Mountain Valley PIPELINE

October 21, 2015

Via Certified Mail
Return Receipt Requested
No. 7015 0640 0000 9694 1211

Mr. William Durham
WVDEP – Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

Re: R13 Permit Application
Mountain Valley Pipeline, LLC – Stallworth Compressor Station
Fayette County, WV

Dear Mr. Durham:

Mountain Valley Pipeline, LLC (MVP) is submitting this request to the West Virginia Department of Environmental Protection (WVDEP) for the construction of a new natural gas transmission compressor station located in Fayette County, West Virginia (Stallworth Compressor Station). MVP is submitting this application to install the following equipment:

- Two (2) Solar Titan 130 natural gas-fired turbines each rated at 19,483 horsepower (hp) at site-specific conditions (ISO rating at 20,500 hp each);
- Ten (10) Capstone C200 natural gas-fired microturbines each rated at 200 kW;
- Two (2) natural gas-fired, fuel gas heaters each rated at 2.31 million British thermal units per hour (MMBtu/hr, heat input);
- One (1) natural gas-fired, office building heater rated at 0.12 MMBtu/hr, heat input; and
- Two (2) miscellaneous storage tanks with capacities less than 15, 000 gallons

The construction of the facility will not trigger prevention of significant deterioration, and the facility will not be a major source with respect to the Title V permit program.

Enclosed are two electronic copies and one original hard copy of the R13 application. The legal advertisement is scheduled to be published in the next few days. The affidavit of publication will be forwarded to WVDEP as soon as it is received from the newspaper. The fees will be paid by credit card once the application is received by your office.

625 Liberty Ave., Suite 1700, Pittsburgh PA 15222
Tel 304.848.0061 | Fax 412.395.3166 www.mountainvalleypipeline.info

MVP appreciates your review of this application. If you have any questions or comments about the attached information or have additional information requirements, please, feel free to contact me at (412) 553-7848.

Sincerely,

Regina Henry
Supervisor, Environmental

Attachments

R13 PERMIT APPLICATION

Mountain Valley Pipeline, LLC
Stallworth Compressor Station

Mountain Valley PIPELINE LLC

Fayette County, West Virginia

Prepared By:

TRINITY CONSULTANTS
4500 Brooktree Rd.
Suite 103
Wexford, PA 15090
(724) 935-2611

October 2015

Trinity Consultants

Environmental solutions delivered uncommonly well

TABLE OF CONTENTS

Mountain Valley Pipeline, LLC (MVP), a subsidiary of EQT Corporation (EQT) is submitting this application to the West Virginia Department of Environmental Protection (WVDEP) for the construction of a new natural gas transmission compressor station located in Fayette County, West Virginia (Stallworth Compressor Station).

1.1. FACILITY AND PROJECT DESCRIPTION

The Stallworth Compressor Station is a natural gas transmission facility that will compress natural gas along the Mountain Valley Pipeline. The station has the potential to operate 24 hours per day, 7 days per week. The Stallworth Compressor Station will consist of the following equipment

- Two (2) Solar Titan 130 natural gas-fired turbines each rated at 19,483 horsepower (hp) at site-specific conditions (ISO rating at 20,500 hp each);
- Ten (10) Capstone C200 natural gas-fired microturbines each rated at 200 kW;
- Two (2) natural gas-fired, fuel gas heaters each rated at 2.31 million British thermal units per hour (MMBtu/hr, heat input);
- One (1) natural gas-fired, office building heater rated at 0.12 MMBtu/hr, heat input; and
- Two (2) miscellaneous storage tanks with capacities less than 15,000 gallons

A description of each source category is included below. A process flow diagram is included as Attachment F. There are no other facilities located within ¼ mile of the Stallworth Compressor Station.

1.1.1. Turbines

MVP is proposing to install two (2) natural gas-fired turbines for the compression and transmission of natural gas. The turbines are each rated at 19,483 hp at site-specific conditions, and equipped with SoLoNOx combustion technology. The function of these turbines is to raise the discharge pressure of the gas to overcome the effect of frictional losses in the pipeline upstream of the station.

1.1.2. Storage Tanks

The Stallworth Compressor Station will operate one (1) produced fluids storage tank, and one (1) used oil storage tank. Once the tanks are filled, the contents are loaded into trucks for transport.

1.1.3. Heaters

MVP is proposing to add two (2) natural gas-fired heaters rated at 2.31 MMBtu/hr of heat input and an office heater rated at 0.12 MMBtu/hr at the Stallworth Compressor Station. The fuel heaters will operate continuously (i.e., 8,760 hours per year) and preheat natural gas to maintain temperature above dewpoint prior to combustion. The office heater will provide comfort heating for the building and will operate as needed.

1.1.4. Microturbine Generators

There will be ten (10) microturbine generators at the Stallworth Compressor Station. The microturbine generators are two (2) Model C1000 low-NO_x generators (5 identical units of 200 kW, each) manufactured by Capstone. One unit will provide main electrical power, while the second will provide backup power to the station.

1.2. R-13 APPLICATION ORGANIZATION

This R-13 permit application is organized as follows:

- Section 2: Sample Emission Source Calculations;
- Section 3: R-13 Application Forms;
- Attachment A: Business Certificate;
- Attachment B: Map;
- Attachment C: Installation and Start Up Schedule;
- Attachment D: Regulatory Discussion;
- Attachment E: Plot Plan;
- Attachment F: Detailed Process Flow Diagram;
- Attachment G: Process Description;
- Attachment I: Emission Units Table;
- Attachment J: Emission Points Data Summary Sheet;
- Attachment K: Fugitive Emissions Data Summary Sheet;
- Attachment L: Emissions Unit Data Sheets;
- Attachment N: Supporting Emission Calculations;
- Attachment O: Monitoring/Recordkeeping/Reporting/Testing Plans;
- Attachment P: Public Notice; and
- Application Fee

2. SAMPLE EMISSION SOURCE CALCULATIONS

The characteristics of air emissions from the Stallworth Compressor Station, along with the methodology used for calculating emissions from the proposed new sources, are described in narrative form below. Detailed supporting calculations are also provided in Attachment N.

Emissions from the Stallworth Compressor Station will result from natural gas combustion in the turbines, fuel gas heaters, Office heaters microturbine generators, and flashing, working, and breathing losses from the storage tanks. In addition, fugitive emissions from component leaks will result from the operation of the station. The methodologies employed in calculating emissions from these sources have been summarized below, with specific citations included in Attachment N.

2.1. TURBINES

Potential emissions of nitrogen oxides (NO_X), CO, VOC, and CH_4 are calculated using factors provided by the turbine manufacturer. Potential emissions of sulfur dioxide (SO_2), particulate matter ($PM/PM_{10}/PM_{2.5}$), and formaldehyde are calculated using factors from Product Information Letters published by the turbine manufacturer. All hazardous air pollutants (HAPs), with the exception of formaldehyde, are calculated using U.S. EPA's AP-42 Section 3.1, Table 3.1-3 "Emission Factors for HAPs from Natural Gas Fired Stationary Gas Turbines". Potential emissions of greenhouse gas pollutants (GHGs) are calculated using manufacturer's data as available (CH_4 in this case) and U.S. EPA's emission factors from 40 CFR Part 98, Subpart C for all others.

Emissions from the turbine may vary due to operational load and ambient temperature. The vendor guarantees emissions concentrations of the SoLoNOx system at and above 0°F. The vendor has also provided estimated emissions from subzero temperatures, which are expected to occur infrequently. To calculate potential emissions, the vendor guaranteed emission rates at 0°F and maximum operating load (on a lb/hr basis) were assumed continuously (i.e., 8,760 hour per year). This calculation resulted in a more conservative (i.e., higher) annual emission rate compared to assuming nominal operation below 0°F and the remainder of the year at annual average temperature.

Annual emissions also include emissions from startup and shutdown, which are calculated by multiplying emissions per startup by the number of estimated startups per year.

2.2. FUEL GAS AND OFFICE HEATERS

Potential emissions of all criteria pollutants and HAPs are calculated using U.S. EPA's AP-42 factors for natural gas combustion equipment. These calculations assume a site-specific heat content. Greenhouse gas emissions are calculated according to 40 CFR 98 Subpart C. Although the operation of these sources may be intermittent, potential emissions are calculated assuming continuous operation (i.e., 8,760 hours per year).

2.3. MICROTURBINE GENERATORS

Potential emissions of NO_X, CO, VOC, methane, and CO_2 are calculated using manufacturer's emission data. Emissions of all other criteria pollutants and HAPs are calculated using U.S. EPA's AP-42 factors for natural gas internal combustion engines. These calculations use a site specific heat content. Although one unit will provide backup power, potential emissions of all units are calculated assuming continuous operation (i.e., 8,760 hours per year).

2.4. STORAGE TANKS

Working, standing, and flash loss emissions of VOC and HAPs from the produced fluids storage tank are calculated using E&P Tank v2.0. Liquid loading emissions are calculated using EPA AP-42 emission factors.

2.5. FUGITIVE EMISSIONS

Emissions from fugitive equipment leaks are calculated using published EPA emission factors and 40 CFR Part 98, Subpart W emission factors. Emissions from blowdown events are calculated using engineering estimates of the amount of gas vented during each event. Site specific gas analyses were used to speciate VOC, HAP, and GHG emissions.

3. R13 APPLICATION FORM

The WVDEP permit application forms contained in this application include all applicable R13 application forms including the required attachments.

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)*:
Mountain Valley Pipeline, LLC

2. Federal Employer ID No. ***(FEIN):***
61-1744744

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

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

5A. Applicant's mailing address:
625 Liberty Avenue, Suite 1700
Pittsburgh, PA 15222

5B. Facility's present physical address:
Dawson-Springdale Rd, Meadow Bridge, WV 25976

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: EQT Corporation

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: Applicant owns 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.): Natural Gas Compressor Station

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**.

From Charleston, WV take I-64 E/I-77 S for 90 miles to Morris Branch Rd in Western. Then take exit 150 toward Dawson/State Route 29/4. Next, Turn right onto Morris Branch Rd. Then, Turn left onto County Rd 27/3. Finally, turn left and travel 2.8 miles on Dawson-Springdale. The site will be on your right.

12.B. New site address (if applicable):	12C. Nearest city or town: Meadow Bridge, WV 25976	12D. County: Fayette
12.E. UTM Northing (KM): 4,191.20	12F. UTM Easting (KM): 521.31	12G. UTM Zone: 17

13. Briefly describe the proposed change(s) at the facility:

Mountain Valley Pipeline, LLC is constructing a new natural gas transmission compressor station as part of the Mountain Valley Pipeline (MVP).

14A. Provide the date of anticipated installation or change: October 2014 – If this is an **After-The-Fact** permit application, provide the date upon which the proposed change did happen:	14B. Date of anticipated Start-Up if a permit is granted: 12/2017

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 Microturbines, Fuel Gas Heater, Office Building Heaters and Turbines

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

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: 10-20-15 *(Please use blue ink)*

35B. Printed name of signee: Shawn Posey		35C. Title: Sr. Vice President – Engineering and Construction
35D. E-mail: sposey@eqt.com	36E. Phone:	36F. FAX:
36A. Printed name of contact person (if different from above): Regina Henry		36B. Title: Supervisor - Environmental
36C. E-mail: rhenry@eqt.com	36D. Phone: 412-553-7848	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

Current Business Certificate

WEST VIRGINIA
STATE TAX DEPARTMENT
BUSINESS REGISTRATION CERTIFICATE

ISSUED TO:
MOUNTAIN VALLEY PIPELINE, LLC
625 LIBERTY AVE, SUITE 1700
PITTSBURGH, PA 15222-0000

BUSINESS REGISTRATION ACCOUNT NUMBER: **2305-4787**

This certificate is issued on: **04/8/2015**

This certificate is issued by
the West Virginia State Tax Commissioner
in accordance with Chapter 11, Article 12, of the West Virginia Code

The person or organization identified on this certificate is registered to conduct business in the State of West Virginia at the location above.

This certificate is not transferrable and must be displayed at the location for which issued

This certificate shall be permanent until cessation of the business for which the certificate of registration was granted or until it is suspended, revoked or cancelled by the Tax Commissioner.

Change in name or change of location shall be considered a cessation of the business and a new certificate shall be required.

TRAVELING/STREET VENDORS: Must carry a copy of this certificate in every vehicle operated by them. CONTRACTORS, DRILLING OPERATORS, TIMBER/LOGGING OPERATIONS: Must have a copy of this certificate displayed at every job site within West Virginia.

atL006 v.4
L0521552192

ATTACHMENT B

Map

ATTACHMENT B - AREA MAP

Figure 1 - Map of Stallworth Station

UTM Northing (KM):	4,191.198
UTM Easting (KM):	521.305
Elevation:	~2,785 ft

ATTACHMENT C

Startup and Installation Schedule

ATTACHMENT C

Schedule of Planned Installation and Start-Up

Unit	Installation Schedule	Startup Schedule
Two (2) Solar Titan 130 Turbines – Each rated 19,483 HP at site-specific conditions (20,500 HP ISO)	2016-2017	4Q 2017
Ten (10) 200 KW Capstone Microturbines	2016-2017	4Q 2017
Two (2) Fuel Gas Heaters – Each rated 2.31 MMBtu/hr	2016-2017	4Q 2017
One (1) 10,080 gallon Produced Fluids Tank	2016-2017	4Q 2017
One (1) 4,200 gallon Used Oil Tank	2016-2017	4Q 2017
Office Building Heater – Rated 0.120 MMBtu/hr	2016-2017	4Q 2017

ATTACHMENT D

Regulatory Discussion

ATTACHMENT D - REGULATORY APPLICABILITY

This section documents the applicability determinations made for Federal and State air quality regulations. The monitoring, recordkeeping, reporting, and testing plan is presented in Attachment O. In this section, applicability or non-applicability of the following regulatory programs is addressed:

- Prevention of Significant Deterioration (PSD) permitting;
- Non-Attainment New Source Review (NNSR) permitting;
- Title V of the 1990 Clean Air Act Amendments;
- New Source Performance Standards (NSPS);
- National Emission Standards for Hazardous Air Pollutants (NESHAP); and
- West Virginia State Implementation Plan (SIP) regulations.

This review is presented to supplement and/or add clarification to the information provided in the WVDEP R13 permit application forms, which fulfill the requirement to include citations and descriptions of applicable statutory and administrative code requirements.

In addition to providing a summary of applicable requirements, this section of the application also provides non-applicability determinations for certain regulations, allowing the WVDEP to confirm that identified regulations are not applicable to the station. Note that explanations of non-applicability are limited to those regulations for which there may be some question of applicability specific to the operations at the station. Regulations that are categorically non-applicable are not discussed (e.g., NSPS Subpart J, Standards of Performance for Petroleum Refineries).

Prevention of Significant Deterioration Source Classification

Federal construction permitting programs regulate new and modified sources of attainment pollutants under PSD and new and modified sources of non-attainment pollutants under NNSR. PSD regulations apply when a new source is constructed in which emissions exceed PSD major source thresholds, an existing minor source undergoes a modification in which emission increases exceed PSD major source thresholds, or an existing major source undergoes a modification in which emission increases exceed PSD significant emission rates. The Stallworth Station will be a minor source with respect to PSD, as shown in Attachment N. As such, PSD permitting is not triggered.

NNSR regulations apply only in areas designated as non-attainment. The Stallworth Station will be located in Fayette County, which is designated as attainment/unclassifiable for all criteria pollutants.[1] Therefore, NNSR regulations do not apply to the Stallworth Station.

Title V Operating Permit Program

Title 40 of the Code of Federal Regulations, Chapter 70 (40 CFR 70) establishes the Federal Title V operating permit program. West Virginia has incorporated the provisions of this Federal program in its Title V operating permit program in West Virginia 45CSR30. 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.[2] The potential emissions of all regulated pollutants are below

[1] U.S. EPA Greenbook, http://www.epa.gov/airquality/greenbook/anayo_wv.html, as of January 30, 2015.
[2] On June 23, 2014, the U.S Supreme Court decision in the case of *Utility Air Regulatory Group v. EPA* effectively changed the permitting procedures for GHGs under the PSD and Title V programs.

the corresponding thresholds for the proposed project. Therefore, the Stallworth Station is not a major source for Title V purposes.

New Source Performance Standards

NSPS, located in 40 CFR 60, require new, modified, or reconstructed sources to control emissions to the level achievable by the best demonstrated technology as specified in the applicable provisions. Moreover, any source subject to an NSPS is also subject to the general provisions of NSPS Subpart A, except where expressly noted. The following is a summary of applicability and non-applicability determinations for NSPS regulations of relevance to the facility.

NSPS Subpart Dc - Steam Generating Units

Subpart Dc, Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units, applies to all steam generating units with a heat input greater than or equal to 10 MMBtu/hr and less than 100 MMBtu/hr. No units at the proposed facility meet the definition of a steam generating unit and have a heat input greater than 10 MMBtu/hr; therefore, the requirements of this subpart will not apply.

NSPS Subpart GG - Stationary Gas Turbines

Subpart GG, Standards of Performance for Stationary Gas Turbines, applies to all gas turbines with a heat input at peak load greater than or equal to 10 MMBtu/hr based on the lower heating value of the fuel fired. This standard was promulgated in 1979. The applicability of Subpart KKKK, promulgated in 2006, is similar to that of Subpart GG and applies to stationary combustion turbines that commence construction after February 18, 2005. Turbines subject to Subpart KKKK are specifically exempt from the requirements of Subpart GG per 40 CFR § 60.4305(b). As such, this subpart does not apply to the proposed Solar turbines at the Stallworth Compressor station as they are subject to the requirements of Subpart KKKK as discussed in the following section. The proposed microturbines have a heat input below 10 MMBtu/hr and are not subject to the requirements of Subpart GG.

NSPS Subparts K, Ka, and Kb - Storage Vessels for Petroleum Liquids/Volatile Organic Liquids

These subparts apply to storage tanks of certain sizes constructed, reconstructed, or modified during various time periods. Subpart K applies to storage tanks constructed, reconstructed, or modified prior to 1978, and Subpart Ka to those constructed, reconstructed, or modified prior to 1984. All storage tanks located at the Stallworth Compressor Station will be constructed after these dates; therefore, the requirements of Subparts K and Ka do not apply. Subpart Kb applies to volatile organic liquid (VOL) storage tanks constructed, reconstructed, or modified after July 23, 1984 with a capacity equal to or greater than 75 m^3 (~19,813 gallons). All storage tanks at the Stallworth Compressor Station will be constructed after this date, but will not have a capacity greater than 75 m^3. Therefore, Subpart Kb does not apply to the storage tanks at the Stallworth Compressor Station.

NSPS Subpart IIII - Compression Ignition Internal Combustion Engines

Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines, applies to manufacturers, owners and operators of compression ignition (CI) engines. There will be no CI engines installed at the Stallworth Compressor Station. Therefore, this subpart is not applicable to the station.

NSPS Subpart JJJJ - Stationary Spark Ignition Internal Combustion Engines

Subpart JJJJ, Standards of Performance for Stationary Spark Ignition Internal Combustion Engines, applies to manufacturers, owners and operators of stationary spark (SI) engines. There will be no SI engines installed at the Stallworth Compressor Station. Therefore, this subpart is not applicable to the station.

NSPS Subpart KKKK - Stationary Combustion Turbines

Subpart KKKK, Standards of Performance for Stationary Combustion Turbines, applies to stationary combustion units with a heat input at peak load equal to or greater than 10 MMBtu/hr, based on the higher heating value of the fuel, commencing construction after February 18, 2005. The microturbines at the Stallworth Compressor station will each have a heat input less than 10 MMbtu/hr. Therefore, they are not subject to this standard.

The proposed Solar turbines for the Stallworth Compressor Station will be subject to the NO_X emissions limitations in §60.4320(a). Turbines with a rated capacity of 50 < MMBtu/hr ≤ 850 MMBtu/hr at peak load are limited to NO_X emissions of 25 ppm at 15% O_2 when firing natural gas. The Solar turbines that will be installed at the station are equipped with lean pre-mix combustion technology and are guaranteed by the manufacturer to emit a maximum of 15 ppm of NO_X at 15% O_2 under variable turbine load conditions when firing natural gas. This vendor guarantee is well below the NSPS KKKK standard.

Mountain Valley Pipeline (MVP) will perform annual performance tests in accordance with §60.4340(a) and §60.4400 to demonstrate compliance with the NO_X emission limitations, or as an alternative, will continuously monitor the appropriate parameters to determine whether the turbine is operating in low-NO_X mode in accordance with §60.4340(b)(2)(ii) and §60.4355(a). The Solar turbines must also comply with the SO_2 emission limits in §60.4330. MVP will comply with the SO_2 requirements by the exclusive use of natural gas which contains total potential sulfur emissions less than 0.060 lb SO_2/MMBtu heat input in accordance with §60.4330(a)(2).

NSPS Subpart OOOO - Natural Gas Production, Transmission, and Storage

Subpart OOOO, Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution, applies to affected facilities that commenced construction, reconstruction, or modification after August 23, 2011. This NSPS was published in the Federal Register on August 16, 2012, and subsequently amended. The list of potentially affected facilities includes:

- Gas wellheads ;
- Centrifugal compressors located between the wellhead and the point of custody transfer to the natural gas transmission and storage segment;
- Reciprocating compressors located between the wellhead and the point of custody transfer to the natural gas transmission and storage segment;
- Continuous bleed natural gas-driven pneumatic controllers with a bleed rate of > 6 scfh located between the wellhead and the point of custody transfer to the natural gas transmission and storage segment (excluding natural gas processing plants);
- Continuous bleed natural gas-driven pneumatic controllers located at natural gas processing plants;
- Storage vessels in the production, processing, or transmission and storage segments; and
- Sweetening units located onshore that process natural gas produced from either onshore or offshore wells.

Since the proposed Stallworth Compressor Station will be a transmission facility located after the point of custody transfer, the only potentially applicable requirements for the proposed equipment are those for new storage vessels where construction commenced after August 23, 2011.

The standards applicable to storage vessels are detailed in 40 CFR §60.5395. The only tank that falls under the Subpart's definition of a 'storage vessel' is the produced fluid storage tank, however, this tank will have potential VOC emissions below 6 tpy. As such, per 60.5365(e), the tank is not a storage vessel affected facility under the rule.

It is important to note that updates to NSPS OOOO have been proposed. However, as the changes are not finalized, applicability will be reviewed once the rules have been finalized.

National Emission Standards for Hazardous Air Pollutants

Regulatory requirements for facilities subject to NESHAP standards, otherwise known as Maximum Available Control Technology (MACT) Standards for source categories, are contained in 40 CFR Part 63. 40 CFR Part 61 NESHAP standards are defined for specific pollutants while Part 63 NESHAPs are defined for source categories where allowable emission limits are established on the basis of a MACT determination for a particular major source. A major source of HAP is defined as having potential emissions in excess of 25 tpy for total HAP and/or potential emissions in excess of 10 tpy for any individual HAP. Part 63 NESHAPs apply to sources in specifically regulated industrial source categories (CAA Section 112(d)) or on a case-by-case basis (Section 112(g)) for facilities not regulated as a specific industrial source type.

Potential HAP emissions from the proposed Stallworth Compressor Station will be below the major source thresholds (i.e., less than 10 tpy of individual HAP and 25 tpy of total HAP) and therefore the facility will be an area source of HAP. The potential applicability of specific MACT standards to the Stallworth Compressor Station is discussed below.

NESHAP Subpart HH - Natural Gas Production Facilities

This standard applies to sources at natural gas production facilities that are major or area sources of HAP emissions. The proposed Stallworth Station is a transmission facility; therefore, this facility will not be subject to Subpart HH.

NESHAP Subpart HHH - Natural Gas Transmission and Storage Facilities

This standard applies to sources at natural gas transmission and storage facilities that are major sources of HAP emissions located downstream of the point of custody transfer (after processing and/or treatment in the production sector), but upstream of the distribution sector. The proposed Stallworth Compressor Station is a transmission facility and is an area source of HAP emissions. Therefore, this facility will not be subject to Subpart HHH.

NESHAP Subpart YYYY - Stationary Combustion Turbines.

Stationary combustion turbines located at facilities that are major sources of HAPs are potentially subject to Subpart YYYY, NESHAP for Stationary Combustion Turbines. Subpart YYYY establishes emissions and operating limitations for lean premix gas-fired, lean premix oil-fired, diffusion flame gas-fired and diffusion flame oil-fired stationary combustion turbines. The proposed Stallworth Station is an area source of HAP and therefore is not subject to the requirements of this subpart.

NESHAP Subpart ZZZZ - Stationary Reciprocating Internal Combustion Engines

Stationary reciprocating internal combustion engines (RICE) at both area and major sources of HAP emissions are potentially subject to Subpart ZZZZ – *NESHAP for Stationary Reciprocating Internal Combustion Engines*

(RICE). There are no proposed RICE at the Stallworth Compressor Station. Therefore, the station is not subject to this subpart.

NESHAP Subpart DDDDD - Industrial, Commercial, and Institutional Boilers and Process Heaters (Major Source Boiler MACT)

This MACT standard applies to industrial, commercial, and institutional boilers of various sizes and fuel types at major sources of HAP. The proposed facility is an area source of HAP; therefore, the requirements of this subpart will not apply.

NESHAP Subpart JJJJJJ - Industrial, Commercial, and Institutional Boilers (Area Source Boiler MACT)

This MACT standard applies to industrial, commercial, and institutional boilers of various sizes and fuel types. The proposed fuel heaters are natural gas-fired and are specifically exempt from this subpart. Therefore, the requirements of this subpart will not apply.

West Virginia SIP Regulations

The station is potentially subject to regulations contained in the West Virginia Code of State Regulations, Title 45. The Code of State Regulations fall under two main categories: those regulations that are generally applicable (e.g., permitting requirements), and those that have specific applicability (e.g., PM standards for manufacturing equipment).

45 CSR 2: To Prevent and Control Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers

45 CSR 2 applies to fuel burning units, defined as equipment burning fuel "for the primary purpose of producing heat or power by indirect heat transfer". The proposed fuel heaters and office building heater are fuel burning units and therefore must comply with this regulation. Per 45 CSR 2-3, opacity of emissions from this unit shall not exceed 10 percent.

45 CSR 4: To Prevent and Control the Discharge of Air Pollutants into the Air Which Causes or Contributes to an Objectionable Odor

According to 45 CSR 4-3:

No person shall cause, suffer, allow or permit the discharge of air pollutants which cause or contribute to an objectionable odor at any location occupied by the public.

The station is generally subject to this requirement. MVP will operate all equipment in a manner as to avoid causing or contributing to an objectionable odor at any location occupied by the public.

45 CSR 6: Control of Air Pollution from the Combustion of Refuse

45 CSR 6 applies to activities involving incineration of refuse, defined as "the destruction of combustible refuse by burning in a furnace designed for that purpose. For the purposes of this rule, the destruction of any combustible liquid or gaseous material by burning in a flare or flare stack, thermal oxidizer or thermal catalytic oxidizer stack shall be considered incineration." The facility will not operate any incinerators under this definition and, as such, has no requirements under this rule.

45 CSR 10: To Prevent and Control Air Pollution from the Emission of Sulfur Oxides

This rule applies to specific emission sources that are listed by name in the rule, to sulfuric acid manufacturing plants, and to sources that combust any refinery process gas stream or any other process gas stream that contains hydrogen sulfide in a concentration greater than 50 grains per 100 cubic feet. The Stallworth Station does not meet any of the categories subject to the rule, and as such is not subject to comply.

45 CSR 13: Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, Permission to Commence Construction, and Procedures for Evaluation

This rule establishes procedures for permitting and reporting of stationary sources. MVP will comply with the requirements of this rule by complying with the applicable general provisions in the facility's construction and operating permits.

45 CSR 16: Standards of Performance for New Stationary Sources

45 CSR 16-1 incorporates the federal Clean Air Act (CAA) standards of performance for new stationary sources set forth in 40 CPR Part 60 by reference. As noted above, the facility will comply with all applicable NSPS subparts.

45 CSR 17: To Prevent and Control Particulate Matter Air Pollution from Materials Handling, Preparation, Storage and Other Sources of Fugitive Particulate Matter

According to 45 CSR 17-3.1:

No person shall cause, suffer, allow or permit fugitive particulate matter to be discharged beyond the boundary lines of the property lines of the property on which the discharge originates or at any public or residential location, which causes or contributes to statutory air pollution.

Due to the nature of the activities at the station, it is unlikely that fugitive particulate matter emissions will be emitted under normal operating conditions. However, MVP will take measures to ensure any fugitive particulate matter emissions will not cross the property boundary should any such emissions occur.

45 CSR 21: To Prevent and Control Air Pollution from the Emission of Volatile Organic Compounds

45 CSR 21 applies only to sources located in Putnam County, Kanawha County, Cabell County, Wayne County, and Wood County, West Virginia. The Stallworth Station will be located in Fayette County. Therefore, the requirements of this section to not apply to the station.

45 CSR 22: Air Quality Management Fee Program

This regulation establishes a program to collect fees for certificates to operate and for permits to construct, modify or relocate sources of air pollution. MVP will comply with this rule by paying all required permitting fees.

45 CSR 34: Emissions Standards for Hazardous Air Pollutants

45 CSR 34-1 incorporates the federal Clean Air Act (CAA) national emissions standards for hazardous air pollutants (NESHAPs) as set forth in 40 CPR Parts 61 and 63 by reference. As noted above, no NESHAP are applicable to the station.

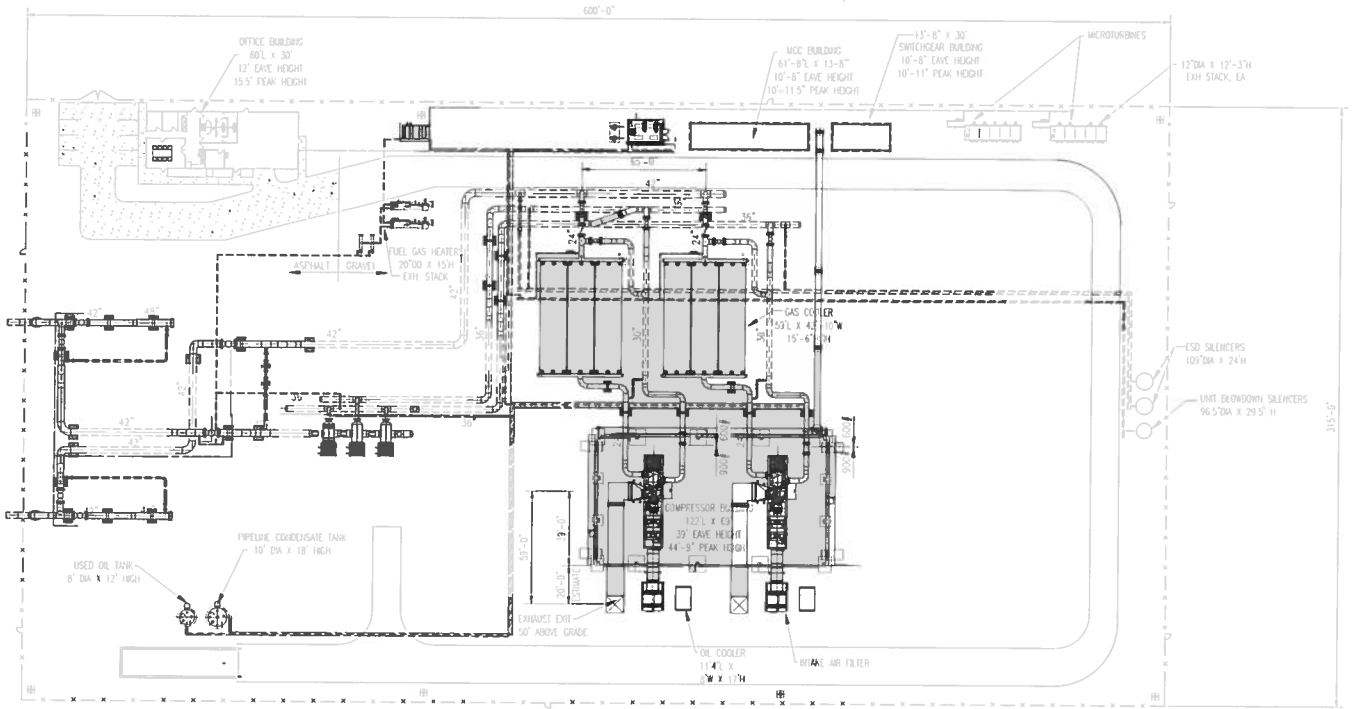
Non-Applicability of Other SIP Rules

A thorough examination of the West Virginia SIP rules with respect to applicability at the station reveals many SIP regulations that do not apply or impose additional requirements on operations. Such SIP rules include those specific to a particular type of industrial operation that is categorically not applicable to the station.

ATTACHMENT E

Plot Plan

STATION NORTH
TRUE NORTH



REFERENCE DRAWINGS		NO	DATE	REVISION	BY	CHK	APPD	NO	DATE	REVISION	BY	CHK	APPD
DRAWING NUMBER	DRAWING TITLE	P		PRELIMINARY									

TO THE BEST OF MY KNOWLEDGE, ALL COMPONENTS OF THIS DRAWING ARE DESIGNED IN ACCORDANCE WITH APPLICABLE GUIDELINES AND SPECIFICATIONS.

MECHANICAL DESIGN ENGINEER — DATE

ELECTRICAL DESIGN ENGINEER — DATE

NOTE: ANY CHANGES TO THE DESIGN SHOWN ON THIS DRAWING MUST BE APPROVED BY THE DESIGN ENGINEER

Mountain Valley PIPELINE

PROJECT ID

DRAWING SCALE 1"=30'

DRAWING TITLE
MOUNTAIN VALLEY PIPELINE
MECHANICAL
PIPING
PLOT PLAN

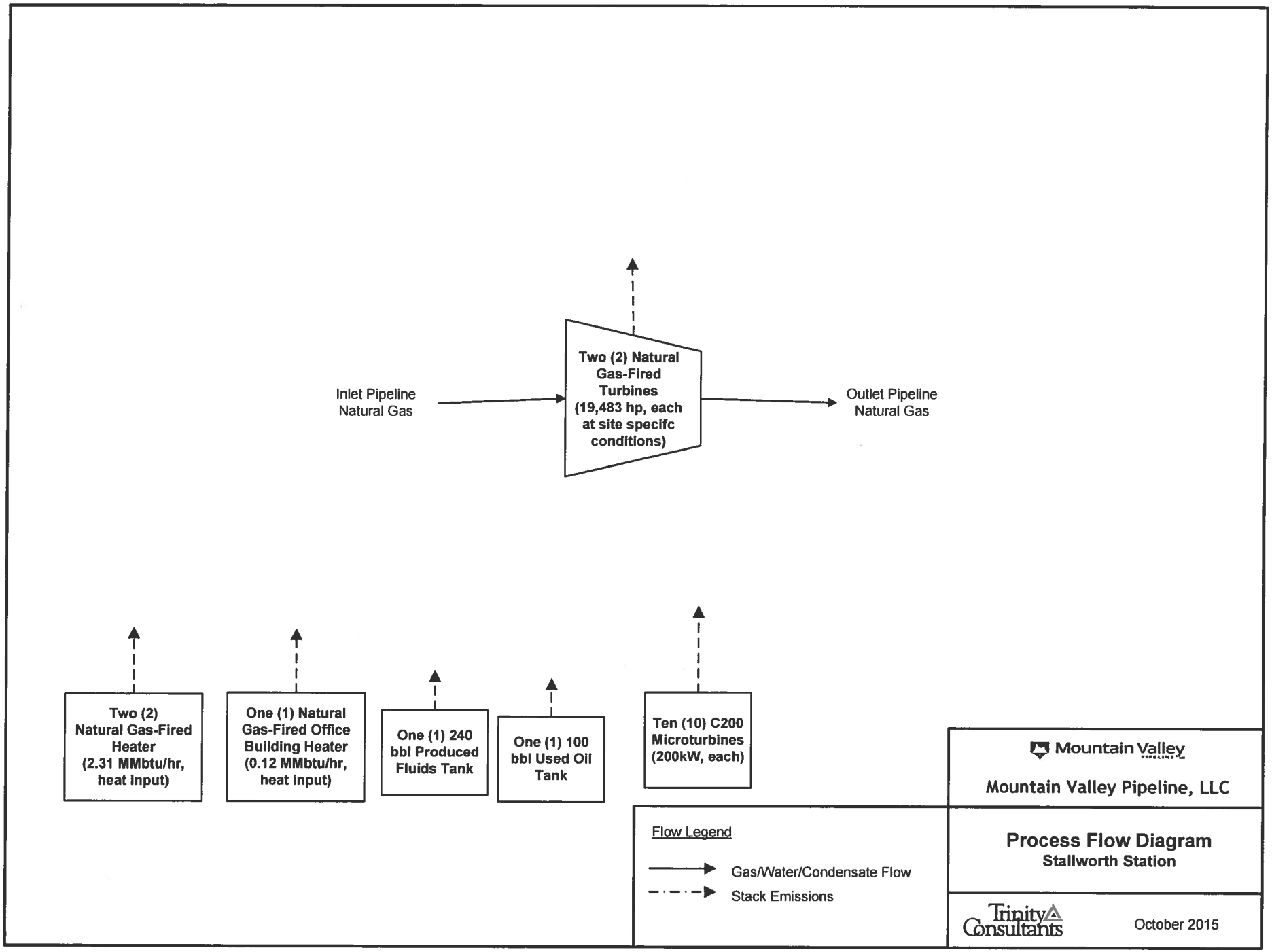
FACILITY	STATE	IDENTIFICATION	SERIES	SHEET	REVISION
C	W	STW01	1100	01	P

Printed by Thompson, Carson on: July 9, 2019 - 4:18 PM

File Path: K:\Vault Working\3D\MVP\Stallworth Compressor Station\Drawing Files\Design Files\Mechanical\2Model\C-W-STW01-1100-01.dwg

ATTACHMENT F

Detailed Process Flow Diagram


Inlet Pipeline Natural Gas
Two (2) Natural Gas-Fired Turbines (19,483 hp, each at site specifc conditions)
Outlet Pipeline Natural Gas
Two (2) Natural Gas-Fired Heater (2.31 MMbtu/hr, heat input)
One (1) Natural Gas-Fired Office Building Heater (0.12 MMbtu/hr, heat input)
One (1) 240 bbl Produced Fluids Tank
One (1) 100 bbl Used Oil Tank
Ten (10) C200 Microturbines (200kW, each)
Flow Legend
Gas/Water/Condensate Flow
Stack Emissions
Mountain Valley
Mountain Valley Pipeline, LLC
Process Flow Diagram
Stallworth Station
Trinity Consultants
October 2015

ATTACHMENT G

Process Description

ATTACHMENT G - PROCESS DESCRIPTION

Mountain Valley Pipeline, LLC (MVP) is submitting this application for the construction of a new natural gas transmission compressor station located in Fayette County, West Virginia (Stallworth Station).

Natural gas from enters the station via the transmission pipeline system and is compressed using one of the two (2) natural gas-fired turbines (each rated at 19,483 hp at site-specific conditions, and ISO rated at 20,500 hp each). The compressed natural gas flows into the pipeline to be transported further along the transmission system. The station is also equipped with two (2) fuel gas heaters, one (1) office building heater, one (1) produced fluids storage tank, one (1) used oil storage tank, and ten (10) natural gas-fired microturbine generators (each rated at 200 kW) providing electricity to the station. Once the tanks are filled, the contents are loaded into trucks for transport.

A process flow diagram is included as Attachment F.

ATTACHMENT I

Emission Units Table

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]
S001	E001	Solar Turbine #1	2016/2017	19,483 HP (site-specific conditions)	New	N/A
S002	E002	Solar Turbine #2	2016/2017	19,483 HP (site-specific conditions)	New	N/A
S003	E003	Microturbine Generator #1	2016/2017	200 KW	New	N/A
S004	E004	Microturbine Generator #2	2016/2017	200 KW	New	N/A
S005	E005	Microturbine Generator #3	2016/2017	200 KW	New	N/A
S006	E006	Microturbine Generator #4	2016/2017	200 KW	New	N/A
S007	E007	Microturbine Generator #5	2016/2017	200 KW	New	N/A
S008	E008	Microturbine Generator #6	2016/2017	200 KW	New	N/A
S009	E009	Microturbine Generator #7	2016/2017	200 KW	New	N/A
S010	E010	Microturbine Generator #8	2016/2017	200 KW	New	N/A
S011	E011	Microturbine Generator #9	2016/2017	200 KW	New	N/A
S012	E012	Microturbine Generator #10	2016/2017	200 KW	New	N/A
S013	E013	Fuel Gas Heater	2016/2017	2.31 MMBtu/hr	New	N/A
S014	E014	Fuel Gas Heater	2016/2017	2.31 MMBtu/hr	New	N/A
S015	E015	Produced Fluids Tank	2016/2017	10,080 gallons	New	N/A
S016	E016	Used Oil Tank	2016/2017	4,200 gallons	New	N/A
S017	E017	Office Building Heater	2016/2017	0.120 MMBtu/hr	New	N/A
S018	E018	Fugitives Components	2016/2017	N/A	New	N/A
S019	E019	Liquid Loading	2016/2017	126,000 gal/yr	New	N/A

[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

Emission Points Data Summary Sheet

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] (ppmv or mg/m[4])
		ID No.	Source	ID No.	Device Type	Short Term[2]	Max (hr/yr)		lb/hr	ton/yr	lb/hr	ton/yr			
S001	Upward Vertical stack	E001	Solar Turbine	NA	NA	NA	NA	NOx	8.49	37.21	8.49	37.21	Gas/Vapor	O[A]	
								CO	8.61	40.02	8.61	40.02		O[A]	
								VOC	0.99	4.35	0.99	4.35		O[A]	
								SO2	0.50	2.20	0.50	2.20		O[A]	
								PM/PM10/PM2.5	2.21	9.69	2.21	9.69		O[A]	
								HAPs	0.47	2.06	0.47	2.06		O[A,B]	
								CO2e	17,502	76,782	17,502	76,782		O[A,C]	
S002	Upward Vertical stack	E002	Solar Turbine	NA	NA	NA	NA	NOx	8.49	37.21	8.49	37.21	Gas/Vapor	O[A]	
								CO	8.61	40.02	8.61	40.02		O[A]	
								VOC	0.99	4.35	0.99	4.35		O[A]	
								SO2	0.50	2.20	0.50	2.20		O[A]	
								PM/PM10/PM2.5	2.21	9.69	2.21	9.69		O[A]	
								HAPs	0.47	2.06	0.47	2.06		O[A,B]	
								CO2e	17,502	76,782	17,502	76,782		O[A,C]	
S003	Upward Vertical Stack	E003	Microturbine	NA	NA	NA	NA	NOx	0.08	0.35	0.08	0.35	Gas/Vapor	O[A]	
								CO	0.22	0.96	0.22	0.96		O[A]	
								VOC	0.02	0.09	0.02	0.09		O[A]	
								SO2	0.01	0.03	0.01	0.03		O[D]	
								PM/PM10/PM2.5	0.02	0.07	0.02	0.07		O[D]	
								HAPs	0.002	0.01	0.002	0.01		O[D]	
								CO2e	266	1,166	266	1,166		O[A,C]	
S004	Upward Vertical Stack	E004	Microturbine	NA	NA	NA	NA	NOx	0.08	0.35	0.08	0.35	Gas/Vapor	O[A]	
								CO	0.22	0.96	0.22	0.96		O[A]	
								VOC	0.02	0.09	0.02	0.09		O[A]	
								SO2	0.01	0.03	0.01	0.03		O[D]	
								PM/PM10/PM2.5	0.02	0.07	0.02	0.07		O[D]	
								HAPs	0.002	0.01	0.002	0.01		O[D]	
								CO2e	266	1,166	266	1,166		O[A,C]	
S005	Upward Vertical Stack	E005	Microturbine	NA	NA	NA	NA	NOx	0.08	0.35	0.08	0.35	Gas/Vapor	O[A]	
								CO	0.22	0.96	0.22	0.96		O[A]	
								VOC	0.02	0.09	0.02	0.09		O[A]	
								SO2	0.01	0.03	0.01	0.03		O[D]	
								PM/PM10/PM2.5	0.02	0.07	0.02	0.07		O[D]	
								HAPs	0.002	0.01	0.002	0.01		O[D]	
								CO2e	266	1,166	266	1,166		O[A,C]	

S006	Upward Vertical Stack	E006	Microturbine	NA	NA	NA	NA	NOx	0.08	0.35	0.08	0.35	Gas/Vapor	O[A]	
								CO	0.22	0.96	0.22	0.96		O[A]	
								VOC	0.02	0.09	0.02	0.09		O[A]	
								SO2	0.01	0.03	0.01	0.03		O[D]	
								PM/PM10/PM2.5	0.02	0.07	0.02	0.07		O[D]	
								HAPs	0.002	0.01	0.002	0.01		O[D]	
								CO2e	266	1,166	266	1,166		O[A,C]	
S007	Upward Vertical Stack	E007	Microturbine	NA	NA	NA	NA	NOx	0.08	0.35	0.08	0.35	Gas/Vapor	O[A]	
								CO	0.22	0.96	0.22	0.96		O[A]	
								VOC	0.02	0.09	0.02	0.09		O[A]	
								SO2	0.01	0.03	0.01	0.03		O[D]	
								PM/PM10/PM2.5	0.02	0.07	0.02	0.07		O[D]	
								HAPs	0.002	0.01	0.002	0.01		O[D]	
								CO2e	266	1,166	266	1,166		O[A,C]	
S008	Upward Vertical Stack	E008	Microturbine	NA	NA	NA	NA	NOx	0.08	0.35	0.08	0.35	Gas/Vapor	O[A]	
								CO	0.22	0.96	0.22	0.96		O[A]	
								VOC	0.02	0.09	0.02	0.09		O[A]	
								SO2	0.01	0.03	0.01	0.03		O[D]	
								PM/PM10/PM2.5	0.02	0.07	0.02	0.07		O[D]	
								HAPs	0.002	0.01	0.002	0.01		O[D]	
								CO2e	266	1,166	266	1,166		O[A,C]	
S009	Upward Vertical Stack	E009	Microturbine	NA	NA	NA	NA	NOx	0.08	0.35	0.08	0.35	Gas/Vapor	O[A]	
								CO	0.22	0.96	0.22	0.96		O[A]	
								VOC	0.02	0.09	0.02	0.09		O[A]	
								SO2	0.01	0.03	0.01	0.03		O[D]	
								PM/PM10/PM2.5	0.02	0.07	0.02	0.07		O[D]	
								HAPs	0.002	0.01	0.002	0.01		O[D]	
								CO2e	266	1,166	266	1,166		O[A,C]	
S010	Upward Vertical Stack	E010	Microturbine	NA	NA	NA	NA	NOx	0.08	0.35	0.08	0.35	Gas/Vapor	O[A]	
								CO	0.22	0.96	0.22	0.96		O[A]	
								VOC	0.02	0.09	0.02	0.09		O[A]	
								SO2	0.01	0.03	0.01	0.03		O[D]	
								PM/PM10/PM2.5	0.02	0.07	0.02	0.07		O[D]	
								HAPs	0.002	0.01	0.002	0.01		O[D]	
								CO2e	266	1,166	266	1,166		O[A,C]	
S011	Upward Vertical Stack	E011	Microturbine	NA	NA	NA	NA	NOx	0.08	0.35	0.08	0.35	Gas/Vapor	O[A]	
								CO	0.22	0.96	0.22	0.96		O[A]	
								VOC	0.02	0.09	0.02	0.09		O[A]	
								SO2	0.01	0.03	0.01	0.03		O[D]	
								PM/PM10/PM2.5	0.02	0.07	0.02	0.07		O[D]	
								HAPs	0.002	0.01	0.002	0.01		O[D]	
								CO2e	266	1,166	266	1,166		O[A,C]	
S012	Upward Vertical Stack	E012	Microturbine	NA	NA	NA	NA	NOx	0.08	0.35	0.08	0.35	Gas/Vapor	O[A]	
								CO	0.22	0.96	0.22	0.96		O[A]	
								VOC	0.02	0.09	0.02	0.09		O[A]	
								SO2	0.01	0.03	0.01	0.03		O[D]	
								PM/PM10/PM2.5	0.02	0.07	0.02	0.07		O[D]	
								HAPs	0.002	0.01	0.002	0.01		O[D]	
								CO2e	266	1,166	266	1,166		O[A,C]	
S013	Upward Vertical stack	E013	Fuel Gas Heater	NA	NA	NA	NA	NOx	0.21	0.93	0.21	0.93	Gas/Vapor	O[F]	
								CO	0.18	0.78	0.18	0.78		O[F]	
								VOC	0.01	0.05	0.01	0.05		O[F]	
								SO2	<0.01	0.01	<0.01	0.01		O[F]	
								PM/PM10/PM2.5	0.02	0.07	0.02	0.07		O[F]	
								CO2e	270	1,184	270	1,184		O[C]	

S014	Upward Vertical stack	E014	Fuel Gas Heater	NA	NA	NA	NA	NOx CO VOC SO2 PM/PM10/PM2.5 CO2e	0.21 0.18 0.01 <0.01 0.02 270	0.93 0.78 0.05 0.01 0.07 1,184	0.21 0.18 0.01 <0.01 0.02 270	0.93 0.78 0.05 0.01 0.07 1,184	Gas/Vapor	O[F] O[F] O[F] O[F] O[F] O[C]	
S-015	Upward Vertical Stack	E-015	Produced Fluids Storage Tank	NA	NA	NA	NA	VOC HAP	0.05 <0.01	0.21 <0.01	0.05 <0.01	0.21 <0.01	Gas/Vapor	O[E]	
S-016	Upward Vertical Stack	E-016	Used Oil Storage Tank	NA	NA	NA	NA	VOC HAP	<0.01 <0.01	<0.01 <0.01	<0.01 <0.01	<0.01 <0.01	Gas/Vapor	O[E]	
S-017	Upward Vertical stack	E-017	Office Building Heater	NA	NA	NA	NA	NOx CO VOC SO2 PM/PM10/PM2.5 CO2e	0.01 0.01 <0.01 <0.01 <0.01 14	0.05 0.04 <0.01 <0.01 <0.01 64	0.01 0.01 <0.01 <0.01 <0.01 14	0.05 0.04 <0.01 <0.01 <0.01 64	Gas/Vapor	O[F] O[F] O[F] O[F] O[F] O[C]	
S-018	Fugitives	E-018	Fugitives including Haul Roads	NA	NA	NA	NA	VOC PM/PM10/PM2.5 HAP CO2e	0.80 0.03 0.06 504	3.52 0.12 0.26 2,207	0.80 0.03 0.06 504	3.52 0.12 0.26 2,207	Gas/Vapor	O[G] O[H] O[G] O[C]	
S-019	Liquid Loading	L1	Liquid Loading	NA	NA	NA	NA	VOC	NA	0.05	NA	0.05	Gas/Vapor	O[I]	

A- Manufacturer's specific pollutant emission factor
B- AP-42 Section 3.1, Table 3.1-3 "Emission Factors for HAPs from Natural Gas Fired Stationary Gas Turbines", April 2000, except for Formaldehyde which is manufacturer's spec.
C- 40 CFR 98, Subpart C for natural gas fired combustion.
D- AP-42 Section 3.1 Table 3.1-2a
E- API E&P Tanks/EPA TANKS 4.09d
F- AP-42 Section 1.4 Tables 1.4-1, 1.4-2 and 1.4-3, July 1998.
G- EPA Leak Protocol, Table 2-4, 40 CFR 98 Subpart W, & Site-Specific Gas Analysis
H- AP-42 Table 13.2.2-2 (Final, 11/06)
I- AP-42 Section 5.2 Table 5.2-1

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

[1] Give at operating conditions. Include inerts.
[2] Release height of emissions above ground level.

ATTACHMENT K

Fugitive Emissions Data Summary Sheet

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	NA	--	--	--	--	--
Unpaved Haul Roads	PM PM_{10} $PM_{2.5}$	0.11 0.03 <0.01	0.46 0.12 0.01	0.11 0.03 <0.01	0.46 0.12 0.01	O[C]
Storage Pile Emissions	NA	---	---	---	---	---
Loading/Unloading Operations	VOC	N/A	0.05	N/A	0.05	O[B]
Wastewater Treatment Evaporation & Operations	NA	---	---	---	---	---
Equipment Leaks (includes blowdowns and maintenance)	VOC HAP	N/A	3.52 0.26	N/A	3.52 0.26	O[A]
General Clean-up VOC Emissions	NA	---	---	---	---	---
Other	NA	---	---	---	---	---

A – Oil *and Gas Production Operations Average Emission Factors*, Protocol for Equipment Leak Emission Estimates, EPA 453/R-95-017, Table 2-4, November 1995, 40 CFR 98 Subpart W, and mass balance.

B- AP 42 Section 5.2.1

C – AP 42 Section 13.2.2.

[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

Emission Unit Data 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*): S001 to S002

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

   Two (2) Natural Gas-Fired Solar Titan 130 Turbines – Each rated at 19,483 HP at site-specific conditions. ISO rating is 20,500 HP (each)

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:

   Does not produce any materials. The turbines compress natural gas.

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

   External combustion of natural gas

* 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 – 144,613 scf/hr (each)

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

Natural gas with negligible H_2S and ash content.

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

Unknown @ °F and psia.

(d) Percent excess air: Unknown

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

Two (2) 141.62 MMBtu/hr stationary gas turbines

(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: 141.62 (each) × 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:

@ Unknown °F and psia

a.	NO_X	**See Emission Calculations in Attachment N**	lb/hr	grains/ACF
b.	SO_2		lb/hr	grains/ACF
c.	CO		lb/hr	grains/ACF
d.	PM_{10}		lb/hr	grains/ACF
e.	Hydrocarbons		lb/hr	grains/ACF
f.	VOCs		lb/hr	grains/ACF
g.	Pb		lb/hr	grains/ACF
h.	Specify other(s)			
	HAP		lb/hr	grains/ACF
			lb/hr	grains/ACF
			lb/hr	grains/ACF
			lb/hr	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
Monitor sulfur content of the fuel per 60.4360	Maintain records of fuel consumption
REPORTING	**TESTING**
Submit report of initial compliance testing in accordance with 40 CFR 60.4375(b) within 60 days of the performance test	Annual performance testing in accordance with 40 CFR 60.4340(a) to demonstrate compliance with NOx emission limitations

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

None

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*): S003 to S012

1. Name or type and model of proposed affected source: Ten (10) natural gas-fired combustion capstone microturbines (each rated at 200kW) – Consists of 10 identical 200kW units
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: Does not produce any materials. Electrical generation from natural gas.
5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants: External combustion of natural gas

* 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 – 2,106 scf/hr (each)

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

Natural gas with negligible H_2S and ash content.

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

Unknown @ °F and psia.

(d) Percent excess air: Unknown

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

Ten (10) 2.28 MMBtu/hr stationary gas turbines

(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: 2.28 (each) × 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:

@ Unknown °F and psia

a.	NO_X	**See Emission Calculations in Attachment N.**	lb/hr	grains/ACF
b.	SO_2		lb/hr	grains/ACF
c.	CO		lb/hr	grains/ACF
d.	PM_{10}		lb/hr	grains/ACF
e.	Hydrocarbons		lb/hr	grains/ACF
f.	VOCs		lb/hr	grains/ACF
g.	Pb		lb/hr	grains/ACF
h.	Specify other(s)			
	HAP		lb/hr	grains/ACF
			lb/hr	grains/ACF
			lb/hr	grains/ACF
			lb/hr	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
None	None
REPORTING	TESTING
None	None

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
None

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*): S013 to S014

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

   Two (2) Natural gas-fired fuel gas heaters (2.31 MMBtu/hr, heat input)

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:

   Does not produce any materials. Thermal generation from natural gas.

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

   External combustion of natural gas

* 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 – 2,100 scf/hr

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

Natural gas with negligible H_2S and ash content.

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

Unknown @ °F and psia.

(d) Percent excess air: Unknown

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

Two (2) 2.31 MMBtu/hr, natural gas fired external combustion heaters

(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: 2.31 × 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:

@ Unknown °F and psia

a.	NO_X	**See Emission Calculations in Attachment N**	lb/hr	grains/ACF
b.	SO_2		lb/hr	grains/ACF
c.	CO		lb/hr	grains/ACF
d.	PM_{10}		lb/hr	grains/ACF
e.	Hydrocarbons		lb/hr	grains/ACF
f.	VOCs		lb/hr	grains/ACF
g.	Pb		lb/hr	grains/ACF
h.	Specify other(s)			
	HAP		lb/hr	grains/ACF
			lb/hr	grains/ACF
			lb/hr	grains/ACF
			lb/hr	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
None	None
REPORTING	TESTING
None	None

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
None

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 Stallworth Compressor Station	2. Tank Name Produced Fluids Storage Tank
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) S015	4. Emission Point Identification No. (as assigned on *Equipment List Form*) E015
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) Not Applicable	
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).	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): None	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. S015: 240 bbl	
9A. Tank Internal Diameter (ft) ~10	9B. Tank Internal Height (or Length) (ft) ~18
10A. Maximum Liquid Height (ft) ~17	10B. Average Liquid Height (ft) ~ 10
11A. Maximum Vapor Space Height (ft) ~18	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. 240 bbl	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
126,000	345

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 12.5

15. Maximum tank fill rate (gal/min): TBD

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
TBD	TBD

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

☒ Fixed Roof _x_ vertical __ horizontal ___ flat roof _x_ 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 Sheets)

19. Tank Shell Construction:

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

20A. Shell Color Gray	20B. Roof Color Gray	20C. Year Last Painted

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): -0.30 to 0.70 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) 0.0625

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 (ft^2)	
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) 54.98	
29. Annual Average Maximum Temperature (°F) 65.75	
30. Annual Average Minimum Temperature (°F) 44.22	
31. Average Wind Speed (miles/hr)	6.05
32. Annual Average Solar Insulation Factor (BTU/(ft^2·day))	1,251
33. Atmospheric Pressure (psia)	14.25

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

34. Average daily temperature range of bulk liquid:			
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	Produced Fluids		
39B. CAS Number	TBD		
39C. Liquid Density (lb/gal)	TBD		
39D. Liquid Molecular Weight (lb/lb-mole)	TBD		
39E. Vapor Molecular Weight (lb/lb-mole)	36.25		

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

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) – Enardo Valve
  - Vacuum Setting 0.30 Pressure Setting 0.70
- ☐ 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):

[1] Complete appropriate Air Pollution Control Device Sheet.

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 attached emission calculations					

[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 Stallworth Compressor Station	2. Tank Name Used Oil Storage Tank
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) S016	4. Emission Point Identification No. (as assigned on *Equipment List Form*) E016
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) Not Applicable	
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).	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): None	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. S016: 100 bbl	
9A. Tank Internal Diameter (ft) ~7.7	9B. Tank Internal Height (or Length) (ft) ~12
10A. Maximum Liquid Height (ft) ~12	10B. Average Liquid Height (ft) ~ 6
11A. Maximum Vapor Space Height (ft) ~12	11B. Average Vapor Space Height (ft) ~6
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 100 bbl	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
3,150	8.6

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)
<1

15. Maximum tank fill rate (gal/min) TBD

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
TBD	TBD

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 Sheets)

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

20A. Shell Color Gray	20B. Roof Color Gray	20C. Year Last Painted

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): -0.30 to 0.25 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 x 7.5 feet wide ☐ Continuous sheet construction 5 x 12 feet wide ☐ Other (describe)		
26D. Deck seam length (ft)	26E. Area of deck (ft^2)	
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) 54.98	
29. Annual Average Maximum Temperature (°F) 65.75	
30. Annual Average Minimum Temperature (°F) 44.22	
31. Average Wind Speed (miles/hr)	6.05
32. Annual Average Solar Insulation Factor (BTU/(ft^2·day))	1,251
33. Atmospheric Pressure (psia)	14.25

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

34. Average daily temperature range of bulk liquid: **See TANKS Summary Sheets**			
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			
39C. Liquid Density (lb/gal)	TBD		
39D. Liquid Molecular Weight (lb/lb-mole)	TBD		
39E. Vapor Molecular Weight (lb/lb-mole)	TBD		

Maximum Vapor Pressure 39F. True (psia) 39G. Reid (psia)	<1.5 psia		
Months Storage per Year 39H. From 39I. To			

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):

[1] Complete appropriate Air Pollution Control Device Sheet.

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 attached emission calculations					

[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
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*): S017

1. Name or type and model of proposed affected source: Natural gas-fired office building heater (0.12 MMBtu/hr, heat input)
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: Does not produce any materials. Thermal generation from natural gas.
5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants: External combustion of natural gas

* 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 – 110 scf/hr

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

Natural gas with negligible H_2S and ash content.

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

Unknown @ °F and psia.

(d) Percent excess air: Unknown

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

One (1) 0.12 MMBtu/hr, natural gas fired external combustion heater

(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: 0.12 × 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:

@ Unknown °F and psia

a.	NO_X	**See Emission Calculations in Attachment N**	lb/hr	grains/ACF
b.	SO_2		lb/hr	grains/ACF
c.	CO		lb/hr	grains/ACF
d.	PM_{10}		lb/hr	grains/ACF
e.	Hydrocarbons		lb/hr	grains/ACF
f.	VOCs		lb/hr	grains/ACF
g.	Pb		lb/hr	grains/ACF
h.	Specify other(s)			
	HAP		lb/hr	grains/ACF
			lb/hr	grains/ACF
			lb/hr	grains/ACF
			lb/hr	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
None	None
REPORTING	TESTING
None	None

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
None

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*): S019

1. Loading Area Name: Liquid Loading

2. Type of cargo vessels accommodated at this rack or transfer point (check as many as apply):

☐Drums ☐ Marine Vessels ☐Rail Tank Cars ☒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:

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	24	24	24	24
days/week	7	7	7	7
weeks/quarter	13	13	13	13

8. Bulk Liquid Data *(add pages as necessary):*							
Pump ID No.		NA					
Liquid Name		Produced Fluids					
Max. daily throughput (1000 gal/day)							
Max. annual throughput (1000 gal/yr)		126					
Loading Method [1]		Splash Fill					
Max. Fill Rate (gal/min)		TBD					
Average Fill Time (min/loading)		TBD					
Max. Bulk Liquid Temperature (°F)		~70					
True Vapor Pressure [2]		0.21 psia					
Cargo Vessel Condition [3]		Unknown					
Control Equipment or Method [4]		NA					
Minimum control efficiency (%)		0					
Maximum Emission Rate	Loading (lb/hr)	0.01					
	Annual (lb/yr)	106					
Estimation Method [5]		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 AdsorptionCO = 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 Liquid throughput (gal/yr)	RECORDKEEPING None
REPORTING None	TESTING None

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

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

Attachment L
FUGITIVE EMISSIONS FROM UNPAVED HAULROADS

UNPAVED HAULROADS (including all equipment traffic involved in process, haul trucks, endloaders, etc.)

		PM	PM-10
k =	Particle size multiplier	0.80	0.36
s =	Silt content of road surface material (%)	4.8	
p =	Number of days per year with precipitation >0.01 in.	150	150

Item Number	Description	Number of Wheels	Mean Vehicle Weight (tons)	Mean Vehicle Speed (mph)	Miles per Trip	Maximum Trips per Hour	Maximum Trips per Year	Control Device ID Number	Control Efficiency (%)
1	Service Truck		4	15	0.75	TBD	365	N/A	0
2	Liquid Hauling – Vendor Fluids		16	15	0.75	TBD	2	N/A	0
3	Liquid Hauling – Produced Fluids		26	15	0.75	TBD	32	N/A	0
4	Employee Vehicles		2	15	0.75	TBD	365	N/A	0
5									
6									
7									
8									

Source: *AP-42 Fifth Edition – 13.2.2 Unpaved Roads*

$E = k \times 5.9 \times (s \div 12) \times (S \div 30) \times (W \div 3)^{0.7} \times (w \div 4)^{0.5} \times ((365 - p) \div 365) =$ lb/Vehicle Mile Traveled (VMT)

Where:

		PM	PM-10
k =	Particle size multiplier	4.9	1.5
s =	Silt content of road surface material (%)	4.8	
S =	Mean vehicle speed (mph)		
W =	Mean vehicle weight (tons)		
w =	Mean number of wheels per vehicle		
p =	Number of days per year with precipitation >0.01 in.	150	150

For lb/hr: [lb ÷ VMT] × [VMT ÷ trip] × [Trips ÷ Hour] = lb/hr

For TPY: [lb ÷ VMT] × [VMT ÷ trip] × [Trips ÷ Hour] × [Ton ÷ 2000 lb] = Tons/year

SUMMARY OF UNPAVED HAULROAD EMISSIONS

Item No.	PM				PM-10			
	Uncontrolled		Controlled		Uncontrolled		Controlled	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
1	0.05	0.24			0.01	0.06		
2	0.00	0.00			0.00	0.00		
3	0.01	0.05			0.00	0.01		
4	0.04	0.17			0.01	0.04		
5								
6								
7								
8								
TOTALS	0.11	0.46			0.03	0.12		

FUGITIVE EMISSIONS FROM PAVED HAULROADS

INDUSTRIAL PAVED HAULROADS (including all equipment traffic involved in process, haul trucks, endloaders, etc.)

I =	Industrial augmentation factor (dimensionless)	N/A
n =	Number of traffic lanes	
s =	Surface material silt content (%)	
L =	Surface dust loading (lb/mile)	

Item Number	Description	Mean Vehicle Weight (tons)	Miles per Trip	Maximum Trips per Hour	Maximum Trips per Year	Control Device ID Number	Control Efficiency (%)
1	N/A						
2							
3							
4							
5							
6							
7							
8							

Source: *AP-42 Fifth Edition – 11.2.6 Industrial Paved Roads*

$E = 0.077 \times I \times (4 \div n) \times (s \div 10) \times (L \div 1000) \times (W \div 3)^{0.7}$ = lb/Vehicle Mile Traveled (VMT)

Where:

I =	Industrial augmentation factor (dimensionless)	N/A
n =	Number of traffic lanes	
s =	Surface meterial silt content (%)	
L =	Surface dust loading (lb/mile)	
W =	Average vehicle weight (tons)	

For lb/hr: [lb ÷ VMT] × [VMT ÷ trip] × [Trips ÷ Hour] = lb/hr

For TPY: [lb ÷ VMT] × [VMT ÷ trip] × [Trips ÷ Hour] × [Ton ÷ 2000 lb] = Tons/year

SUMMARY OF PAVED HAULROAD EMISSIONS

Item No.	Uncontrolled		Controlled	
	lb/hr	TPY	lb/hr	TPY
1	N/A		N/A	
2				
3				
4				
5				
6				
7				
8				
TOTALS				

Attachment L
EMISSIONS UNIT DATA SHEET
CHEMICAL PROCESS

For chemical processes please fill out this sheet and all supplementary forms (see below) that apply. Please check all supplementary forms that have been completed.

- ☐ *Emergency Vent Summary Sheet*
- ☒ *Leak Sources Data Sheet*
- ☐ *Toxicology Data Sheet*
- ☐ *Reactor Data Sheet*
- ☐ *Distillation Column Data Sheet*

1. Chemical process area name and equipment ID number (as shown in *Equipment List Form*)
   Fugitives

2. Standard Industrial Classification Codes (SICs) for process(es)
   4922

3. List raw materials and ☐ attach MSDSs
   NA

4. List Products and Maximum Production and ☐ attach MSDSs

Description and CAS Number	Maximum Hourly (lb/hr)	Maximum Annual (ton/year)
NA		

5. Complete the *Emergency Vent Summary Sheet* for all emergency relief devices.

6. Complete the *Leak Source Data Sheet* and describe below or attach to application the leak detection or maintenance program to minimize fugitive emissions. Include detection instruments, calibration gases or methods, planned inspection frequency, and record-keeping, and similar pertinent information. If subject to a rule requirement (e.g. 40CFR60, Subpart VV), please list those here.
   LDAR program in accordance with 40 CFR 98 Subpart W

7. Clearly describe below or attach to application Accident Procedures to be followed in the event of an accidental spill or release.
   NA

8A. Complete the *Toxicology Data Sheet* or attach to application a toxicology report (an up-to-date material safety data sheets (MSDS) may be used) outlining the currently known acute and chronic health effects of each compound or chemical entity emitted to the air. If these compounds have already been listed in Item 3, then a duplicate MSDS sheet is not required. Include data such as the OSHA time weighted average (TWA) or mutagenicity, teratogenicity, irritation, and other known or suspected effects should be addressed. Indicate where these are unknown, and provide references.

8B. Describe any health effects testing or epidemiological studies on these compounds that are being or may be conducted by the company or required under TSCA, RCRA or other federal regulations. Discuss the persistence in the environment of any emission (e.g. pesticides, etc.).

9. **Waste Products** - Waste products status: (If source is subject to RCRA or 45CSR25, please contact the Hazardous Waste Section of WVDEP, OAQ at (304) 926-3647.) NA

9A. Types and amounts of wastes to be disposed:

9B. Method of disposal and location of waste disposal facilities:
Carrier: Phone:

9C. Check here if approved USEPA/State Hazardous Waste Landfill will be used ☐

10. Maximum and Projected Typical Operating Schedule for process or project as a whole (circle appropriate units).

circle units:	(hrs/day) (hr/batch)	(days), (batches/day), (batches/week)	(days/yr), (weeks/year)
10A. Maximum			
10B. Typical			

11. Complete a *Reactor Data Sheet* for each reactor in this chemical process.

12. Complete a *Distillation Column Data Sheet* for each distillation column in this chemical process.

13. **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
None	None
REPORTING	**TESTING**
None	None

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 or 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 or air pollution control device.

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

LEAK SOURCE DATA SHEET

Source Category	Pollutant	Number of Source Components[1]	Number of Components Monitored by Frequency[2]	Average Time to Repair (days)[3]	Estimated Annual Emission Rate (lb/yr)[4]
Pumps[5]	light liquid VOC[6,7]				
	heavy liquid VOC[8]				
	Non-VOC[9]				
Valves[10]	Gas VOC	210	TBD	TBD	607
	Light Liquid VOC				
	Heavy Liquid VOC				
	Non-VOC				
Safety Relief Valves[11]	Gas VOC				
	Non VOC				
Open-ended Lines[12]	VOC	20	TBD	TBD	26
	Non-VOC				
Sampling Connections[13]	VOC				
	Non-VOC				
Compressors	VOC				
	Non-VOC				
Flanges	VOC	575	TBD	TBD	101
	Non-VOC				
Other	VOC				
	Non-VOC				

[1 - 13] See notes on the following page.

Notes for Leak Source Data Sheet

1. For VOC sources include components on streams and equipment that contain greater than 10% w/w VOC, including feed streams, reaction/separation facilities, and product/by-product delivery lines. Do not include certain leakless equipment as defined below by category.

2. By monitoring frequency, give the number of sources routinely monitored for leaks, using a portable detection device that measures concentration in ppm. Do not include monitoring by visual or soap-bubble leak detection methods. "M/Q(M)/Q/SA/A/O" means the time period between inspections as follows:

   Monthly/Quarterly, with Monthly follow-up of repaired leakers/Quarterly/Semi-annual/Annually/Other (specify time period)

   If source category is not monitored, a single zero in the space will suffice. For example, if 50 gas-service valves are monitored quarterly, with monthly follow-up of those repaired, 75 are monitored semi-annually, and 50 are checked bimonthly (alternate months), with non checked at any other frequency, you would put in the category "valves, gas service:" 0/50/0/75/0/50 (bimonthly).

3. Give the average number of days, after a leak is discovered, that an attempt will be made to repair the leak.

4. Note the method used: MB - material balance; EE - engineering estimate; EPA - emission factors established by EPA (cite document used); O - other method, such as in-house emission factor (specify).

5. Do not include in the equipment count sealless pumps (canned motor or diaphragm) or those with enclosed venting to a control device. (Emissions from vented equipment should be included in the estimates given in the Emission Points Data Sheet.)

6. Volatile organic compounds (VOC) means the term as defined in 40 CFR □51.100 (s).

7. A light liquid is defined as a fluid with vapor pressure equal to or greater than 0.04 psi (0.3 Kpa) at 20°C. For mixtures, if 20% w/w or more of the stream is composed of fluids with vapor pressures greater than 0.04 psi (0.3 Kpa) at 20 °C, then the fluid is defined as a light liquid.

8. A heavy liquid is defined as a fluid with a vapor pressure less than 0.04 psi (0.3 Kpa) at 20°C. For mixtures, if less than 20% w/w of the stream is composed of fluids with vapor pressures greater than 0.04 psi (0.3 Kpa) at 20 °C, then the fluid is defined as a heavy liquid.

9. LIST CO, H_2S, mineral acids, NO, NO_2, SO_3, etc. DO NOT LIST CO_2, H_2, H_2O, N_2, O_2, and Noble Gases.

10. Include all process valves whether in-line or on an open-ended line such as sample, drain and purge valves. Do not include safety-relief valves, or leakless valves such as check, diaphragm, and bellows seal valves.

11. Do not include a safety-relief valve if there is a rupture disk in place upstream of the valve, or if the valve vents to a control device.

12 Open-ended lines include purge, drain and vent lines. Do not include sampling connections, or lines sealed by plugs, caps, blinds or second valves.

13. Do not include closed-purge sampling connections.

ATTACHMENT N

Supporting Emission Calculations

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: R13 Permit Application

TABLE 1. Internal Combustion Turbine Emissions Calculations

Turbine Information:

Source ID:	S001-S002
Manufacturer:	Solar
Model No.:	Titan 130
Year Installed:	TBD
Fuel Used:	Natural Gas
Fuel Heating Value (Btu/scf):	979
Rated Horsepower (bhp at site conditions):	19483
Maximum Fuel Consumption at 100% Load (scf/hr):	144613
Heat Input (MMBtu/hr)	141.62
Control Device:	None
Stack Designation:	TBD

Operational Details:

Potential Annual Hours of Operation (hr/yr):	8,760
Potential Fuel Consumption (MMscf/yr):	1,266.81
Potential Startup/Shutdown Events (per year):	12

Manufacturer Specific Pollutant Emission Factors:

Pollutant	Emission Factors	Units	Emission Factor Source
NO_x	8.490	lb/hr	Manufacturer
CO	8.610	lb/hr	Manufacturer
SO_2	3.54E-03	lb/MMBtu	Manufacturer
PM_{10}	0.016	lb/MMBtu	Manufacturer, PIL 171
$PM_{2.5}$	0.016	lb/MMBtu	Manufacturer, PIL 171
VOC	0.986	lb/hr	20% of UHC per Manufacturer
Formaldehyde	0.003	lb/MMBtu	Manufacturer, PIL 168
CO_2	122.82	lb/MMBtu	40 CFR 98, Subpart C, Table C-1
CH_4	3.944	lb/hr	80% of UHC per Manufacturer
N_2O	2.3E-04	lb/MMBtu	40 CFR 98, Subpart C, Table C-2

*Emission factors from AP-42 and Subpart C are based on HHV. To calculate a LHV emission factor, emissions are multiplied by (HHV/LHV). For AP-42 HHV is 1020 Btu/scf, for Subpart C HHV is 1028 Btu/scf. PM and HCHO emission factors are provided in HHV in the specifications and were converted to LHV using a HHV value of 1020 Btu/scf.

Pollutant Emission Rates:

Pollutant	Potential Emissions (lb/hr)[1]	(tpy)[2]
NO_x	8.49	37.21
CO	8.61	40.02
SO_2	0.50	2.20
PM_{10}	2.21	9.69
$PM_{2.5}$	2.21	9.69
VOC	0.99	4.35
Formaldehyde	0.42	1.86
CO_2	17,393	76,197
CH_4	3.94	21.72
N_2O	0.03	0.14
GHG (CO2e)	17502	76782

*Annual emissions shown above include startup/shutdown events.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: R13 Permit Application

TABLE 1. Internal Combustion Turbine Emissions Calculations

Hazardous Air Pollutant (HAP) Emission Rates:

Pollutant	Emission Factor (lb/MMBtu)[3]	Potential Emissions (lb/hr)[1]	Potential Emissions (tpy)[2,4]
HAPs:			
Acetaldehyde	4.17E-05	5.90E-03	2.58E-02
Acrolein	6.67E-06	9.44E-04	4.13E-03
Benzene	1.25E-05	1.77E-03	7.75E-03
1,3-Butadiene	4.48E-07	6.34E-05	2.78E-04
Propylene Oxide	2.90E-05	4.11E-03	1.80E-02
Ethylbenzene	3.33E-05	4.72E-03	2.07E-02
Toluene	1.35E-04	1.92E-02	8.40E-02
Xylene	6.67E-05	9.44E-03	4.13E-02
Polycyclic Organic Matter:			
Naphthalene	1.35E-06	1.92E-04	8.40E-04
PAH	2.29E-06	3.25E-04	1.42E-03
Total HAP (Including HCHO)		**0.47**	**2.06**

1. Emission Rate (lb/hr) = Rated Capacity (MMBtu/hr) × Emission Factor (lb/MMBtu)
2. Emission Rate (tpy) = Emission Rate (lb/hr) × Hours of Operation (hr/yr) / 2000 (tons/lb) + SU/SD emissions, as applicable
3. Emission factors from AP-42 Section 3.1, Table 3.1-3 "Emission Factors for HAPs from Natural Gas Fired Stationary Gas Turbines", April 2000. Factors are based on HHV. Therefore, they were converted to LHV by multiplying by (HHV/LHV).
4. Emission calculations are based on maximum operating load of 100% load, ambient temperature 0°F and site elevation. The turbine ratings can vary with ambient conditions. Each Turbine is ISO rated at 20,500 HP

Startup/Shutdown Combustion Emission Factors:

Pollutant	Startup Emissions[1] (lbs/event)	Shutdown Emissions[1] (lbs/event)	Emission Factor Source
NO_X	1.9	2.4	Manufacturer
CO	176.9	207.6	Manufacturer
VOC	2.0	2.38	20% of UHC per Manufacturer
CO_2	1161	1272	Manufacturer

1. Each startup and shutdown event is estimated to last approximately 10 minutes, per manufacturer.

Pneumatic Start Venting Emissions		
Natural Gas Purged During Startup	4500	scfm
Duration of Normal Purge	4.0	min
Total Gas Purged (Per Startup)	18000	scf
VOC Purged (Per Startup)	27	lbs/startup
CO_2 Purged (Per Startup)	6	lbs/startup
CH_4 Purged (Per Startup)	742	lbs/startup

Density of natural gas: 0.05 lb/ft^3 @ STP (www.engineeringtoolbox.com)

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: R13 Permit Application

TABLE 2. Microturbine Emissions Calculations

Microturbine Unit Information:

Engine ID:	S003-S012
Manufacturer:	Capstone
Model No.:	C200
Projected Startup Date:	Upon Approval
Number of Units:	10

Microturbine Fuel Information:

	Per Unit	As Combined
Fuel Type:	Natural Gas	Natural Gas
Rated Electrical Power Output (kW):	200	2,000
Rated Electrical Power Output (MW):	0.2	2
Rated Horsepower (bhp):	268.2	2,682
Heat Input (MMBtu/hr)	2.28	22.8
Potential Fuel Consumption (MMBtu/yr)	19,973	199,728
Max. Annual Hours of Operation (hr/yr):	8,760	8,760

Microturbine Emissions Data:

Pollutant	Emission Factors	Units	Maximum Potential Emissions		Maximum Potential Emissions		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	lbs/hr	tpy	
NO_X	0.40	lb/MWhe	0.08	0.35	0.80	3.50	Manufacturer's Specifications
VOC	0.10	lb/MWhe	0.02	0.09	0.20	0.88	Manufacturer's Specifications
CO	1.10	lb/MWhe	0.22	0.96	2.20	9.64	Manufacturer's Specifications
SO_X	0.0034	lb/MMBtu	0.01	0.03	0.08	0.34	AP-42, Table 3.1-2a (Apr-2000)
PM_{10}	0.0066	lb/MMBtu	0.02	0.07	0.15	0.66	AP-42, Table 3.1-2a (Apr-2000)
$PM_{2.5}$	0.0066	lb/MMBtu	0.02	0.07	0.15	0.66	AP-42, Table 3.1-2a (Apr-2000)
GHG (CO_2e)	See Table Below		266	1,166	2,663	11,663	Manufacturer's Specifications / 40 CFR 98, Table C-2
Other (Total HAP)	See Table Below		0.00	0.01	0.02	0.10	AP-42, Table 3.1-3 (Apr-2000)

Notes:
1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this engine type, including HCHO.

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	Emission Factor	Units	Maximum Potential Emissions		Maximum Potential Emissions		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	lbs/hr	tpy	
GHGs:							
CO_2	1330	lb/MWhe	266	1,165	2,660	11,651	Manufacturer's Specifications
CH_4	0.001	kg/MMBtu	0.01	0.02	0.05	0.22	40 CFR 98, Tables C-1 & C-2
N_2O	0.0001	kg/MMBtu	0.00	0.00	0.01	0.02	40 CFR 98, Tables C-1 & C-2
GHG (CO_2e)			**266**	**1,166**	**2,663**	**11,663**	
HAPs:							
1,3-Butadiene	4.3E-07	lb/MMBtu	0.00	0.00	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Acetaldehyde	4.0E-05	lb/MMBtu	0.00	0.00	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Acrolein	6.4E-06	lb/MMBtu	0.00	0.00	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Benzene	1.2E-05	lb/MMBtu	0.00	0.00	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Ethylbenzene	3.2E-05	lb/MMBtu	0.00	0.00	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Formaldehyde	7.1E-04	lb/MMBtu	0.00	0.01	0.02	0.07	AP-42, Table 3.1-3 (Apr-2000)
Naphthalene	1.3E-06	lb/MMBtu	0.00	0.00	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
PAH	2.2E-06	lb/MMBtu	0.00	0.00	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Propylene oxide	2.9E-05	lb/MMBtu	0.00	0.00	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Toluene	1.3E-04	lb/MMBtu	0.00	0.00	0.00	0.01	AP-42, Table 3.1-3 (Apr-2000)
Xylene	6.4E-05	lb/MMBtu	0.00	0.00	0.00	0.01	AP-42, Table 3.1-3 (Apr-2000)
Total HAP			**0.002**	**0.010**	**0.023**	**0.10**	

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: R13 Permit Application

TABLE 3. Fuel Gas Heater Emissions Calculations

Fuel Gas Heater Information:

Source ID:	S013-S014
Projected Startup Date:	Upon Approval
Number of Units:	2

Fuel Gas Heater Information:

Fuel Type:	Natural Gas
Higher Heating Value (HHV) (Btu/scf):	1,083
Heat Input (MMBtu/hr)	2.31
Potential Fuel Consumption (MMBtu/yr):	20,215
Max. Fuel Consumption (MMscf/hr):	0.0021
Max. Fuel Consumption (MMscf/yr):	18.7
Max. Annual Hours of Operation (hr/yr):	8,760

Fuel Gas Heater Information:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
NO_X	100	lb/MMScf	0.21	0.93	AP-42, Table 1.4-1 (Jul-1998)
VOC	5.5	lb/MMScf	0.01	0.05	AP-42, Table 1.4-2 (Jul-1998)
CO	84	lb/MMScf	0.18	0.78	AP-42, Table 1.4-1 (Jul-1998)
SO_X	0.6	lb/MMScf	0.00	0.01	AP-42, Table 1.4-2 (Jul-1998)
PM_{10}	7.6	lb/MMScf	0.02	0.07	AP-42, Table 1.4-2 (Jul-1998)
$PM_{2.5}$	7.6	lb/MMScf	0.02	0.07	AP-42, Table 1.4-2 (Jul-1998)
Formaldehyde (HCHO)	0.08	lb/MMScf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
GHG (CO_2e)	See Table Below		270	1,184	40 CFR 98, Tables C-1 & C-2
Other (Total HAP)	See Table Below		0.00	0.02	AP-42, Tables 1.4-3 & 1.4-4 (Jul-1998)

Notes:

1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable)
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CC_2 (GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this source type

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: R13 Permit Application

TABLE 3. Fuel Gas Heater Emissions Calculations

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
GHGs:					
CO_2	53.06	kg/MMBtu	269.99	1,183	40 CFR 98, Tables C-1 & C-2
CH_4	0.001	kg/MMBtu	0.01	0.02	40 CFR 98, Tables C-1 & C-2
N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Tables C-1 & C-2
GHG (CO_2e)			**270**	**1,184**	
Organic HAPs:					
2-Methylnaphthalene	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
3-Methylchloranthrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
7,12-Dimethylbenz(a)anthracene	1.60E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthylene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Anthracene	2.40E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benz(a)anthracene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzene	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(a)pyrene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(b)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(g,h,i)perylene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(k)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Chrysene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dibenzo(a,h)anthracene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dichlorobenzene	1.20E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluoranthene	3.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluorene	2.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
n-Hexane	1.80E+00	lb/MMscf	0.00	0.02	AP-42, Table 1.4-3 (Jul-1998)
Indeno(1,2,3-c,d)pyrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Naphthalene	6.10E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Phenanthrene	1.70E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Pyrene	5.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Toluene	3.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Metal HAPs:					
Arsenic	2.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Beryllium	4.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cadmium	1.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Chromium	1.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cobalt	8.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Lead	5.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
Manganese	3.80E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Mercury	2.60E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Nickel	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Selenium	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Total HAP			**0.004**	**0.02**	

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: R13 Permit Application

TABLE 4. Storage Tank Emissions Calculations - Produced Fluids Tank

Storage Tank Information:

Source ID:	S015
Tank Capacity (gallons):	10,080
Tank Contents:	Produced Water
Annual Throughput (gallons/year):	126,000
Daily Throughput (bbl/day)	8
Percent Condensate	1%
Condensate Throughput (bbl/day)	0.1
Control Type:	None
Control Efficiency:	N/A
Max. Annual Hours of Operation (hr/yr):	8,760

Tank Emissions Data:

Pollutant	Uncontrolled Emissions		Controlled Emissions		Emissions Estimation Method
	lbs/hr	tpy	lbs/hr	tpy	
VOC	0.05	0.21	0.05	0.21	E&P TANK 2.0
HAPs	0.00	0.00	0.00	0.00	E&P TANK 2.0
GHG (CO2e)	0.48	2.10	0.48	2.10	E&P TANK 2.0

E & P Tanks Emissions Data:

Pollutant	Total Emissions (Working + Breathing + Flashing)			Total Emissions		
	lbs/hr	lbs/yr	tpy	lbs/hr	lbs/yr	tpy
VOC	0.05	429.24	0.21	0.05	429.24	0.21
HAPs	0.00	0.00	0.00	0.00	0.00	0.00
GHG (CO_2e)	0.48	4,161.00	2.10	0.48	4,161.00	2.10

Notes:
1. E & P TANKS software estimates working, breathing, and flashing losses and reports as one total. Emissions are based on a conservative estimate of 99% water and 1% condensate
2. This tank does contain hydrocarbons that could be flashed off at tank operating conditions

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: R13 Permit Application

TABLE 5. Storage Tank Emissions Calculations - Used Oil Tank

Storage Tank Information:

Source ID:	S016
Tank Capacity (gallons):	4,200
Tank Contents:	Used Oil
Annual Throughput (gallons/year):	3,150
Control Type:	None
Control Efficiency:	N/A
Max. Annual Hours of Operation (hr/yr):	8,760

Tank Emissions Data:

Pollutant	Uncontrolled Emissions		Controlled Emissions		Emissions Estimation Method
	lbs/hr	tpy	lbs/hr	tpy	
VOC	0.00	0.00	0.00	0.00	EPA TANKS 4.0.9d
HAPs	0.00	0.00	0.00	0.00	EPA TANKS 4.0.9d
GHG (CO_2e)	N/A	N/A	N/A	N/A	N/A

Notes:
1. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).

EPA TANKS Emissions Data - Glycol Tank:

Pollutant	Working Losses	Breathing Losses	Flashing Losses	Total Emissions		
	lbs/yr	lbs/yr	lbs/yr	lbs/hr	lbs/yr	tpy
VOC	0.06	1.28	N/A	0.00	1.34	0.00
HAPs	0.06	1.28	N/A	0.00	1.34	0.00

Notes:
1. Working and breathing losses estimated using EPA TANKS 4.0.9d software based on Distillate fuel oil No. 2.
2. This tank does not contain hydrocarbons that would be expected to be flashed off at tank operating conditions.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: R13 Permit Application

TABLE 6. Office Building Heater Emissions Calculations

Fuel Gas Heater Information:

Source ID:	S017
Projected Startup Date:	Upon Approval
Number of Units:	1

Fuel Gas Heater Information:

Fuel Type:	Natural Gas
Higher Heating Value (HHV) (Btu/scf):	1,083
Heat Input (MMBtu/hr)	0.12
Potential Fuel Consumption (MMBtu/yr):	1,051
Max. Fuel Consumption (MMscf/hr):	0.0001
Max. Fuel Consumption (MMscf/yr):	1.0
Max. Annual Hours of Operation (hr/yr):	8,760

Fuel Gas Heater Information:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
NO_x	100	lb/MMScf	0.01	0.05	AP-42, Table 1.4-1 (Jul-1998)
VOC	5.5	lb/MMScf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
CO	84	lb/MMScf	0.01	0.04	AP-42, Table 1.4-1 (Jul-1998)
SO_x	0.6	lb/MMScf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
PM_{10}	7.6	lb/MMScf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
$PM_{2.5}$	7.6	lb/MMScf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
Formaldehyde (HCHO)	0.08	lb/MMScf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
GHG (CO_2e)	See Table Below		14	62	40 CFR 98, Tables C-1 & C-2
Other (Total HAP)	See Table Below		0.00	0.00	AP-42, Tables 1.4-3 & 1.4-4 (Jul-1998)

Notes:

1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable)
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CC_2 (GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this source type

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: R13 Permit Application

TABLE 6. Office Building Heater Emissions Calculations

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
GHGs:					
CO_2	53.06	kg/MMBtu	14.04	61	40 CFR 98, Tables C-1 & C-2
CH_4	0.001	kg/MMBtu	0.00	0.00	40 CFR 98, Tables C-1 & C-2
N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Tables C-1 & C-2
GHG (CO_2e)			**14**	**62**	
Organic HAPs:					
2-Methylnaphthalene	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
3-Methylchloranthrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
7,12-Dimethylbenz(a)anthracene	1.60E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthylene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Anthracene	2.40E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benz(a)anthracene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzene	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(a)pyrene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(b)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(g,h,i)perylene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(k)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Chrysene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dibenzo(a,h)anthracene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dichlorobenzene	1.20E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluoranthene	3.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluorene	2.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
n-Hexane	1.80E+00	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Indeno(1,2,3-c,d)pyrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Naphthalene	6.10E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Phenanthrene	1.70E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Pyrene	5.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Toluene	3.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Metal HAPs:					
Arsenic	2.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Beryllium	4.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cadmium	1.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Chromium	1.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cobalt	8.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Lead	5.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
Manganese	3.80E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Mercury	2.60E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Nickel	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Selenium	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Total HAP			**0.000**	**0.00**	

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: R13 Permit Application

TABLE 7. Fugitive Emissions Calculations

Fugitive Component Information:

Component Type	Estimated Component Count	Gas Leak Emission Factor		Average Gas Leak Rate	Max Gas Leak Rate	Potential VOC Emissions	Potential HAP Emissions
		(lb/hr/component)	Factor Source	(lb/hr)	(tpy)	(tpy)	(tpy)
Connectors	355	0.0004	EPA Protocol, Table 2-4	0.16	0.75	0.02	0.00
Flanges	220	0.001	EPA Protocol, Table 2-4	0.19	0.91	0.03	0.00
Open-Ended Lines	20	0.004	EPA Protocol, Table 2-4	0.09	0.42	0.01	0.00
Pump Seals	0	0.005	EPA Protocol, Table 2-4	0.00	0.00	0.00	0.00
Valves	210	0.010	EPA Protocol, Table 2-4	2.08	10.04	0.30	0.02
Other	0	0.019	EPA Protocol, Table 2-4	0.00	0.00	0.00	0.00
Total				**2.52**	**12.13**	**0.37**	**0.03**

Notes:
1. "Other" equipment types include compressor seals, relief valves, diaphragms, drains, meters, etc.
2. The component count is a preliminary estimate based on the proposed design of the station.
3. Conservatively assumed that maximum leak rate is 10% greater than measured average leak rate for the purposes of establishing PTE.
4. VOC and HAP emissions are based on fractions of these pollutants in the site-specific gas analysis.

Dry Seal Emissions

Number of Compressors	Number of seals Per Compressor	Leak Rate (scf/hr/seal)	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)	Potential CO_2 Emissions (tpy)	Potential CH_4 Emissions (tpy)	Potential CO_2e Emissions (tpy)
2	2	6	210,240	0.16	0.01	0.03	11.02	275.60
Total				**0.16**	**0.01**	**0.03**	**11.02**	**275.60**

1. Leak rate and seal information from EPA Natural Gas Star Program (http://www.epa.gov/gasstar/documents/ll_wetseals.pdf)
2. Emission calculations for VOC are calculated assuming a desnity of natural gas of 0.05 lb/ft^3 @ STP (www.engineeringtoolbox.com)
Sample calculation: Volume vented (scf/yr) x density of natural gas (lb/scf) x wt % VOC / 2000 lb/ton
3. GHG emissions calculated in accordance with EquationsW-35 and W-36 in Subpart W of 40 CFR 98.
Sample calculation: Volume vented (scf/yr) x density of GHG (kg/scf) x mol % VOC x 2.2 lb/kg / 2000 lb/ton

VOC and HAP Vented Blowdown Emissions

Blowdown Emissions Sources	Vented Gas Volume Per Blowdown Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)
Station ESD Vent	1,400,000	1	1,400,000	1.06	0.08
Compressors	320,000	8	2,560,000	1.94	0.14
Total				**3.00**	**0.22**

GHG Vented Blowdown Emissions

Blowdown Emissions Sources	Vented Gas Volume Per Blowdown Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential CH_4 Emissions[1] (tpy)	Potential CO_2 Emissions[1] (tpy)	Potential CO_2e Emissions (tpy)
Station ESD Vent	1,400,000	1	1,400,000	26.79	0.21	670
Compressors	320,000	8	2,560,000	48.99	0.39	1225
Total				**75.8**	**0.60**	**1895**

1. Calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.

GHG Fugitive Emissions from Component Leaks:

Component Type	Estimated Component Count	GHG Emission Factor		CH_4 Emissions	CO_2 Emissions	CO_2e Emissions
		(scf/hr/component)	Factor Source	(tpy)	(tpy)	(tpy)
Connectors	355	0.003	40 CFR 98, Table W-1A	0.18	0.001	4.46
Flanges	220	0.003	40 CFR 98, Table W-1A	0.11	0.001	2.77
Open-Ended Lines	20	0.061	40 CFR 98, Table W-1A	0.20	0.002	5.11
Pump Seals	0	13.3	40 CFR 98, Table W-1A	0.00	0.000	0.00
Valves	210	0.03	40 CFR 98, Table W-1A	0.95	0.008	23.77
Other	0	0.04	40 CFR 98, Table W-1A	0.00	0.000	0.00
Total				**1.44**	**0.01**	**36.12**

Notes:
1. The component count is a preliminary estimate based on the proposed design of the station.
2. CH_4 and CO_2 emissions are based on fractions of these pollutants in the site-specific gas analysis.
3. Emissions are calculated in accordance with Equations W-32a, W-35 and W-36 in Subpart W of 40 CFR 98.
4. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).

Fugitive Component Emissions Data:

Pollutant	Atmospheric Emissions		Emissions Estimation Method
	lbs/hr	tpy	
VOC	0.80	3.52	EPA Protocol, Table 2-4 & Site-Specific Gas Analysis
HAPs	0.06	0.26	EPA Protocol, Table 2-4 and Site-Specific Gas Analysis
GHG (CO_2e)	504	2,207	40 CFR 98, Table W-1A and Site-Specific Gas Analysis

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: R13 Permit Application

TABLE 8. Liquid Loading Emissions Calculations

Liquid Loading Information:

Parameter	Value	Description
S	1.45	saturation factor for splash loading (AP-42 Table 5.2-1)
Collection Efficiency	0.0%	No Control
Control Efficiency	0%	No Control
P	0.21	true vapor pressure of liquid loaded (psia) - assume octane
M	114.23	molecular weight of vapors (lb/lb-mol) - assume octane
T	516.4	temperature of liquids loaded (deg R) - TANKS Data

Description	Loading Losses	Maximum Throughput[2]	VOC Emissions	
	(lb/10^3 gal)[1]	(gal)	(lb/hr)	(tpy)
Liquids Hauling	0.8	126,000	0.01	0.05

Notes:

1. Uncontrolled Loading Losses: L_L (lb/10^3 gal) = 12.46 (SPM)/T
2. Engineering Estimates of Produced fluids throughput at the Facility. Produced Water will not compose of HAP

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: R13 Permit Application

TABLE 9. Haul Road Emission Calculations

Unpaved Road Information:

Unpaved Roads: $E\ (lb/VMT) = k(s/12)^a(W/3)^b)*[(365-p)/365]$

	PM	PM_{10}	$PM_{2.5}$	
k Factor (lb/VMT)	4.9	1.5	0.15	AP-42 Table 13.2.2-2 (Final, 11/06)
Silt content, s	4.8 %			AP-42 Table 13.2.2-1 (11/06), for Sand and Gravel Processing
Number of Rain Days, p	150			AP-42 Figure 13.2.1-2
a	0.7	0.9	0.9	AP-42 Table 13.2.2-2 (Final, 11/06)
b	0.45	0.45	0.45	AP-42 Table 13.2.2-2 (Final, 11/06)

Description	Weight of Empty Truck (tons)	Weight of Truck w/ Max Load (tons)	Mean Vehicle Weight (tons)	Length of Unpaved Road Traveled (mile/trip)	Trips Per Year	Mileage Per Year	Control (%)	Emissions (tpy) PM	PM_{10}	$PM_{2.5}$
Service Truck	4	4	4	0.75	365	274	0	0.24	0.06	0.01
Liquids Hauling - Vendor Fluid	12	20	16	0.75	2	2	0	0.00	0.00	0.00
Liquids Hauling - Produced Fluid	20	32	26	0.75	32	24	0	0.05	0.01	0.00
Employee Vehicles	2	2	2	0.75	365	274	0	0.17	0.04	0.00
Total Potential Emissions								**0.46**	**0.12**	**0.01**

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: R13 Permit Application

TABLE 10. Site-Specific Gas Analysis

Sample Location: Multiple Locations
HHV (Btu/scf): 1,083

Constituent	Natural Gas Stream Speciation (Vol. %)	Natural Gas Stream Speciation (Wt. %)
N2	0.4949	0.788
METHANE	90.4241	82.411
CO2	0.2608	0.652
ETHANE	7.6812	13.124
PROPANE	0.6778	1.698
I-BUTANE	0.0754	0.249
N-BUTANE	0.1355	0.447
I-PENTANE	0.054	0.223
N-PENTANE	0.045	0.186
I-H EXAN ES	0.000	0.000
N-HEXANE	0.045	0.222
BENZENE	0.000	0.000
CYCLOHEXANE	0.000	0.000
HEPTANES	0.000	0.000
TOLUENE	0.000	0.000
2,2,4 Trimethylpentane	0.000	0.000
N-OCTANE	0.000	0.000
*E-BENZENE	0.000	0.000
*m,o,&p-XYLENE	0.000	0.000
I-NONANES	0.000	0.000
N-NONANE	0.000	0.000
I-DECANES	0.000	0.000
N-DECANE	0.000	0.000
I-UNDECANES +	0.000	0.000
Totals	99.895	100

*Gas Analysis showed no detectable compounds above hexane +, conservatively assumed all hexane + was n-hexar

TOC (Total)	99.14	98.56
VOC (Total)	1.03	3.03
HAP (Total)	0.05	0.22

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: R13 Permit Application

TABLE 11. Potential Atmospheric Emissions from Each Source at the Facility

Source	Pollutants																	
	VOC		NO_x		CO		PM_{10}		$PM_{2.5}$		SO_x		HCHO		Total HAPs		GHG (CO_2e)	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Turbine 1 (S001)	0.99	4.35	8.49	37.21	8.61	40.02	2.21	9.69	2.21	9.69	0.50	2.20	0.42	1.86	0.47	2.06	17,502	76,782
Turbine 2 (S002)	0.99	4.35	8.49	37.21	8.61	40.02	2.21	9.69	2.21	9.69	0.50	2.20	0.42	1.86	0.47	2.06	17,502	76,782
Microturbine 1 (S003)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 2 (S004)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 3 (S005)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 4 (S006)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 5 (S007)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 6 (S008)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 7 (S009)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 8 (S010)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 9 (S011)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 10 (S012)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Fuel Gas Heater (S013)	0.01	0.05	0.21	0.93	0.18	0.78	0.02	0.07	0.02	0.07	0.00	0.01	0.00	0.00	0.00	0.02	270	1,184
Fuel Gas Heater (S014)	0.01	0.05	0.21	0.93	0.18	0.78	0.02	0.07	0.02	0.07	0.00	0.01	0.00	0.00	0.00	0.02	270	1,184
Produced Fluids Tank (S015)	0.05	0.21	--	--	--	--	--	--	--	--	--	--	--	--	0.00	0.00	0	2
Used Oil Tank (S016)	0.00	0.00	--	--	--	--	--	--	--	--	--	--	--	--	0.00	0.00	--	--
Office Building Heater (S017)	0.00	0.00	0.01	0.05	0.01	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14	62
Fugitives (S018)	0.80	3.52	--	--	--	--	0.03	0.12	0.00	0.01	--	--	--	--	0.06	0.26	504	2,207
Liquid Loading (S019)	0.01	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
1. PM_{10} and $PM_{2.5}$ emissions are filterable + condensable.
2. VOC emissions for the engines are conservatively estimated as: VOC=NMNEHC+HCHO (Formaldehyde)
3. Fugitives emissions include haul road emissions.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: R13 Permit Application

TABLE 12. Total Potential Emissions from All Sources at the Facility

Pollutants	Estimated Site-Wide Emissions	
	lb/hr	tpy
VOC	3.06	13.46
NO_X	18.22	79.84
CO	19.79	91.28
SO_X	1.08	4.74
PM_{10}	4.64	20.30
$PM_{2.5}$	4.61	20.20
Formaldehyde (HCHO)	0.87	3.79
Total HAPs	1.03	4.53
GHG (CO_2e)	38,725	169,866

Notes:
1. PM_{10} and $PM_{2.5}$ emissions are filterable + condensable

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* Project Setup Information *
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Project File : \\Pit-dc1\p\Client\EQT Corporation\Corporate\02 Projects\143901.0087 Mountain Valley Project\04 Draft\2015-0312 Harris R13\2015-0312 Harris PF Tank v1.0.ept
Flowsheet Selection : Oil Tank with Separator
Calculation Method : RVP Distillation
Control Efficiency : 0.0%
Known Separator Stream : Low Pressure Oil
Entering Air Composition : No

Filed Name : EQT - Stallworth Produced Fluid Tanks
Well Name : PTE
Date : 2015.03.12

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

Separator Pressure : 414.00[psig]
Separator Temperature : 60.00[F]
Ambient Pressure : 14.70[psia]
Ambient Temperature : 55.00[F]
C10+ SG : 0.8024
C10+ MW : 163.342

-- Low Pressure Oil ----------

No.	Component	mol %
1	H2S	0.0000
2	O2	0.0000
3	CO2	0.0840
4	N2	0.0000
5	C1	9.9570
6	C2	8.1140
7	C3	6.8240
8	i-C4	1.8640
9	n-C4	4.8700
10	i-C5	2.9440
11	n-C5	3.3610
12	C6	2.2410
13	C7	9.7080
14	C8	11.4500
15	C9	8.4380
16	C10+	25.3730
17	Benzene	0.0910
18	Toluene	0.7580
19	E-Benzene	0.1130
20	Xylenes	1.3570
21	n-C6	2.4330
22	224Trimethylp	0.0200

-- Sales Oil ----------
Production Rate : 0.1[bbl/day]
Days of Annual Operation : 365 [days/year]
API Gravity : 59.11
Reid Vapor Pressure : 10.60[psia]

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

-- Emission Summary ----------

Item	Uncontrolled [ton/yr]	Uncontrolled [lb/hr]	Controlled [ton/yr]	Controlled [lb/hr]
Total HAPs	0.000	0.000	0.000	0.000
Page 1----------				E&P TANK
Total HC	0.423	0.097	0.423	0.097
VOCs, C2+	0.339	0.077	0.339	0.077
VOCs, C3+	0.213	0.049	0.213	0.049

Uncontrolled Recovery Info.
Vapor 28.1600 x1E-3 [MSCFD]
HC Vapor 28.0700 x1E-3 [MSCFD]
GOR 281.60 [SCF/bbl]

-- Emission Composition ----------

No	Component	Uncontrolled [ton/yr]	Uncontrolled [lb/hr]	Controlled [ton/yr]	Controlled [lb/hr]
1	H2S	0.000	0.000	0.000	0.000
2	O2	0.000	0.000	0.000	0.000
3	CO2	0.002	0.000	0.002	0.000
4	N2	0.000	0.000	0.000	0.000
5	C1	0.084	0.019	0.084	0.019
6	C2	0.125	0.029	0.125	0.029
7	C3	0.109	0.025	0.109	0.025
8	i-C4	0.023	0.005	0.023	0.005
9	n-C4	0.045	0.010	0.045	0.010
10	i-C5	0.014	0.003	0.014	0.003
11	n-C5	0.012	0.003	0.012	0.003
12	C6	0.003	0.001	0.003	0.001
13	C7	0.004	0.001	0.004	0.001
14	C8	0.001	0.000	0.001	0.000
15	C9	0.000	0.000	0.000	0.000
16	C10+	0.000	0.000	0.000	0.000
17	Benzene	0.000	0.000	0.000	0.000
18	Toluene	0.000	0.000	0.000	0.000
19	E-Benzene	0.000	0.000	0.000	0.000
20	Xylenes	0.000	0.000	0.000	0.000
21	n-C6	0.002	0.000	0.002	0.000
22	224Trimethylp	0.000	0.000	0.000	0.000
	Total	0.424	0.097	0.424	0.097

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

No.	Component	MW	LP Oil	Flash Oil	Sale Oil	Flash Gas	W&S Gas	Total Emissions

		mol %	mol %	mol %	mol %	mol %	mol %
1	H2S	34.80	0.0000	0.0000	0.0000	0.0000	0.0000
2	O2	32.00	0.0000	0.0000	0.0000	0.0000	0.0000
3	CO2	44.01	0.0840	0.0069	0.0001	0.3251	0.3289	0.3254
4	N2	28.01	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	C1	16.04	9.9570	0.2491	0.0001	40.3145	12.0792	38.6045
6	C2	30.07	8.1140	1.3061	0.2375	29.4027	52.0759	30.7759
7	C3	44.10	6.8240	3.2946	2.8877	17.8607	22.6275	18.1494
8	i-C4	58.12	1.8640	1.5368	1.5034	2.8873	3.1206	2.9014
9	n-C4	58.12	4.8700	4.6049	4.5743	5.6989	6.0623	5.7209
10	i-C5	72.15	2.9440	3.4237	3.4639	1.4439	1.5163	1.4483
11	n-C5	72.15	3.3610	4.0550	4.1140	1.1907	1.2521	1.1944
12	C6	86.16	2.2410	2.8819	2.9372	0.2370	0.2510	0.2378
13	C7	100.20	9.7080	12.7165	12.9774	0.3002	0.3211	0.3015
14	C8	114.23	11.4500	15.0807	15.3960	0.0965	0.1043	0.0969
15	C9	128.28	8.4380	11.1296	11.3633	0.0212	0.0250	0.0215
16	C10+	163.34	25.3730	33.4860	34.1908	0.0030	0.0034	0.0030
17	Benzene	78.11	0.0910	0.1181	0.1204	0.0064	0.0068	0.0064
18	Toluene	92.13	0.7580	0.9963	1.0170	0.0128	0.0138	0.0128
19	E-Benzene	106.17	0.1130	0.1490	0.1521	0.0005	0.0006	0.0005
20	Xylenes	106.17	1.3570	1.7892	1.8267	0.0056	0.0061	0.0056
21	n-C6	86.18	2.4330	3.1494	3.2114	0.1926	0.2046	0.1933
22	224Trimethylp	114.24	0.0200	0.0262	0.0268	0.0005	0.0005	0.0005

MW	95.74	116.43	118.13	31.04	35.93	31.33
Stream Mole Ratio	1.0000	0.7577	0.7421	0.2423	0.0156	0.2579
Heating Value [BTU/SCF]				1808.07	2072.28	1824.07
Gas Gravity [Gas/Air]				1.07	1.24	1.08
Bubble Pt. @ 100F [psia]	406.75	28.61	13.23			
RVP @ 100F [psia]	101.88	15.92	10.81			

Spec. Gravity @ 100F	0.685	0.715	0.717

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

Identification

User Identification:	S016 - MVP
City:	
State:	West Virginia
Company:	Mountain Valley Pipeline, LLC
Type of Tank:	Horizontal Tank
Description:	4,200 gallon Used Oil Tank

Tank Dimensions

Shell Length (ft):	11.70
Diameter (ft):	7.80
Volume (gallons):	4,200.00
Turnovers:	0.75
Net Throughput(gal/yr):	3,150.00
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):	0.00
Pressure Settings (psig)	0.00

Meterological Data used in Emissions Calculations: Elkins, West Virginia (Avg Atmospheric Pressure = 13.73 psia)

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

S016 - MVP - 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
Distillate fuel oil no. 2	All	55.41	46.54	64.27	51.30	0.0061	0.0040	0.0081	130.0000			188.00	Option 1: VP50 = .0045 VP60 = .0074

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

S016 - MVP - Horizontal Tank

Annual Emission Calcaulations	
Standing Losses (lb):	1.2610
Vapor Space Volume (cu ft):	356.0945
Vapor Density (lb/cu ft):	0.0001
Vapor Space Expansion Factor:	0.0691
Vented Vapor Saturation Factor:	0.9987
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	356.0945
Tank Diameter (ft):	7.8000
Effective Diameter (ft):	10.7822
Vapor Space Outage (ft):	3.9000
Tank Shell Length (ft):	11.7000
Vapor Density	
Vapor Density (lb/cu ft):	0.0001
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0061
Daily Avg. Liquid Surface Temp. (deg. R):	515.0759
Daily Average Ambient Temp. (deg. F):	49.0583
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	510.9683
Tank Paint Solar Absorptance (Shell):	0.5400
Daily Total Solar Insulation Factor (Btu/sqft day):	1,193.8870

Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0691
Daily Vapor Temperature Range (deg. R):	35.4636
Daily Vapor Pressure Range (psia):	0.0041
Breather Vent Press. Setting Range(psia):	0.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0061
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0040
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0081
Daily Avg. Liquid Surface Temp. (deg R):	515.0759
Daily Min. Liquid Surface Temp. (deg R):	506.2100
Daily Max. Liquid Surface Temp. (deg R):	523.9417
Daily Ambient Temp. Range (deg. R):	24.1833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9987
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0061
Vapor Space Outage (ft):	3.9000
Working Losses (lb):	0.0592
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0061
Annual Net Throughput (gal/yr.):	3,150.0000
Annual Turnovers:	0.7500
Turnover Factor:	1.0000
Tank Diameter (ft):	7.8000
Working Loss Product Factor:	1.0000
Total Losses (lb):	1.3402

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

Emissions Report for: Annual

S016 - MVP - Horizontal Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	0.06	1.28	1.34

LAFAYETTE AREA LABORATORY
4790 N.E. EVANGELINE THRUWAY
CARENCRO, LA 70520
PHONE (337) 896-3055
FAX (337) 896-3077

Certificate of Analysis : 13050161-002A

Company:	Gas Analytical Services	**For:**	Gas Analytical Services
Well:	OXF 131 Pad		Alan Ball
Field:	EQT Production		PO Box 1028
Sample of:	Condensate-Spot		
Conditions:	414 @ N.G.		Bridgeport, WV, 26330
Sampled by:	GR-GAS		
Sample date:	5/14/2013	**Report Date:**	5/29/2013
Remarks:	Cylinder No.: GAS		
Remarks:			

Analysis: (*GPA 2186M*)	**Mol. %**	**MW**	**Wt. %**	**Sp. Gravity**	**L.V. %**
Nitrogen	0.000	28.013	0.000	0.8094	0.000
Methane	9.957	16.043	1.664	0.3000	3.884
Carbon Dioxide	0.084	44.010	0.039	0.8180	0.033
Ethane	8.114	30.070	2.542	0.3562	4.991
Propane	6.824	44.097	3.135	0.5070	4.324
Iso-butane	1.864	58.123	1.129	0.5629	1.403
N-butane	4.870	58.123	2.948	0.5840	3.533
Iso-pentane	2.944	72.150	2.213	0.6244	2.479
N-pentane	3.361	72.150	2.526	0.6311	2.801
i-Hexanes	2.241	86.177	1.990	0.6795	2.104
n-Hexane	2.433	85.734	2.184	0.6640	2.288
2,2,4 trimethylpentane	0.020	114.231	0.024	0.6967	0.024
Benzene	0.091	78.114	0.065	0.8846	0.059
Heptanes	9.708	98.181	9.953	0.7010	9.943
Toluene	0.758	92.141	0.641	0.8719	0.588
Octanes	11.450	107.956	13.087	0.7510	12.206
E-benzene	0.113	106.167	0.053	0.8718	0.102
M-,O-,P-xylene	1.357	106.167	1.501	0.8731	1.214
Nonanes	8.438	122.962	11.137	0.7603	10.366
Decanes Plus	25.373	163.342	43.169	0.8024	37.658
	100.000		100.000		100.000

Calculated Values	**Total Sample**	**Decanes Plus**
Specific Gravity at 60 °F	0.6999	0.8024
Api Gravity at 60 °F	70.675	44.841
Molecular Weight	96.001	163.342
Pounds per Gallon (in Vacuum)	5.835	6.690
Pounds per Gallon (in Air)	5.829	6.683
Cu. Ft. Vapor per Gallon @ 14.73 psia	23.120	15.507

Brian Gaspard

Southern Petroleum Laboratories, Inc.

LAFAYETTE AREA LABORATORY
4790 N.E. EVANGELINE THRUWAY
CARENCRO, LA 70520
PHONE (337) 896-3055
FAX (337) 896-3077

Certificate of Analysis : 13050161-002A

Company:	Gas Analytical Services	**For:**	Gas Analytical Services
Well:	OXF 131 Pad		Alan Ball
Field:	EQT Production		PO Box 1028
Sample of:	Condensate-Spot		
Conditions:	414 @ N.G.		Bridgeport, WV, 26330
Sampled by:	GR-GAS		
Sample date:	5/14/2013	**Report Date:**	5/29/2013
Remarks:	Cylinder No.: GAS		
Remarks:			

Analysis: (*GPA 2103*)	**Mol. %**	**MW**	**Wt. %**	**Sp. Gravity**	**L.V. %**
Nitrogen	0.000	28.013	0.000	0.8094	0.000
Methane	9.957	16.043	1.664	0.3000	3.884
Carbon Dioxide	0.084	44.010	0.039	0.8180	0.033
Ethane	8.114	30.070	2.542	0.3562	4.991
Propane	6.824	44.097	3.135	0.5070	4.324
Iso-butane	1.864	58.123	1.129	0.5629	1.403
N-butane	4.870	58.123	2.948	0.5840	3.533
Iso-pentane	2.944	72.150	2.213	0.6244	2.479
N-pentane	3.361	72.150	2.526	0.6311	2.801
Hexanes	4.674	85.734	4.174	0.6652	4.392
Heptanes Plus	57.308	98.181	79.630	0.7010	72.160
	100.000		100.000		100.000

Calculated Values	**Total Sample**	**Heptanes Plus**
Specific Gravity at 60 °F	0.6999	0.7741
Api Gravity at 60 °F	70.675	51.303
Molecular Weight	96.001	133.398
Pounds per Gallon (in Vacuum)	5.835	6.454
Pounds per Gallon (in Air)	5.829	6.447
Cu. Ft. Vapor per Gallon @ 14.73 psia	23.120	18.402
Standing-Katz Density (lb. / ft^3)		

Brian Gaspard

Southern Petroleum Laboratories, Inc.

Certificate of Analysis

Number: 2030-13050161-002A

Carencro Laboratory
4790 NE Evangeline Thruway
Carencro, LA 70520

Alan Ball
Gas Analytical Services
PO Box 1028
Bridgeport, WV 26330

May 22, 2013

Station Name: OXF 131 Pad
Station Number: 512441
Station Location: EQT Production
Sample Point: Wellhead

Sampled By: GR-GAS
Sample Of: Condensate Spot
Sample Date: 05/14/2013 13:00
Sample Conditions: 414 psig
Cylinder No: GAS

Analytical Data

Test	Method	Result	Units	Detection Limit	Lab Tech.	Analysis Date
Color-Visual	Proprietary	L STRAW			AR	05/22/2013
API Gravity @ 60° F	ASTM D-5002	61.22	°		AR	05/22/2013
Specific Gravity @ 60/60° F	ASTM D-5002	0.7342			AR	05/22/2013
Density @ 60° F	ASTM D-5002	0.7335	g/ml		AR	05/22/2013
Shrinkage Factor	Proprietary	0.9043			AR	05/22/2013
Flash Factor	Proprietary	256.6792	Cu. Ft./S.T. Bbl		AR	05/22/2013

Patti L. Perro

Hydrocarbon Laboratory Manager

Quality Assurance: The above analyses are performed in accordance with ASTM, UOP, GPA guidelines for quality assurance, unless otherwise stated.

MVP Turbine/Compressor Package Performance Evaluation Sheet

Constants		
Elevation (fasl)	2775	
Relative Humidity	80%	
Fuel HHV (BTU/SCF)	1085	
Fuel LHV (BTU/SCF)	979.3	
Emissions Load Range	50-100%	Guaranteed
Turbine ISO Rating (HP)	20500	T130
Number of Units	2	Station 3

Ambient Temp			50% Load	75% Load	100% Load
0°F	Turbine Performance	Output Shaft Speed (RPM)	6505	7896	8296
		Output Shaft Power (HP)	9742	14613	19483
		HP Utilization (%)	50.0%	75.0%	100.0%
		Heat Rate (BTU/HP-hr)	8400	8490	7269
		Unit Fuel Consumption (MMSCF/D)	2.006	3.04	3.47
		Engine Thermal Efficiency (%)	30.3	30	35
		Exhaust Temp (°F)	708	902	903
		Unit NO_x (PPMvd)	15	15	15
		Unit NO_x (lb/hr)	4.89	7.43	8.49
		Unit CO (PPMvd)	25	25	25
		Unit CO (lb/hr)	4.96	7.54	8.61
		Unit UHC (PPMvd)	25	25	25
		Unit UHC (lb/hr)	2.84	4.32	4.93

Ambient Temp			50% Load	75% Load	100% Load
20°F	Turbine Performance	Output Shaft Speed (RPM)	7114	7879	8316
		Output Shaft Power (HP)	9578	14367	19156
		HP Utilization (%)	50.0%	75.0%	100.0%
		Heat Rate (BTU/HP-hr)	10613	8371	7147
		Unit Fuel Consumption (MMSCF/D)	2.49	2.95	3.36
		Engine Thermal Efficiency (%)	24	30.4	35.6
		Exhaust Temp (°F)	940	920	910
		Unit NO_x (PPMvd)	15	15	15
		Unit NO_x (lb/hr)	6.08	7.19	8.19
		Unit CO (PPMvd)	25	25	25
		Unit CO (lb/hr)	6.17	7.3	8.31
		Unit UHC (PPMvd)	25	25	25
		Unit UHC (lb/hr)	3.53	4.18	4.76

Ambient Temp			50% Load	75% Load	100% Load
40°F	Turbine Performance	Output Shaft Speed (RPM)	7061	7841	8330
		Output Shaft Power (HP)	9334	14001	18668
		HP Utilization (%)	50.0%	75.0%	100.0%
		Heat Rate (BTU/HP-hr)	10548	8312	7097
		Unit Fuel Consumption (MMSCF/D)	2.412	2.85	3.25
		Engine Thermal Efficiency (%)	24.1	30.6	35.9
		Exhaust Temp (°F)	969	939	924
		Unit NO_x (PPMvd)	15	15	15
		Unit NO_x (lb/hr)	5.87	6.94	7.91
		Unit CO (PPMvd)	25	25	25
		Unit CO (lb/hr)	5.96	7.05	8.02
		Unit UHC (PPMvd)	25	25	25
		Unit UHC (lb/hr)	3.41	4.04	4.6

MVP Turbine/Compressor Package Performance Evaluation Sheet

Ambient Temp			50% Load	75% Load	100% Load
60°F	Turbine Performance	Output Shaft Speed (RPM)	6968	7760	8319
		Output Shaft Power (HP)	8905	13357	17809
		HP Utilization (%)	50.0%	75.0%	100.0%
		Heat Rate (BTU/HP-hr)	10683	8370	7184
		Unit Fuel Consumption (MMSCF/D)	2.33	2.74	3.135
		Engine Thermal Efficiency (%)	23.8	30.4	35.4
		Exhaust Temp (°F)	997	961	949
		Unit NO_x (PPMvd)	15	15	15
		Unit NO_x (lb/hr)	5.65	6.64	7.6
		Unit CO (PPMvd)	25	25	25
		Unit CO (lb/hr)	5.73	6.74	7.71
		Unit UHC (PPMvd)	25	25	25
		Unit UHC (lb/hr)	3.28	3.86	4.42

Ambient Temp			50% Load	75% Load	100% Load
80°F	Turbine Performance	Output Shaft Speed (RPM)	6833	7609	8200
		Output Shaft Power (HP)	8159	12238	16318
		HP Utilization (%)	50.0%	75.0%	100.0%
		Heat Rate (BTU/HP-hr)	11204	8675	7396
		Unit Fuel Consumption (MMSCF/D)	2.24	2.6	2.96
		Engine Thermal Efficiency (%)	22.7	29.3	34.4
		Exhaust Temp (°F)	1025	989	969
		Unit NO_x (PPMvd)	15	15	15
		Unit NO_x (lb/hr)	5.38	6.24	7.1
		Unit CO (PPMvd)	25	25	25
		Unit CO (lb/hr)	5.45	6.34	7.2
		Unit UHC (PPMvd)	25	25	25
		Unit UHC (lb/hr)	3.12	3.63	4.13

Ambient Temp			50% Load	75% Load	100% Load
100°F	Turbine Performance	Output Shaft Speed (RPM)	6659	7399	8005
		Output Shaft Power (HP)	7237	10856	14474
		HP Utilization (%)	50.0%	75.0%	100.0%
		Heat Rate (BTU/HP-hr)	12035	9158	7814
		Unit Fuel Consumption (MMSCF/D)	2.134	2.44	2.77
		Engine Thermal Efficiency (%)	21.1	27.8	32.6
		Exhaust Temp (°F)	1056	1026	999
		Unit NO_x (PPMvd)	15	15	15
		Unit NO_x (lb/hr)	5.03	5.75	6.54
		Unit CO (PPMvd)	25	25	25
		Unit CO (lb/hr)	5.11	5.83	6.64
		Unit UHC (PPMvd)	25	25	25
		Unit UHC (lb/hr)	2.93	3.34	3.8

Solar Turbines
A Caterpillar Company

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

EMISSIONS ESTIMATES IN NON-SOLONOX MODE (LOW LOAD)

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

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

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

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

Table 4. Estimated Emissions in non-SoLoNOx Mode

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

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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.

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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

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PIL 170
Product Information Letter

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

Leslie Witherspoon
Solar Turbines Incorporated

PURPOSE

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

INTRODUCTION

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

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

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

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

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

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

START-UP SEQUENCE

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

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

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

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

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

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

SHUTDOWN PROCESS

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

START-UP AND SHUTDOWN EMISSIONS ESTIMATES

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

COMMISSIONING EMISSIONS

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

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

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

Data will NOT be warranted under any circumstances

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

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

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

Assumes unit is operating at full load prior to shutdown.

Assumes natural gas fuel; ES 9-98 compliant.

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

Data will NOT be warranted under any circumstances

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

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

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

Assumes unit is operating at full load prior to shutdown.

Assumes natural gas fuel; ES 9-98 compliant.

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

10 Minute Start-up and 10 Minute Shutdown

Natural Gas Fuel

Data will NOT be warranted under any circumstances

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

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

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

Assumes unit is operating at full load prior to shutdown.

Assumes natural gas fuel; ES 9-98 compliant.

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

Data will NOT be warranted under any circumstances

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

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

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

Assumes unit is operating at full load prior to shutdown.

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

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

Data will NOT be warranted under any circumstances

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

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

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

Assumes unit is operating at full load prior to shutdown.

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

Emissions from Centrifugal Compressor Gas Seal Systems

Anthony Pocengal
Solar Turbines Incorporated

PURPOSE

The U.S. Environmental Protection Agency ("EPA") has recently established regulations related to monitoring, reporting and control of Greenhouse Gas (GHG) emissions from industrial sources. Methane, the main constituent of natural gas, is a GHG which may escape from various points along the gas turbine package and the driven equipment. One source of 'fugitive' emissions under regulatory scrutiny includes the gas seal systems installed in centrifugal gas compressors. As natural gas is used as seal gas there will be some emission of methane through the seal vents. The purpose of this PIL is to provide information pertaining to expected emissions leakage from Solar compressor dry gas seals. Regulatory requirements for wet seal systems are also briefly summarized.

DRY GAS SEAL LEAKAGE DATA

The figures in the Appendix may be used to estimate dry gas seal leakage through the primary and secondary (combined) vents based on the compressor suction pressure (P1). The charts show the expected leakage rate per each compressor. Leakage rates are not be guaranteed.

For further technical information on Dry Gas Seal systems refer to PIL 140 Dry Gas Face Seals for Solar Gas Compressors.

Note on PIL 140: The maximum dynamic leakage from Tables 3 and 4 are the maximum possible dynamic leakage rates at maximum allowable speed and pressure and should not be utilized for emission inventories or expected emissions from Solar compressors.

REGULATIONS CONCERNING CENTRIFUGAL COMPRESSOR GAS SEAL EMISSIONS

There are two EPA regulations in Title 40 of the Code of Federal Regulations (CFR) which concern emissions from centrifugal compressor gas seal systems: Part 98, Subpart W (40 CFR §§ 98.230 – 98.238) and Part 60, Subpart OOOO (40 CFR §§ 60.5360 – 60.5423). The final rule that promulgated Subpart W was published in in November 2010 and requires reporting of GHG emissions for oil and gas operations beginning in September 2012. Subpart OOOO, New Source Performance Standards for Crude Oil and Natural Gas Production, Transmission and Distribution, requires the reduction of volatile organic compounds (VOCs) from oil and gas operations and became effective October 15, 2012.

Neither regulation requires actual measurement of emissions from compressor dry gas seal systems.

Although measurement of dry gas seal emissions is not required by EPA, several US state environmental agencies are requiring customers to estimate dry gas seal vent emissions as part of the air permitting process. Dry gas seal vent emissions estimates are provided in the Appendix. A brief summary of the regulations follows.

Subpart W - Mandatory Reporting of Greenhouse Gases: Petroleum and Natural Gas Systems

Subpart W is included in the EPA's Mandatory Reporting of Greenhouse Gases regulation. While there is no requirement for measurement of dry gas seal emissions, emissions from wet gas seal de-gas systems are required to be measured by operators in the gas processing, transmission, storage and LNG segments of the industry. Or, as applicable, estimates from Best Available Monitoring Methods (BAMM) may be used. BAMM may be very common in the initial years (e.g., 2011 and 2012 GHG inventories) but EPA does not anticipate long term BAMM, so measurements in future years will be required. Production operators use an emission factor rather than measurement and the distribution segment does not report wet seal system emissions. See 40 CFR §§ 98.236 for details on reporting. Subpart W also requires reporting of emissions from blowdown vents and leakage from unit isolation valves (note that these emission sources are not directly emitted from the compressor). See 40 CFR §§ 98.233(o) and 98.234 for further details.

Subpart OOOO - Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution

40 CFR Part 60, Subpart OOOO impacts centrifugal compressors with wet gas seal systems that are new, modified, or reconstructed after August 23, 2011, that are used in natural gas gathering and processing. Compressors located at well-heads or in the transmission, distribution or storage segments are not affected by Subpart OOOO.

Compliance with Subpart OOOO requires a dry seal system, or a wet seal system that reduces VOC emissions by 95% (through routing of seal de-gas emissions through a closed vent system to a control device or recirculation to the compressor suction). Note that although Subpart OOOO mentions flaring, flares may present a safety hazard and should not be used with wet seal applications.

Subpart OOOO applicability to Solar equipment would be limited to new, modified, or reconstructed (since August 23, 2011) centrifugal compressors with wet seal systems in use at gathering facilities or gas processing plants.

Under Subpart OOOO if a control device (such as an adsorbent chiller) is used, monitoring and performance testing to verify 95% VOC reduction is required. See 40 CFR § 60.5413 for further details. Inspections of closed vent systems are required per 40 CFR § 60.5416.

At this time EPA has not provided an interpretation of what constitutes a 'modified' or 'reconstructed' centrifugal compressor, and guidance is not likely until an operator requests an applicability determination from EPA. According to the NSPS definitions, a compressor restage would be considered a modification if there is an increase in emissions; or reconstruction would apply in cases where the restage costs are greater than 50% of a comparable new compressor.

SUMMARY

Per Subpart W, wet seal de-gas emissions from centrifugal compressors must be measured (or estimated with BAMM) for all sources except those in the offshore production or distribution segments. Onshore production uses emission factors rather than direct measurement. Emissions estimates from blowdown vents and isolation valves, although not emitted directly from the compressor, are also required.

Per Subpart OOOO, new, modified, or reconstructed centrifugal compressors as of August 23, 2011 at gas gathering or production sites must use dry seals or reduce VOC emissions from wet seal systems by 95%.

No specific requirements apply to emissions from dry gas seal systems although state environmental agencies may require estimates of these emissions for air permitting purposes. Emissions estimates are included in the Appendix.

Table of Figures

Centrifugal Compressor Dry Gas Seal Leakage Estimates

APPENDIX

The charts shown below are the total seal / process gas that leaks across the two primary dry gas seals and is vented through the primary and secondary vents on a Solar Gas Compressor. The dry gas seal leakage flow is a function of the compressor suction pressure. The charts show seal gas vented flow (scfm) vs. compressor suction pressure (psig)

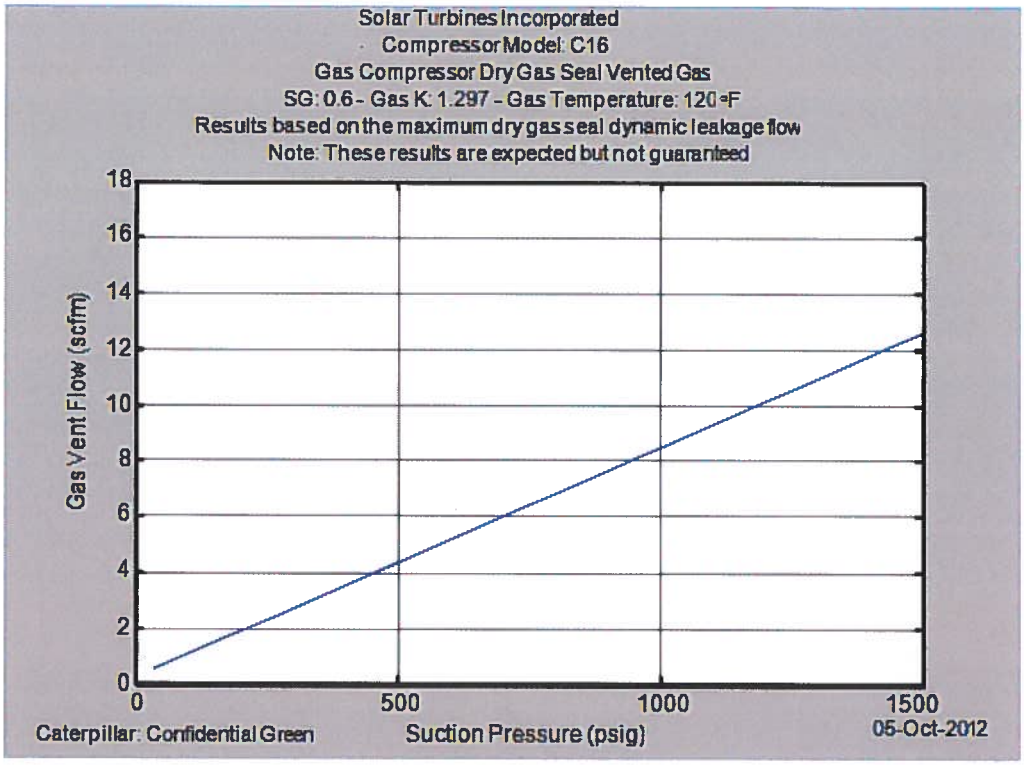

Figure 1 C16

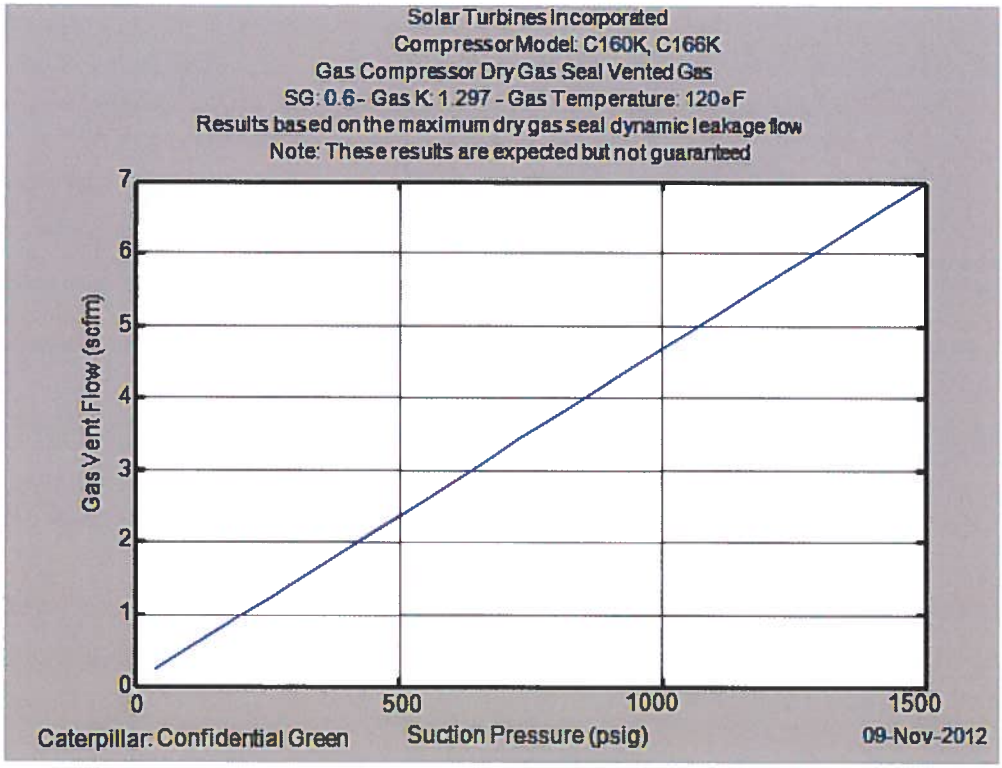

Figure 2 C160K, C166K

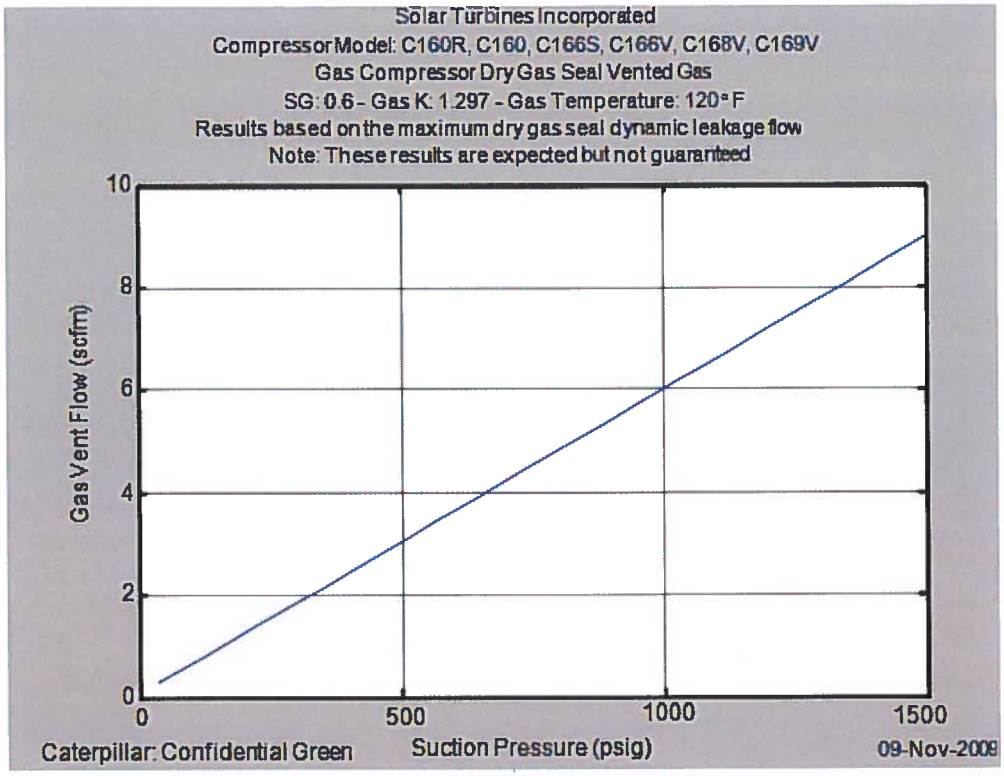

Figure 3 C160R, C160, C166S, C166V, C168V, C169V

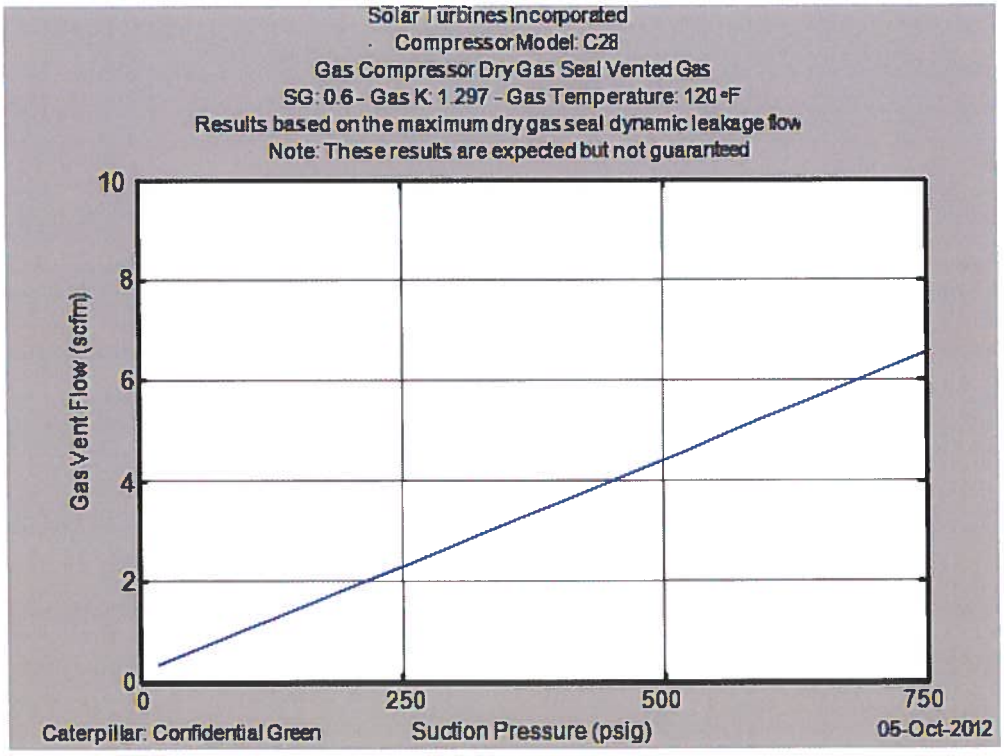

Figure 4 C28

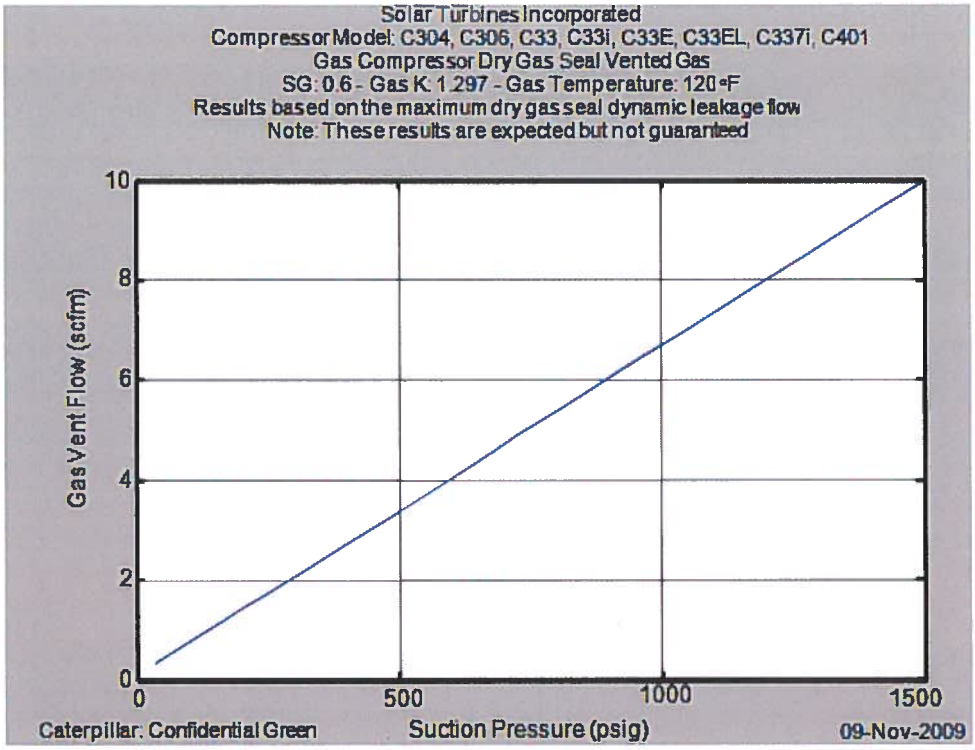

Figure 5 C304, C306, C33, C33i, C33E, C33EL, C337i, C401

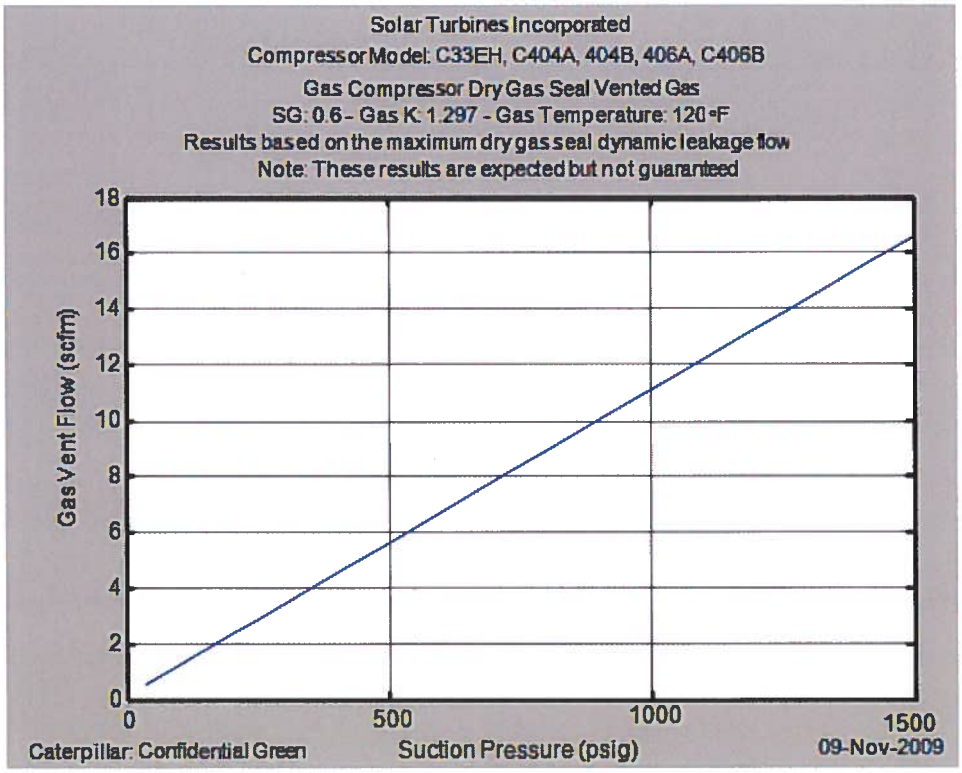

Figure 6 C33EH, C404A, C404B, 406A, 406B

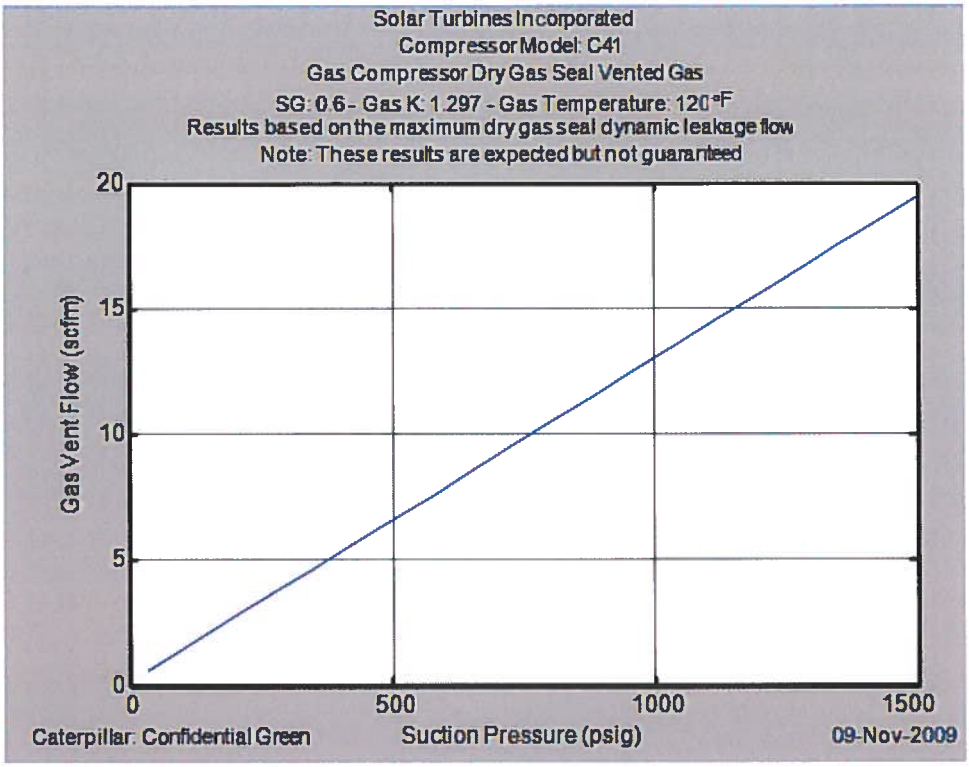

Figure 7 C41

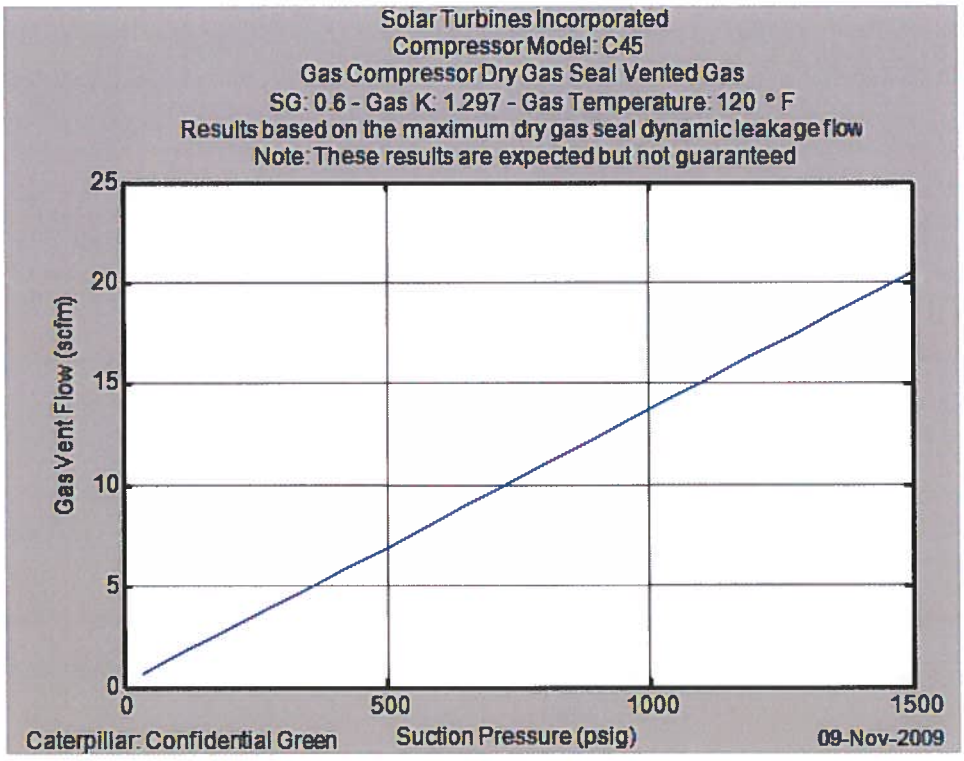

Figure 8 C45

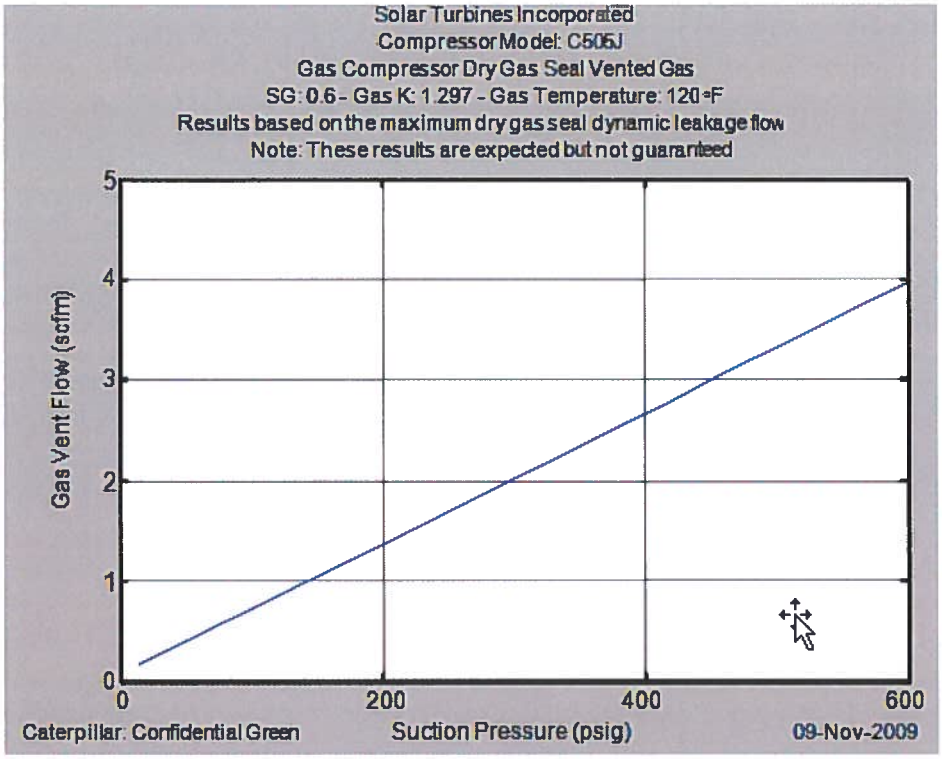

Figure 9 C505J

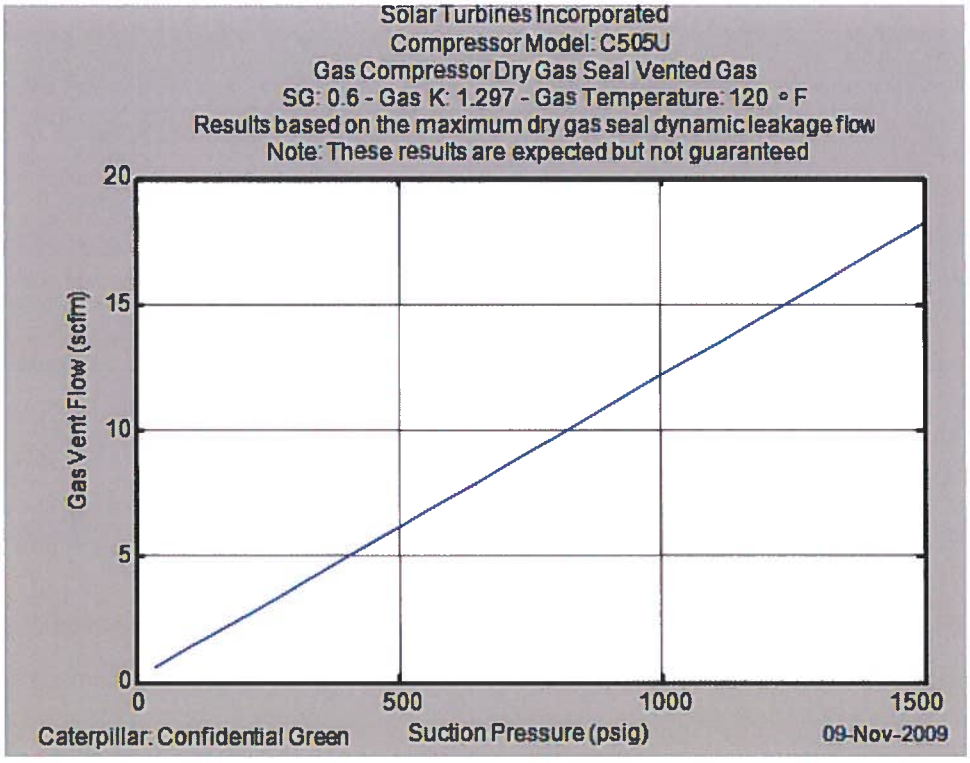

Figure 10 C505U

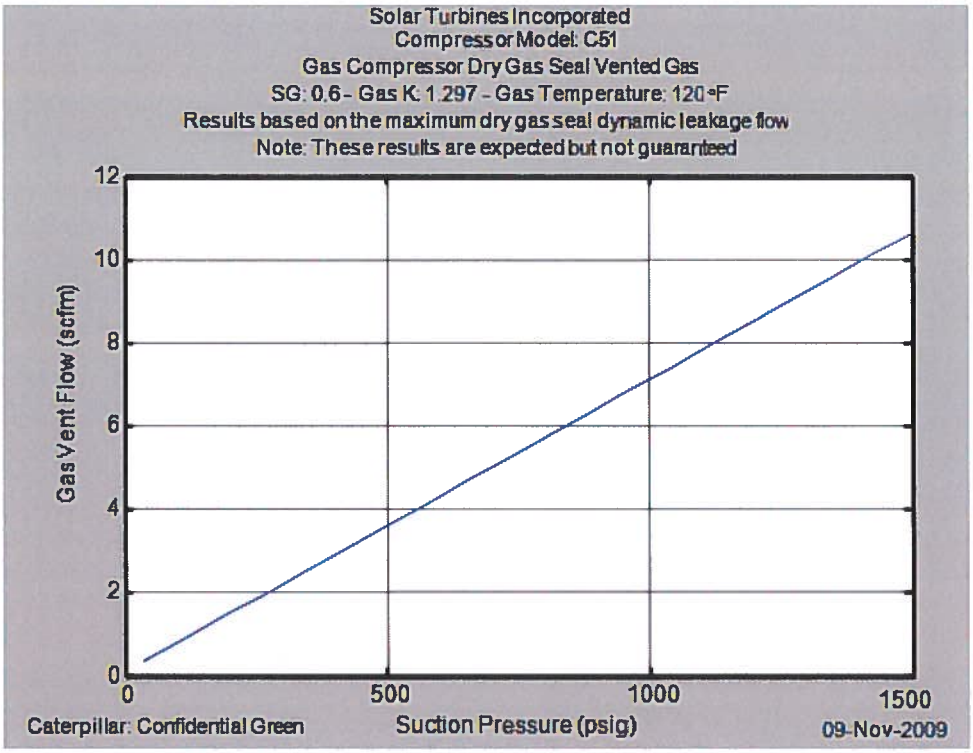

Figure 11 C51

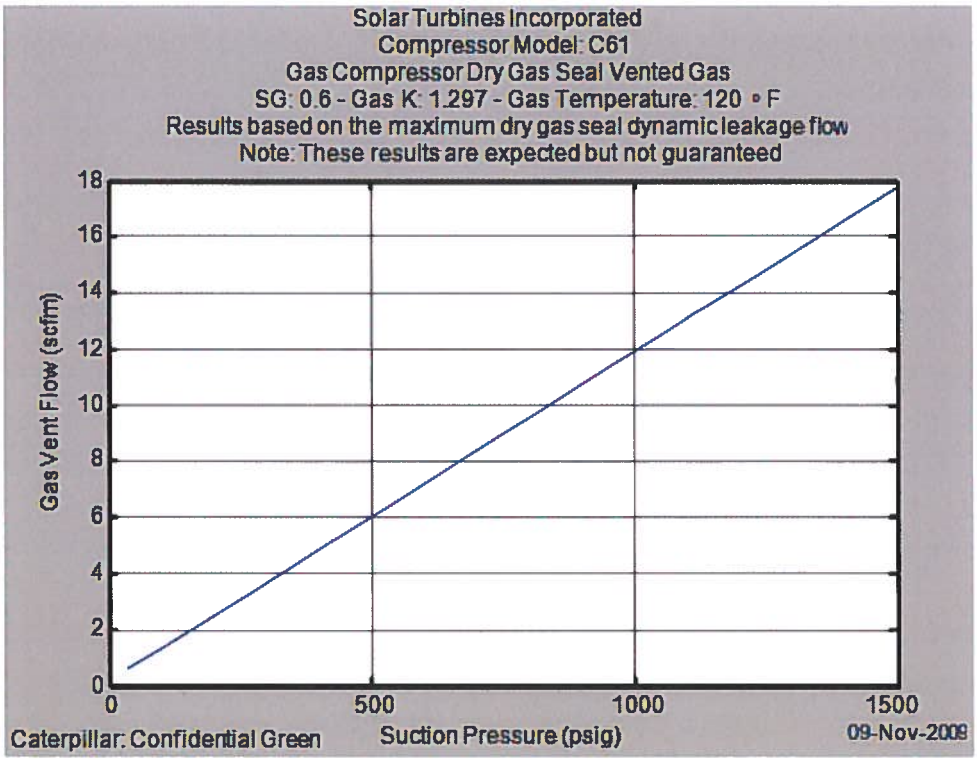

Figure 12 C61

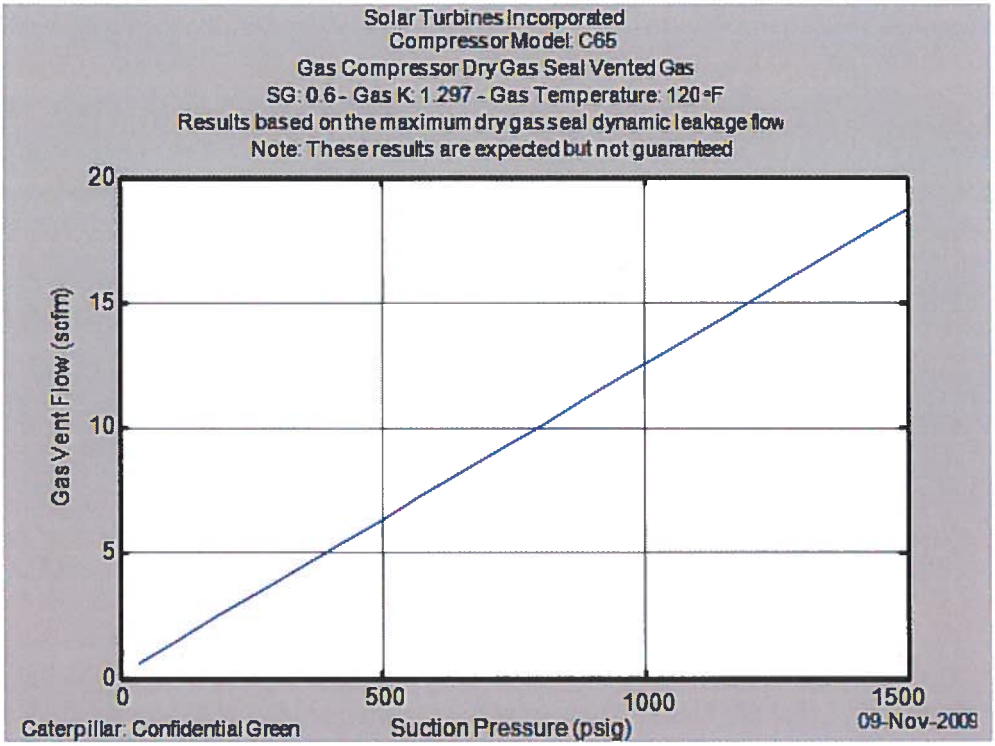

Figure 13 C65

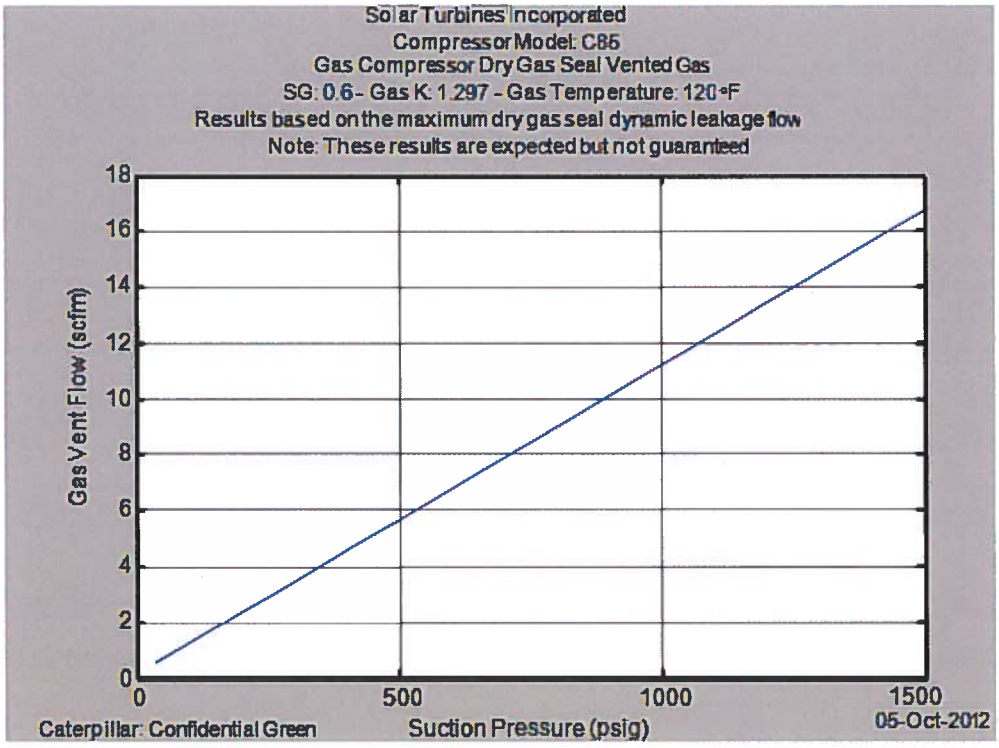

Figure 14 C85

Solar Turbines Incorporated
9330 Sky Park Court
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Particulate Matter Emission Estimates

Leslie Witherspoon
Solar Turbines Incorporated

PURPOSE

This document summarizes Solar's recommended $PM_{10/2.5}$ emission levels for our combustion turbines. The recommended levels are based on an analysis of emissions tests collected from customer sites.

Particulate Matter Definition

National Ambient Air Quality Standards (NAAQS) for particulate matter were first set in 1971. Total suspended particulate (TSP) was the first indicator used to represent suspended particles in the ambient air. Since July 1, 1987, the Environmental Protection Agency (EPA) has used the indicator PM_{10}, which includes only the particles with aerodynamic diameter smaller than 10 micrometers. PM_{10} (coarse particles) come from sources such as windblown dust from the desert or agricultural fields and dust kicked up on unpaved roads by vehicle traffic.

The EPA added a $PM_{2.5}$ ambient air standard in 1997. $PM_{2.5}$ includes particles with an aerodynamic diameter less than 2.5 micrometers. $PM_{2.5}$ (fine particles) are generally emitted from activities such as industrial and residential combustion and from vehicle exhaust. Fine particles are also formed in the atmosphere when gases such as sulfur dioxide, nitrogen oxides, and volatile organic compounds, emitted by combustion activities, are transformed by chemical reactions.

Nearly all particulate matter from gas turbine exhaust is less than one micrometer (micron) in diameter. Thus the emission rates of TSP, PM_{10}, and $PM_{2.5}$ from gas turbines are theoretically equivalent although source testing will show variation due to test method detection levels and processes.

TESTING FOR PARTICULATE MATTER

The turbine combustion process has little effect on the particulate matter generated and measured. The largest contributor to particulate matter emissions for gas and liquid fired combustion turbines is measurement technique and error. Other, minor contributing, sources of particulate matter emissions include carbon, ash, fuel-bound sulfur, artifact sulfate formation, compressor/lubricating oils, and inlet air.

Historical customer particulate matter source test data show that there is significant variability from test to test. The source test results support the common industry argument that particulate matter from natural gas fired combustion sources is difficult to measure accurately. The reference test methods for particulate matter were developed primarily for measuring emissions from coal-fired power plants and other major emitters of particulates. Particulate concentrations from gas turbine can be 100 to 10,000 times lower than the "traditional" particulate sources. The test methods were not developed or verified for low emission levels. There are interferences, insignificant at higher exhaust particulate matter concentrations that result in emissions greater than the actual emissions from gas turbines. New methods are being developed to address this problem.

Due to measurement and procedural errors, the measured results, in most cases, may not be representative of actual particulate matter emitted. There are many potential error sources in measuring particulate matter. Most of these have to do with contamination of the samples, material from the sampling apparatus getting into the samples, and general human error in samples and analysis.

Recommended Particulate Matter Emission Factors

When necessary to support the air permitting process Solar recommends the following $PM_{10/2.5}$ emission factors:

- Natural Gas: 0.015 lb/MMBtu fuel input (HHV)
- Landfill Gas: 0.03 lb/MMBtu fuel input (HHV)
- Liquid Fuel: 0.06 lb/MMBtu fuel input (HHV). The liquid fuel emission factor assumes fuel sulfur content is <500 ppm and ash content is <0.005% by wt.

The emission levels cited above are only for engine operation with the fuels listed. Other fuels may not yield similar results.

Recent customer source testing has shown that AP-42 (EPA AP-42 "Compilation of Air Pollutant Emission Factors.") emission factors for natural gas are achievable in the field, when the test method recommendations shown below are followed. Historically, Solar did not recommend using AP-42 because while some source test firms have measured below AP-42 levels, others have measured higher. Because particulate matter emissions levels are highly dependent on the test firm and have very little to do with the turbine, Solar does not warrant AP-42 levels but does recognize they are achievable in the field. Customers generally choose a particulate matter emissions factor at or above the AP-42 level that works for their site permitting recognizing that the lower the emissions factor the higher the risk for source testing. Any Solar warranty on particulate matter would be at the recommended levels above, e.g. 0.015 lb/MMBtu (HHV) for natural gas.

Test Method Recommendation

Solar recommends that EPA Methods 201/201A[1] be used to measure the "front half". "Front half" represents filterable particulate matter.

EPA Method 202[2] (with nitrogen purge and field blanks) should be used to measure the "back half". "Back half" measurements represent the condensable portion of particulate matter.

EPA Method 5[3], which measures the front and back halves may be substituted (e.g. where exhaust temperatures do not allow the use of Method 202).

Testing should include three test runs of 4 hours each.

Solar recommends using the aforementioned test methods until more representative test methods are developed and made commercially available.

References

[1] EPA Method 201, Determination of PM10 Emissions, Exhaust Gas Recycle Procedure. EPA Method 201A, Determination of PM10 Emissions, Constant Sampling Rate Procedure, 40 CFR 60, Part 60, Appendix A.

[2] EPA Method 202, Determination of Condensible Particulate Emissions from Stationary Sources, 40 CFR 60, Part 60, Appendix A.

[3] EPA Method 5, Determination of Particulate Emissions from Stationary Sources, 40 CFR 60, Part 60, Appendix

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

C200 MicroTurbine
High-pressure Natural Gas

World's largest air-bearing microturbine produces 200kW of clean, green, and reliable power.

- Ultra-low emissions
- One moving part – minimal maintenance and downtime
- Patented air bearing – no lubricating oil or coolant
- 5 and 9 year Factory Protection Plans available
- Remote monitoring and diagnostic capabilities
- Integrated utility synchronization and protection
- Small, modular design allows for easy, low-cost installation
- Proven technology with tens of millions of run hours and counting
- Internal fuel gas compressor available for low fuel pressure natural gas applications

C200 MicroTurbine

Electrical Performance[1]

Electrical Power Output	200kW
Voltage	400–480 VAC
Electrical Service	3-Phase, 4 wire
Frequency	50/60 Hz, grid connect operation
	10–60 Hz, stand alone operation
Maximum Output Current	290A RMS @ 400V, grid connect operation
	240A RMS @ 480V, grid connect operation
	310A RMS, stand alone operation[2]
Electrical Efficiency LHV	33%

Fuel/Engine Characteristics[1]

Natural Gas HHV	30.7–47.5 MJ/m^3 (825–1,275 BTU/scf)
Inlet Pressure[3]	517–552 kPa gauge (75–80 psig)
Fuel Flow HHV	2,400 MJ/hr (2,280,000 BTU/hr)
Net Heat Rate LHV	10.9 MJ/kWh (10,300 BTU/kWh)

Exhaust Characteristics[1]

NOx Emissions @ 15% O_2[4]	< 9 ppmvd (18 mg/m^3)
NOx / Electrical Output[4]	0.14 g/bhp-hr (0.4 lb/MWhe)
Exhaust Gas Flow	1.3 kg/s (2.9 lbm/s)
Exhaust Gas Temperature	280°C (535°F)
Exhaust Energy	1,420 MJ/hr (1,350,000 BTU/hr)

Reliable power when and where you need it. Clean and simple.

Dimensions & Weight[5]

Width x Depth x Height[6]	1.7 x 3.8 x 2.5 m (67 x 150 x 98 in)
Weight – Grid Connect Model	2776 kg (6,120 lb)
Weight – Dual Mode Model	3413 kg (7,525 lb)

Minimum Clearance Requirements[7]

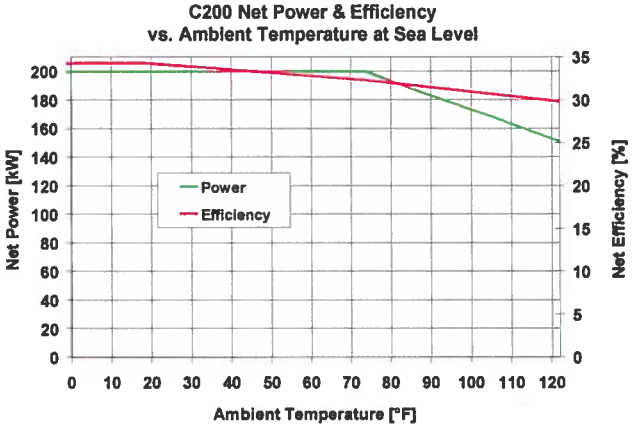
Vertical Clearance	0.6 m (24 in)
Horizontal Clearance	
Left & Right	1.1 m (42 in)
Front	1.1 m (42 in)
Rear	1.8 m (70 in)

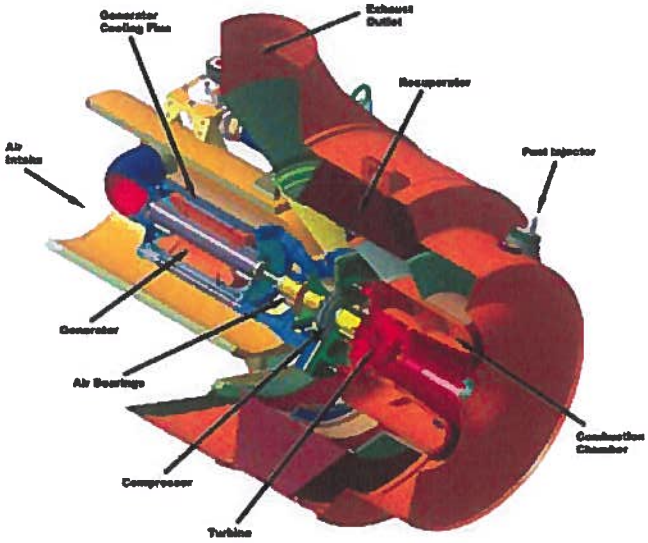
Sound Levels

Acoustic Emissions at Full Load Power	
Nominal at 10 m (33 ft)	65 dBA

Certifications

- UL 2200 and UL 1741 natural gas operation[8]
- Complies with IEEE 1547 and meets statewide utility interconnection requirements for California Rule 21 and the New York State Public Service Commission
- CE certified





(1) Nominal full power performance at ISO conditions: 59°F, 14.696 psia, 60% RH
(2) With linear load
(3) Inlet pressure for standard natural gas at 39.4 MJ/Nm³ (1,000 BTU/scf) (HHV)
(4) Emissions for standard natural gas at 39.4 MJ/Nm³ (1,000 BTU/scf) (HHV)
(5) Approximate dimensions and weight
(6) Height dimensions are to the roof line. Exhaust outlet extends at least 8 inches above the roof line
(7) Clearance requirements may increase due to local code considerations
(8) All natural gas models are planned to be UL Listed

Specifications are not warranted and are subject to change without notice.

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Technical Reference

Capstone MicroTurbine™ Systems Emissions

Summary

Capstone MicroTurbine™ systems are inherently clean and can meet some of the strictest emissions standards in the world. This technical reference is to provide customers with information that may be requested by local air permitting organizations or to compare air quality impacts of different technologies for a specific project. The preferred units of measure are "output based"; meaning that the quantity of a particular exhaust emission is reported relative to the useable output of the microturbine – typically in pounds per megawatt hour for electrical generating equipment. This technical reference also provides volumetric measurements in parts per million and milligrams per normal cubic meter. A conversion between several common units is also provided.

Maximum Exhaust Emissions at ISO Conditions

Table 1 below summarizes the exhaust emissions at full power and ISO conditions for different Capstone microturbine models. Note that the fuel can have a significant impact on certain emissions. For example landfill and digester gas can be made up of a wide variety of fuel elements and impurities, and typically contains some percentage of carbon dioxide (CO_2). This CO_2 dilutes the fuel, makes complete combustion more difficult, and results in higher carbon monoxide emissions (CO) than for pipeline-quality natural gas.

Table 1. Emission for Different Capstone Microturbine Models in [lb/MWhe]

Model	Fuel	NOx	CO	VOC (5)
C30 NG	Natural Gas (1)	0.64	1.8	0.23
CR30 MBTU	Landfill Gas (2)	0.64	22.0	1.00
CR30 MBTU	Digester Gas (3)	0.64	11.0	1.00
C30 Liquid	Diesel #2 (4)	2.60	0.41	0.23
C65 NG Standard	Natural Gas (1)	0.46	1.25	0.10
C65 NG Low NOx	Natural Gas (1)	0.17	1.30	0.10
C65 NG CARB	Natural Gas (1)	0.17	0.24	0.05
CR65 Landfill	Landfill Gas (2)	0.46	4.0	0.10
CR65 Digester	Digester Gas (3)	0.46	4.0	0.10
C200 NG	Natural Gas (1)	0.40	1.10	0.10
C200 NG CARB	Natural Gas (1)	0.14	0.20	0.04
CR200 Digester	Digester Gas (3)	0.40	3.6	0.10

Notes:

(1) Emissions for standard natural gas at 1,000 BTU/scf (HHV) or 39.4 MJ/m3 (HHV)
(2) Emissions for surrogate gas containing 42% natural gas, 39% CO2, and 19% Nitrogen
(3) Emissions for surrogate gas containing 63% natural gas and 37% CO2
(4) Emissions for Diesel #2 according to ASTM D975-07b
(5) Expressed as Methane

Table 2 provides the same output-based information shown in Table 1, but expressed in grams per horsepower hour (g/hp-hr).

Table 2. Emission for Different Capstone Microturbine Models in [g/hp-hr]

Model	Fuel	NOx	CO	VOC [5]
C30 NG	Natural Gas [1]	0.22	0.60	0.078
CR30 MBTU	Landfill Gas [2]	0.22	7.4	0.340
CR30 MBTU	Digester Gas [3]	0.22	3.7	0.340
C30 Liquid	Diesel #2 [4]	0.90	0.14	0.078
C65 NG Standard	Natural Gas [1]	0.16	0.42	0.034
C65 NG Low NOx	Natural Gas [1]	0.06	0.44	0.034
C65 NG CARB	Natural Gas [1]	0.06	0.08	0.017
CR65 Landfill	Landfill Gas [2]	0.16	1.4	0.034
CR65 Digester	Digester Gas [3]	0.16	1.4	0.034
C200 NG	Natural Gas [1]	0.14	0.37	0.034
C200 NG CARB	Natural Gas [1]	0.05	0.07	0.014
CR200 Digester	Digester Gas [3]	0.14	1.3	0.034

Notes: - same as for Table 1

Emissions may also be reported on a volumetric basis, with the most common unit of measurement being parts per million. This is typically a measurement that is corrected to specific oxygen content in the exhaust and without considering moisture content. The abbreviation for this unit of measurement is "ppmvd" (parts per million by volume, dry) and is corrected to 15% oxygen for electrical generating equipment such as microturbines. The relationship between an output based measurement like pounds per MWh and a volumetric measurement like ppmvd depends on the characteristics of the generating equipment and the molecular weight of the criteria pollutant being measured. Table 3 expresses the emissions in ppmvd at 15% oxygen for the Capstone microturbine models shown in Table 1. Note that raw measurements expressed in ppmv will typically be lower than the corrected values shown in Table 3 because the microturbine exhaust has greater than 15% oxygen.

Another volumetric unit of measurement expresses the mass of a specific criteria pollutant per standard unit of volume. Table 4 expresses the emissions in milligrams per normal cubic meter at 15% oxygen. Normal conditions for this purpose are expresses as one atmosphere of pressure and zero degrees Celsius. Note that both the ppmvd and mg/m3 measurements are for specific oxygen content. A conversion can be made to adjust either unit of measurement to other reference oxygen contents, if required. Use the equation below to convert from one reference oxygen content to another:

$$\text{Emissions at New } O_2 = \frac{(20.9 - \text{New } O_2 \text{ Percent})}{(20.9 - \text{Current } O_2 \text{ Percent})} \text{ X Emissions at Current } O_2$$

For example, to express 9 ppmvd of NOx at 15% oxygen to ppmvd at 3% oxygen:

$$\text{Emissions at 3\% } O_2 = \frac{(20.9 - 3.0)}{(20.9 - 15.0)} \text{ X } 9 = 27 \text{ ppmvd}$$

Table 3. Emission for Different Capstone Microturbine Models in [ppmvd] at 15% O2

Model	Fuel	NOx	CO	VOC
C30 NG	Natural Gas (1)	9	40	9
CR30 MBTU	Landfill Gas (2)	9	500	40
CR30 MBTU	Digester Gas (3)	9	250	40
C30 Liquid	Diesel #2 (4)	35	9	9
C65 NG Standard	Natural Gas (1)	9	40	7
C65 NG Low NOx	Natural Gas (1)	4	40	7
C65 NG CARB	Natural Gas (1)	4	8	3
CR65 Landfill	Landfill Gas (2)	9	130	7
CR65 Digester	Digester Gas (3)	9	130	7
C200 NG	Natural Gas (1)	9	40	7
C200 NG CARB	Natural Gas (1)	4	8	3
CR200 Digester	Digester Gas (3)	9	130	7

Notes: same as Table 1

Table 4. Emission for Different Capstone Microturbine Models in [mg/m3] at 15% O2

Model	Fuel	NOx	CO	VOC (5)
C30 NG	Natural Gas (1)	18	50	6
CR30 MBTU	Landfill Gas (2)	18	620	30
CR30 MBTU	Digester Gas (3)	18	310	30
C30 Liquid	Diesel #2 (4)	72	11	6
C65 NG Standard	Natural Gas (1)	19	50	5
C65 NG Low NOx	Natural Gas (1)	8	50	5
C65 NG CARB	Natural Gas (1)	8	9	2
CR65 Landfill	Landfill Gas (2)	18	160	5
CR65 Digester	Digester Gas (3)	18	160	5
C200 NG	Natural Gas (1)	18	50	5
C200 NG CARB	Natural Gas (1)	8	9	2
CR200 Digester	Digester Gas (3)	18	160	5

Notes: same as Table 1

The emissions stated in Tables 1, 2, 3 and 4 are guaranteed by Capstone for new microturbines during the standard warranty period. They are also the expected emissions for a properly maintained microturbine according to manufacturer's published maintenance schedule for the useful life of the equipment.

Emissions at Full Power but Not at ISO Conditions

The maximum emissions in Tables 1, 2, 3 and 4 are at full power under ISO conditions. These levels are also the expected values at full power operation over the published allowable ambient temperature and elevation ranges.

Emissions at Part Power

Capstone microturbines are designed to maintain combustion stability and low emissions over a wide operating range. Capstone microturbines utilize multiple fuel injectors, which are switched on or off depending on the power output of the turbine. All injectors are typically on when maximum power is demanded, regardless of the ambient temperature or elevation. As the load requirements of the microturbine are decreased, injectors will be switched off to maintain stability and low emissions. However, the emissions relative to the lower power output may increase. This effect differs for each microturbine model.

Emissions Calculations for Permitting

Air Permitting agencies are normally concerned with the maximum amount of a given pollutant being emitted per unit of time (for example pounds per day of NOx). The simplest way to make this calculation is to use the maximum microturbine full electrical power output (expressed in MW) multiplied by the emissions rate in pounds per MWhe times the number of hours per day. For example, the C65 CARB microturbine operating on natural gas would have a NOx emissions rate of:

NOx = .17 X (65/1000) X 24 = .27 pounds per day

This would be representative of operating the equipment full time, 24 hours per day, at full power output of 65 kWe.

As a general rule, if local permitting is required, use the published agency levels as the stated emissions for the permit and make sure that this permitted level is above the calculated values in this technical reference.

Consideration of Useful Thermal Output

Capstone microturbines are often deployed where their clean exhaust can be used to provide heating or cooling, either directly or using hot water or other heat transfer fluids. In this case, the local permitting or standards agencies will usually consider the emissions from traditional heating sources as being displaced by the useful thermal output of the microturbine exhaust energy. This increases the useful output of the microturbine, and decreases the relative emissions of the combined heat and power system. For example, the CARB version C65 ICHP system with integral heat recovery can achieve a total system efficiency of 70% or more, depending on inlet water temperatures and other installation-specific characteristics. The electric efficiency of the CARB version C65 microturbine is 28% at ISO conditions. This means that the total NOx output based emissions, including the captured thermal value, is the electric-only emissions times the ratio of electric efficiency divided by total system efficiency:

NOx = .17 X 28/70 = .068 pounds per MWh (based on total system output)

This is typically much less than the emissions that would result from providing electric power using traditional central power plants, plus the emissions from a local hot water heater or boiler. In fact microturbine emissions are so low compared with traditional hot water heaters that installing a Capstone microturbine with heat recovery can actually decrease the local emissions of NOx and other criteria pollutants, without even considering the elimination of emissions from a remote power plant.

Greenhouse Gas Emissions

Many gasses are considered "greenhouse gasses", and agencies have ranked them based on their global warming potential (GWP) in the atmosphere compared with carbon dioxide (CO_2), as well as their ability to maintain this effect over time. For example, methane is a greenhouse gas with a GWP of 21. Criteria pollutants like NOx and organic compounds like methane are monitored by local air permitting authorities, and are subject to strong emissions controls. Even though some of these criteria pollutants can be more troublesome for global warming than CO_2, they are released in small quantities – especially from Capstone microturbines. So the major contributor of concern is carbon dioxide, or CO_2. Emission of CO_2 depends on two things:

1. Carbon content in the fuel
2. Efficiency of converting fuel to useful energy

It is for these reasons that many local authorities are focused on using clean fuels (for example natural gas compared with diesel fuel), achieving high efficiency using combined heat and power systems, and displacing emissions from traditional power plants using renewable fuels like waste landfill and digester gasses.

Table 5 shows the typical CO_2 emissions due to combustion for different Capstone microturbine models at full power and ISO conditions. The values do not include CO_2 that may already exist in the fuel itself, which is typical for renewable fuels like landfill and digester gas. These values are expressed on an output basis, as is done for criteria pollutants in Table 1. The table shows the pounds per megawatt hour based on electric power output only, as well as considering total useful output in a CHP system with total 70% efficiency (LHV). As for criteria pollutants, the relative quantity of CO_2 released is substantially less when useful thermal output is also considered in the measurement.

Table 5. CO_2 Emission for Capstone Microturbine Models in [lb/MWh]

Model	Fuel	CO_2	
		Electric Only	70% Total CHP
C30 NG	Natural Gas (1)	1,690	625
CR30 MBTU	Landfill Gas (1)	1,690	625
CR30 MBTU	Digester Gas (1)	1,690	625
C30 Liquid	Diesel #2 (2)	2,400	855
C65 NG Standard	Natural Gas (1)	1,520	625
C65 NG Low NOx	Natural Gas (1)	1,570	625
C65 NG CARB	Natural Gas (1)	1,570	625
CR65 Landfill	Landfill Gas (1)	1,520	625
CR65 Digester	Digester Gas (1)	1,520	625
C200 NG	Natural Gas (1)	1,330	625
C200 NG CARB	Natural Gas (1)	1,330	625
CR200 Digester	Digester Gas (1)	1,330	625

Notes:

(1) Emissions due to combustion, assuming natural gas with CO_2 content of 117 lb/MMBTU (HHV)

(2) Emissions due to combustion, assuming diesel fuel with CO_2 content of 160 lb/MMBTU (HHV)

Useful Conversions

The conversions shown in Table 6 can be used to obtain other units of emissions outputs. These are approximate conversions.

Table 6. Useful Unit Conversions

From	Multiply By	To Get
lb/MWh	0.338	g/bhp-hr
g/bhp-hr	2.96	lb/MWh
lb	0.454	kg
kg	2.20	lb
kg	1,000	g
hp (electric)	.746	kW
kW	1.34	hp (electric)
MW	1,000	kW
kW	0.001	MW

Definitions

- ISO conditions are defined as: 15 °C (59 °F), 60% relative humidity, and sea level pressure of 101.3 kPa (14.696 psia).
- HHV: Higher Heating Value
- LHV: Lower Heating Value
- kW_{th}: Kilowatt (thermal)
- kW_e : Kilowatt (electric)
- MWh: Megawatt-hour
- hp-hr: horsepower-hour (sometimes referred to as "electric horsepower-hour")
- Scf: Standard cubic foot (standard references ISO temperature and pressure)
- m3: Normal cubic meter (normal references 0 °C and one atmosphere pressure)

Capstone Contact Information

If questions arise regarding this technical reference, please contact Capstone Turbine Corporation for assistance and information:

Capstone Applications

Toll Free Telephone: (866) 4-CAPSTONE or (866) 422-7786

Fax: (818) 734-5385

E-mail: applications@capstoneturbine.com

ATTACHMENT O

Monitoring/Recordkeeping/Reporting/Testing Plans

ATTACHMENT O - MONITORING, RECORDING, REPORTING, AND TESTING PLANS

Plan Type	Emission unit	Pollutant	Requirements	Frequency	Method of Measurement	Regulatory Reference
Monitoring, Recordkeeping	Compressor Turbines S001, S002	NO_X	Performance test	Annual	EPA Test Methods	NSPS KKKK
Monitoring	Compressor Turbines S001, S002		Amount of natural gas consumed, hours of operation	Monthly	N/A	
Monitoring, Recordkeeping	Liquid Loading (S019)	VOC	Monitor throughput of loading	Monthly	Records	

See Attachment D for additional information.

ATTACHMENT P

Public Notice

AIR QUALITY PERMIT NOTICE
Notice of Application

Notice is given that Mountain Valley Pipeline, LLC (MVP) has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a construction permit (R-13) to construct a new natural gas transmission compressor station (Stallworth Station) located on Dawson-Springdale Rd about 5 miles east of Meadow Bridge in Fayette County, West Virginia. The site latitude and longitude coordinates are: 37.86801 N, -80. 75776 W.

The applicant estimates the potential increase in the following Regulated Air Pollutants associated with the project after the installation of the proposed equipment:

Particulate Matter (PM) = 20.30 tpy
Sulfur Dioxide (SO2) = 4.74 tpy
Volatile Organic Compounds (VOC) = 13.46 tpy
Carbon Monoxide (CO) = 91.28 tpy
Nitrogen Oxides (NOx) = 79.84 tpy
Hazardous Air Pollutants (HAPs) = 4.53 tpy
Carbon Dioxide Equivalents (CO_2e) = 169,866 tpy

Startup of operation will begin around the 4th quarter of 2017. 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 1250, during normal business hours.

Dated on October XX, 2015.

By: Mountain Valley Pipeline, LLC.
Shawn Posey, Senior Vice President – Engineering and Construction
625 Liberty Avenue Suite 1700
Pittsburgh, PA 15222