES ☐ NO

25D. If YES, how is the secondary seal mounted? (check one) ☐ Shoe ☐ Rim ☐ Other (describe):

25E. Is the Floating Roof equipped with a weather shield? ☐ YES ☐ NO

25F. Describe deck fittings; indicate the number of each type of fitting:		
ACCESS HATCH		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
AUTOMATIC GAUGE FLOAT WELL		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
COLUMN WELL		
BUILT-UP COLUMN – SLIDING COVER, GASKETED:	BUILT-UP COLUMN – SLIDING COVER, UNGASKETED:	PIPE COLUMN – FLEXIBLE FABRIC SLEEVE SEAL:
LADDER WELL		
PIP COLUMN – SLIDING COVER, GASKETED:	PIPE COLUMN – SLIDING COVER, UNGASKETED:	
GAUGE-HATCH/SAMPLE PORT		
SLIDING COVER, GASKETED:	SLIDING COVER, UNGASKETED:	
ROOF LEG OR HANGER WELL		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	SAMPLE WELL-SLIT FABRIC SEAL (10% OPEN AREA)
VACUUM BREAKER		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
RIM VENT		
WEIGHTED MECHANICAL ACTUATION GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
DECK DRAIN (3-INCH DIAMETER)		
OPEN:	90% CLOSED:	
STUB DRAIN		
1-INCH DIAMETER:		
OTHER (DESCRIBE, ATTACH ADDITIONAL PAGES IF NECESSARY)		

26. Complete the following section for Internal Floating Roof Tanks ☒ Does Not Apply			
26A. Deck Type: ☐ Bolted ☐ Welded			
26B. For Bolted decks, provide deck construction:			
26C. Deck seam: ☐ Continuous sheet construction 5 feet wide ☐ Continuous sheet construction 6 feet wide ☐ Continuous sheet construction 7 feet wide ☐ Continuous sheet construction 5 × 7.5 feet wide ☐ Continuous sheet construction 5 × 12 feet wide ☐ Other (describe)			
26D. Deck seam length (ft)		26E. Area of deck (ft²)	
For column supported tanks: 26F. Number of columns:		26G. Diameter of each column:	

IV. SITE INFORMANTION (optional if providing TANKS Summary Sheets)

27. Provide the city and state on which the data in this section are based. **Charleston, WV**
28. Daily Average Ambient Temperature (°F) **70 °F**
29. Annual Average Maximum Temperature (°F) **65.5 °F**
30. Annual Average Minimum Temperature (°F) **44.0 °F**
31. Average Wind Speed (miles/hr) **18 mph**
32. Annual Average Solar Insulation Factor (BTU/(ft²·day)) **1,123**
33. Atmospheric Pressure (psia) **14.70**

V. LIQUID INFORMATION (optional if providing TANKS Summary Sheets)

34. Average daily temperature range of bulk liquid: Ambient			
34A. Minimum (°F)		34B. Maximum (°F)	
35. Average operating pressure range of tank:			
35A. Minimum (psig)		35B. Maximum (psig)	
36A. Minimum Liquid Surface Temperature (°F)		36B. Corresponding Vapor Pressure (psia)	
37A. Average Liquid Surface Temperature (°F)		37B. Corresponding Vapor Pressure (psia)	
38A. Maximum Liquid Surface Temperature (°F)		38B. Corresponding Vapor Pressure (psia)	
39. Provide the following for <u>each</u> liquid or gas to be stored in tank. Add additional pages if necessary.			
39A. Material Name or Composition	**Pipeline Fluids**		
39B. CAS Number	**NA**		
39C. Liquid Density (lb/gal)	**5.47**		
39D. Liquid Molecular Weight (lb/lb-mole)	**84.91**		
39E. Vapor Molecular Weight (lb/lb-mole)	**84.91**		

Maximum Vapor Pressure 39F. True (psia) 39G. Reid (psia)	NA NA		
Months Storage per Year 39H. From 39I. To	January December		

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

40. Emission Control Devices (check as many as apply): ☒ Does Not Apply

- ☐ Carbon Adsorption[1]
- ☐ Condenser[1]
- ☐ Conservation Vent (psig)
  - Vacuum Setting — Pressure Setting
- ☐ Emergency Relief Valve (psig)
- ☐ Inert Gas Blanket of
- ☐ Insulation of Tank with
- ☐ Liquid Absorption (scrubber)[1]
- ☐ Refrigeration of Tank
- ☐ Rupture Disc (psig)
- ☐ Vent to Incinerator[1]
- ☐ Other[1] (describe):

41. Expected Emission Rate (submit Test Data or Calculations here or elsewhere in the application).

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
***See calculations included in Attachment N.**					

[1] EPA = EPA Emission Factor, MB = Material Balance, SS = Similar Source, ST = Similar Source Test, Throughput Data, O = Other (specify)

☒ Remember to attach emissions calculations, including TANKS Summary Sheets if applicable.

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

Provide the following information for each new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT www.epa.gov/tnn/tanks.html), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (http://www.epa.gov/tnn/chief/).

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name **Tank Area**	2. Tank Name **Hydrocarbon (Waste Oil) Tank**
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) **TK-2**	4. Emission Point Identification No. (as assigned on *Equipment List Form*) **NA**
5. Date of Commencement of Construction (for existing tanks) **2018**	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) **NA**	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode). **NA**	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): **NA**	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. **2,000 gal**	
9A. Tank Internal Diameter (ft) **4.12**	9B. Tank Internal Height (or Length) (ft) **10**
10A. Maximum Liquid Height (ft) **8**	10B. Average Liquid Height (ft) **5**
11A. Maximum Vapor Space Height (ft) **8**	11B. Average Vapor Space Height (ft) **5**
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. **1,000**	

13A. Maximum annual throughput (gal/yr) **10,000 gal**	13B. Maximum daily throughput (gal/day) **27.40 gal**
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume) **5**	
15. Maximum tank fill rate (gal/min) **0.02**	
16. Tank fill method ☐ Submerged ☒ Splash ☐ Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☒ Does Not Apply	
17A. Volume Expansion Capacity of System (gal) **NA**	17B. Number of transfers into system per year **NA**

18. Type of tank (check all that apply):

☒ Fixed Roof ___vertical X horizontal ___ flat roof ___ cone roof ___ dome roof ___ other (describe)

☐ External Floating Roof ___ pontoon roof ___ double deck roof

☐ Domed External (or Covered) Floating Roof

☐ Internal Floating Roof ___ vertical column support ___ self-supporting

☐ Variable Vapor Space ___ lifter roof ___ diaphragm

☐ Pressurized ___ spherical ___ cylindrical

☐ Underground

☐ Other (describe)

III. TANK CONSTRUCTION & OPERATION INFORMATION (optional if providing TANKS Summary

19. Tank Shell Construction:

☐ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☒ Other (describe) Welded

20A. Shell Color **Light Grey**	20B. Roof Color **Light Grey**	20C. Year Last Painted **N/A**

21. Shell Condition (if metal and unlined):

☒ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable

22A. Is the tank heated? ☐ YES ☒ NO

22B. If YES, provide the operating temperature (°F)

22C. If YES, please describe how heat is provided to tank.

23. Operating Pressure Range (psig):

24. Complete the following section for **Vertical Fixed Roof Tanks** ☒ Does Not Apply

24A. For dome roof, provide roof radius (ft)

24B. For cone roof, provide slope (ft/ft)

25. Complete the following section for **Floating Roof Tanks** ☒ Does Not Apply

25A. Year Internal Floaters Installed:

25B. Primary Seal Type: (check one) ☐ Metallic (Mechanical) Shoe Seal ☐ Liquid Mounted Resilient Seal ☐ Vapor Mounted Resilient Seal ☐ Other (describe):

25C. Is the Floating Roof equipped with a Secondary Seal? ☐ YES ☐ NO

25D. If YES, how is the secondary seal mounted? (check one) ☐ Shoe ☐ Rim ☐ Other (describe):

25E. Is the Floating Roof equipped with a weather shield? ☐ YES ☐ NO

25F. Describe deck fittings; indicate the number of each type of fitting:		
ACCESS HATCH		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
AUTOMATIC GAUGE FLOAT WELL		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
COLUMN WELL		
BUILT-UP COLUMN – SLIDING COVER, GASKETED:	BUILT-UP COLUMN – SLIDING COVER, UNGASKETED:	PIPE COLUMN – FLEXIBLE FABRIC SLEEVE SEAL:
LADDER WELL		
PIP COLUMN – SLIDING COVER, GASKETED:	PIPE COLUMN – SLIDING COVER, UNGASKETED:	
GAUGE-HATCH/SAMPLE PORT		
SLIDING COVER, GASKETED:	SLIDING COVER, UNGASKETED:	
ROOF LEG OR HANGER WELL		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	SAMPLE WELL-SLIT FABRIC SEAL (10% OPEN AREA)
VACUUM BREAKER		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
RIM VENT		
WEIGHTED MECHANICAL ACTUATION GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
DECK DRAIN (3-INCH DIAMETER)		
OPEN:	90% CLOSED:	
STUB DRAIN		
1-INCH DIAMETER:		
OTHER (DESCRIBE, ATTACH ADDITIONAL PAGES IF NECESSARY)		

26. Complete the following section for Internal Floating Roof Tanks ☒ Does Not Apply		
26A. Deck Type: ☐ Bolted ☐ Welded		
26B. For Bolted decks, provide deck construction:		
26C. Deck seam: ☐ Continuous sheet construction 5 feet wide ☐ Continuous sheet construction 6 feet wide ☐ Continuous sheet construction 7 feet wide ☐ Continuous sheet construction 5 × 7.5 feet wide ☐ Continuous sheet construction 5 × 12 feet wide ☐ Other (describe)		
26D. Deck seam length (ft)	26E. Area of deck (ft²)	
For column supported tanks: 26F. Number of columns:	26G. Diameter of each column:	

IV. SITE INFORMANTION (optional if providing TANKS Summary Sheets)

27. Provide the city and state on which the data in this section are based. **Charleston, WV**
28. Daily Average Ambient Temperature (°F) **70 °F**
29. Annual Average Maximum Temperature (°F) **65.5 °F**
30. Annual Average Minimum Temperature (°F) **44.0 °F**
31. Average Wind Speed (miles/hr) **18 mph**
32. Annual Average Solar Insulation Factor (BTU/(ft² day)) **1,123**
33. Atmospheric Pressure (psia) **14.70**

V. LIQUID INFORMATION (optional if providing TANKS Summary Sheets)

34. Average daily temperature range of bulk liquid: Ambient			
34A. Minimum (°F)		34B. Maximum (°F)	
35. Average operating pressure range of tank:			
35A. Minimum (psig)		35B. Maximum (psig)	
36A. Minimum Liquid Surface Temperature (°F)		36B. Corresponding Vapor Pressure (psia)	
37A. Average Liquid Surface Temperature (°F)		37B. Corresponding Vapor Pressure (psia)	
38A. Maximum Liquid Surface Temperature (°F)		38B. Corresponding Vapor Pressure (psia)	
39. Provide the following for <u>each</u> liquid or gas to be stored in tank. Add additional pages if necessary.			
39A. Material Name or Composition	**Used Oil**		
39B. CAS Number	**NA**		
39C. Liquid Density (lb/gal)			
39D. Liquid Molecular Weight (lb/lb-mole)	**200.00**		
39E. Vapor Molecular Weight (lb/lb-mole)	**380.00**		

Maximum Vapor Pressure 39F. True (psia) 39G. Reid (psia)	NA NA		
Months Storage per Year 39H. From 39I. To	January December		

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

40. Emission Control Devices (check as many as apply): ☒ Does Not Apply

- ☐ Carbon Adsorption[1]
- ☐ Condenser[1]
- ☐ Conservation Vent (psig)
  - Vacuum Setting — Pressure Setting
- ☐ Emergency Relief Valve (psig)
- ☐ Inert Gas Blanket of
- ☐ Insulation of Tank with
- ☐ Liquid Absorption (scrubber)[1]
- ☐ Refrigeration of Tank
- ☐ Rupture Disc (psig)
- ☐ Vent to Incinerator[1]
- ☐ Other[1] (describe):

41. Expected Emission Rate (submit Test Data or Calculations here or elsewhere in the application).

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
***See calculations included in Attachment N.**					

[1] EPA = EPA Emission Factor, MB = Material Balance, SS = Similar Source, ST = Similar Source Test, Throughput Data, O = Other (specify)

☒ Remember to attach emissions calculations, including TANKS Summary Sheets if applicable.

Attachment L
EMISSIONS UNIT DATA SHEET
BULK LIQUID TRANSFER OPERATIONS

Furnish the following information for each new or modified bulk liquid transfer area or loading rack, as shown on the *Equipment List Form* and other parts of this application. This form is to be used for bulk liquid transfer operations such as to and from drums, marine vessels, rail tank cars, and tank trucks.

Identification Number (as assigned on *Equipment List Form*): **LR-01**	
1. Loading Area Name: **Tank Truck Loading Area**	
2. Type of cargo vessels accommodated at this rack or transfer point (check as many as apply): ☐ Drums ☐ Marine Vessels ☐ Rail Tank Car ☒ Tank Trucks	
3. Loading Rack or Transfer Point Data:	
Number of pumps	1
Number of liquids loaded	1
Maximum number of marine vessels, tank trucks, tank cars, and/or drums loading at one time	1
4. Does ballasting of marine vessels occur at this loading area? ☐ Yes ☐ No ☒ Does not apply	
5. Describe cleaning location, compounds and procedure for cargo vessels using this transfer point: **NA**	
6. Are cargo vessels pressure tested for leaks at this or any other location? ☐ Yes ☒ No If YES, describe:	

7. Projected Maximum Operating Schedule (for rack or transfer point as a whole):

Maximum	Jan. - Mar.	Apr. - June	July - Sept.	Oct. - Dec.
hours/day	**As Needed, expect a max. of 5 transfers/year**			
days/week	**As Needed , expect a max. of 5 transfers/year**			
weeks/quarter	**As Needed , expect a max. of 5 transfers/year**			

8. Bulk Liquid Data *(add pages as necessary):*		
Pump ID No.		**NA**
Liquid Name		**Pipeline Fluids**
Max. daily throughput (1000 gal/day)		**2.5**
Max. annual throughput (1000 gal/yr)		**12.5**
Loading Method [1]		**BF**
Max. Fill Rate (gal/min)		**84**
Average Fill Time (min/loading)		**30 min**
Max. Bulk Liquid Temperature (°F)		**70 °F**
True Vapor Pressure [2]		**NA**
Cargo Vessel Condition [3]		**U**
Control Equipment or Method [4]		**NA**
Minimum control efficiency (%)		**NA**
Maximum Emission Rate	Loading (lb/hr)	**0.001**
	Annual (lb/yr)	**0.006**
Estimation Method [5]		**EPA AP-42**
[1] BF = Bottom Fill SP = Splash Fill SUB = Submerged Fill		
[2] At maximum bulk liquid temperature		
[3] B = Ballasted Vessel, C = Cleaned, U = Uncleaned (dedicated service), O = other (describe)		
[4] List as many as apply (complete and submit appropriate *Air Pollution Control Device Sheets*): CA = Carbon Adsorption LOA = Lean Oil Adsorption CO = Condensation SC = Scrubber (Absorption) CRA = Compressor-Refrigeration-Absorption TO = Thermal Oxidation or Incineration CRC = Compression-Refrigeration-Condensation VB = Dedicated Vapor Balance (closed system) O = other (descibe)		
[5] EPA = EPA Emission Factor as stated in AP-42 MB = Material Balance TM = Test Measurement based upon test data submittal O = other (describe)		

9. **Proposed Monitoring, Recordkeeping, Reporting, and Testing** Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.	
MONITORING **Atlantic Coast Pipeline, LLC. will comply with all monitoring requirements set forth in the permit that is issued.**	RECORDKEEPING **Atlantic Coast Pipeline, LLC. will comply with all recordkeeping requirements set forth in the permit that is issued.**
REPORTING **Atlantic Coast Pipeline, LLC. will comply with all reporting requirements set forth in the permit that is issued.**	TESTING **Atlantic Coast Pipeline, LLC. will comply with all testing requirements set forth in the permit that is issued.**
MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.	
RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.	
REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.	
TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.	
10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty **NA**	

Attachment M

Attachment M
Air Pollution Control Devices

There are no proposed air pollution control devices at the ACP-1 Station owned by Atlantic Coast Pipeline, LLC. The combustion turbine will utilize ultra-low NO_x burners (SoLoNOx), oxidation catalyst, and selective catalytic reduction (SCR) on the combustion turbines. These components are considered integral to the design of the equipment.

Attachment N

Table N-1 Permit to Construct Application Project Equipment List

ACP Marts Compressor Station - Lewis County, West Virginia

Emission Point ID	Source	Manufacturer	Model/Type	Rated Capacity
CT-01	Compressor Turbine	Solar Turbines	Titan 130-20502S	21,765 hp
CT-02	Compressor Turbine	Solar Turbines	Mars 100-16000S	17,574 hp
CT-03	Compressor Turbine	Solar Turbines	Taurus 70-10802S	11,882 hp
CT-04	Compressor Turbine	Solar Turbines	Taurus 60-7800S	8,414 hp
EG-01	Emergency Generator	Caterpillar	G3516C	2,098 hp
WH-01	Boiler	TBD	TBD	10.7 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	--	--	2,000 gal
TK-3	Ammonia Tank	--	--	8,000 gal
LR-01	Truck Loading Rack	--	--	90 gal/min

Table N-2 Potential Emissions From Combustion Sources
ACP Marts Compressor Station - Lewis County, West Virginia

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

Generator Operational Parameters:

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 Titan 130 Turbine	21,765	hp	Natural Gas	26.6	43.1	2.41	2.58	4.36	4.36	4.36	10.8	90,075	6.52	2.27	90,915	10.2	0.962
Solar Mars 100 Turbine	17,574	hp	Natural Gas	21.9	35.5	1.97	2.12	3.60	3.60	3.60	8.90	74,298	5.37	1.87	74,991	8.12	0.785
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 Taurus 60 Turbine	8,414	hp	Natural Gas	11.2	18.0	1.01	1.08	1.83	1.83	1.83	4.53	37,813	2.7	0.95	38,165	4.29	0.410
Caterpillar G3516C Egen	2,098	hp	Natural Gas	0.116	0.451	0.123	0.0004	0.0279	0.0279	0.0279	0.007	103	1.03	0	129	0	0.0213
Boiler	10.7	MMBtu/hr	Natural Gas	2.30	3.86	0.253	0.0276	0.0873	0.0873	0.0873	0.262	5,514	0.106	0.101	5,546	0	0.0868
Total (tons/yr)				77.0	125	7.13	7.24	12.3	12.3	12.3	30.5	257,782	19.4	6.46	260,193	28.4	2.790

Turbine Control Efficiencies

Control Technology	NOx	CO	VOC
Selective Catalytic Reduction	44%	-	-
Oxidation Catalyst	-	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 Titan 130 Turbine	21,765	hp	Natural Gas	14.8	8.62	1.21	2.58	4.36	4.36	4.36	10.8	90,075	6.52	2.27	90,915	10.2	0.962
Solar Mars 100 Turbine	17,574	hp	Natural Gas	12.1	7.09	0.987	2.12	3.60	3.60	3.60	8.90	74,298	5.37	1.87	74,991	8.12	0.785
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 Taurus 60 Turbine	8,414	hp	Natural Gas	6.23	3.59	0.505	1.08	1.83	1.83	1.83	4.53	37,813	2.73	0.954	38,165	4.29	0.410
Caterpillar G3516C Egen	2,098	hp	Natural Gas	0.116	0.451	0.123	0.0004	0.0279	0.0279	0.0279	0.007	103	1.03	0	129	0	0.0213
Boiler	10.7	MMBtu/hr	Natural Gas	2.30	3.86	0.253	0.028	0.087	0.087	0.087	0.262	5,514	0.106	0.101	- 5,546	0.00	0.0868
Total (tons/yr)				43.8	28.4	3.75	7.24	12.3	12.3	12.3	30.5	257,782	19.4	6.46	260,193	28.4	2.790

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) Emergency generator engine hp taken from manufacturer data
(6) Boiler assumed to have low-NOx burners
(7) See the "HAP Emissions" worksheet for a more detailed breakdown of HAP emissions
(8) See Emissions Factors table for Emissions Factors for each operating scenario.

Table N-3 Event Based Potential Emissions From Combustion Sources
ACP Marts Compressor Station - Lewis County, West Virginia

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 Titan 130 Turbine	21,765	hp	Natural Gas	100	0.0950	8.85	0.101	58.1	0.404	68.2
Solar Mars 100 Turbine	17,574	hp	Natural Gas	100	0.0700	6.18	0.0710	41.5	0.284	48.6
Solar Taurus 70 Turbine	11,882	hp	Natural Gas	100	0.0400	3.66	0.0420	26.0	0.168	30.2
Solar Taurus 60 Turbine	8,414	hp	Natural Gas	100	0.0350	3.22	0.0370	20.5	0.148	24.2
Total (tons/yr)					0.240	21.9	0.261	146	1.00	171

Shutdown Emissions

Combustion Sources	Power Rating	Units	Fuel	Shutdown Events	Criteria Pollutants (tpy)			GHG Emissions (tpy)		
					NOx	CO	VOC	CO2	CH4	CO2e
Solar Titan 130 Turbine	21,765	hp	Natural Gas	100	0.120	10.4	0.119	53.8	0.476	75.5
Solar Mars 100 Turbine	17,574	hp	Natural Gas	100	0.0950	7.46	0.0950	46.0	0.340	54.5
Solar Taurus 70 Turbine	11,882	hp	Natural Gas	100	0.0550	4.67	0.0530	28.8	0.212	34.1
Solar Taurus 60 Turbine	8,414	hp	Natural Gas	100	0.0200	1.65	0.0190	10.2	0.0760	12.1
Total (tons/yr)					0.280	24.2	0.276	149	1.10	176
Total SUSD Emissions (tons/yr)					0.520	48.1	0.527	2.48	2.11	347

Compressor Blowdown Emissions

Source Designation:	FUG-01

Blowdown Start-up Events

Blowdown from Start-up	38,000	scf/event
Volumetric flow rate	385	scf-lbmol
Methane Molecular Weight	16	lb-lbmol
Methane Percent Weight	93%	%
Start-up Blowdown	1,691	lb/event

Blowdown Shutdown Events

Blowdown from Shutdown	63,000	scf/event
Volumetric flow rate	385	scf-lbmol
Methane Molecular Weight	16	lb-lbmol
Methane Percent Weight	93%	%
Shutdown Blowdown	2,803	lb/event

Gas Composition

Pollutant	Molecular Weight (lb/lb-mol)	Initial (Volume) Fraction (mol%)	Wt. Fraction[1] (wt. %)
Total Stream Molecular Weight	16.69		
Non-VOC			
Carbon Dioxide	44.01	1.041%	1.71%
Nitrogen	28.01	0.994%	1.66%
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	0.002%	0.15%
n-Heptane	100.21	0.049%	0.29%
Total VOC Fraction			2.62%
Total HAP Fraction			0.15%

Blowdown from Startup Events

Combustion Sources	Start-up Events	VOC	GHG Emissions (tpy)			HAPs
			CO2	CH4	CO2e	
Solar Titan 130 Turbine	100	2.216	2.293	75.6	1,893	0.125
Solar Mars 100 Turbine	100	2.216	2.293	75.6	1,893	0.125
Solar Taurus 70 Turbine	100	2.216	2.293	75.6	1,893	0.125
Solar Taurus 60 Turbine	100	2.216	2.293	75.6	1,893	0.125
Total (tons/yr)		8.87	9.17	303	7,573	0.500

Blowdown from Shutdown Events

Combustion Sources	Startup Events	VOC	GHG Emissions (tpy)			HAPs
			CO2	CH4	CO2e	
Solar Titan 130 Turbine	100	3.67	3.80	125	3,139	0.207
Solar Mars 100 Turbine	100	3.67	3.80	125	3,139	0.207
Solar Taurus 70 Turbine	100	3.67	3.80	125	3,139	0.207
Solar Taurus 60 Turbine	100	3.67	3.80	125	3,139	0.207
Total (tons/yr)		14.7	15.2	502	12,555	0.830

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-1	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)	24.7	25.6	844	21,124	1.40

Table N-4 Combustion Source Criteria Pollutant Emission Factors
ACP Marts Compressor Station - Lewis County, West Virginia

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 Taurus 60 Turbine	Natural Gas	lb/hr	2.40	4.00	0.230	0.247	0.418	0.418	0.418	1.03	8633	0.624	0.218	8713	0.979
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
Solar Mars 100 Turbine	Natural Gas	lb/hr	4.68	7.90	0.450	0.485	0.821	0.821	0.821	2.03	16963	1.23	0.428	17121	1.85
Solar Titan 130 Turbine	Natural Gas	lb/hr	5.70	9.60	0.550	0.588	1.00	1.00	1.00	2.46	20565	1.49	0.519	20757	2.33

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 Taurus 60 Turbine	Natural Gas	lb/hr	32.0	24.0	0.460	18.7	1,600	9.20
Solar Taurus 70 Turbine	Natural Gas	lb/hr	42.4	31.8	0.620	24.7	2,120	12.4
Solar Mars 100 Turbine	Natural Gas	lb/hr	62.4	47.4	0.900	36.4	3,160	18.0
Solar Titan 130 Turbine	Natural Gas	lb/hr	76.0	57.6	1.10	44.33	3,840	22.0

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 Taurus 60 Turbine	Natural Gas	lb/event	0.700	64.3	0.740	410	2.96	484	0.400	33.0	0.380	204	1.52	242
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
Solar Mars 100 Turbine	Natural Gas	lb/event	1.40	124	1.42	829	5.68	971	1.70	149	1.70	920	6.80	1090
Solar Titan 130 Turbine	Natural Gas	lb/event	1.90	177	2.02	1161	8.08	1363	2.40	208	2.38	1272	9.52	1510

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
1500 KW Caterpillar Egen	Natural Gas	lb/hp-hr	0.001102	0.004298	0.001168	4.08E-06	0.0002663	0.0002663	0.000266	6.87E-05	0.98078	0.00983	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 N-5 Hazardous Air Pollutant (HAP) Emissions From Combustion Sources
ACP Marts Compressor Station - Lewis County, West Virginia

Annual HAP Emissions (lb/yr)									
Quantity @ ACP-1		1	1	1	1	1	1	1	1
Pollutant	HAP?	Solar Taurus 60 Turbine	Solar Taurus 70 Turbine	Solar Mars 100 Turbine	Solar Titan 130 Turbine	Boiler < 100 MMBtu	Boiler < 100 MMBtu	Boiler < 100 MMBtu	1500 KW Caterpillar Egen
1,1,2,2-Tetrachloroethane	Yes								0.035
1,1,2-Trichloroethane	Yes								0.028
1,1-Dichloroethane	Yes								0.021
1,2,3-Trimethylbenzene	No								0.019
1,2,4-Trimethylbenzene	No								0.059
1,2-Dichloroethane	Yes								0.023
1,2-Dichloropropane	Yes								0.024
1,3,5-Trimethylbenzene	No								0.010
1,3-Butadiene	Yes								0.438
1,3-Dichloropropene	Yes								0.023
2,2,4-Trimethylpentane	Yes								0.452
2-Methylnaphthalene	No					0.002	0.000	0.000	0.011
3-Methylchloranthrene	No					0.0002	0.0000	0.0000	
7,12-Dimethylbenz(a)anthracene	No					0.001	0.000	0.000	
Acenaphthene	No					0.0002	0.0000	0.0000	0.001
Acenaphthylene	No					0.0002	0.0000	0.0000	0.002
Acetaldehyde	Yes								4.142
Acrolein	Yes								4.153
Anthracene	No					0.0002	0.0000	0.0000	0.000
Benz(a)anthracene	No					0.0002	0.0000	0.0000	0.000
Benzene	Yes					0.193	0.009	0.004	1.036
Benzo(a)pyrene	No					0.0001	0.0000	0.0000	0.000
Benzo(b)fluoranthene	No					0.0002	0.0000	0.0000	0.000
Benzo(e)pyrene	No								0.000
Benzo(g,h,i)perylene	No					0.0001	0.0000	0.0000	0.000
Benzo(k)fluoranthene	No					0.0002	0.0000	0.0000	0.000
Biphenyl	Yes								0.002
Butane	No					192.978	9.018	3.607	2.536
Butyr/Isobutyraldehyde	No								0.233
Carbon Tetrachloride	Yes								0.032
Chlorobenzene	Yes								0.024
Chloroethane	Yes								
Chloroform	Yes								0.025
Chrysene	No					0.0002	0.0000	0.0000	0.000
Cyclohexane	No								0.164
Cyclopentane	No								0.051
Dibenzo(a,h)anthracene	No					0.0001	0.0000	0.0000	
Dichlorobenzene	Yes					0.110	0.005	0.002	
Ethane	No					284.872	13.312	5.325	37.847
Ethylbenzene	Yes								0.058
Ethylene Dibromide	Yes								0.039
Fluoranthene	No					0.0003	0.0000	0.0000	0.000
Fluorene	No					0.0003	0.0000	0.0000	0.001
Formaldehyde	Yes	773.647	992.029	1483.207	1816.631	6.892	0.322	0.129	29.466
Hexane (or n-Hexane)	Yes					165.409	7.729	3.092	0.238
Indeno(1,2,3-c,d)pyrene	No					0.0002	0.0000	0.0000	0.000
Isobutane	No								2.002
Methanol	Yes								1.324
Methylcyclohexane	No								0.180
Methylene Chloride	Yes								0.078
n-Nonane	No								0.016
n-Octane	No								0.040
Naphthalene	Yes					0.056	0.003	0.001	0.051
PAH	Yes								0.072
Pentane (or n-Pentane)	No					238.925	11.165	4.466	0.817
Perylene	No								0.000
Phenanthrene	No					0.002	0.000	0.000	0.002
Phenol	Yes								0.022
Propane	No					147.031	6.871	2.748	15.320
Propylene Oxide	Yes								
Pyrene	No					0.0005	0.0000	0.0000	0.000
Styrene	Yes								0.029
Tetrachloroethane	No								
Toluene	Yes					0.312	0.015	0.006	0.514
Vinyl Chloride	Yes								0.013
Xylene	Yes								0.143
Arsenic	Yes					0.018	0.001	0.000	
Barium	No					0.404	0.019	0.008	
Beryllium	Yes					0.001	0.000	0.000	
Cadmium	Yes					0.101	0.005	0.002	
Chromium	Yes					0.129	0.006	0.002	
Cobalt	Yes					0.008	0.000	0.000	
Copper	No					0.078	0.004	0.001	
Manganese	Yes					0.035	0.002	0.001	
Mercury	Yes					0.024	0.001	0.000	
Molybdenum	No					0.101	0.005	0.002	
Nickel	Yes					0.193	0.009	0.004	
Selenium	Yes					0.002	0.000	0.000	

Table N-5 Hazardous Air Pollutant (HAP) Emissions From Combustion Sources
ACP Marts Compressor Station - Lewis County, West Virginia

Annual HAP Emissions (lb/yr)									
Quantity @ ACP-1		1	1	1	1	1	1	1	1
Pollutant	HAP?	Solar Taurus 60 Turbine	Solar Taurus 70 Turbine	Solar Mars 100 Turbine	Solar Titan 130 Turbine	Boiler < 100 MMBtu	Boiler < 100 MMBtu	Boiler < 100 MMBtu	1500 KW Caterpillar Egen
Vanadium	No					0.211	0.010	0.004	
Zinc	No					2.665	0.125	0.050	
Lead	Yes					0.046	0.002	0.001	
Total HAPs		819.314	1050.586	1570.758	1923.863				
Total HAP/unit (lb/yr)		819	1051	1571	1924	174	8.11	3.24	43
Total HAP/unit (TPY)		0.410	0.525	0.785	0.962	0.0868	0.004	0.002	0.021

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 N-6 Combustion Source HAP Emission Factors
ACP Marts Compressor Station - Lewis County, West Virginia

Pollutant	HAP?	Emission Factors					
		Solar Taurus 60 Turbine	Solar Taurus 70 Turbine	Solar Mars 100 Turbine	Solar Titan 130 Turbine	Boiler < 100 MMBtu	1500 KW Caterpillar Egen
		lb/MMBtu	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	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

Table N-6 Combustion Source HAP Emission Factors
ACP Marts Compressor Station - Lewis County, West Virginia

Pollutant	HAP?	Emission Factors					
		Solar Taurus 60 Turbine	Solar Taurus 70 Turbine	Solar Mars 100 Turbine	Solar Titan 130 Turbine	Boiler < 100 MMBtu	1500 KW Caterpillar Egen
		lb/MMBtu	lb/MMBtu	lb/MMBtu	lb/MMBtu	lb/MMscf	lb/hp-hr
Tetrachloroethane	No						
Toluene	Yes					3.4E-03	2.5E-06
Vinyl Chlonde+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	
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	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 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 N-7 Potential Emissions From Fugitive Leaks
ACP Marts Compressor Station - Lewis County, West Virginia

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	0.971	250

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 calculation: 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	952	4.28	18.8	0.026	0.492	0.0271	0.509	0.895	16.8	1.48E-09	2.78E-02
Compressors	Gas	5.71E+01	4	228	1001	0.026	26.2	0.0271	27.1	0.895	895	1.48E-03	1.48E+00
Pump Seals	Gas	2.40E-03		0.00	0.00	0.026	0.00	0.0271	0.000	0.895	0.00	1.48E-09	0.00E+00
Others (compressors and others)	Gas	8.80E-03		0.00	0.00	0.026	0.00	0.0271	0.000	0.895	0.00	1.48E-03	0.00E+00
Connectors	Gas	2.00E-04	3	6.00E-04	2.63E-03	0.026	6.89E-05	0.0271	7.13E-05	0.895	2.35E-03	1.48E-09	3.89E-06
Flanges	Gas	3.90E-04	658	0.257	1.124	0.026	0.029	0.0271	0.030	0.895	1.006	1.48E-09	1.66E-03
Open-ended lines	Gas	2.00E-03		0.00	0.00	0.026	0.00	0.0271	0.000	0.895	0.000	1.48E-02	0.00E+00
			Total	233	1021	-	26.8	-	27.7	-	913	-	1.51E+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.
3. Source count for fugitive emissions includes equipment from ACP-1, ACP Kincheloe M&R station, and SHP CNX M&R Station.
4. SHP CNX M&R Station source counts based on Long Run M&R Station equipment counts.

Sample Calculation:

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 N-8a Tank Emissions
ACP Marts Compressor Station - Lewis County, West Virginia

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

Tank Parameters

Source	Type of Tank	Contents	Capacity	Throughput	Tank Diam.	Tank Length	Paint Color	Paint Condition
			(gal)	gal/yr	ft	ft		
TK-1	Horizontal, fixed	Produced Fluids	2,500	12,500	4.61	20	Light Grey	Good
TK-2	Horizontal, fixed	Lube Oil	2,000	10,000	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	1.03E-06	4.50E-06	2.98E-06	1.31E-05	4.01E-06	1.76E-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 N-8b Pipeline to Truck Liquid Loading Rack Emissions
ACP Marts Compressor Station - Lewis County, West Virginia

Source Designation:	LR-1

Chemical Parameters

Chemical	Vapor Mol. Weight [1] (lb/lb-mol)	Avg. Vapor Pressure [1] (psia)	Avg. Temperature [2] (deg. R)	Saturation Factor [3]	Throughput [4] Mgal/yr
Pipeline Liquids	43.86	7.70	520	0.6	12.50

References:

1. Vapor molecular weight and vapor pressure based on E&P output for Pipeline Liquids Storage Tank TK-1.
2. Based on average ambient temperature data for the area.
3. Saturation Factor based on "Submerged loading: dedicated normal service" in Table 5.2-1 of AP-42, Ch. 5.2.

Total Potential Emissions

Source	Total Loading Losses[1]		Pump Capacity [2]	Max Hourly Losses
	Average (lbs/Mgal)	Annual (tpy)	(gal/min)	lb/hr
Pipeline Liquids Truck Loading	4.86	0.03	90	26.2

References:

1. AP-42, Ch. 5.2, Equation 1 (Loading Loss = 12.46 x (Saturation Factor x TVP x Molecular Weight) / Temp.)
2. Assumed pump rate.

Speciated Potential Emissions

Source	Contents	VOC Weight Fraction[1] (%)	HAP Weight Fraction[1] (%)	Total VOC Emissions		Total HAP Emissions	
				lb/hr	tpy	lb/hr	tpy
Pipeline Liquids Truck Loading	Pipeline Liquids	20%	0.002%	5.25	0.006	4.98E-04	5.77E-07

References:

1. VOC and HAP weight fractions are based on 118-PF-04 tank emissions speciation.

Table N-9 Project Potential Emissions

ACP Marts Compressor Station - Lewis County, West Virginia

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 Titan 130 Turbine	CT-01	15.0	27.8	1.43	2.58	4.36	4.36	4.36	10.8	90,196	7.40	2.27	91,059	10.2	0.962
Solar Mars 100 Turbine	CT-02	12.3	20.7	1.14	2.12	3.60	3.60	3.60	8.90	74,385	6.00	1.87	75,094	8.12	0.785
Solar Taurus 70 Turbine	CT-03	8.35	13.1	0.775	1.43	2.42	2.42	2.42	5.99	50,035	4.00	1.26	50,511	5.77	0.525
Solar Taurus 60 Turbine	CT-04	6.28	8.46	0.561	1.08	1.83	1.83	1.83	4.53	37,843	2.96	0.954	38,201	4.29	0.410
Caterpillar G3516C Egen	EG-01	0.116	0.451	0.123	0.0004	0.0279	0.0279	0.0279	0.007	103	1.03	0	129	0.00	0.0213
Boiler	WH-01	2.30	3.86	0.253	0.0276	0.0873	0.0873	0.0873	0.262	5,514	0.106	0.101	5,546	0.00	0.0868
Fugitive Leaks - Blowdowns	FUG-01	-	-	24.7	-	-	-	-	-	25.6	844	-	21,124	-	1.40
Fugitive Leaks - Piping	FUG-02	-	-	26.8	-	-	-	-	-	27.7	913	-	22,856	-	1.51
Accumulator Tank	TK-1	-	-	0.350	-	-	-	-	-	-	-	-	-	-	-
Hydrocarbon (Waste Oil) Tank	TK-2	-	-	1.76E-05	-	-	-	-	-	-	-	-	-	-	-
Truck Loading Rack	LR-01	-	-	0.006	-	-	-	-	-	-	-	-	-	-	5.77E-07
Total (tons/yr)		**44.4**	**74.4**	**56.1**	**7.24**	**12.3**	**12.3**	**12.3**	**30.5**	**258,130**	**1,779**	**6.46**	**304,519**	**28.4**	**5.70**

```
*****************************************************************************************
*     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 [ton/yr]	Uncontrolled [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

E&P TANK

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):	20.06
Diameter (ft):	4.12
Volume (gallons):	2,000.00
Turnovers:	5.00
Net Throughput(gal/yr):	10,000.00
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 Calculations	
Standing Losses (lb):	0.0261
Vapor Space Volume (cu ft):	170.3396
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):	170.3396
Tank Diameter (ft):	4.1200
Effective Diameter (ft):	10.2608
Vapor Space Outage (ft):	2.0600
Tank Shell Length (ft):	20.0800
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):	515.8933
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):	512.6386
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):	0.0090
Vapor Molecular Weight (lb/lb-mole):	380.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0001
Annual Net Throughput (gal/yr.):	10,000.0000
Annual Turnovers:	5.0000
Turnover Factor:	1.0000
Tank Diameter (ft):	4.1200
Working Loss Product Factor:	1.0000
Total Losses (lb):	0.0352

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	0.03	0.04

Solar Turbines Emissions Estimates

Titan 130-20502S

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	10883	90.71	30.53	9	3.2	25	5.5	25	3.2	2.5	0.3	11856	0.02	2.0	704	334,570
59	10005	105.64	24.10	9	3.8	25	6.4	25	3.7	2.5	0.4	13738	0.02	2.3	992	312,106
100	8135	96.16	21.52	9	3.4	25	5.7	25	3.3	2.5	0.3	12273	0.02	2.1	1051	272535

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	16324	137.74	30.15	9	5.0	25	8.4	25	4.8	2.5	0.5	18019	0.02	3.0	899	412,957
59	15007	124.31	30.72	9	4.4	25	7.5	25	4.3	2.5	0.4	16161	0.02	2.7	955	357,451
100	12202	109.82	28.27	9	3.8	25	6.5	25	3.7	2.5	0.4	14813	0.02	2.4	1019	303557

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	21765	157.33	35.20	9	5.7	25	9.6	25	5.5	2.5	0.6	20565	0.02	3.5	900	437,973
59	20010	142.45	35.74	9	5.1	25	8.6	25	4.9	2.5	0.5	18511	0.02	3.1	944	392,270
100	16269	125.42	33.01	9	4.4	25	7.5	25	4.3	2.5	0.4	16001	0.02	2.8	994	339519

Solar Turbines Emissions Estimates

Mars 100-16000S

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	8787	73.11	30.58	9	2.6	25	4.4	25	2.5	2.5	0.3	9609	0.02	1.6	650	298,129
59	7760	85.24	23.16	9	3.1	25	5.2	25	3	2.5	0.3	11107	0.02	1.9	949	275,560
100	6580	75.95	22.05	9	2.7	25	4.5	25	2.6	2.5	0.3	9713	0.02	1.7	1009	240842

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	13180	115.67	28.99	9	4.2	25	7.1	25	4.0	2.5	0.4	15140	0.02	2.5	870	355,319
59	11640	101.99	29.04	9	3.7	25	6.2	25	3.5	2.5	0.4	13260	0.02	2.2	916	310,038
100	9870	90.11	27.87	9	3.2	25	5.4	25	3.1	2.5	0.3	11519	0.02	2.0	965	271481

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	17574	129.64	34.49	9	4.7	25	7.9	25	4.5	2.5	0.5	16983	0.02	2.9	864	366,922
59	15519	116.41	33.92	9	4.2	25	8.6	25	4.9	2.5	0.5	15148	0.02	2.6	908	334,207
100	13160	104.09	32.17	9	3.7	25	6.2	25	3.6	2.5	0.4	13299	0.02	2.3	945	298619

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	7497	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	6538	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

Taurus 60-7800S

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	4207	49.41	21.67	9	1.8	25	3.0	25	1.7	2.5	0.2	6478	0.02	1.1	876	166,972
59	3750	44.11	21.63	9	1.6	25	2.7	25	1.5	2.5	0.2	5748	0.02	1.0	950	144,301
100	3121	39.61	20.05	9	1.4	25	2.4	25	1.4	2.5	0.1	5067	0.02	0.9	999	128111

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	6311	58.62	27.39	9	2.1	25	3.6	25	2.1	2.5	0.2	7678	0.02	1.3	883	180,945
59	5625	51.92	27.56	9	1.9	25	3.2	25	1.8	2.5	0.2	6761	0.02	1.1	937	158,403
100	4682	46.07	25.86	9	1.6	25	2.7	25	1.6	2.5	0.2	5869	0.02	1.0	984	139855

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	8414	65.97	32.45	9	2.4	25	4.0	25	2.3	2.5	0.2	8633	0.02	1.5	889	186,881
59	7500	60.58	31.5	9	2.2	25	3.7	25	2.1	2.5	0.2	7881	0.02	1.3	956	169,979
100	6242	53.78	29.53	9	1.9	25	3.2	25	1.8	2.5	0.2	6870	0.02	1.2	999	151663

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PIL 167
Product Information Letter

SoLoNOx Products: Emissions in Non-SoLoNOx Modes

Leslie Witherspoon
Solar Turbines Incorporated

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

Solar Turbines Incorporated
9330 Sky Park Court
San Diego, CA 92123-5398

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PIL 168
Product Information Letter

Volatile Organic Compound, Sulfur Dioxide, and Formaldehyde Emission Estimates

Leslie Witherspoon
Solar Turbines Incorporated

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

Solar Turbines Incorporated
9330 Sky Park Court
San Diego, CA 92123-5398

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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).

Solar Turbines Incorporated
9330 Sky Park Court
San Diego, CA 92123-5398

[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)	7.5	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	Marts
Application	Simple Cycle
Number of SCRs	17

PROCESS DATA			Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9	Case 10	Case 11	Case 12
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
Customer Design Case														
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	186690	161704	247265	179824	367228	289445	437956	341226
Exhaust Gas Volumetric Flowrate, Wet		ACFM	87269	73508	91761	80971	107807	96052	139492	112383	207193	177363	254956	215260
Exhaust Gas Temperature		degrees F	779.0	873.0	871.0	1004.0	999.0	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	15.28	14.80	14.08	14.50	13.93	14.39	13.83	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	75.68	73.01	75.78	72.96	75.74	72.93	75.85	73.06	75.75	72.63
CO2	44.010	vol% (wet)	2.41	2.27	2.84	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	0.63	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	4.63	4.03
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	50077.2	73373.3	160076.6	104237.6	98593.9	147099.4
Cooling Air Volumetric Flowrate, Wet		ACFM	1387	6438	5653	13303	7475	15516	7739	16991	31601	24139	19040	34084
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	89398	80938	98394	96292	116550	113926	148553	131945	220785	205196	277241	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	15.99	15.78	15.99	15.62
H2O	18.015	vol% (wet)	4.48	7.38	4.72	7.55	4.64	7.67	5.11	7.79	4.64	7.70	4.84	7.84
N2	28.013	vol% (wet)	76.30	73.71	76.21	73.85	76.16	75.91	76.95	73.55	76.15	73.99	76.16	73.54
CO2	44.010	vol% (wet)	2.31	1.87	2.43	1.97	2.50	2.63	2.63	2.10	2.50	2.04	2.49	2.12
Ar	39.948	vol% (wet)	0.91	0.88	0.91	0.63	0.91	0.88	0.91	0.88	0.91	0.88	0.91	0.86
			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	3.86	4.63
CO		ppmvd	50.00	50.13	25.00	25.11	25.00	25.11	25.00	25.10	25.00	25.09	25.00	25.13
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		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
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	8	5	7	6	10	7	14	10	17	13
Aqueous Ammonia Requirement		gallons/h	1046	772	569	452	692	551	932	659	1311	1000	1648	1269
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	253531.2	427643.2	394020.0	536894.1	488666.8
Exhaust Gas Vol Flowrate, Wet at SCR Catalyst		ACFM	89073	81113	98556	96465	116732	114093	148727	132119	220962	205371	277421	254642
Performance Warranting	@ %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	2.15	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	0.89	0.51	0.80	0.84	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

G3516C

GAS ENGINE TECHNICAL DATA

CATERPILLAR®

ENGINE SPEED (rpm):	1800	RATING STRATEGY:	STANDARD
COMPRESSION RATIO:	11.3:1	APPLICATION:	Genset
AFTERCOOLER TYPE:	SCAC	RATING LEVEL:	STANDBY
AFTERCOOLER - STAGE 2 INLET (°F):	130	FUEL:	Nat Gas
AFTERCOOLER - STAGE 1 INLET (°F):	198	FUEL SYSTEM:	CAT LOW PRESSURE WITH AIR FUEL RATIO CONTROL
JACKET WATER OUTLET (°F):	210		
ASPIRATION:	TA	FUEL PRESSURE RANGE(psig):	0.5-5.0
COOLING SYSTEM:	JW+OC+1AC, 2AC	FUEL METHANE NUMBER:	80
CONTROL SYSTEM:	ADEM3 W/ IM	FUEL LHV (Btu/scf):	905
EXHAUST MANIFOLD:	DRY	ALTITUDE CAPABILITY AT 77°F INLET AIR TEMP. (ft):	6000
COMBUSTION:	Low Emission	POWER FACTOR:	0.8
NOx EMISSION LEVEL (g/bhp-hr NOx):	0.5	VOLTAGE(V):	400-480

RATING		NOTES	LOAD	100%	75%	50%
GENSET POWER	(WITHOUT FAN)	(1)(2)	ekW	1500	1125	750
GENSET POWER		(1)(2)	kVA	1875	1406	937
ENGINE POWER	(WITHOUT FAN)	(2)	bhp	2098	1578	1065
GENERATOR EFFICIENCY		(1)	%	95.9	95.6	94.4
GENSET EFFICIENCY(@ 1.0 Power Factor)	(ISO 3046/1)	(3)	%	36.3	35.2	32.3
THERMAL EFFICIENCY		(4)	%	48.9	49.5	51.8
TOTAL EFFICIENCY (@ 1.0 Power Factor)		(5)	%	85.2	84.7	84.1
ENGINE DATA						
GENSET FUEL CONSUMPTION	(ISO 3046/1)	(6)	Btu/ekW-hr	9467	9751	10629
GENSET FUEL CONSUMPTION	(NOMINAL)	(6)	Btu/ekW-hr	9698	9989	10888
ENGINE FUEL CONSUMPTION	(NOMINAL)	(6)	Btu/bhp-hr	6935	7121	7664
AIR FLOW (77°F, 14.7 psia)	(WET)	(7)	ft3/min	4477	3515	2516
AIR FLOW	(WET)	(7)	lb/hr	19853	15587	11156
FUEL FLOW (60°F, 14.7 psia)			scfm	268	207	150
COMPRESSOR OUT PRESSURE			in Hg(abs)	95.2	78.5	60.7
COMPRESSOR OUT TEMPERATURE			°F	416	355	264
AFTERCOOLER AIR OUT TEMPERATURE			°F	138	134	129
INLET MAN. PRESSURE		(8)	in Hg(abs)	81.9	64.8	46.6
INLET MAN. TEMPERATURE	(MEASURED IN PLENUM)	(9)	°F	139	137	138
TIMING		(10)	°BTDC	28	28	28
EXHAUST TEMPERATURE - ENGINE OUTLET		(11)	°F	873	908	932
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia)	(WET)	(12)	ft3/min	11988	9653	7035
EXHAUST GAS MASS FLOW	(WET)	(12)	lb/hr	20585	16153	11567
MAX INLET RESTRICTION		(13)	in H2O	10.04	10.04	10.04
MAX EXHAUST RESTRICTION		(13)	in H2O	20.07	20.07	20.07
EMISSIONS DATA - ENGINE OUT						
NOx (as NO2)		(14)(15)	g/bhp-hr	0.50	0.50	0.50
CO		(14)(16)	g/bhp-hr	1.95	2.04	2.06
THC (mol. wt. of 15.84)		(14)(16)	g/bhp-hr	5.25	6.21	7.03
NMHC (mol. wt. of 15.84)		(14)(16)	g/bhp-hr	0.79	0.93	1.05
NMNEHC (VOCs) (mol. wt. of 15.84)		(14)(16)(17)	g/bhp-hr	0.53	0.62	0.70
HCHO (Formaldehyde)		(14)(16)	g/bhp-hr	0.52	0.52	0.61
CO2		(14)(16)	g/bhp-hr	445	490	518
EXHAUST OXYGEN		(14)(18)	% DRY	9.4	9.2	9.1
LAMBDA		(14)(18)		1.70	1.72	1.70
ENERGY BALANCE DATA						
LHV INPUT		(19)	Btu/min	242453	187291	136100
HEAT REJECTION TO JACKET WATER (JW)		(20)(28)	Btu/min	34325	26067	24171
HEAT REJECTION TO ATMOSPHERE		(21)	Btu/min	7856	6559	5280
HEAT REJECTION TO LUBE OIL (OC)		(22)(28)	Btu/min	6183	5514	4704
HEAT REJECTION TO EXHAUST (LHV TO 77°F)		(23)(24)	Btu/min	78811	65120	48226
HEAT REJECTION TO EXHAUST (LHV TO 248°F)		(23)	Btu/min	57518	47746	35501
HEAT REJECTION TO A/C - STAGE 1 (1AC)		(25)(28)	Btu/min	16058	9070	2712
HEAT REJECTION TO A/C - STAGE 2 (2AC)		(26)(29)	Btu/min	8305	6074	3860
PUMP POWER		(27)	Btu/min	1964	1964	1964

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	100
SET POINT TIMING	-	-	-	-	-	20	22	24	28	28	28	28
DERATION FACTOR	0	0	0	0	0	0.90	0.91	0.93	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	0.97	0.94	0.90	0.86	0.83	0.79	0.75	0.70	0.65	0.60	0.55
120	1	1	1	0.98	0.94	0.90	0.86	0.83	0.79	0.75	0.70	0.65	0.59
110	1	1	1	1	0.98	0.94	0.90	0.86	0.83	0.79	0.75	0.69	0.64
100	1	1	1	1	1	0.98	0.94	0.90	0.86	0.82	0.79	0.75	0.68
90	1	1	1	1	1	1	0.96	0.93	0.89	0.85	0.82	0.78	0.74
80	1	1	1	1	1	1	0.99	0.95	0.91	0.87	0.83	0.79	0.75
70	1	1	1	1	1	1	1	0.96	0.92	0.88	0.84	0.80	0.75
60	1	1	1	1	1	1	1	0.96	0.92	0.88	0.84	0.80	0.75
50	1	1	1	1	1	1	1	0.96	0.92	0.88	0.84	0.80	0.75

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	1.29	1.33	1.38	1.44	1.49	1.54	1.59	1.59	1.59	1.59	1.59	1.59	1.59
120	1.23	1.28	1.32	1.37	1.43	1.48	1.53	1.53	1.53	1.53	1.53	1.53	1.53
110	1.17	1.22	1.27	1.31	1.36	1.42	1.47	1.47	1.47	1.47	1.47	1.47	1.47
100	1.11	1.16	1.21	1.25	1.30	1.35	1.40	1.40	1.40	1.40	1.40	1.40	1.40
90	1.05	1.10	1.15	1.19	1.24	1.29	1.34	1.34	1.34	1.34	1.34	1.34	1.34
80	1	1.04	1.09	1.13	1.18	1.23	1.28	1.28	1.28	1.28	1.28	1.28	1.28
70	1	1	1.03	1.07	1.12	1.17	1.21	1.21	1.21	1.21	1.21	1.21	1.21
60	1	1	1	1.01	1.06	1.10	1.15	1.15	1.15	1.15	1.15	1.15	1.15
50	1	1	1	1	1	1.04	1.09	1.09	1.09	1.09	1.09	1.09	1.09

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 notes 28 and 29 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.

INLET AND EXHAUST RESTRICTIONS FOR ALTITUDE CAPABILITY:

The altitude derate chart is based on the maximum inlet and exhaust restrictions provided on page 1. Contact factory for restrictions over the specified values. Heavy Derates for higher restrictions will apply.

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, 1st stage aftercooler, 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 ± 2.5% 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 manifold pressure is a nominal value with a tolerance of ± 5 %.
9. Inlet manifold temperature is a nominal value with a tolerance of ± 9°F.
10. Timing indicated is for use with the minimum fuel methane number specified. Consult the appropriate fuel usage guide for timing at other methane numbers.
11. Exhaust temperature is a nominal value with a tolerance of (+)63°F, (-)54°F.
12. Exhaust flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of ± 6 %.
13. Inlet and Exhaust Restrictions are maximum allowed values at the corresponding loads. Increasing restrictions beyond what is specified will result in a significant engine derate.
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.
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 ± 2.5%.
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 A/C - Stage 1 based on treated water. Tolerance is ±5% of full load data.
26. Heat rejection to A/C - Stage 2 based on treated water. Tolerance is ±5% of full load data.
27. Pump power includes engine driven jacket water and aftercooler water pumps. Engine brake power includes effects of pump power.
28. Total Jacket Water Circuit heat rejection is calculated as: (JW x 1.1) + (OC x 1.2) + (1AC x 1.05) + [0.84 x (1AC + 2AC) x (ACHRF - 1) 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.
29. Total Second Stage Aftercooler Circuit heat rejection is calculated as: (2AC x 1.05) + [(1AC + 2AC) x 0.16 x (ACHRF - 1) 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.

FREE FIELD MECHANICAL & EXHAUST NOISE

MECHANICAL: Sound Power (1/3 Octave Frequencies)

Gen Power Without Fan	Percent Load	Engine Power	Overall	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz
ekW	%	bhp	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
1500	100	2098	116.6	81.0	89.6	93.8	93.8	95.7	96.4	99.2	102.7	103.2	103.6
1125	75	1578	114.9	80.2	89.1	92.4	91.0	94.1	95.0	97.9	102.2	102.5	102.9
750	50	1065	113.5	78.3	86.2	89.0	85.6	90.7	93.0	96.6	102.0	100.4	101.9

MECHANICAL: Sound Power (1/3 Octave Frequencies)

Gen Power Without Fan	Percent Load	Engine Power	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz
ekW	%	bhp	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
1500	100	2098	106.0	106.0	104.4	103.2	103.8	102.7	102.0	101.8	106.5	108.5	99.7
1125	75	1578	105.4	105.7	103.8	102.5	103.5	102.5	101.8	101.9	106.5	99.6	98.1
750	50	1065	104.6	104.8	103.0	101.7	102.8	101.7	100.8	101.9	97.3	97.3	97.2

EXHAUST: Sound Power (1/3 Octave Frequencies)

Gen Power Without Fan	Percent Load	Engine Power	Overall	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz
ekW	%	bhp	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
1500	100	2098	123.1	105.1	116.6	113.3	109.6	101.7	100.5	106.0	103.3	97.4	100.7
1125	75	1578	122.0	103.7	116.3	113.3	109.9	101.0	98.5	105.0	101.3	94.6	100.8
750	50	1065	121.4	103.1	116.4	113.4	110.4	100.8	100.1	102.0	97.8	92.5	99.2

EXHAUST: Sound Power (1/3 Octave Frequencies)

Gen Power Without Fan	Percent Load	Engine Power	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz
ekW	%	bhp	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
1500	100	2098	102.4	104.4	106.9	109.4	110.1	109.6	110.7	111.9	113.2	108.7	110.5
1125	75	1578	100.5	99.8	103.9	107.6	107.8	107.2	108.3	109.9	112.4	110.2	105.4
750	50	1065	98.8	100.5	102.5	105.7	106.2	105.2	106.4	108.8	113.3	104.4	102.1

SOUND PARAMETER DEFINITION:

Sound Power Level Data - DM8702-02

Sound power is defined as the total sound energy emanating from a source irrespective of direction or distance. Sound power level data is presented under two index headings:
Sound power level – Mechanical
Sound power level – Exhaust

Mechanical: Sound power level data is calculated in accordance with ISO 6798. The data is recorded with the exhaust sound source isolated.

Exhaust: Sound power level data is calculated in accordance with ISO 6798 Annex A. Exhaust data is post-catalyst on gas engine ratings labeled as "Integrated Catalyst".

Measurements made in accordance with ISO 6798 for engine and exhaust sound level only. No cooling system noise is included unless specifically indicated. Sound level data is indicative of noise levels recorded on one engine sample in a survey grade 3 environment.

How an engine is packaged, installed and the site acoustical environment will affect the site specific sound levels. For site specific sound level guarantees, sound data collection needs to be done on-site or under similar conditions.

Attachment O

Attachment O

Monitoring, Recordkeeping, Reporting, Testing Plans.

ACP, LLC. will comply all of the monitoring, recordkeeping, reporting, and testing requirements established in the issued permit for ACP 1 Station.

AIR QUALITY PERMIT NOTICE
Notice of Application

Notice is given that Atlantic Coast Pipeline, LLC. has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a General Permit for a compressor station operation located in West Milford, Lewis County, West Virginia. The latitude and longitude coordinates are: 39.14190 and -80.47318.

The applicant estimates the maximum potential to discharge the following regulated air pollutants on a facility-wide basis will be:

Carbon Monoxide (CO) = 74.42 tpy
Nitrogen Oxides (NO_x) = 44.36 tpy
Particulate Matter ($PM_{Condensable}$) = 30.48 tpy
Particulate Matter ($PM_{2.5}$) = 12.33 tpy
Particulate Matter (PM_{10}) = 12.33 tpy
Sulfur Dioxide (SO_2) = 7.24 tpy
Formaldehyde = 3.03 tpy
Volatile Organic Compounds (VOC) = 56.13 tpy
Benzene = 0.01 tpy
Toluene = 0.02 tpy
Ethylbenzene = <0.001 tpy
Xylene = <0.001 tpy
Hazardous Air Pollutants (HAPs) = 5.70 tpy
Carbon Dioxide Equivalents (CO_2e) = 304,519 tpy

Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57th Street, SE, Charleston, WV 25304, for at least 30 calendar days from the date of publication of this notice.

Any questions regarding this permit application should be directed to the DAQ at (304) 926-0499, extension 1227, during normal business hours.

Dated this the 18th day of September, 2015.

By: Atlantic Coast Pipeline, LLC.
Robert Bisha
Project Director Atlantic Coast Pipeline
500 Dominion Blvd.
Glen Allen, VA 23060

Attachment Q

Attachment Q
Business Confidential Claims

There is no confidential information associated with this permit application.

Attachment R

Attachment R
Authority Forms

Since this application is signed by the "Responsible Official", this section is not applicable.

Attachment S

Attachment S
Title V Permit Revision Information

An Attachment S is not being provided with this permit application since the site does not currently possess a Title V Permit.